# Removing the engine from a Vespa

There are many jobs that can be done with the engine in the frame, but a full rebuild will be 10 times easier with the engine out of the bike. This section will show how to remove a large frame engine from any year so that it can be split on a work bench. Depending on what bike you have, the pictures may look different than the P200 engine in this section but it should be similar. To remove the engine you'll need:

- Everything to drain the oil.
- Paper and a pen.
- A 7 & 8mm wrench for the clutch nipple.
- A 11mm socket and driver for the gear selector
- A 13mm socket and driver for the rear brake connection.
- A 14mm socket and driver for the rear shock connection.
- A 14mm wrench to hold the other end of the shock bolt.
- A 22mm socket and driver for the pivot bolt
- A large flathead screwdriver.
- A large phillips screwdriver.
- Vice grips for pulling out the pivot bolts.
- A hammer.
- Something to support the rear of the bike like a milk crate or jack stand.
- A helper if possible.

**(1) General:** The first step is to remove the engine side cowl and get the bike up on its stand. Wedge something like a jack stand or a piece of wood under the rear of the frame to get the rear wheel just off the ground. On a P200 you can remove the snap in plastic bumper so that it doesn't get damaged.

**(2) Drain the oil:** Draining the oil is not absolutely necessary, but there are some positions the engine may be in that will cause oil to leak during the removal process. Click here for a step by step instruction to remove the oil.

**(3) Disconnect the electrics:** There is a small junction box located on the flywheel side casing of the motor that connects the engine electrics to the frame as shown below.

Remove the single screw and open the cover to expose the wiring. There are many connectors that are separated in slots in the plastic casing. Pull these out of the plastic junction box and grab a piece of paper and pen to right down what colors connect. This is very important as it is easy to forget when the engine is put back in 2 months later.

Usually one wire from the frame will also go down to the CDI or coil. On a P200 this is the first green wire on the CDI box. Lift the rubber boot going to the external CDI box to expose the 4 wires which plug into it. Remove the first green wire and pull it out through the top of the rubber boot (see below).

Follow the wiring to where it comes out of the frame. All these wires should now be disconnected as shown below

**(4) Disconnect the fuel line (& oil line on some models):** Turn your fuel valve to off. On all vespas this should be the far left position. Locate the carb box and remove the two screws on the cover as shown below.

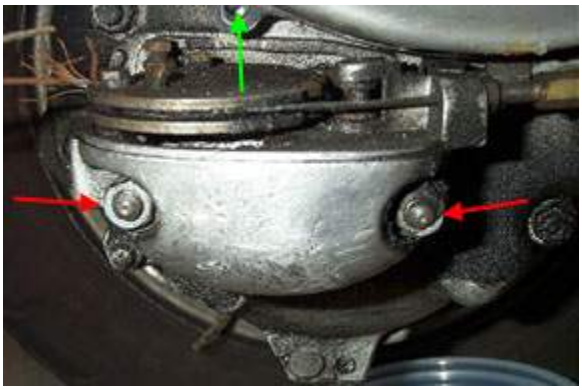
Once the cover is removed the air filter must be removed to get better access to the fuel line connection. You can also remove the rubber bellow between the carb box and the frame by simply pulling it off at each end. This will give you better access to the fuel line. The filter is removed by removing the two flathead screws as shown below.

With the filter out of the way, the fuel line is visible going into the carb (red arrow below). I always put a pipe clip over mine to replace Vespas wire clip - either way remove the clip and force the fuel line off the carb stub. If this is very tough you can use a 10mm wrench on the fuel stub itself. It will then be easier to pull the stub from the line. Don't worry if a little gasoline spills from the line - it is just the remainder of gas left in the line and should stop quickly. Once removed push it through the bottom of the carb box. The bellow opening in the frame is a great place to stuff the fuel line back into to keep it clear of the engine.

This bike has had the oil pump removed, but if you have one, the oil line will also need to be disconnected. It is usually easy to slide off the oil pump metal tube just outside the carb box. Stuff the end into the frame bellow hole, as it is higher than the oil tank and will stop the oil flow.

**(5) Disconnect the gear selector:** The gear selector can come off in one piece with the gear cables still connected. You ma or may not need to remove the kickstart because on some models the kickstart bolt will hit the gear cable adjuster and stop the selector coming completely off. Start be removing the selector box cover which is retained by a

single screw at the base of the fan cover (green arrow below). Then remove the two 11mm nuts that hold the selector on (see red arrows below).



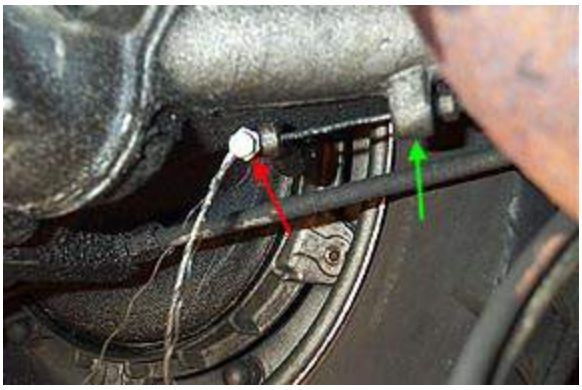
At the headset, turn the gear selector grip all the way to 4th gear and the gear selector should push itself out from the engine casing. You may get a small amount of residual oil leaking from the join, but it will stop quickly. Once the gear selector is in 4th gear you should be able to pull disengage the small arm on the end of the drive axle and pull it clear as shown below.

**(6) Disconnect the control cables:** The clutch, throttle, choke, and rear brake cables must also be disconnected. Let's start at the carb box first. The choke cable is a small wire cable looped over a hook on the carb (upper red arrow below) and the throttle slide is next to it (almost visible with the 2nd red arrow below). This shot still has the fuel line even though it should be disconnected by now.

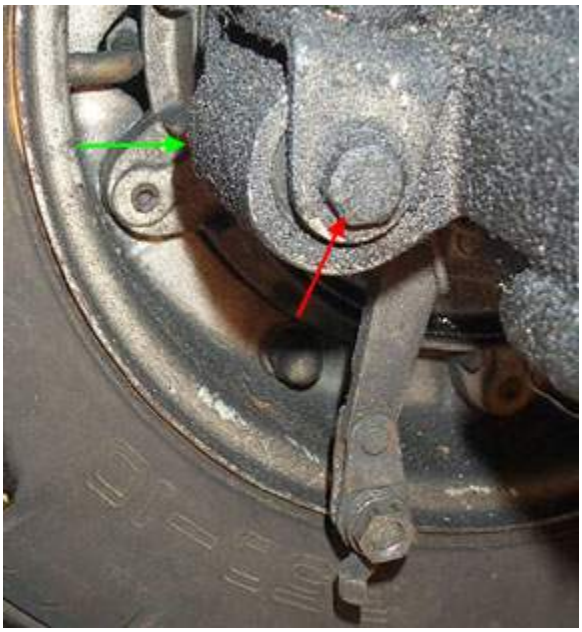
Unhook the choke cable and push it back through the carb box hole. Use the frame bellow hole again to keep it clear of the engine. The throttle cable has a a soldered nipple which has to be dislodged from the carb slide/oil pump end. Use headset throttle to open up the throttle, and then catch it with a screwdriver at a half open point and remove the throttle cable from the slide end. Push this back through the carb box and bend it up into the frame bellow opening.

The rear brake arm is located just below the rear shock mount and has a single 13mm bolt with a hole through the center which holds the brake cable in place by compression. Loosen the nut on the outside face of the brake arm and the cable should pull through (see below). Once free, pull the cable out of the casing mounted cable adjuster and clear of the engine.

Lastly, the clutch cable needs to be disconnected from the clutch arm. Look underneath the engine on the bottom of the swing arm to find the clutch nipple and arm. There is a single nipple holding it in place with an 8mm outer and a 7mm inner (see red arrow below). Use the 8mm wrench to hold the outer, while using the 7mm wrench to loosen the pinch bolt. Once loosened it will thread off the cable and the entire cable can be pulled free of the casing mounted clutch adjuster (green arrow below).



**(7) Removing the main pivot bolt and rear shock bolt.** The last two items that hold the engine in place are the rear shock connection and the main pivot bolt which passes through the swingarm and the frame. The shock bolt is usually the best to remove first (see below). Use a 14mm driver on the open side (red arrow), and a 14mm wrench on the hidden nut on the back side (green arrow). If you don't stop the back side from rotating the entire bolt will rotate rather than coming loose. Once removed, used a pair of vice-grips to pull it free. The engine should drop slightly until the rear wheel hits the ground.



The main pivot bolt has a hex head on the engine side and a nut and lock washer on the glovebox (60s bikes) or spare wheel side (70s-80s bikes). Use the 22mm socket to remove the nut. You may need to clamp some vice-grips to the bolt side to stop it from rotating. The nut and lock washer can be removed without danger of the engine falling out of the bike.

If you have really nice paint work it is advisable to put a rag between the cylinder and the frame, and another between the top of the muffler and the frame before removing the pivot bolt. To remove the pivot bolt I like to use a large flathead screwdriver. I have found that if you just pull the bolt out the engine starts to lean towards the left of the bike and makes it harder to get it out. It is much easier to have the engine lean to the right instead. To make this happen I drive the bolt through with a screwdriver and hammer. This way when the threaded end is pushed through the frame, the screwdriver takes the weight. I then use the vice-grips to pull the bolt out at the engine side.

This then makes the engine lean over to the right as seen below. It is really helpful to have someone to help out because the engine/rear wheel, and muffler weighs about 90 lbs.

The gear cables now need to be moved clear of the exhaust and then the whole engine can be pivoted down and out of the frame. Push the rear shock back towards the rear of the frame to get it clear. From here you can get the engine up on a clean workbench and have all the space and light you need.

# P Series Vespa Flywheel Removal

[Older Vespa Flywheel removal]

The flywheel serves as a weight that allows the engine to move through the compression stage when there is no power being produced by the engine. When a two stroke has finished the combustion stage and the piston is traveling down, the crank doesn't have enough rotational inertia to go past bottom dead center and go into the compression stage. The flywheel is heavy enough that to stop it rotating is less force than is required to move the piston up to the combustion stage. Lighter flywheel motors (like on tuned bikes) usually have a higher idle rate because the flywheel needs to be spinning faster to move the piston with the same amount of force.

Anyway - Flywheel removal is necessary when you want to adjust the timing, remove the stator or split the casings. On P-series bikes it is an easy task - you'll need:

- a 19mm socket and driver
- a flywheel holding tool
- a flywheel puller and a one wrench for the extractor and another to stop the puller rotating (these differ with every manufacturer).
- a medium sized Phillips head screwdriver

Remove the right hand side cowl for access to the motor. There are a series of bolts that retain the flywheel cover which need to be removed. These are arrowed below.

Once these are removed the central 19mm nut has to be loosened. You'll find that the flywheel is a tapered fit on the crank and it is impossible to remove the nut without somehow stopping the flywheel from rotating. I have jammed everything from screwdrivers to wrenches into the flywheel fins to stop it but the actual tool for the job

makes it a snap. The tool fits into the access hole and allows the 19mm socket to pass through the center as shown below. This is a standard thread nut so it must be unscrewed in a counter clockwise motion.

Once the nut is removed a puller must be used to force the flywheel of the crank taper. The inside face of the flywheel nut recess is threaded to take this tool, and there is an extractor bolt which can be tightened to push the flywheel off the end of the crank. The end of the puller is hexagonal so it can be held in place with a large wrench or pliers as shown below. The center bolt can then be tightened until there is a small pop. This sound is when the flywheel finally breaks its force fit with the crank and it can now be removed completely. There are powerful magnets in the flywheel to generate electricity and these may make the flywheel feel like it is stuck on something, but it should pull off to reveal the stator with minimal effort.

I usually leave the flywheel puller in the flywheel until I am ready to reinstall it. It also keeps the lock washer secure because it can't go anywhere. When the flywheel is fully removed you'll see a small woodruff key in the crank taper (or it may fall out). A woodruff key is a small D shaped piece of metal that fits into a keyway in the crank taper. The flywheel also has a slot for the key and this makes sure that the flywheel can only be installed in one position. This is very important because the flywheel position, in relation to the piston, must be fixed in order for the spark to fire at the right time.

At this point you should have the stator visible as shown below. If you are working on a P125 or P150 the stator will look different from the one pictured below.

For more on timing see the timing section in tips and tricks

# Older Vespa Flywheel Removal

[P Series Flywheel removal]

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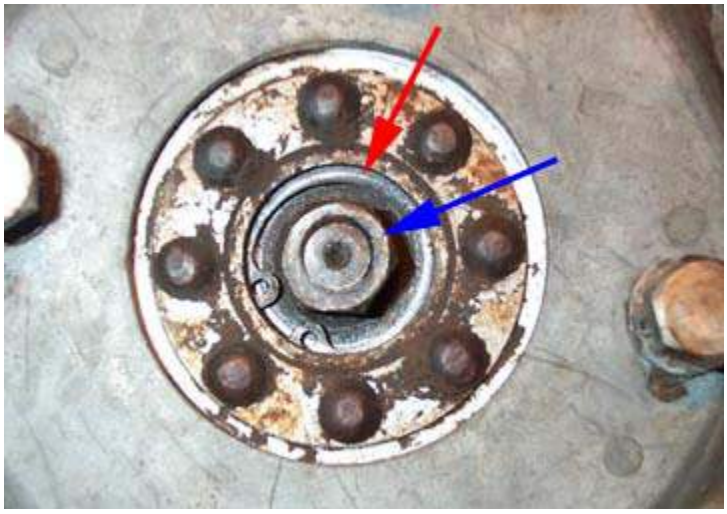
Anyway - Flywheel removal is necessary when you want to adjust the timing, remove the stator or split the casings. On older Vespas the system is a little different than a P series bike - you'll need:

- a 14mm socket and driver
- a flywheel holding tool of some sort

Remove the right hand side cowl for access to the motor. There are a series of bolts that retain the flywheel fan cover which need to be removed to get access to the flywheel. Once these are removed the flywheel fan cover will come off.

The idea behind the system is that a flywheel puller is not necessary. Instead there is a circlip (red arrow) and a central nut (blue arrow) with a special integral flat lip. The circlip fits in a groove in the flywheel, and as the central nut is loosened the lip of the nut starts to push on the circlip, which tries to push the flywheel off the tapered crank.

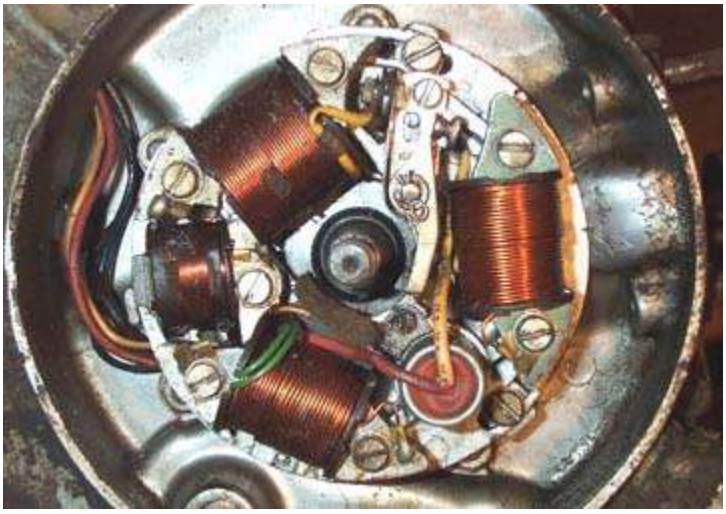


In theory this is a great idea as it doesn't really require any special tools. In practice it works most of the time but be careful to make sure the circlip doesn't try to get out of the groove.

I like to spray a little WD40 on the circlip before loosening the nut. This reduces any friction between the rotating lip of the main nut and the circlip. It is especially useful if either part is a little rusty. Use a 14mm socket on the main nut and loosen it until it hits the circlip. You may need to stop the flywheel from trying to turn while you do this - a handy way to do this is to remove the fan from the flywheel by loosening the four fan bolts. Once the fan is removed you can either bolt a long piece of metal to two of the fan bolt holes, or use something in the access holes.

When the flywheel is fully removed you'll see a small woodruff key in the crank taper (or it may fall out). A woodruff key is a small D shaped piece of metal that fits into a keyway in the crank taper. The flywheel also has a slot for the key and this makes sure that the flywheel can only be installed in one position. This is very important because the flywheel position, in relation to the piston, must be fixed in order for the spark to fire at the right time.

At this point you should have the stator visible as shown below. There are various different types of stators for points type Vespa ignitions, but yours should look somewhat like the one below.



For more on timing see the timing section in tips and tricks.

# Vespa Rally & P Series Engine Casing Split

[Older Vespa casing split page]

Splitting the casings allows access to the crank, the oil seals, main bearings, and transmission components. There are only a few specialized tools required to do this on a P series engine, although older engines also require a heat source like a propane torch to help split the casings.

The casings can be split in the bike which can be very handy if you are simply replacing a shift cross or gear. To start you need to:

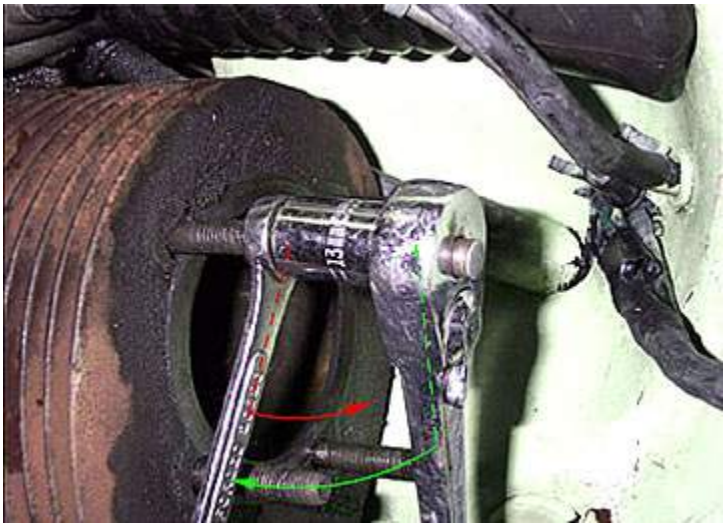
- Drain the oil from the transmission.
- Remove the cylinder cowling by removing the single flat head bolt near the spark plug, and the two bolts top and bottom of the flywheel cover noted with green arrows.
- Remove the flywheel cover by removing the series of small bolts around the rim noted with red arrows. The gear selector cover will also come off with this.
- Remove the exhaust - The exhaust removing procedure can be seen in the tuning exhaust page.
- The stator plate connections and coil can remain in place or be disconnected. The bike pictured was having the flywheel side casing replaced due to a nasty crack so everything was removed from the old casing and put onto the new one. If you leave the electrics connected it just means that the flywheel side casing will only be able to hinge away from the bike rather than removed all together.

From this point your engine should look like below. We just bought this bike so I have no idea what the little box is next to the carb box. I am guessing we'll bin it and solve the electrical problem without it. It may be an AC regulator??!

Remove the cylinder head with a 13mm socket and pull it off the studs. The cool thing about splitting Vespa casings is that you don't really have to mess too much with the top end. What is important is to remove the two flywheel side barrel studs so that the barrel will stay in place but allow the casing half to be removed. This means you don't have to mess around with removing the barrel, refitting the piston, compressing the rings, etc.. There is also a small locating stud on the bottom of the barrel which keys into the flywheel side casing which we'll get to a little later on.

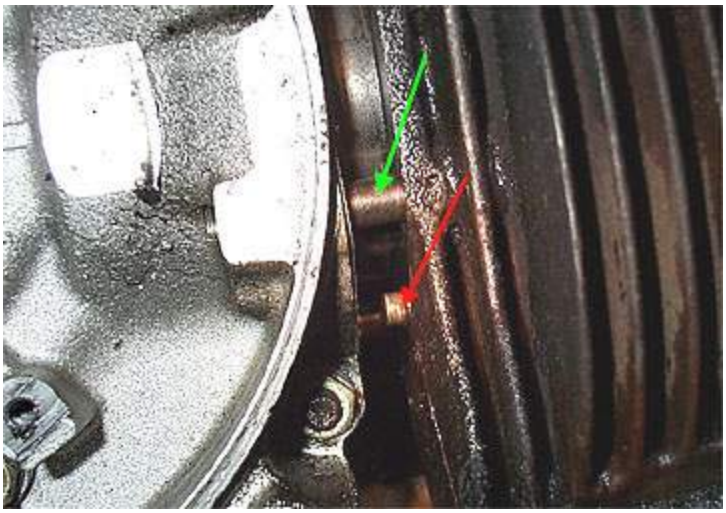
To remove the studs while in place, use the lock nut trick. Take two 13mm nuts and thread them onto one of the two studs furthest away from the bike.

Then take either two 13mm wrenches or a single 13mm wrench and a 13mm socket (as shown below) and tighten the nuts against each other.



Once tight, loosen the upper nut and the stud should turn and unscrew from the casing. Leave the two nuts on the stud as they can be used to reinstall it when you are done with the engine work.

Once both flywheel side casing studs have been removed the barrel must slide up about 1/4 of an inch to allow a small locating stud in the barrel to dislocate from the casing as shown below with the red arrow - This picture was taken before the barrel studs were removed (by mistake) and the barrel stud is shown with the green arrow to avoid confusion.

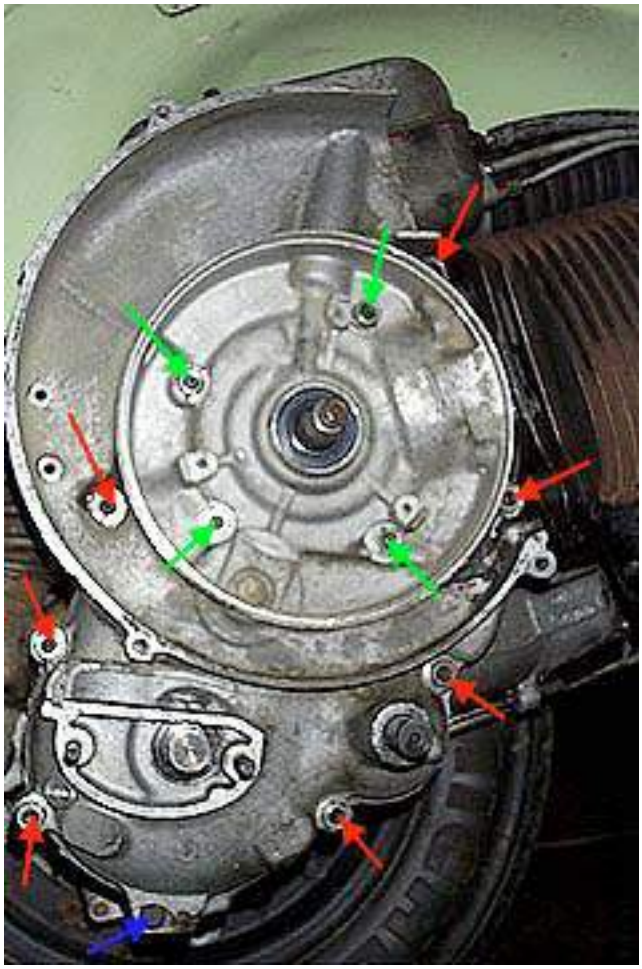


The gear selector box must also be removed before the casings are split. It is bolted on to the flywheel side casing with two 11mm nuts. Loosen these nuts, remove the lock nuts and washers, and store them in a safe place. Grab the gear selector handgrip on the headset and turn it as far towards 4th gear as possible. This should pop the selector off the casing and is handy because you don't have to mess with the disconnecting the control cables as shown below.

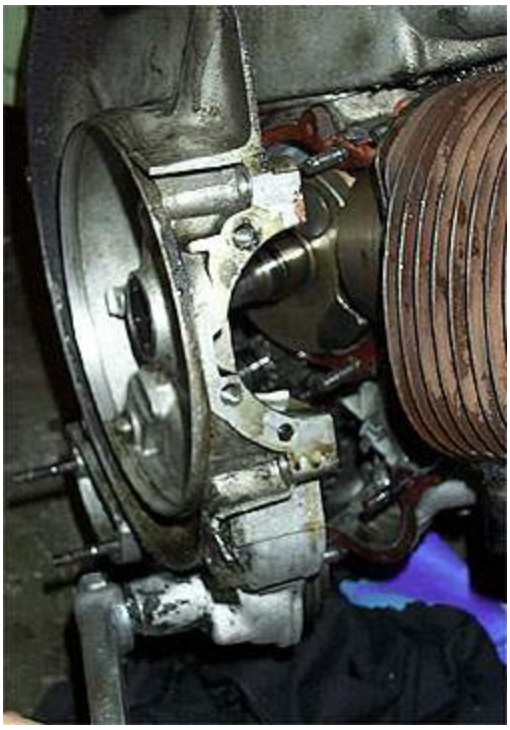
All the crankcase bolts can now be released. Both the flywheel and stator plate must be removed to get to the crankcase bolts around the main crank. Click here for the flywheel removal page.

The next step is to use an 11mm socket to loosen all the casing bolts. The ends of the casing bolts that pass through the engine are D shaped so they should not rotate. All these

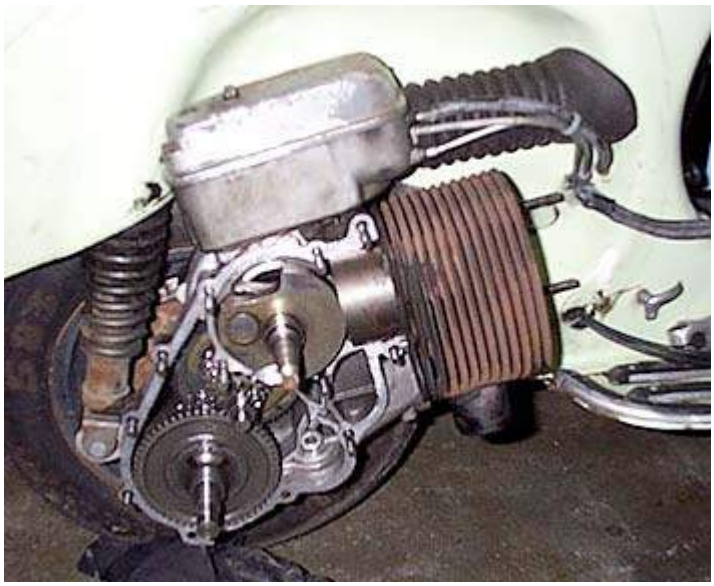
are arrowed below in red. The only casing bolts that have inaccessible ends are the ones directly around the crank, arrowed in green. The final type of bolt is a through bolt that goes the opposite direction than all the others, arrowed in blue.



This should be the moment of truth. Refit the kick start and tighten it down - it makes a handy thing to pull on. I usually start by placing one hand behind the flywheel air scoop just below the carb box, and the other on the kick start. You shouldn't have to pull very hard to get things moving and once the casing has cleared the crankshaft it can be removed completely.



You may find that a single spring and a kickstart gear will fall out of the engine when the casings are split and this is completely normal. Once we put this back together again I'll post a page showing where they are supposed to go. Now the casings should be apart and you are ready to replace bearings, replace the shift cross or gears, fit a new casing gasket, replace the kick start rubbers, etc..



# Older Vespa Engine Casing Split

[Vespa Rally & P Series Engine Casing Split]

Splitting the casings allows access to the crank, the oil seals, main bearings, and transmission components. There are only a few specialized tools required to do this on an older Vespa engine and a heat source like a blowtorch will also be needed. The images on this page are from a very sad looking engine but if you can look past the grime the principles are still good.

The casings can be split in the bike which can be very handy if you are simply replacing a shift cross or gear. To start you need to:

- Drain the oil from the transmission.
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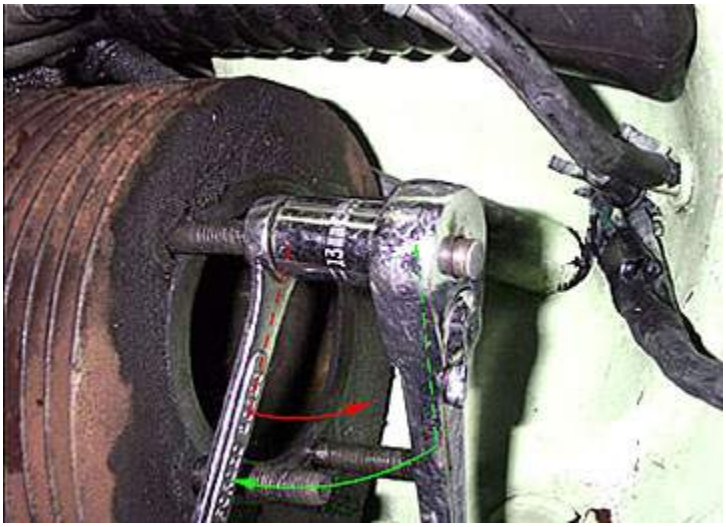

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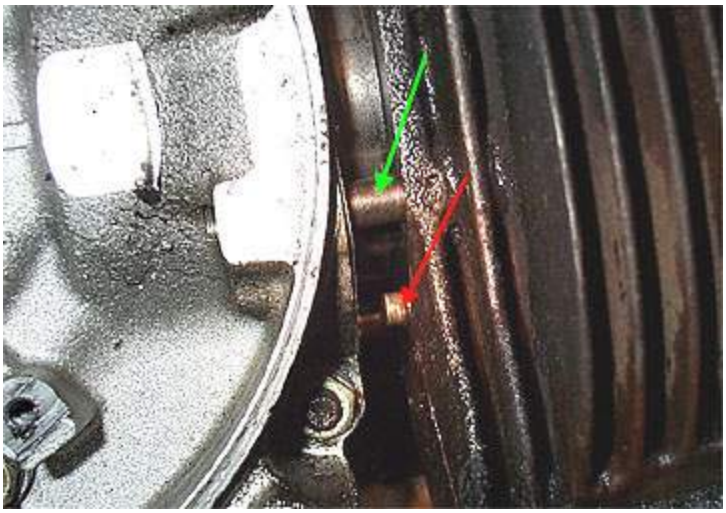

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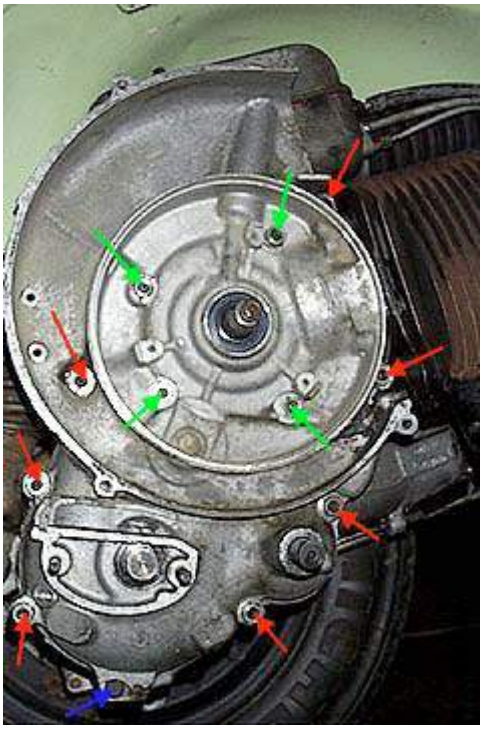

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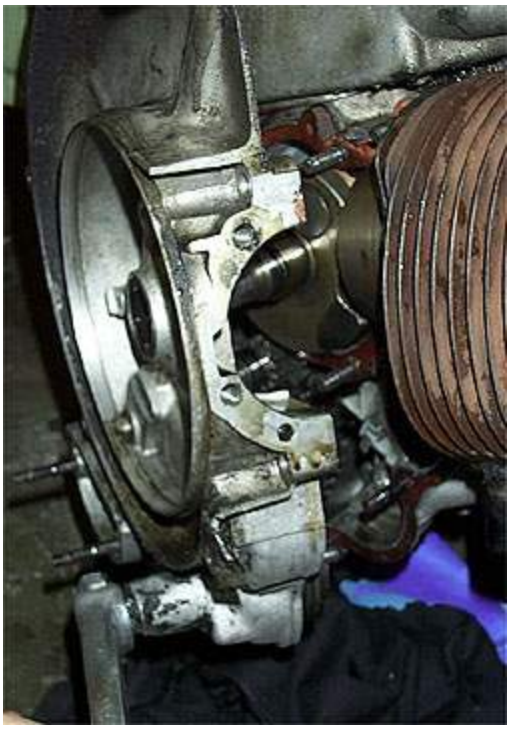

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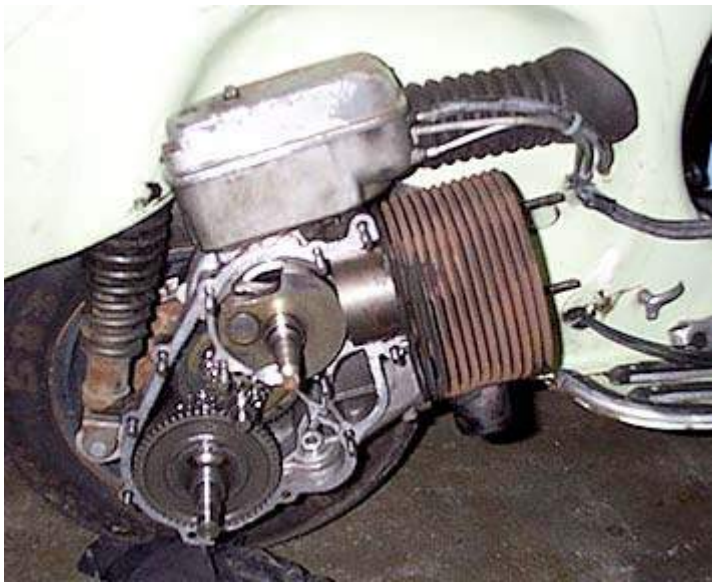


# Vespa Oil Seals: Flywheel Side

There are three main oil seals in a Vespa engine (the one shown is a P-series):

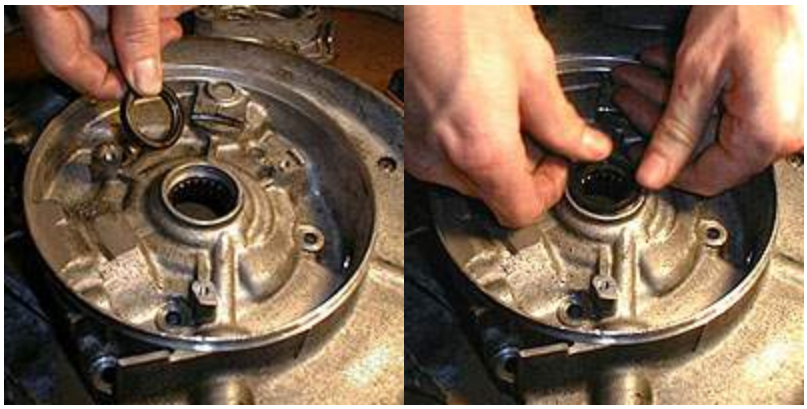
- Main bearing oil seal (at the crank): Keeps the gearbox oil from mixing with the oil/gas mixture.
- Flywheel side oil seal (at the crank): Keeps the oil/gas mix from the outside of the casing.
- Rear wheel oil seal: Seals the gearbox oil around the rear axle.

There are also some more minor seals around the kickstart quadrant, the clutch cover, and the rear wheel back plate.

The main seals should be replaced every time the engine is taken apart as they are cheap to buy but they are buried pretty deep in the engine. If you have the engine apart you might as well drop them in.

Flywheel side seal: The flywheel side seal on a typical P series motor is shown below on the left once the stator plate and crank have been removed. The seal is the black rubber like ring visible just in front of the bearing. It can be removed with a small screwdriver if care is taken not to damage the roller bearing beyond as shown on the right. This is also possible to do with the crank still in the machine but the clutch side seal is not.

Fitting a new flywheel side seal is as simple as pushing the seal into place firmly with equal pressure on all sides as shown below.



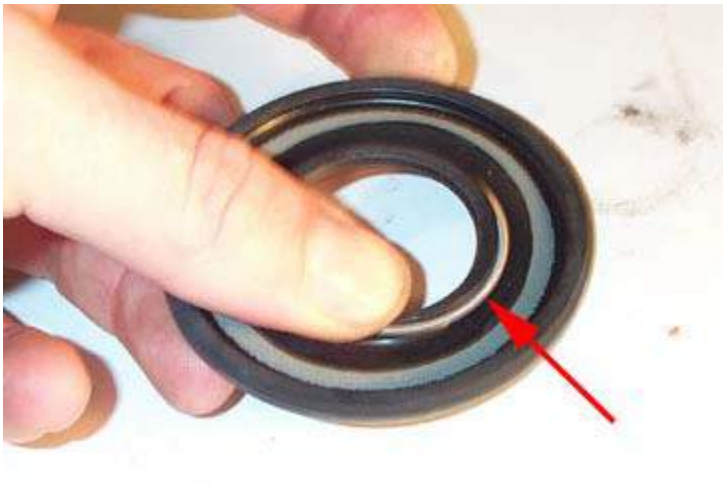
# Vespa Oil Seals: Clutch Side

There are three main oil seals in a Vespa engine (the one shown is from a P-series):

- Main bearing oil seal (at the crank): Keeps the gearbox oil from mixing with the oil/gas mixture.
- Flywheel side oil seal (at the crank): Keeps the oil/gas mix from the outside of the casing.
- Rear wheel oil seal: Seals the gearbox oil around the rear axle.

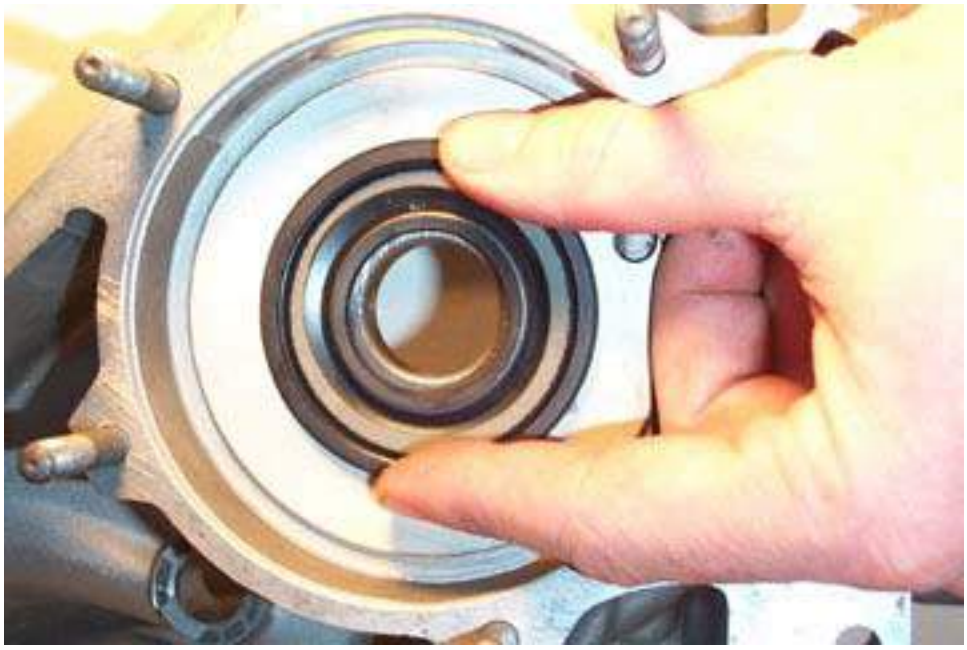
There are also some more minor seals around the kickstart quadrant, the clutch cover, and the rear wheel back plate.

The main seals should be replaced every time the engine is taken apart as they are cheap to buy but they are buried pretty deep in the engine. If you have the engine apart you might as well drop them in.

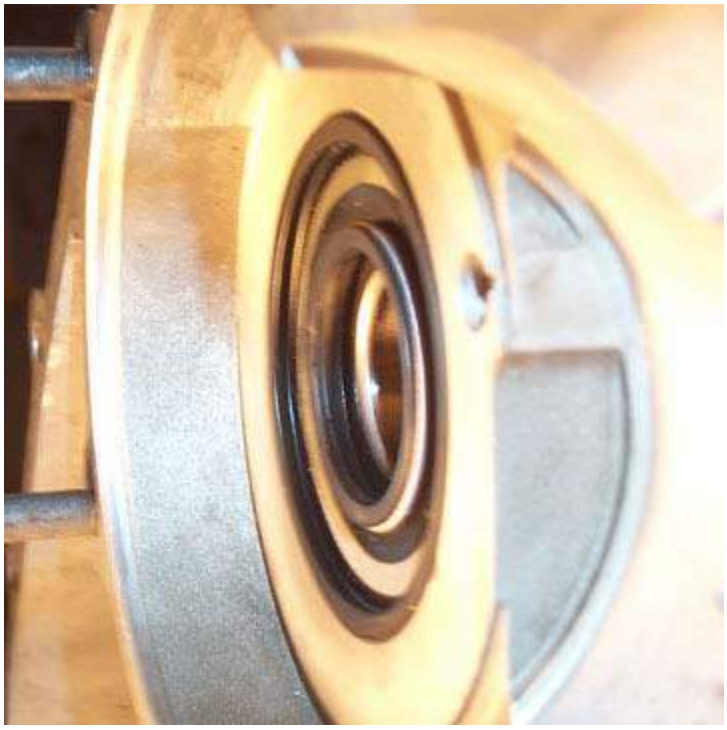


To remove the clutch side seal use a screw driver to poke it out through the main bearing. Fitting a new one is as easy as pushing it in to place. The main oil seal is made from rubber with a metal center and has a circular spring around a flexible lip. This spring must always face the pressure (i.e. the crank web). Above is a shot illustrating the ring (arrowed) with the rubber lip peeled back.

Above is the correct orientation of the clutch side oil seal. You can see the main bearing and circlip beyond. Older Vespas are similar except that the oil seal is outside the main bearing instead of inside. The difference is that when the bearing is on the crank side of the seal it is lubricated by the two stroke oil/gasoline mix, and when the bearing is on the outside of the oil seal it is lubricated by the transmission oil



Place the oil seal in with your fingers and push hard around the edges. Try to get the outer lip flush with the casing. This isn't always possible and when it is stubborn you can use a large washer as long as the outer diameter of the washer is larger than the diameter of the seal. Use a hammer and tap the face of the washer until the washer is flush with the casing.



Above is a shot of the oil seal correctly placed. The lip is as tight as it can go in the casing even though it is not entirely flush.

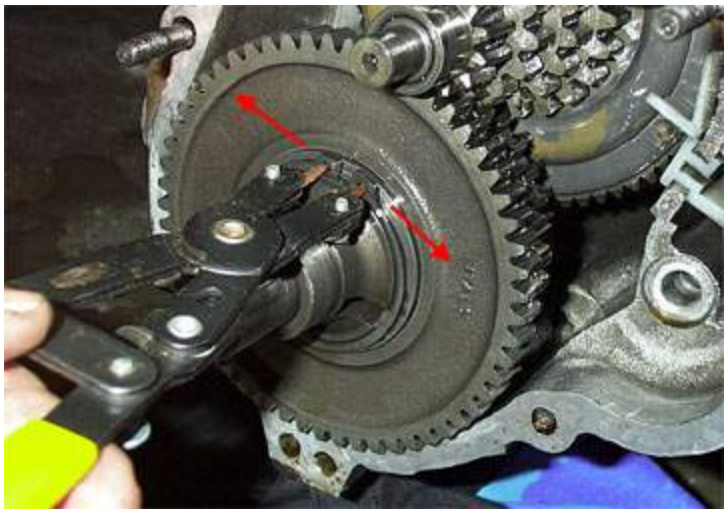
# Vespa Shift Cross Replacement

When the shift cross starts to wear you'll find the machine will quickly jump out of gear and then back in causing lurching. It is a relatively cheap part (around $25) but it is buried right in the center of the engine and requires a fair bit of work to get to it.

The first thing to do is split the casings which gives access to the transmission. Once the casings are split continue with the following steps.

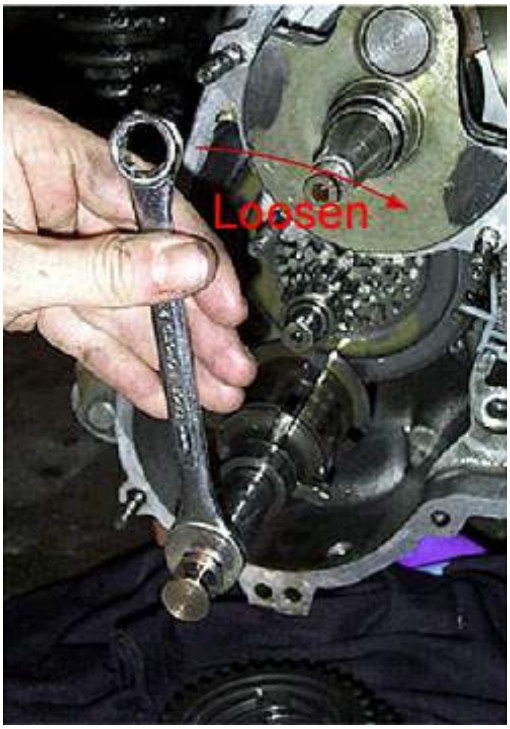
The shift cross is located within the output shaft which terminates at the rear wheel. The axle can turn within the four separate gears and is slotted to allow the shift cross to move up and down, engaging only one gear at a time. The external selector box connects to a long plunger which moves the selector to the correct gear.

To gain access to the shift cross all the gears need to be removed from the output shaft. They are retained by a large circlip and a tabbed shim washer. Use a pair of circlip pliers to expand the circlip out and remove the tabbed shim washer.

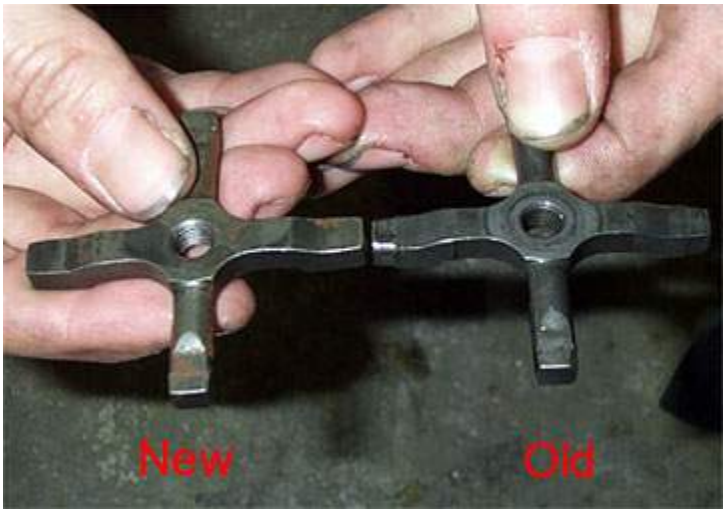


At this point the gears should come off the shaft. If they are held up try rotating the shift cross until they come free. Make sure you remove them and keep them stacked in exactly the same way they came off. If they are reversed the shifter will no longer align with the correct gear. Once all the gears are off the shaft, the edge of the shift cross can be visible through the slots.

The plunger is threaded into the shift cross with a LEFT HAND THREAD which basically means to tighten it, it needs to be turned counter clockwise. This is because the engine would try to unscrew the plunger if it was a typical thread due to the rotation of the gears. Remove the plunger and be careful not to loose the small washer on the end which fits between the plunger and the shift cross. See the picture below for more info.




The shift cross has two rounded legs which can be used to rotate it 90 degrees and remove it from the output shaft slot. Once removed it can be inspected for wear. Any wear will be evident by rounded over ends to each of the legs. Below is a shot of a new shift cross on the left compared to the one removed from a high mileage machine. If you'd like more detail, click the picture for a high resolution image.



Replace the shift cross in the same way it was removed and tighten the plunger down. Remeber that there is a thick washer between the cross and the plunger. If this is not installed your gear to cross alignment will be off. You can also use a bit of thread lock on the plunger threads to be safe. Be sure to install the new shift cross as shown below because if it is in backwards the gear selection will be incorrect.


Re-assembly is the reverse of assembly. The only tolerance to check is between the end float of the gear cluster and the circlip that retains it. This should be between 0.15 - 0.40mm and needs to be checked with two feeler gauges so that the tolerance is measured when the gears are flat on the shaft. See below for the correct tolerance check with two feeler gauges.

# Installing a Vespa P Series crank

This section assumes that you have already split the casings and removed the old crankshaft from the main bearing. These pictures are all from a P200E engine and older models have a different bearing set up.

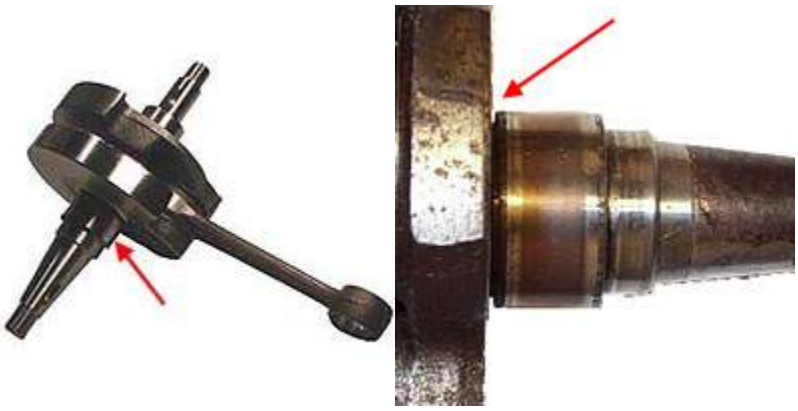
The first thing you should always do is to replace the clutch side oil seal. This part is cheap but will cause you big headaches if you leave the old one in and it fails.

Purchasing a new crank is pretty easy. Most scooter shops have them in stock and can fit the flywheel side race noted below for a small price. It is wise to change both crank bearings located in the crankcases if there is excessive play. The main bearing on the clutch side can be removed by taking off 2 nuts and tabs and a retaining clip visible once the oils seal is removed. It can then be driven out with a large socket of equal diameter to the outside race. European or non-autolube models have a large retaining clip instead of the tabs. The flywheel side bearing has 2 parts - an internal race which is tightly fitted to the new crankshaft and a caged needle bearing set into the flywheel side casing. To remove the casing side of the flywheel bearing remove the flywheel side oil seal (which should also be replaced), and gently heat the casing with a blow torch, shown below.

The easiest way to remove the bearing is to find a socket which is the right diameter to align with the outside lip of the bearing and hit it out in the direction of the crank with a hammer. Since this bearing will be going in the trash anyway you can also use a flat head screwdriver and tap around the outside lip. Be careful not to scratch the surface where the oil seal will be fitted. The new flywheel bearing can now be fitted by reversing this process and tapping the bearing in with a large socket or flat metal plate.

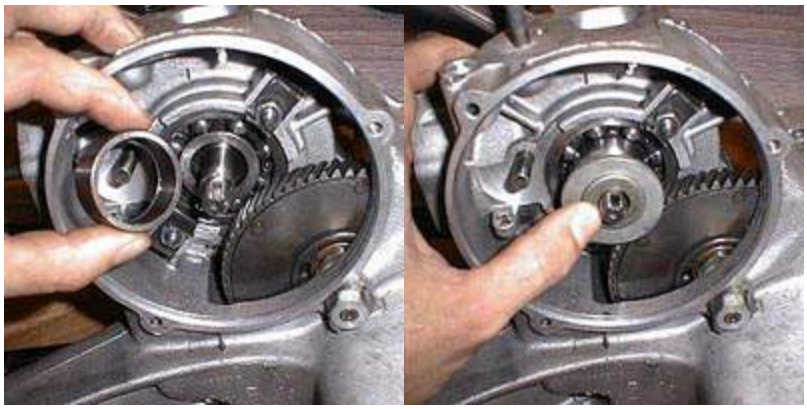
An internal race must also be fitted to the flywheel side taper of the crank. This is an easy item for the scooter shop to fit when the crank is bought but it can also be installed with a large deep socket or correct diameter metal tube. Heating the race with a blowtorch makes installation very easy. Using the tube or socket slide the race down until it stops. At this point, lightly tap the bearing race on the crank. Heating the race will aid in this process. Make sure that the flywheel side crank web is fully supported or you will put stress on the crank pin and possibly distort a nice new crank. This race should not touch

the flywheel, but be spaced of by about 0.5mm. Below is the race location on a new crank and the clearance on a dead crank.



Before you install the crank, grease the lip of the clutch side oil seal so it is not damaged by the installation. Getting the crank into the main bearing race is a very tight fit. The trick I use is to exploit the fact that metal contracts and expands at different temperatures. I throw the crank in the freezer for a couple of hours and either put the clutch side casing half in the oven (make sure all flammable liquids are thoroughly cleaned form the casing) or heat up the main bearing with a blow torch.

Either way be sure that the temperature is low enough so it does not damage the clutch side oil seal! With the crank and bearing being at such different temperatures they should drop together with only your hands force. If not I have used the method below to draw the crank into the main bearing:



Use the flywheel side bearing you just removed as a spacer and make sure it fits directly over the inner race of the main bearing. Add a couple of washers so that only about a 1/4" of thread is showing.

Lastly, thread the clutch nut onto the crank and have someone hold the clutch side web of the crank. Unless it is a very tight fit it shouldn't be too hard to stop the crank from turning. As you tighten the nut with a clutch nut tool the crank will be drawn through the bearing.

Above is a shot of the crank correctly seated. The important part to note is that the crank web lip fully seals and unseals the intake hole in the casing. Make sure the lip of the crank web drops down into the groove in the casing. If you look at the shoulder of the crank against the clutch side of the main bearing it may not be totally flush, but as long as the lip is in the groove the crank is well installed. The crank is all furry with ice condensation because it was frozen before I installed it. If you use this method and don't plan to use the engine the same day as the rebuild, spray the crank with WD40 so the ice doesn't melt and start to rust the crank or bearings.

# Vespa Clutch Overview

The Vespa clutch has remained almost unchanged since the 60s. It is a basically a system of cork and steel plates running in the transmission oil, which is forced together by a series of internal springs. On large frame Vespas it connects directly to the end of the crankshaft, and on small frames it connects to the transmission input shaft.

On a large frame Vespa the clutch works like this - the crank is attached to the clutch bell which always rotates when the engine is running. Inside are three cork plates which fit into grooves within the clutch bell wall and rotate as a unit. In between each cork plate is a plain steel plate which all slot into a central drive gear only. Springs apply pressure to sandwich the steel plates and make both parts of the clutch rotate as a whole. When the clutch is disengaged the springs compress and the cork plates on the crank can rotate independently from the plain plates on the drive gear. As Vespas evolved through the years, the amounts of springs increased for more pressure on the plates to deal with the increased power from newer engines.

The clutch can suffer from a multitude of problems when different parts begin to wear. The most likely cause of a slipping clutch are the cork plates themselves which are cheap to replace if you can do the work yourself. The same plates are standard replacements for all large frame Vespas since at least the GS150. Other problems may be clutch drag, slipping, and sudden lurching.

# Vespa Clutch Removal

The clutch on all large frame Vespas is located on the rear wheel side of the crankshaft. There is an access cover which can be removed while the engine is still in the bike. Although the pictures are all from a P200E, these instructions will be correct for all large frame bikes after the GS150 & GS160. To remove the clutch you will need:

- A 10mm socket and driver (later PX200 models use an 8mm socket)
- A 13mm socket and driver for the rear wheel rim.
- A clutch nut tool.
- A new castelated nut and tabbed retaining washer (from your scooter shop).
- A small flathead screwdriver.
- A small pair of needle nose pliers.
- Something to support the rear of the bike like a milk crate or jack stand.

If you are going to replace the clutch plates you'll also need:

- A pint of SAE 30 transmission oil.
- 3 new cork clutch plates.
- New springs (might as well)!
- A clutch compressor tool or a home made version from typical hardware store items.

The first step is to get the bike up on the main stand and put something like a milk crate, 2x4, or a jack stand between the tail of the frame and the ground. You need something just long enough to allow the rear wheel to spin freely. On a P200 the plastic tail bumper is a snap fit and can be removed before taking the weight of the bike on the tail. Remove the five 13mm wheel rim nuts on the right side of the rear tire (battery or glovebox side) to remove the rim.

Once this is done the rear rim should come loose. The rear wheel will only come out of the frame one way. You have to dislodge it from the rear hub, and move it backwards towards the tail.

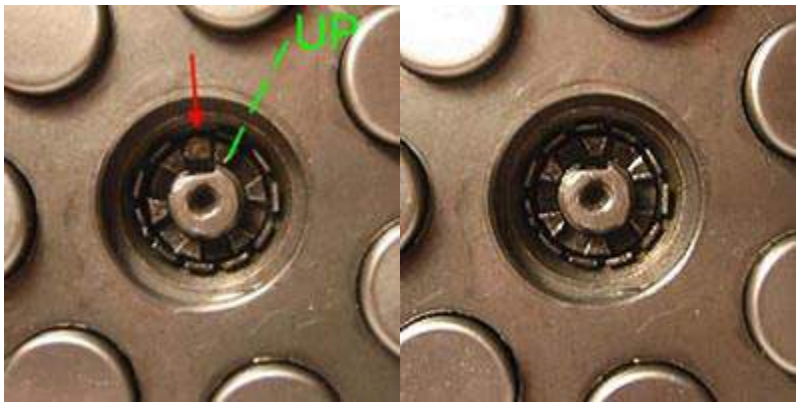
Then turn it out from the frame at about 30 degrees right at the tail and it should come free.


With the jack stand in place and the bike still on the center stand it is easier to get the clearance to get at the clutch cover. The cover is located just above the rear wheel hub and has a small arm and spring coming out of the bottom of it.

If your bike has seen some good use your clutch cover will look somewhat like the one pictured above. It is a good idea to run a rag over the area where the clutch cover seals against the crankcase to make sure that no grime falls into the transmission. To remove the clutch cover you'll need a 10mm socket and driver. Do not confuse the end of the transmission input shaft as one of the bolts. It is located right on the side of the clutch cover and is much larger than 10mm. It is not necessary to disconnect the clutch cable from the clutch arm unless you need to replace or completely remove the clutch cover. Once the three bolts (arrowed above) are removed the clutch cover will come off with a small pull on the clutch arm, away from the casing. There is a small brass plunger which may fall out so be sure to save it for later.

Above is a shot of the clutch with the cover removed. The clutch is actuated by the small brass plunger (which may or may not have fallen out of the clutch cover) pushing on the center plate of the bell housing. The center plate has a small bent piece of wire which secures it over the clutch retaining washer and nut. To remove it use a pair of needle nose pliers to push both ends toward the center of the plate.

With the center plate removed, the nut and retaining washer are now clearly visible. The way the retaining washer works is that it has many metal tabs around the perimeter, and a single tab in the center which slides into a slot in the crankshaft. When the castelated nut is torqued down, one of the tabs will usually line up with a 'valley', and is bent into the lower part of the castelated nut. This stops the nut from loosening under turning from the crank and/or clutch.

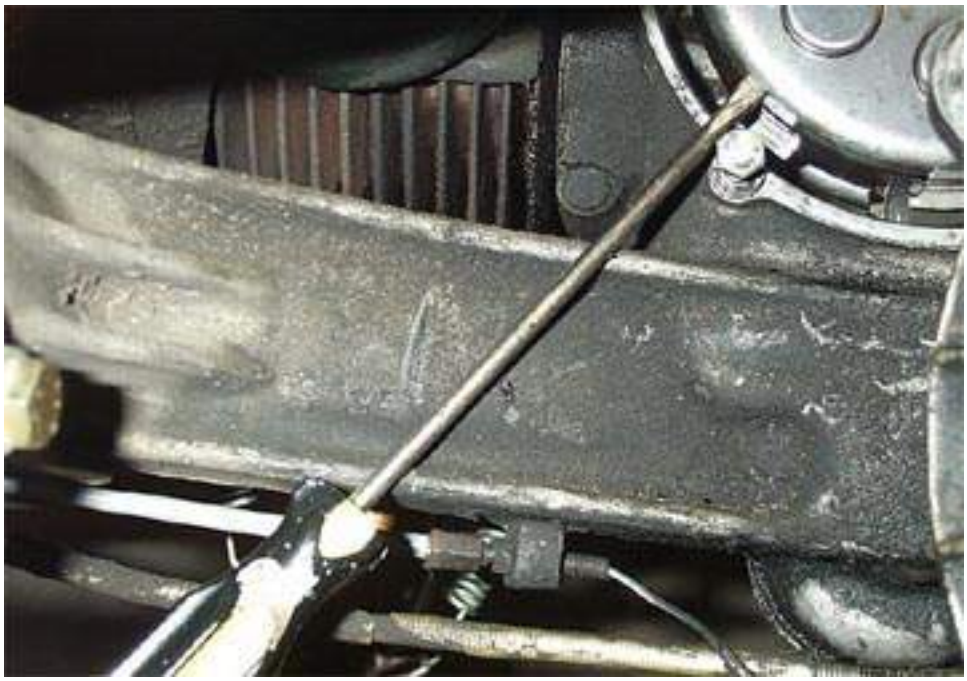


Firstly, if the end of your crank looks anything like the one pictured above, you may want to consider a more comprehensive rebuild. These pictures were taken with an old crank/clutch combination out of the bike to show the detail of the nut/washer relationship as it is very important. In the first picture above, the red arrow above shows the tab bent over in the 'valley' of the castelated nut. You can also see the slot in the crank end which forces the washer to turn with the crank rather than with the nut. The green dashed line is there to show how to orient the clutch before you remove it. There is a woodruff key set in the crank end which is hidden but can drop into the gearbox unless it is facing upwards. The green line should face directly up even though it is off by 15 degrees or so in these shots.

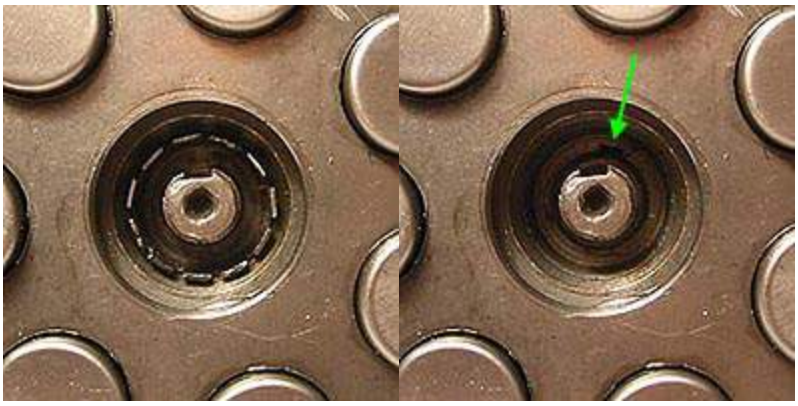
The second picture above shows the tab bent back in line with all the others which will allow the clutch nut to be loosened and removed. I use a small flat head screwdriver to get under the tab and pry it back. Before loosening and removing the clutch nut the clutch bell has to be stopped from turning. On most bikes the clutch will not need anything more than a rag and a tough grip by yourself or a helper. If it still wants to turn with the crank here are a few things you should **NOT** do:

- Lock the flywheel with something to stop it turning. This could warp the crank because one side is trying to turn while the other is stationary this and could put harmful force on the big end pin.
- Jam a screwdriver in between the clutch bell and the primary drive gear which is visible through the space around the clutch bell. If you chip a gear tooth it will mean a full rebuild.
- Jam anything through the spark plug hole to lock the engine by stopping the piston from traveling upwards.

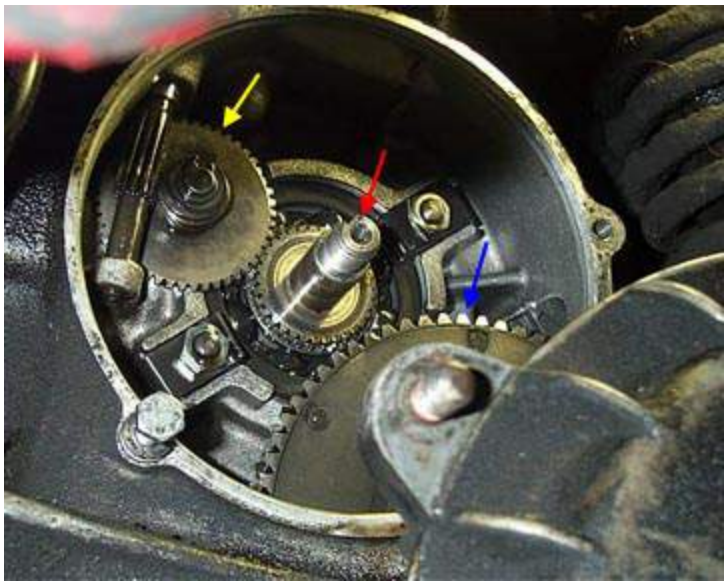
Of course Vespa has a tool which locks the clutch in place and while you could make one, I have found that with a little care, the following method works quite well (thanks Matthew). I thread the lower 10mm bolt almost all the way back into the casing by hand and get a small flathead screwdriver to wedge into one of the clutch bell housing slots. If the screwdriver is long enough the handle will then jamb on the swingarm as you increase the pressure on the clutch nut.



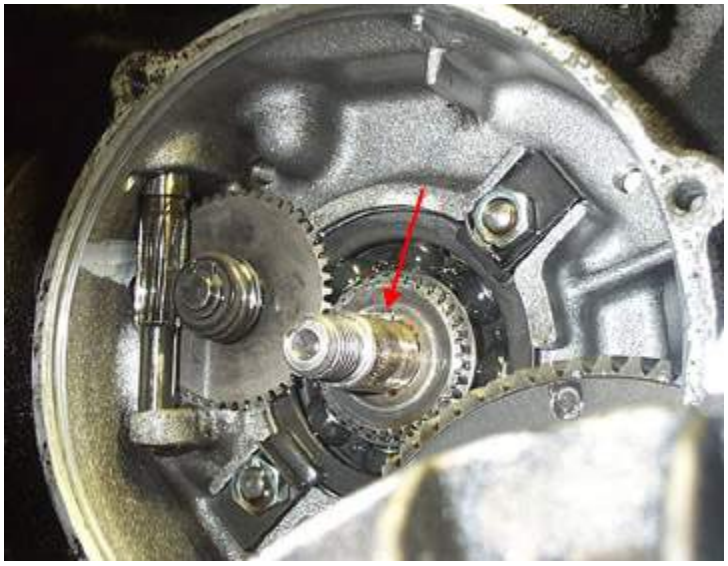
This system seems to work well and doesn't elongate or put a slot in the clutch bell housing because the force loosening the clutch nut is slowly applied Please note that this is not really the correct way to do it but it has worked for me on the few times a rag and a strong grip hasn't been successful. Try it at your own risk...



Now use the clutch nut removal tool and a driver to remove the clutch nut. This should always be replaced along with the retaining washer as they are cheap and the more times they are used the more rounded of the nut edges get which will make it harder to loosen in the future. When the clutch nut is removed the retaining washer can slide out of the recess. In the second picture above you can now see the woodruff key slot in the clutch drive assembly, which must face directly up before pulling the clutch off the crank.



The clutch can now be pulled free using only your hands. If it is stubborn do nut use screwdrivers to lever it off as they may damage the sealing face of the clutch casing opening. The clutch has been removed on the shot above. Since this clutch system was used for so many years, not all Vespas will look like this, but they will look similar. This shot is from an autolube P200E. If you are interested, the yellow arrow shows the oil metering drive, the red shows the end of the crank. and the blue shows the large helical cut primary drive gear.



Once removed be sure to either remove the woodruff key (red arrow) in the crank or tape it in place. There is nothing worse than one falling into the gearbox making an hour long clutch replacement turn into a full rebuild.

# Vespa Small Frame Clutch Removal

[Large frame Vespa clutch removal]

The clutch on all small frame Vespas is located on the rear wheel side of the gear shaft. There is an access cover which can be removed while the engine is still in the bike but the rear wheel and backplate have to be removed to gain access to the cover. To remove the clutch you will need:

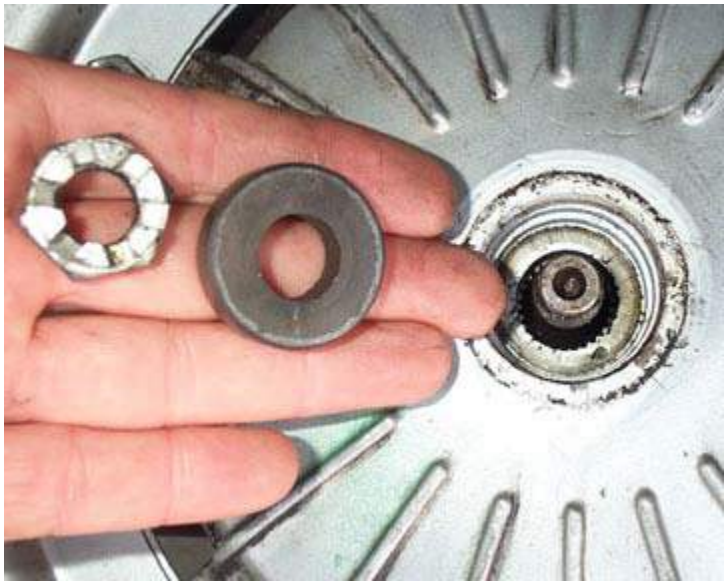
- A 10mm socket and driver for the cover.
- A 13mm socket for the rear wheel backplate
- A 17mm socket for the clutch nut
- A 22mm socket for the rear axle nut
- A small frame clutch puller
- An adjustable wrench and driver for the clutch tool
- A new clutch tabbed retaining washer from your scooter shop
- A small and large flathead screwdriver
- A hammer
- A new split pin for the rear wheel
- Some grease
- Not req'd but a good idea: a new rear axle oil seal, backplate gasket, & clutch cover gasket.

If you are going to replace the clutch plates you'll also need:

- A pint of SAE 30 transmission oil.
- 3 new cork clutch plates.
- New spring (these are usually sold with the plates)
- A clutch compressor tool or a home made version from typical hardware store items.

The first step is to set the bike over so that the right hand side is on the ground. Before you tip it over it is a good idea to run the carb dry by starting it with the gasoline valve off until it stalls because of lack of gasoline. What this is doing is using up all the gasoline in the float bowl so when it is on its side the carb will not leak. Also open the fuel filler cap and put a piece of plastic bag over the hole and tighten the filler cap down again. This blocks the breather hole so gasoline should not leak when the bike is horizontal. The scoot will rest on the right hand side grip and the kickstart lever, but you may want to put down a pillow if you have nice paint work.

Pry off the central nut cap with a screwdriver to expose the axle nut underneath. Remove the split pin and discard it.



Use a 22mm socket to remove the castelated axle nut. It may be stubborn so you can have a friend hold the rear brake pedal down while you crank on the nut. Once it is loose, remove it along with the thick rear axle washer (as shown above) and place them somewhere safe for the reassembly.

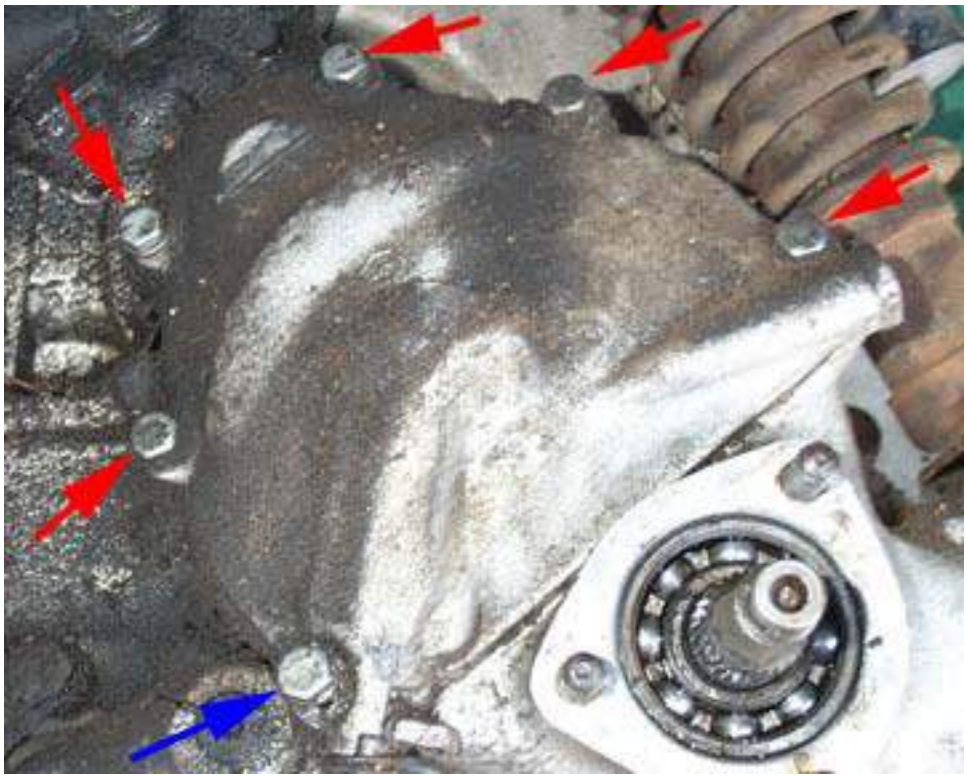
With the nut removed, the entire wheel rim, tire, and hub can be removed. It is a tight fit past the exhaust pipe but a little wiggling will get it clear. To get to the clutch on a small frame the rear hub backplate must also be removed along with the brake pads.


The brake shoes are held on with two small clips at the pivoting end of the shoes. At the other end is a spring between the two shoes. Pull off the pivot clips with a small screwdriver and make sure they don't go shooting off into the depths of the garage. Once they are off use a large screwdriver in between where the shoe touches the activator cam to lever the brake shoe away from the cam. Once it is clear you should be able to pull the

shoe off the pivot point by pulling equally on each end. Once one shoe is free the other is very easy to remove.

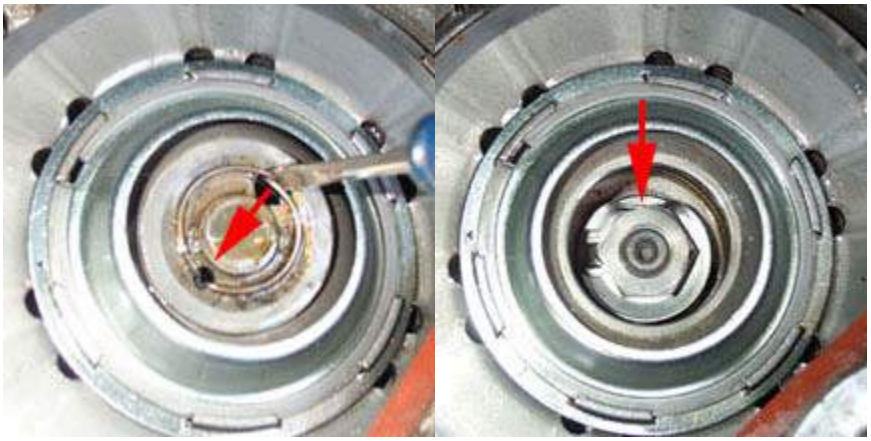
The rear wheel backplate is held to the casing by three 13mm bolts. Each bolt should have a washer and a locknut. Remove each nut and the backplate can be lifted off the casing to reveal the rear axle bearing. The rear brake cable does not need to be disconnected. The bike must remain horizontal from this point on as the gearbox oil can leak out of the main axle bearing if it is put upright before all the work is done.

At this point the clutch cable needs to be disconnected from the clutch arm (shown arrowed above). There is no need to remove the nipple from the cable, just unhook the entire end of the cable from the clutch arm. You may need a screwdriver to get the leverage necessary to move the clutch arm enough to unhook the cable.



Using a 10mm socket, loosen the six bolts shown above. The one that is arrowed in blue is longer than all the others, so remember this when reassembling the bike. Clean around the join between the clutch cover and the casing so that no dirt falls into the gearbox when the cover is removed. Carefully lift off the cover and look out for the brass activating plunger which may be left sitting on the center of the clutch. If it is not, look for it inside the clutch cover.

The clutch should now be exposed. Be very careful working around it with your tools. If you drop anything into the casings now and it falls into the lower gearbox, you'll need to split the casings to get it out.



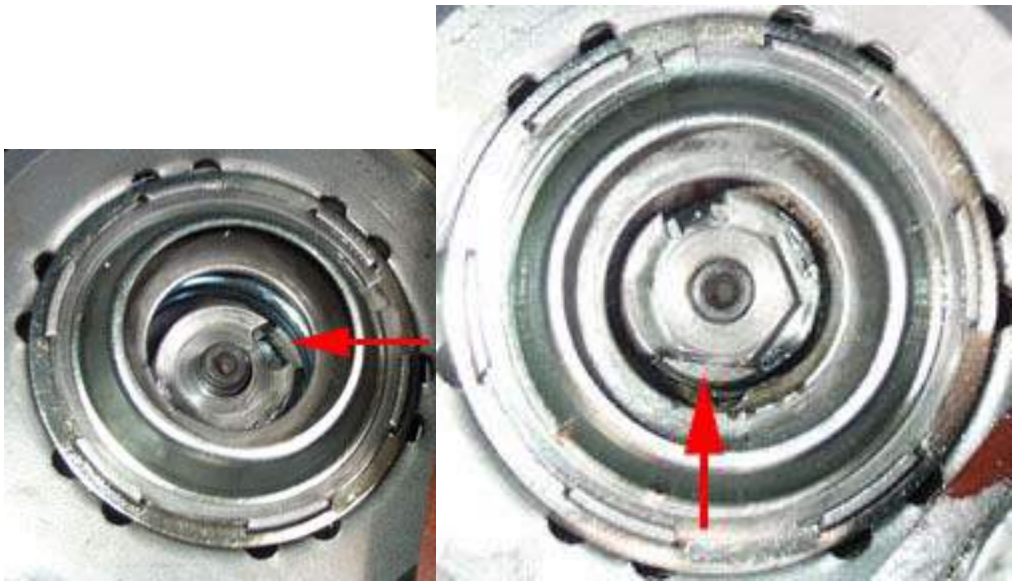
To remove the pressure plate, use a small screwdriver to move the small wire spring in the direction of the arrow in the left image above. Once the wire is pushed in as shown, the plate can be lifted out at end where you are using the screwdriver. It will then expose the single 14mm clutch nut and locking washer. The washer is bent up against one side of the nut to stop it rotating. Use a screwdriver and hammer to bend it clear of the nut before loosening the nut with a 14mm socket. The clutch will try to turn while you loosen. There is a Vespa tool to hold the clutch in place which is the proper way to do things, but I have found a large screwdriver usually does the trick if you are careful. It can be wedged between the outer basket of the clutch and the engine casing, but be careful not to damage either with excessive force.

The picture above shows the 14mm nut and the special tabbed locking washer removed from the clutch. Small frame motors have a tapered clutch side gear shaft end, so the only way to get the clutch off the gear shaft is with a special clutch puller.

The clutch puller tool threads into the clutch body, and then a second bolt is tightened, forcing the clutch off the gear shaft. Use an adjustable wrench around the body of the puller, and a socket and driver on the bolt.

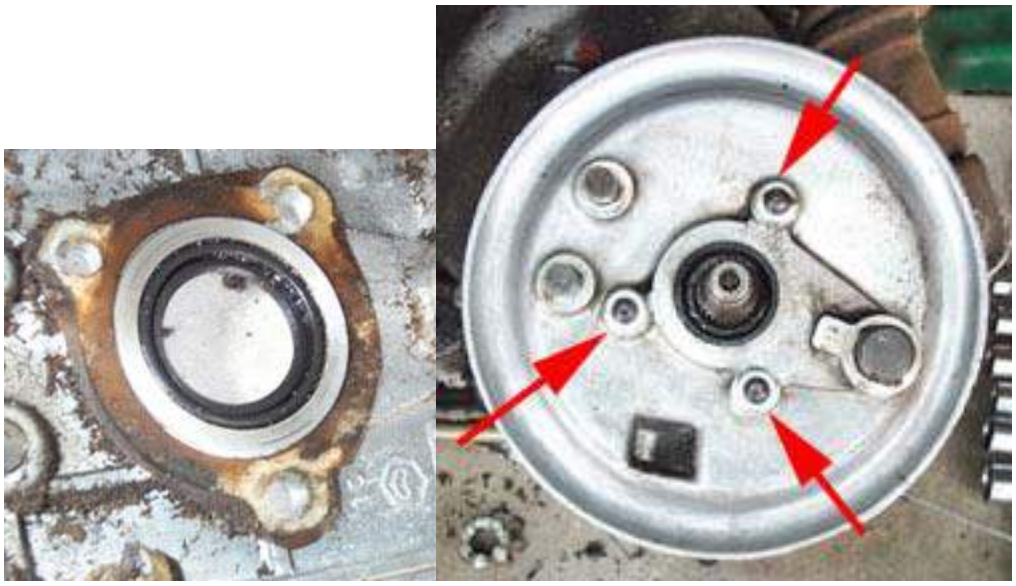
Once the puller has done its job the clutch can be removed from the bike. Be careful to find the small woodruff key that locates the clutch on the crank. It is a small half moon shaped piece of metal that fits into a slot on the gear shaft. On this bike it came out with the clutch, but on most bikes it should stay in the gear shaft end. Keep it for the reassembly process. If you plan to rebuild and replace clutch parts, go to the small frame clutch rebuild page.

Fit either a new or the used woodruff key to the gear shaft end where arrowed above. This key only locates the clutch. Once the clutch nut is tightened the tapered shaft will hold the clutch in place similar to a flywheel set up. Fit the clutch back in the motor, making sure the keyway slot in the clutch aligns with the woodruff key in the gear shaft. The outer clutch basket can spin independently to the gear shaft and you can rotate it so that all the clutch plate tabs fall within the cutouts in the basket.



Refit the tabbed washer, making sure that the tab locates properly in the slot. This is required so that the tab doesn't try to spin. Refit the 14mm nut and tighten it up. Use the same method of stopping the clutch from rotating as you did before. If you use a screwdriver make sure it rests against the clutch basket and not the cork plate tabs as it can distort them. Once the nut is tight, get a screw driver and bend part of the washer up against one side of the nut to stop it rotating as shown above in the image to the right.

Have a look at the inside of the clutch cover. Remove the brass plunger by activating the clutch arm by hand. Add a little grease to the bore and fit it back in. The grease will help the plunger from falling out when you turn the clutch cover over to fit it back against the casing. Before fitting the cover have a look at the gasket. It is always best to replace the gasket, but if it looks good and you want to get the project done, go ahead and use the old one. Tighten up the 10mm bolts (remembering the one long one) and reconnect the clutch cable end to the clutch arm. Try pulling the clutch lever at the headset. It may need adjusting with the small threaded adjuster due to the fact that the new plates are not worn.



Flip the backplate over to examine the rear wheel oil seal and gasket. As always, it is best to replace both the gasket and the seal. The seal is a press fit and the small circular spring should face the transmission. You may have to peel back the oil seal lip to see the spring if you are unclear which way it should face. Refit the gasket and move the backplate into place. Tighten the three 13mm nuts and if you feel like it, give the backplate a good cleaning.

Grease each brake shoe pivot, grease the cam, and refit the shoes. Fit the small retaining clips on the brake shoe pivots. Smear a little grease on the oil seal before fitting the entire hub and rear rim/tire. Fit the large thick rear axle washer, followed by the axle nut. Tighten it as tight as you can, but make sure that some of the holes in the axle align with the nut so that you can fit a new split pin. This is one area where it is necessary to use a new item. This may be the only thing that stops the wheel from falling off in the future and it is very cheap. Always bend the ends in either direction as shown above. Lastly, fit the chrome axle cap.

Remove the plastic bag over the filler cap or the engine will periodically stall. Take it for a spin and adjust the clutch cable if necessary.

# Vespa Clutch Rebuild

Usually when the clutch is not functioning well, nine times out of ten only the plates need to be replaced. Once the clutch has been removed changing the plates and any other work is easy. You'll need:

- A pint of SAE 30 transmission oil.
- 3 new cork clutch plates.
- New springs (might as well)!
- A clutch compressor tool or a home made version from typical hardware store items.

A special Vespa clutch compressor is a nice tool, but you can make one for under $4 at your local hardware store from standard nuts, bolts and washers.

You are looking for:

- A hex head bolt of between #10 and 3/8" (6mm - 10mm) about 2" (5cm) long.
- A nut for the above bolt
- 2 washers with an outside diameter not more than xxx. You may have to build these up as shown in the example above.