

the not particularly essential

forza horizon 4 tuning guide



developed by anchovie

Glossary

Car people like to use abbreviations for things, and to their credit it does make writing much less cumbersome. Here are some common terms used throughout this document:

- **FF**: Front engine, front wheel drive
- **FR**: Front engine, rear wheel drive
- **MR**: Mid engine, rear wheel drive
- **RR**: Rear engine, rear wheel drive
- **AWD**: all wheel drive
- **HP**: horsepower
- **Power Band**: RPM range where the engine makes peak HP/torque
- **Understeer**: a vehicle's tendency to plow and go straight when cornering, typically due to the front wheels losing traction
- **Transitional Understeer**: a vehicle's tendency to understeer upon weight transfer in a corner
- **Oversteer**: a vehicle's tendency steer too much when cornering, typically due to the rear wheels losing traction

Preface: Unlocking Potential

Some vehicles are best-suited for certain applications. You wouldn't drag race a bus, right? Frankly, you should build whatever you want, but if you want an easy starting point then this might help.

Rally



FF, FR, AWD
High ground clearance
Square wheelbase
Even weight distribution

Track

FF, FR, MR
Low ground clearance
Lightweight
Low center of gravity



Cross Country



Anything, with enough ground clearance.
Seriously, just fucking send it.

Establishing a Baseline Tune

Upgrade your vehicle.

Take your stock vehicle and upgrade it to the class you desire to race it in.

Drive your vehicle.

Make observations about its behavior when you're hard on the throttle, slowing down, entering a corner, powering out of a corner, feathering the throttle in the middle of a corner. Note moments when the car understeers, oversteers, becomes twitchy, etc. unpredictably.

Tune your vehicle.

Go through the tuning menus and (referencing this guide for help) make changes to the differential, suspension, tires, and/or brakes. Try to eliminate the worst problems that you observed while driving.

Drive your vehicle. Again.

Do a race (or drive hard & fast) in conditions you want to be racing regularly in. Observe your vehicle's behavior again, and note what has improved vs. what hasn't. Hopefully, there are some significant improvements!

Tune your vehicle. Again.

At this point, focus on small tweaks. Try to smooth out anything you might have adjusted too far, or double down on parameters that you want to be more impactful. You should now have a vision for how the vehicle wants to be balanced; coax it the rest of the way there.

Congratulations, you have a baseline tune!

This guide keeps descriptions and tutorializing slim, as it is intended to teach you how to establish a baseline tune with zero prior knowledge about tuning. By following it repeatedly, my hope is that you can get a "feel" for tuning and start feeling confident about your car's behavior. When you are ready to learn about in-depth tuning for specific applications, get online and find tutorials that other (much more talented) tuners have made.

Tuning Best Practices

Dismiss notions about handling behaviors being inherently good or bad.

Behaviors such as understeer and oversteer are only troublesome when they occur inconveniently or inconsistently. For example, RWD cars have a tendency to oversteer under acceleration. This is advantageous when entering a corner; it enables the vehicle to enter with an aggressive line and stay on the power until the corner's exit. However, when exiting the corner too much throttle can cause the vehicle to enter a slide and lose speed. Thus, oversteer is both a benefit and a detriment depending on what part of the corner you're in. Tuning can compensate for the downsides by making the car understeer more when exiting corners under hard acceleration, while leaving the turn-in oversteer alone for aggressive entry.

When tuning, always keep in mind:

1. How the vehicle behaves in a given situation (straight, corner entry, corner exit)
2. Your driving style and cornering strategy

There is no right or wrong tuning order. My tuning order preference is:

1. Alignment
2. Differential
3. Antiroll Bars
4. Damping
5. Brakes
6. Gearing
7. Aero
8. Tires

General tips:

- Once you have a baseline tune and are dialing in the details, tune a maximum of two parameters at a time. Be scientific about your adjustments and control how many variables are changing at once.
- Tune in small to moderate increments. Every tuning parameter is connected to each other, so some adjustments can have cascading effects.
- Not all vehicles respond the same way to tuning a specific parameter. Feel out what each vehicle is most sensitive to.
- Your tuning is only as good as your driving. Learn to recognize when you are driving poorly or exceeding the vehicle's limits. Separate that from vehicle behaviors that can be fixed by tuning.
- Not every build is a winner. Know when to save your sanity and move on.

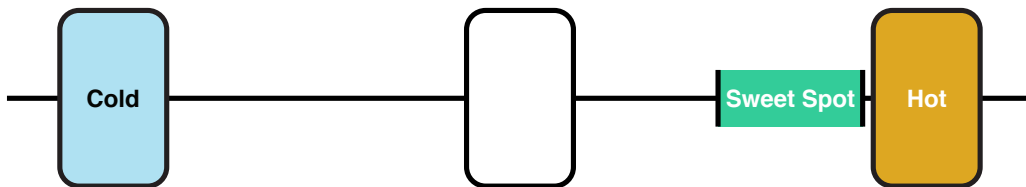
Be persistent. Be patient. Find your vehicle's sweet spot.

Section 1: Tires

Tires have optimal temperatures and pressures for maximizing traction. To achieve this, two main doctrines of tire tuning exist. According to The Internet, both are effective, so I've chosen to summarize each and leave you to choose a preference.

Tuning by telemetry:

This one depends on the weather, but is easy to do. Access the HEAT telemetry panel while pushing the car hard in the conditions you want to race in. Take a look at the temperatures.

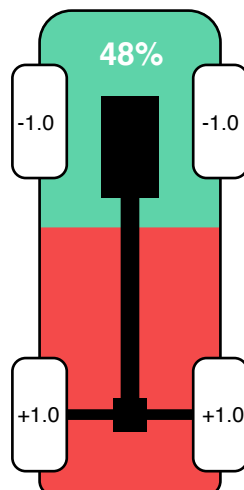


The temperature for peak traction is in the range just before they go from clear to yellow. If the tires are too cold when cornering hard, lower the PSI. If the tires are too hot, increase the PSI.

Avoid setting the PSI too low or too high, as this will make the vehicle unresponsive.

Tuning by weight distribution:

Start with front and rear tires set to the same value of 30 PSI. Look at the front half of the vehicle. For each 1% of weight distribution higher than 50%, add 0.5 PSI. For each 1% of weight distribution lower than 50%, subtract 0.5 PSI. Repeat with the rear half. See the visual example below:



Section 2: Gearing

Factors to consider:

- Vehicle power band (RPM range where the engine makes peak HP/torque)
- Vehicle class
- Race course layout (e.g. technical corners vs. long straights)

X	999
S2	998
S1	900
A	800

For A class and higher:

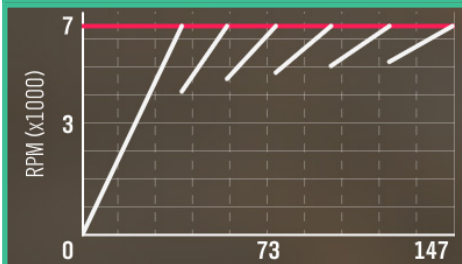
Start with final drive tuning unlocked, at a minimum.

B	700
C	600
D	500

For B class and lower:

Start with a stock or sport transmission. Sometimes they're set up well enough for low speed racing, especially on tight, technical tracks.

Simple Tune



Move the final drive such that all the gears fit within the graph (see Fig. 1). Done! This is a good option for vehicles that do not have race transmissions with individual gear tuning.

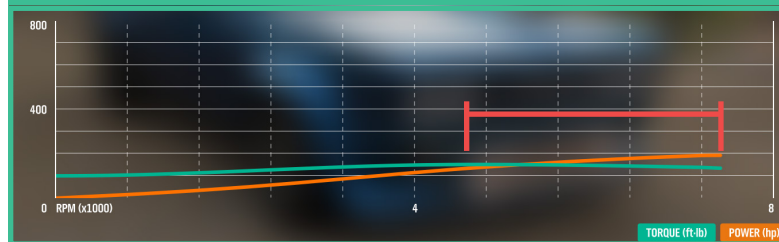
Optimized tune:

Take a look at the power band of your vehicle. Note the RPM where the HP/torque peak. This is the bottom of your power band (see Fig. 1).

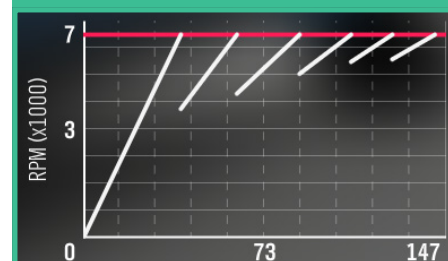
Next, go to the gearing section of the tuning menu.

- **1st:** If the vehicle repeatedly bounces off the rev limiter on launch, set the gear towards speed until it is improved. Do not lengthen the gear too much—if the vehicle can't break traction then it will take forever to get up into the power band.
- **2nd:** Set the bottom of the gear's line to the bottom of your vehicle's power band.
- **3rd-onwards:** Set the bottom of the gear's line 100-200 RPM higher than the last gear's bottom. Sometimes higher gears need more accel.
- **Final Drive:** Tune this to reach the top of your final gear at the fastest part of a track (but leave a bit of headroom).

Fig. 1 My B700 Abarth 131's Power Band (~4500-7400 RPM)

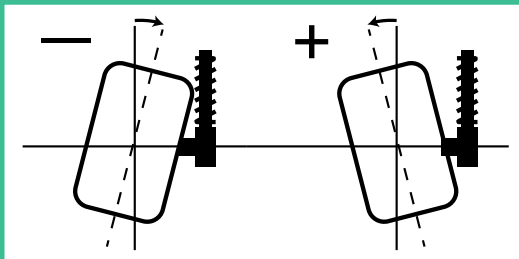


My Optimized Tune



Section 3: Alignment

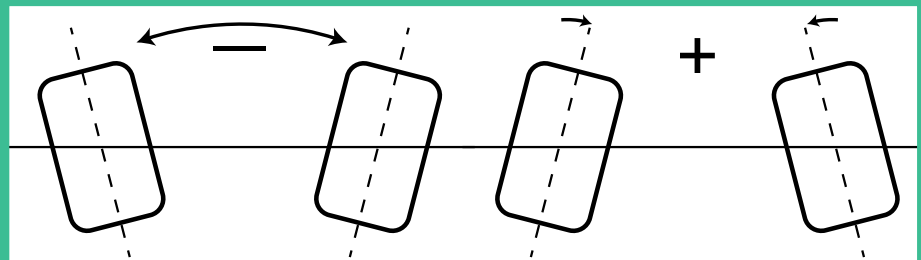
Camber



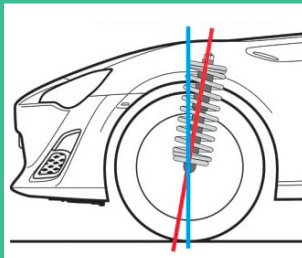
- Camber: + oversteer, - straight stability
- + Camber: + understeer, + straight stability

Toe

- Toe: + turn in, - straight stability
- + Toe: - turn in, + straight stability



Caster

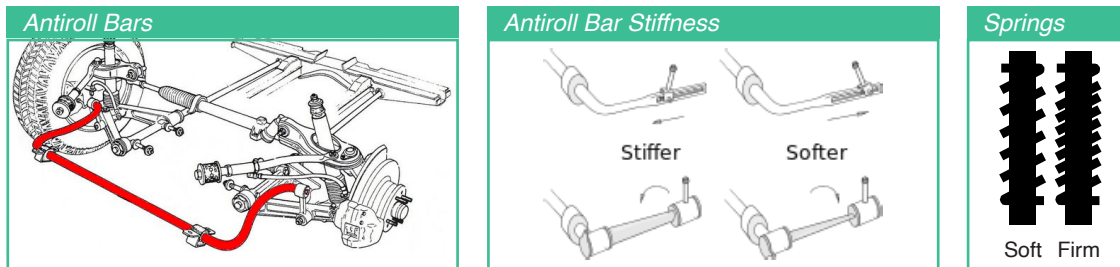


Increase to run less negative camber while retaining straight stability



Tip: Avoid extremes, as they make the vehicle twitchy and unpredictable.

Section 4: Antiroll Bars & Springs



For tuning front antiroll bars:

- Soft: + turn in, too soft will cause the car to plow under hard braking
- Stiff: – turn in

For tuning rear antiroll bars:

- Soft: + understeer
- Stiff: + oversteer, too stiff will cause liftoff on hard cornering

The balance between front & rear stiffness affects the balance between understeer and oversteer, i.e. the stiffer your rear bars are relative to the fronts, the more the vehicle will oversteer.

For tuning front springs:

Soft: + oversteer, too soft will cause traction loss

Stiff: + understeer, too stiff will cause plowing

For tuning rear springs:

Soft: + understeer, too soft will reduce steering responsiveness

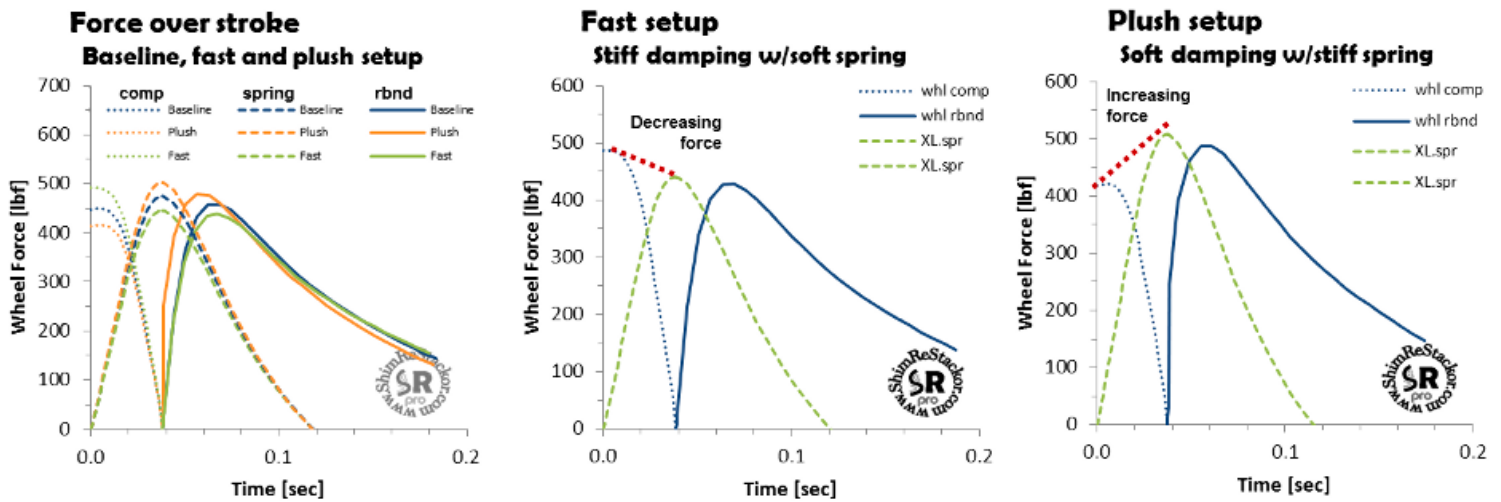
Stiff: + oversteer

The balance between front & rear stiffness affects the balance between understeer and oversteer. i.e. the stiffer your rear springs are relative to the fronts, the more the vehicle will oversteer.



Tip: Avoid extremes, as they will make the vehicle plow or snap-oversteer.

Section 5: Damping



For tuning front bump:

Soft: – transitional understeer

Stiff: + transitional understeer, too stiff will make the vehicle twitchy over bumps

For tuning rear bump:

Soft: + transitional understeer

Stiff: – transitional understeer, too stiff will make the vehicle twitchy over bumps

For tuning front rebound:

Soft: + oversteer

Stiff: + understeer

For tuning rear rebound:

Soft: + understeer

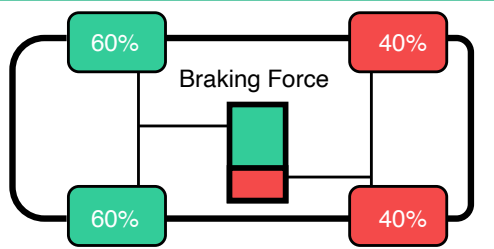
Stiff: + oversteer



Tip: Bump should typically be 50-75% of rebound, to avoid wheel liftoff.

Section 6: Aero & Brake Bias

Brake Bias



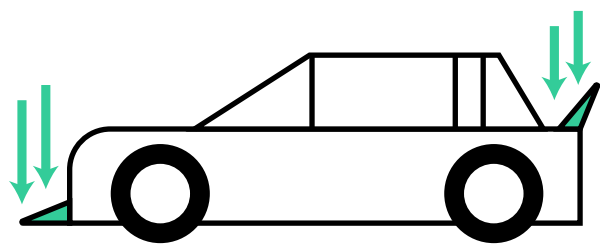
Front Bias: + understeer, + stability
Rear Bias: + oversteer, – stability

Avoid extremes, as this will result in longer braking time and twitchier handling on corner entry

Aero

Speed: – downforce, + top speed, + acceleration
Cornering: + downforce, – top speed, – acceleration

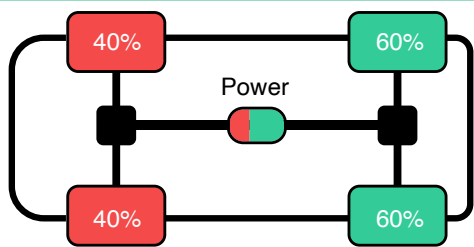
More downforce means more air is pressing the car into the pavement, resulting in better traction



Tip: Your front brakes do most of the work! Most cars run a front bias.

Section 7: Differential

Differential Balance (AWD)



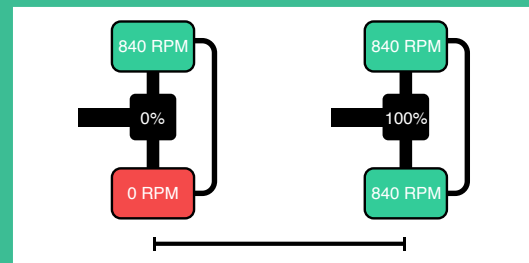
Controls the % of power that gets sent to the front wheels vs. the rear wheels.

Rear: makes the vehicle behave more like a RWD car
Front: makes the vehicle behave more like a FWD car

Differential Locking

A differential controls the allowed difference in wheel spin between the left and right wheels of an axle. This difference is a gradient ranging from 0-100% relative speed.

0%: Wheels can spin at any speed independently.
100%: Both wheels must spin at the same speed.



For tuning front diff:

- + Accel: + understeer
- Accel: + oversteer
- + Decel: + lift-throttle oversteer
- Decel: - lift-throttle oversteer

For tuning rear diff:

- + Accel: + understeer, + stability
- Accel: + oversteer, - stability
- + Decel: + lift-throttle oversteer
- Decel: - lift-throttle oversteer



Tip: Tune in increments of 5-10% at a time. Differentials can make a huge impact!

Tuning FAQ

This is meant to be a quick-diagnosis guide, and will not work with every vehicle.

Q: My car is plowing into turns :(

A: – front camber or + front caster, – front toe

Q: My car understeers when I get on the gas :(

A: soften front springs, soften front bump & rebound, – rear diff accel

Q: My car is twitchy over bumpy terrain!

A: + ride height, soften front & rear bump, bring camber closer to zero and increase caster angle

Q: My C class car isn't accelerating in 5th gear :(

A: yeah, it probably won't ever, but try tightening the final drive ratio or tuning 5th gear more towards acceleration (if you have a race transmission)

Q: My car snap-oversteers when I touch the throttle!

A: rear diff + accel (if applicable), bring camber closer to zero, balance your antiroll bars and springs if they are extreme, check your weight distribution vs. tire pressure

Q: My car is twitchy when I'm feathering the throttle!

A: – decel differential, zero rear camber

Q: My car keeps oversteer-sliding when cornering :(

A: front bias brakes, + accel differential, stiffen front bump