

## Variator, roller weights and contra spring mechanics for dummies! Learn how it works

OK, another issue I see asked a lot is about different roller weights, different variators, and different contra springs. So I am going to attempt to put it out in simple terms. I drew these pictures real quick, and they are not to scale, but they should work and give you a good idea.

The truth of the matter is, A new variator, spring, and weights WILL NOT increase your vehicles over all power!!!

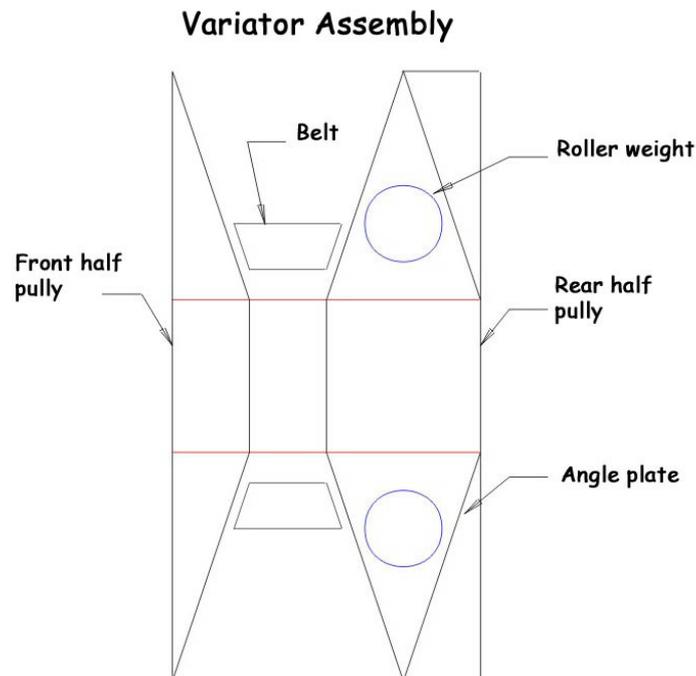
What it does do is adjust your rate of acceleration, and at what RPM your motor runs at while it is accelerating, and at what speed the motor is revving when you reach the highest gear ratio available.

Now having said both of those things, the key is to have your motor running at about 8000-8500 rpm's consistently while accelerating. This is where your greatest horsepower is generated. If you are accelerating at 5000 rpm's or 9500 rpm's, this will decrease your acceleration because your horsepower is not at it's peak.

This is achieved through trial and error. Changing your contra spring, and then trying different roller weights is how this is achieved.

In order for you to understand which way you need to go with weights and springs, you must first understand how the entire drive train works.

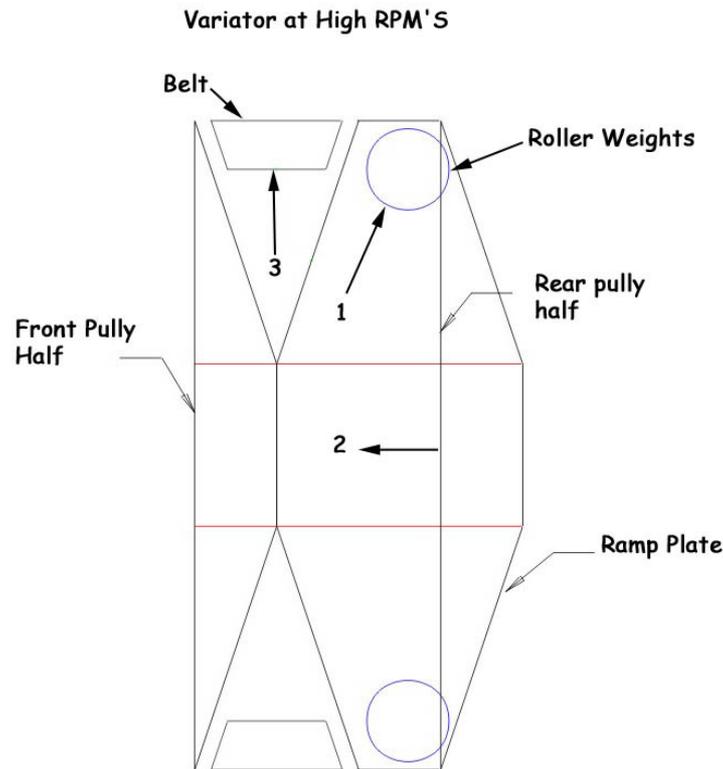
Lets start with the front pulley of the variator. This is where your roller weights and ramp plate are located.



Now as the rpm's of the motor increase, the centrifugal force pushes the roller weights out (Number 1 in picture).

The roller weights push out and onto the angle plates surface. This causes the rear half of the pulley to move toward the front half of the pulley (Number 2 in Picture).

When the rear half of the pulley pushes to the front pulley, it forces the belt out to a higher gear ratio. (Number 3 in picture).



If you are thinking about getting a new variator, Let me first start by telling you that it will probably not have any effect on your over all top speed. What it will do is give you a more steady acceleration. The distance that the rear half of the pulley can travels pretty much remains the same. Meaning that it will only push the belt out as far as the stock variator will which results in the same high gear ratio as the stock variator. The key difference between the stock and performance variators is the angle on which the roller weights travel and the angle on the angle plate in the rear of the variator. This will only help give you a smoother - more constant acceleration.

Now as for the different weights for the rollers. It is really rather simple. The heavier the weight, the more force will be applied to the angle plate forcing the rear pulley forward faster. If the roller weights are too heavy, it will force the gear into too high of a gear too fast.

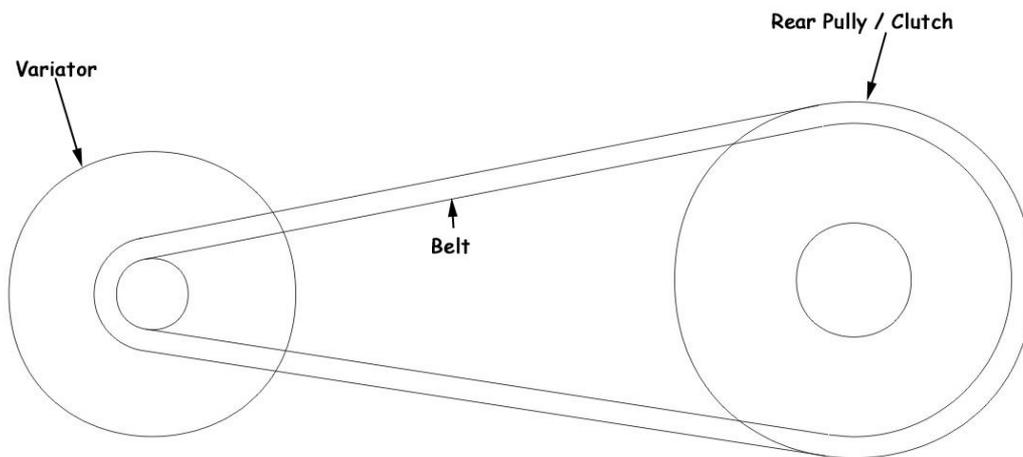
I like to use a 10 speed bicycle as a comparrrison. From a dead start, if you are in 10th gear, it is very difficult to get going. But if you are in first gear, it is very easy to get moving. the same principle applies here. You want the weights to keep you in first gear, and as the rpm's increase, it will gradually step the gears up untill it

reaches tenth gear.

If your roller weights are too light, then there will not be enough force to push the ramp plate out and the rear half forward. This will result in good acceleration, but a low top end.

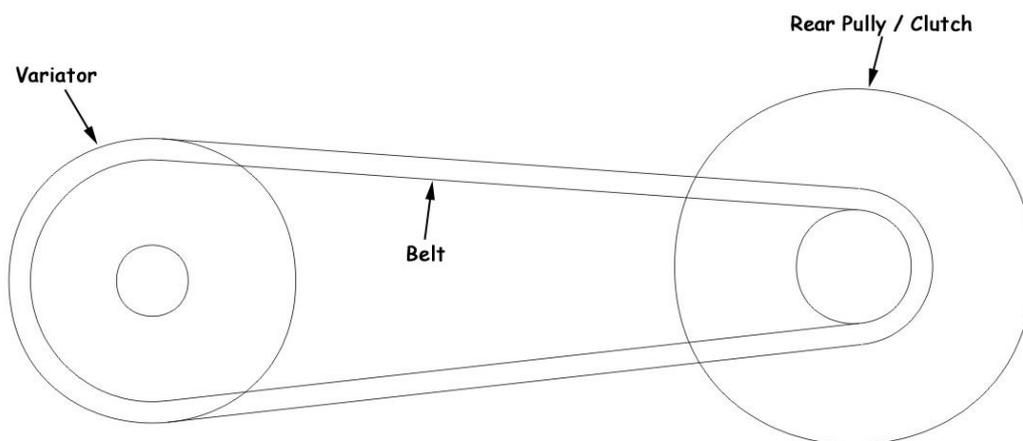
This is what the ratio looks like in low gear. You will see that the front pulley is small, and the rear pulley is large. This is like first gear of the 10 speed bike:

### Engine at low RPM'S



This is what the gear ratio looks like when the roller weights are pushed out and the rear half of the pulley is forward. The belt is pushed out to a higher ration. This is like tenth gear on the bicycle:

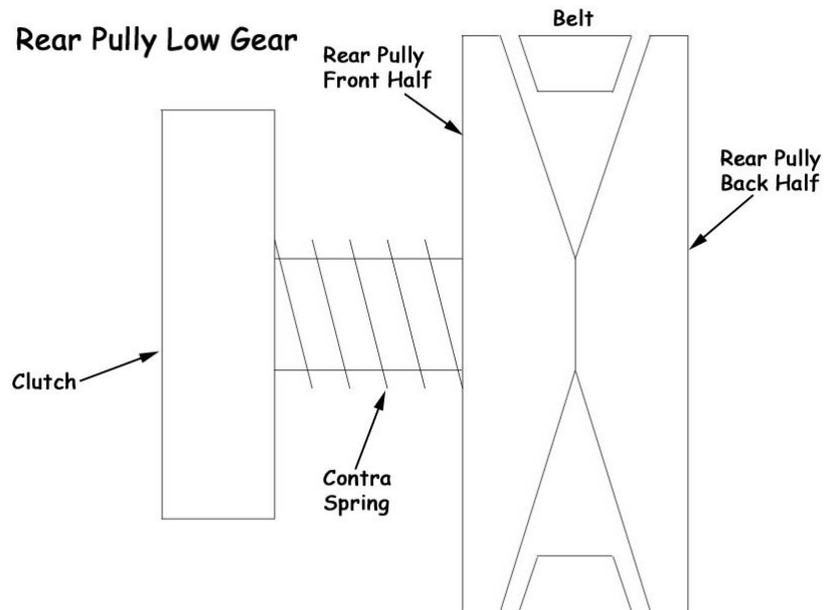
### Variator at High RPM'S



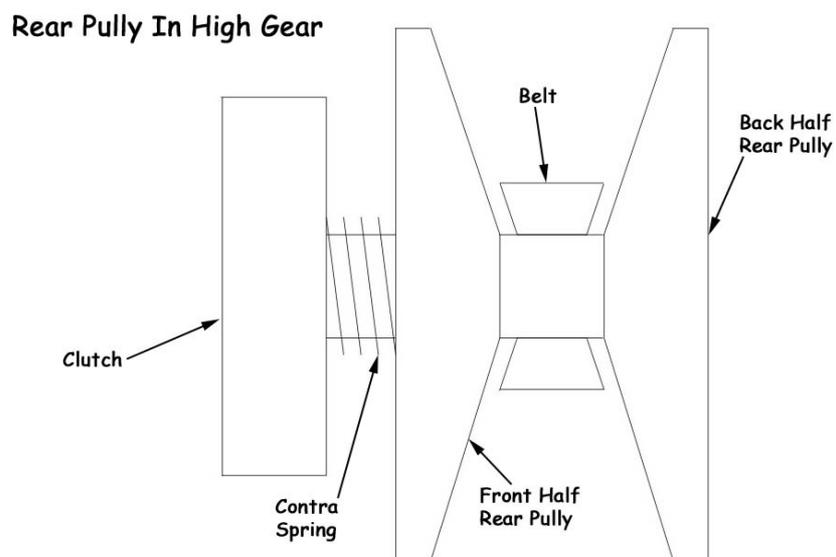
Now the other factor in this equation is the rear pulley. The rear pulley has a spring holding it together. This is your contra spring.

The front half of the pulley is also torque controlled. There are angled grooves that the pulley travels on. As torque is applied, this limits the belt from traveling in too quickly. Likewise, as you go up a hill and torque is applied to the pulley, it is supposed to force the pulley together giving you a lower gear ratio.

This is what the rear pulley looks like at low rpm's:



This is what the rear pulley looks like at high rpm's:



If your roller weights are giving you good acceleration, and a good top end, but when you approach a small hill the scooter slows drastically, this may be caused by having too light of a contra spring. The contra spring helps push the rear pully back together when torque is applied to the rear pully.

Also if you are running good at say 50MPH, and you slow down to say 35MPH. If you try to accelerate, and you have hardly any acceleration, this can also be caused by having too light of a contra spring. When you slow down, the spring is supposed to push the rear pully together into a lower gear ratio. If the spring isn't strong enough, the pully will remain in a high gear, and then when you try to accelerate, there isn't enough power to push you because you are in too high of a gear.

On the other hand, if your spring is too strong, then the roller weights may not be heavy enough to force the belt out all the way and into it's highest gear ratio.

If you go with a heavier contra spring, you may need to go to a slightly higher roller weight. Likewise, if you go to a lower spring, you may need to go to a lighter weight.

There is a very fine balance that you must achieve between the contra spring and your roller weights. This is only accomplished through trial and error.

Malossi sells a new torque driver for you rear pully. I haven't tried this, so I am not sure exactly how well it works, but the concept is that the angles on the shaft that it travels on are at a different angle, supposedly helping you to maintain your speeds better, while giving you better acceleration and better speed.

You can purchase it from AF1 Racing here for \$110 :  
<http://apriliaforum.safeshopper.com/63/1068.htm?863>

If you are looking for some different roller weights, click here for carb models :  
<http://apriliaforum.safeshopper.com/63/cat63.htm?863>

And Click here for roller weights for ditech models :  
<http://apriliaforum.safeshopper.com/64/cat64.htm?863>

If you want different contra springs, click here for carb models :  
<http://apriliaforum.safeshopper.com/63/1067.htm?863>

Click here for contra springs for ditech models :  
<http://apriliaforum.safeshopper.com/64/1120.htm?863>

If you are going to get a new spring, I reccomend getting the red one. It is the strongest spring made, and you can adjust your roller weights accordingly.

If you are looking for a new Malossi multivar variator, click here for carb models :  
<http://apriliaforum.safeshopper.com/63/1044.htm?863>

If you are looking for a new Malossi multivar variator, click here for ditech models :  
<http://apriliaforum.safeshopper.com/64/1113.htm?863>

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02' SR Ditech - 03' Mojito Retro - 04' Mojito Custom

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