Guide to Oval Setups in *Assetto Corsa*

What you need to know to have fun larping as a crew chief.

Table of Contents:

American Oval Racing Glossary:

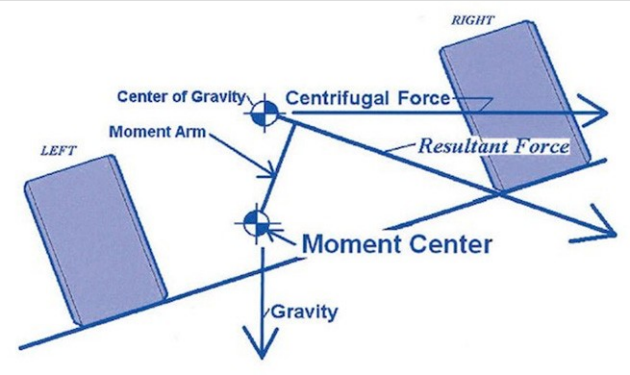
Tight = Understeer
Loose = Oversteer
Run = Stint
Shocks = Dampers
Cross Weight = Wedge
Sway Bar = Anti-Roll Bar

NOTE: Assetto Corsa is an Italian sports car simulator, and it was never designed to accommodate oval racing. Some things I describe in this document might not apply to real life racing, and vice versa. If a car setup option common on circle track cars doesn't show up in this document, it most likely doesn't exist in game (because, again, it's a sports car simulator). If I come to incorrect conclusions about oval setup theory, or if I spout some blatantly untrue garbage, please feel free call me an idiot on Discord. (Narwhal#6381)

Part 1: Springs and Shocks

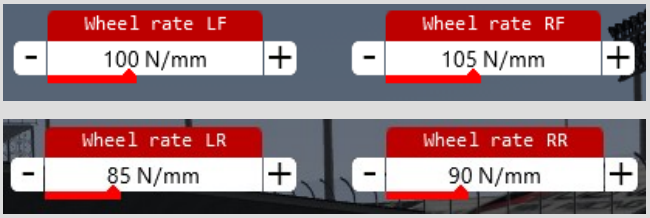
The oval setup, at its very core, is designed to make turning left as easy and quick as possible. Because this is the case, the setup needs to be asymmetrical, with different setup values for all 4 wheels. The most central part of the asymmetric oval setup is the springs and shocks.

The first thing we must set when making our oval setup is the spring split from left to right. As the car turns left, the right side tires will be loaded at a greater rate than the left side tires.

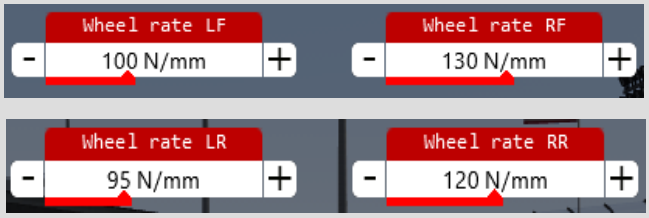


Because of this, our right side springs must be stiffer than our left side springs. The exact difference, or “spring split”, depends on the track. Higher banked or faster tracks require a higher spring split to deal with the increased loads on the right side tires. Lower banked or slower tracks with less force on the right side tires require a lower spring split.

Spring Split from Martinsville, a flat, slow track



Spring Split from Charlotte, a high-banked, high speed track



Car: 1990’s NASCAR Stock Car

One other thing we must also keep in mind when setting our springs initially is the difference from front to rear. On flatter or slower tracks, the decreased grip means the front springs must be stiffer than the rear springs,

much like a conventional road course setup. On a high banked oval, the increased grip allows us to run front and rear springs that are closer together in stiffness.

Shocks will act similarly to the springs, specifically the bump stiffness. We must set the bump stiffness in a similar manner to the springs, higher on the right than the left and at a higher split when the right side tires are under more load. However, while the right side tires are being loaded entering the corner, the left sides are being unloaded, and therefore are subject to the rebound stiffness rather than the bump stiffness. In a little bit, we will look at adjustments for each wheel, keep in mind this fact when making those adjustments.

At this time, you should also decide how high or low you want the car. Adjustments later will be made in a manner that preserves the ride heights that you have set.

A NASCAR Cup Series Stock Car riding low and even through a high load, banked corner.

Part 2: Tires and Alignment

The next thing we must do in making our oval setup is set our tire stagger.

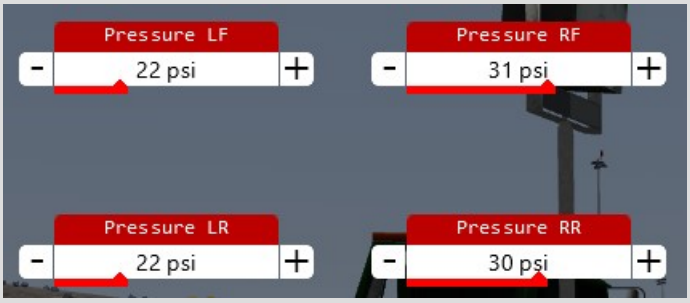
Ever watched one of these roll around on it's side? Have you noticed that the larger side makes the cup roll in the opposite direction? Tire stagger works on the same principles. If the right side tires have a larger circumference than the left side tires, than the car as a whole will naturally rotate to the left. Stagger is special because it works through the entire corner, not just at certain moments.

Rules allow for Sprint Cars to run completely different sized tires to achieve stagger. This is a very extreme example.

Tire stagger can be achieved by using two completely different sized tires on the right and left sides, or by increasing the air pressure of the right side tires

to increase the circumference of equally sized tires. The latter method is what we will use in Assetto Corsa, as not only are different sized tires banned in most asphalt oval track series, but also the Kunos engine does not allow for different sized tires from left to right, only from front to rear.

When setting the stagger of our car, we must again look to the type of track we will be running. A higher banked track offers more natural rotation via increased grip, reducing the need for higher stagger. A flatter track will require more natural rotation to be done by the car, and will therefore need more stagger.



High-stagger setup at Phoenix, a track with long, flat turns.

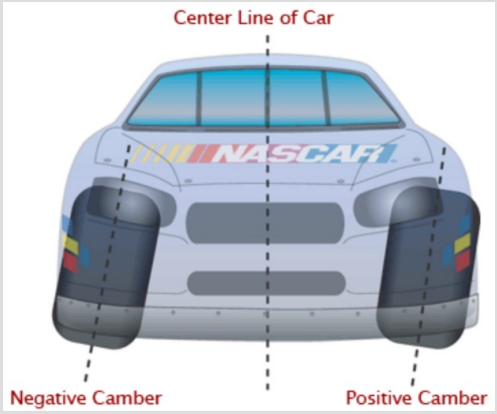
Keep in mind that as the tires get more heat in them, their pressure increases, which also increases the tire stagger. Use the tire app to get an accurate picture of your stagger during the run.

Stagger is one of the easier adjustments to make, and it can be done mid race during a pit stop. If the car is tight around the corners, increase the stagger on your next stop. If the car is too loose, decrease the stagger on your next stop. You can also change the stagger at one end of the car if you want only the front or rear to handle differently. Keep in mind, though, that there is an upper limit for the tire where the increased pressures decrease grip to a point where it outweighs the benefits of tire stagger.

PRESETS		
1	2	3
GENERAL		
ADD LITERS	+83	
TYRES		
COMPOUND	O	
PRESSURE LF	22	
PRESSURE RF	32	
PRESSURE LR	22	
PRESSURE RR	31	
REPAIR		
BODY	NO	
SUSPENSION	NO	
ENGINE	NO	

The car picked up a tight condition as the run went on, and I lost pace compared to the rest of the field. For this stop, I increased the right side pressures by 1 PSI, which will help the car rotate as the tires wear.

The camber of the tires is also an important part of the setup. Because the car only needs to turn left, the left tires must have positive camber while the right side tires must have negative camber. Try different camber values, and use the tire app to get temperatures across the tire. A tire with good camber should have a difference of about 3°C on the surface, biased towards the cambered edge (inside on the right, outside on the left).



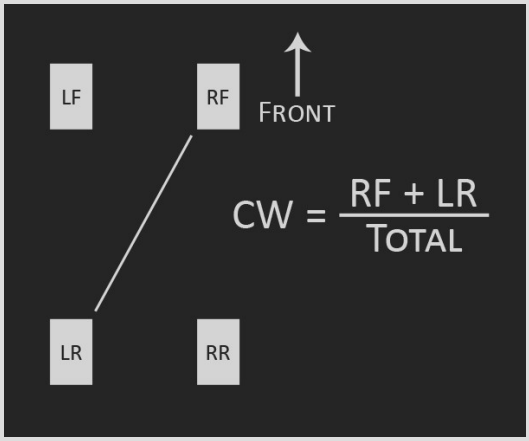
Most oval cars still use a solid rear axle, meaning that rear camber and toe angles cannot be adjusted. This is something you will just have to accept.

Adjusting front toe angles changes the way the car behaves when initially turning into a corner. A general rule of thumb is to leave the right front tire completely straight or slightly positive, while most of the adjusting is done in the negative, or outward, direction on the front left tire. More toe out on the front left tire helps the car turn in, but can cause increased wear, and can scrub some speed on the straightaways. If you feel like the car is hesitant to turn in, but you are happy with the car in general, use this adjustment.

The open front wheels on Doug Coby's #10 Modified demonstrate circle track wheel camber.

Part 3: Cross Weight

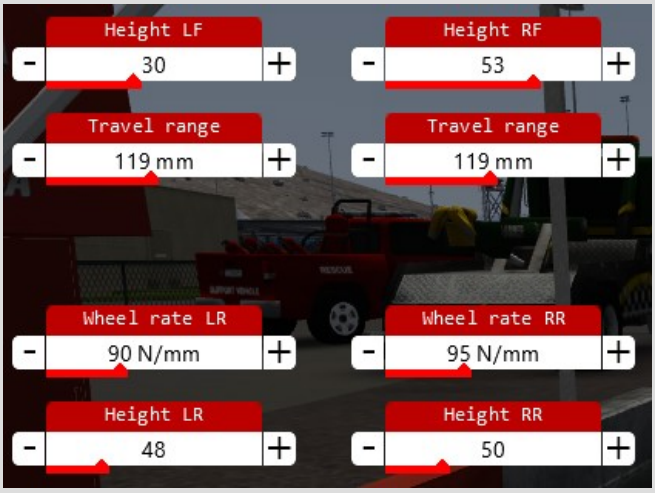
The most important concept to understand when making an oval setup is cross weight. If you have ever seen a table with a short leg rock back and forth, then you are already somewhat familiar with this concept. Each corner of the table wobbles in conjunction with it's opposite corner. A race car functions in a very similar way. In a turn, the car works like an "X", and on an oval, we can assign each line in the "X" to a handling condition.

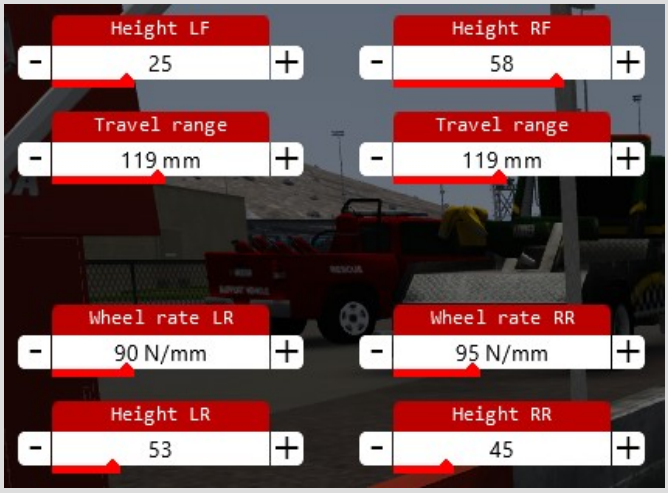


The cross weight value is equal to the total weight on the right front and left rear tires compared to the total weight of the car (for example, 56% Cross Weight on a 2,600 Lb car is 1,456 Lb on the RF-LR diagonal). As a general rule, **higher cross weight = a tighter car, lower cross weight = a looser car.** Cross weight is also commonly referred to as "wedge".

Unfortunately, there is currently no way in Assetto Corsa to view the weight on each tire to calculate cross weight. All wedge adjustments currently have to be done by feel. There are two main ways to adjust your cross weight: changing spring rate, and changing ride height. Spring rate adjustments are drastic, and will make a big change in the cross weight. Increasing spring rate increases the weight on the tire, which increases/decreases the cross weight depending on the corner being adjusted. Most often, you will make small adjustments using suspension heights. Increasing height increases the weight on the tire.

To keep the ride heights constant, make wedge adjustments in pairs. When changing the overall wedge, take equal amounts of weight on and off each cross of the “X”. This is done so the ride height of the car stays the same. Check this by comparing the front/rear ride height values that Assetto Corsa displays before and after making the adjustment.





This car was slightly loose through the corner. To help tighten the car, I added some cross weight using the suspension heights (5 clicks put on the RF and LR, and 5 clicks off the LF and RR).

Adjusting each corner of the car also has it’s own specific effect. **These should be done in pairs as well, as to not change the car’s ride height.** This is a general summary of each wheel and it’s effect on the handling of the car:

Left Front:

More Weight = Makes the front of the car looser, especially on corner exit

Less Weight = Tightens the front of the car up

Right Front:

More Weight = Front gets tighter on corner entry, mid corner

Less Weight = Car gets looser on entry and mid corner, front “bites” more

Left Rear:

More Weight = Tighter car on corner entry and exit

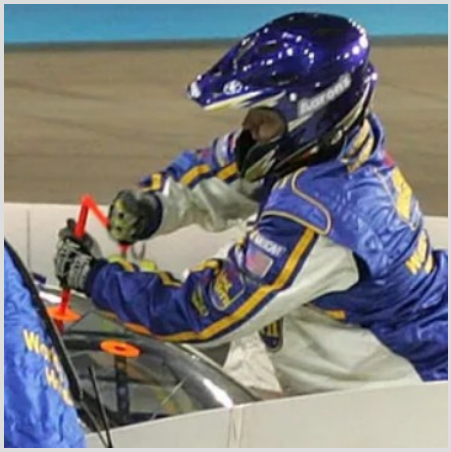
Less Weight = Car gets loose on entry and on exit

Right Rear:

More Weight = Car gets looser everywhere

Less Weight = Car gets tighter everywhere

When adjusting a front tire, the other front tire should be given an equal, opposite adjustment. When adjusting a rear tire, the other rear tire should, again, be given an equal, opposite adjustment. This is to keep the ride height consistent between adjustments. In situations where you don’t mind changing the ride height, and the handling issue is significant but not worth a massive swing, changing one corner’s spring hight independently is fine, but not ideal.



A NASCAR pit crew member making a right rear wedge adjustment during a pit stop.

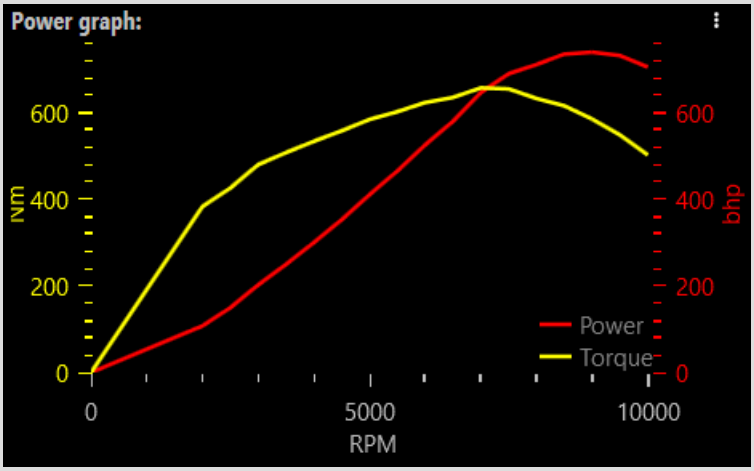
Part 4: The Sway Bar

The sway bar, in the majority of oval racing series in America, is limited to the front of the car only. Rear sway bars are banned. The sway bar on an oval car connects the front tires, and it effectively controls the spring rate of the front right tire under loading. This increases the cross weight when the load on the right front tire is the highest (in the entry and middle of the corner).

Keep in mind that as the right front tire travels, the left front tire, connected by the bar, also will travel. The left front tire is having load taken off of it during a turn normally. With a stiffer sway bar, the front tires traveling together will result in even more load being taken off the left front tire, decreasing it's grip even more. This creates a tight condition right before the apex of the corner. Decreasing the distance the right front travels, increasing the travel of the left front, removing cross weight, and softening the sway bar will help with this condition.

Part 5: Powertrain and Miscellaneous

For most oval cars, you will want to only use one gear around the entire track, as shifting with a manual gearbox is slower than any slight advantage you might gain from having higher revs. Most oval car gearboxes run 4 gears, with 4th gear being the one you will want to use when at speed. Find the RPM's at which the car's engine produces the most power, and change the diff gear or 4th gear until the car's maximum speed for the track is reached just after that point.



Most circle track V8 engines, such as this one from a 2020 NASCAR Cup Car, produce power at very high RPM's.

At shorter tracks, a lot of your moves on other cars will occur on corner exit under power. Since most of the power is generated at extremely high RPM's it might be worth it to set the gearing so that the car actually hits the rev limiter for a half second at the end of the straight, providing higher RPM's earlier to get along side the other car. This strategy for gearing is very track dependent, and also doesn't work if the engine is damaged at the rev limiter.

Brake bias can be a useful tool for setup diagnosis and management of the car during a run. If the brake bias is in the extreme direction one way or another, that can be proof of an unbalanced handling condition in the car that has been compensated for using the brakes. Also, as the tires wear during a run and the fuel burns off, the condition of the car will change. Brake bias can be adjusted forward to help tighten the car on entry, and rearward to help get rotation on entry and near the middle if applicable.

Bump stops/springs can be used to help restrict travel on the front tires. This is important when dealing with an aerodynamically sensitive car, where more air traveling over the car generates more front grip, while air traveling under the car generates less grip. Bump stops in this situation keep the car's nose as low as possible under load while preventing the car from bottoming out. Once the car travels through the suspension and hits the bump stop, the wheel in question gains an incredible amount of stiffness, changing cross weight dramatically. The timing of when the car hits the bump stops in the corner is crucial. Decreasing travel in the right front using bump stops could also potentially help the left front stay in contact with the track, as the roll bar would not be in torsion as much with lower travel on the right.

A quick-change differential

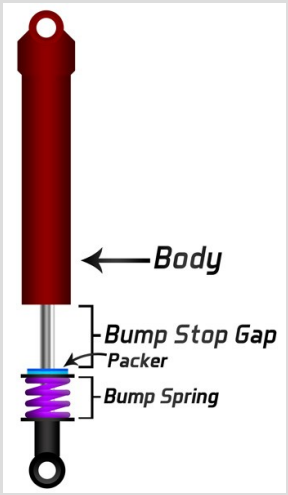


Diagram of a common bump spring shock setup

Good luck!

And remember, every hundredth helps!