

Squeaking starter

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If you have a BMW R1150 and hear a squeaking noise a second or two after the engine has started, you might have a Squeaking Starter. Fixing it is relatively simple. In many cases you will need a puller (a tool) to assemble your bike afterwards. A detailed description of the puller is offered. However, you might not need it. No other special tools are needed. Procedure will take about two hours in the worst case.

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Please notice that this guide has been written by a professor in computer science with no formal training in mechanics. It describes a procedure he applied on his own bike, one fine Friday afternoon, in Tuscany, after a decent lunch. It is offered here solely for entertainment purposes. As this guide includes forward-looking statements such as “believe,” “estimate,” “anticipate,” “plan,” “predict,” “may,” “hope,” “can,” “will,” “should,” “expect,” “intend,” “is designed to,” “with the intent,” “potential,” the negative of these words and such other variations thereon, and also comparable terminology, you are advised to obtain legal council before basing any actions or decisions on this guide.



One fine morning you might notice that you noticed something that you have, in fact, noticed for quite some time, but not noticed that you have noticed it. When you start the bike, after the starter has cranked the engine for a few seconds, and ~~it~~ the engine fires and starts, then you hear a squeaking noise (metal against metal, teeth grinding). It only lasts for a second. Maybe two. You get nervous. You say to yourself: *Was this noise here earlier? Is something very wrong? Will my bike die? Will I die?*

What you are hearing is the “Squeaking Starter”. Simply stated, the facts are:

- Yes, you will die, but not from this.
- Yes, your bike will probably also die, but not from this.
- If you are able to both read (this article) and ride (your vision is OK and you have nimble fingers), you are capable of fixing it yourself. Since you ride a bike and want to reward yourself with another accomplishment here is how to proceed.

This guide uses a 2000 BMW R1150GS. I have been told that all R1150s are the same in this respect, but I have not verified this. Proceed carefully and verify these instructions with your own bike.

If you have other types of problems with the starter, this guide can help you to disassemble the starter for further repair. Additional repairs are not covered (at all).

The source of the terrible sound is dirt and dust which has clogged a moving part within the starter. Here is a (brief) outline of the procedure that should work:

1. Lift (no need to remove) the tank to disconnect the battery
2. Remove the starter and remove the upper half. You can try to clean and grease the starter without further disassembly. It might be sufficient in many cases. In fact, Google will tell you that this will be sufficient in most cases. If it works for you, you put back the upper half, re-mount the starter and you will be back on the road after 20 minutes. Furthermore, if you do not have (access to) a puller, this is as far as you will want to venture!
3. If you do have access to a puller... disassemble the starter gear. In almost all cases, this will be sufficient to solve the Squeaking Starter problem. Grease, assemble, and install. You'll be back on the road in two hours.

To re-assemble the starter gear you will need a *puller* (that is, if you proceed with step 3 you need a *puller* to get back on the road). More details on this tool later. Or, in other words: If you don't have (access to) a puller, do not disassemble the starter gear.

Here is a list of the tools I used:

- Torx T-20
- Torx T-25
- Allen wrench 10 mm and 13 mm
- 6 mm hex. Two versions are discussed
- A small, flat screw driver that you are willing to destroy
- Small hammer (used to destroy the screw driver)
- A pair of pliers
- A pair of scissors or wire cutters (to cut a plastic strip)
- A plastic (nylon) strip/tie.
- Torque wrench for 20 NM
- 6 mm hex that can attach to the torque wrench

- An extender that you can find in the stock tool kit of your bike (that is, below the passenger seat). A picture is provided to help you find the right one.
- A puller

The puller might not be needed; read the whole story and see for yourself. But if you need it, there is no way to manage without one. But please read on.

This guide shows the procedure in great detail. Perhaps too much detail for an experienced mechanic. But the purpose of the guide is to give all riders, even those who feel somewhat mechanically-challenged, the courage to just DO IT.

Part one – Lifting the tank

As the starter has a wire attached directly to the battery, you must lift the tank and disconnect the battery before trying to remove the starter. If you don't disconnect the power from the battery you might severely damage your bike, and you might severely injure yourself.

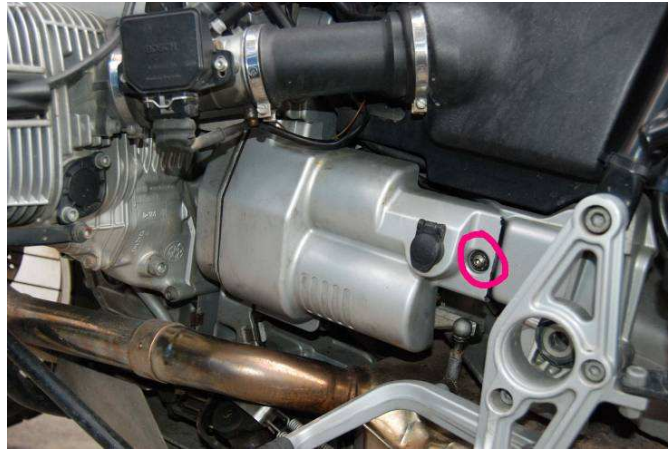


To lift the tank, you carefully remove the black plastic cover on the right hand side of the bike. This will reveal, among other things, a 6 mm hex bolt. With your fingers feel for the back nut, unscrew the bolt and withdraw the nut and then the bolt. Carefully move the tank backward a few centimeters, and then lift the rear (not the front!) up about 20 cm. Insert a piece of wood to support the tank as shown on the picture above. Pay attention to the fact that if the tank falls while you have your fingers below its scissors-like edge, your fingers might take a real beating. Make sure this doesn't happen!

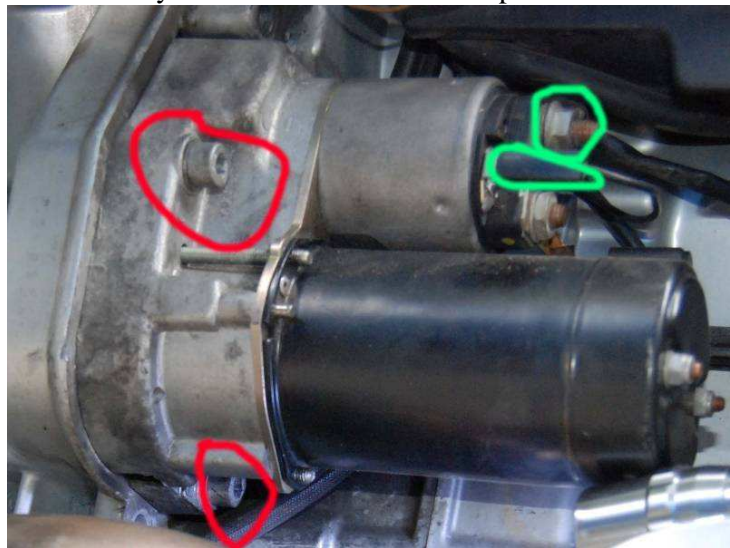
It is an advantage, but not strictly necessary, to use wood from a cherry tree. There is no functional difference between different types of woods, but cherry is the by far most beautiful and *beauty adds life*. Oh well.

In the photo above, the bolt that secures the tank is shown in red. The negative pole of the battery, which is the one you will want to disconnect, is shown in green.

Part two – Removing the starter



The starter is located behind a plastic shield found on the left-hand side of the bike. The cover is attached with a single T-25 Torx. After having removed the screw, move the cover slightly backward to disconnect the front. Detach the cable and remove the cover. What you will see is shown in the picture below.



After making sure your battery is disconnected, use a 13mm Allen wrench to remove the nut holding the upper of the two cables. Pull off the thin electrical wire shielded by the black plastic. They are both marked in green in the picture above.

Try to slide the big wire off the bolt. This might not be possible. If not, you need to cut the strip/tie holding the wires together above and behind the starter. Use a pair of scissors or wire cutters. Be careful not to cut a wire.

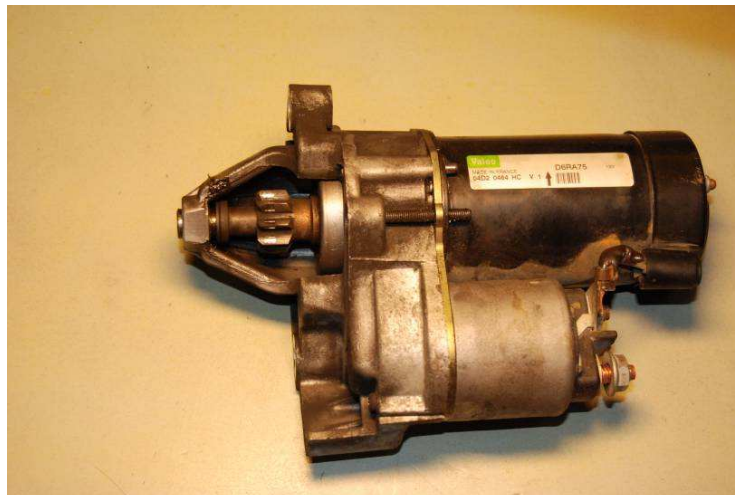
The starter is attached by means of two 6 mm hex head bolts. These two bolts are marked in red above. The lower bolt has limited space around it. You have three options, two of which are pictured below.



The dirty solution is to insert a simple 6mm hex (the lower tool shown above) and use a pair of pliers to turn it. This works (I did it the first time I cleaned my starter – what is documented here is a second removal in order to take pictures and write this guide) but it really sucks. In particular because when you need to tighten the bolt afterwards, you have no idea of how much force you are using. The correct way is to use a 6mm hex head socket, a swivel joint and an extension; you will need the swivel joint because you need to get to it at an angle. But, as I said, you can use the simple approach if you want.

The third option is to remove the left foot peg. This should (Note: this is a typical forward-looking statement) give ample access also to the lower bolt. I have not tried it as I used a swivel joint instead.

After having removed the two bolts, you should be able to wiggle the starter, and get it off. It looks like this.

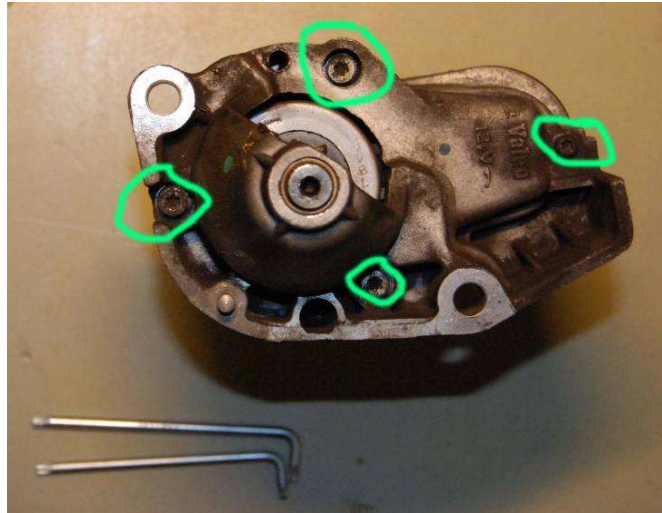


It is unlikely that your starter will be as clean as this one.

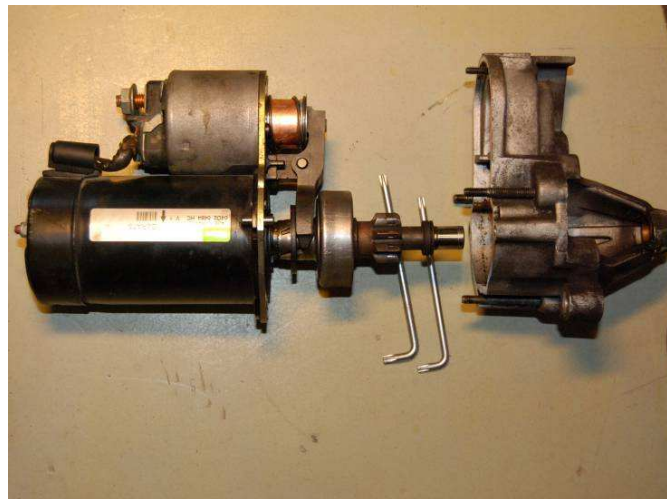
Part three – Disassemble the starter

This part consists of two parts: Removing the upper half of the starter, and disassembly the starter gear. Putting everything back together without a puller can be done as long as you do not disassembly the starter gear.

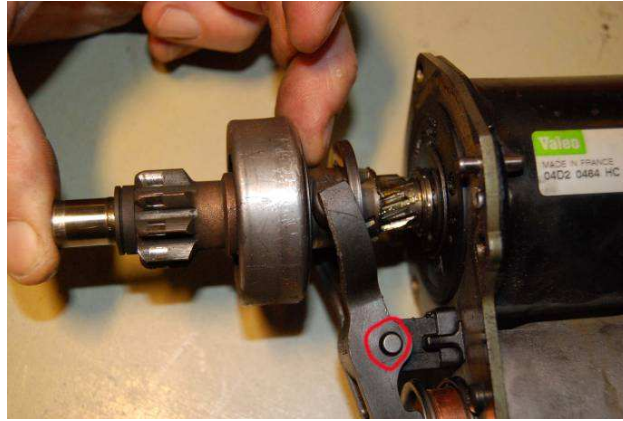
The upper half of the starter is attached with four torx head screws. Three are T-25 and one is T-20 (oh, how convenient)



The picture also shows the two torx-keys I used. A few more minutes, and we are done.



At this point we are in many cases able to fix the problem with the Squeaking Starter. We have not disassembled the part that requires the puller in order to be assembled. But let us look at the problem. Below is a close-up of the problem area; notice the pin that I have marked with red. It will fall out; try not to loose it!



Notice that this particular starter was recently cleaned. Yours will probably be *a lot* dirtier. Now, it works like this: when you press the start button, the starter gear (that's the thing on which I hold my index finger) will be forced to the left (the way I hold it). When you let go of the starter button, the gear should snap back to disengage from the flywheel. The cause of the Squeaking Starter is the shaft gets clogged with old oil and dust and the starter gear doesn't move away quickly enough.

Pull the starter gear all the way to the left and let go. It should snap back by itself. If it doesn't you are looking at the cause of the Squeaking Starter. If it does snap back without resistance, you most likely have some other problem with your bike. Put the starter back in (see below how to do it properly!), take your bike to your dealer.

Depending on the amount of dirt you find, and your willingness to live with a half-baked solution, you can simply clean the parts you can manage to reach. Use compressed air and solvent to try to get at what you can, and then grease the shaft and gear on the right with silicone grease. Be careful with the solvent – you don't want it to fill the starter itself. When satisfied, you re-install the starter and you're one happy rider.

Far better results, however, can be obtained by removing the starter gear from the shaft and cleaning all of it properly.

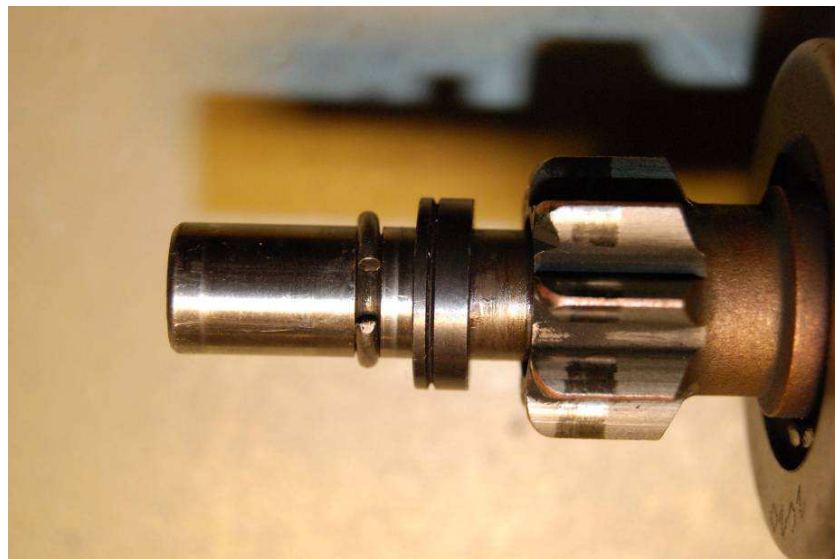
Before proceeding beyond this point, please make sure you have access to a suitable *puller*. Details about it can be found below. You need the puller to pull the starter gear together again after you are done cleaning it.

You don't need to own one as you can take your starter to a shop to have it pulled together. In fact, if you would like to proceed but don't not feel competent to use a puller, then go to a shop (any mechanical shop will do) and ask them if you can bring a starter that needs to be pulled together. When they say yes, you run home and take the starter gear apart. I bought my puller because I really wanted to clean the starter properly. It set me back a mere 18 euro (in the currency favored in the New Colonies this would amount to about 26 so called dollars) – nothing compared to the joy of putting my starter back together all by myself! It is worth noting that I almost failed; my puller is slightly too large. You, on the other hand, should get a smaller puller than the one I got, because you have a guide. Good for you! Rest assured, I'll point out why my puller was too large.

The reason the starter gear doesn't fly off to the shaft is due to a *bushing*. To remove the bushing you'll need to force it down the shaft. One way is to use the extender you'll find in the tools that comes with your bike – but any tube will do. That particular extender from the tool box is shown in the picture below. Before grabbing a random tube and hitting it, read on to learn more of the details.



You hold the starter with the shaft pointing upwards, slide the extender down on the shaft so that it rests on the bushing. The pipe must not be too small – there must be some room between the shaft and the pipe (for reasons that will be apparent in a few moments). Carefully use a *small* hammer and tap the extender. The bushing didn't slide down? Well, tap it again using a little more force. After five wimpy tries, you'll give it a real knick, and off it comes! But be careful!



When the bushing slides down, it will reveal a small steel ring loosely set in a groove on the shaft, this ring retains the bushing and not surprisingly is called a *retaining ring*. We now understand how this design works. The bushing is slightly smaller than the sum of the shaft (minus the groove) and the retaining ring. Thus then the bushing is forced over the retaining ring, they are stuck together. Now you can see

why the pipe must not be too tight on the shaft: There must be room for the retaining ring between the inside of the tube and the shaft.

Get your small, flat screwdriver. Carefully get the retaining ring out of the groove, and off. You will have to open it somewhat, but do not open it fully - just enough to get it upwards and off. It is quite stiff, but since you need to reuse the ring, be careful. Here they are, together with the screwdriver that doesn't like to be used for this purpose. Notice that the bushing is placed as it was on the shaft when the shaft pointed upwards. Notice that there is a groove also inside the bushing.



When you look at the picture above, you'll see that I had to widen the retaining ring to get it off. I used a pair of pliers to carefully force it back to its "circular" normal form. But don't make it too small because then you'll won't get it back on the shaft.

And here are all the parts:



Now is the time to clean and grease. Look for any damages and excessive wear. The copper cylinder (it is called the solenoid) should not be greased, where it slides in. But clean it and make sure it slides properly.

Now, the big black part on the left on the picture above can also be taken apart; the electrical motor is inside. However, we will not cover that operation here. It is more complex and your Squeaking Starter will be cured by the work you have already done.

It is now time for a proper Tuscan lunch. Then a pennichella (nap), a glass of water, an espresso, and we'll be back in two hours. Boun appteito.

Part four – assemble the starter

When everything is clean, greased (but not too much), you assemble the parts by sliding on the starter gear, attach the solenoid and the lever (and the little pin that will continue to fall out), followed by the bushing orientated with the opening facing up, and finally the retaining ring. Of course, getting the retaining ring on is the hardest part. You want it to be as small as possible to fit nicely into the groove, while as big as possible to slide on the shaft without you having to use too much force. But sooner or later, you'll get it ready. Now attach the puller as shown in the picture below. The idea is to put gentle force on the bushing while you work on the retaining ring to force it into the groove. Slowly increase the force while you use the flat screw driver to gently tap on the retaining ring to try to force it into the groove. My advice: Study the two grooves, the inside of the bushing, and the retaining ring in detail before you start. Make sure you understand how "shrinking" the retaining ring will make it possible to slide the bushing over it (where it will become stuck). A good understanding of how the three parts work together will make you understand how to work with your screw driver and *little* hammer.



My puller (for the sake of completeness: The puller is the blue thing you see above) is slightly too large. If you look at detail inside the red ring, you will see that there is barely room for the puller between the starter gear and the lever. The problem is that the "arms" of the puller are too big. But I managed, and so will you (typical forward-looking statement).

Put on the housing and screw in the four bolts. There is no specific torque. Don't over-do it. Put the starter back in place, and torque the two bolts to 20 Nm. Again the

lower one is the problem (unless you have removed the foot peg). Here is how I did it (before attaching the torque wrench)



Attach the cable to the upper bolt and torque to 10 Nm, slide on the plastic-covered wire, attach the 12V auxiliary to the plastic cover and attach the screw to hold the plastic cover. Attach the battery cable and lower the tank, while being very careful with all cables and tubes. Do not forget to put back the bolt holding the tank.

Before starting, turn the throttle all the way to reset the so called Throttle Position Sensor, then start.

If your eyes glaze over due to excessive joy when you hear (or fail to hear, depending on your point of, well, hearing) that your starter is no longer Squeaking, refrain from riding before your vision has been fully restored.