Let me introduce you to another "big" project I chose to undertake again. This time I am dealing with ABS installation … you might think I am insane but the truth is plain.
Many fellow Alfa 33 owners around the globe have successfully replaced the standard drums setup with disks off an ABS fitted 33. The advantages of this conversion are quite many as you can imagine and that's why disk axles have quite a demand but supply is limited. In my case I chose to take one further step: instead of just fitting the rear axle, I proceeded in installing the complete ABS system to my vehicle.

Just a few words for the Alfa 33 ABS. This specific system (BOSCH ABS 2) was first introduced in 1978 and Mercedes-Benz S Class was the first commercial passenger vehicle to feature such an advanced system for that era. The advantages of that new back then ABS system, was its compactness – this system combined the ABS control unit and hydraulic system in one single assembly.

The basic principle of the ABS system is as follows:

ABS Unit: It comprises of two individual hydraulic circuits with each circuit consisting of two solenoid valves – load valve normally in open state and drain valve in closed state. The load valve is responsible for increasing hydraulic pressure to the brakes whereas the drain valve is responsible for reducing hydraulic pressure.

Wheel speed sensors: Every wheel of the vehicle is monitored by an inductive sensor fitted close to moving parts (wheel bearing or CV joint). These sensors feed the ABS Control Unit with data indicating that all four wheels revolve at the same rate. Should any of the four wheels decelerate at a greater rate than another (indicating that the brake is about to lock), the respective sensor seizes to supply current to the ABS Control Unit – this is interpreted by the CU and acts on the specific circuit by reducing (load valve closed & drain valve opened), increasing (load valve open & drain valve closed) or maintaining (load valve open & drain valve closed) fluid pressure. The result of the operation of the load/drain valves is the pulsation we feel on the brake pedal during the ABS functioning. The pulsation is actually the downward movement of the brake pedal to the floor (drain valve action) and the upward movement of the brake pedal towards the driver (load valve action).The practical outcome of this operation is the specific wheel regaining traction on the road, avoiding skidding. The vehicle maintains stability and steering response.

BOSCH ABS 2 system however has a major drawback as seen by today's modern ABS systems. Since the braking system of the Alfa 33 is a cross-channeled one, the ABS version of the Alfa 33 retains the same setup meaning that each channel corresponds to two wheels; left front & right rear and right front and left rear. As a result when one of the two wheels in each channel lock, the ABS Control unit will regulate *both wheels* even though one of the two may have not locked upon braking. This is not found on today's vehicles as each wheel has its own hydraulic channel and regulated independently. This drawback seems to be evident on low speeds (~ 30km/h) but any speed above that limit seems to performing with no problems.

The parts comprising the ABS system for Alfa 33 are the following.

- ABS unit found on the left of the servo unit

- Half-shafts consisting of teethed CV joints.
- Wheel hubs which incorporate support for the ABS sensor.
- Rear axle consisting of disks and calipers
- Different handbrake lever compared to the standard drum one
- ABS wiring
- Different brake line running down the bulkhead and bias valve compared to non ABS versions.

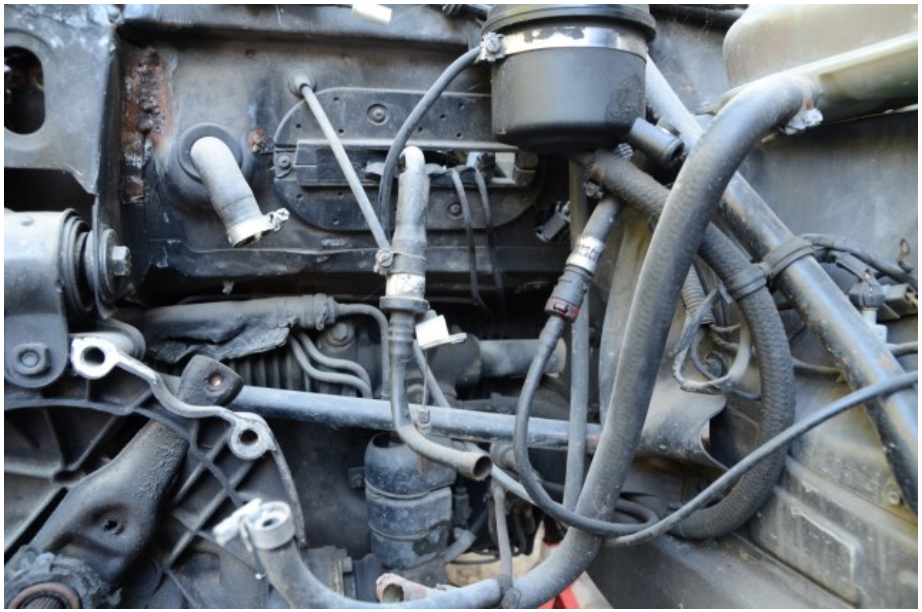
Donor Car.
The donor car was located in October 2012. It was a matter of 3 hrs to have all parts removed as many obstacles were already not present. Engine was out, front and rear suspension springs were also out so it was a matter of dropping the half shafts and rear axle.

Here are some photos of the donor car showing all the parts required: ABS unit location, half shafts, hubs, rear axle and brake lines.

Starting from the front:

ABS Unit on the left side of the service compartment. Intermediate wiring connector on top of the brake servo container.

ABS sensor connector (yellow plug) – also found on the left of the service compartment



Engine is missing so this made things easy to remove the different brake lines needed for the ABS conversion. Notice the lines coming off the bulkhead opening along with servo vacuum tube.

Going to the wheels side:

Front hubs showing the ABS wiring. Not seen on the photo is the different CV joint compared to the non ABS versions. The ABS version features a teeth ring which the ABS sensor reads the status of the wheel (rolling or locked)

Rear axle. Luckily springs are already out so we will remove the axle easily.

Here is the different brake lines layout. Notice the brake line which runs around the circumference of the spare wheel well.

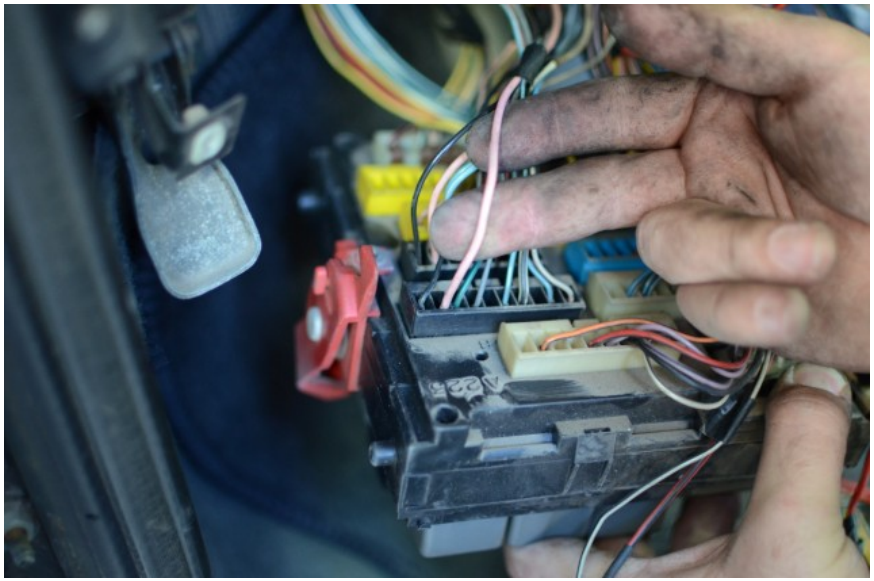
Different bracket setup. A bracket holds the brake hose and the ABS sensor wiring.

Right side of the rear axle. Brake hose attached to the right wing rail bracket while the ABS sensor wiring runs to the same area.

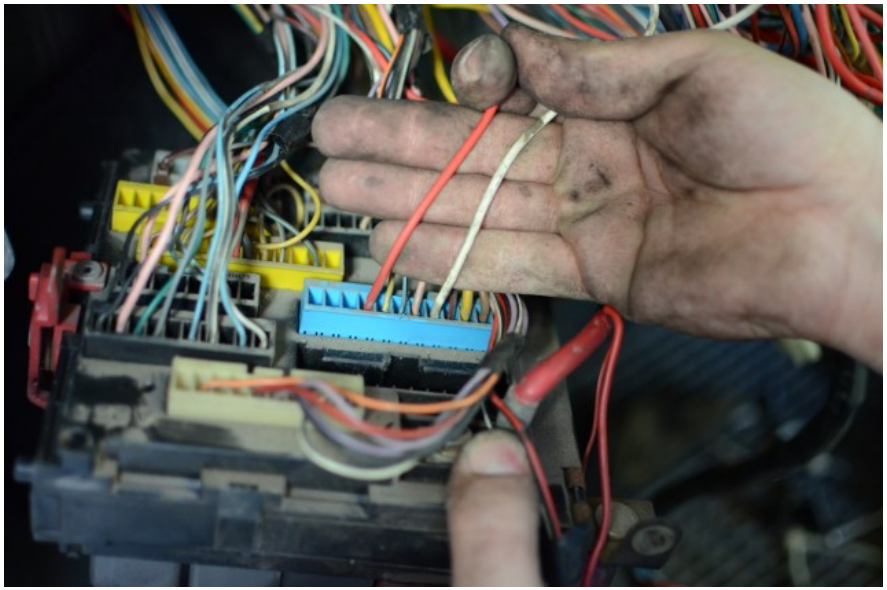
Setup from a different angle.

ABS wiring enters boot through the designated openings on each side.

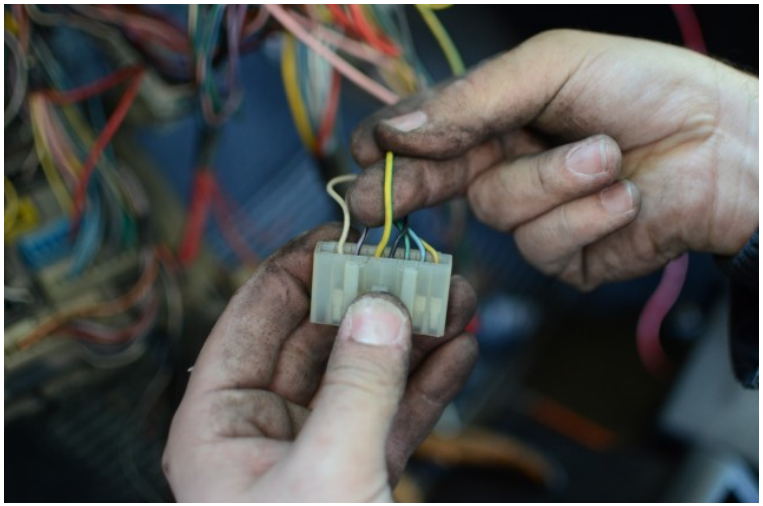
Inside the passenger compartment. ABS sensor wiring runs under the rear seats.



Lets now move on removing the respective wiring. The pink wire is activated upon ignition and it is intended to power up or “wake up” the ABS unit.



These two wires are connected to the brake light switch. This variation of wiring compared to non-ABS versions feed the ABS unit with input letting it know when the brake pedal is pressed.



Instrument panel connector. This wire (non existent on non ABS versions) illuminates the ABS warning check and it is connected to the ABS ECU.

Rear axle removed and getting ready for disassembly.