

Carl's Tech Tip #5: Water Pump

One of the parts of the 308 and 328 series Ferrari that was subject to continuing development is the water pump. There are four versions and it's important to understand the differences if you wish to rebuild or replace yours. The first version was fitted to the 308 GT/4, 308 GTB and 308 GTS. This is the so called small bearing version #107128. The next version appeared on the 308 Quattrovalvole models, including the Mondial from around chassis number 48529. The pump housing is the same shape as the previous model (Though not the same internally) and the bearings are the same size too. This pump is #121255. The main difference with this new pump is the introduction of a small rubber seal, # 121263 that is designed to protect the bearings from any small weepage from the main seal. This seal can also be retrofitted to the first generation pump.

The third version is #121290 and was fitted from the 3.2 litre cars in 1986. This pump uses the same seal as the previous #121255 but the bearings are updated. Finally, the fourth version is identical to the third but has a plastic impeller, the previous three having a brass one.

The 308 Ferrari does have an indifferent relationship regarding the pumps reliability. Bearing failure, seizure and the leakage of the seal are all problems that we are all familiar with. On the 308 GT/4 and the 308 GTB the belt for the water pump also drives the alternator. Ferrari was obviously conscious of the belt trying to do too much and by the time the Quattrovalvole models were released they had a separate belt for the pump and alternator. However, if the belt tension is correct and the pulleys are in alignment it appears that it is always the seal that fails first. It seems common practice to over tighten the belt, naturally placing excessive strain on the bearings. The later injection models had a belt just for the pump and a separate one for the alternator and of course you need to exercise the same care in tensioning the belt with these models.

Luckily, there are two ways to replace the pump. The first way is simply to buy a new pump. That's fine but the pump is well into four figures so if you think it's worth it, go ahead, but don't read any further! If you plan to fit a big bearing 328 pump on a 308, you will have to machine the pump flange to take the pulley as the 328 pulley is not compatible with the 308. The other way is rebuild the pump and replace the bearings, shaft and the seal. Buying parts for all the versions of the pumps is no problem but you have to be careful to identify which model is on your car as most parts are not interchangeable.

On cars prior to the 1979 model year, the water pump was hidden by the front cam belt cover. (It's also fouled by the rear cam belt cover but this easy to remove. See footnote). If your car is this model, I'm sorry but to remove the water pump is a real pain. Unfortunately you will have to remove the air intake ducting, air conditioning compressor and the coolant hoses from the thermostat housing. You may as well throw a set of cam belts and tensioner bearings on if you need to remove all this! The pump is then very easy to remove, just seven nuts and off it comes. Unless you are an originality freak, use the side of the pump as a template and mark the area on the forward cam cover that fouls it. With a steady hand and an angle grinder you can remove the 7mm of offending aluminium from the cam belt cover. A medium grade grinding wheel will actually match the factory casting marks pretty closely, so if you are careful, you will not be able to tell it's not standard. The post 1979 cars had the cut out cast into the cover making removal much easier.

If your car is post 1979 or already has the cam cover modification, the easiest way to remove the pump is through the drivers side rear wheel arch. Just remove the inner guard and away you go. If it's the earlier version, as you will have to remove the compressor it's easier to do the job from above.

Tools required:

3/8" or 1/2" drive socket set.
13,14,17 & 19mm ring spanners.
Selection of flat head screwdrivers.
23mm & 27mm Open ended ring spanners
(For the air-con lines)
8mm 1/4" drive socket with extension
(For removing the air box)
Bearing press, but a big vice will do
Loctite 243 (For sealing the shaft thread)
Note, the 242 suggested is no longer available.
Circlip pliers Sealant (See text)
Angle grinder (For cam cover modification)

Parts required:

Pump seal:

Early version: 100433

Late version after approx chassis # 48529: 120948 & 121553 (Sealing ring) also required for late version only, but optional on the early version)

Bearing (2)

Small bearing: 103877.

Large bearing: 116159

Shaft

Early version: 103795

Late version: 121253

Pump gasket 103952, updated version 135121. Same for all pump variants

Lock tab 100434

Dome nut 100436

Circlip

Early version: 11059475

Late version: 11060076 Belt 104336 (Note, carburettored cars only)

Once the pump is removed from the car I would suggest a thorough soaking overnight in penetrant. Often the bearings can be rusted in and in my case; the bearings had rusted on to the shaft. How the pump usually fails is the interface between the seal and the shaft fails allowing water to enter the bearings. The pump seal is actually a ceramic bearing and this seems to rarely give trouble. The way to a long pump life is to ensure the correct anti-corrosion additive is in the cooling system. If it's not, the pump shaft will rust and the subsequent deformation of the shaft will allow water past the seal.

The disassembly of the pump is very simple. Remove the pulley and the woodruff key. The shaft needs to be pressed out and this is accomplished from the pulley end. A large vice should be sufficient to push it out. If not, then the bearings have rusted to the shaft and you will need a press. As the shaft is pressed out you will destroy the flat seal that sits in the pump body (Not on the shaft) so don't worry when ceramic fragments fall out. Once the shaft is out, the bearings need to be removed. With a brass drift or centre punch (Remember you can be as rough as you like removing the old parts) tap out the outer bearing. This must be done before the inner bearing as it's held in with a circlip, and you cannot remove the clip

without first removing the outer bearing. Now that the outer bearing is out remove the inner bearing by first removing the circlip. Again from the inside (Impeller end) tap out the bearing. It is not uncommon for the bearing to disintegrate, leaving the outer race jammed in the housing. If this happens, another squirt with WD-40 should help things along.

Once the pump housing is clean, especially where the inner seal sits it's time to reassemble. Begin by installing the inner bearing. Because we like to do things properly, smear a small amount of grease on the inside of the housing to make the bearing installation easier and to facilitate it's removal next time. The easiest way to install the bearings is to find a socket that is very slightly smaller than the bearing but still covers the outer race. If the bearing is installed by pressing on the inner race, the bearing will be damaged and it's life dramatically shortened.

Be careful! Once the inner bearing is fitted, replace the small washer followed by the circlip. Now fit the shaft into the housing. We have to do this now, as the flange on the shaft will not allow us to fit the inner seal otherwise. Fit the shaft spacer (This fits over the shaft and determines the distance between the bearings. Followed with the outer bearing, again being very careful of placing any load on the inner bearing race. Fit the pulley (Don't forget the woodruff key) as this will prevent the shaft from moving inwards and at this stage it's fine just to do it up finger tight. Now fit the seal. The seal is in two parts, the pump side and the shaft side. Be very careful not to damage its fine ceramic surface. Place the flat seal with the ceramic section facing outwards into the circular cutout on the pump body. It's advisable to use a small amount of anaerobic hardening sealant on the rubber to side to ensure that no water can enter the bearings. After the flat seal has been pressed in make sure it is parallel to the pump body. Now fit the shaft seal to the shaft. There is a spring on the shaft, which pre-loads the seal in order to ensure no leakage. The shaft seal is held under tension by the impeller so make sure it's clean and ready to be installed. You will appreciate an extra set of hands at this stage.

When fitting the impeller, you may wish to use some sealant on the interface between the impeller and the seal to prevent water from trying to get past the shaft. I think this is a good idea, though you will have to ask me next time I pull the pump down to see if it was any help! With the impeller being held on the shaft, fit the locking key, run some Loctite 243 down the shaft thread and fit the dome nut. Tighten the pulley nut too and there you have it. Ready for installation. A few points: In the pump body, there are two drain holes, make sure they are not blocked. If the seal fails, you will not see the leaking water and also should there be any small seepage from the pump it will not be allowed to escape. Remember too that the belt tension is important, not too tight. You should be able to move the belt at least 2 cm with moderate pressure between the pump and the crank pulley. Finally, remember the correct coolant to use!

Good Luck. Carl.

Footnote: Regarding the rear cam cover. This will also need to be removed to gain access to the pump. Again, Ferrari made this difficult on cars pre 1978. The 1974 to 1977 models had studs inserted into the block with three nuts holding the cover on. Unfortunately, if you remove the three nuts the cover still won't come out, as the studs do not allow the cover to slide past the chassis rail! So, not only do you have to remove the three nuts, but also you have to get a stud puller to remove the studs! Crazy stuff! Again, you can modify this to later specifications by simply replacing the studs with three bolts. Note that they are a metric fine thread.