SL55 or SL500 Regulator and Alternator DIY

Project car and symptoms: 2003 SL55 AMG with 88K miles

This project started as a "RED Battery Warning" and "STOP – SBC you are going to DIE!" message on the dashboard. It was due to low battery voltage.

Went through a number of diagnostics checks that pinpointed the alternator was bad. I had previously replaced the regulator 3000 miles ago, so I was pretty sure *that* item was not the issue.

From what I have seen - the issue can be fuses, relays, Battery Control Module, regulator, alternator, bad connections on battery cables, and probably a couple more things given the nature of this beast.

General: On a scale of 1-10, this job is probably a 3-4, mostly due to patience required in tight spaces. Expect a full day if you have the parts on hand, and don't have a lift. 4 hours if you have a lift.

Here is a helpful diagnostic sequence to pinpoint the issue:

1. Install scan tool and test for Diagnostic Trouble Code (DTC) in battery control unit, also called power supply module.

2. Test both front and rear batteries. Testing with an electronic tester is recommended to properly test batteries.

3. Perform charging system test with rear battery.

4. Verify battery voltage at battery cable on back of alternator.

5. On two wire connector at back of alternator, test for approximately battery voltage on the Blue wire with connector unplugged and key on.

6. With connector connected, backprobe the Blue wire. There needs to be 0 volts. Start engine, with alternator working, the voltage will change to charging system voltage.

7. If voltage is correct, a factory compatible scan tool is needed to perform function testing of the Passenger Signal Activation Module (SAM).

8. If no scan tool is available to test for Diagnostic Trouble Codes (DTC) in the battery control unit, and there are no other issues found when testing, make sure to check for blown fuses in fuse panel F52.

Warnings:

1. You will need to get under the car. If it falls, you die. Use proper jack stands to prevent this.
2. Batteries have plenty of juice in this car and you need to disconnect them to work on this electrical system. There is a procedure and reset required when you disconnect them, described below.

Tools required: nothing special; jack and jack stands; set of metric open end wrenches and sockets; E14 (6 point star head) socket for alternator bolts; stubby Phillips screwdriver (for regulator done in the car); volt meter; a creeper; trouble light to see in the dark spaces; nitrile work gloves and the usual rags.

Parts costs: 180 Amp Bosch alternator
Regulator: about $40 online
Alternator: used $60-150 (take your chances); rebuilt $150-200 (lifetime warranty), new $350 for Bosch.

Procedure:

1. Disconnect rear battery ground strap.
2. Disconnect front battery ground strap.
3. Jack up right side of car (or both sides) and place jack stands. I use the front suspension mount points for supporting the car, and the rear jack pads.
4. Remove 2 front under trays with 8mm socket.

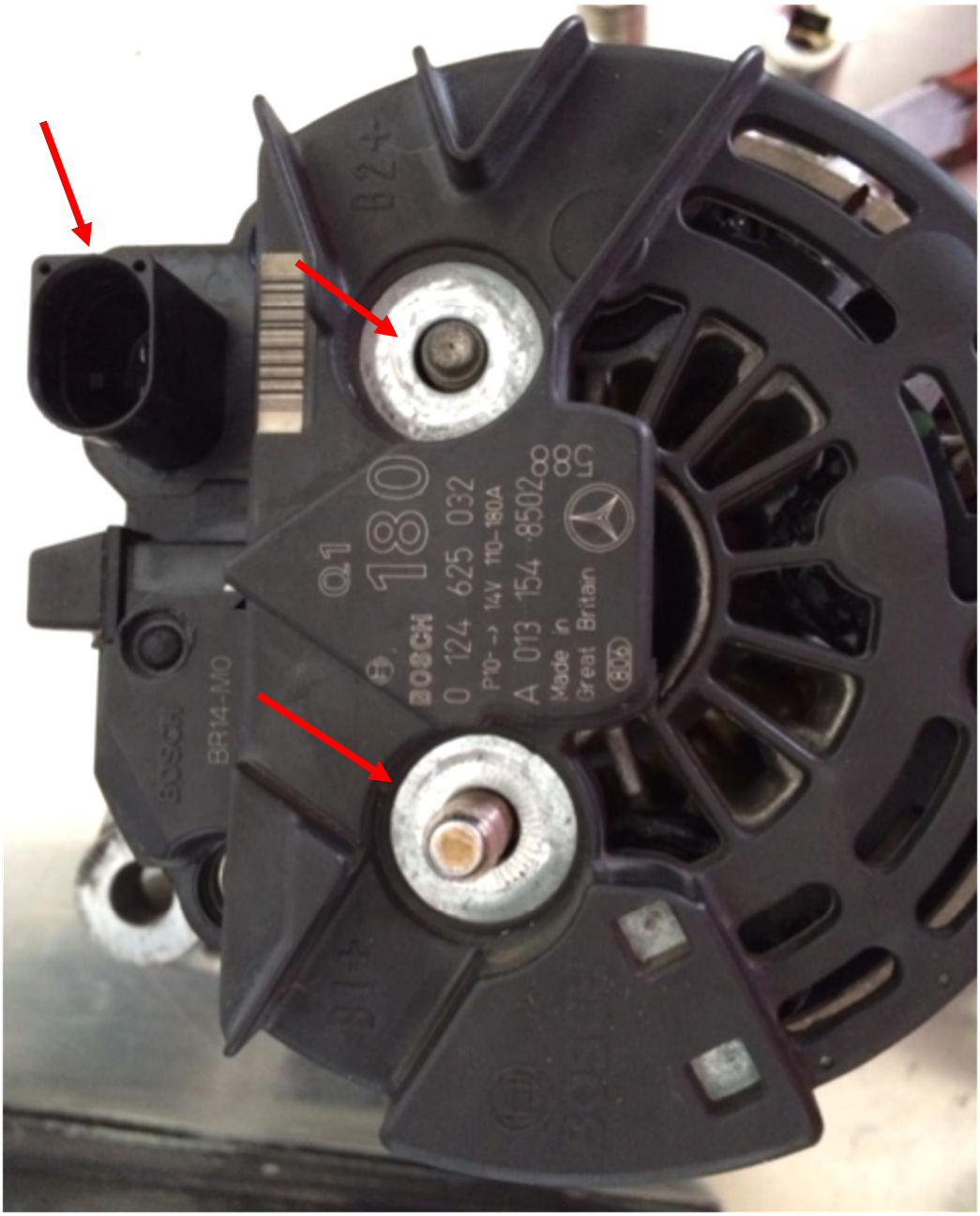
Options:

A – If you are just changing the regulator, you can do it all from under the car. It is a tight space, but possible.

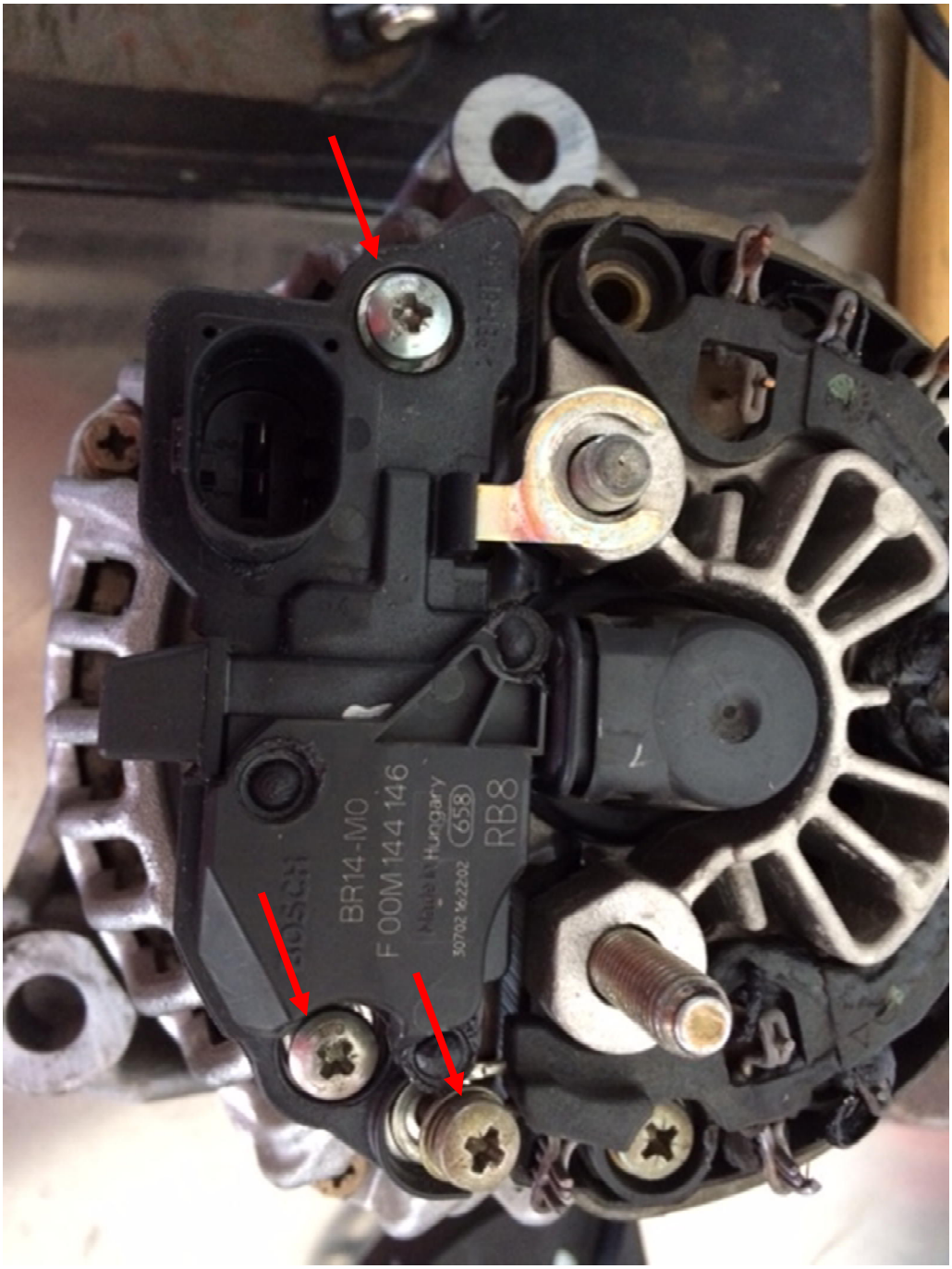
B – Pulling the alternator will require removing the wiring from the alternator under the car, then working from the top to do the rest.

Option A – remove and replace regulator with alternator in the car. (I did not take photos of this operation, but have alternator photos to show what is done and where.)

Below is: lower cable nut removed; top nut holding cover; top left power supply connector plug.



1. Remove the plastic cap from the heavy cable nut (alternator output).
2. Using a 14mm socket, remove the nut holding the cable.
3. Using a 14mm (deep) socket, remove the nut that was under the cable.
4. Using the 15mm socket remove the other large nut holding the cover.
5. Pull the field supply wiring connector plug from the socket by squeezing the lever and wiggling it back.
6. Remove the Phillips screw at the right of the cover and remove with a stubby screwdriver.
7. Now remove the rear cover.



8. You can now fully see the regulator, and remove it by removing the 3 Philips screws holding it (photo above).
9. The regulator has brushes that can wear, and when worn out the output weakens, or stops. (New brushes shown below)

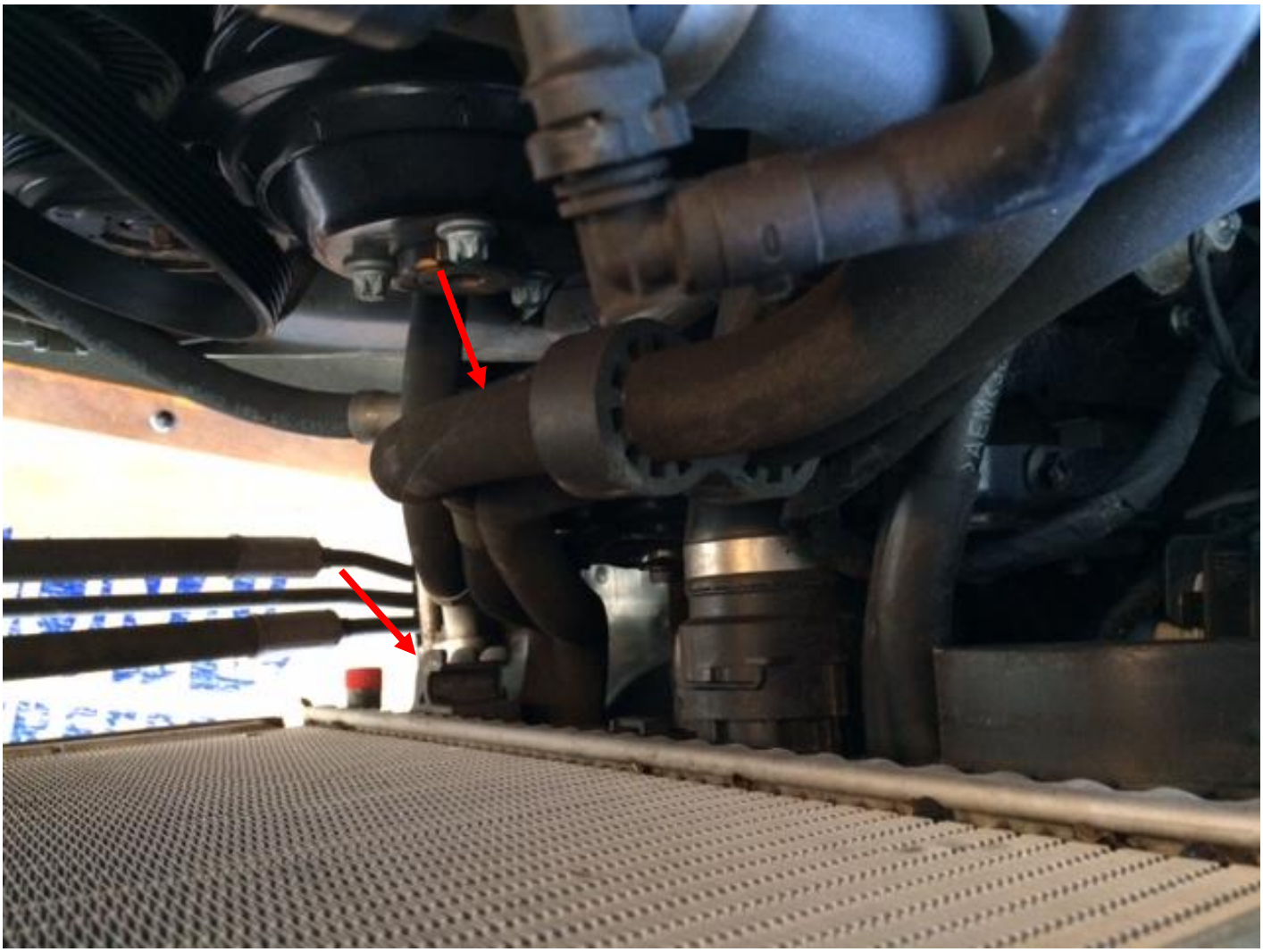
10. Replace in reverse order.
11. Drop car to ground.
12. Hook up front battery first, then rear battery.
13. Start car and turn steering wheel lock to lock. This resets the ESP sensor in the steering wheel. Not doing this gives ESP warnings, which happen every time you disconnect the battery. Don't forget your clock.
14. Check voltage at rear battery with car running. Should be about 14 volts. Turn car off and check voltage. Should be 13 volts typically.

Option B – remove and replace alternator (more pictures show this operation).

1. Starting under the car. Remove the plastic cap from the heavy cable nut (alternator output).
2. Using a 14mm socket, remove the nut holding the cable. (same as photos above)
3. Pull the field supply wiring connector plug from the socket by squeezing the lever and wiggling it back.
4. Now move to the top of the car.

5. Begin by removing the belts. Loosen the tensioner using the 12 point socket that fits the top (front) tensioner from the belt tensioner, and a 6 point socket for the lower (rear) tensioner. *Your car may vary.* In my case – the belt wrap kit added additional complexity, as I had to loosen the flat bar brace to remove the alternator. Photo above shows belts removed from alternator (and alternator removed, and belt wrap brace hanging.)
6. Remove the intake tubes from both side for more room.
7. Remove the radiator fan. Start with removing the (2) 10mm hex head bolts at the top. (no photos)
8. Unclip and move the hose across the top of the radiator rear toward the supercharger.

9. Now release the oil cooler lines from the left side clips (photo below are the lines to fight, and the radiator support). It is better if you can remove the hose clips and mounting plate completely, but the push pins are tough to get too, and will likely break if messed with.



10. Now disconnect the fitting to the radiator on the right side (photo below - 16mm I think). The radiator does not have room to come out unless this line is removed. It will only have a drop of oil come out.

11. Push the top of the radiator fan rearward, then lift the fan. The oil lines will make this difficult, but be patient and work the radiator fan up and out.
12. When the fan is almost out, disconnect the power supply to the fan by squeezing both sides of the plug and pulling up. It is hard to reach when buried in the car.
13. Now you can tackle the alternator. Start by unclipping various hose supports from around the alternator to provide movement of the hoses.
14. Remove the (2) E14 bolts from the front of the alternator.
15. Pry the alternator from its mounting bracket to set it free.
16. Wrestle the alternator forward through the hoses until it is behind the radiator. I think a good coating of silicone on the hoses would assist with slipping through the tight space.
17. Lift straight up and out of the car. Have a beer to celebrate.
18. Replace in reverse order.
19. Drop car to ground.
20. Hook up front battery first, then rear battery.
21. Start car and turn steering wheel lock to lock. This resets the ESP sensor in the steering wheel. Not doing this gives ESP warnings, which happen every time you disconnect the battery. Don't forget your clock.
22. Check voltage at rear battery with car running. Should be about 14 volts. Turn car off and check voltage. Should be 13 volts typically.
23. Have another beer and celebrate saving about $1000 from a dealer.

Below is the fried alternator from my car. The copper wires inside had turned brown. The XM radio had a ton of static. The car drove about 10 miles before the warning lights went ballistic. It was able to drive 10 miles home without issue. I bought a lifetime warranty remanufactured unit for about $150 delivered to my door.