AFTER AN AUTOTUNE SESSION, I AM PROMPTED TO CAP OR SCALE. WHAT DOES THAT MEAN?

If you are prompted to Cap or Scale after an AutoTune session, this means that AutoTune wants to increase one cell or more, in the VE tables, beyond the maximum value of 127.5. If this happens, AutoTune will prompt you to make a choice. Cap will raise that cell or cells to 127.5 and stop there. Scale will increase the engine displacement by a percentage, and then decrease all of the VE cells by that same percentage; effectively giving you the exact same amount of fuel. Then AutoTune will apply the changes it learned during the session. It is usually safe to choose Scale once or twice, and then choose Cap thereafter.

Above is our standard FAQ about this prompt, and should be considered a good starting point for casual tuners. To really know whether you should choose Cap or Scale, it becomes a little more involved.

Keep in mind the basic purpose of running an AutoTune session is to improve the tune. As a tuner, you need to have a pretty good idea of how a bike runs with a given tune, before running an AutoTune session. Don’t flash a new tune to the bike, and immediately start an AutoTune session. You missed the first step; getting a feel for how this tune works on this bike. Once you complete an AutoTune session, and flash the resulting tune to the bike, the critical thing is to compare how it runs with the new tune, to how it ran before. If the bike runs better than it did before, great. If the bike runs worse, go back to the previous tune, and try to figure out why AutoTune didn’t work. This would be rule#1 of AutoTune, comparing the before and after tunes.

When tuning and running AutoTune against a tune, you really need to have a pretty good idea what the VE tables look like, and how the engine is running before you start an AutoTune session. If the bike runs very lean, you should expect to get the prompt Cap or Scale. If you have VE tables with a bunch of very large cells like the below table, and the bike was running lean during wide open runs, you should expect to be prompted to Cap or Scale.

<table>
<thead>
<tr>
<th>Rpm</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>750</td>
<td>82.5</td>
<td>83.6</td>
<td>84.8</td>
<td>86.0</td>
<td>87.3</td>
<td>88.6</td>
<td>90.0</td>
<td>91.6</td>
<td>93.3</td>
<td>95.0</td>
<td>96.8</td>
<td>98.7</td>
<td>100.7</td>
</tr>
<tr>
<td>1500</td>
<td>82.5</td>
<td>83.6</td>
<td>84.8</td>
<td>86.0</td>
<td>87.3</td>
<td>88.6</td>
<td>90.0</td>
<td>91.6</td>
<td>93.3</td>
<td>95.0</td>
<td>96.8</td>
<td>98.7</td>
<td>100.7</td>
</tr>
<tr>
<td>2250</td>
<td>82.5</td>
<td>83.6</td>
<td>84.8</td>
<td>86.0</td>
<td>87.3</td>
<td>88.6</td>
<td>90.0</td>
<td>91.6</td>
<td>93.3</td>
<td>95.0</td>
<td>96.8</td>
<td>98.7</td>
<td>100.7</td>
</tr>
<tr>
<td>3000</td>
<td>82.5</td>
<td>83.6</td>
<td>84.8</td>
<td>86.0</td>
<td>87.3</td>
<td>88.6</td>
<td>90.0</td>
<td>91.6</td>
<td>93.3</td>
<td>95.0</td>
<td>96.8</td>
<td>98.7</td>
<td>100.7</td>
</tr>
</tbody>
</table>

For either of these reasons you may be prompted to Cap or Scale because AutoTune wants to add fuel in some cells, but it can’t because the cell already is, or will be maxed out at 127.5. If you select Cap, those cells will be capped at 127.5. You will not get much, if any more fuel in the needed cells. If the engine is fairly lean in that area, this would not be acceptable.
CASE#1

In the example below we have a bike that seems to be lean on wide open runs. We run an AutoTune session and are prompted to Cap or Scale. If we choose to Scale the tune, the AutoTune process will pick a percentage to increase the engine displacement, and decrease both VE tables by that same percentage. Below is the engine displacement field before, and after Scaling up by 7.5%.

![Engine Displacement](image1)

This is the same VE table after scaling down by -7.5%, but before the AutoTune results have been applied.

**Note:** the entire VE table cells are smaller, allowing AutoTune to add fuel where it is needed. This is an example where **Scale** was the correct choice.

CASE#2

What follows is an example of being prompted to Cap or Scale, and Cap would be the correct choice.

You have a bike that seems to run pretty well. You have monitored air fuel ratio, and see the bike is fairly close to the numbers you would expect to see. You run an AutoTune session, and are prompted to Cap or Scale. You choose Cap and look at the resulting tune in WinPV. You look at engine displacement, and it matches the actual engine displacement of this bike at 103.3.

![Engine Displacement](image2)

You look at the VE tables, and notice there is one cell that has been capped at 127.5.

This is the only cell that has been capped at 127.5 in either VE table. This cell is at 20 kpa, and 2500 rpm. This would be the deceleration area of the table. **Choosing Cap was the correct choice here.**
CASE#3

What follows is an example of when selecting Scale would be the wrong choice, and Cap should have been chosen. The tables below are not real tables from AutoTune sessions, but made up to display similar results we have seen in the real world.

You have a bike that seems to run well. You run AutoTune over and over again, and are prompted to Cap or Scale. You select Scale each time, and the bike runs worse each time. You have ignored rule#1.

You start with a tune, the actual engine displacement is 103, the field in the tune is currently 103.3. The VE rear table looks like this.

You run an AutoTune session, are prompted to Cap or Scale, and you choose Scale. The engine displacement has been scaled up to 110.5. The rear VE table looks like this.

The bike seems to run ok, maybe worse, but you decide to run AutoTune again. You are prompted to Cap or Scale, and you choose Scale. The engine displacement is now 116.0, the rear VE table looks like this.

Now using this tune the bike runs very poorly. The VE cells around idle are in the 50’s and 60’s. There is only one cell at 20 kpa and 2500 rpm that is fairly large. This one cell is what prompted the Cap or Scale message, The injectors are shutting off under deceleration on this bike, causing a lean reading, and AutoTune to try to add fuel. This tune has been scaled too far. The only solution would be to go back to one of the tunes before you scaled, and start over. Remember to Cap each time you run AutoTune on this bike.