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1

Converting Volvo C303/306 to Mercedes Benz 6 cylinder 300 D (OM603)

This instruction considers mounting the Mercedes 6 cylinder diesel engine OM603 in Volvos vehicle C303/306. Two types of the engine exist, with turbo and without turbo. This instruction, complete with pictures, consider the engine without turbo, but will mostly suit the turbo engine too.

We begin to take out the old engine. Take out the battery/batteries. The engine together with gearbox will be lifted down to the garage floor (not up), and therefore we begin to take away the hood over the engine and even the floor, in the passengers' cabin. Take away the drive shafts (the axles between the gearbox and the front and rear axles), and even the exhaust system. Take away the fan with axle and the radiator with all rubber hoses. Use an engine lifter and put the arm of the lifter in thru one of the passenger doors. Mount a lifting chain on the engine lifting hooks. Make a loop on the lifting chain somewhere over the rear part of the engine. Try to lift and see if the engine and gearbox will hang horizontally, if not you must move the loop. When it hangs horizontally, lift the engine and gearbox down to the floor. Let the holders for the gearbox follow the gearbox down.

We will now begin to do the diesel engine ready for mounting. If the engine has a servo pump on the left side of the engine, you have to take that away, even the fan, if the engine has one. The diesel engine's alternator is normally mounted on the right side of the engine, and that is not possible, with the engine mounted in C303/306. It will come in collision with the front axle with that position. We must therefore move it over to the left side of the engine. Most of the C303/306 has 24 volts electrical system, and therefore it is not possible to use the diesel engine's original alternator. Instead we use the alternator from the B30 engine, which was in the car before, and we also have the cables already in the car for that alternator. When we move the alternator over to the other side, we also have to draw the fan belt over to the other side, and that will be a problem, because the vacuum pump will come in collision with the belt. The belt has to pass over the vacuum pump, and the holder for the alternator in the kit, has been constructed so we can mount a pulley wheel in the holder, so the belt can pass over. You can see the holder on picture 1 (the holder on the picture is an early prototype, and has another look today; you can see the ordinary holder on picture 5). Before we mount the alternator on the engine, we have to put the pulley from the Mercedes alternator, to the Volvo B30 alternator. Now you can mount the holder for the alternator on the engine, but only with the two outer M8 bolts. Behind the inner holes, for the two M6 bolts, you will now have a space between the holder and the engine. Measure the space and mount the holder with plates between the holder and the engine. When the holder is mounted, you can mount the alternators upper hole, in the lower hole on the holder, as on the picture 1.

Control that the belt will be in line with the other two pulleys; that on the crankshaft, and on the water pump. This moment is very important! The modern flat belts must be in line with all pulleys; otherwise it will be very noisy. Use a ruler to check it up. If it is not in line, bent the lower part of the holder to have the alternator in position (or use plates between the holder and the alternator, if the alternator has to be moved backwards, or use plates between the pulley and the alternator, if it has to be moved forward). When everything is OK, put the plate for the lower holder of the alternator on place, see picture 2. Put the bolt in the lower hole on the alternator, and screw it in the metal

block (which is in the kit), and use the original bolt, the one which was mounted on the B30 engine, and fix it with a cramp, as shown in picture 2 and 3. Control again that the belt is in line with the other two pulleys and veldt the block to the holder. After that it will look as in picture 4. The belt will be 1738-1740 mm long, with the same grooves as in the pulley wheels. The upper pulley wheel is an original Mercedes pulley wheel with spare part number 601 200 07 70, and the lower is an original Volvo pulley wheel with spare part number 1257120. Behind each of them it will be a distance piece. You find them in the kit. Put the belt and the pulley wheels in place, as shown in picture 5.

If the engine has pump for level control, you have to take that away, and mount the upper pulley of the camshaft chain without the clutch for the pump. Be carefully when you mount the pulley, so it not will loosen afterwards when driving! The hole in the front of the cylinder head you cover with the seal plate you find in the kit, together with a rubber gasket. The seal plate you can see in picture 6 and 7. The tube for the oil level dipstick you have to bend to the look you can see in picture 5. The picture 6 shows how it looks before the modification and picture 7 how it looks after.

Now we will begin with the modification of the bell house. You must do that to be able to put the starter in the hole in the adapter. Begin to loosen the bell house from the gearbox, and mount the adapter on the bell house. In picture 8 you can see how the edge of the house will pass over the hole for the starter, and therefore you have to take away a piece of the edge, so the nose of the starter will have place. Use a drilling machine with grinding stick and/or an angle grinder. Don't take away too much; you have to save so much so you have space about 1-2 mm between the starter and the house. That space you can fill with silicone, if you want to wade in water with the car. In the kit you have a distance ring to put between the starter and the bell house, when you test how much you must take away. That ring is done to avoid mounting the bell house back to the engine, every time you want to check the space. The ring has the same thickness as the engine has, where the hole is for the starter. You can see the ring in picture 9 between the starter and the adapter. Picture 10 shows the result of the work and picture 11 when the starter is mounted on the engine. However, before the final mounting of the starter, you have to mount the adapter, flywheel and the clutch. Mount the adapter on the engine, and use the countersink bolts in the kit on its places. As starter ring gear on the flywheel you can use Mercedes original to the engine. If you have the original flywheel to the engine, you can use the gearwheel on that. If you carefully knock around the ring gear, it will loosen slowly from the flywheel, and then you warm it up and put it on the new flywheel. If it not will fasten so much as necessary, you can veldt some points in the seam, which are diametric to each other, and the same sizes. In the middle of the flywheel you have to put a bearing (some of the flywheels have it already there) with the dimensions 15x35x10(or 11-12). Knock the bearing carefully in the flywheel. When it is done, you can mount the flywheel with the Allen bolt in the kit, see picture 12. As clutch cover you use the Mercedes original to the engine, and as clutch driven plate you use a plate from Land rover series 1. Mount the clutch on the flywheel with clutch centralizing tool, and mount the gearbox on the engine, and at the same time you put the holder for the wire to the clutch, as you can see in picture 18 (the ordinary hole for the wire, disappeared when you modified the bell house).

The engine will lean more than original, and therefore it is suitable to complete the oil pan with one more drain plug, as is it shown on picture 13 (the engine is here in place in the car).

If the engine is without turbo, you have an air cleaner on the left side of the engine. Sorry to say, this air cleaner is too big to have in the car, so we have to solve the problem in another way. We made a tube from an ordinary exhaust system tube, with diameter 64 mm (on one end diameter 67 mm). You can see the tube on pictures 14, 15 and 16. The smaller end of the tube will be closed by welding. You can se a drawing of the tube in this instruction. The 6 rubber tubes which connect the

tube and the inlet manifold are the original tubes to the engine. A good thing to do is to fix the smaller end of the tube to the engine with a strip of sheet, which you weld to the tube, and the other end you screw to the engine, on a suitable place. The other end of the tube will be fixed with the air cleaner. As air cleaner we used two parts from the original inlet system. On picture 17 you can see two connected parts from the original inlet system. The lower part on the picture will be loosen, and instead you connect it to the black cover from the B30-engines air cleaner, and then screw it to the adapter on the two highest holes. You can see the result on picture 18 (the best thing is to wait to do this, until the engine is on place). A disadvantage with this kind of air cleaner is that you have to modify the hood and the floor in the passenger's cabin (see in the end of the description). If you don't can use this way, you have to do another solution with an air cleaner on another place.

As engine suspension rubber you can use two alternatives. The most useful is the right engine suspension rubber from Mercedes 240 D 3,0 (model year 1974-76). The right rubber is bigger than the left one. This cars are very old, so it may be difficult to find them, and instead you can use rubbers from Mercedes 300 D from 1976 to 1985 (the 123 model). You must thread and put Helicoil M12 in the hole, otherwise you cannot put a bolt from the upper side.

Now we are ready to lift in the engine. The engine and the gearbox must be connected, but the engine mountings shall not be mounted. To make it easy, you can loosen the fuel filter on the engines left front corner on top of the engine, and let it hang in the hoses. Put the engine and gearbox under the car. Do the same as when you took the B30 engine out : use an engine lifter and put the arm of the lifter in thru one of the passenger doors. Mount a lifting chain on the two engine lifting hooks. Make a loop on the lifting chain somewhere over the rear part of the engine. Try to lift and see if the engine and gearbox will hang horizontally, if not you must move the loop. Lift the engine and put 2 bolts in the mountings on the gearbox. Mount the holders on the engine and the chassis on both sides. Put the engine suspension rubbers in its places (put some plates in the cavity above the holes, if the rubbers are from the 123-model), and put down the engine on the rubbers with two M12 bolts in the holes from above. When it's finished, it will look like picture 19 and 20.

The parking brakes must be modified, concerning the fixation of the wire to the handle. The pictures 21, 22 and 23 show how it is original before modifying. After the modifying it looks's like pictures 24, 25 and 26. Instead of the original pin, as you can see on picture 25, we drilled a hole in a bolt, which you can see on picture 26, and moved the fixation of the wire to the inside of the holder. The wire and its fixation will, after the modification, be closer to the engine wall and, at the same time, the rear part of the wire be bent up, so it not will come into collision with the fuel filter.

As throttle wire you can use the car's original wire, connected to the Mercedes engine's original wire. Cut off the rectangular hole in the upper right corner in picture 27 from the car's original wire holder. Build from this, among other things, a construction shown on picture 28. Picture 29 shows the holder from above, where the car's wire coming in from the right side, and connects with the engines wire, which is coming in from the left side. The holder on place you can see on picture 30.

The water tube, from the radiator's lower outlet, you can see on picture 31. You have to modify it, with cutting away a bit, as shown in picture 32. The bit you have to cut away is shown under the tube. The upper rubber tube you connect as is shown on picture 33. You can use the car's original tube and twist it a little. On the picture you can see the smaller tube connecting the vacuum pump and the vacuum tank for the brakes. Connect also the heating system to the engine.

Take away the water temperature senders from both engines. The temperature sender from the diesel engine is placed behind the diesel injection pump. In the hole for the switch on the diesel engine, you have to put the adapter you find in the kit, as shown on picture 34, and then you can mount the sender from the B30-engine.

The exhaust system you can build as shown on pictures 36, 37 and 38. The last piece of the system, you must change to a flexible tube, as shown on picture 39, otherwise the system will collapse by vibrations.

The diesel engine needs a return pipe to the tank. You can connect the pipe to the tank if you take away the drain plug in the tank's right front corner, and put a banjo plug there, as shown on picture 40.

The electrical circuit diagram you will find on picture 41. We suppose the car has 24 volt system, and the diesel engine's system is for 12 volt, which is most frequent, and that the car has two batteries for 12 volt. It is possible to take out 12 volt from one of the batteries during short times, with no unequal charge in the batteries, but if you do that continuously one of the batteries will be without charge, in spite of that both batteries have charge. Therefore we connect the starter and the glowing system to one of the batteries, because this moments will not take place during any long times. In the diagram you can see the batteries to the left, and there we have connected a thick cable to the starter. From the connection point at the starter, we also have connected a 24 volts relay, to pin number 30 on the relay. You can use an ordinary relay for extra lights. From pin number 87 on the relay, you connect to the solenoid on the starter. You can also look at picture 6. Connect the pin 86 to ground (chassis), and pin 85 to the starter key (the same connection as earlier was to the solenoid on the b30-engine).

The glowing is also working with 12 volt. Use the same sort of 24 volts relay as above, and connect pin 30 to 12 volt (the same connection as the cable to the starter). Pin 86 to ground, and pin 85 connects to one of the two pins on a button, which you mount on the dashboard somewhere, and the other pin to the starter key. Connect it to a pin, which have 12 volt when it is switch on (you can take the same connection which was connected to the ignition coil before). Pin 87 connects to the glowing plugs.

The alternator connects to the same cables as before (it is the same alternator). You can move the charging relay, which you find behind the passenger's seat, over to the left side, behind the driver's seat. Then you can use the same cables as before.

To the radiator we use an electrical fan, instead of the mechanical one for the B30-engine. The first thing to do is to solder a thermo contact in the bottom of the radiator. That one starts the fan, when the water in the bottom of the radiator is still too warm, after it has passed the radiator. Use a suitable fan, new or used (we find a used one from Ford Scorpio, which we adjust a little). If you take a one for 12 volt, you must have a resistant before you can connect it to 24 volt; otherwise it will burn for you. In order to count how big the resistant has to be, you must connect the fan to a 12 volt battery in series with an ampere meter, to measure how many ampere it will take, when it run. In our case, it was 14 ampere. The resistant have to be $12/14$ (12 volt divided with 14 ampere), that is 0,86 ohm, rounded to 1 ohm. We must also have the watt for the resistant. $12 \text{ volt} \times 14 \text{ ampere}$ is 168 watt, rounded to 200 watt. The resistant will be on 1 ohm and 200 watt. The best place to mount the resistant is in front of the radiator, as we have done in picture 42. The electrical drawing you find in the diagram.

The last thing to do about the electrical is to fix the stop of the engine. You can use an electrical regulator from Mercedes, with number 001 540 70 97, or 001 540 68 97. You can take the cheapest one; they work the same both of them. If you will find them used, you can find them on some of the Mercedes 190 gasoline models, and 123 models with gasoline engines. On pictures 43 and 44 you can see how to connect it. The upper pipe you connect to the vacuum plastic connection in the rear of the injection pump, and the horizontal pipe you connect to the vacuum pump in front of the engine. See picture 1. The electrical sockets connect to ground and to one of the sockets on a button in the dashboard. The button's other socket we connect direct to 12 volt, because if you by

mistake switch off the key (the engine will not stop by that) you must have direct source of current to stop the engine.

What is now left to do is to modify the engine hood in the passenger's cabin, if you did as we have done, with the air cleaner in the end of the engine. The diesel engine with air cleaner need more space backwards. The picture 45 to 48 shows how to do. Here you also can see how to connect the air cleaner to the tube on the left side of the engine room, which was before used to the B30-engine. The last moment is to change the rubber mountings on the gearbox to softer ones.

If you have some to ask, you can phone the office 004615530040, or mobile 0046707531200, or fax 004615533339. And good luck!

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