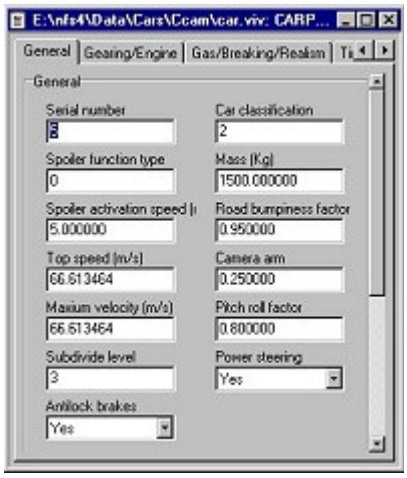
Editing NFSHS Car Performance Tutorial

By Justin Martin a.k.a. IH8COPS

The purpose of this tutorial is to teach people how to edit the performance file of NFSHS cars. Please do not email me with questions regarding this tutorial, I will not respond to questions about car performance editing.

Overview

As a simple review of NFSHS, cars are located in the directory \Data\Cars. In this directory are subfolders for each car; for example, the CCam folder contains the Chevrolet Camaro. In each car subfolder will be a file named car.viv. VIV files are opened using a program called NFSWizard, which you can download from the Tools Needed section below.



Open a car.viv file in NFSWizard. You will see a list of about a dozen files. The car's performance is in the carp.txt, double click on it and a box similar to the one in the pic to the right will appear. This is the car's performance file, the carp.txt.

The carp.txt is divided into five sections, each section is denoted by a tab at the top of the box. Click on a different tab to move to a different section. Each page is usually divided into upper and lower halves; this tutorial treats each vertical half separately. The titles of each vertical section are in bold italic.

In each of the sections, you will see many text fields with numbers in them. Some of them have a icon that looks like a white graph to the right of the text field, clicking on that icon will open a graph showing all of the numbers in that text field. A few of the text fields are drop down boxes, with Yes and No selections.

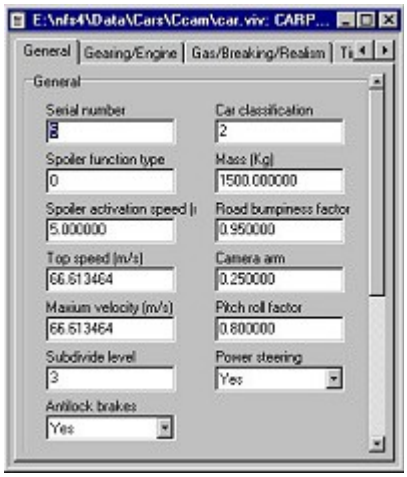
This tutorial discusses each section of the carp.txt individually, for example, on the main tutorials page, you can see there is a link to a section of the tutorial called "Part 2: Gearing/Engine". This section would cover the Gearing/Engine section of the carp.txt. The preferred way to read this tutorial would be to read through each page, then use the "Next Page" link at the bottom of each section to go to the next section.

As a warning, almost all measurements in the carp.txt are done in Metric; using Standard measurements instead of Metric will result in an inaccurate carp. This tutorial will denote when necessary which measurements are Metric and which are Standard.

Part 1: General

General

Serial Number - The car's serial number. NFSHS seems to only read serial numbers out of the fedata files, however, set this to the same as the serial number in the fedata files anyway.



Spoiler Function Type - Enables the popup spoiler part, 0 = off, 1 = on. The pop up spoiler part is not used by any of EA's cars, however, it does exist and was discovered by CPD. Simply create a spoiler shaped part named :OS and if the Spoiler Function is set to 1, the spoiler will rotate approx. 30' around it's center, which is denoted as the light gray crosshairs in CarCad.

Spoiler Activation Speed - One would presume this is the speed

at which the movable spoiler pops up, but it isn't, this has no effect on the speed at which the spoiler pops up.

Top Speed - Top Speed, measured in meters per second. Here's how to calculate meters per second. (M/s)

From kilometers - km/h x 0.2777 = m/s
from miles per hour - mph x 0.4498 = m/s
Maximum Velocity - As same as the Top Speed. (Read above)

Subdivide Level - Unknown function, all of EA's cars are set to 3. I don't recommend changing this.

Anti-Lock Brakes - Activates ABS for the car. It doesn't seem to make a difference, but turn it on anyway if the real car has ABS.

Car Classification - Seems to work like the Car Class in the fedata files, but a little bit differently. EA's cars really don't seem to follow any set pattern, however, when I was working on the Detroit Muscle mod, the classifications had to be coordinated to prevent computer opponents from racing Cobras against class B cars like the '57 Oldsmobile.

In general, find an EA car with similar performance, and give your car the same classification number.

Mass - This is the car's weight in kilograms. EA's cars seem to use curb weight plus about 50kg to 100kg, so that is what I'd recommend using.

Road Bumpiness Factor - This sets how much bumps affect the car, higher numbers give smoother rides. Here's a approximate guide to go by:

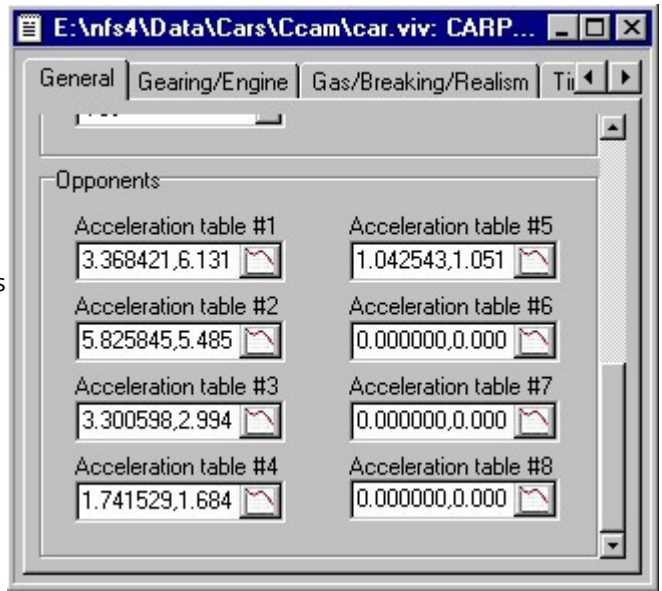
Race Cars - 0.5 to 0.6
Sports Cars - 0.6 to 0.95
Trucks - 0.7 to 0.8
Family Sedans - 0.85 to 1.1
Luxury Cars - 1.0 to 1.25

Camera Arm - The Camera Arm controls the angle of the Heli Cam view. In general, keep this to 0.25, but if you want to play around with it, keep it this number below 10.0. For cars that you are going to release, please, for the sake of humanity, keep this below 1.0.

Pitch Roll Factor - How much the car rolls in turns, higher numbers give more roll.

Race Cars - 0.55 to 0.70
Sports Cars - 0.70 to 1.00
Trucks - 1.25 to 1.50
Family Sedans - 1.00 to 1.25

Power Steering - Turns the power steering on and off.



Opponents
The Opponent Acceleration data tables are a set of acceleration curves that tell the game how fast the opponent cars accelerate at any given speed. The is contained within eight text fields in the carp.txt, as seen in the pic at right. Clicking on the graph icon beside any of the text fields will open a graph

showing the acceleration curve.

The horizontal axis of the graph is in meters per second. Meters per second is a metric measure of speed, and is abbreviated as ms. One ms equals 3.6kph or 2.24mph

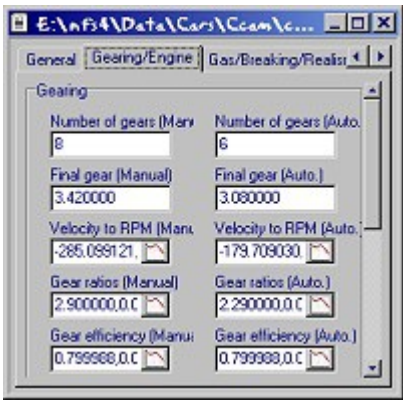
The vertical axis of the graph is in meters per second per second. A meter per second per second, which is abbreviated as ms2, is basically a measure of how hard the car is accelerating. In simple terms, if a car is accelerating at 10 ms2, every second it will increase it's speed by 10 ms.

Each point determines how fast a car accelerates in ms2 at the speed represented by the point. Each point on the table represents 1ms, or 3.6 kph. So the first point would be how hard the car is accelerating at 1ms, (3.6kph) the second point is how hard the car is accelerating at 2ms, (7.2kph) the third is how hard the car is accelerating at 3ms, (10.8kph) and so on. Each table has 14 points on it, for a range of 14ms or 51kph.

Acceleration Table Speeds (in kph)
Acceleration Table #1 - 000-051
Acceleration Table #2 - 052-101
Acceleration Table #3 - 102-151
Acceleration Table #4 - 152-201
Acceleration Table #5 - 202-251
Acceleration Table #6 - 252-301
Acceleration Table #7 - 302-351
Acceleration Table #8 - 352-401

To calculate top speed, divide top speed (kph) by 3.6. So, if you have a car with a top speed of 130 kph, 130 / 3.6 = 36. This means the 36th point will be top speed. Thus you need to make the 37th point a 0. Since there are 14 points in each table, it would be in the third table. The difference between 28 (the number of points in the first and second tables combined) and 36 is 8, so the 36th point would be the 8th point on the third table.

Once you calculate what point is the top speed, then you kinda guess the rest of it. Drive the car in game on a long, straight track against a computer opponent. If the car stays alongside you up to 75kph, then suddenly bursts ahead with speed, go find where 75kph is on the opponent tables and lower the 75kph point and a few after that. Keep repeating this process until you and the opponent stay neck and neck all the way to the top speed.



Part 3: Gearing/Engine

Gearing

The Gearing page is in two columns, both are identical except for Shift Delay. The left column is for the manual transmission; the right column is for the automatic transmission. If a car doesn't have an automatic (in real life) set the automatic variables the same as the manual is set to. And vise versa if the car is only available with an automatic.

Number of Gears - Total number of forward, reverse and neutral gears. A BMW M5 has 6 forward gears, 1 neutral and 1 reverse, so the number of gears is set to 8. The maximum number of gears is 8; anything higher will not work properly.

***Note**: It is possible to add more than 8 gears, however, when I tried adding a 7th gear, the game loaded the car okay, and everything worked until I shifted into 7th. When I did, the engine hit redline, no matter what speed I was at. So basically, the game doesn't like 7th gears, and 7th is not useable. Unless you just think it's cool to see 7 gears displayed in the HUD, a 7th gear would serve no purpose.*

Final Gear - Seems to have no effect on acceleration or at what speed a car hits redline in each gear. I hit 33mph in 1st gear and ran a 5.3 sec 0-60 in the Camaro with the Final Gear set to both 3.42 and 5.42. In real life, with a 5.42 rear end, I should have hit redline in 1st at something like 20mph and ran a 0-60 in the 4 sec range. However, I set this value to the rear axle ratio that the car has from the factory, just in case it does have an effect. I've been told it may have an effect on slopes, though I've not been able to confirm that.

Velocity to RPM - VTR sets the maximum speed at which the car can travel in each gear. It is done in meters per second, (m/s) and it is very important that this is set correctly if you want an accurate carp.

The easiest way to set this would be to download the NFSHS Velocity to RPM Calculator from the Editing Tools page. It is a Microsoft Excel spreadsheet that takes your car's gear ratios; tire size and engine redline and tells you what the VTR should be set to. If you don't have Excel, you can use the manual way described below.

From kilometers - rpm / (km/h x 0.2777) = VTR
From miles per hour - rpm / (mph x 0.4498) = VTR

For example, my Chevy truck hits it's 5500 rpm redline in 2nd gear at 65mph. To figure VTR for second gear, I would first multiply 65mph by 0.4498, which gives me 29.237. Then, I would divide 5500 by 29.237, which would give me a VTR of 188.177795. Here's how it would look written out....

5500 / (65 x 0.4498) = 188.177795

Additionally, negative numbers produce a reverse gear, and settings of 0 produce a neutral gear. The first number in the VTR is always reverse, second is neutral, third is 1st forward, fourth is 2nd forward gear, and so on.

Gear Ratios - Like the Final Gear seems to have no effect on the performance. I've also noticed that on EA's cars, the gear ratios are rarely set to the correct factory ratios. Set them to the correct gear ratios for the tranny anyway, but if you can't find out the correct ratios, don't worry about it.

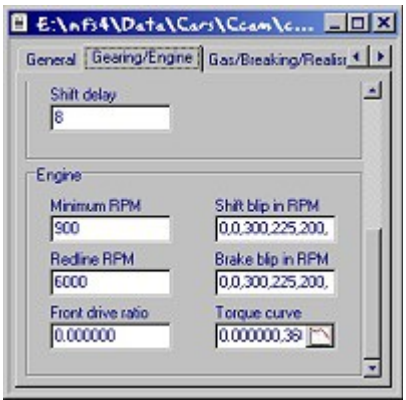
Gear Efficiency - Basically, this sets how efficient each gear ratio is at converting horsepower into rolling acceleration. If you set everything else on this page to the correct factory specs, and the car's acceleration matches factory specs, then don't mess with this. The Gear efficiency can be useful though, sometimes cars with low traction tires will accelerate faster in NFS than a real car would because the real car would be bogged down in wheel spin due to the low traction. Simply lower the 1st gear efficiency until the 0-60 times match factory times.

Similarly, if you set everything else on the page correctly, and the car's acceleration is too slow, you can make raise the efficiency, which will make the car accelerate faster. Think of the gear efficiency as the fine-tuning for car acceleration.

Shift Delay - The Shift Delay sets how long it takes for the car to shift. Even though this is only in the manual column, it affects both manuals and automatics. Generally, for most cars, set it to between 4 to 10. Trucks would be about 8 to 15. Cars with electronic shifts, like the Ferrari 360F1 and the Aston Martin Vanquish should be set to about 0 to 2.

Engine

Minimum RPM - This is the engine's idle speed, or how fast the engine turns at idle. Generally, this will range between 600 and 1200 rpm, with most cars in the 800 to 1000 ranges. Some highly modified and racing engines may idle much higher.



Usually, the best way to find out a car's idle speed is by letting a car idle in park/neutral and reading how fast the engine is turning on the tachometer. If you don't have access to the car you are modeling, a service manual for that car/engine is just as good. Idle speed is usually found in the service manual's tune up section.

Redline RPM - This is the maximum speed at which the engine can safely turn. The best place to find out an engine's redline would be in a magazine road test of the car or on the manufacturer's webpage. If you have access to the car you are modeling, you might find the redline by reading either the tachometer (if the car has one) or the owners manual. (Which most likely won't tell)

Front Drive Ratio - Presumably the final drive ratio for the front axle, in my experience, this is usually more trouble that it is worth. It won't cause the front wheels to spin in the game, and it doesn't seem to affect off road or wet traction either. I do wonder why it is in the Engine section, rather than the Gearing section....

Interestingly, negative numbers cause straight line acceleration to be much faster, positive numbers also slightly increase acceleration, but mostly produce mega torque steer. Probably the only use this has would be for cars with allot of torque steer, (like the SAAB 9-3 Viggen) a good setting for realistic torque steer would be 0.5 to 1.1. Otherwise, leave it set to 0.

Shift Blip in RPM - Not complete

Brake Blip in RPM - Not complete

Torque Curve - The torque curve is obvious, except for one thing. It is done in Metric torque, called Newton-Meters, or NM for short. 1 nm = 0.7374 lbft - Using this formula, if you have a torque figure in lbft, you would divide that number by 0.7374, which would give you torque in nm.

If you click on the graph icon beside the torque curve text field, it will open a nice graph showing the torque curve. Each dot represents how much torque the engine is producing at that RPM. The dot on the far left is 0 rpm, the second is 500rpm, third is 1000 rpm and so on. Click and hold on a dot, and you can move it up and down to increase or decrease torque at that rpm. For the best accuracy, find a real torque curve, and make a list of how much torque the engine is putting out at 500 rpm intervals, starting at 500 RPM and ending at redline.

If you can't find a graph of a torque curve, but you have the maximum torque at RPM and maximum horsepower at RPM, enter those numbers into CarTest, which will give you a approx. torque curve.

As a last resort, if all you have is a approx. torque figure, make a educated guess as to what the torque curve will look like. I have had to do that with several cars, most notably my Lotus 49.

How to make a estimated torque curve

Generally, engines with high redlines, variable valve timing and small displacement will develop their maximum torque at about 70% to 100% of redline, and the maximum torque will be much lower than maximum horsepower. Case in point being the Honda S2000, which produces 240hp out of only 2.0l, but puts out only 150lbft of torque at 7500rpm. However, there are some exceptions. The naturally aspirated Oldsmobile Acieva SCX has a 180hp 2.3l DOHC 4cyl, but it produced over 190lbft of torque at only 4500 rpm.

Engines with large displacement and low redline will generally produce their maximum torque at 30% to 70% of redline, and generally have a higher maximum torque figure than maximum horsepower. A good example is the 5.7l Camaro Z/28, it produces 305hp @ 5200rpm and 335lbft @ 4000 rpm.

Diesel engines generally have a low redline, anywhere from 2000 to 4000 rpm, produce huge amounts of torque, but at very low rpm, generally around 1500 to 2500 rpm. Older diesel engines produce very little horsepower, despite their great amounts of torque.

However, most new diesels, notably the diesels from Mercedes-Benz, BMW, VW and the new Chevy truck diesel have much more efficient fuel systems, so they produce more horsepower than older diesels did. The 6.6l Chevy heavy truck diesel produces much more torque, (520lbft vs. 455lbft) and almost as much horsepower, (300hp vs. 340hp) as the much less fuel-efficient 8.0l gas V8.

***Final note**: Make sure the torque readings are in Newton Meters!*

Now, delete all the numbers in the torque curve box, type a 0 (obviously you don't have any torque at 0 rpm, where the graph starts) then a comma, then the torque reading for 500 rpm, then a comma, then the torque reading for 1000 rpm, then a comma, and so on. When you have entered all of the readings into the torque curve, add a 0 at the end.

Now, click on the graph icon, and if the graph pops up normally, your torque curve is good. If it gives a exception caught error, then there is a problem; most likely you forgot to separate two readings with a comma.

Part 4: Gas/Braking/Realism

Gas/Braking

Gas Increasing Curve - No effect at all on car performance. There always seems to be eight numbers in this field, which along with the name - suggests that this might have something to do with gears. However, replacing all the numbers with a single zero had no effect, so I'd say this is a unimplemented feature of some kind. I'd recommend leaving this set to what EA set it to.

Gas Decreasing Curve - No effect on game, see Gas Increasing Curve for more information.

Brake Increasing Curve - No effect on game, see Gas Increasing Curve for more information.

Brake Decreasing Curve - No effect on game, see Gas Increasing Curve for more information.

G Transfer Factor - This is presumably a car's lateral grip, also called roadholding. The EA cars seem to always be set to exactly one-half of the car's real roadholding. Roadholding can be found in almost any magazine road test and is expressed in G. Simply divide that number in half, and put it in the G Transfer Factor. I've played around with this, and major variations do not seem to have any effect, so I wouldn't consider this to be very important to realism. Still, as with all such things, set it to the real setting, just in case.

Here's a estimated chart for G Transfer Factors

Trucks, SUV, old family sedans - 0.25 to 0.35
Old sports cars & muscle cars - 0.30 to 0.40
Family sedans, economy cars - 0.30 to 0.42
New sports cars & muscle cars - 0.43 to 0.46
Supercars - 0.45 to 0.50
Racecars - 0.50 to 0.60

Front Brake Bias Ratio - This is the percentage of braking that the front brakes provide. In most modern cars with four wheel disc brakes, the front/rear bias ratio will be close to 50%, meaning both front and rear brakes are contributing a equal amount of braking power. In cars with rear drums, or with a lot of weight over the front wheels, the ratio may be around 60% forward. In trucks, which have little weight on the back end when unloaded, the front brakes provide most of the braking, probably 75%.

The number in the text field is a decimal, 0.5 would be a 50% forward bias, and 0.65 would be a 65% forward bias.

Gas Off Factor - This is how quickly the car decelerates when you lift off the gas. A higher number

means the car decelerates faster, setting this to 0 would produce no deceleration when you lift. How much a car decelerates is a combination of many factors, weight and drag coefficient mainly, EA may have used a formula to get a accurate number, but in my opinion, it's inconsequential enough that just guessing is realistic enough.

Here's a basic chart of approximate Gas off factors using weight and drag coefficient (a.k.a. CD)

0.10 - Ultra aerodynamic speed record cars
0.20 - Very light and aerodynamic cars, like the Lotus Eleven, Lotus Elite and GM EV1
0.30 - Most less than 0.30cd medium weight cars (i.e. Lexus LS430) and 0.30cd to 0.45cd lightweight cars (i.e. BMW Z3, Mazda Miata)
0.35 - 0.30cd to 0.40cd medium weight cars (i.e. Honda Accord, Pontiac Firebird)
0.40 - 0.30cd to 0.40cd heavy weight cars (i.e. Lincoln Town Car)
0.50 - 0.40cd to 0.50cd medium weight cars
0.55 - 0.40cd to 0.50cd heavy weight cars

Maximum Braking Deceleration - This is how fast the car decelerates under braking, measured in m/s. This is affected by weight, so there is no easy way to realistically figure this. I usually use EA's cars as a guide; for example, I set my Aston Martin Vanquish to the same as the Ferrari 550.

If you happen to have a deceleration time, like 60 to 0, you could use that to accurately figure the MBD. Most magazines print deceleration in distance covered, though for a few special tests, like 0-100-0, they may give time.

Realism
All of the text fields in this area have absolutely no effect on car performance. They are most likely unimplemented features. Don't bother messing with them.

Part 5: Tires/Grip

Tires

Tire Specs Front - The size specs of a tire. These seem to have absolutely no effect on car performance; however, I always set them to the correct setting anyway. This should be pretty much self-explanatory, the first number is width, the second is width/height ratio and the third is diameter. These numbers can be found in magazine road tests, on a car's webpage, in a car's owner's manual, in the doorjamb sticker, and they are always written on the side of the tire.

However, as you could probably guess, this seems to have little effect on the game. Don't believe me? Replace the tire specs (front and rear) with a single zero.

Tires Specs Rear - Same as Tire Specs Front, except these are the specs for the rear tires.

Tire Wear - Absolutely no effect on the game, given that NFSHS does not support damage/wear to tires, I'd assume this is yet another unimplemented feature. Leave it set to the EA setting of 0.0

Tire Factor - As with the Tire Wear, this does not have any effect on car performance. Leave it set to 1.0

Lateral Acceleration Grip Multiplier - This has a major effect on handling, and is probably one of the most important handling settings. Low settings make the car less nimble, slower to react to

steering inputs. High settings make the car more nimble and quicker to react to steering inputs. Nimbleness seems to be affected slightly by other settings also, so there is no real guide on what to set the Lateral Acceleration, because it will vary depending on other settings.

Lateral Acceleration also seems to have a effect on grip, though not much. In general, keep this setting between 2.0 and 5.0

Aerodynamic Downforce Multiplier - This is the amount of downforce the car produces. The effect of this is usually only seen on tracks with sudden, sharp rises, where cars with low downforce will get airborne.

This setting does effect handling, but for all but the most extreme settings, the difference is hardly noticeable. I'd recommend trying this set at 0.05 to 0.1 just so you'll see how it affects handling, however, that setting would be way beyond realism for even a grand prix car. The larger the number, the more downforce the car has.

Here's a approximate guide to go by

0.000500 - Low Downforce Vehicles (i.e. trucks, suv, some cars like Lotus 7, Morgan)
0.001000 - Typical modern car (i.e. Honda Accord)
0.001500 - Sports cars (i.e. Corvette)
0.002000 - Supercars (i.e. Ferrari 550)
0.002500 - Race cars (i.e. Mercedes CLK-GTR)
0.003000 - Grand Prix cars (i.e. Formula 1, CART)

Front Grip Bias - Seems to be weight distribution, though it is set a bit more rearward than the car's real weight distribution. For example, the Camaro's FGB is 0.53, the real weight distribution is 56%/44%.

In general, EA seems to set the FGB about 3% more rearward than the real weight distribution, so that's what I'd recommend using.

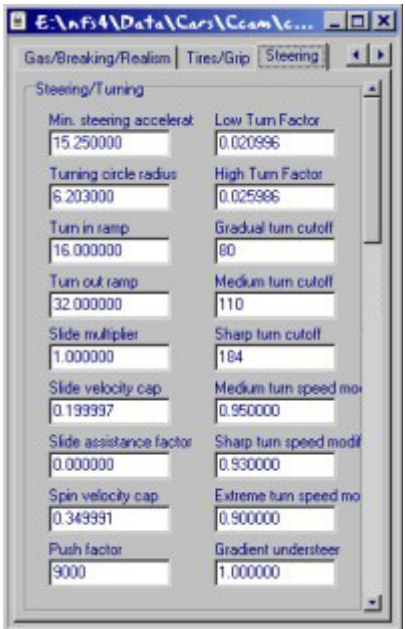
Wheelbase - A car's wheelbase is the length from the center of the front wheel to the center of the back wheel. This is common information, printed in almost all magazine road tests, on manufacturers webpages, and in owner's manuals. If all else fails, get out the freakin' tape measure and measure the wheelbase you. Unfortunently, this does not seem to make any difference on performance, even when set unrealistically long or short. But set it to the correct setting anyway.

Note that the wheelbase is measured in Meters.

Part 6: Steering

Steering/Turning

Min. Steering Acceleration - Like the Lateral Acceleration Grip, this seems to have a effect on nimbleness. It does not seem have to affect grip. In general, I'd keep this between 14 and 16, and use the Lateral Acceleration Grip to adjust the nimbleness of the car.



However, if you think your car has too much grip, you can try reducing the Lateral Acceleration Grip and increasing the Min. Steering. This will slightly reduce the grip, but without causing the slow, heavy steering associated with low Lateral Acceleration Grip settings.

Turning Circle Radius - This is the car turning radius, i.e., the radius of a circle a car would make in a full lock low speed turn. (Like a U-turn) In typical fashion, EA seems to set their car's turning radius to about 1 to 1.5 meters smaller than the car's real turning radius. Set it to the cars real turning radius, if you can find that information. If not, then set it to 6.0 for cars, 10.0 for trucks/Suv's. If you are doing something like a tank or a bulldozer, setting this to 0 would give the pivot-around-a-point low speed turning such vehicles have.

Turn In Ramp - Not complete

Turn Out Ramp - Not complete

Slide Multiplier - Not complete

Slide Velocity Cap - Not complete

Slide Assistance Factor - Not complete

Spin Velocity Cap - Not complete

Push Factor - Not complete

Low Turn Factor - Not complete

High Turn Factor - Not complete

Gradual Turn Cutoff - Not complete

Medium Turn Cutoff - Not complete

Sharp Turn Cutoff - Not complete

Medium Turn Speed Modifier - Not complete

Sharp Turn Speed Modifier - Not complete

Extreme Turn Speed Modifier - Not complete

Gradient Understeer - This sets the amount of understeer/oversteer a car has when you reach the limit of the car's grip. 1.0 is neutral, numbers lower than 1.0 will give understeer, numbers higher than 1.0 give oversteer. The settings that give the appropriate amount of understeer/oversteer will vary slightly depending on other settings, but here's a rough guide that should get you pretty close to correct.

0.70 - Dump trucks, other mega-understeer vehicles
0.80 - full size trucks, old large cars, bad handling muscle cars
0.85 - muscle cars (without anti roll bars)
0.90 - muscle cars (with anti roll bars) typical fwd family sedans
0.95 - modern muscle cars, most sports sedans or good handling family sedans, some sports cars
1.0 - neutral; most sports cars, sports sedans
1.1 - sports cars with somewhat wild tails, like Porsche 993's
1.2 - wild handling rear engine cars, old Porsches & Corvairs mostly

Here's a sampling of what I've set some of my cars to:

1957 Olds 88 - 0.80
1970 Porsche 911S - 1.19

1975 Porsche 911 Carrera RSR 3.0 - 1.20
1981 Chevy Silverado - 0.80
Lotus Super 7 - 1.0025
Toyota MR2 Turbo - 1.00