

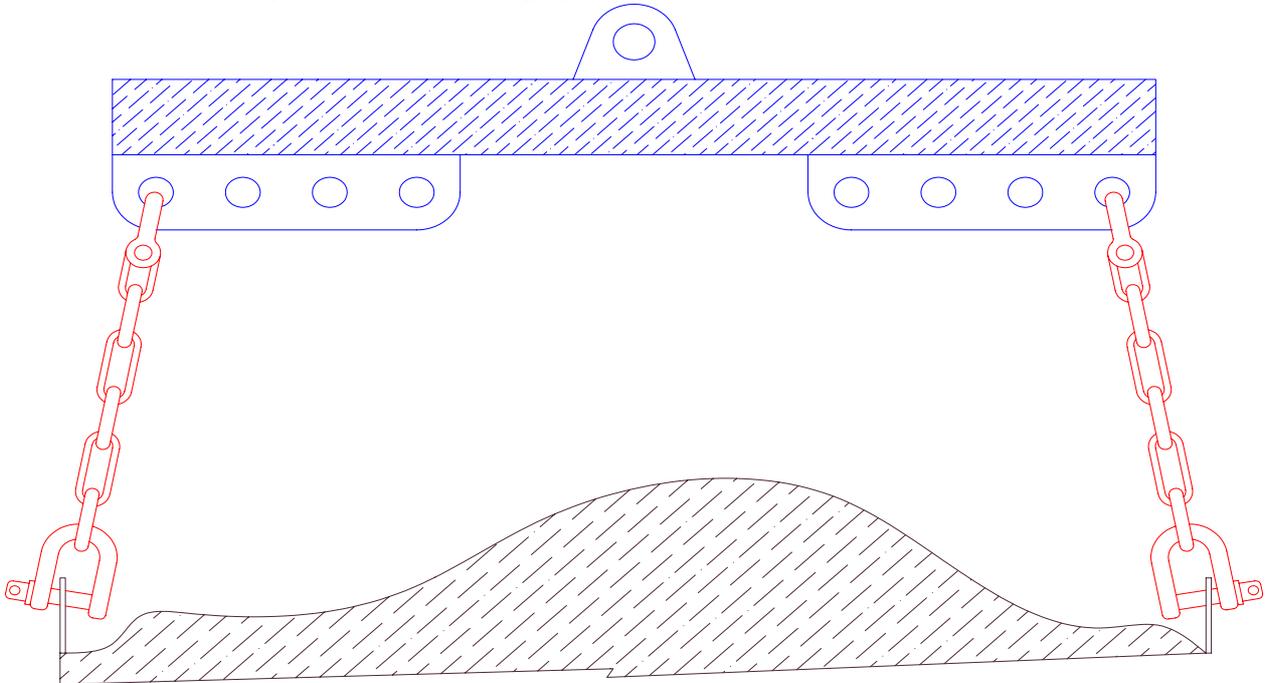
# Engine & Gearbox Installation

## Tool and equipment required:

1. Engine crane or A-frame hoist + suitable lifting chains/straps/ropes.
2. Bolts and nuts for engine mounts.
3. Socket and spanner sets
4. Protective cloths or old carpet to prevent damage to engine or paint work.

## Lifting engine:

**Note:** Make sure the lifting equipment you are about to use is of the correct load rating and all the chains, straps, ropes, are all in good condition and are without damage. When fitting lifting straps, ropes, or chains they should not have an angle of more than 60 degrees between them. Anything over this angle will increase the side ways load on the lifting eyes.



1. Clean the workshop floor if you are using an engine crane with wheels. When it has the load of an engine, the wheels will stop on the smallest stone or nut on the floor. This can make the engine swing on the crane and in worst case topple over.
2. If you are using an A-frame hoist (that has no wheels) you will need to roll the chassis under the hoist once the engine and gearbox is lifted to an adequate height.
3. Position your lifting gear over the engine. It is best to lift an engine with a lifting bar and keep the ropes, straps, chains shorter. The engine can be lifted higher and it is easier to keep the chains, straps and ropes at less than 60 degrees.
4. When fitting lifting gear make sure when the load is placed on it that the straps/chains/ropes will not pull against any of the components on the engine, such as water pipes or electrical components/sensors, as this could cause damage.

- 5.** Once you are happy that the engine and gearbox are attached securely, have a test lift to make sure that it lifts at the right angle and does not roll to one side. It should lift with the gearbox down at about 15 to 25 degrees.



- 6.** Position your engine over the chassis. It is best to cover the tops of the front shocks and wishbones with padding or carpet. Also cover the cross member over the gearbox.

- 7.** It's now good to have some assistance to help lower the engine into the chassis without banging it on pipes/paint work/brackets/wishbones & shocks.



- 8.** If you have your prop shaft at this point, it is easiest to fit the prop to the diff before fitting the engine. This is not essential as it can be fitted after the engine is in position.



**9. Note:** Don't tighten the engine or gearbox mounts fully before fitting the engine but leave them loose with the nuts just on the end of the studs.

**10.** Position a trolley jack under the rear of the gearbox to keep the output shaft at the right height. To line up the prop shaft, jack up the rear of the gearbox as you slowly lower the engine into place and bring it back to level.



**11.** Locate the gearbox onto its mounts, by using a jack from underneath to lift it above the threads of the mounts. Then lower until the gearbox weight is on the mount. Keeping the engine above the studs of the front mount as this will allow you to move the engine more easily to locate the gearbox onto its mounts. If and M20, you may have to fashion plates to mount your gearbox.

**12.** Align the engine mounts over the studs and lower the engine onto the mounts until the weight is on the mounts. Now you can fit the nuts and washers onto the mounts and tighten according to your workshop manual for your engine and transmission.



**13.** Remove all chains and lifting gear, remove the padding from the chassis, your engine is now in place. Now connect the fuel pipes and begin fitting the other ancillary parts.

**14.** If you have your manifolds this is a good time to fit them, as you have much greater access to the bolts and studs without the body on (this is not to say it cannot be reached after the body is on).



Fuel pipes ready for connection



Exhaust manifolds in position (side pipes)  
M20 block 525i



M30 535i block manifolds (under floor system)



Complete under floor system fitted

**15.** Depending on engine and gear box fitted you may now be able to modify if required and fit the gear stick.

**16.** If you are fitting the BMW engine you will need to have the linkage shortened as in the pictures below.



- 17.** This will require cutting and **TIG** welding of the upper aluminum and the lower steel arm, if you have the **M30** or **M40** engines you need to make this as short as you can, which means cutting out the parallel part of the “H” section of the top arm. The round section of the lower arm and same amount from the top and bottom arms should also be removed. **M20** engines will need less cut out as the gearbox is shorter. The end of the rod behind the gear stick ball joint should be just in front of the 19 x 19mm box (3 to 5 mm).
- 18.** Using the rubber bushing from the donor car that holds the round section behind the ball joint of the gear lever, fabricate a small bracket to hold this bush onto the 19 x 19 mm box section just behind the gearbox. This should be mounted so that the rod part of the linkage is just below the lower edge of the 19 x 19mm box (approximately 3 to 4 mm) to prevent the rod section from hitting the chassis when the engine moves under load. This should be slightly higher than in the picture this was the prototype only.
- 19.** Radiator fitting: This will depend a lot on the engine that you have fitted. A number of radiators can be fitted. The 535i (E28) as in the pictures below and some of the E34 radiators can be used. There are a large number of differences throughout the E34 range and it is more of a case of “if it fits” and if the outlets do not run straight into the chassis, it can be used. If the donor radiator fits, it will have the required amount of cooling for your engine. If your radiator will not fit, make sure that the new one is of equivalent size (area) and core numbers, as there are 1, 2, & 3 core radiators. If you are not sure of what you require in this area contact RVD. We can supply new made to specification radiators. (If you have a huge race engine we can supply to your requirements) or point you in the right direction.



E28 535i radiator and two Toyota fans  
On fabricated frame and cowls



Engine brace to prevent rocking under  
heavy use! (As we plan to do with this car)

- 20.** It is not essential to fit the radiator at this time, as there is good access even when the body has been fitted. You may find that one fan is ample for small engines up to 2.5L and two fans for bigger engines including American V8's.
- 21.** Now you are at a good point to fit the body, as you now need to fit pedal box and master cylinders, to terminate the brake pipes and continue your build.
- 22. *Note:*** As our body shells are made outside the UK, there could be a reasonably long lead time on orders for bodies from time to time depending on shipping dates. It is best not to wait until you reach this point to order your body. If you want to build right away, RVD will be happy to hold your body for a short time, if you do not have space to store it. We will store, instead of you having to wait.