

“STUFF” HAPPENS

True Quality Takes Time



BY BOB THOMAS

Nobody is perfect. No matter how hard you, your employees or I myself try, mistakes will be made. That is a fact that every business owner must accept and be prepare for. Our best hope is to make them as few and far between as humanly possible and handle them properly when they do happen.

That said, I had two different alternators delivered to me recently that were verified OK but claimed by end users to not work properly on their vehicles. The fact that both happened to have been factory remanufactured by large production rebuilders under respected name brands should not make any of us feel any better. I present these cases here not to condemn or embarrass anyone, but to emphasize that this can happen to any of us, whenever we cut corners to save time.

CASE 1 – 7706JA Leece Neville

This alternator was purchased by a local shop from a trusted supplier and sold to a friend of mine who operates a Snap-On dealership. He is nearing retirement and using an older truck, which should be obvious by the alternator. Having worked on this particular truck personally since it was new and more than a few times, I know that he needs around 100 amps at high idle to operate three AC condenser cooling fans, two AC blower fans and the inside product display lighting. This alternator, conservatively rated at 165 amps was designed do that, but the regulator is nearly full fielding when it does.

Once installed, it appeared to be charging normally but was never tested at idle under load. On the job, it failed to keep up when parked for long periods at high idle. He returned it to the seller who bench tested the alternator, said it was working OK and handed it back to him. This happened twice, before he called me for help.

When I bench tested the alternator, it did put out 165 amps at high speed, but only managed about 50 amps at a high idle. I noticed that the scope pattern looked a little strange too, unlike any pattern I'd ever seen before. Output noise sounded normal. I knew immediately that the low end output was not normal and frankly suspected too much air gap or the wrong rotor, dismissing the scope pattern as an anomaly. I pressured my friend to return for it a third time, offering to intervene on his behalf with the shop's owner and his supplier. I was familiar with both of them. But he begged me to fix it for him. He said that he no longer trusted the shop that he bought it from and vowed he would never go back there. I could see his point and agreed to look inside.

What I found is what you saw on the front cover of this issue. Did you notice what was wrong with the picture? I am not referring to the bare spot on the rectifier lead wire. That was not the main problem. Look again at the cover. I will give you a few hints. I have no idea how this alternator ever put out 165 amps on the top end. And the scope pattern looked strange even though the diodes were brand new and good. If you still do not see it, drop me an email or give me a call. Do not be ashamed. It took me longer than I would like to admit to see it myself.

This mistake could have been made by anyone of us. But

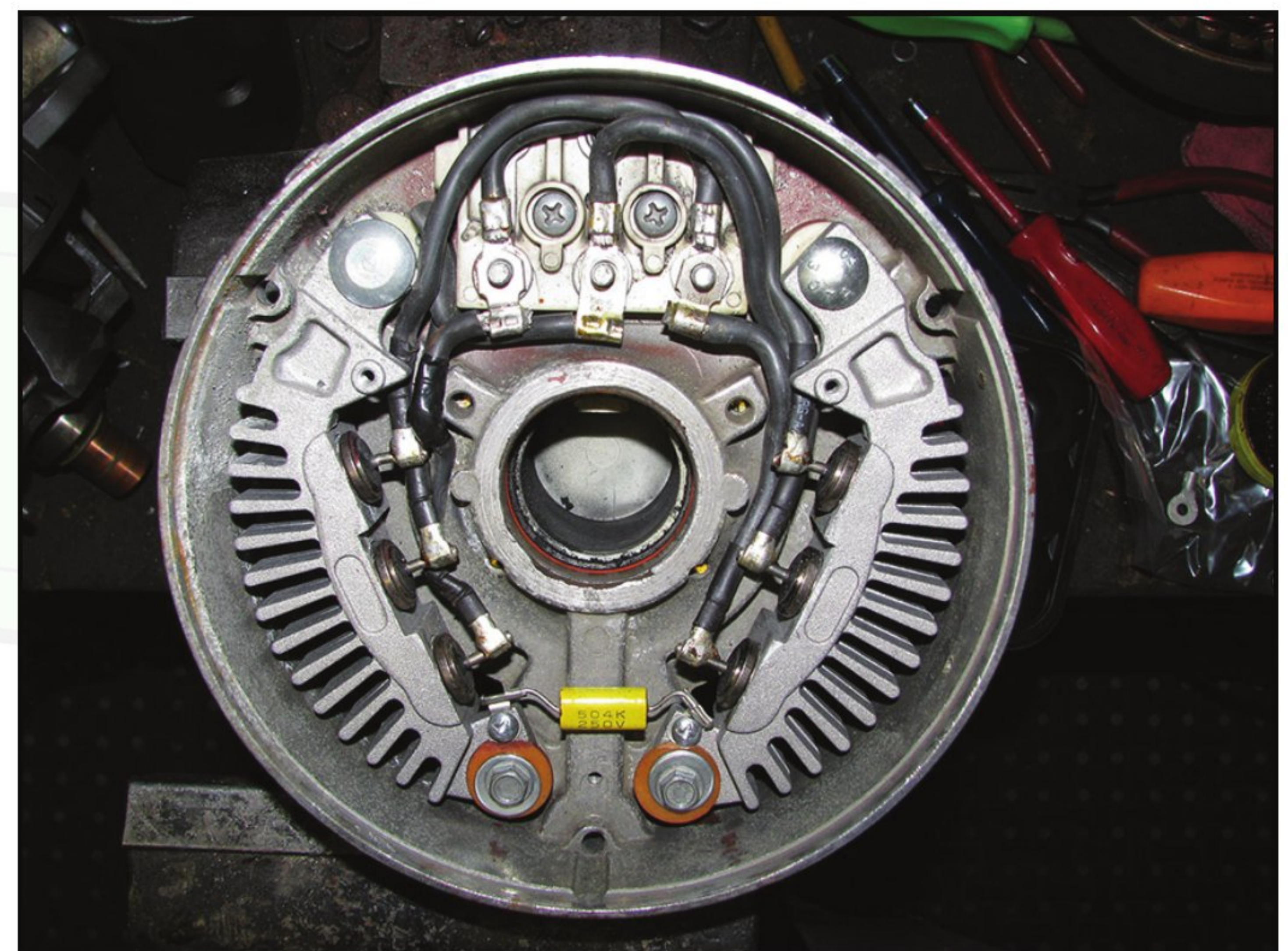


Figure 1 – This photo shows the Leece Neville slip ring end housing assembly once the repairs were made.

what bothers me most is that it was tested at least three times, once by the remanufacturer and twice by the local shop. It was passed as being OK three times. Here is one more hint for you (see Figure 1). That photo was taken after the repair was made.

CASE 2 – Ford Focus 6G

A few months ago, a friend of a friend shipped me an alternator that was causing voltage fluctuations on the Ford Focus in which it had been installed. The technician who sent it to me wanted confirmation that the issue was within the alternator and not something else on the vehicle. He suspected a bad regulator. It had tested fine for the parts store from which he bought it.

Upon bench testing this 6G Ford, I confirmed that the problem was indeed inside the alternator. At first, it performed perfectly at various speeds and loads. I was able to adjust voltage both high and low using Regitar's PWM (pulse width modulated) signal test box. Then I let it run at low speed and a 14.5 volt setting under a moderate load of 50 amps, forcing the regulator to carry a high field load. After about 10 minutes of operation, I noticed the voltage reading began to fluctuate between 15.0 and 15.6 volts.

Having seen pulsing voltage like this before, I knew that it would be visible in the instrument lighting at night, which was the Focus owner's exact complaint. That single extra volt may seem minimal but it can be obvious under the right conditions to a driver.

The question was now coming down down to finding the cause. Unlike the tech, I never suspected the regulator although I knew that anything was indeed possible. As you know, Ford's 6G regulator is attached to the rectifier with three 4mm torx-head screws (see Figure 2). One of them is regulator ground. Another is regulator B+ and the third is the phase (stator output) connection. The topic of these screws becoming loose has been covered previously in print publications, the ERA Website Forums and several seminars. But evidently it is still a problem. The ground screw in particular can become

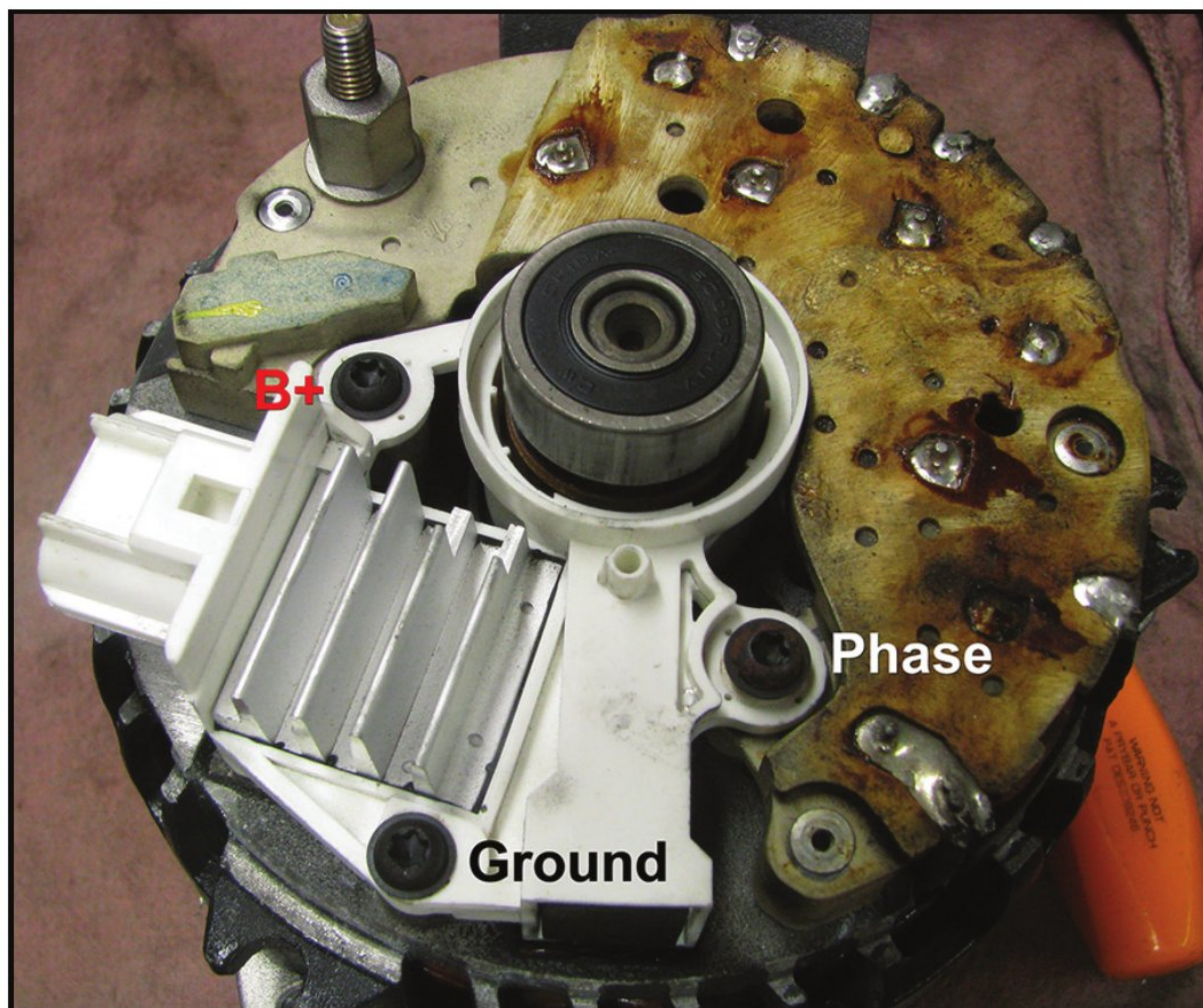
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Figure 2 – This is the remanufactured Ford 6G with the rear housing removed. It was on the Focus one week.



Figure 3 – This is a close up photo of the pitting on the surface of the regulator's ground side mounting post.



Figure 4 – Here you can clearly see arcing on the regulator's ground tab, caused by a loose mounting screw.

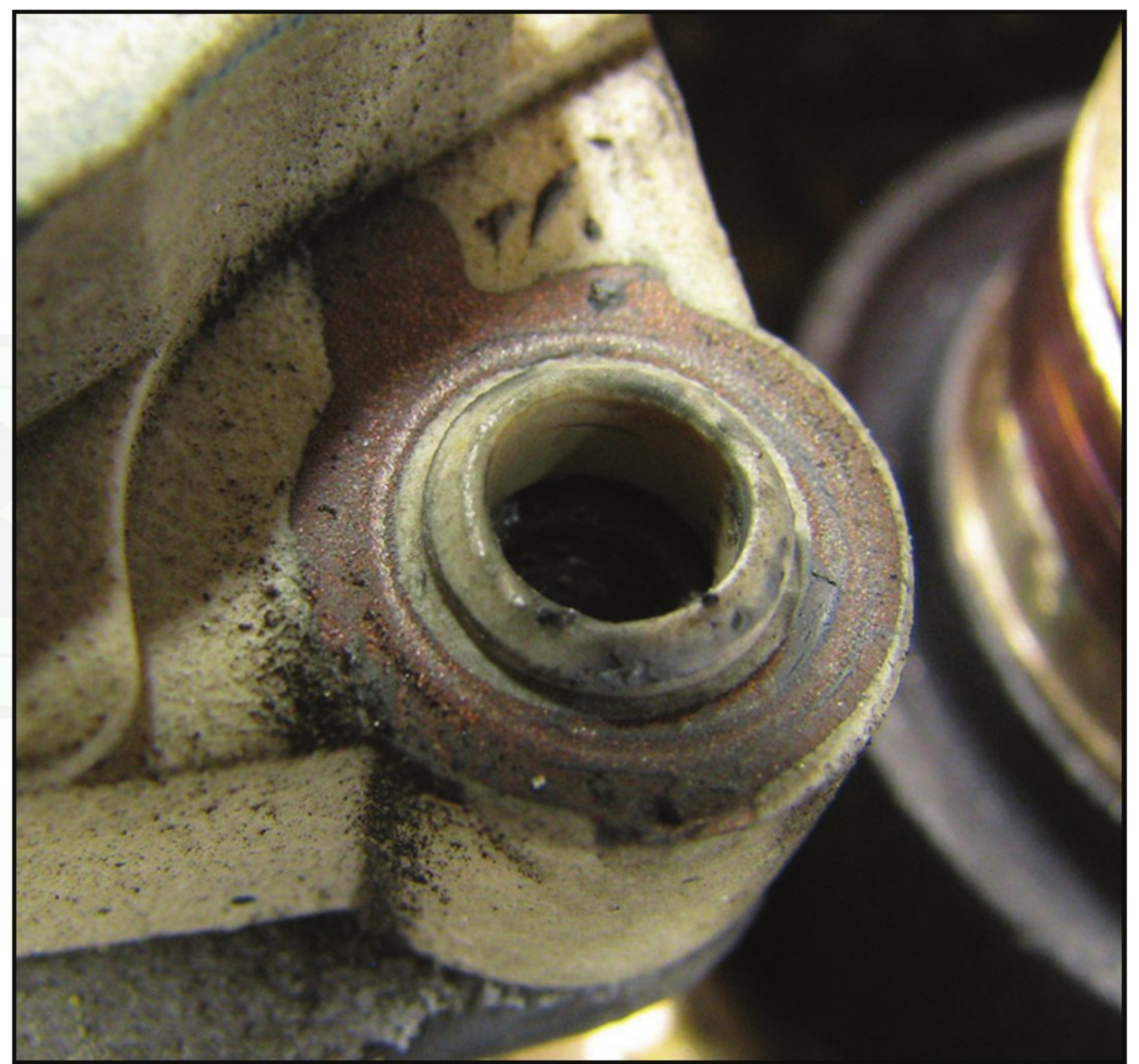


Figure 5 – The corrosion on the regulator's B+ contact on the rectifier indicates that it was never cleaned properly.

loose or the plastic regulator housing may relax enough under high heat to allow it to become loose. Since this is an A-circuit regulator, that ground connection must carry the full load of the rotor. So under full electrical load at low speed in particular, you are talking about passing 6 to 8 amps through a loose ground.

This regulator also depends upon that ground to sense output voltage directly from the rectifier. So resistance on that ground connection under load will fool the regulator into sensing voltage that is lower than the rectifier's actual output voltage. When that happens, the regulator will compensate, which results in momentary overcharging. Once the regulator eventually senses the target voltage it cuts back, which cause voltage to drop and the cycle starts all over again. What led me to suspect that? It was overcharging once the pulsing started, even at the low point of the cycle.

Since this was a name brand factory remanufactured alternator, I did not want to violate the warranty policy. Before going forward, I asked the technician for his permission to investigate further to confirm what I suspected. In this case he was eager to know the facts not my theory. He gave me the go ahead to remove the rear housing to get to the regulator.

Once inside, I found several problems that included a loose ground. For the record, this alternator was on the car for just one week before being brought back by the owner.

The first thing that I noticed was that the reclaimed rectifier was dirty and pitted. Though not the cause of the pulsing voltage, this short cut did reflect back on the quality control of the remanufacturer. When removing the regulator hold-down screws I noticed that the ground was loose and B+ was not as tight as it should have been either. Once the regulator was out of the way, I took a close look at the regulator's ground pad on the rectifier (see Figure 3). Obviously, this level of pitting took a lot longer than a week to develop. A close look at the regulator's

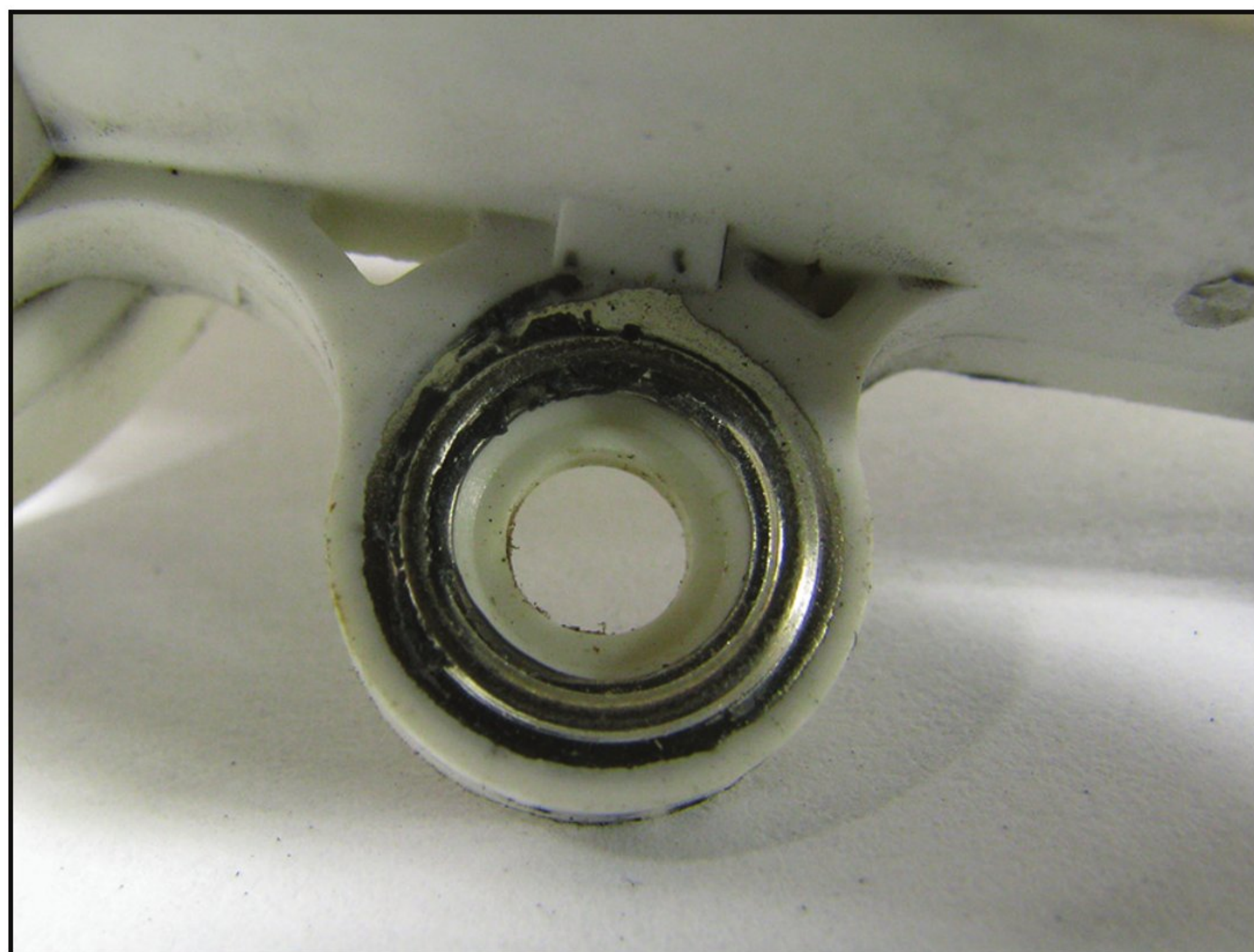
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Figure 6 – Here you can see residue from the rectifier contact on the regulator's B+ tab. Note that there are no signs of arcing.

ground tab revealed some arcing had been taking place at that connection (see Figure 4). While the loose ground screw was the primary cause of the customer's complaint, the pitted ground pad on the rectifier invited further corrosion that would have occurred eventually, even if the screws had been tightened properly.

Upon checking the B+ pad on the rectifier (see Figure 5), I noticed that it too was corroded, so much so that it was likely never cleaned at all. There was dirt and corrosion debris on the new regulator's B+ tab (see Figure 6), although there were no signs of arcing there. This B+ connection on a 6G is the source of field current, so it too must also be capable of carrying that 6 to 8 amps of potential rotor current.

The sad fact here is that this rectifier was fully functional and could have been reclaimed successfully with a proper cleaning and resurfacing of the regulator's ground pad. While I can excuse the parts store for not operating this alternator under load long enough to get the problem to arise, I would be embarrassed if this alternator had been a product of my business.

A few simple lessons can be learned from all of this. Do not take shortcuts when reclaiming good used parts. Clean and tighten all electrical connections using dielectric grease to block out air and moisture. And when bench testing an alternator that is being returned, allow enough time. Test it long and hard enough to insure that no connection points are breaking down under loads. Keep in mind that good regulators can be tricked into doing bad things and most important of all - we all make mistakes.

Special thanks to the friends who shared these two examples of poor workmanship so that others might learn from them. Their names shall remain anonymous to protect the innocent.