

Tuning the Idle Mixture with Factory Pro Chip

Marc Salvisberg at [Factory Pro](#) tuning has put a lot of time and experience into a new chip for the Falco/Mille. It pulls very hard midrange to top, but I especially appreciate the time he put into making the low cruise rpms smooth. The first thing most people notice if you use this chip is that the idle speed comes up significantly. There is usually not enough range in the idle adjustment thumbscrew to bring the idle down! As Marc says, funny things happen when you give an engine the right amount of fuel for the throttle settings.

On the right side of the frame rail is a thumbscrew for adjusting the idle stop. This idle stop determines how far the throttle plates are open when they are in their closed position. Turning the thumbscrew counterclockwise will reduce the idle until a the throttle linkage hits a second idle stop, hidden under the airbox and set by the factory. You can remove the airbox and adjust this factory stop to lower the idle further, but driveability will suffer. As the throttle plates approach a sealed position, the off-closed throttle response gets jerky. If you have moved this factory stop, it can be reset by turning it out until the throttle plates are just completely closed, then turn it in between 1/2 and 3/4 turns. Tighten the M5 locknut when you are done.

The lower throttle stop screw is connected via flexible shaft to a thumbscrew on the frame rail. a spring holds tension on it. The upper throttle stop is set at the factory, 1/2 to 3/4 turns in from the position where the throttle plates are completely closed. A locknut holds it in place.



From the factory, the throttle position sensor (TPS) is zero'd to the value of this secondary throttle stop. If you have lowered the throttle stop, the TPS adjuster will now have a negative offset, but this is a small problem as the primary map at low throttle openings is vacuum axis and not throttle position. You can verify the correct setting of the TPS removing the seat and removing the rubber cover on the ECU protection box. There will be two mating barrel connectors, unplugged in the rubber box. Plug these together, then turn on the key *without* starting the bike. When the throttle plates are closed against the throttle stop, the computer should be reading the TPS potentiometer as "0" (look at the right-hand dash display for a "-1", "0", or "1" indicator). If the dash display reads "-1", your TPS has a slight negative offset, and you should pick up the idle stop a bit until it reads "0". If it reads "1", your TPS is not adjusted properly. It is likely that your idle stop is a hair too high. Try readjusting it lower, but staying in the 1/2 to 3/4 turn range. If the TPS display will not come down to "0" in this range, the TPS can be reset by loosening the mounting screws and rotating the potentiometer. This is very unusual, however, so be sure you've not made a mistake before moving your TPS from the factory position. Turn off the bike and unplug the diagnostic connector when you are done.



The diagnostic connector is located in the rubber ECU box. Plug the two connector halves together with the engine off. Turn on the key (without starting the bike) and the computer will enter diagnostic mode.

Unlike many other bikes, you don't need an ohmmeter to set up the TPS. In diagnostic mode, the computer will tell you where it thinks "zero" throttle position is.



With your throttle plates set and TPS verified, you can now set the idle mixture for the desired idle. There are two inputs left, the air bleed screws and the CO trim pots. The air bleed screws control the amount of air bypassing the throttle plates. There are two of them so they may be used for synchronizing the cylinders. These are the large brass screws in the base of the throttle bodies, visible from the clutch lever side of the bike. The goal is going to be adjusting the idle speed by moving these screws. Stock, they are approximately 1-1/4 turns counterclockwise from fully seated. With the Factory Pro chip, they will need to be approximately 1/2 turn out to get good driveability.



The mixture is trimmed with air bleed screws. Clockwise closes off the orifice, making the mixture richer. The stock setting is about 1-1/4 turns out from fully seated, but the Factory Pro chip will require that these be closer to 1/2 turn out.

Lightly seat the air bleed screws (clockwise), then turn them out one turn counterclockwise. Start and warm the bike above 176 F (80 C). Turn the screws clockwise equal amounts until the idle drops to your desired range, but the idle is still smooth. The factory idle setting is 1150 - 1350 rpm, but I have not been able to get my bike to idle smoothly below 1500 rpm. If the idle drops off sharply, you are probably too rich and should back the screws a bit.

With the Factory chip (and some other aftermarket chips), the CO pots are enabled. These are located in the metal ECU box, and can be accessed through holes in the front next to the

connectors. These are 1 turn potentiometers, nominally centered in the middle of the range. With USA stock chips, these pots are disabled in software. With the Factory Pro chip, they are enabled, and should be adjusted for best idle.

If you like, you can also synchronize the cylinders at this point. The more I fiddle with this bike, the less important I think exact cylinder synchronization is. In fact, the service manual emphasizes trimming the screws to synchronize CO emissions, and verifying vacuum only to see that it is in the correct range (22.5 cm Hg, plus or minus ten percent). I have found the bike runs a bit smoother with a "stronger" front cylinder. See the procedure for setting up the vacuum gauges and [synchronizing cylinders](#) if you wish to verify your vacuum balance.

A Comparison of Different Air Filters

The Falco shares the same filter element as the Mille. It's no surprise then that there are a few aftermarket air filters available. Reports on these have been mixed. It seems the majority of people are convinced that there are no performance benefits to using an alternative filter. In most cases, though, the aftermarket filters are renewable, so it's more likely that they will be free-flowing and they will be cheaper in the long run. Click on any image to enlarge it.

Getting access to the filter is quite simple. See my [airbox page](#) for a quick look at how to get to the filter.

The **stock filter** is a pleated paper element. There is plenty of surface area. In fact, I'll venture a guess that this filter is larger than those used on most automobiles. Construction is certainly identical. I do not know the cost of this element.



The stock disposable element. Paper pleats with a wide wire mesh on the exit side of the element.

The most sought-after aftermarket element seems to be the **K&N filter**. Made by [K&N Engineering](#), this reusable filter is a proven design. The filter is made of cotton, sandwiched between two layers of thin profile mesh which reportedly "orient" the airflow to prevent turbulence. The trapping ability of the filter comes largely from the fact that the element is conditioned with a tacky oil. K&N filters are typically expensive in the US, and not all elements are imported. If you want a K&N filter for your Falco, you'll need to find part number [AL-0003](#) overseas (this part number does not exist in the US). Both [Red Racing](#) in Italy and [PDQ](#) in England will export filters at reasonable cost (\$45), but the lead time has been known to be long at times. K&N filters come pre-oiled, but eventually you will want to buy their renewing kit

containing a mild detergent and a spray can of oil. Never use engine oil, as it breaks down in the presence of water.

K&N renewable filter. Cotton pleats with fine wire mesh on the intake and exit sides. K&N filter oil is red so you can see how even your coverage is.



Tired of not being able to get filters for resale from K&N, Ken Zeller contracted to have his own made using the same materials. You can find these filters at his site, [Evoluzione Cyclesports](#). Their part number is [75000](#). The filter prices are currently sale priced at \$31 delivered in the US, \$41 overseas. Their site claims 2 BHP increase with this filter. The filter is pre-oiled.



Evoluzione Cyclesports filter.

Factory Pro Tuning is selling a filter made by BMC that they claim is the only filter they've tested for the Mille that made a horsepower difference (although it was something like 1 HP). Their website mentions Evolutione filter, but its not clear to me if this is the same filter sold by Ken Zeller at Evolutione or not. Contact [Factory Pro](#) for more information about the filter, number [FI-BMC-20306](#). BMC makes street and race filters, and it seems from the website that this is a street flow. The filter prices are \$60.

I've been told that the Mille SP comes with a performance filter made of oiled foam in a wire cage, similar to Uni filters. In general, these foam filters flow extremely high, even higher than the cotton filters. Although it uses a different airbox, the filter is supposed to be a bolt on item for the Mille and should also fit the Falco. The possible downside is that an Aprilia representative has said that the filtering ability of the SP airbox is not great. Its a race only item.

For those of you looking for the ultimate in performance and value, I've found an inexpensive element with more surface area than all the other filters. This will require a bit of airbox modification but I think the results would be worth it.

Sears Shop-Vac filter. Paper pleats. This filter has stood up for 12 years in my 8 gallon shop-vac.



Summary of Air Filter Features						
<i>Filter</i>	<i>Material</i>	<i>Height</i>	<i>ID</i>	<i>Pleat size</i>	<i>Pleats</i>	<i>Surface area</i>
Stock	Paper (disposable)	4-1/2 in	3-7/8 in	1/2 in	92	414 sq in
K&N	Oiled Cotton (cleanable)	4-1/2 in	4 in	1/2 in	47	212 sq in
Evoluzione	Oiled Cotton (cleanable)	n/a	n/a	n/a	n/a	n/a
BMC	Cleanable -- no details	n/a	n/a	n/a	n/a	n/a
Mille SP	Oiled Foam (cleanable)	n/a	n/a	n/a	n/a	n/a
Sears	Indestructable paper	7 in	4-1/2 in	1-1/4 in	111	1,942 sq in

Servicing the Clutch Slave Cylinder

The Falco has a hydraulic-actuated clutch, as opposed to the cable-actuated clutches found on many sportbikes. There are advantages and disadvantages. Some would say the cable clutches have better feel, or one-to-one connection between ones hand and the clutch action. But the hydraulic clutch, while somewhat vague at times, suffers none of the cable friction. This, coupled with the vacuum feedback circuit, means less clutch effort for a heavy-sprung big-bike clutch. Also, in theory, a hydraulic clutch should be very reliable with no routing difficulties, lubrication issues, or cable breakage. I've found this to not be the case, as bleeding and the seal failure of the Brembo cylinder are more of a problem than they should be.

The Falco clutch fluid has always turned black a couple of weeks after changing it. This has not been a problem, as I flush it every oil change. But recently on a trip, I lost a large portion of my

clutch travel. The seal seemed intermittent, and the last little bit of lever travel that did work was very hard to actuate. Needless to say, my hand was cramped up in no time and I did not look forward to shifting. No fluid had been lost, but I suspected the slave cylinder ("control cylinder") based on the experience of many a Falco and Mille owner. I removed the cylinder for inspection.



The clutch slave cylinder lies behind the countershaft sprocket cover. Three bolts hold it in place. There is a weep hole in the housing ("flange") behind the cylinder, and on my bike there was a few drops of hydraulic fluid around this hole. If you are replacing the cylinder, you should probably remove the clutch hydraulic line first, but for inspection it is not necessary.

You can remove the piston from the cylinder by pumping the clutch lever a few times. Unlike a brake cylinder, there is no square seal in the bore. Instead, the piston is more like an accelerator pump or fork seal, with a one-way wiper on the piston itself. The bore should not be scratched, and the seal should be flexible and intact. Any nicks or cracks, and a rebuild is in order. The rubber seal on the flat end of the piston is simply a grease seal for the end of the actuator rod. It should be cleaned but is not critical. On my bike there was some grooving of the actuator rod where it touched the seal. If this grooving is sharp, you would want to lightly sand it.



The slave cylinder bolts to a spacer, or flange. This is easily removed and should be cleaned to keep sand and chain grit away from the cylinder. Clean the actuator rod, particularly where it touches the seals.

After cleaning the piston and bore with brake cleaner, I lubricated the seal and bore with fresh brake fluid and reassembled them. A dab of fresh grease in the hole at the end of the piston will

reduce friction on the actuator rod. The torque spec on the three bolts is 8.7 ft-lb (12 Nm). The torque spec on the bleeder nipple is 10.8 ft-lb (15 Nm). After refilling and bleeding the system, my clutch lever was restored to its original feel.

Had a rebuild been necessary, there are a few options. I've been told Brembo does *not* sell a service kit, but I believe some manufacturer in the UK does (please email me if you have purchased one). Outside of buying another stock cylinder, [Evoluzione Cyclesports](#) sells a replacement. This replacement has reduced clutch effort, but at the price of a different feel that you may or may not like (generally, more leverage means more travel is required). I would speak to them before ordering to make sure the countershaft cover can fit over it, as the original Mille cylinder they offered required some cutting.

Aprilia Falco Coolant Change

The Aprilia service manual calls for changing the engine coolant in the Falco every two years. It is an easy, if not messy job.

Less than one gallon of mixed 50% water and 50% ethylene glycol antifreeze solution is required. When purchasing the coolant, look for a brand that does *not* include silicates (such as silicone-silicate) as a corrosion inhibitor. These materials have been known to cause premature water pump failure in some motorcycles and are worth avoiding. I've found that many "extended-life" brands of coolants such as Prestone Extended Life do not contain silicates. The original coolant in the Falco was a beautiful cobalt blue color. You can mix any color of ethylene glycol coolant in as a replacement, as the color is only cosmetic. There are other additives and coolant types that make their way into motorcycles. I have tried "Water Wetter" on the track where ethylene glycol is forbidden. I don't know if it worked, but it seemed to do no harm. There are other formulations of coolant that others have used besides ethylene glycol. I have not had a need to try these. I personally would not use any "flush", sealer, cleaner or anti-rust additives as these are likely to contain silicates to scour the system.



In order to access the engine drain bolt, removal of the lower cowl and middle-right (brake lever side) cowl is necessary. Take care in detaching the connector for the turn signal. It is a good idea to store the shoulder bolts in their original locations while you work as they are not all the same size. The drain bolt is behind the coolant overflow reservoir, which is held by one bolt then lifted out of place. The relief tube snakes around the bracket, but can be easily fished out and the reservoir will then hang out of the way. Click on image to view zoom of drain plugs.

Draining steps

- With a catch pan, open the reservoir to drain as it is hangs upside down

- Next, drain the coolant from each radiator. At the bottom of the radiator is a drain bolt with an aluminum crush washer. If you want a good flow, crack the filler neck on the right (brake lever) side of the gas tank. The cap on the filler neck contains a pressure relief that can be examined.
- The lowest-most bolt on the water pump (behind the reservoir with two rubber hose connections) is the engine drain bolt. It is backed by a copper or aluminum crush washer. Remove this to finish draining the system.
- Replace the engine drain bolt and torque to 8.7 ft-lbs (12 Nm). Replace the radiator bolts and torque to only 7.2 ft-lbs (10 Nm). The service manual recommends Loctite 572 (a thread sealant) on the radiator bolts. I used a generous amount of teflon tape instead.
- Replace the coolant overflow reservoir, and route the relief hose up and around and down into the hold clamp under the reservoir.

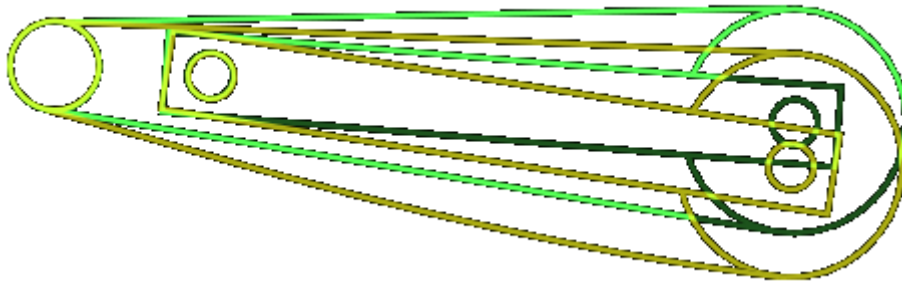
To fill, a narrow-necked funnel is required to fit in the filler neck beside the gas tank. Fill the system close to the top, then "burp" it by squeezing the hoses at the bottom of the radiators. Top it off and close the cap down. Fill the reservoir until the coolant in the sight tube is at the max level. This system does not need to be bled, but after the first heat and cool cycle the level in the reservoir will need to be reset. Replace the bodywork, then wash the bike!



Aprilia Falco Chain Adjustment

According to the Owner's Manual, the Falco chain slack should be set to 25 mm at mid-run, with the bike on the rear stand. As the chain stretches, slack needs to be taken up to keep the chain from whipping against the exhaust or frame, or worse yet, jumping off the sprockets. But running a chain too tight will quickly stretch it, will accelerate sprocket wear, and may damage your countershaft bearings too. It is always better to err on the slack side, and your chain will last much longer loose than tight.

As the swingarm travels downwards, the chain slack increases. So, when measuring chain slack when the rear wheel is hanging (such as when using a GP style swingarm pivot stand), if you set the slack to 25 mm it will actually be too tight by Aprilia's specifications. Also, if you've raised the ride height using an aftermarket shock, or with a Mille swingarm, the chain slack specification is no longer valid.



The swingarm radius (swingarm pivot to rear axle) and chain radius (countershaft sprocket to driven sprocket) are not concentric. The result is that the driven sprocket is farthest away from the countershaft sprocket when the three pivots are in line. As the swingarm is moved above or below this line, the chain slack increases.

To set the chain slack without specs, put the bike up on jackstands through the swingarm pivot (unweighting the swingarm). Support the swingarm by putting a scissors jack under a swingarm button, then remove the lower shock mounting bolt from the linkage. Using the jack, raise the swingarm until the countershaft sprocket, swingarm pivot, and rear axle are all in line. This is the point where the chain will be tightest.

Using a taut string as a reference, raise the swingarm until the countershaft, swingarm pivot, and rear axle are all in line. Be careful not to let the string touch anything.



With the swingarm and sprockets in line, tighten the chain so the chain is almost snug, but the rear wheel spins freely. At least one chain manufacturer recommends a half inch (12 mm) of slack. That seems to be a good target for a free spinning wheel and no suspension load on the countershaft.

After setting the chain slack, lower the swingarm and replace the shock bolt. Now let the swingarm hang free. The chain should not be able to touch the frame or exhaust at this point. Aprilia has been nice enough to dent the exhaust pipe for clearance. If the chain appear loose enough to cause damage, take in a little slack and line up the swingarm and sprockets again to verify that there is still slack there. If you can't satisfy both conditions, you have too much suspension travel (ride height). Dirt bikes have solved this problem by installing chain rollers to keep the chain from sawing critical components.

When you are satisfied that the chain will not jump off the sprockets or saw the exhaust when the rear wheel drops into a pothole, put the swingarm back on the rear stand and remove the jack stands. Check the chain slack at this position. Record the value, and this will be your new

specification for chain slack with your ride height configuration. Chances are, its more than 25 mm, but will probably be less than 40 mm in order to clear the exhaust. On my bike with Penske set so the swingarm hangs freely about an inch lower than stock, 35 mm appears to be the right number.



I can't read the swingarm marks very well, so I use a caliper to get both sides of the axle spaced the same. This technically isn't any more accurate than the marks, because it relies on the blocks and swingarm opening being machined accurately. To really be accurate, you need to measure back from the axle to the swingarm piv

Aprilia Falco Chain Wear Measurement

If the o-rings are kept in good shape and the chain is not allowed to rust, it will likely end its long life because it has stretched too much. This is due to wear in the pins, not because the side plates are weak. The Falco has no chain stretch indicators on its swingarm, not that they would be valid if you swapped your gearing as many people do. So, periodically, you should check its stretch by measuring it.

The quick rule of thumb for measuring chain wear is to grab the chain at back of the sprocket behind the rear axle, and pull it off the sprocket. With a worn chain, you will be able to pull the chain away. The rule-of-thumb says that if you can see half a tooth on the sprocket, the chain is dangerously worn and should be replaced. This is an old check, though, and may be for a non o-ring chain. Nevertheless, its a handy way to check for excessive wear when you're looking at buying a used bike.

After 12,000 miles, this Falco chain can hardly be pulled away from the sprocket at all. When half a tooth can be exposed, its time for a new chain.



In order to accurately measure chain stretch, first tension the chain. If the chain is on the bike, you can hang 20 lb from the lower span of the chain with the bike in neutral and the rear wheel raised. Now measure a length of chain, along the top, preferably from center of pin to center of pin, across as many pins as possible. Measuring 10 to 20 pins is desirable, but in this case I

used a 6-inch caliper so I was only able to measure four links (8 pins). Rotate the wheel a bit and repeat this measurement in at least two more locations.



In this picture, the calipers are measuring from the edge of a plate. You should measure from the center of the rivets in order to remove manufacturing tolerances as much as possible. The more pins you measure across at a time, the less accurate you need to be.

Average your measurements to remove manufacturing tolerances and measurement inaccuracies. Now, to compare against the standard, you need to divide your measurement by the number of pins that were measured. There are two pins in each link, so if you measured from a rivet to another point 5 links away, divide your measurement by 5. Now compare this value to the standard value for a "525" chain: 0.625 inches (15.9 mm) per link (the leading "5" means the pitch is 5/8ths of an inch). If the chain has stretched more than 1% (greater than 0.631 inches or 16.0 mm per link), it should be replaced. If for some reason you are running a non o-ring chain, wear of 2% is the allowed.

Measuring Chain Stretch

<i>Measurement 1</i>	5.028 in
<i>Measurement 2</i>	5.032 in
<i>Measurement 3</i>	5.030 in
<i>Average of three measurements =</i>	5.030 in
<i>Divide by 8 pins measured =</i>	0.629 in
<i>Subtract standard value 0.625 in =</i>	0.004 in
<i>Divide by standard value 0.625 in =</i>	0.0064
<i>Multiply by 100% =</i>	0.64 %
<i>Answer above less than 1%</i>	Yes, chain is OK

At 12,000 miles, this chain was still OK, but on its way out.

Aprilia Falco Chain: Worn Out

Between 12,000 and 18,000 miles my chain rapidly took a turn for the worse. It finally reached a wear point where I couldn't adjust it properly. Some spots were tighter than others, so it could

be loose enough to touch the exhaust but be too tight in other spots. Once I could feel it in the suspension, I couldn't put off the replacement for fear of damaging the countershaft sprocket.

After 19,000 miles, this Falco chain can be pulled away from the sprocket enough to expose well over half a tooth. You can also see that once I knew the chain was doomed, cleaning it wasn't on the top of my list.



When I removed the chain, it could be stretched and collapsed like an accordion due to pin wear. For kicks, I measured the percent stretch.

End of Life Chain Stretch

<i>Measurement 1</i>	5.090 in
<i>Measurement 2</i>	5.100 in
<i>Measurement 3</i>	5.093 in
<i>Average of three measurements =</i>	5.094 in
<i>Divide by 8 pins measured =</i>	0.637 in
<i>Subtract standard value 0.625 in =</i>	0.012 in
<i>Divide by standard value 0.625 in =</i>	0.019
<i>Multiply by 100% =</i>	1.9 %
<i>Answer above less than 1%</i>	No, chain is BAD

It can be seen that chain wear really accelerates once the chain is past half-life. After 12,000 miles, it still had 40% of its life left. After 19,000 miles, it was almost twice the allowed wear limit.

To Reuse Your Sprockets Or Not

There is noticeable wear and hooking on this front sprocket. This sprocket has seen about 12,000 miles service and will be tossed.



Even the large steel rear sprocket teeth were worn and would quickly damage a new chain if reused.

Continue to [chain replacement instructions](#).

Aprilia Falco Chain Replacement

Between 12,000 and 18,000 miles my chain rapidly took a turn for the worse. It finally reached a wear point where I couldn't adjust it properly. Some spots were tighter than others, so it could be loose enough to touch the exhaust but be too tight in other spots. Once I could feel it in the suspension, I couldn't put off the replacement for fear of damaging the countershaft sprocket.

The Falco comes with a riveted chain, and with its horsepower, it should not be fitted with a clip-type master link. A loose-fit clip link is good for motorcycles of 250 cc or less as it only has about 65% of the strength of the other links. A press-fit master link is recommended for 400 cc or less, and gives 80% of the strength of the rest of the chain. Beyond that, a rivet chain is necessary. And a properly installed rivet master link approaches 100% of the strength of the factory riveted links (for a 525 chain, this is over 8,000 lbs breaking strength). But to install this type of master link, a special tool is necessary. If you don't replace chains often, it may be more cost-effective to have a dealer replace your chain.

An imported chain kit can break and press cam and drive chains of any size used on a motorcycle.



Removing The Chain

The Falco chain cannot be removed without removing the swingarm, or by breaking the chain. The latter is easiest by far. If you wanted to reuse the chain, you will need a new master link, and should break the chain on the old master link. If you are throwing away the chain, you can break the chain on any link.



It is easiest to place the master link on the rear sprocket to hold the chain while you work.

To ease the stress on your chain breaking tool, grind or file off the rivet heads. You technically only need to grind off one head, and you might want to leave the other head as a reference for how far to expand the new rivets.



Configure the tool as a through-press, without an anvil (note the hole on the left side of the C body). The rivet must be able to push through the hole in the C-clamp. For smaller size press pins, a guide is required but for the Falco chain a large #380 pin is used. Oil up all the threads on the press before using.

Snug up the press guide on the chain, carefully aligning the pin to the rivet. If you do not align it carefully, you can break the pin. Its best to tighten slowly, and back off to verify you are pushing on the rivet and not the side plate.

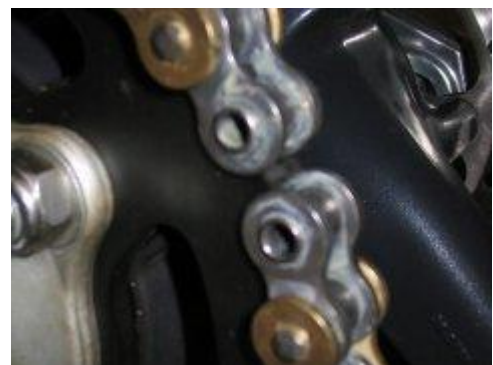


This picture is a bit blurry, but you can see the rivet is nearly pushed all the way through.

Aprilia Falco Chain Installation

After removing the chain, and [replacing the sprockets](#), you'll likely need to cut the new chain before fitting. The Falco uses 106 links by default, but if you increase the number of teeth on the front and back by more than +1 you'll need to [adjust the number of links](#). The safest thing to do is to line the new chain out on the floor next to the old one and mark off the length of cut. Remember that the master link will add one sideplate link, and you'll need to cut the new chain so the two ends can be joined by a sideplate.

Feed the new chain onto the sprockets, leaving the ends over the rear sprocket to hold it in place for riveting. Note the chain is cut one link short so that the addition of the master link will come out to the desired length (usually 106)



Place two new o-rings on the new riveted master link sideplate. Grease the pins and o-rings, and place grease in the holes in the chain. Place the new riveted master link sideplate through the chain. If you feed from the inside to the outside, it will be easier to see your work when you press the final sideplate. The downside is the free sideplate may get marred a bit, so

cosmetically you may want it facing inwards. You can start the sideplate by hand, but don't forget to put two new greased o-rings on the pins first!



This sideplate is ready to be pressed. It is greased, and all four new o-rings are in place.

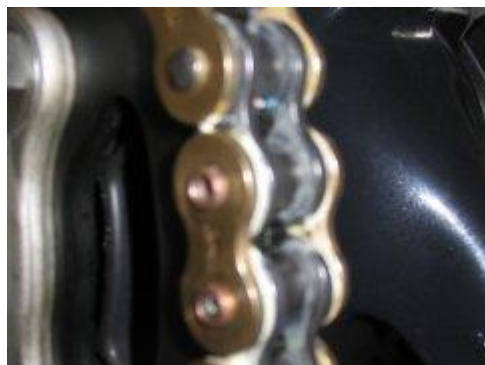
This particular chain tool can be configured with flat press plates to press on the sideplate before riveting. The plate with the channel goes on the anvil side of the tool. The plate with the holes slips onto the screw side, so that the un-bucked rivets can come through the press plate without damage. If you don't have the flat press plates, you can press on the plate with the tool as it was configured before, with the press pin withdrawn (this mode will mar the chain sideplate a bit).

Press the sideplate on until it just about aligns with the other plates. Do not overcompress the o-rings. Later, when we buck the rivet it may press the plate a bit more so don't overdrive the plate now.



We now configure the tool as a fixed press with an anvil to hold the head of the rivet, and a heavy riveting pin to spread the open end of the rivet.

Snug up the press guide to hold the sideplate in line with the other sideplates (this step can mar the finish on the chain). Then turn the press pin screw a little at a time, checking your progress often.



Stop pressing when the master link sideplates are in line with the rest of the chain, and the rivet head is expanded similar to the head size on the other links.

You're done. Give the bike a careful test ride, and check that the chain is OK. I have known at least one dealer-installed master link to work loose (the rivets weren't properly expanded), so as always, check your work.

Changing the Aprilia Falco Battery

Like many early Falco buyers, my battery was never really up to its task. It struggled turning over the motor, and after a couple weeks of sitting I was subject to getting the dreaded dash reset. I never remember seeing a full voltage on the on-board voltmeter (although I've seen inaccuracies in these when checking against a handheld meter). Finally, after a long winter, my battery was no longer reliably getting me home from work.

The stock battery is a Yuasa YTX14-BS, of the maintenance-free variety. I've had decent life out of [Yuasa](#) batteries, but in this case a company called [Westco](#) made a replacement with higher capacity (and rave reviews). Their price has recently jumped from a competitive \$60 to a high \$90, but I was still willing to try it.

Comparison of Published Battery Capacities

Spec	Yuasa YTX14-BS*	Westco SVR-14
Reserve Charge Capacity	14 A-h	14 A-h
Max Cold Cranking Amps	200 A	250 A (+25%)

**Others similar: PowerSource WD14-B, Westco 12V14-B, etc*

Click on any image to enlarge it.



The battery is under the pilot's seat. There is only one bolt holding it in, but you'll need to hold the lock nut with a 10 mm socket from inside the wheel well while you remove it. I remove the negative battery terminal first, then the positive. This reduces the chances of shorting an energized screwdriver to the frame.

Westco's tech line lists the Falco as requiring a height spacer (SVR-14L), but in fact, the SVR-14 battery alone is the same height as stock. If your battery ships with the large black plastic spacer shown here, discard it. The red cap in the pictures contains two new terminal bolts and two spacers that make using the side terminals easier.



Before using the battery, you should absolutely make sure it has been charged. Failure to initially charge the battery will reduce its maximum capacity forever. In the case of the Westco SVR line of glass-mat batteries, they claim no charging is necessary if the battery is less than six months old. I had no real way of verifying the state of charge, so to be safe I put it on my 2-amp charger for the morning.



When replacing the battery, brighten the posts with a little sandpaper, then connect the positive terminal first. If you connect the main leads to the top of the posts, you can attach accessories to the side posts. The supplied side-post spacers help you clear the case, but you'll need to find your own bolts. Like car batteries, the Westco terminals have a molded-in threaded block that stays put while you're starting the screws. With Yuasa (Diehards, etc) I have always fed a small spring under the threaded blocks

to force them to pop up and meet the bolts.

A good compilation of battery facts exists on Bill Darden's [Battery FAQ website](#).

Note that the Westco battery weighs about a pound more than the stock battery. This is probably good for battery capacity, but if you are really, really performance oriented you might look at the Mille-R battery. It weighs less than the stock Falco battery (and has less reserve capacity).

Checking Aprilia Falco Rotor and Wheel Runout

After changing my tires, I was experiencing a lot of brake scuffing noise. Although it was probably just a pad not seated correctly, it was possible I had bent a rotor while replacing the tire. It was easy enough to check.

To check runout, an inexpensive dial indicator and a sturdy stand is all you need. It's probably a good idea to ride the bike first, using the brakes to center the rotor. These fake floating rotors do flex a little and may not be centered if you have worked on them.

Click on image to enlarge it.



Here I've attached the indicator to the work stand. It is better if you can attach it to the forks as they will move together with the rotor if you push the bike. This setup worked well enough, though, with a little care in rotating the wheel by hand.

Measurement of Axial Rotor Run-out

Measurement	My Bike	Spec
Peak-to-peak runout, left rotor	0.003-in	<0.012-in
Peak-to-Peak runout, right rotor	0.0045-in	<0.012-in

I measured the rotor on the inside of the pad area and the outside, with little difference. While I had the indicator out, I checked the front wheel eccentricity at the rim and bead, axial direction only.

Measurement of Axial Wheel Run-out

Measurement	My Bike	Spec
Peak-to-peak runout, at rim edge	0.003-in	<0.080-in
Peak-to-Peak runout, at bead seating area	0.006-in	<0.080-in

Two things can be said here: the runout is well within spec, and the specs are quite large compared to Japanese bikes. You would likely notice something odd in the ride and breaking at less than the limit.

The rotors are also marked with a minimum thickness (presumably in case you turn them on a lathe). I measured my thickness with micrometers.

Measurement of Front Rotor Thickness

Measurement	My Bike	Spec
Thickness, left rotor	4.96 mm	>4.5 mm
Thickness, right rotor	4.97 mm	>4.5 mm

(after 17,400 mi sintered street pads)

I did not think to measure radial runout of the front wheel, but the specification is also 0.080-in.

After doing this exercise, I deglazed the discs with a light sanding with 100-grit sandpaper, and pushed back and resealed the brake pads. At the moment, the noise seems to have gone away.

Falco Suspension Tuning -- My current setup

This page used to be a diary of mistakes and successes I had made in the quest to make the Falco handle well. It was interesting to me to keep track of what I had done, but it was getting quite long-winded. If you are interested in how I got to my present setup, you can still have a look at my [suspension tuning diary](#). But the abbreviated version appears below.

My Set-up As Of January 17, 2002

Me

<i>Weight</i>	145 lbs in street clothes
<i>Riding style</i>	Intermediate on bumpy mostly 45-75 mph roads
<i>Preference</i>	Softer suspension (more traction, more motion)

Bike

<i>Description</i>	2000.5 Falco with aftermarket slip-ons
<i>Weight</i>	450-475 lbs depending on fuel

Fork Setup

<i>Specification</i>	<i>My setting</i>	<i>Stock setting</i>
<i>Description</i>	Stock Showas 43 mm USDs with steel cartridge	
<i>Installed height</i>	4 spaces showing (16 mm triple to anodized cap)	3 spaces (12 mm)
<i>Valving</i>	Stock	-
<i>Rebound screw setting</i>	0.75 turns out	1.5 turns out
<i>Compression screw setting</i>	1.75 turns out	1.5 turns out
<i>Oil viscosity</i>	5W (Showa/Honda Pro)	probably 5W or 7.5W ?
<i>Oil level</i>	150 mm (from top, collapsed, no spring)	116-120 mm
<i>Spring rate</i>	0.95 kg/mm	1.01 kg/mm
<i>Spring free length</i>	272 mm	292 mm
<i>Preload spacer</i>	128 mm plus stock washers	100 mm
<i>Preload cap</i>	6 lines (12 mm from anodized to taper)	5 lines (10 mm)
<i>Sag (bike)</i>	22 mm	?
<i>Sag (rider)</i>	35 mm	25 mm

Shock Setup

<i>Specification</i>	<i>My setting</i>	<i>Stock setting</i>
<i>Description</i>	Penske 8981 (8900 series deCarbon damper with 8100 reservoir)	Sachs emulsion-type damper
<i>Installed height</i>	~320 mm eye-to-eye ~ 1 thread showing on adjuster	~312 mm non-adjustable
<i>Sag (bike)</i>	~5 mm	?
<i>Sag (rider)</i>	32 mm	41 mm
<i>Spring rate</i>	800 lb/in (6-inch spring)	-
<i>Oil viscosity</i>	standard	-
<i>Valving</i>	standard (track)	-
<i>Rebound screw setting</i>	? about midscale +2 to +4 more clicks	-16 clicks from full-in
<i>Compression knob setting</i>	"1" of 6 (largest orifice)	non-adjustable
<i>Preload</i>	20 mm threads above lock ring	41 mm threads above lock ring

Tires

<i>Specification</i>	<i>My setting</i>	<i>Stock setting</i>
<i>Type</i>	Dunlop D207	Metzeler MEZ3
<i>Front size</i>	120/70	120/70

Rear size	180/55	180/55
Tire pressure (F/R)	32/34 psi ?	35/36 psi

Update: Some advice (July 2003)

People email me a lot asking for setup advice. Although its pretty much up to your tastes, I've done a lot of [trial-and-error](#) and can offer this:

- Set your sag. This step is free and the target numbers are easily measured (not a subjective measurement). Don't worry about number of lines or threads showing, or spacer lengths. Just try to hit the [sag targets](#) and if you can't you know that you need to change your springs.
- Replace your Metzlers. When you wear out your Metzlers, try a set of BT-010/020's, Pilot Sports, or my favorites, D208's.
- Replace your shock. From here, there are no cheap knob changes that are going to hide the fact that the stock Falco shock is just terrible. I hate to say that I could not make it work with this bike. It needs to be revalved, lengthened, and from some owner's reports, fitted with a spring that doesn't permanently set.

Aprilia Falco Final Ratio and Effects On Wheelbase

Unless you ride GP bikes for a living, you're unlikely to ever notice the secondary effects of changing sprockets and what that does to the handling of a motorcycle. Regardless, its interesting to study, and has some practical applications too when you are deciding how to obtain a ratio.

The chain used on the Falco, a "525" chain, has a pitch of 5/8ths of an inch (we know this from the leading "5" in "525"). So, dropping a tooth off the front or rear sprocket changes the circumference of the sprocket by 5/8ths of an inch. This requires a radius reduction of 5/8ths, divided by two times pi. What this means to us is that if the same chain is used and a sprocket is changed, subtracting a tooth from either sprocket increases the wheelbase by 2.5 mm. Adding a tooth reduces the wheelbase by 2.5 mm.

We should first be concerned because there is a limited amount of adjustability in the wheelbase, given by the length of the axle slot in the swingarm. Some ratios will not be able to be obtained without changing chains. Adding one link to a chain will lengthen the wheelbase by half of 5/8ths of an inch, or 7.9 mm. Deleting a link will reduce wheelbase by 7.9 mm.

Final Ratios and Wheelbase Compared to Stock

Countershaft sprocket	Chainring	Final Ratio	Change in Wheelbase	Stock Chain?
-----------------------	-----------	-------------	---------------------	--------------

16	41	2.56	0.0 mm	Yes
16	42	2.63	-2.5 mm	Yes
16	43	2.69	-5.1 mm	No
15	41	2.73	+2.5 mm	Yes
16	44	2.75	-7.6 mm	No
15	42	2.80	0.0 mm	Yes
15	43	2.87	-2.5 mm	Yes
15	44	2.93	-5.1 mm	No

Aprilia SL-1000 Final Ratio -- The Countershaft Sprocket

Front sprockets are harder to come by in the US, but [Talon Engineering](#) in the UK will export them. Eventually, they will have US distribution for street sprockets as they do for dirt bike sprockets. Price with shipping is approximately \$22, and if the sprocket is in stock shipping is about a week.

The Falco (and Mille) in the US come standard with 16 tooth front sprockets. You can raise the final ratio six percent, using your stock chain, by switching to a 15T sprocket. There doesn't appear to be any swingarm clearance problems with this change, although the chain may wear a bit faster (reducing the circumference of the chainring means the chain links must swivel a greater amount for each revolution, and less links are bearing the load of the drive force).

The front sprocket lives behind the plastic countershaft cover. The first time you remove the shift lever, mark the shaft with a centerpunch to remember your spline alignment.



On the Falco, a single bolt and washer retains the sprocket. Place the bike in gear, step on the rear brake, and remove the bolt (it does turn counterclockwise to loosen). Because of the tight clearances, you'll need to remove the sprocket before removing the chain. This takes a lot of

chain slack, so it may be easier to remove the rear axle, drop the wheel, and remove the chain from the rear chainring. The sprocket is removed by sliding it off the splined countershaft.



The clearances are tight. Its doubtful a 17T sprocket would fit. A lot of chain slack is needed to slide the sprocket off the splines because the chain will hit the frame.

As you remove the old sprocket, pay attention to which side was facing out. It's important to get the offset correct for chain alignment, and this sprocket is asymmetrical. Its conventional for the number of teeth to be marked on the side of the sprocket facing away from the engine (or wheel in the case of a rear sprocket). The sprocket teeth should be closer to the bolt head than to the motor cases (the wider boss faces in). Before replacing the new sprocket, grease the splines, not as a lubricant, but to prevent rust which gets rubbed away and eventually increases tolerances. Grease the sprocket teeth too, as it needs to break in to the old chain. This is probably the time to say never put a new chain on worn sprockets, or a new sprocket on a worn chain. Replacing all components at once will give the longest component life, but I doubt this is as economical as only replacing worn components.

Like the original, the new sprocket is made of steel (as any 15T sprocket on a 100 HP bike should be). The Talon Engineering sprocket appears to be cadmium-plated and looks as strong, if not stronger than the original. Fit to the countershaft was excellent.



Slip the chain on the new sprocket and slide it onto the countershaft splines. Being smaller than the original, there should be a bit more clearance to work. Clean the threads of the retaining bolt, Loctite it (use thread locking compound), and tighten it (clockwise) with the bike in gear and the rear brake on. The torque spec for this bolt is 36 ft-lbs or 50 Nm which is not a lot. You don't want to damage the threads in the countershaft, as the cases would have to be split to replace it. Finish up by replacing the countershaft cover, shift lever, rear wheel and adjusting the chain slack.

Sprocket retaining bolt torque:	36 ft-lbs (50 N-m)
---------------------------------	--------------------

It's a good idea to take a few easy miles with a lubed chain, then pull over and check the chain for shiny spots or metal shavings. If all looks OK, enjoy your newly placed powerband.

Final Ratios Using Stock Chain			
	Countershaft sprocket	Chainring	Final Ratio
Stock SL	16	41	2.56
15T sprocket	15	41	2.73

Update April-2006: I replaced the front sprocket again, this time using a slightly more expensive part from [Sprocket Specialists](#) (part no. 623). I had a moment of doubt, as the sprocket wasn't broached completely and only fit on the countershaft one way (what I thought was the wrong way!). After checking the sprocket alignment a few times, I was sure that the sprocket needed to be reversed so the numbers were facing out. This required a few passes of a file on the internal teeth to finish up the machining, after which the sprocket slipped on the spline freely. The moral is to be careful: if your sprocket only slips on one way it may be due to sloppy machining and not on purpose.