# 2000-1/2 Aprilia Falco SL-1000

#### A Collection of Technical Articles About Aprilia's Half-Faired, Sporting V-Twin

### Engine

* How-to: [Derestriction info](http://www.oocities.org/sl_mille/derestrict.html)
* Information on how to [change the oil](http://www.oocities.org/sl_mille/oil.html)
* Replacing [the Clutch](http://www.oocities.org/sl_mille/clutch.html)
* A comparison of [EPROMs](http://www.oocities.org/sl_mille/eprom.html)
* A comparison of [Aftermarket exhausts](http://www.oocities.org/sl_mille/exhaust.html)
* Aprilia/RSC "SL-Carbon" [Canisters and EPROM](http://www.oocities.org/sl_mille/dyno.html)
* Alternatives in [air filters](http://www.oocities.org/sl_mille/filters.html)
* Differences in [spark plugs](http://www.oocities.org/sl_mille/plugs.html)
* How to: [adjust the valves](http://www.oocities.org/sl_mille/valves.html)
* How to: [Sync the cylinders](http://www.oocities.org/sl_mille/synch.html)
* Setting your [idle mixture](http://www.oocities.org/sl_mille/idle.html)
* Replacing the [engine coolant](http://www.oocities.org/sl_mille/coolant.html)
* Servicing the [clutch slave cylinder](http://www.oocities.org/sl_mille/slave.html)
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### Chassis

* Upgrade your [battery](http://www.oocities.org/sl_mille/battery.html)
* Replacing the [fork springs](http://www.oocities.org/sl_mille/springs.html)
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* Changing [rear sprockets](http://www.oocities.org/sl_mille/sprocket.html), [countershaft sprockets](http://www.oocities.org/sl_mille/sprocket2.html), and [effect](http://www.oocities.org/sl_mille/df.html)
* Some information on [aftermarket shocks](http://www.oocities.org/sl_mille/shock.html)
* Some [shocks installation notes](http://www.oocities.org/sl_mille/shock2.html)
* Dimensions of the stock [rearsets](http://www.oocities.org/sl_mille/rearset.html)
* Installing aftermarket [brake lines](http://www.oocities.org/sl_mille/lines.html)
* Replacing the front [brake pads](http://www.oocities.org/sl_mille/brakes.html)
* Fixing the [sidestand switch](http://www.oocities.org/sl_mille/sidestand.html)
* Setting [chain slack](http://www.oocities.org/sl_mille/chain.html), [measuring chain wear](http://www.oocities.org/sl_mille/chain1.html), and [replacing the chain](http://www.oocities.org/sl_mille/newchain.html)
* Replacing a [headlamp](http://www.oocities.org/sl_mille/headlamp.html)
* Remove the [wheels](http://www.oocities.org/sl_mille/wheels.html)
* Checking rotor and wheel [runout](http://www.oocities.org/sl_mille/runout.html)

### Accessories

* Aprilia Hard/Soft [Luggage](http://www.oocities.org/sl_mille/luggage.html)
* Yet another [Fender Eliminator](http://www.oocities.org/sl_mille/fender.html)

### Where to read more

* Check out answers to [frequently asked questions](http://www.oocities.org/sl_mille/faq.html) (FAQ)
* What's the story with the [recall](http://www.oocities.org/sl_mille/recall.html)?
* [Links](http://www.oocities.org/sl_mille/articles.html) to online articles and sites

# Derestricting the Aprilia Falco

Like the RSV Mille, the Falco is delivered restricted. Very restricted, like 84 HP vs 106 HP. My dealer did the derestriction at 600 miles for me, but I took a few pictures that should let you do it yourself. Click on any image to enlarge it.

To derestrict the Falco, you need to clip a logic wire on the ECU, and remove a restricting plate in the airbox. You should be warned that the intake noise will greatly increase after derestriction, as will the torque and power. Unlike the RSV Mille, there is no modification necessary to the exhausts. The detailed procedure used to be outlined at Apriliaworld.com, but that site seems to have fallen off the map as of 18-Dec-2002. I've given some Falco specific notes below, and anyone with the a link to the old Mille instructions, please send them along to [sl\_mille@yahoo.com](mailto:sl_mille@yahoo.com).

To get at the ECU wire, remove the passenger saddle (or cover) and the driver's saddle. In the space between the two saddle openings (in front of the toolkit area and behind the battery), a rubber covered box will be visible. Lift the four rubber tabs on the box and pull the flexible cover out the passenger area. The metal shielded ECU box will now be visible, with two connectors in the front. The wire that was clipped on mine was blue, with a green stripe, on the smaller connector closest to the shift lever. There are several blue and green wires. On my bike, the wire enters the connector on the lower row, leftmost of all the other wires when facing the ECU. After you clip the wire, tape or shrink wrap the ends so that it cannot ground to the frame.

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| ***Step One:*** Cut and insulate this wire | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/ecuwire.jpg) |

To remove the airbox restrictor, you'll need to lift the tank. I give a [description of this](http://www.oocities.org/sl_mille/airbox.html) elsewhere, but it's pretty self-explanatory. Open the airbox, remove the air filter and underneath you'll see a circular plastic bung with a small, one-inch opening. Retaining this bung is a screw from underneath, so you'll need to remove the airbox lower from the inlet air dict by loosening the big hose clamp. See my [airbox page](http://www.oocities.org/sl_mille/airbox.html) for some hints.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/airbox1.jpg) | ***Step Two:*** Remove the intake restrictor plate from beneath the air filter element |

That's it. Buy a case of earplugs, and enjoy the power.

Update for 2002: I've been asked about procedure on newer motorcycles. According to [ApriliaForum's site](http://www.apriliaforum.com/), for the 2002 Falco the derestriction procedure has not changed. For the 2002 Mille, they say do not cut the wire any more, but there are also additional air intake modifications to make. I haven't heard any reports on 2003 models yet. The Futura and Caponord do not follow the above procedures for any year.

**Aprilia Falco Oil Change**

The oil change procedure isn't documented in the US owner's manual. In fact, it's recommended that the dealer change your oil. It's really not that difficult.

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| *Location of various parts (click to enlarge)* | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/drainplug.jpg) |

Note: Instructions and torque values below are from the Australian RSV-1000 owner's manual.

The first drain plug is easy to find at the bottom of the oil tank on the right side. It is a hex-cap bolt with a 10 mm head. Remove the bolt and let the oil drain. The owner's manual says to retorque the bolt to 15 N-m (11 ft-lbs, 133 in-lbs). Due to the poor machining I've seen on the oil tank (mine has overcut threads), I would absolutely tighten this plug by hand. If there is any doubt, use a new M8 aluminum crush washer, and tighten it jut snug enough to feel the crush washer yield. Two people have emailed me to tell me they have stripped this plug, so be very careful!

The second drain plug is located on the kickstand side of the engine. It is a socket cap plug and mine was installed by a gorilia. The first time you remove it, use a tight fitting allen key. If it gives you any grief, use a hammer-driven impact on it instead of rounding it out. The plug is magnetic, and should be cleaned before reinstalling it. Tighten the plug to 12 N-m (9 ft-lbs, or 106 in-lbs).

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| [Click on         image to enlarge](http://www.oocities.org/sl_mille/images/falco-oil.jpg) | *Location of oil filter (click to enlarge)* |

Behind the oil filter cover is a paper filter element (made by Champion, sold by Aprilia for about $14). Remove the two socket cap screws shown in the picture. The filter fill be pressed into the cover. Pry it loose (noting the orientation) and press on another another filter. The o-ring on the cover can be reused. I primed my filter by filling it with oil before installing it. Tighten the two cover screws just firmly.

There is a filter screen in the bottom of the oil tank that is supposed to be cleaned every other oil change. (I have not cleaned this yet, so I'm not speaking with experience here.) A good time to clean it is when you have the [recalled hose](http://www.oocities.org/sl_mille/recall.html) replaced, because to service the filter you are supposed to remove the lower hose clamp on the oil tank. Make sure you have an extra hose clamp on hand before removing one of the "clic" clamps. After removing the hose, unscrew the tank filter and clean it with compressed air. Replace the filter and tighten it to 30 N-m (22 ft-lbs).

I've found that if you fill the cold oil level to the horizontal fin on the engine cover (see [picture](http://www.oocities.org/sl_mille/images/drainplug.jpg)) when on the sidestand, the level will rise to nearly the MAX line when hot. Start with 3-1/2 quarts, idle the engine for a minute, then you will need to top it off. The owner's manual recommends checking the oil level with the engine hot (15-20 minutes riding), turned off, and held level. Internet wisdom has said otherwise, but I think there's more important things to worry about than 50 cc's of oil.

Misc stuff: I know oil is a controversial subject for some, so take these notes with a grain of salt.

* The owner's manual says oil change interval is first 600 miles, then every 4500 miles (2300 miles if you race the bike).
* The owner's manual says to use 15W-50 weight oil.
* I've been changing my oil every 3000 miles, and using 15W-50 Mobil 1 (synthetic) since the 3,000 mile mark. *In my opinion*, the engine was not broken in fully by 600 miles by far, so I used regular non-synthetic oil at the first service. Lately (7,500 miles), I've been experiencing some clutch slippage in 2nd gear, so I'm going to try a different oil.
* Update July 2001: I replaced my clutch at 7,500 mi and have been using semi-synthetic ever since. Motul 3100 last year and Torco semi-synth this year. 11,500 miles and no clutch slippage yet, although it is harder than ever to get it into neutral now with the Torco oil.
* Update October 2002: After using nothing but semi-synthetic oil for the last 7,500 miles, I'm at 15,000 miles and need yet another clutch. I conclude the predominant cause of clutch failure on this bike is not related to oil.

**Aprilia Falco Clutch Replacement**

At approximately 6,000 miles, I began noticing clutch slip at high 2nd gear loads. Over the next 1,500 miles, it got worse, until the clutch would break free in second and third under any hard acceleration.

At this time, Aprilia considers this a consumable item and doesn't cover the clutch under warranty. Fortunately, at $160 list (I paid $144) for the entire clutch kit, it is reasonably priced. Even better, it is very easy to replace. Still, please ask your dealer to bring early clutch failure to the attention of Aprilia. If enough of us complain, maybe they'll redesign it.

Update (17-Jan-2002) Barnett now makes a clutch kit for the Falco. John Abatte has installed one. Priced similar to the Aprilia clutch, it has different construction and may provide better life.

Disassembly procedure: Click on images to enlarge

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/clutch0.jpg) | Start by setting the bike on the sidestand, clean the clutch cover and oil tank bottom, then drain the oil tank. You do not need to remove the magnetic oil plug or oil filter. The clutch is behind the right hand (brake lever side) engine cover. Only the eight M5 screws on the inner cover need to be removed. You can leave the vacuum hose in place. |

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| Carefully set the cover aside. Lift the eight tabs on the vacuum diaphram and rotate the diaphram off the tabs. Use a 19mm wrench on the M12 locknut while holding the clutch disengagement shaft with an allen key. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/clutch1.jpg) |

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/clutch2.jpg) | Remove the outer washer, vacuum "pressure plate", diaphragm, support disc, and inner washer and set them aside in order. The "spring holder" hub will now be exposed. Shift the bike into gear, hold the rear brake down and remove the six M6 bolts, washers and springs. |

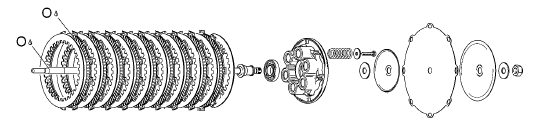
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| Remove the hub, exposing the clutch stack. Fish out the steels and frictions from the basket. You do not need to remove the shaft, but don't bend it. Inspect the basket and hub, especially along the fingers. Smooth wear spots are normal, but there should be no edges that would prevent the stack from sliding easily. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/clutch3.jpg) |

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/clutch4.jpg) | You should inspect any new or old components before you reinstall them. Frictions should always be replaced. Inspect them for glazing, wear (thickness), and cracking. Steels should be checked for bluing (a sign of overheating), and warpage. I check for warping by holding two steels together and looking for light between them (spec is less than 0.006 in warpage for one plate). Springs should be checked to make sure they have adequate free length (short springs are an indicator of fatigue and the reduced spring rate will not provide enough holding pressure). |

Measurements for the Stock Aprilia clutch:

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| Item | Avg, New | Avg, Used | Aprilia Spec |
| Spring | 1.72 in | 1.73 in | > 1.69 in |
| Steel plate | 0.059 in | 0.058 in |  |
| Friction plate (new measured dry) | 0.137 in | 0.135 in |  |
| Stack height (steels+frictions) | 1.82 in | 1.80 in | > 1.77 in |

Assembly procedure:



* The clutch should be installed wet--soak the new frictions in oil while you are taking apart the clutch.
* Replace the clutch stack, alternating steels and frictions. The stack starts and ends with a steel. My steels were placed in the clutch from the factory with the chamfered side facing out, but Barnett advises just to make sure they are all pointing the same way. Note that the new Aprilia kits have a special chamfered steel that goes on the hub first. Slide the frictions into the deep fingers in the basket. You'll notice one friction plate may have a red dot painted on it. As far as I could measure, it was identical to the other frictions, but I saved it for last. The last friction is rotated 15 degrees from the others and fits in the shallow fingers of the basket. End the stack with a steel. Note that the *Barnett* stack is not made up of uniform sized plates. You should follow the instructions on stack assembly provided with their kit.
* Replace the hub. Snug down the bolts, washers and new springs in a cross-ways pattern. Step on the rear brake and torque them gently to 11 N-m. This isn't much--don't crack the basket!
* Replace the washer, support plate, rubber diaphragm, pressure plate, washer and nut on the end of the clutch actuating rod. Before torquing the nut down, rotate the rubber diaphragm so it isn't hooked on the tabs. It will lie flatter if it is free to rotate when you torque down the nut. The nut should be tightened down to 20 N-m, but you'll need a crowsfoot adapter (with appropriate torque conversion) if you want to use a torque wrench while you hold the rod with an allen key. Alternatively, you could hold the nut with a wrench and use a torque wrench in the counterclockwise direction on the actuating rod. If the diagragm has a ripple and isn't lying flat, loosen the nut and try again. Hook the tabs on the rubber diagragm.
* Replace the cover and snug the bolts down in a cross-ways order. The torque spec is 5 Nm, which is just snug. If the cover weeps oil, you can always tighten it up a bit more later. I didn't disconnect the cover vacuum line, so I tested for a vacuum seal by starting the engine and feeling the feedback in the clutch lever. But don't forget to replace the oil before starting the bike.
* You may want to bleed your slave cylinder. I had no problems, but at least one person has reported getting a bubble in the line somehow during the clutch replacement procedure.
* Remember to break in your clutch. You don't want to burn your new steels while you're taking down the high spots. I think with the slipper clutch it doesn't take long at all.

Update (July 2003) I've finally faced the inevitable and replaced my clutch a second time (at 16,000 miles). I again chose the stock

**Aprilia Falco Electronic Control Unit**

The brains of the Falco engine management is an ECU made by Nippodenso. It's run by a 8MHz microcontroller reading code from a 32kB EPROM. Not exactly cutting edge technology when compared to a 3000 MHz Pentium IV, but it's more than adequate for an engine spinning its crankshaft at a maximum of 175 Hz (0.000175 MHz).

The Falco ECU, identical to the RSV ECU, reads many sensors in order to determine its outputs: injection volume (most likely duration) and ignition timing advance. Throttle position, engine speed, and manifold pressure are primary inputs to the lookup tables stored on the EPROM. The values read from these tables are used in an algorithm (also stored on the EPROM), along with secondary inputs of air and coolant temperature, atmospheric pressure and crankshaft position to calculate the desired injection and advance values.

I've tried as many EPROMs as I could get my hands on. Unfortunately, not always back to back or under the best test conditions. Here's a summary of EPROMs I've tried and a few comments. All worked well. If I had to pick one, I'd probably pick the Arrow as good performance for a value (especially with the RSC EPROMs running $200 each). I don't run it now because it is significantly leaner than stock at part throttles, so I'd like to check the exhaust gases on the dyno. The only one I've dyno'd was the RSC SL-Carbon chip, and with the stock air filter it was a good tune, perhaps a little rich up top but good near the midrange. This is the chip I ran until I tried the Factory chip. The Factory chip isn't cheap ($229 now that its copy protected?), but it is very smooth. My only complaint with it is that you need to warm up the bike to 120 F before you take off, or the throttle was choppy. This takes about one minute. Also, it required a bit of tuning of air screws and CO pots to get the idle back below 1700 rpm.

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| EPROMs That Work In The SL-1000 Falco (US) | | |
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| Chip | Checksum | Comments |
| SL 2k stock 49 state USA | 0x2865A1 | Good midrange. I haven't tried this since fitting the RSC pipes. |
| RSC SL-Carbon | 0x28AADF | Installed with the RSC pipes. Great low end, extended top end. Very wide powerband, but slower acceleration. Lots of torque. Stumbles a bit below 4k. |
| RSV 2k stock 49 state USA | 0x28712E | Faster acceleration through midrange, good top end hit but with less torque? Not as smooth below 6k. |
| RSC Titanium | 0x2899AD | Not all that different than the SL-Carbon. Good performance, maybe not as sharp a throttle response as the SL-Carbon in the midrange? |
| [Arrow RSV](http://www.oocities.org/sl_mille/arrow.html) | 0x287868 | Similar to SL-Carbon. Perhaps more power in 6-8k range? A very fun chip, very linear torque. One of my favorites. |
| [Factory R13](http://www.factorypro.com/) | 0x297E93 | Very smooth, very fast reving. No stumbles. Requires retuning of the air screws to lower idle and improve cold driveability. The chip I run now. |
| [Factory R14](http://www.factorypro.com/) | ? | A slight tweak of the R13 map, I haven't tried. May be better for stock pipes. |
| Renegade | 0x288604 | Comes with Renegade pipes. I haven't tried it. |
| BBPower | ? | I don't own it. Reportedly quite fast revving and more power. |
| DYNOTEC | ? | See [www.dynotec.de](http://www.dynotec.de/) (Germany).  One owner reports having this and liking it. |
|  | | |

If you have a Javascript enabled browser, I've written a [graphic utility](http://www.oocities.org/sl_mille/eprom.html#fuelscript) to compare fuel injection maps. Pop-up blockers may need to be disabled to see this.

Other hints:

* The ECU has two pots for trimming idle %CO. The software for these is disabled in the US model bikes, so don't waste your time on them. If you have European chip, they work. They are enabled on the Factory chip, and the bike seems to idle smoother with the front cylinder leaner and the rear cylinder richer.
* There appear to be differences in aftermarket chips between derestricted and restricted mapping, so cut the wire even when using a non-stock chip. Factory sells a combination R13/R14 chip with minor differences. You can switch between the two maps with the destriction wire.
* RSC chips are useless without the daughterboard, and if you read them through the daughterboard they are still scrambed. The SL-Carbon and RSV-Titanium use the same daughterboard. BBPower chips reportedly use a daughterboard too. Factory chips, except the prototypes, use a daughterboard.
* If you happen to remove your RSC chip from it's daughterboard, you'll notice there is no pin 1 indicator. The silkscreened text "dibias"on the board should be on the pin 1 end.
* There's some guys pirating these chips now. Give your money to the people who develop the chips instead, and encourage them to keep up the good work.

# Aprilia SL-1000 Aftermarket Exhausts

Let's face it. The stock exhaust canisters on the Falco are heavy boat anchors. Big, heavy, quiet boat anchors. You need to hear some soul in your twin. Polish the stainless all you want, they still don't make any noise. And with an aftermarket chip, you should expect an increase in power from 106 HP to 115 HP or more. Here's a listing of some currently available exhausts for the Falco.

(Update 16-May-2003:  Hey guys, this page is of course always hopelessly out of date. If you want to correct or add an entry in the table please give me a shout at [sl\_mille@yahoo.com](mailto:sl_mille@yahoo.com). --Ken)

## Aprilia Falco Exhausts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Manufacturer | Type | Eprom? | Price | Performance | Availablility |
| Aprilia (by RSC) | S L C O | Yes SL-Carbon chip included (US$200 seperately) | US $950 list ($855 reported) | [See crankshaft chart](http://www.oocities.org/sl_mille/images/dyno-ap0.gif) (101 HP measured on Factory dyno) | Aprilia dealers |
| Notes: Retains all stock items. Allows use of Aprilia soft bags. EPROM is included. | | | | |
| [Akrapovic](http://www.akrapovic-ai.si/) | S L C O | No |  | 109 HP (stock chip?) | Available now |
| [Arrow](http://www.arrow.it/) |  | RSV Map Available (add US $60) | US $699 |  | Available now. Try [Mototek](http://www.mototek.com) |
| [Bos Exhausts](http://www.bos-exhausts.com) | S L A/T O |  |  |  | Available now |
| [Blue Flame](http://www.blueflameperformance.co.uk/) | S L T O | Yes - separate | UK £445 |  | Available now (UK). Try [Need for speed](http://www.needforspeed.co.uk/) |
| Carbon Can Co | S L C O |  |  |  | Available now (UK). |
| Edge |  |  | UK £438 |  | UK |
| G-Force | S ? A | Yes | >UK £120 |  | UK. Try [RSVR.NET](http://www.rsvr.net/). |
| S ? C | >UK £199 |
| S ? T | >UK £230 |
| [Laser/Jama](http://www.laser-jama.nl) |  |  |  |  | Available now |
| [Leovinci](http://www.leovince.com/) | S H C | No | US $880 list (US $735 reported) |  | Available now |
| S H A | US $616 |
| S H T | US $870 |
| Notes: Retains footpegs, moves turn signals. Should allow use of Aprilia bags, check for contact. | | | | |
| [Ninja/Supersport](http://www.losange.fr/pageApriliaFalco-ss.htm) | S L C |  |  |  | France/Europe distribution only? |
| [Renegade](http://www.renegade-products.com/) | S L/H S R/O | Yes | UK £475 | 95.5 hp on Factory Dyno | UK/Europe, will ship direct to USA |
| S L/H C R/O | UK £535 |
| S L/H T R/O | UK £545 |
| Notes: Add £75 for hi-mounts. Add £40 for ovals. | | | | |
| [Staintune](http://www.staintune.com.au/) |  |  | US $735 $Aus960.00 | [See rear wheel chart](http://www.oocities.org/sl_mille/images/staintune.jpg) 115 djHP | Available now. Try CBT Imports 1 800 782 4648 in US |
| Shark |  | Yes - Dynatec? |  |  | Available now (?) |
| [Micron](http://www.micron-exhaust.com/) | No plans in near future | | | | |
| [Wolf](http://www.wolfracing.co.uk/) | No plans in near future | | | | |
| Key to types |
| **S** = Slip-ons, **F** = full L = Low-mount, **H** = High mount |

**Aprilia/RSC SL-Carbon Slip-Ons**

[](http://www.oocities.org/sl_mille/images/pipe8.jpg)

I recently installed an Aprilia "SL-Carbon" exhaust on my 2000-1/2 Aprilia SL1000. The twin carbon fiber oval slip-ons are manufactured for Aprilia by RSC (Racing Services Corporation). It comes with an EPROM that they say must be installed for performance and reliable engine life.

Installation was pretty simple--the exhaust comes with a picture book showing installation of the chip and exhaust. I guess the only thing not really covered to my satisfaction was proper electrostatic discharge protection when handling the ECU and chip. Yeah, I'm anal-retentive but ESD damage is often subtle and difficult to diagnose. Wearing a ground strap is easy in comparison. Give yourself an hour for [installation](http://www.oocities.org/sl_mille/dyno-install.html) and you'll have time left over for a test ride.

See [some pictures](http://www.oocities.org/sl_mille/pipe.html).

The pipe definitely improves the bike's torque all around. There are no tradeoffs in performance. Most noticeable is the torque below 5k. You can now use 6th gear on the highway without feeling the bike shudder under acceleration. The first two tanks of gas after installing this chip weren't on reserve by 150 miles. I was *always* on reserve at 125-130 miles before. You'll notice the front end wants to leave the ground in first gear at roll-on rates that were safe before. The bike always pulled strong to redline, in my opinion. It still does, maybe a little better in fact. Aprilia provided a before/after dyno plot with the pipe. Units of power are in CV (*cheval vapeur*), which is equivalent to one metric horsepower (PS). Multiply by 0.9863 to get James Watt's standard definition of horsepower. Torque is in kg-m. You can convert this to ft-lbs by mulitplying by 7.26. The scale is unbelievable--I'm pretty sure they were measuring crank horsepower. But the comparison is what's important.

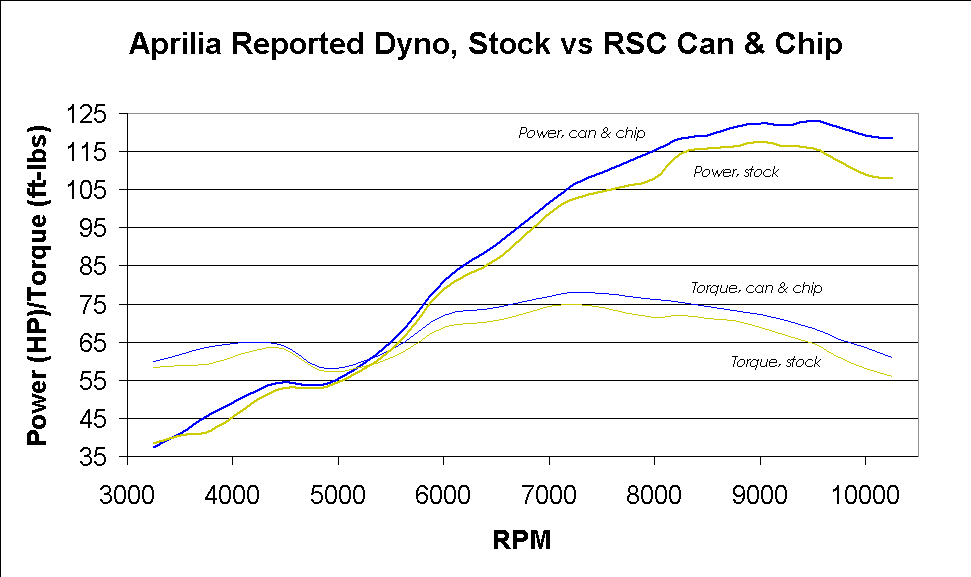
Noise? Well, I consider the Falco a noisy bike. I wear earplugs because all that mechanical cam/countershaft/gear/chain noise makes me feel as if I'm hurting the bike when I get on it. Once derestricted, the airbox noise was pretty loud before. Now, pretty much all you hear is the pipe. At idle, you hear every power pulse. Under throttle it is beautiful. And it has a nice deceleration note (no popping). Finally, some soul for the bike. I guess I didn't really answer the question. Yes, it's pretty loud. Not obnoxious like a Harley, but louder than your average 600 cc with slip-on. I can live with it, and I'm not a loud pipe kind of guy. I wouldn't feel right riding it through my neighborhood at 4 AM, though.

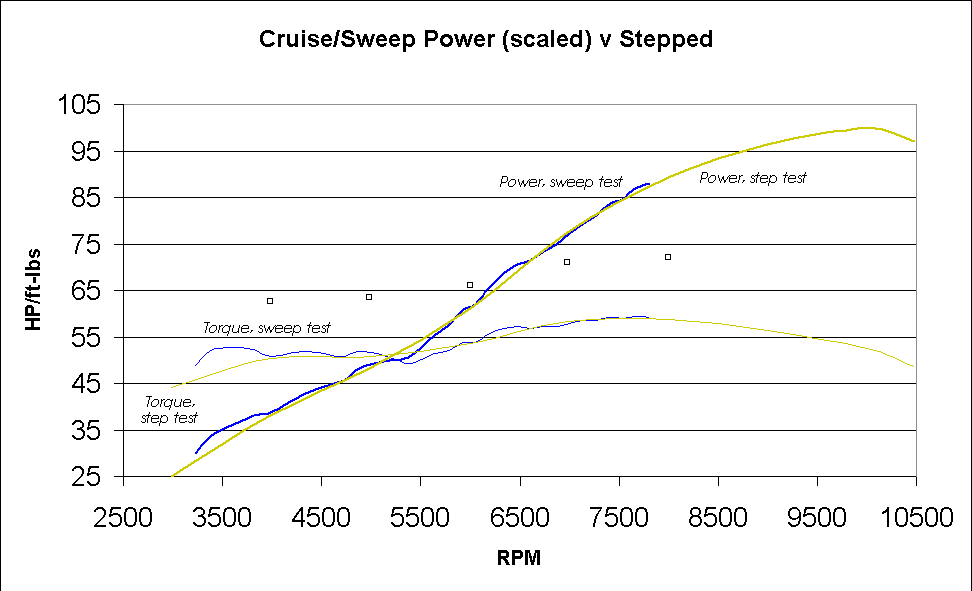
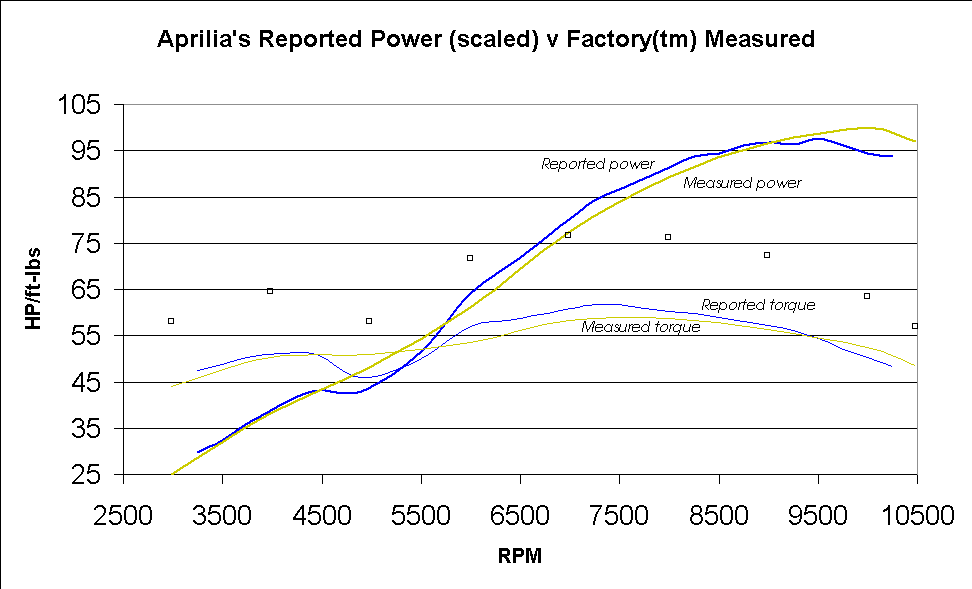
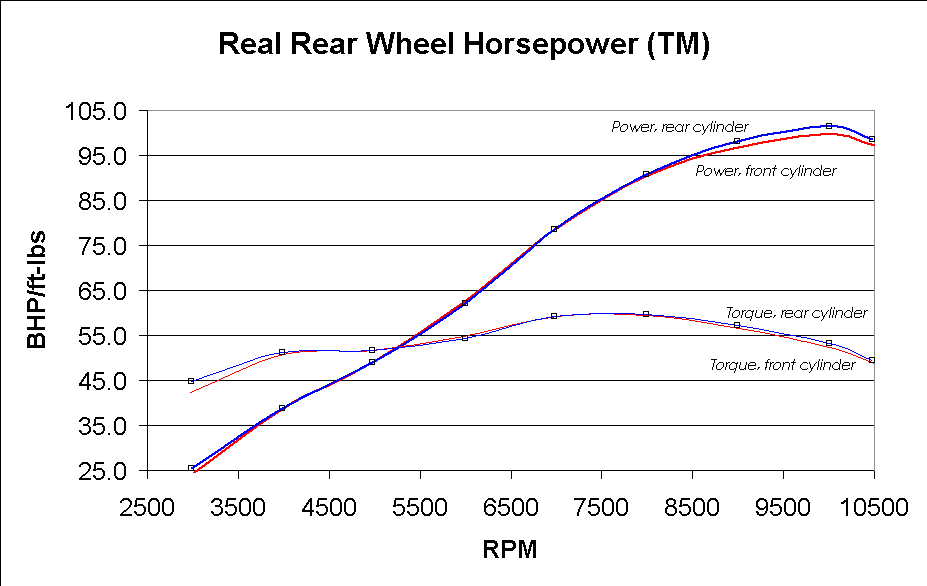
Weight is down about ten pounds. I weighed the stock canisters at 9 lbs a side, the carbon canisters at 4 lbs a side. Can I tell the difference? Not really.

Cost? List is $950. I get 10% off accessories purchased at my dealer, plus there's no sales tax. It's a bit steep, I'll admit, but I was pretty confident Aprilia's chip would work. You can now get Arrow round carbon slip-ons in the states now. I think price is $650 plus shipping. I don't know if there is a chip.

To check mixture and performance, I took the bike to a dyno. They had never tested an Aprilia before, so I really had no "before" curves, but I was able to confirm that the bike was not running dangerously lean anywhere. It looked like Aprilia had designed the chip to walk that fine line between performance and economy. According to the dyno operator, most bikes make good power between 4 and 8% CO (steady state). My bike produced around 3.5 to 4.5% CO everywhere. There is a lean spot at 5,000 rpm, the same place the torque dip on the stock and stock/derestricted always occured. I don't think it is dangerously lean, but it is curious why it couldn't have been corrected. The skeptic in me believes it may be lean for cruising MPG, as I've been told there is an irregularity in the map numbers there too. Conversations I've had the helpful people at Factory Pro Tuning make me think there's more power to be had.

Again, I didn't answer the question. Short answer was the bike made 101 HP at the rear wheel on a Factory Eddy Current dyno. For those of you with Dynojet numbers in your head, that's about 116 Dynojet HP. See [Factory's website](http://www.factorypro.com/) for other bikes they've tuned, including the piped and jetted GSXR750's at 102-104 HP, or more closely related, the a piped and jetted VTR1000 SuperHawk at 98 HP.





# Aprilia/RSC SL-Carbon Slip-On Installation Details

## Installation steps: EPROM (injection/advance field map)

* Remove passenger seat or solo cowl piece (using the key)
* Remove seat (pull back pad on either side towards the rear--you'll see a socket cap screw on each side. Remove screws and seat will slide backwards and up).
* Ron E adds:  
  "For California bikes, there is a smog canister behind the ECU box. All you have to do is pull the bolts holding the plastic cover, then the two socket heads holding the rear seat/cowl latch and the canister bracket." Thanks, Ron.
* Remove rubber cover from ECU (half on back side, half on front side).
* Carefully remove two connectors from ECU on seat side--depress release tabs and pry with a fat bladed screwdriver. Don't pull by the wires!
* Remove the ECU box (from the rear). Take it somewhere clean, and preferably humid and conductive.
* Cut the warranty sticker and remove the four #0 Philips head screws holding the ECU cover down. Remove the cover.
* Wearing your ground strap, cut and carefully remove the RTV sealant from around the stock EPROM, without scratching through the green solder mask into the small copper traces. Try to remain in contact with the metal ECU box while you work. I recall it was easy to find the EPROM because it was the only socketed dual-inline package on the board. Other components were surface-mounted and soldered.
* Open the package containing the new EPROM. Before removing it from the conductive foam, touch the conductive foam to the ECU box to allow both to come to the same potential.
* Note which end of the old EPROM is notched (some packages have a smooth dot instead of a notch). This directional indicator must be observed when installing the new EPROM. Carefully pry out the old EPROM. A chip puller can be obtained from Radio Shack for under $2. Alternatively, a screwdriver can be used. Just try to pry the chip straight upwards without bending the leads or leveraging off of any other components. Place the old EPROM in the conductive foam.
* Install the new EPROM in the same direction that the old was removed. Do not remove the EPROM from it's daughter board. Without the copy protection, the chip is useless. Line up all the pins on the daughter board with the socket first, get them all started, then carefully press the board in place.
* You may now safely place RTV on the new EPROM/daughterboard for vibration protection. Try not to make a mess--a couple stripes like the original will do.
* Replace the cover, the screws and plug the ECU back into the bike. Install the plugs, rubber cover, seat and cowl cover.

## Installation steps: Canisters

* Remove spring holding the stock canister to collector/header. If you don't have a spring puller, vice grips work well.
* Remove the socket cap screw holding the canister to the passenger footpeg. Note the location of the two washers next to the rubber mount.
* Apply a little anti-seize to the inside and outside of the new canister inlet, one inch from the end.
* Slip the new canister in place.
* Install the hanger bolt. Bolt head-canister-washer-mount-washer-nut is the order I recall. Try to center up the bolt head on the canister tab before tightening.
* Install the spring.
* Do the other side.

Start her up! The canisters will smoke and stink for a while. They are a straight-through design, so watch what you are aiming them at. The inlets don't seal that great, so expect to clean up a little anti-seize that blows out the joint. If you detect hot gasses blowing on your beautiful swingarm, you may want to loosen the mounts and try for a tighter seal.

# 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](http://www.oocities.org/sl_mille/airbox.html) 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.

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| --- | --- |
| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/filter0.jpg) | 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](http://www.knfilters.com/), this reuseable 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](http://www.redracingparts.com) in Italy and [PDQ](http://www.pdq1.com/) 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. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/filter1.jpg) |

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](http://www.evoluzione.net). 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.

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| Image from www.evoluzione.net | 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](http://www.factorypro.com/) 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.

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| Sears Shop-Vac filter. Paper pleats. This filter has stood up for 12 years in my 8 gallon shop-vac. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/filter3.jpg) |

| Summary of Air Filter Features | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Filter | Material | Height | ID | Pleat size | Pleats | Surface area |
| 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 |

# A Comparison of Different Spark Plugs

The Falco owners' manual calls out two acceptable spark plugs. Both are [NGK](http://www.ngksparkplugs.com/) resistors plugs, standard gap with maybe a slightly extended nose. This is an inexpensive plug, at about $3 apiece. My bike was shipped with the colder heat range DCPR9E. You can go safely go up one heat range to a DCPR8E according to the sticker on the bike. There are probably plugs made by other manufacturers (Denso, perhaps) that have the same reach and heat range, but there is no universal conversion of heat ranges between manufacturers that works for all engines.

The R in the plug identification means the plug contains a high resistor in order to surpress radio noise. Most likely, the high tension leads feeding the plug are highly resistive too (8kohm a foot typical).

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| --- | --- |
| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/plugs0.jpg) | Two types of NGK plugs are specified by Aprilia for the Falco. On top is the DCPR8E. Below is the stock DCPR9E. |

A colder plug means that the electrode does not extend as far into the cylinder. The electrode will be more shielded from combustion heat, but more importantly will have less thermal impedance, or will sink more heat back into the cylinder head than a "hotter" plug. The objective is to select a heat range that burns off contaminants at the same rate they are deposited. Too cold a plug will become coated with deposits and will foul. Too hot and the insulator may crack, the electrode edges will round, pre-ignition can occur, or if the plug reaches too far, the plug could actually contact the piston at speed.

Street plugs typically have extended noses like this one, because they must be operated in conditions of low speed or idling without fouling. Service intervals are not as often as a race bike either, so it's helpful that deposits can become greater without fouling the extended nose plug.

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| The Falco uses two plugs per cylinder, each fed by its own coil. These plugs were regapped once at 4,500 miles, then removed at 7,500 miles. The insulators are tan colored and dry. The electrodes are still fairly sharp, and the deposits on the grounds are typical of pump gas. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/plugs1.jpg) |

Much has been said about "reading" plugs. I guess what you have to remember is that the plug is a history of a lot of running hours, under many different operating conditions and with fuel from different pumps. If the plug is burning hot, it may be dominated by a snapshot of the last operating condition, but if you were running lean for 10,000 miles then pulled the plug after operating the choke for 1 minute, you'd probably never see the lean condition. If you really want to read plugs, you have to start with a fresh plug and operate the bike at the one condition you are interested in. Then kill the motor and coast it to a stop without changing the conditions. An exhaust gas analyzer is much easier to read.

The ignition system in the Falco is mostly likely "inductive", as opposed to CDI, or capacitive discharge. I say this because the plug gap is fairly low, not because I could read the wiring diagram. Some day I will put a scope on it. Each plug is fed by its own coil (four in total). Ken Zeller at [Evoluzione Cyclesports](http://www.evoluzione.net/) makes a device for the Falco which boosts the coil primary voltage to strengthen the spark. It is supposedly a well-tried and failsafe device. I'm not sure if it makes more power, or just makes a more reliable spark.

The Falco manual says to clean and regap the plugs at the 4,650 mile service, then to replace at 9,350 miles. It is a good idea to file the electrode sharp at the first service. A sharp edge will arc over at lower voltages, or will maintain a spark longer. You probably don't want to clean plugs with a wire wheel as I've done in the past. I've read that this can embed conductive particles in the insulator and your plug can short. I also used to work at a shop that had a portable sandblasting tool for cleaning plugs. Even blowing with compressed air afterwards, you were never quite sure if there was a piece of sand still stuck up in the insulator. I usually just replace them if I have new plugs on hand, or file and regap and skip the cleaning step.

Before removing the spark plugs on the Falco, you'll definitely want to blast the head cavities with compressed air. Mine were full of sand. For a description of how to get to the plugs, see the [airbox](http://www.oocities.org/sl_mille/airbox.html) page. When replacing the plugs, you can use the torque figures given below, but this is one of the only places I don't trust a torque wrench. The feel of the gasket crushing has an eerie feeling similar to that of threads stripping. It has to be experienced by hand to be appreciated.

| Summary of Spark Plug Features | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NGK plug | Heat range | Operating conditions | Reach | Thread dia | Gap | Socket size | Torque |
| DCPR9E | Colder | Higher speed/higher temperature | 18 mm | 12 mm | 0.024-0.028 in (0.6-0.7 mm | 5/8 in | 14 ft/lbs (20 Nm |
| DCPR8E | Hotter | Lower speed/lower temperature |

# Servicing Your Aprilia Falco Valves

## Background

The Falco utilizes four valves per cylinder head (two exhaust, two intake), driven by two overhead cams per cylinder head (one intake and one exhaust), and of course there are two cylinder heads. The cams are gear and chain driven off the crankshaft, with a system of guides and a self-adjusting tensioner to keep the chain from jumping. Over each valve stem is a small cylindrical shim, 10 mm in diameter and about 2mm thick. The entire keeper and spring is covered by an inverted bucket, providing a smooth and hardened surface for the cam lobes to push against. In this system, the valve shim sees little wear, and service intervals are high. There are also no rocker arms (or followers) so reliable operation at 10,500 rpm is possible. The downside is that servicing the shim requires removal of the camshafts.

In order to allow for thermal expansion of the valve stem, and wear of the valve seat, there must be some cold clearance between the valve stem/bucket and camshaft base radius. With zero clearance, the valve will not fully close and seal the combustion chamber. Also, the valve cooling comes from the time that the valve is sitting closed in the valve seat. A valve that isn't in the seat long enough will overheat, particularly on the exhaust side. Too much clearance is not as bad, but will create excessive noise. This is why US spec machines often have tighter clearances than European spec. Also, the more the clearance, the later on the lobe the valve opens, so duration is reduced and performance at higher RPM will suffer.

As the valve and seat wears in, the clearance will become smaller. A valve clearance that increases would generally indicate cam lobe wear. According to Aprilia, you should examine your valve clearances at the initial break-in service, and again every 9,350 miles. If you find a valve near a clearance limit, you may want to decrease the service interval unless you routinely reset the clearances of all your valves (easy on screw type adjusters, time consuming and possibly expensive on shim type).

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| Image          from Aprilia |
| Drawing of one cylinder head. Two of four valves shown. Shims are labeled "1" in the diagram. Unlike shim-on-bucket designs, there is no way to extract the shims without removing the camshafts. | |

## Checking the Clearances

Remove the airbox. In order to access the valves, you need to lift the tank and remove the airbox. See the [airbox](http://www.oocities.org/sl_mille/airbox.html) page for some tips on this. In my case, I had removed the tank anyways, and I really appreciated not having it in my way while I worked. To remove the tank, it's helpful to have a second quick disconnect (dry break) to use to drain the tank, because there is no petcock on the high pressure fuel outlet. You can unplug the sender at the harness under the seat. At any rate, it's probably not necessary to remove the tank to service your valves.

Remove the valve covers. It goes without saying that you want to be clean at this point, so wipe down any dirt from around the frame rails and underside of the tank. Anything that can fall in the motor while you work needs to be moved. There is nothing really in the way of removing the rear valve cover. The five screws come off and it's free. The front valve cover takes a bit of blind work to get at the screws, and you'll probably have to loosen the throttle body boot clamps and pop the throttle body off to get removal clearance. You don't need to totally remove the throttle body--just unseat it a bit to raise the throttle cables. On the rear cover, remove the reuseable rubber gasket with the cover. On the front, my gasket was tacked in place near the throttle body with a blob of silastic. This turned out to be very helpful, so I recommend you leave the gasket on the cylinder head if the factory has tacked yours down too.

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|  | Remove five perimeter bolts to remove the valve covers. Rear cover shown here. Front will probably require that the throttle body boots be loosened too. |

Find Top Dead Center. At this point, the cams are now exposed (enough). When you are measuring the clearance on a valve, you want the cam lobe to be rotated completely off the bucket. In principle, you can measure clearances anytime the cam lobe you are working on is not in the 90 degree rotation that faces the valve. At TDC, you can measure all four valves at once. On most bikes, it's easiest to just remove the access plug and rotate the crankshaft with a socket until the cylinder you are working on is at top dead center. On the Falco, this requires a 14 mm allen key which I didn't have. I chose to just bump the bike over with the starter. Be careful with this route--you don't want to start the bike and the Falco won't bump over with the kill switch active. Any way you choose to turn the bike over, it's nearly impossible to stop the motor at TDC with the spark plugs installed. You need to release the compression. I removed a plug and reinstalled it into the plug cap with a ground lead attached between the battery ground and the plug ground. The Falco ignition is probably not CDI, so this step may not be necessary, but I wanted to be sure there was a spark gap to load the coil just in case. On the Falco, the two cam lobes are facing away from each other at TDC. If you look at the cam drive gears, each is marked twice: once with an intake mark (IN) and once with an exhaust mark (EX). This is because the cam gears are one common part and are used on both cams. When viewing the exhaust cam (the cam closest to the header pipe), only pay attention to the EX mark. When viewing the intake cam (the cam closest to the throttle bodies), only pay attention to the IN mark. At top dead center, the EX on the exhaust cam faces and aligns with the IN mark on the intake cam. You can measure the clearances without these being perfectly aligned. The other hitch is that on the rear head, there is a balance shaft drive gear blocking the exhaust timing marks. Just bring the intake mark horizontal and facing the exhaust cam and you'll have TDC.

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| A view of the cam timing marks on the rear head. This head is NOT at TDC. Notice that the balance shaft drive gear blocks the marks on the exhaust cam. To find TDC, this motor would need to be bumped around until the *IN* mark comes around to horizontal (facing the other cam). |  |

Measure the clearances. Slip a feeler gauge between the cam and the bucket. The range of acceptable clearances is small, so you'll probably just be able to do a go-no-go type of test. The there is a little drag on the feeler, you've got the right size. If it slides in easily, you probably have a clearance a half size looser. Of course, if the gauge doesn't fit at all, you've got less clearance than the gauge. Try to determine and record the valve clearance for each valve to the nearest half feeler size.

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|  | Measuring the clearance on a rear exhaust valve. This engine is not at TDC, so in order to measure the intake side it will have to be bumped over. There are another set of valves to measure that are not visible here. Use the access slots in the cam hold-down to feel those clearances. Both lobes on a cam are in the same position. |

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| **2000-1/2 Aprilia Falco Valve Clearance Specs and Measurements** | | | | |
| Valve Type | Valve Location | Acceptable Clearance | Front Cylinder Measurement (my bike) | Rear Cylinder Measurement (my bike) |
| Intake | Gear side | 0.005-0.007 in | **0.0045** | 0.0060 |
| Opposite Gear | 0.0050 | 0.0055 |
| Exhaust | Gear side | 0.009-0.011 in | 0.0090 | 0.0100 |
| Opposite Gear | 0.0100 | 0.0095 |

You can see from the table that I had an intake valve on the front cylinder was too tight. While it wasn't an exhaust valve, it could still be subjected to overheating. Also, I have no history so I don't know if it will continue to move before my next service interval. That shim will need to be swapped. If your valve clearances are in tolerance, congratulations. Button the bike up and check them again in 9,300 miles.

**Synchronizing the Cylinder Vacuum**

Motorcycle cylinders work quite independently compared to automobiles. Separate carburation, intake manifolds, exhaust pipes and sometimes even independent air filters allow the cylinders to be tuned so that one may be making more power than another. This can be due to differences in air flow, temperature, injection, or valve adjustment betwen the cylinders. Periodically, the cylinders should be synchronized. This is usually done by comparing intake manifold vacuum beneath each throttle and trimming the mixture until balanced.

Some old-timers will tell you it can be done by ear, listening to the air flow in each carb throat through a tube stuck in your ear. Most modern tuners have switched to mercury sticks. Rigid tubes stuck in a bath of mercury are attached to the vacuum source. The vacuum draws the mercury up the sticks in proportion to pressure difference between the manifold and the atmosphere. In order to smooth out the individual vacuum pulses, a damping device is needed. This is nothing more than a small orifice (pin hole) restriction in the lines, placed close to the manifold with an air reservoir (length of tube) behind it. Because there is no real air flow in the gauges, there is no pressure drop across the orifice. But when the manifold vacuum drops there is a delay before the gauge pressure can bleed off and it appears steady and readable. Other types of vacuum gauges include mercury-less versions (that draw metal rods), or traditional needle, or "clock" gauges. The clock gauges are very fast acting (they are designed that way so you can see engine problems such as sticking valves). You will definitely need a damper if you choose a clock gauge. I would recommend using two side by side gauges for checking cylinder synch. The reason is, the cylinders are not perfectly independent. As one cylinder drops strength, the idle drops, and this will change the vacuum in the second cylinder's manifold. It takes a bit of fooling around to get a cause-and-effect feel when you are turning the screws. Swapping gauges would make this difficult.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/sync0.jpg) | *A cheap set of carb sticks. Marked in centimeters of mercury, these are very sensitive. Most manufacturers request balance less than 2 cm Hg. Up to four cylinders can be viewed side-by-side.* |

The Falco control unit uses manifold pressure as one of its primary map variables (especially at idle). You would like to synch the cylinders with this control "open loop" so you will need to unplug the electrical connector from the manifold pressure sensor. This sensor is clipped to the lower left side of the airbox. Attached to this are two very small vacuum lines, connected between a "tee" connector and each of the manifolds below the throttle body. These should be unplugged from the tee. You can use them as a vacuum source, or you can plug them. You will need very small adapters to attach these hoses to most vacuum gauges. I found suitable conical shaped adapters in my Mitivac vacuum test kit.

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| --- | --- |
| *On the left side of the airbox, unplug the electrical connector to the manifold pressure sensor. Also, remove the two vacuum hoses from the "tee". Test vacuum may be taken off of these. Or plug them.* | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/sync1.jpg) |

On the right side of the intake manifolds, there are larger vacuum ports. The front port is plugged. The rear is attached to the clutch diaphragm. You can use these for test vacuum and they will fit most gauges easily. The clutch line uses Aprilia's favored clic-clamp. You may not be able to reuse this clamp if you remove it. Plan on having a 1/4-in worm clamp on hand.

|  |  |
| --- | --- |
| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/sync2.jpg) | *Larger vacuum ports are on the right side of the intake manifolds. The rear line feeds the slipper clutch. Depending on how you remove the clamp, you may not be able to reuse it.* |

|  |  |
| --- | --- |
| *Attaching the gauges to the left-side vacuum lines. Note the adapters and damper orifices in the lines.* | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/sync3.jpg) |

You'll want to adjust the cylinders while warmed up, but if you plan on idling for an extended time, you may want to put a fan in front of the bike. You can start the bike up and idle it with the gauges in place, but remember never to rev the throttle on or off quickly with the sticks attached. It is possible to suck mercury out of the gauges and into your engine. Before starting your bike, though, locate the brass air bleed screws on the left side of the throttle body. Mark the slot location, then turn the screws lightly all the way in, counting the turns. Turn them back out to their original location. Record the number of turns so if you get messed up you can get back to where you were.

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| --- | --- |
| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/sync4.jpg) | *The mixture is trimmed with air bleed screws. Clockwise closes off the orifice, making the mixture richer. Count the number of turns to seat the screws before you start working. From the factory, these screws are usually set an equal number of turns out (approximately 1-1/4).* |

If you are working for the EPA, you'll want to see how lean you can possibly set these screws and still have the bike idle without overheating or stalling. For the rest of us, the tuning theory is to richen these screws (turn clockwise) until doing so no longer results in a better idle. Better idle, loosely defined, is a faster idle speed and a steadier vacuum. Your secondary objective is to balance the vacuum in the manifolds for each cylinder. While you do this, you will want to keep the idle speed around 1,300 - 1,500 rpm. Balancing at too high an rpm accentuates differences in port flow. Adjust the idle speed with the thumbscrew on the right side frame. Note that the thumbscrew and idle screws do the same thing: control the amount of air in the mixture. So, many different "solutions" of air screw settings and idle screw settings are possible (not to mention the CO adjust screws in the ECU box). Driveability will dictate the best settings. Normally, that is around 1 to 1-1/4 turns out on the air screws and the idle adjust thumbscrew near its lowest possible setting (it will stop reducing the idle when the throttle plates hit the second idle stop). If you are running a Factory Pro or other aftermarket chip, you may find that lower air screw settings and more throttle plate opening are necessary for good off-idle throttle response. See the [idle adjustment](http://www.oocities.org/sl_mille/idle.html) page for hints in this case.

I can only suggest a tuning procedure here, as I haven't read the manual on this. I ended up with the front screw out 1-3/4 turns and the rear screw out 1-1/4 turns. So a good starting place would probably be with both screws 2 turns out. Richen up a quarter turn at a time until the idle drops. Eventually, it will drop noticeably. When it does, back the screws out 1/4 turn. Balance the cylinders from there, by turning the strong cylinder's screw out. Watch the vacuum gauges. If the vacuum is erratic, as if searching for an idle speed, try leaning out another 1/4 turn. My bike never did have a really steady vacuum when balanced, but seemed to run better with the front cylinder slightly stronger. I've been told this is not abnormal.

When you are done, reset the idle speed and reconnect the vacuum lines and electrical connector.

Update: August 2001. A Mille owner from Australia was good enough to send me a copy of the Mille service manual for the cylinder synchronization procedure. In summary:

* They did not synchronize vacuum, they synchronized %CO emissions, setting them to between 0.8% and 1.3% CO at 1250 rpm (plus or minus 100 rpm). This is quite lean, of course. Coolant temperature during this test is 80-100 C (176-212 F), and air temp is 20-30 C (68-86 F).
* Vacuum was checked, and targeted at 300 mbar plus or minus 30 mbar (22.5 cm Hg plus or minus 2.25 cm). The manual warned that small differences in vacuum were acceptable only if the CO% was in range. They did not disconnect the pressure sensor (but my dealer told me they did this at Aprilia training).

# Tuning the Idle Mixture with Factory Pro Chip

Marc Salvisberg at [Factory Pro](http://www.factorypro.com/) 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.

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| 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. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/idle0.jpg) |

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 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.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/tps0.jpg) | 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. |

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| 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. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/tps1.jpg) |

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.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/sync4.jpg) | 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 synchonize 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](http://www.oocities.org/sl_mille/synch.html) if you wish to verify your vacuum balance.

**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.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/coolant0.jpg) | *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.

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| *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!* | [Click on image         to enlarge](http://www.oocities.org/sl_mille/images/coolant1.jpg) |

# 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-springed 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 seamed 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.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/slave0.jpg) | 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. |

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| 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. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/slave1.jpg) |

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/slave2.jpg) | 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](http://www.evoluzione.net/) 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 Oil Filter Cross-Reference**

The Falco uses a simple paper element for oil filtration. According to one manufacturer, it is specified as such:

* Cartridge Filter
* No anti-drain-back valve
* Height: 75 mm
* OD: 56 mm

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| [Click on         image to enlarge](http://www.oocities.org/sl_mille/images/falco-oil.jpg) | *Paper element oil filter (click to enlarge)* |

Here is a list of oil filters that are likely to be compatible with the Aprilia Falco motor. I say *likely*, because I have not tried any of these. Despite rumors of parts shortages and substitutions, I have yet to have problems getting OEM filters for my bike.

| Part Number Cross-Reference | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| *Manufacturer/Distributor* | *Part Number* | *Comment* |  |  |  |  |
| Champion (A Federal Mogul brand) | RB-X312 X312 (10050447) | OEM Manufacturer |  |  |  |  |
| K&N | NIC-KN-152 (KN-152) |  |  |  |  |  |
| Hi-Flo | HF-152 | PUHF152 is two pack ~$17 |  |  |  |  |
| Perform | APR-2, APR-OF2 | ~$8 |  |  |  |  |
| Cardy | FHM152 | French company |  |  |  |  |
| Amsoil | SMF-121 |  |  |  |  |  |
| Aprilia | 0256187 | ~$12, Application: 1000 cc Aprilia Rotax engines |  |  |  |  |
| Bombardier | 420256188, 420-256-188 | Application: ATV/Rotax |  |  |  |  |
| Delo | see Champion |  |  |  |  |  |
| Filtrex | OIF032 | Reported by Pete M. |  |  |  |  |

Here is a list of motorcycles and off-road vehicles that are *likely* to use this same filter.

* Aprilia Falco (SL-1000)
* Aprilia Mille (RSV-1000), Mille-R, Mille-SP, Mille-R-Factory
* Aprilia Caponord
* Aprilia Tuono
* Bombardier DS650/Baja/X
* Bombardier Outlander 330/400/Std/Max/XT (also Can-Am)
* Bombardier Outlander 800 (also Can-Am?)
* Can-am X800 500 650 400
* Ski-Doo LT800 SWT800 TUV800

# Changing the Aprilia Falco Battery

Like many early Falco buyers, my battery was never really up 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](http://www.yuasabattery.com/) batteries, but in this case a company called [Westco](http://www.westcobattery.com/) 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

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| Spec | YuasaYTX14-BS\* | WestcoSVR-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.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/battery00.jpg) | 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. |

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| 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. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/battery01.jpg) |

Before using the battery, you should absolutely make sure it has been charged. Failure to intitially 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.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/battery02.jpg) | 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](http://www.batteryfaq.org/).

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).

# Aprilia SL-1000 Fork Spring Replacement

## Fork Spring Selection

The Falco is shipped stock with Showa USD (upside-down) cartridge forks. The spring rate is quite stiff for a street bike, at 1.0 kg/mm (straight rate). Most people will have to turn the preload adjusters all the way out to get even close to 35 mm rider sag (a good starting point for modern sportbikes). Under those conditions, the Falco will only have about 15 mm static sag, and gurus say a value close to 60% of rider sag, or 20 mm indicates you're in the ballpark for the right spring rate. For a race bike, less than 20 mm static sag would suggest a marginally stiff spring rate. For road use, traction (and comfort) will benefit from reducing the spring rate further.

* View Traxxion Dynamics' suggested [spring rate chart](http://www.oocities.org/sl_mille/images/traxxion_rate.gif) (Traxxion specializes in racing applications, so consider this a recommendation for smooth surfaces). [From [*Traxxion's website*](http://www.traxxion.com/) as of August 2001]
* View Race Tech's suggested [spring rate chart](http://www.oocities.org/sl_mille/images/racetech_rate.jpg). Race Tech markets their parts for street and competition, and give different curves for each application. Many aggressive riders find Race Tech's recommendations a bit on the soft side. [Chart from [*Race Tech's*](http://www.racetech.com/) installation guide as of July 2000]

From magazine test articles, I estimate the weight of the Falco with aftermarket cans at 475 lbs. Don't forget to add your rider weight with gear before using the graphs above.

I went conservative and chose .95 kg/mm springs, only a 5 percent reduction in stock spring rate. Just to try a different vendor, I went with [Traxxion Dynamics](http://www.traxxion.com/) springs. I've used [Race Tech's](http://www.racetech.com/) in the past, and both appear to be similar products (shot-peened, heat-treated, pre-set, chrome silicon, guaranteed rate, etc, etc). Although there is one notable difference: the Race Tech springs for the Falco are reportedly tapered and small enough in inside diameter that you will have to remove a plastic locating spacer from the damping rod to install them (this requires removing the cartridge). The Traxxion springs are very similar to the stock springs and do not require this additional step. I should also note that both Traxxion and Race Tech market straight rate springs (like the OEM springs in this bike). If progressive rate springs are preferable, try [Hyperpro](http://www.hyperpro.com/).

## Spring Replacement Procedure

Before starting, you'll need a few parts on hand. First is fork fluid. I strongly recommend you don't go any higher than 5 Wt. fork oil with the stock valving. Honda markets Showa oil in 475 ml bottles. You'll need one bottle per fork leg. If your fork seals are leaking, or you suspect your bushings are worn, this is a perfect time to replace them. But pulling the seals is not required to replace fork springs, so I chose not to replace my seals at this time. Also, you'll most likely want to alter the length of your preload spacers unless you happen to get new springs of the exact same free length as the old springs. Race-tech usually supplies spacer material. Traxxion did not, and their springs are shorter than stock so you couldn't cut down the original spacers. Spacers can be made from thin-walled aluminum tubing, or even 1-inch PVC water pipe.

IMPORTANT: You may also want to rig up a few tools to make this job easier. Read this procedure fully to see what is required before deciding if you want to attempt this job without the special tools.

* You do not have to remove the forks to replace the fork springs. But I really believe it would be more messy and time consuming to work with them in place. So, I recommend placing the bike on a suitable front stand. Both [Pit Bull](http://www.pit-bull.com/) and [CFM Motorsports (Woodcraft)](http://www.woodcraft-cfm.com/) make front stands to fit the Falco steering head (27 mm pin is required, as well as unbolting of the air dam and top of the horn cover). However you choose to suspend the front of the bike, do not weight the wheel or forks, as these are being removed! Remove the front wheel (unbolting the calipers helps--see the owner's manual), and remove the front fender (four bolts, very easy). Slip the axle back through the forks.

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|  | CFM front stand in use. Forks are ready to be removed. You probably shouldn't hang your calipers by the hoses. I propped them up after I got the fork removed. Slip the axle through the forks and you can unbolt one without it dropping. |

* Working on only one fork for now, loosen the pinch bolts on the upper triple clamp and clip-ons.
* Before removing the fork leg, break loose the preload caps (the red anodized caps). These are very soft aluminum. I've deformed mine a bit using a 12-pt socket on them, so now I use an open ended wrench that's been taped to protect the anodizing. Try not to scratch the tank or smash the instrument panel. If you have a soft-jawed pipe vice, you can skip this step and break the cap loose later.
* Loosen the pinch bolts on the lower triple clamp, keeping the axle through the fork to keep it from dropping to the ground. Remove the axle and carefully pull the fork out of the clamps from the bottom.
* Take the fork leg somewhere clean, and clean the fork leg of any dirt before you open it up. During disassembly, it's helpful to have a way of clamping the fork in an upright position while you work. A soft jawed vice will work. I stacked up about four used tires on a square of carpet and placed the fork in there. Even if the fork tipped, it couldn't tip enough to spill oil.

**Aprilia SL-1000 Fork Oil Replacement**

It's hard to tell from the US owner's manual (I think they printed part of the maintenance table in Italian), but I believe the fork oil is scheduled for replacement at 4,600 miles. I put this service off mostly because there are no oil drain screws, and partly because I've never had a bike with USD forks, but at 7,700 miles I had the front end suspended to work on the suspension, so I changed the fork oil then. The following is the procedure I used. I didn't have a manual to guide me on this, so I can't guarantee it's accuracy. It worked for me.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/fork0.jpg) | Raise the front of the bike securely so that the front wheel is unweighted. I suspended my bike from an engine hoist. Loosen the top pinch bolts on the triple clamp, as well as the pinch bolts on the clip-ons. Unscrew the fork caps--if you back off the preload completely, they will not be under any pressure. You may want to tape the anodized caps so you don't scratch them up like I did. |
| After removing the caps, raise the front wheel so that the forks compress all the way and the fork caps stick out the top, then measure the oil level from the top of the forks. (I think I made this measurement without the forks completely compressed, so my measured values were in error). |

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| The trick to avoid removing the forks is to drain the oil through the compression valves. For reference, count the number of turns in to seat the adjusters. Then back the adjustment screw out all the way so the needle isn't contacting the orifice. With an pan or beaker underneath, remove the entire compression valve with a 14 mm wrench and allow the oil to drain. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/fork1.jpg) |

Replace the compression valves snugly and reset the adjustment screw. Refill the oil from the top. After adding about 8 ounces, I pumped the fork up and down a few times to bleed the cartridge (I'm not sure this works for USD forks), then I compressed the forks completely and set the final oil level. Replace the fork caps, then torque the pinch bolts on the triple clamps and handlebars to 25 N-m. Reset your preload adjustment if you changed it.

I don't have the oil level spec for the Falco or RSV, nor do I know if the level would be specified with the cartridge and spring still in the fork. I ended up setting my oil level to 6 cm, using approximately 925 ml of fork oil (460 per leg). Later, I measured the volume I drained out to be almost 900 ml (450 ml per leg). I used Showa 10wt fork oil, sold in 475 ml bottles under the Pro-Honda label. The oil that I drained from my forks was very clean (the cleanest I've even drained), so it's probably OK to postpone this service.

*Updates*

* It's spring in New England and I've had the bike out to some fun roads. I have to guess, 10W is not the oil viscosity you want. Too much rebound and compression damping. I turned down the compression last fall, but the rebound is incredibly high. The wheels leave the ground a lot. I'm guessing 5W is the way to go.
* John Abate recently changed his fork oil, and was careful with his measurements. Here's what he provided:

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| *Fork oil volume drained (per leg):* | *455-457 ml* |

* Racetech's page for the RSV with Showa forks lists this information:

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| *Recommended oil viscosity:* | *5W* |
| *Oil level:* | *8 cm* |
|  |  |

# 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](http://www.oocities.org/sl_mille/sag.html). But the abbreviated version appears below.

## My Set-up As Of January 17, 2002

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

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| --- | --- |
| Bike | |
| Description | 2000.5 Falco with aftermarket slip-ons |
| Weight | 450-475 lbs depending on fuel |

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

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

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| --- | --- | --- |
| Tires | | |
| Specification | My setting | Stock setting |
| Type | Dunlop D207 | Metzeler MEZ3 |
| Front size | 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 adice. Although its pretty much up to your tastes, I've done a lot of [trial-and-error](http://www.oocities.org/sl_mille/sag.html) 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](http://www.oocities.org/sl_mille/sag.html#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 SL-1000 Final Ratio -- Rear Sprockets

In the USA, the Falco comes with a 41/16 final ratio. It's geared for 173 mph or so, at least that's what I hit on the dyno. The Mille comes with 42/16, so swapping a Mille stock sprocket is an easy way to raise the final ratio and still keep your stock chain.

A slightly used Mille rear sprocket was easy to come by, but the downside is that it's a steel unit and is quite heavy. At least it will last a while. You can order aluminum sprockets in the USA at [Sprocket Specialists](http://www.sprocketspecialists.com/).

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| The Falco and Mille use the same rear sprocket patterns | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/sprocket0.jpg) |

Replacing the sprocket is easy. Remove the rear wheel, and pull the sprocket carrier out of the cush drive (there's nothing holding it in but friction). Put the sprocket in a vice and use two wrenches to remove the five M10 nuts from the dowels holding the chainring to the carrier. When you replace the sprockets, use Loctite 243 (blue) if you don't have lock nuts. Torque the nuts down to 50 N-m.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/sprocket1.jpg) | This is a good time to verify wheel balance. My wheel was off. The heavy spot was opposite the stem, red dot, wheel weights and new tire patch. Go figure? |

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| --- | --- | --- | --- |
| Final Ratios Using Stock Chain | | | |
|  | Countershaft sprocket | Chainring | Final Ratio |
| Stock RSV | 16 | 42 | 2.63 |
| Stock SL | 16 | 41 | 2.56 |

# Aprilia Falco Drive Force Diagrams

Power output from a motor is interesting data, but your bike's acceleration is going to depend on its weight and how much force it's generating at the contact patch. Drive force diagrams tell you how much force you are applying to the road, and they let you evaluate the effects of changing internal and final gear ratios, wheel sizes, even aerodynamics. You can also find optimum shift points from them, and predict wheelspin or wheelie "problems" that may limit your acceleration.

The starting point for a drive force diagram is a power measurement. While it's true that torque is the real work you can feel, torque is scaled up and down on it's path from the crankshaft through the primary gears, the transmission, the final drive and rear wheel. At each point leverage is applied, frictional losses occur. A simple method of dealing with these losses is to measure power at the rear wheel, and assume power was conserved back from the engine. Calculations at the crankshaft from this data will be in error, but calculations at the rear wheel (where the accelerating force is applied) will be correct.

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| A rear wheel horsepower measurement (smoothed). This is from a calibrated Factory eddy-current dyno. If you use a dyno that estimates frictional losses, or applies generic inertial loads to the rear wheel, you may get good bragging numbers but you won't have an accurate drive force diagram | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/df0.gif) |

To make a useful chart, the axis has to be in road speed (MPH), not RPM. You can calculate road speed from engine speed knowing all the reduction ratios (primary, transmission, final), and knowing the rolling radius of the rear tire. I used a program to derive the diameter of the rear tire from the metric size (P180/55-17), and then tweaked the number a little until the rpm/mph function agreed with my measured data of 100 mph (indicated) at 6000 rpm (indicated), and the dyno data of 173 mph at 10,500 rpm in sixth gear. There's a 1% difference in radius between a new and fully worn tire, so don't worry too much about this.

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| --- | --- |
| Data for Aprilia SL-1000 Falco | |
| Primary ratio | 60/31 |
| 1st gear ratio | 35/14 |
| 2nd gear ratio | 28/16 |
| 3rd gear ratio | 26/19 |
| 4th gear ratio | 24/22 |
| 5th gear ratio | 22/23 |
| 6th gear ratio | 23/27 |
| Final ratio | 42/16\* |
| Tire Rolling radius | 12.4 in |
| \*stock final ratio is 41/16 in USA | |  |

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| --- | --- |
| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/df1.gif) | You can calculate road speed from engine speed, knowing all the reduction ratios (then converting rpm of the circumference of the rear tire to linear miles per hour). You can use dyno data taken with a MPH axis (if was taken in only one gear!), but it's a pain because you need to multiply all your forces by the ratio of desired gear reduction to dyno gear reduction. |

Once you have the reductions figured out, you can build a table of speeds for each rpm sampled, for each gear. These speeds become the independent axis in the final plots. Calculating drive force is trickier. You need to convert measured power to torque at the rear wheel in each gear reduction . One way to start is by calculating torque at the engine (from the first graph), then applying the product of all the reduction ratios. This will give you torque at the rear wheel. Apply that torque (ft-lbs) through the radius of the rear tire (ft), and you have force (lbs) at the contact patch.

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| A completed drive-force diagram. Plotting the table of contact patch forces in each gear at the each rpm, vs the road speed in that gear at that rpm, generates this family of curves. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/df2.gif) |

**Aprilia Falco Drive Force Diagram Discussion**

If this is the first drive force diagram you've seen, it may not mean much to you. It's a family of curves, one for each gear, plotted from minimum useable rpm to maximum useable rpm. The independent axis of the graph shows you what road speed you'll be doing over that range. The dependent axis shows you how much force is propelling your bike at the rear contact patch. Acceleration is directly dependent on this force, so the higher up the curve, the quicker you are accelerating (changing speed). The further to the right you are on the curve, the faster your speed.

Also plotted to the graph are two additional curves.

* The "Ultimate Force" curve is a theoretical line. It shows what the drive force would be if the engine were operated at the single rpm where it made peak power, and that power were transmitted through an infinitely variable transmission (something like two conical shaped pulleys with a belt between them). This is the most force you can possibly hope for at any given roadspeed. Your goal would be to build a bike that had curves as close as possible to this line.
* The "Wind resistance" curve is a curve I fit, increased with the square of road speed. It demonstrates how much force the wind pushing against you takes away from your net drive force. For each drive curve, you need to subtract the wind resistance force. You can not accelerate when the wind resistance is stronger than the force your bike is producing. A second resistance, rolling resistance (not shown), is approximately independent of speed. It is the force you need to push your bike slowly around the parking lot (once it's already moving). It is a small value and it's usually ignored.

Some things you can derive from the graph:

* If the bike really isn't making useable power beyond the ends of the curves (<3000 rpm or >10,500 rpm), then in first gear you need to be slipping the clutch to be able to accelerate from below 16 mph.
* The wind is going to make your terminal velocity around 160 mph. After this speed, wind resistance is producing more force than the bike can overcome. This bike, as geared now, won't pull to redline in sixth gear. That's "wasted range", but gearing it that was may be useful in making the other gears more driveable, or in fuel economy.
* This is a wide ratio transmission (typical for twins), especially through 1-2-3. For maximum acceleration, you are going to want to take the bike to redline (maybe the 5th-6th shift could be a little earlier). In the lower three gears, when you are forced to upshift by the rev limiter, you are going to notice a significant drop in acceleration in the next gear (this is not a good racing transmission). In particular, first is very low, and you probably won't want to downshift into it unless you're smooth. It's a common misconception that you want to shift at maximum power, or maximum torque. You really would want to shift whenenver the next gear brings more drive force than the previous. With the possible exception of fifth gear near redline, this bike doesn't cross it's force curves.
* The physics of the wheelie and of wheelspin are detailed, but a loose rule of thumb is that interesting things start to happen when the bike is putting down more force than the weight of the bike and rider. That's about 625 lbs for me. From the graph, it appears that the bike will wheelie quite happily anywhere in first, and is pretty safe to push once you shift to second.

# Aprilia SL-1000 Final Ratio -- The Countershaft Sprocket

Front sprockets are harder to come by in the US, but [Talon Engineering](http://www.talon-eng.co.uk/) 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).

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| --- | --- |
| 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. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/countershaft0.jpg) |

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.

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| [Click on image to enlarge](http://www.oocities.org/sl_mille/images/countershaft1.jpg) | 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.

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| 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. | [Click on image to enlarge](http://www.oocities.org/sl_mille/images/countershaft2.jpg) |

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.

|  |  |
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| 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](http://www.sprocketspecialists.com/) (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.

# 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, substracting 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.

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| --- | --- | --- | --- | --- |
| 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 Shock Absorbers**

The Sachs shock on the Falco leaves a lot to be desired. Less high-speed compression damping, a stiffer spring, and ride height adjustment would be useful improvements. A remote reservoir is also desirable with the proximity of the rear header.

Will a Mille shock fit? This is an ongoing question. The answer is *PROBABLY* yes with a remote reservoir, no with a piggyback. But it's still unclear. Reportedly, with a Mille swingarm, the Mille shock will just fit (Ohlins or Sachs, I don't know). Anyone with first hand information on this please share...

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| --- | --- | --- |
| [Ohlins](http://www.ohlins.com/) | Manufacturer: | Ohlins (NL) |
| Type: | DeCarbon with piggy-back reservoir |
| Adjustments: | preload, rebound, compression |

Ohlins has a shock for the Falco. The part number is **AP 941 46 PRC**. Ohlins typically selects one model shock for a given bike, taking a guess at what the price point of the bike and riding style needs. Unfortunately, this may be a compromise (just like the stock shock) as no two people are alike. I believe this particular model has preload, compression and rebound damping adjustment, with a piggy back reservoir. No remote reservoir, remote hydraulic preload adjustment, or ride height adjustment. There are US sources, such as [Mototek](http://www.mototek.com/). You used to be able to import the shock from Wim Kroon Import in the Netherlands, for about $505 plus $25 shipping, but I believe Ohlins has put a stop to this because the pricing was too low compared to US dealers ($800 or more).

Pros:

* Ohlins has a reputation for making a shock that is never harsh under any conditions.
* Their parts are reportedly the highest quality, which means less frequent rebuilds.

Cons:

* At least one user has complained that the damping on this particular shock fades during an aggressive ride.
* You pay for setting up the shock if it is shipped with an unacceptable spring rate or damping characteristic.
* No ride height increase, a need for this bike.

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| [Penske](http://www.penskeshocks.com/) | Manufacturer: | Penske (USA) |
| Type: | DeCarbon with remote reservoir (cheaper emulsion option available from [Traxxion Dynamics](http://www.traxxion.com/)) |
| Adjustments: | preload, rebound, compression (several options), ride height |

Penske has fitted a shock to an SL-1000, Penske's base model (one compression adjustment) lists at $725. Their base shock (8100 series) has preload, compression , rebound and ride height adjustment, with a remote reseroir. Two premium options are also available to increase compression damping adjustability.

Pros:

* Has ride height adjustment, although its use may be limited by chain/swingarm-to-pipe clearance.
* Penske will revalve and swap springs at no charge for a short period after you buy the shock.
* Shocks are upgradable to more clicks of compression adjustability, or even separate high and low speed control.

Cons:

* Shocks were shipped with very short reservoir hoses, limiting placement. (But hose swaps are free too).
* At least one user thinks the shock is a bit harsh on sharp bumps.

Here's some pictures of the Penske shock on Javier's bike  click on images to enlarge

[](http://www.oocities.org/sl_mille/images/penske0.jpg)  [](http://www.oocities.org/sl_mille/images/penske1.jpg)

More Penske info  
I've installed a Penske on my bike. Read [my report](http://www.oocities.org/sl_mille/shock2.html) before ordering.

New Product Option  
Max McAllister of Traxxion Dynamics has arranged a deal with Penske to sell their 8900 series race shock in emulsion form, without the remote reservoir. Called the "Sport Shock", it will still offer adjustable ride height and rebound damping, and can be upgraded at any time with a 8100 or 8700 reservoir if compression adjustability is desired. This is supposed to be available for limited applications, but they are going to try to make the shock for as many models as possible. At $550 (free shipping) it comes with a spring rate for your weight.

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| Traxxion Dynamics Sport Shock | | | |
| *Traxxion Dynamics offers an 8900 Penske racing body with the reservoir port blocked off* | | | |
| [Works Perf](http://www.worksperformance.com/) | | Manufacturer: | Works Performance |
| Type: | DeCarbon with piggy-back reservoir (plus cheaper emulsion option) |
| Adjustments: | preload, rebound, compression (on DeCarbon) |

Works Performance is reported to have two shocks for the Falco now. Their standard upgrade unit, and a premium unit with remote reseroir and adjustable compression and rebound. Their website does not yet list Aprilia applications, but US pricing is likely to be $480 standard, $699 premium).

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| --- | --- | --- |
| Technoflex | Manufacturer: | Technoflex (NL) |
| Type: | DeCarbon with piggy-back or remote reservoir |
| Adjustments: | preload (remote available), rebound, compression (high and low speed) |

Technoflex (Netherlands) hase a Falco shock now. I am not familiar with their company, but their website shows a good selection of competition quality, rebuildable shocks with a large adjustment range. Typical remote reservoir units are priced at EU 591. Piggyback sells for EU 745. Remote preload adjustment is available. A good Falco unit with optional preload adjustment and separate high and low speed compression adjustment is US$630.

NEW *(Added September 25, 2001)*  
Hugo has installed a Technoflex on his Falco

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| --- | --- | --- | --- |
| Here's a picture of the Technoflex shock on Hugo's bike (Click on image to enlarge) | | | [Hugos bike](http://www.oocities.org/sl_mille/images/technoflex0.jpg) |
| [Fox](http://www.foxracingshox.com/) | Manufacturer: | Fox (USA) | |
| Type: | DeCarbon with remote reservoir | |
| Adjustments: | preload, rebound, compression, ride height | |

Fox has fitted a shock to an RSV, so they may have an SL-1000 application soon. Fox shocks typically list for $599 or $735 depending on the type but are often discounted.

# Aprilia Falco Shock Installation

This is really straightforward, but I wanted to share a couple tips.

When I measured rear sag, I suspended my bike from an engine hoist to raise the rear. It's much easier to put the bike on a rear stand, then push a piece of steel rod through the swingarm pivot. Place jackstands under the rod and lower the bike off the rearstand onto the jackstands. You can then put a scissor jack under the swingarm buttons to just take the weight off the shock. Now the shock will practically fall out with no muscle.

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|  | The swingarm pivot on the Aprilia is hollow, so you can slide a length of rod through the bike. Use a jack to just take the weight of the wheel and swingarm off the shock. |

After removing the one top and one rear bolt on the shock, there is enough clearance to drop the shock and pull the top through the right side over the swingarm. Here's a picture of my Penske with original hose, bolted up. I sent the shock back to have an 8-inch hose put on (measured from fitting end to end).

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| The subframe has a crossmember behind the shock which would neatly tie up the shock reservoir, I think. On my RS250, they actually molded a reservoir cavity into the inner fender plastic here. There's some hoses to clear on the left side, so I think it would be best to have the compression adjust face to the right. The stock hose is too short for this. |  |

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# Aprilia Falco Footpeg Brackets

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| I'm providing some footpeg bracket measurements here because a few RSV owners have inquired about their compatibility with Mille units. | | |
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| Spec | APPROXIMATE distance |
|  |  |
| Offset between frame mounting holes on footpeg bracket | 77 mm |
| Rear master cylinder model no. | Brembo #4767 |
| Offset between mounting holes on master cylinder | 40 mm |
| Distance from rear master cylinder mount hole to lever pivot | 85 mm |

**Aprilia Falco Brake Line Installation**

I think the stock lines on the Falco are pretty good, but after riding a Mille-R I knew they could be firmer. I normally make my own lines out of kit parts from Earl's Supply (WM Engineering), but my dealer was ordering some kits from [Fren Tubo](http://www.frentubo.com/), so I ordered a set from him. I believe the kit was around $220 (includes front and rear brakes and clutch). As a reference point, it usually costs me about $40 to build a line for one caliper.

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| --- | --- |
|  | *This braided steel kit by Fren Tubo is part number 320037-1. The fittings are plated aluminum, and the lines are plastic coated with a very subtle purple tint (?) It contains aluminum banjo bolts and crush washers. Unlike most kits I've seen, the front lines are a one-into-two (T) like the stock lines, not two separate lines from caliper to master cylinder. The lines are DOT approved, which I believe means they were pressure-tested.* |

Basic Front Line Installation Procedure.

* 1. Cover all your paint with towels. Put a rag over your wheels too. Brake fluid is going to leak and it will damage paint pretty quickly.
* 2. Siphon out the master cylinder reservoir. I have a Mitivac siphon unit, but I actually prefer my homemade siphon jar and good old lung action.
* 3. Remove the lower banjo bolts (on the calipers) and let them drain.

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| *The sock is to soak up the inevitable fluid spill. Always use a closed end or at least a flare nut wrench on the banjos.* |  |

* 4. Remove (or at least slide down) the air dam to gain access to the line junction (three 8mm headed bolts). Remove the junction holddown too (7mm).
* 5. Place a few rags under the upper banjo bolt and remove it from the master cylinder.
* 6. Wrap bags over the ends of the lines and seal with tape. Remove the lines.

|  |  |
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|  | *If you take this opportunity to wrap the threads of the bleed screws with teflon tape, no air bubbles will leak by them while you bleed the brakes.* |

* 7. Feed the new brake lines into position. Fren Tubo lines come with grommets for the air dam, but the Galfers I put on my RS250 didn't. You can remove the grommets from the old line and slip them onto the new line. The longer line is for the left caliper (furthest from the master cylinder). Roughly position the banjos and feed a few threads of the bolts to hold everything in place.

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| *The Fren Tubo lines have a junction like the OEM lines. Others makes (such as Galfer) run individual lines from each caliper to a double-length banjo bolt at the master cylinder. With either setup, you can feed the far line through the junction holddown.* |  |

* 8. When you are satisfied that the lines aren't twisted, place a new crush washer on either side of the fitting and tighten the upper banjo snugly onto the master cylinder. Don't completely tighten it, just good enough not to leak.
* 9. Place the crush washers on either side of the lower fittings and begin to feed them into the calipers. On the left side (furthest from the master cylinder), snug the fitting finger tight. Leave the right side loose and tie a rag around it.
* 10. Fill the master cylinder with new DOT4 brake fluid. Castrol LMA works well for me but I have to hunt around to find it. Allow gravity to take the fluid down the lines, making sure the master cylinder doesn't run dry. In a few minutes, the right side line will start leaking fluid. When it does, snug it down.
* 11. Loosen the left side line and wait for it to gravity bleed. Don't allow the master cylinder to run dry. When fluid starts leaking out, snug down the left side fitting.
* 12. Now properly bleed the brakes, starting at the caliper furthest from the master cylinder. A siphon jar is nice, but sometimes you can force the most bubbles out by pumping the brake lever. Tap the lines and caliper periodically and you should see more bubbles. If you are using a siphon device to bleed the brakes and the bubbles never seem to end, its likely air is leaking around the bleed screw threads. Continue to the other caliper, never letting the master cylinder run dry.
* 13. Finally, bleed the line at the master cylinder fitting. Most times I do this by wrapping a rag around the fitting and cracking the banjo bolt loose as I squeeze the brake lever. Be careful--brake fluid will spray out so wrap it with a rag. On the Falco, there's a bleed screw on the front brake master cylinder and this worked well.
* 14. The brakes should be quite firm now. Tighten down the upper banjo a little, making sure the line doesn't interfere with the steering from lock to lock. When you are satisfied with the routing, snug it down tightly (no more than 15 N-m).
* 15. Position the lower banjos so that the lines aren't rubbing on the fenders. There should be a loop of line to the back so that the line will fold nicely when the forks compress. When you are satisfied with the routing, tighten down the banjos.
* 16. You may want to bleed the brakes one last time now, or if the lever feels firm, wait until you've ridden the bike a while.
* 17. Top off the master cylinder and replace the cover.

Clutch Line Installation Procedure. The clutch line is very similar to the brake lines, with a few exceptions.

* You will need to remove the shift lever and countershaft cover to get at the clutch slave cylinder. If you are building your own line, you can probably snake the line though the original routing and put the end on the line afterwards. If you are installing premade lines, you'll want to remove the left lower fairing and loosen the top mount to the oil tank to feed the line through.

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|  | *Use a center punch to mark your favorite spline position on the shift lever.* |

* The clutch slave cylinder bleed screw is in the top of the banjo. If you want to retain a bleed screw at the slave cylinder, you'll probably need to reuse this "rare" fitting. You may be able to obtain an aluminum banjo with bleedscrew from Jenspeed products. I used the OEM banjo with new aluminum washers.

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| *The stock clutch line has the bleed screw in the banjo bolt. The Fren Tubo supplied banjo bolt did not come with bleed screw.* |  |

Rear Brake Line Installation Procedure. The rear brake line is a little different.

* The rear line runs within a protective channel under the swingarm. Remove the channel, but be careful not to push on the wellnut on the inside of the swingarm. If you lose it into the swingarm, you'll need to find another. It is the same size used on many windscreens, such as the Honda CBR600F4.
* It is nearly impossible to bleed the rear caliper without removing it, due to the fact that the fittings and bleed screw are at the lowest point. Remove the caliper when bleeding and hold it above the master cylinder. You'll need to place something between the pads to keep them from pushing together.
* When you are done, replace the zip ties holding the brake line to the speedometer sensor cable, and the brake line to the brake switch and reservoir line. Also, there's two guides on the motor to contain the line. You can zip tie the line to those too. The line runs outside of the inner guide, inside of the outer guide.

# Replacing the Front Brake Pads

Sintered pads don't seem to wear out, they just seem to get harder and harder. After nearly 11,000 miles, mine still had a lot of friction material on them, but not a lot of bite. It would stop, but not without a lot of effort. I was way overdue for new pads.

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|  | I haven't tried a lot of different pad brands, but I'm always impressed with EBC HH's on the track. They seem to work very well with stainless rotors, and when warm they are great with iron rotors too. I decided to try the EBC HH pads on the Falco, part number *FA 244 HH*. The Falco, Mille, and RS250 Challenge share the same pads, so there's sure to be a lot of different brands to try. |

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| After removing the two M10 bolts, the calipers can be removed without removing the wheel. Sometimes, its necessary to push back the pads a bit to make clearance to tip the caliper. Only remove one caliper at a time so you don't overflow your master cylinder! Plus, it never hurts to leave a caliper intact in case you forget how to put it together. |  |

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|  | To remove the pads, you need to remove the two retaining clips, then the two slide pins. The pads will then slide out of the caliper. |

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| It is possible to remove the pins and pads without removing the caliper. But if you have time, you'll probably want to remove the caliper in order to clean the dust from around the pistons. |  |

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|  | Make sure you have a little airspace at the top of your master cylinder, then carefully pry back the pistons to make sure they are free. This also allows the new (usually thicker) pads to fit over the caliper. If you flip the pads and place them in the calipers, you can pry back the pistons squarely without damaging the pads. |

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| Sintered pads are hard. Very hard. Like modern clutch plates, they can be work hardened to the point of losing friction properties long before they wear out of spec (< 2mm). On the left is the new EBC pad, with less friction material than the 11,000-mile old stock pad on the right. |  |

Before reassembly, there's a few things to do.

* Using small files, knock down the edges around the locating holes and sides of the brake pad backing plates. We want to make sure there's no burrs or edges that can dig in and prevent the pads from sliding during use.
* An anti-squeal trick I was taught for cars was to use a file to knock down the sharp leading and trailing edge of the friction material too. I do this on bikes too, although I don't know if it makes a difference.
* Use steel wool to clean the slide pins. There may be a couple divots in them from hard braking. Sand these out but try not to remove so much material that the pads will rattle excessively.
* Before reinstalling the slide pins, wipe a very thin coat of anti-seize lubricant on them. The pins slide into the caliper, through the pads, picking up the "hooks" on the anti-rattle plate at each pin. There is an arrow on the anti-rattle plate which points "up" when properly installed.
* Reinstall the retaining clips, and tuck the upper clip under the anti-rattle plate for added safety.
* Install the caliper with the mounting bolts just snug. Pump the brake lever to seat the pads, then torque the M10 mounting bolts to 50 N-m (about 35 ft-lbs).
* Do the other side!

When EBC HH pads first came out, the trackside vendors had posted a notice from EBC on proper break-in procedure. I think the posters have long since disappeared, but from memory, this is how EBC recommends breaking in their pads for track use. I imagine for street use, you can adapt this technique, or simply follow the back of the packaging which says that 250 miles of frequent, light use is needed to bed in the pads.

## EBC HH Pad Break-in Procedure for the Track

* Take two slower laps of the track, using the brakes lightly to warm them up and bed them in.
* Take one hot lap of the track, using full braking power.
* Pull into the pits and allow the pads to completely cool.
* The pads are now ready to race.

# Fixing the Sidestand Safety Switch

Almost everyone owning a 1999-2000 manufactured Falco or Mille has experienced a failure of the sidestand switch. For most, the result is a dash light that bears no connection to whether or not the sidestand is actually down. For some unlucky others, the engine cutout function has come in and prevented their bikes from starting.

The root cause of the problem is a plastic locating pin on the switch rotor. When tight, the switch rotor tends to spin from the friction of the sidestand, but it can slip and the plastic pin is supposed to prevent the rotor from getting misaligned. Instead, the weak pin just shears, leaving a stub in the sidestand hole.

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|  | The plastic pin in the switch rotor is easily sheared by the sidestand. |

There are several solutions. When mine broke in the break-in period, I just loosened the switch, realigned the broken pin to the hole and tightened it down well. It held like this until about 10,000 miles when it slipped again.

The best solution is probably to complain to your dealer. Aprilia redesigned the switch to use a metal rotor in 2001. Dealers have been slow in getting a stock of these switches, but they may have them by now. As a safety item that probably broke during warranty, I'd expect the switch to be free.

Another solution is to remove the switch and jumper the wiring harness. I believe Aprilia even sells these jumpers for racing use, but you could easily cut your switch cabling and make up your own. This would disable the light on the dash permanently.

The solution shown here is simple. Drill out the old plastic pin and replace it with something more sturdy. Some have used bicycle spokes. I managed to fit a small machine screw in there, but the hole was large so I broke through the sidewall of the rotor with the tap and needed a bit of epoxy to finish the job. There's a guy on the Mille list who fitted a titanium pin (some people are serious about their weight savings!).

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| There's just enough width in the rotor to drill and tap a small machine screw. A bicycle spoke is probably a better solution if you have one on hand. |  |

# 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.

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| 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.

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| 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.

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|  | 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 pivot. 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 desireable, 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  |  |  | | --- | --- | | Measurement 1 | 5.028 in | | Measurement 2 | 5.032 in | | Measurement 3 | 5.030 in | | Average of three measurements = | 5.030 in | | Divide by 8 pins measured = | 0.629 in | | Subtract standard value 0.625 in = | 0.004 in | | Divide by standard value 0.625 in = | 0.0064 | | Multiply by 100% = | **0.64 %** | | Answer above less than 1% | Yes, chain is OK |   At 12,000 miles, this chain was still OK, but on its way out. 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. |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Replacing A Headlamp This spring I lost my low beam. Its fairly easy to swap out a headlight, but I had the digital camera handy so here's a quick description.   |  |  | | --- | --- | |  | The low beam is a tight squeeze to get to. You can gain some hand-room if you drop the air dam down and work from the bottom. Also, with an 8 mm socket you can remove either the fuse or relay box and move them out of your way. This is a necessity if replacing a high-beam, but just convenience if doing a low beam. |   The low beam in the Falco is an H7. Its a single filament halogen lamp, about 55  W and pricey at $15 (from a local Napa auto parts store). Carefully remove the connector by rocking it. Then remove the rubber weather guard (there's a tab on it to pull). The tricky part is releasing the bulb holder. Its held by a hinged piece of wire. The wrong way to do it is to be impatient (and blind) like I was and put a Philips head screwdriver to the screw. The wire will spring loose and you'll have a puzzle to put together (I removed a high beam and had a look at how it was secured to figure out the low beam). The proper way is to push the unhinged side of the spring further in towards the bulb, then slide it to a side to clear the tab that captures it. It will then swing open like a door and the bulb holder can be removed.   |  |  | | --- | --- | | The black plastic holder with the electrical tabs on it is not included in the replacement bulb, so don't throw it away. |  |   If you want to test the old bulb, put 12 V across it, or use an ohmmeter (it will read very high impedance if blown, certainly less than 1 ohm if good). If its bad, rock the old bulb out of the holder. Its always a good idea to avoid touching lamps when you replace them. The oils in your fingers will create leakage paths and reduce the life of halogen bulbs. When you've seated the new bulb, rotate it in the headlamp until the tab falls in place, then swing the wire hinge back in place. Replace the weather guard and the connector and you should be good to go. |  |  Aprilia Falco Wheel Information Wheel removal is pretty straightforward on the Falco. The only special tools required are the stands to support the bike. Front Wheel  |  |  | | --- | --- | |  | To remove the front wheel, suspend the front of the bike any way except through the axle. A fork stand or steering head stand works well. Be warned that most front stands must be used along with a rear stand for stability.  The calipers must be removed in order to release the wheel. After removing the two bolts on each caliper, loosen the axle nut, then the axle pinch bolts (two on each side). You can just slip the calipers off the rotors and out of the way. I can usually hold the wheel up with my boot while I knock the axle out with a mallet.  Replacing the wheel is simple. Remember to clean and replace the spacer on the throttle side of the wheel (the side with the axle nut). If you get confused, the direction of rotation is shown as an arrow cast into one of the spokes on the wheel. I generally try to tighten down the large axle nut as much as possible before tightening the axle clamp bolts. When the axle spins, I then tighten the the pinch bolts. Tighten all fasteners to the specs given below. Its a good idea to clean the caliper bolt threads and use thread-locking compound on them. |  Rear Wheel  |  |  | | --- | --- | | In order to remove the rear wheel, only the large axle nut needs to be removed. After knocking out the axle (support the tire with your boot), you can maneuver the wheel inwards a bit and remove the chain from the sprocket. Hang the chain out of the way on the swingarm. The wheel can usually be lowered to the ground with the caliper still in place. The caliper is mounted to a bracket that rides on a single boss (pin) on the inside of the swingarm. With the wheel leaned out of the way, slip the caliper bracket inwards off the pin and move it out of the way. The wheel should be free for removal now (don't scratch it on the caliper boss).  Before replacing the wheel, clean up the caliper bracket, boss, and chain adjustment blocks. Hold the wheel back in place with your boot, and slip the caliper over the disc and onto the swingarm pin. Start the axle through from the chain side, but before driving it all the way, replace the chain on the sprocket. My rear stand interferes with the axle blocks a bit if I don't remember to put them in place before replacing the axle. Line up the caliper mounting bracket with the wheel bearings and finish driving the axle through.  After adjusting my chain, and before tightening the rear wheel, I usually put a screwdriver in the teeth of the rear sprocket and rotate the chain over it. This will pull the wheel in snug against the chain adjustment screws so you can tighten the axle nut. |  |  Tightening torques    |  |  |  | | --- | --- | --- | | Tightening torques | | | | Front axle nut | 30 mm wrench | 58 ft-lbs (80 Nm) torque | | Front axle pinch bolts | 10 mm | 16 ft-lbs (22 Nm) | | Front caliper mount bolts | 13 mm | 36 ft-lbs (50 Nm) | | Rear axle nut | 32 mm | 87 ft-lbs (120 Nm) | |

# 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.

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|  | 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

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| 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

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| 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

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| 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 reseated the brake pads. At the moment, the noise seems to have gone away.

# Aprilia Falco Hard/Soft Luggage

Here's some (poor) pictures of the Aprilia luggage mounted on my Falco. The saddlebags are expandable Aprilia bags. The top bag on the tail is an Eclipse pack, mounted using straps and racks from the Aprilia kit.

The lightweight racks mount at the passenger grab handle, the passenger footpeg bracket, and the exhaust canister mount. Spacers are provided so the racks only contact the bike in areas normally covered by fasteners. There's really no damage to be done to the bike by these bags if properly installed.

I put some clear tape on the tail ridge where one of the straps came very close to the bodywork. It wasn't touching, but I imagined if it worked loose it would quickly whip through the clearcoat on the ridge.

The Aprilia price on the kit is $296 before discounts. It's pretty reasonable if you consider the cost of one similarly sized tank bag.

The kit includes the two expandable bags (shown here closed), with luggage handles, rain covers, draw string liner and zippered compartment and rubber coating on the bottom. There are two powder-coated racks and mounting hardware. The bags fit on the racks with keyhole mounts at the bottom, and straps at the top. The kit also includes a piece of cut and drilled closed-cell foam and additional straps so you can mount one bag alone on the passenger seat. The foam protects your seat from indentations from the bag mounting posts. I believe a bag mounted this way without the racks would require a strap against the paint (I didn't try it). The Eclipse bag I showed in the pictures is clipped and strapped to the racks, sitting on the foam. It didn't contact the seat or paint. I don't remember how much I paid for the Eclipse bag ten years ago.

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Here's a suction cup radar detector mount in action (Radio Shack, $7 about seven years ago). I wired it off the battery with a 1A fuse, so it's not switched. You could try tapping into the headlamp relay, but I didn't want to sacrifice reliability.

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# Aprilia Falco Fender Eliminator

There's a few options available for people looking for a ready-made fender eliminator for the Falco. Ken Zeller's [Evoluzione Cyclesports](http://www.evoluzione.net/) makes a popular kit for low money ($34 delivered in the US). You can also make your own pretty easily, like Nick Chiechi did. Nick's site has a lot of photos of aftermarket parts for the Falco. You can see his fender eliminator on his site at [Rideaprilia.com](http://www.rideaprilia.com/).

Earlier in the winter I had a moment of weakness and picked up an aluminum piece from my dealer's case. It was very expensive at $80. I haven't installed it yet, but I thought I'd share pictures of it in case somebody is shopping for one. The brushed and anozided piece is etched with the logo "BC Moto", so that's probably a clue as to who made it. I've since sold this before I ever installed it, and my dealer says they're no longer available.

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|  | B.C. Moto fender eliminator. Brushed aluminum. Anodized black. Very well done, but very expensive at $80. |

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| There are cut-outs to reuse the stock license plate lamp assembly and turn signals. Rubber grommets in the license plate attachment holes isolate the plate from the bracket. There is a cable clamp with lock nut for the lamp wiring. |  |

# Aprilia Falco Articles and Links

Want to read more?

## Magazines with Falco Articles

* Cycle World (US), 2000
* Motorcyclist (US), 2000
* Sport Rider (US), 2000
* Roadracing World (US), September 2000
* Performance Bikes (UK), February 2000, November 2000
* Bike (UK), July 2000, March 2000
* Superbike (UK), January 2000, February 2000, December 2000
* Motorcycle News (UK), July 19, 2000; October 11, 2000.

I'm working to archive all these articles to CD-ROM. PLEASE let me know if you have any Falco articles in print, or if you've seen any on the net that aren't listed here.

## Online Falco Articles

These are constantly going outdated, but I've archived them.  Let me know of others so I can capture them while they exist).

* Motorcycle Daily (US) - [Aprilia SL-1000: The Practical Italian Superbike](http://www.motorcycledaily.com/sl1000.html)
* Motorcycle News (AU) - [Test: Aprilia SL-1000 Falco](http://www.mcnews.com.au/Testing/Falco/ApriliaFalco.htm)
* 2WF.com (US) - [Aprilia SL 1000 Falco - A Mille Lite?](http://www.2wf.com/content/view/198/28/)
* Motorcycle News (UK) - [Aprilia SL1000 Falco (1999-2005)](http://www.motorcyclenews.com/MCN/bikereviews/searchresults/Bike-Reviews/Aprilia/Aprilia-SL1000-Falco-1999-2005/)
* NI Biker (N Ire) -- [SLV 1000 Falco, A Review By Gary English](http://www.nibiker.co.uk/reviews/bikes/falco/index.html)
* Motorcycle.com - [2000 Aprilia Falco SL1000V - A Mille Coupe](http://www.motorcycle.com/manufacturer/aprilia/2000-aprilia-falco-sl1000v-14759.html)

## Manufacturers' Sites That Support the Falco

* [ElectroSport (formerly Electrex USA)](http://www.electrosport.com/)  
  Greg Nestler of Electrex USA has emailed me to let me know they are now offering brand new high output stators for the Falco, Mille, Futura and Caponord.
* [Evoluzione Cyclesports](http://www.evoluzione.net/)  
  Developer of trick Mille and Falco performance parts
* [Factory pro tuning](http://www.factorypro.com/)  
  My Falco results are on the hard-to-find [Aprilia page](http://www.factorypro.com/Prod_Pages/proda10.html)
* [Leo-vinci exhausts](http://www.leovince.com/)  
  Many Aprilia applications.
* [Madaz Custom Exhausts](http://www.madaz.com.au)  
  Mark Harris from Madaz asked me to list his site, featuring "custom-made" exhausts.
* [Red Racing](http://www.redracingparts.com/)  
  Italian company that exports K&N filters for the Falco
* [Renegade Exhausts](http://www.renegade-products.com/)  
  Makes exhausts in the UK for the SLV1000 Falco.
* [Sargent Cycle](http://www.sargentcycle.com/aprwsfalco.htm)  
  Has sent me a notice that they now carry seats for the Falco in your choice of fabrics.
* [Sprocket Specialists](http://www.sprocketspecialists.com/)  
  Carries sprockets for the [Falco](http://www.sprocketspecialists.com/SearchResults.aspx?txtSearch=623)
* [Talon Engineering (UK)](http://www.talon-eng.co.uk/)  
  Supplier of hard to find sprockets, like the 15T front for the Falco

## Some Aprilia Dealers

* [Blackmans Cycle](http://www.blackmans.com/)  
  PA Aprilia Dealer, sponsoring Formula Extreme RSV, an RSV250!, and an RS250 Challenge bike.
* [Mototek](http://www.mototek.com/)  
  Racing an RSV, near Austin TX.
* [Seacoast Sport Cycle](http://seacoastsport.com/)  
  A good Aprilia dealer in NH, racing an RS250 Challenge and RSV-R in the [Loudon Roadracing Series](http://www.lrrsracing.com/).
* [South Bay Triumph](http://www.southbaytriumph.com/)  
  These guys are building some trick Aprilias, Falcos included.

## Falco Owners' Sites

* [Captain Futura](http://www.apriliafutura.co.uk)  
  Pat has a great Futura site that is sure to have some useful info for Falco owners
* [Thomas Caplan](http://www.caplan77.com/)  
  Falco owner Thomas Caplan shows the modifications to his bike
* [Markolf Gudjons](http://mgu.mtnsub.org/)  
  German, I believe, but his site is in English