

3 Amigos due to SVS Fault – Finding & Solving

Situation: report that the anti-lock braking system (ABS), traction control (TC) and hill descent control (HDC) warning lamps are illuminated, well-known as “**3 AMIGOS**”.

Action: The cause of an SVS failure warning does not necessarily come from the Modulator. The troubleshooting procedure should be used to diagnose the problem further and ensure that the correct action is taken.

The Diagnostic Procedure will determine if installing a new SVS is the appropriate repair. **ABS Modulators should not be replaced unnecessarily.**

This procedure will allow you to check whether the fault is due to wiring faults, bad grounding, faulty SVS, SVS replacement and SVS connection mod to avoid future problems.

Wiring faults external to the ABS modulator may also cause SVS fault codes. The diagnostic procedure will determine if an external wiring problem is the root cause of the symptoms. Wiring faults may be intermittent due to hidden breaks and poor connections. Always try to provoke intermittent faults by flexing wires while checking. Faulty wires should be repaired.

1. Position the ignition to the OFF position and perform the following:

- Inspect the ground stud connection C0561 for damage and corrosion.
- If the ground stud is damaged or corroded clean the eyelet and stud and tighten the nut to 10 Nm (7.5 lbf-ft).



- Check for continuity between the ground stud C0561 and the black wire on the ABS modulator body connector C0500.



CAUTION: Connector pins must only be renewed one at a time to ensure the pins are returned to the correct position.

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2. Disconnect and check the 13-pin connector at the ABS modulator (C0501)..



3. Disconnect the 15-pin connector C0506 at the Self Leveling and Anti-lock Braking (SLABS) ECU.



4. Inspect both connectors for moisture ingress or corrosion and correct as follows:

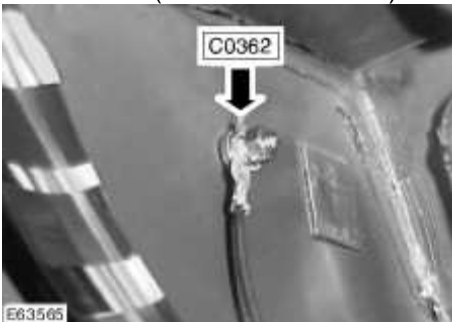
- If moisture or corrosion is present, dry and clean the connectors.
- Repair corroded connectors as necessary.

5. With connectors C0501 and C0506 disconnected perform the following:

- Check for continuity between pin 6 of the 15-pin SLABS ECU connector (C0506) and pin 9 of the 13-pin ABS modulator connector (C0501) yellow/green wire.
- If there is no continuity (or intermittent continuity when the wire is flexed), repair as necessary and ensure the wire is correctly crimped and soldered.
- Check for continuity between pin 3 of the 15-pin SLABS ECU connector (C0506) and pin 8 of the 13-pin ABS modulator connector (C0501) black/slate wire.
- If there is no continuity (or intermittent continuity when the wire is flexed), repair as necessary and ensure the wire is correctly crimped and soldered.

6. Disconnect the 18-pin SLABS ECU connector (C0504).

7. Check for continuity between pin-12 of C0504 and the ground connection located under the left-hand side of the fascia (C0362 – black wire).



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8. If there is no continuity (or intermittent continuity when the wire is flexed), repair as necessary and ensure the wire is correctly crimped and soldered.
9. Connect the connectors to the SLABS ECU and ABS-Modulator.
10. If repairs were completed, clear all logged codes using Nanocom or Hawkeye and perform the following:
 - Road test the vehicle.
 - Using Nanocom or Hawkeye, check for fault codes
11. If fault codes have **NOT** returned, no further action is required.
12. If fault codes are present, checking your existing SVS will be necessary, as follows:
 - Connect an ohmmeter between pin 9 of the ABS modulator connector (C0501-9 yellow/green wire) and ground.

NOTE: An assistant is required to perform the brake pedal application actions in the following steps.

13. Monitor and record the change in resistance as an assistant very slowly depresses the brake pedal.
14. Check results against the values shown in the resistance table below:

Approximate pedal position	Minimum resistance	Maximum resistance
No travel	2555 Ohms	4088 Ohms
Partial travel	1533 Ohms	2554 Ohms
Full Travel	511 Ohms	1532 Ohms

- Values within these ranges indicate that the SVS are OK, therefore, no replacement is required. If outside these ranges, please replace the SVS with a new **SWO500030**.

15. Proceed with the modification described below:

- What you will need:
 - Shuttle Valve Switch SWO500030 (if you just found out that yours are gone)
 - Cable...same gauge as the switch wiring
 - One crimp ring terminal
 - Heat Shrink
 - Butt connectors...self solder & glue type
 - Multimeter
 - 7mm Allen key
 - 7m hex socket
 - 10mm ratcheting spanner
 - Wire Nippers/Strippers
 - Conduit
 - Electrical tape
 - M6 x 20mm bolt

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M6 nylock nut

M6 Penny washer

- Now...this is the pain in the butt part...go to the truck...
- If you don't have small hands this next part must be nigh on impossible...
- So, its modulator time...first thing, undo the 3 retaining nuts of the modulator (mod), 1 engine side, 2 inner wing side...keep them safe.
- Bulkhead side of the modulador is a large cream connector held on to it by a metal spade..
- Unclip it out of the way. Unclip the PAS/ACE reservoir...I'm not going to say when to put it back as you need to move it back and forth so many times its too many to mention! No disconnection of PAS pipes is necessary... I unclipped the MAF multiplug too as it gets in the way.
- DO NOT CUT ANY WIRES YET...If you can't get the SVS out, for whatever reason, you will have disabled the ABS system...PLEASE cut the wires last when the new SVS is fitted.
- There are 3 rubber mounting bushes where you undid the nuts...take off the 2 rears and put them to one side...leave the front one on...you need this to balance the modulator.
- Lift the front of the modulator out of its mount, straight up and then pull the rear studs out of their holes. The modulator will happily rest on the mounting bracket on the front rubber bush.
- FROM NOW ONWARD YOU WILL BE LIFTING AND GENTLY ROCKING THE MODULATOR. THIS WILL MEAN YOUR BRAKE LINES ARE FLEXING...YES I WASN'T KEEN BUT BE CAREFUL AND YOU'LL BE FINE...JUST DON'T PULL THEM ABOUT TOO MUCH!!
- You should be looking at this..resting on that front bush...



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- Here, you can see how far you can get it to lift out of the bracket (ignore the white wire in the picture. you won't have one of those)

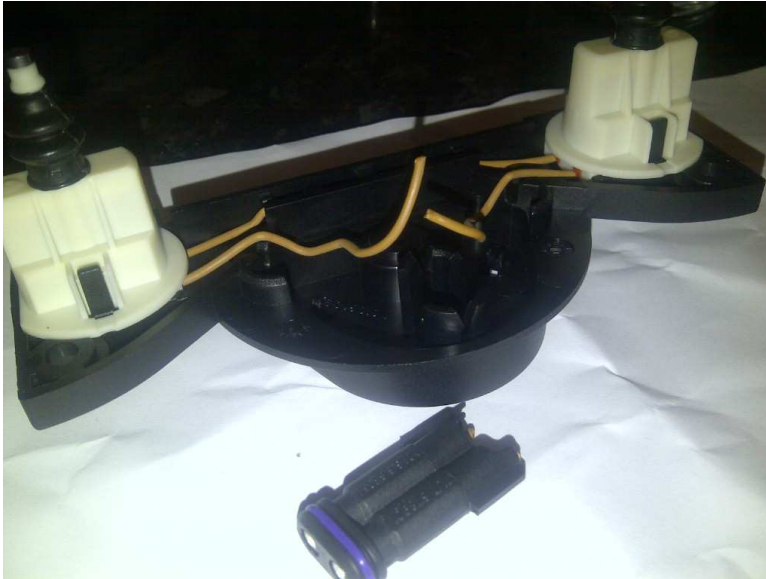


- Now with a combination of the allen key and ratchet spanner (easier) and hex bit, feel your way about underneath around the SVS and find the bolts. It is fiddly and very hard to locate the heads, especially the centre one but it is “doable”. Do the 2 outer ones first, then the centre one...keep the bolts.
- Once the bolts are out, the SVS will pull down out the bottom easily, then pull the multiplug out & gently remove the old one (here pictured a new SVS). Remove multiplug gently.



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- Cut the connector off as close to the housing as possible so you have enough wire to play with (either if a new or old SVS).



- Now hook up your multimeter as shown below to test the resistance and that the switch is not faulty...

Strip about 5mm off the ends of the wires...temporarily curl the end so you can hook them up to the Multimeter probes...either probe to either wire...you're just completing a circuit so no worry about polarity.

Reading 1...both switches open-PASS



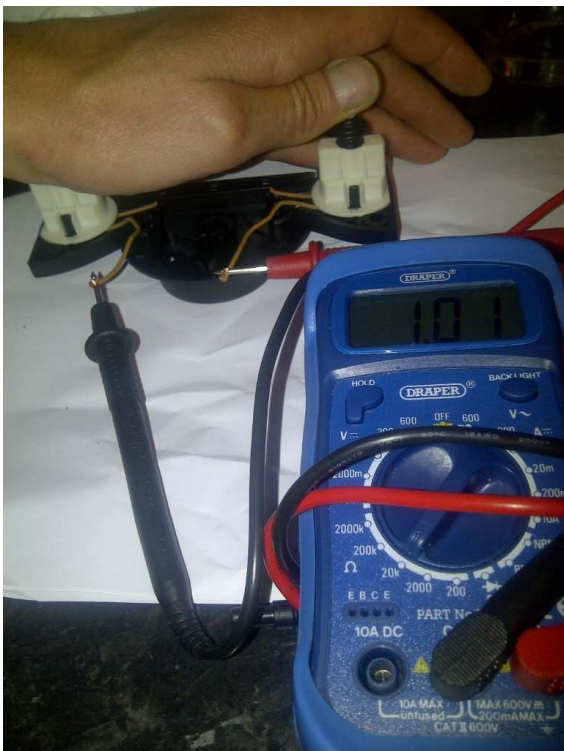
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Reading 2...1 switch closed (push one switch down)-PASS



Reading 3...both closed (push both switches down)-PASS



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- Now you need to rewire the switch. I used twin core, same gauge as the existing wiring. At this stage I cut a 300mm (1ft) length.

Expose the 2 ends of the twin core by about 3", strip the sheaths to bare cable for inserting in the connectors. The cable needs to be passed through the back of the switch where the original multiplug was you cut off...there are 2 convenient holes here.



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- Once in the switch, employ 2 of your butt connectors and join the new cable to the switch cables you've cut



- Test the ends of the new cable as before to ensure the same resistance.
- Now fit the new SVS, reverse of removal...much easier than taking the old one out. Once done, you can now relocate the modulator and bolt it back in
- Now to cut the loom...strip back the outer loom sheath of the modulator multiplug...you need the YG (Yellow/Green) cable...cut it just short of the connector...



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- You can now cut down your twin core to length...I took the red trace of my twin core and used another connector to join the two. Tape it and conduit it.



- Take the black trace of your twin core, crimp your ring terminal on the end... It must be grounded somewhere. Between the modulator bracket and the PAS reservoir bracket you will see a hole in the wing .
- If there is nothing already bolted there, remove paint, install a bolt and with a washer and nylock nut you'll get a nice grounding point.



16. If the modification has been completed, clear all logged codes using Nanocom or Hawkeye and perform the following:

- Road test the vehicle.
- Using Nanocom or Hawkeye, check for fault codes.

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17. If any fault still present, connect an ohmmeter between pin 6 of the SLABS connector (C0506-6 yellow/green wire) and ground.
18. Monitor and record the change in resistance as an assistant very slowly depresses the brake pedal.
19. Check results against the values shown in the resistance table at item 14 above.
 - If the resistance is between the minimum and maximum values, check for continuity between pin 12 of the 18-pin SLABS ECU connector (C0504-12 - black wire) and ground C0362-1 located high on the LH inner fender within the passenger compartment. If there is no continuity or intermittent continuity when the wire is flexed, repair or replace the damaged wire.
 - Check for continuity between pin 3 of the 15-pin SLABS ECU connector (C0506-3 black/slate wire) and ground. If there is no continuity or intermittent continuity when the wire is flexed between C0506-3 and ground, check for continuity between pin 3 and pin 8 of ABS modulator connector (C0501-8). If there is no continuity or intermittent continuity when the wire is flexed between C0506-3 and C0501-8, repair or replace the damaged wire.
 - If there is continuity between C0506-3 and C0501-8, **replace the modulator.**
 - If there is continuity between C0506-3 and ground, **replace the SLABS ECU.**