



USER MANUAL NASCAR O'REILLY CARS



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DEAR IRACING USER,

Congratulations on your purchase of a NASCAR O'Reilly Series car! From all of us at iRacing, we appreciate your support and your commitment to our product. We aim to deliver the ultimate sim racing experience, and we hope that you'll find plenty of excitement with us behind the wheel of your new car! The NASCAR O'Reilly Series is the final step on the stock car ladder to the NASCAR Cup Series Chevs, Fords and Toyotas raced in the NASCAR iRacing.com Class A Series, the NASCAR iRacing Series and the eNASCAR Coca-Cola iRacing Series. These cars have been updated with an all-new build reflecting their performance in the current NASCAR XFINITY Series season.

Like their NASCAR Truck Series counterparts, these cars are powered by a 358 cu in (5.8 liter) pushrod V8 putting out 650-700 hp (450 hp with restrictor plates) and sports non-adjustable nose "splitters" and rear spoilers along with a variety of safety features including double frame rails aligning with front and rear bumpers to improve protection in side impacts.

The following guide explains how to get the most out of your new car, from how to adjust its settings off of the track to what you'll see inside of the cockpit while driving. We hope that you'll find it useful in getting up to speed.

Thanks again for your purchase, and we'll see you on the track!





CHASSIS



DOUBLE WISHBONE INDEPENDENT FRONT, LIVE AXLE TRUCK ARM REAR

LENGTH	WIDTH	WHEELBASE	DRY WEIGHT	WET WEIGHT WITH DRIVER
4953 mm 195 in	1803 mm 71 in	2794 mm 110 in	1556 kg 3430 lbs	1631 kg 3596 lbs

POWER UNIT



NATURALLY ASPIRATED STEEL BLOCK PUSHROD V8

DISPLACEMENT	RPM LIMIT	TORQUE	POWER
5.86 Liters 358 CID	9000 RPM	500 lb-ft 678 Nm	675 bhp 503 kW



INTRODUCTION

The information found in this guide is intended to provide a deeper understanding of the chassis setup adjustments available in the garage, so that you may use the garage to tune the chassis setup to your preference.

Before diving into chassis adjustments, though, it is best to become familiar with the car and track. To that end, we have provided baseline setups for each track commonly raced by these cars.

To access the baseline setups, simply open the Garage, click iRacing Setups, and select the appropriate setup for your track of choice. If you are driving a track for which a dedicated baseline setup is not included, you may select a setup for a similar track to use as your baseline.

After you have selected an appropriate setup, get on track and focus on making smooth and consistent laps, identifying the proper racing line and experiencing tire wear and handling trends over a number of laps.

Once you are confident that you are nearing your driving potential with the included baseline setups, read on to begin tuning the car to your handling preferences.

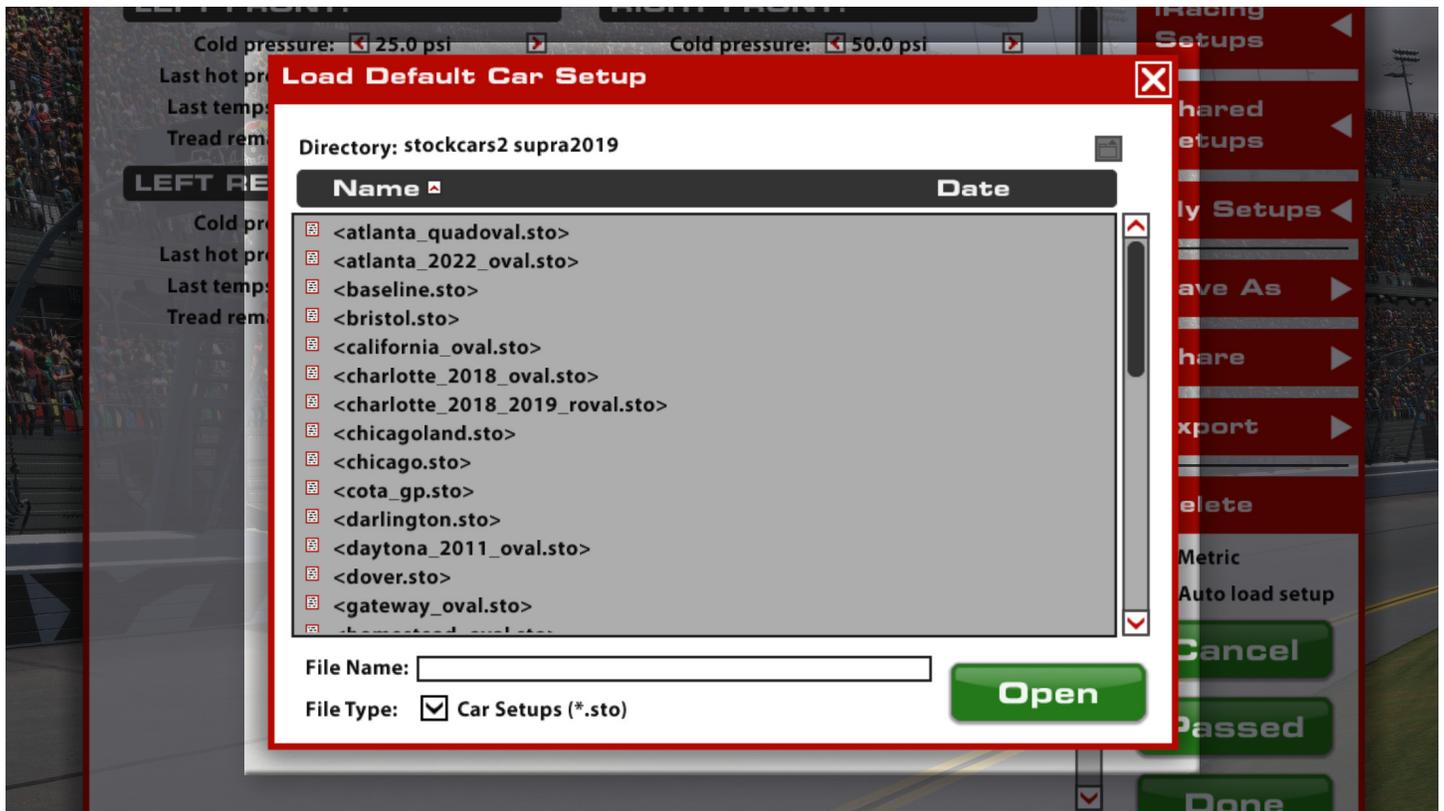
GETTING STARTED



Once you load into the car, press the clutch and select 1st gear. Give it a bit of throttle and ease off the clutch pedal to get underway. This car uses an h-pattern transmission, but only requires the clutch pedal to get the car rolling and when coming to a stop in gear.

To upshift, simply let off the throttle and select the next higher gear. To downshift, give the throttle a blip while selecting the next lower gear. Upshifting is recommended when the red RPM warning light illuminates. If you downshift too early, or don't blip the throttle sufficiently, the wheel speed and engine speed will be mismatched, leading to wheel hop at the rear and a possible spin.

LOADING AN iRACING SETUP



When you first load into a session, the iRacing Baseline setup will be automatically loaded onto the car. If you would like to try any of the other iRacing pre-built options, you may select it by going to Garage > iRacing Setups > and then selecting another option that fits your needs.

Because this car uses slightly different chassis and body configurations on different types of tracks, it will be necessary to load a setup from the same track type to pass tech inspection. For example, a setup for Talladega will pass at Daytona, but likely will not pass at Bristol. If you would like to customize the setup, simply make the changes in the garage that you would like to update and click apply. If you would like to save your setup for future use click "Save As" on the right to name and save the changes.

To access all of your personally saved setups, click "My Setups" on the right side of the garage. If you would like to share a setup with another driver or everyone in a session, you can select "Share" on the right side of the garage to do so. If a driver is trying to share a setup with you, you will find it under "Shared Setups" on the right side of the garage as well.

DASH PAGES

Each manufacturer has its own unique dash and gauge cluster configuration, but each provides the same information, with the exception that the Toyota does not include cooling system pressure. Oil temperature and water temperature are important gauges for ensuring the engine is running in its optimal temperature range and preventing damage to the engine. These will turn red when the values are in a dangerous range. If they turn red in normal driving, it may be necessary to reduce tape on the grill opening, or make a gear change to reduce RPM. If they turn red while drafting in a pack, it will be necessary to pull out of the pack and cool the engine. If this happens too often, reducing the tape may be necessary to run in the pack competitively.

CHEVROLET CAMARO



For the Chevrolet, the two gauges to the left are oil temperature and water temperature respectively, with the cluster of four gauges including the charging system volts, water pressure, oil pressure, and fuel pressure, and the large gauge being the tachometer. The tachometer includes an array of LED lights in the center that illuminate yellow when approaching pit speed limit, green when running at the limit, and red when the limit is exceeded. When green and red, the RPM numbers and increments also illuminate. This light sequence is calibrated for the speed of the car when it is running in 2nd gear. The RPM numbers and increments alone will illuminate red when the RPM limit is approached.

FORD MUSTANG



For the Ford, the smaller gauges in order from left to right are the water temperature, cooling system pressure, charging system volts, oil temperature, oil pressure, and fuel pressure. The large central gauge is the tachometer. The tachometer includes an array of LED lights in the center that illuminate yellow when approaching pit speed limit, green when running at the limit, and red when the limit is exceeded. When green and red, the RPM numbers and increments also illuminate. This light sequence is calibrated for the speed of the car when it is running in 2nd gear. The RPM numbers and increments alone will illuminate red when the RPM limit is approached.

TOYOTA SUPRA



For the Toyota, the two gauges to the left are oil temperature and oil pressure, the two gauges to the right are water temperature and charging system volts, and the lone gauge in the center of the car is fuel pressure, with the large gauge being the tachometer. The tachometer includes an array of LED lights around the rim that illuminate yellow when approaching pit speed limit, green when running at the limit, and red when the limit is exceeded. When green and red, the RPM numbers and increments also illuminate. This light sequence is calibrated for the speed of the car when it is running in 2nd gear. The RPM numbers and increments alone will illuminate red when the RPM limit is approached.

TACHOMETER

FORD MUSTANG & CHEVROLET CAMARO

NASCAR does not allow the use of either a speedometer or a pit speed limiter, thus the pit road speed limit can only be followed by running a specific RPM in a given gear. To help the driver maintain proper pit road speed without having to look at the tachometer, the Spek Pro tachometer features Pit Speed lights, which illuminate either yellow, green, or red to show whether the vehicle is traveling too slowly or speeding on pit road. These lights are accurate to a track's pit road speed limit only when the transmission is in 2nd Gear, and are set automatically when loading a track in the sim.

PIT SPEED INDICATOR



If the vehicle is below the pit road speed limit, the tachometer will illuminate the speed lights in yellow, with 1 light being farthest from pit road speed and all 7 being moderately slower than the pit road speed limit, usually just a few miles-per-hour slower than the limit.

APPROACHING PIT SPEED LIMIT



As the vehicle's speed approaches the pit road speed limit (but is not exceeding the speed limit), the pit lights will turn green, with 1 green light being the farthest from the pit road speed limit and 6 lights being just underneath the pit road speed limit.

AT PIT SPEED LIMIT



When the vehicle is traveling at the pit road speed limit, the 7th light will illuminate in green and the backlight color will change to green, illuminating the entire gauge with a green light.

EXCEEDING PIT SPEED LIMIT



When the pit road speed limit is exceeded, the entire gauge backlight will turn red and the speed lights will also change from green to red. Similar to the other modes, 1 red light is just above pit road speed limit and each additional light signals the vehicle is exceeding the speed limit. If the vehicle continues accelerating after the 7th red light, all speed lights will turn off and the backlight will return to its standard color.

SHIFT LIGHT



The tachometer is also equipped with a Shift Light mode, which turns the gauge backlight to red. This is distinguishable from the pit road speeding mode by the speed lights being off, and will be enabled just before the engine reaches the rev limiter.

TACHOMETER

TOYOTA SUPRA

PIT SPEED INDICATOR



If the vehicle is below the pit road speed limit, the tachometer will illuminate the speed lights in yellow, with 1 light being farthest from pit road speed and all 7 being moderately slower than the pit road speed limit, usually just a few miles-per-hour slower than the limit.

APPROACHING PIT SPEED LIMIT



As the vehicle's speed approaches the pit road speed limit (but is not exceeding the speed limit), the pit lights will turn green, with 1 green light being the farthest from the pit road speed limit and 9 lights being just underneath the pit road speed limit.

AT PIT SPEED LIMIT



When the vehicle is traveling at the pit road speed limit, the 10th light will illuminate in green and the backlight color will change to green, illuminating the entire gauge with a green light.

EXCEEDING PIT SPEED LIMIT



When the vehicle is traveling at the pit road speed limit, the 10th light will illuminate in green and the backlight color will change to green, illuminating the entire gauge with a green light.

SHIFT LIGHT



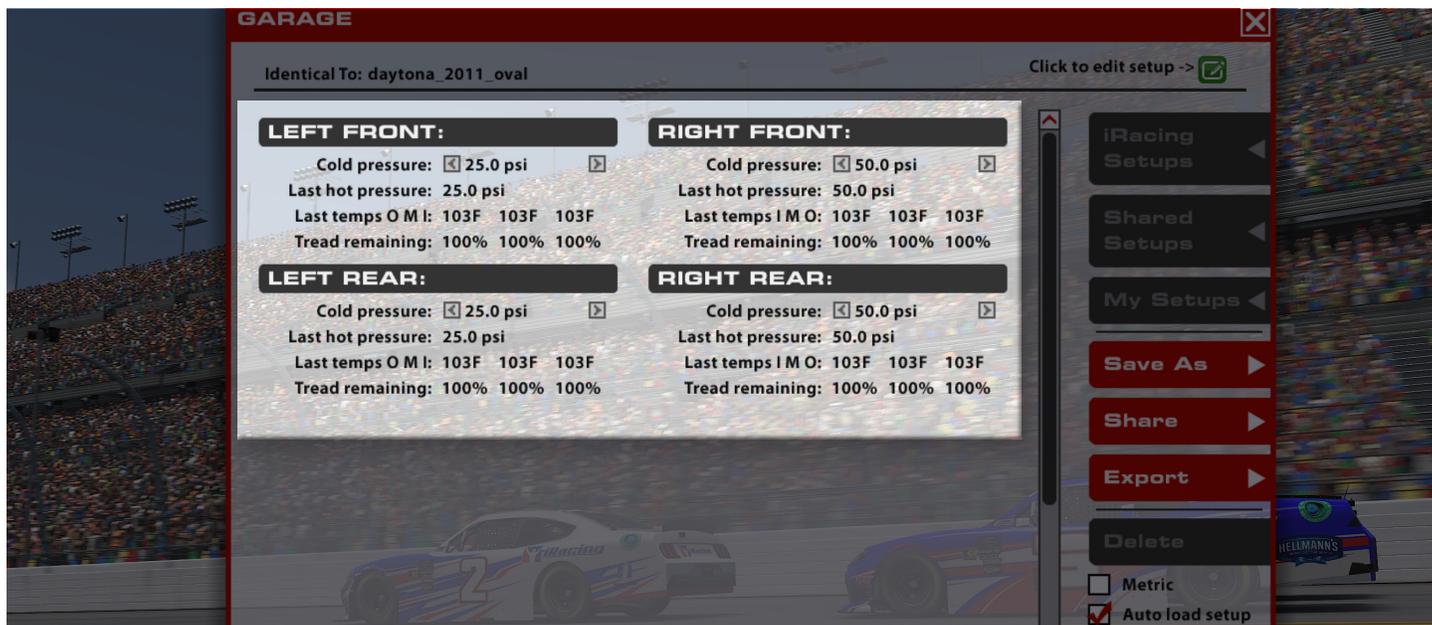
The tachometer is also equipped with a Shift Light mode, which turns the gauge backlight to red. This is distinguishable from the pit road speeding mode by the speed lights being off, and will be enabled just before the engine reaches the rev limiter.

ADVANCED SETUP OPTIONS

This section is aimed toward more advanced users who want to dive deeper into the different aspects of the vehicle's setup. Making adjustments to the following parameters is not required and can lead to significant changes in the way a vehicle handles. It is recommended that any adjustments are made in an incremental fashion and only singular variables are adjusted before testing changes.

TIRES

TIRE DATA



COLD AIR PRESSURE

Air pressure in the tire when the car is loaded into the world. Higher pressures will reduce rolling drag and heat buildup, but will decrease grip. Lower pressures will increase rolling drag and heat buildup, but will increase grip. Higher speeds and loads will require higher pressures, while lower speeds and loads will see better performance from lower pressures. Cold pressures should be set to track characteristics for optimum performance. For typical road courses or for oval left side tires, lower tire pressures are recommended. For oval right side tires, the greater loads experienced by the tires require higher starting pressures.

LAST HOT PRESSURE

Air pressure in the tire after the car has returned to the pits. The difference between Cold and Hot pressures can be used to identify how the car is progressing through a run in terms of balance, with heavier-loaded tires seeing a larger difference between Cold and Hot pressures. Ideally, tires that are worked in a similar way should build pressure at the same rate to prevent a change in handling balance over the life of the tire, so Cold pressures should be adjusted to ensure that similar tires are at similar pressures once up to operating temperature. On ovals, the right front and right rear would be similar, and the left front and left rear would be similar. On road courses, the left front and right front would be similar, and the left rear and right rear would be similar.

LAST TEMPS

Tire carcass temperatures once the car has returned from the pits. Wheel Loads and the amount of work a tire is doing on-track is reflected in the tire's temperature, and these values can be used to analyze the car's handling balance. Center temperatures are useful for directly comparing the work done by each tire, while the Inner and Outer temperatures are useful for analyzing the wheel alignment while on track. These values are measured in three zones across the tread of the tire. For ovals, the left sides of the tires should typically be the most heavily loaded and hottest, so the outsides of the left side tires and insides of right side tires. For road courses, the insides of each tire should carry the greatest loads and temperatures.

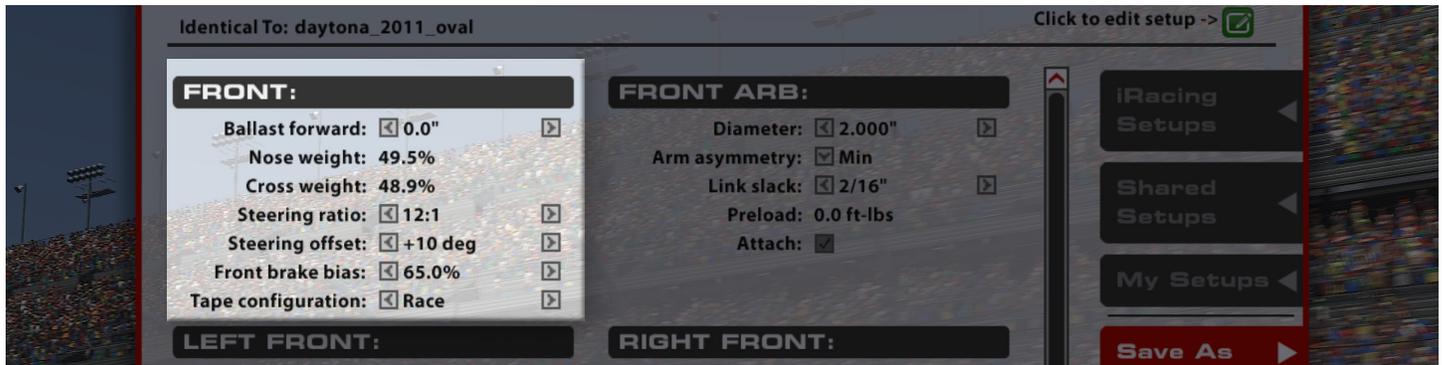
TREAD REMAINING

The amount of tread remaining on the tire once the car has returned from the pits. Tire wear is very helpful in identifying any possible issues with alignment, such as one side of the tire wearing excessively, and can be used in conjunction with tire temperatures to analyze the car's handling balance. These values are measured in three zones across the tread of the tire.



CHASSIS

FRONT



BALLAST FORWARD

To meet minimum weight requirements, tungsten blocks are installed within the lower frame rails on the chassis. These blocks can be moved fore and aft in the chassis, directly influencing the car's Nose Weight value. The Ballast Forward value is simply a measurement of the location of these tungsten blocks relative to a reference point in the frame rail. Moving ballast forward in the car raises Nose Weight, moving it rearward reduces Nose Weight.

NOSE WEIGHT

The vehicle's Nose Weight is the percentage of total vehicle weight on the front tires, directly adjustable through the Ballast Forward adjustment. Nose Weight represents a rough approximation of the longitudinal Center of Gravity location in the vehicle and has a direct influence on the high-speed stability of the vehicle. Higher Nose Weight values result in a more directionally-stable vehicle, good for low-grip tracks and situations where the vehicle is set up with extra front downforce. Conversely, lower Nose Weight values are good for high-grip tracks and configurations with high rear downforce levels. Smaller tracks will also see benefits from lower Nose Weight values, as it will allow the rear of the vehicle to rotate easier.

CROSS WEIGHT

Cross weight is the amount of weight on the car's Left-Rear and Right-Front tires relative to the entire weight of the car, displayed in percent. This is adjusted via the corner Spring Perch Offset adjustments as well as Front ARB preload and, to a very small extent, the Truck Arm Preload. For an oval car, Cross Weight is one of the most influential settings for grip level and handling balance. Higher Cross Weight values will add weight to the left-rear and right-front, both stabilizing entry and helping drive-off on corner exit. Lower Cross-Weight values will help the vehicle rotate and keep it "free" in the corner to prevent speed from being lost, however too low can result in unstable entry and exit.

STEERING RATIO

The Steering Ratio is a numerical value for how fast the steering response is to driver inputs at the steering wheel. This ratio can be thought of as the degrees of steering input needed to produce one degree of turn on the steering box output shaft. For example, a 12:1 steering ratio will require 12° of steering input to rotate the steering output shaft 1°. A steering box with a lower ratio will feel more responsive to steering inputs and will require less steering input to reach the amount needed to navigate a corner. A steering box with a higher ratio will feel less responsive and will require more steering input to reach the amount needed to navigate a corner.

STEERING OFFSET

Degrees of steering wheel offset, achieved with a combination of installing the steering wheel into the quick release mechanism off-center and adjusting front tie-rods. This can be used to compensate for chassis settings which place the wheel off center and is primarily a driver comfort adjustment.

FRONT BRAKE BIAS

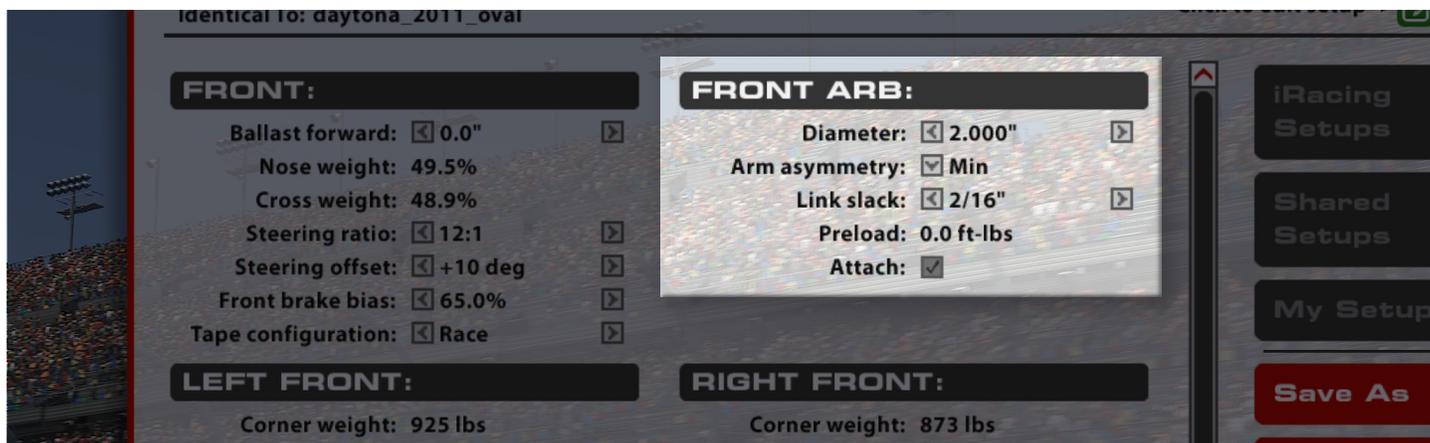
Brake Bias is the percentage of braking force that is being sent to the front brakes. Values above 50% result in more pressure being sent to the front, while values less than 50% send more force to the rear. This should be tuned for both driver preference and track conditions to get the optimum braking performance for a given situation.

TAPE CONFIGURATION

Two options for grille tape are available: Race and Qual. The Race configuration will open up the radiator opening on the front fascia to allow air into the radiator and keep the engine at safe operating temperatures for race sessions or long runs in practice. For Qualifying, where performance is key, the Qual setting will fully block the radiator opening in the front fascia. This will dramatically reduce drag and increase downforce, but will cause the engine to overheat very quickly and possibly fail. The Qual setting is not available in Race sessions.



FRONT ARB



DIAMETER

The ARB (Anti-Roll Bar) diameter influences the stiffness of the front suspension in roll. Increasing the ARB size will increase the roll stiffness of the front suspension, resulting in less body roll and improved aerodynamic stability but increasing mechanical understeer. This can also, in some cases, lead to a more responsive steering feel for the driver. Conversely, reducing the ARB size will soften the suspension in roll, increasing body roll and reducing aerodynamic efficiency but decreasing mechanical understeer. This can result in a less-responsive feel from the steering. ARB diameter can be used as a fine tuning adjustment for dynamic wheel rate, and to control roll angle for optimal ride heights and aerodynamic performance.

ARM ASYMMETRY

The difference in length between the left and right sway bar arms can be altered via the Arm Asymmetry settings. The "None" setting will set the two arms at equal length, while increasing the setting will increase the difference in length of the two arms. This can be used to produce multiple effects, primarily serving to produce a higher anti-roll force on the right-front suspension than on the left-front, effectively rolling the chassis to the left when under load. This can be used to correct excessive roll without increasing the ARB diameter. A knock-on effect of asymmetry is a slight increase in front end heave stiffness, or resistance to vertical travel. Since the two different lengths of arms cause the bar to be twisted at different rates, vertical travel will load the ARB, possibly leading to higher front ride heights on straights.

LINK SLACK

The left-side sway bar linkage can be adjusted to either delay bar engagement or apply a static load to the bar. The linkage itself is a slider-type linkage, and any positive link slack will require the left-front wheel to travel prior to the ARB experiencing any load. This adjustment directly affects the bar's Preload, outlined below.

PRELOAD

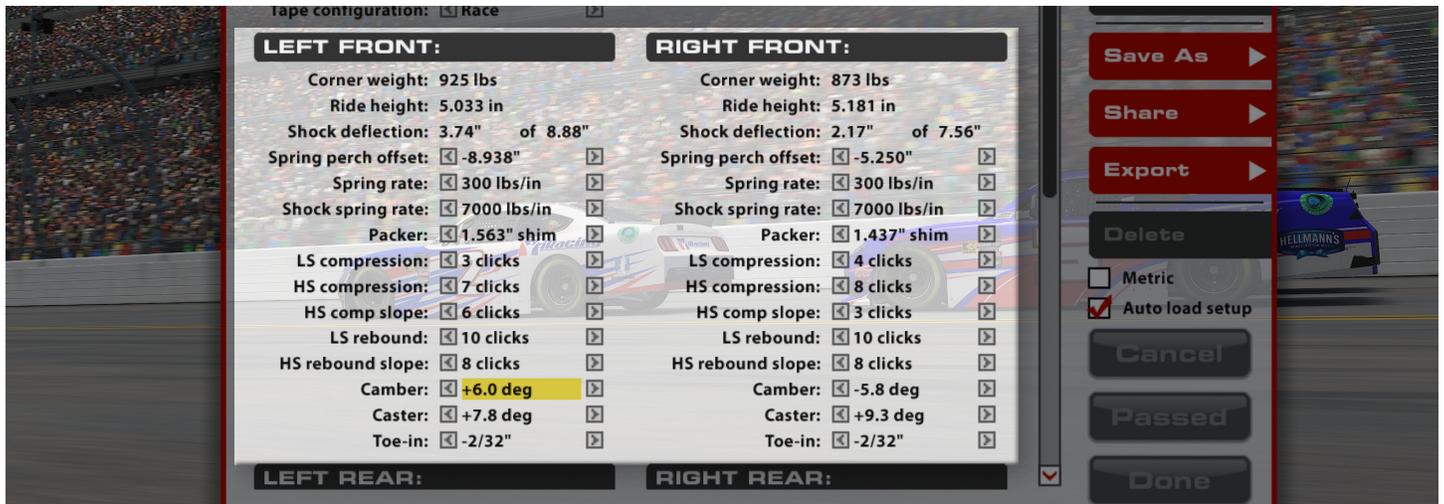
The ARB Preload is the static load in the bar while the vehicle is in the garage. Preload adjustments can be used to alter the dynamic loads in the bar while on track, and can be used to remove or add bar load in the corners and on the straights.

ATTACH

A quick way to unhook the anti-roll bar to allow for static suspension adjustments without bar twist confusing things; increase link slack and unhook the ARB before making spring/ride height adjustments; attach and reduce link slack (ARB preload) when done. If the ARB is attached with any preload while making adjustments, this will influence all other adjustments and quickly lead to improperly adjusting the chassis in compensation for the preload.



FRONT CORNERS



CORNER WEIGHT

The weight distribution on each tire under static conditions in the garage. Correct weight arrangement around the car is crucial for optimizing a car for a given track and conditions. Individual wheel weight adjustments and crossweight adjustments are made via the spring perch offset setting. Once ride heights and corner weights are set, any change to a spring rate will typically require a corresponding spring perch offset adjustment to maintain static corner weight.

RIDE HEIGHT

Distance from ground to a reference point on the chassis. Front heights are measured at the bottom of the chassis frame rail just behind the wheel well and can be roughly identified via the skirt rivets at the bottom of the door. Since these values are measured to a specific reference point on the car, these values may not necessarily reflect the vehicle's ground clearance, but instead provide a reliable value for the height of the car off of the race track at static values. Adjusting Ride Heights is key for optimum performance, as they can directly influence the vehicle's aerodynamic performance as well as mechanical grip.

SPRING PERCH OFFSET

Spring perch offset is used to adjust ride height and corner weight. Adjusting this setting changes the preload on the spring under static conditions. Decreasing the value increases preload on the spring, adding weight to its corner and increasing the ride height at that corner. Increasing the value does the opposite, reducing height and weight on a given corner. These should be adjusted in pairs (left and right, for example) or with all four spring preload adjustments in the car to prevent crossweight changes while adjusting ride height.

SHOCK SPRING RATE

The shock spring is a small metallic coil spring mounted on the shock body that keeps the shock from bottoming. If a car's suspension compresses into the shock spring while on track, the stiffness of the shock spring will affect the handling in the same way the regular corner spring rates do.

PACKERS

Packers are shims inserted between the shock springs and shock body to change the amount of shock deflection at which the shock spring is engaged in compression. This allows fine control over dynamic ride heights which can improve the aerodynamic downforce and alter the mechanical balance.

LS COMPRESSION

Low-Speed (LS) Compression affects how resistant the shock is to compression (reduction in length), usually in chassis movements as a result of driver input, such as the front shocks under braking. Higher LS Compression settings will prevent the shock from compressing quickly and can quickly increase the load transferred to the wheel when the suspension is in compression, but can prevent the suspension from absorbing smaller bumps and dips in the track. Lower LS compression settings will allow for better bump absorption, but can hurt aerodynamic stability due to excessive body movement with driver inputs.



HS COMPRESSION

The High-Speed (HS) Compression controls how resistant the shock is to compression at higher shock shaft speeds, roughly 1.5 in/s. This range of motion is usually associated with very bumpy racing surfaces or curb strikes, such as seen on road courses. Lower HS Compression values will reduce the force exerted in these situations, allowing these large forces to be absorbed by the suspension without changing the low-speed characteristics of the shock. This is great for very bumpy tracks or road courses where the car will see heavy curb usage, while smoother tracks will benefit from higher HS Compression values.

HS COMP SLOPE

The High-Speed Compression can be further tuned with the Compression Slope setting. This setting shifts the high-speed adjustment of the shocks higher or lower, allowing for a wider range of options for various track conditions. Higher slope settings will produce a more linear compression setting, with compression force increasing with velocity. These settings are good for very bumpy surfaces to keep the shock from "blowing out" over large bumps, preventing the chassis from striking the racing surface. Lower slope settings will produce a more digressive compression setting, with forces not increasing significantly as velocity increases. This is good for smoother tracks where large suspension movement is not expected. When tuning shocks for a track, change the slope setting first to suit the track, then fine-tune the shock using the high- and low-speed settings.

LS REBOUND

Low-Speed (LS) Rebound affects how resistant the shock is to extension (increase in length), typically during body movement as a result of driver inputs, such as the rear shocks under braking. Higher rebound values will slow extension of the shock, lower values will allow the shock to extend faster. Higher rebound values can better control aerodynamic attitude but can result in the wheel being unloaded when the suspension can't extend enough to maintain proper contact with the track. Excessive front rebound can lead to unwanted oscillations due to the wheel bouncing off of the track surface instead of staying in contact.

HS REBOUND SLOPE

The High-Speed Rebound can be further tuned with the Rebound Slope setting. This setting shifts the high-speed adjustment of the shocks higher or lower, allowing for a wider range of options for various track conditions. Higher slope settings will produce a more linear rebound setting, with rebound force increasing steadily with velocity. These values will give a more controlled damping characteristic over very bumpy surfaces. Lower values will result in a more digressive rebound curve, which is good for smoother surfaces.

CAMBER

Camber is the vertical angle of the wheel relative to the center of the chassis. Negative camber is when the top of the wheel is closer to the chassis centerline than the bottom of the wheel, positive camber is when the top of the tire is farther out than the bottom. Greater camber angles will increase the cornering force generated by the tire, but will reduce the amount of longitudinal grip the tire will have under braking. Excessive camber values can produce very high cornering forces but will also significantly reduce tire life, so it is important to find a balance between life and performance. For ovals, set the left side positive and the right side negative. For road courses, all four wheels should be set with negative camber.

CASTER

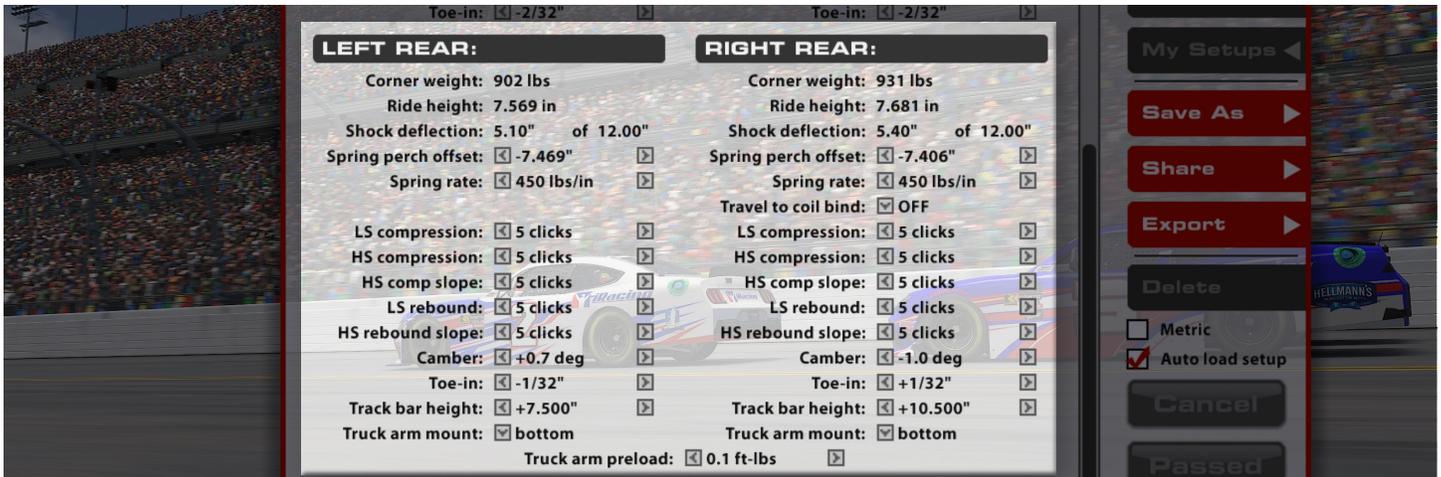
How much the steering axis is leaned back (positive) or forward (negative), which influences dynamic load jacking effects as the car is steered. More positive caster results in a heavier steering feel but decreases dynamic crossweight while turning, as well as adding straight-line stability. Running less caster on the left-front will cause the vehicle to pull to the left, a desirable effect on ovals.

TOE-IN

Toe is the angle of the wheel, when viewed from above, relative to the centerline of the chassis. Positive toe-in is when the front of the wheel is closer to the centerline than the rear of the wheel, and negative toe-in (toe-out) is when the front of the wheel is farther away from the centerline than the rear of the wheel. On the front, negative toe-in is generally preferred. More negative toe-in typically provides better turn in response and makes the car less stable in a straight line, but can increase tire temperature and wear.



REAR CORNERS



CORNER WEIGHT

The weight underneath each tire under static conditions in the garage. Correct weight arrangement around the car is crucial for optimizing a car for a given track and conditions. Individual wheel weight adjustments and crossweight adjustments are made via the Spring Perch Offset setting.

RIDE HEIGHT

Distance from ground to a reference point on the chassis. Since these values are measured to a specific reference point on the car, these values may not necessarily reflect the vehicle's ground clearance, but instead provide a reliable value for the height of the car off of the race track at static values. Adjusting Ride Heights is key for optimum performance, as they can directly influence the vehicle's aerodynamic performance as well as mechanical grip. Increasing rear ride height will increase rear downforce as well as slightly increasing overall downforce and drag. Conversely, reducing rear ride height will reduce rear and overall downforce and reduce drag.

SPRING PERCH OFFSET

Used to adjust ride height and corner weight, adjusting this setting applies a preload to the spring under static conditions. Decreasing the value increases preload on the spring, adding weight to its corner and increasing the ride height at that corner. Increasing the value does the opposite, reducing height and weight on a given corner. These should be adjusted in pairs (left and right, for example) or with all four spring preload adjustments in the car to prevent crossweight changes while adjusting ride height.

SPRING RATE

Spring Rate changes how stiff the spring is, represented in force per unit of displacement. Primarily responsible for maintaining ride height and aerodynamic attitude under changing wheel loads, stiffer springs control the chassis attitude better (less roll or pitch change) which is good for aerodynamics and camber control, but mechanical grip is often better with softer springs which allow for more track surface compliance but reduce aerodynamic control. For ovals, a softer left-rear spring (relative to the right-rear) is desired to prevent the dynamic cross from being too high in the corners, which will result in a balance shift towards understeer through a run.

TRAVEL TO COIL BIND

On ovals over 1.0 mile (excluding Gateway), the right rear spring can be coil bound to control rear heights for aerodynamic platform stability. If the installed right-rear spring rate is under 400lb/in the Travel to Coil Bind value will dictate how far the spring will compress (from its length at tech height, not necessarily the garage height) before it begins binding. Right-rear coil bind is most useful to maintain lower rear heights on the straights to reduce drag while maintaining a stable attitude in cornering for downforce. Smaller values will bind the spring sooner through rear travel while larger values will delay binding until lower rear ride heights.

LS COMPRESSION

Low-Speed (LS) Compression affects how resistant the shock is to compression (reduction in length), usually in chassis movements as a result of driver input, such as the rear shocks under acceleration or when leaving a banked corner. Higher LS Compression settings will prevent the shock from compressing quickly and can quickly increase the load transferred to the wheel when the suspension is in compression, but can prevent the suspension from absorbing smaller bumps and dips in the track. Lower LS compression settings will allow for better bump absorption, but can hurt aerodynamic stability due to excessive body movement with driver inputs.



HS COMPRESSION

The High-Speed (HS) Compression controls how resistant the shock is to compression at higher shock shaft speeds, roughly 1.5 in/s. This range of motion is usually associated with very bumpy racing surfaces or curb strikes, such as seen on road courses. Lower HS Compression values will reduce the force exerted in these situations, allowing these large forces to be absorbed by the suspension without changing the low-speed characteristics of the shock. This is great for very bumpy tracks or road courses where the car will see heavy curb usage, while smoother tracks will benefit from higher HS Compression values.

HS COMP SLOPE

The High-Speed Compression can be further tuned with the Compression Slope setting. This setting shifts the high-speed adjustment of the shocks higher or lower, allowing for a wider range of options for various track conditions. Higher slope settings will produce a more linear compression setting, with compression force increasing with velocity. These settings are good for very bumpy surfaces to keep the shock from "blowing out" over large bumps, preventing the chassis from striking the racing surface. Lower slope settings will produce a more digressive compression setting, with forces not increasing significantly as velocity increases. This is good for smoother tracks where large suspension movement is not expected. When tuning shocks for a track, change the slope setting first to suit the track, then fine-tune the shock using the high- and low-speed settings.

LS REBOUND

Low-Speed (LS) Rebound affects how resistant the shock is to extension (increase in length), typically during body movement as a result of driver inputs, such as the rear shocks under braking. Higher rebound values will slow extension of the shock, lower values will allow the shock to extend faster. Higher rebound values can better control aerodynamic attitude but can result in the wheel being unloaded when the suspension can't extend enough to maintain proper contact with the track. Excessive front rebound can lead to unwanted oscillations due to the wheel bouncing off of the track surface instead of staying in contact.

HS REBOUND SLOPE

The High-Speed Rebound can be further tuned with the Rebound Slope setting. This setting shifts the high-speed adjustment of the shocks higher or lower, allowing for a wider range of options for various track conditions. Higher slope settings will produce a more linear rebound setting, with rebound force increasing steadily with velocity. These values will give a more controlled damping characteristic over very bumpy surfaces. Lower values will result in a more digressive rebound curve, which is good for smoother surfaces.

CAMBER

Toe is the angle of the wheel, when viewed from above, relative to the centerline of the chassis. Positive toe-in is when the front of the wheel is closer to the centerline than the rear of the wheel, and negative toe-in (toe-out) is when the front of the wheel is farther away from the centerline than the rear of the wheel. At the rear, toe-out will help with turn in and direction changes, while toe-in will increase straight-line stability. For short tracks or tracks where traction is a problem, setting both rear wheels toed to the left (positive right-rear and negative left-rear) can help to straighten the car on throttle application.

TOE-IN

Toe is the angle of the wheel, when viewed from above, relative to the centerline of the chassis. Positive toe-in is when the front of the wheel is closer to the centerline than the rear of the wheel, and negative toe-in (toe-out) is the opposite. On the rear end, adding toe-in will increase straight-line stability but may hurt how well the car changes direction. The left and right toe can be adjusted independently, which can be useful for slight adjustments of the vehicle's yaw attitude on ovals.

TRACK BAR HEIGHT

The rear axle is held in place laterally via a Track Bar, mounted to the left side of the rear axle housing and to the chassis frame on the right side. Overall height of the track bar dictates roll center location for the rear suspension and thus affects roll stiffness, with a higher track bar increasing rear roll stiffness and shifting the chassis balance to oversteer. Lower track bar settings will increase lateral traction due to a reduction in roll stiffness and roll center height. The track bar end heights can also be set to different values, known as "rake" or "split". A positive track bar rake, with the right-side mounted higher, will increase oversteer on corner exit, as well as adding skew through vertical travel. Negative track bar rake will increase traction on corner exit, but will remove skew through vertical travel.

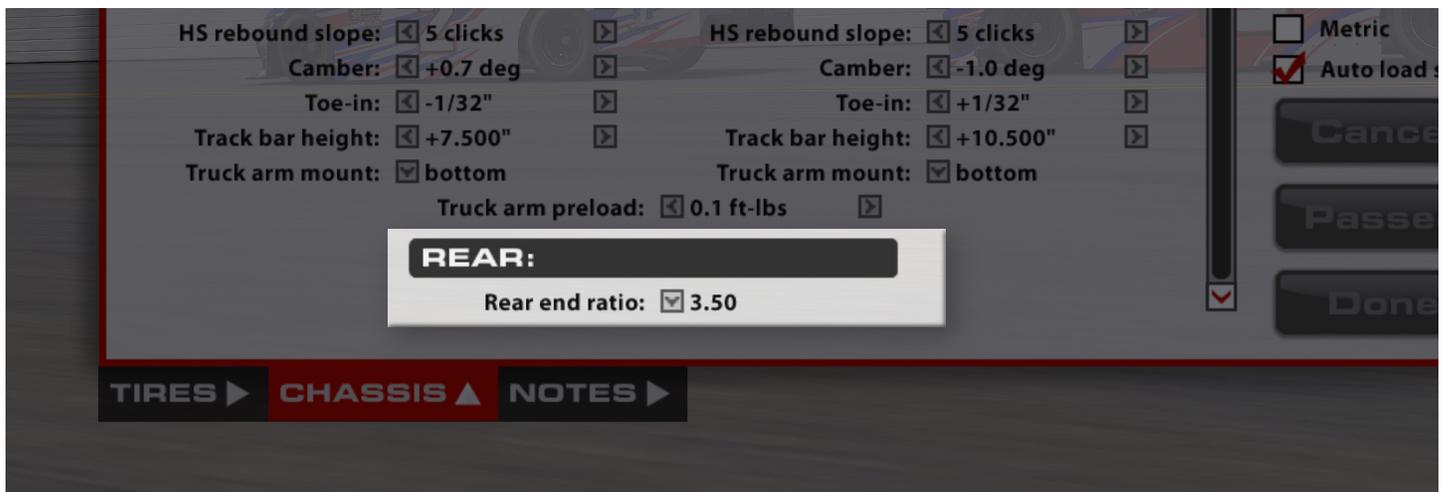


TRUCK ARM MOUNT

The rear axle is held in place longitudinally with two truck arms, mounted to the bottom of the chassis underneath the driver compartment. The forward mounts can be adjusted up and down, resulting in various anti-squat and rear-steer configurations. Higher truck arm mounts will reduce rear end grip, increase rear steer, add anti-squat, and reduce wheel hop under heavy braking. Lower truck arm mounts will increase rear end bite, decrease rear steer, reduce anti-squat, and increase the chances of wheel hop under heavy braking.

On the right-rear corner, the Truck Arm Mount can be used to raise or lower rear ride heights when the right-rear spring is binding. If the allowable range from the "Travel to Coil Bind" setting results in heights that are too low, raising the right-rear Truck Arm Mount will raise the rear ride height when the spring is bound. Conversely, lowering the Truck Arm mount will result in lower dynamic rear heights when the spring is binding.

REAR



REAR END RATIO

The Rear End Gear Ratio is the ratio between the driveshaft pinion and the differential ring gear. For all ovals with NASCAR-sanctioned events, this value is either locked to one ratio or there is a choice of two ratios. Higher number values produce better acceleration but reduce top speed, lower number values reduce acceleration but result in a higher top speed.

TRUCK ARM PRELOAD

Due to the truck arm mounting design on the rear axle, most chassis adjustments will result in the truck arms applying a torque to the rear axle housing. This preload has an extremely small effect on the chassis balance, but can be removed to eliminate any potential issues. It is good practice to reset this value to as close to zero as possible after making adjustments.

SETUP TIPS

This section is aimed toward helping users who want to dive deeper into the different aspects of the vehicle's setup.



SETUP TIPS

The NASCAR O'Reilly cars provide a step up in difficulty from the Truck Series with less downforce and slightly more engine performance, putting a larger emphasis on driver skill and mechanical grip. As with other oval cars, the setup process is based on ride height targets and weight distribution and can be very simple with practice. With relatively low aerodynamic performance when compared against other NASCAR series, the O'Reilly car will often require a stiffer setup to maintain the ideal aerodynamic attitude on the track.

RIDE HEIGHTS & ATTITUDE

As with all oval cars, the setup process involves hitting predetermined height targets in the corners and finding a way to keep the chassis and body in that position as long and as consistently as possible.

SPLITTER HEIGHT & FRONT SPRINGS

The optimum splitter height, and minimum ideal height, is around 0.25" or just above 6mm, measured via the telemetry channel CFSRrideheight. This height sensor is placed on the leading edge of the splitter along the centerline and displays the ground clearance to the front of the car. As this height is reduced, overall downforce will increase and aero balance will shift forward slightly. If the splitter is allowed to pass below the minimum height of 0.25", an aerodynamic stall will occur and overall downforce will drop significantly. Further, a risk of ground contact from the splitter will occur, unloading the front tires and inducing heavy understeer.

Tuning the splitter height is relatively a relatively simple process and can be done in three steps:

- Shock Spring Rate selection
- Packer setting
- Anti-Roll Bar / Crossweight settings

Shock Spring rates are going to come down to personal preference and track characteristics. Tracks with high loads or very smooth surfaces can use very stiff spring rates (7000 lb/in or more), while rougher tracks or tracks with lower cornering speeds may see better performance with slightly softer spring rates. Further, some drivers may prefer one spring stiffer than the other or both the same rate, but this will come down to testing configurations and finding which you like the best.

Packers are shims placed on top of the Shock Spring that reduce the amount of travel needed for the shock body to contact the Shock Spring, and thus engage the shock spring as the acting suspension rate. Adding packers will engage the spring sooner and raise the dynamic front heights, removing packers will delay

To complicate matters the low downforce also means mechanical grip can play a key role as well, sometimes leading to a compromise between aerodynamics and mechanical grip. Generally the O'Reilly car will not have enough grip to run without at least some braking and coasting through the center of a corner, and corner exits are usually an exercise in throttle control and how well a driver can keep the car on the limit.

Your targets for chassis setup will be a minimum splitter height and a rear height range.

spring engagement and reduce the dynamic front ride height. Due to differences in corner suspension loads and motion ratios, the amount of Packers needed to achieve the desired heights may differ between each front corner.

For any car with shock springs the front Anti-Roll Bar is a key part for timing shock spring engagement and managing shock spring loads in the front suspension. If the bar is too weak it can result in too much roll and disengagement of the Left-Front shock spring, while if the bar is too stiff it may prevent the suspension from engaging the Right-Front shock spring.

On ovals, where ride heights are often different from left to right, vertical travel will load the Anti-Roll bar and introduce a vertical spring rate to the front suspension. This can cause the front end to "pop" up on corner exit, reducing overall downforce and shifting aero aggressively forward in severe cases. This can be corrected by using a positive Link Slack value, allowing the suspension to drop from the mandated Ride Heights without loading the Anti-Roll Bar.

In many cases, a combination of Packers and Anti-Roll Bar settings can lead to counter-intuitive behavior from the front suspension and should be avoided if possible. Specifically, trying to remove chassis roll by adding packer to the lower side of the car will often result in raising the opposite side of the car due to how the Anti-Roll bar works. For example, adding packers to the right-front suspension will begin loading the Anti-Roll bar sooner and prevent the suspension from dropping down to the Left-Front Shock Spring, resulting in a higher overall front ride height. Many try to fix this by removing Left-Front Packer, further increasing bar load and making this issue worse. As a general rule, keep the packer values relatively close to each other and use the Anti-Roll Bar or Left-Rear spring stiffness to control front-end chassis roll.



REAR RIDE HEIGHTS & REAR SPRINGS

Rear ride heights are best run in a range of heights for most situations. The Xfinity car will see maximum downforce between 4.5" and 5.0" (114-127mm) for rear ride height. Running the rear higher than this range will add very little downforce but a lot of drag and is not recommended. Running lower than this range can reduce drag and downforce for tracks with the highest top speeds but can risk damaging the underside of the car.

Choosing rear spring rates is much simpler than choosing front spring rates, as each of the rear springs has its own specific purpose. The simplest way to approach rear springs is to set the Right-Rear spring for the target rear height and adjust the Left-Rear spring for handling and roll, with the Right-Rear spring generally being a few times stiffer than the Left-Rear. Generally you will want the stiffest Right-Rear spring you can handle and then fine-tune the dynamic height with the Perches. For the Left-Rear, softening the spring will roll the car to the left and free the chassis up through the corner while stiffening the spring will raise the left side of the chassis and tighten the car through the corner.

RIGHT-REAR COIL BINDING

The O'Reilly Car has an option to "bind" the right-rear spring for large tracks. This option will take a very soft spring and travel until the spring is bound, or touching the spring coils, to prevent further suspension travel. To enable this, you must be at a track larger than 1.0 miles (except Gateway and Superspeedways) and the right-rear spring needs to be set below 400lb/in.

Once the spring rate is selected, reset the ride heights to what they were initially. Then choose a value in the "Travel to Coil Bind" option. This value is the amount of travel the spring must go through before it binds, referenced from the spring's length at Tech Heights, or about 8" rear ride height. (Since this reference is often higher than the actual ride height, the travel is not exactly what is selected!!) Higher travel values will allow the spring to travel further, resulting in lower rear dynamic heights in the corners, while smaller travel values will bind sooner and result in higher dynamic corner heights. When this option is enabled, the Ride Height setting itself is not as important, or can be completely unimportant, when tuning on-track heights and this travel value will be the main consideration.

Sometimes the loads for a track may be too high or too low to reach the desired ride heights with the allowed values in the Travel to Coil Bind setting. If you need to raise or lower the rear of the car because of this, the adjustment to correct the heights is the Truck Arm Mount setting. Since the rear springs are mounted directly to the Truck Arms, this setting raises or lowers the spring itself and will alter the dynamic rear heights accordingly. To make this change, move the Truck Arm Mount to a new setting and reset the ride height with the Spring Perch Offset, and then run a few laps to see where the Travel to Coil Bind setting needs to be moved to.

ADJUSTING FOR WEATHER AND TIME-OF-DAY

Varying weather conditions and race start times can greatly affect the amount of grip available from the track surface. Hotter track temperatures will produce less grip and often cause the car to oversteer, especially on throttle, while cooler tracks will increase grip and shift the balance towards understeer.

To correct for weather and track temperature changes, the only adjustment needed is crossweight: Increase crossweight for warmer temperatures, decrease it for cooler temperatures.



CROSSWEIGHT

One of the most important settings in the garage is the crossweight, or the percentage of the chassis' total weight on the Right-Front and Left Rear as a percentage. This value is a major factor in the mechanical handling balance and how the car will get into and out of the corner.

To adjust crossweight without introducing other issues, follow these steps:

Note the current Front ARB Preload and disconnect the bar. Once disconnected, increase the Link Slack option to a large positive value, which will prevent the bar from influencing other adjustments while disconnected.

If the bar has a large amount of preload this may cause the ride heights to move into illegal ranges. This is okay, as they should return to legal ranges when the bar is reattached and loaded. Using the Spring Perch Offsets, adjust the crossweight by making the following changes:

Increase Crossweight

Right Rear - Right Click (Increase value, decrease corner weight)

Left Rear - Left Click (Decrease value, increase corner weight)

Left Front - Right Click (Increase value, decrease corner weight)

Right Front - Left Click (Decrease value, increase corner weight)

Decrease Crossweight

Right Rear - Left Click (Decrease value, increase corner weight)

Left Rear - Right Click (Increase value, decrease corner weight)

Left Front - Left Click (Decrease value, increase corner weight)

Right Front - Right Click (Increase value, decrease corner weight)

If you're new to the setup process, keep these adjustments to one or two clicks at a time and watch what happens to the chassis.

If you're comfortable with the adjustments, multiple clicks (Shift-Click is equal to 5 clicks) can be made as long as you keep track of everything that's changing. Always pay attention to the ARB preload to make sure it stays at zero during crossweight adjustments. If it registers a value, simply adjust the Link Slack to remove the preload and continue with weight adjustments.

Once the desired crossweight change has been made, reattach the ARB and preload the bar to what it was initially. Following these steps you should now have a change in crossweight with almost no change in ride heights or alignment!

Deciding on a crossweight adjustment is usually fairly simple, it will come down to how the car is behaving through the center and on throttle application. If the car understeers through the center or has too much rear traction on throttle causing understeer on exit, decrease the crossweight. If the car oversteers through the center or the rear tires spin too easily on initial throttle, increase the crossweight.

It is also very important to focus on crossweight adjustments progressively through the corner: Start with entry and work on the car around the corner. It's very easy to fall into the trap where the rear of the car loses grip on exit and the driver wants more crossweight to correct that, when the root cause is understeer through the center of the corner. This understeer will result in the driver applying too much steering input and over-slipping the front tires, which "bite" as steering is removed through corner exit and causing the rear to lose traction. In this situation, adding crossweight will make the center of the corner worse and potentially make the car "looser" on exit. This pitfall can be avoided by looking at the tire temperatures screen (after a steady run without spins) and noting whether the temperatures show hotter on the RF than the RR tire, an indication that the car is understeering and the crossweight needs to be reduced. This will often, counter-intuitively, tighten the car on exit and free the car up through the center.

FINAL CONSIDERATIONS

Once these areas of the setup are complete you can move onto finer details like shocks and alignments. These settings will be dependent on the spring package and track characteristics, so don't be afraid to test various settings to see what works for you.

The Fixed setups provided with the car are close to where the car would like to be run as far as heights and weight balance, but are tuned more towards mild understeer to make the car more approachable. Keep it simple, make small adjustments, and you should be able to get wherever you want to go!

