GRAN TURISMO™

Reference Manual

GRAN TURISMO

WARNING: READ BEFORE USING YOUR PLAYSTATION® GAME CONSOLE

A very small percentage of individuals may experience epileptic seizures when exposed to certain light patterns or flashing lights. Exposure to certain patterns or backgrounds on a television screen or while playing video games, including games played on the PlayStation game console, may induce an epileptic seizure in these individuals. Certain conditions may induce previously undetected epileptic symptoms even in persons who have no history of prior seizures or epilepsy. If you, or anyone in your family, has an epileptic condition, consult your physician prior to playing. If you experience any of the following while playing a video game – dizziness, altered vision, eye or muscle twitches, loss of awareness, disorientation, any involuntary movement, or convulsions – IMMEDIATELY discontinue use and consult your physician before resuming play.

WARNING TO OWNERS OF PROJECTION TELEVISIONS

Do not connect your PlayStation game console to a projection TV without first consulting the user manual for your projection TV, unless it is of the LCD type. Otherwise, it may permanently damage your TV screen.

HANDLING YOUR PLAYSTATION® DISC

- This compact disc is intended for use only with the PlayStation® game console.
- Do not bend it, crush it, or submerge it in liquids.
- Do not leave it in direct sunlight or near a radiator or other source of heat.
- Be sure to take an occasional rest break during extended play.
- Keep this compact disc clean. Always hold the disc by the edges and keep it in its protective case when not in use.
- Clean the disc with a lint-free, soft, dry cloth, wiping in straight lines from the outer edge. Never use solvents or abrasive cleaners.

GRAN TURISMO™ TIPS AND HINTS

PLAYSTATION® HINT LINE

Hints for all games produced by SCEA are available:

- **WITHIN THE U.S.: 1-900-933-SONY (1-900-933-7669)**
  $0.95/min. auto hints; $1.40/min. live; $6.95 - $16.95 for tips by mail (when available); $5.00 - $20.00 for card recharge.
  For U.S. callers, game counselors are available 8AM-5PM PST, M-F. Automated support: 24 hours a day, 7 days a week.
- **WITHIN CANADA: 1-900-451-5757**
  $1.50/min. auto hints. In Canada, automated support is available 24 hours a day, 7 days a week.
  Live support for Canada is not available at this time.

This hint line supports games produced by Sony Computer Entertainment America. No hints will be given on our Consumer Service Line. Callers under 18 years of age, please obtain permission from a parent or guardian before calling. This service requires a touch-tone phone.

- **CONSUMER SERVICE/TECHNICAL SUPPORT/ORDER LINE: 1-800-345-SONY (7669)**
  Call this number for help with technical support, installation or general questions regarding the PlayStation® game console and its peripherals. Representatives are available 8AM-6PM PST, M-F.
- **PLAYSTATION ONLINE: http://www.playstation.com**
  Our news is always hot! Visit our website and find out what's happening – new titles, new products and the latest information about the PlayStation® game console.

CONTENTS

GT REFERENCE

BASIC DRIVING TECHNIQUES

ACCELERATING

To drive fast, it's obvious that you need to floor the gas pedal.

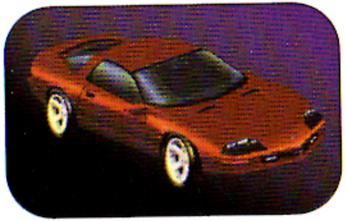
- If you're driving an automatic, all you need to do is keep the throttle open.
- With a manual transmission, you must increase the RPM at each gear to accelerate. It may take some practice, but this shouldn't be too difficult.

The tricky part is getting the fastest acceleration from a car at rest. Especially with a manual transmission, acceleration will depend greatly on how well you use the clutch to shift gears. If you suddenly engage 1st gear with the engine revving high, the sudden power transmitted to the tires will cause them to lose traction and slip, causing the car to spin its wheels. It may look good, but in reality there is barely any forward motion during this time.

Conversely, if you engage 1st gear so that there's absolutely no indication of wheel spin, you're probably not traveling very fast.

The ideal situation is to gradually transmit the engine's power to the tires by manipulating the clutch so that you're just on the verge of spinning your wheels. It's usually best to keep the engine's RPM constant when you shift gears. The exact RPM to maintain will depend on such factors as the type of car you're driving, road conditions, and the condition of your tires.

The only way to find out is to practice and learn.



BRAKING

The most complex yet important aspect of race car driving is braking.

- For circuit racing or races on winding roads, you can improve on your lap times only when you're able to brake quickly and efficiently.

Most beginners do not apply enough pressure to the brake pedal when braking. Only by applying sharp pressure at the beginning of braking will you allow the brakes to deliver their maximum braking power. If you haven't yet mastered this technique, you've got to be prepared to use all your body strength when stepping on the brake pedal. You know you've gotten there when the brakes are nearly fully locked and you can almost hear the tires screeching.

If the tires lock, you've applied the brakes too hard. If you're able to lock up the brakes, ease up just a tad so that you nearly cause the brakes to lock, but not quite. Master this and you're right there with the pros!

Note: This information is also covered in more detail in the "Tires" section of this manual, beginning on pg. 10.

FRONT ENGINE/ FRONT-WHEEL DRIVE

FF stands for front engine/front-wheel drive.

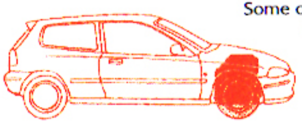
- Most cars are now front-wheel drive.

Rear-wheel drive used to be most common among passenger cars, but front-wheel drive offers the advantage of eliminating the drive-train mechanism necessary to transmit the driving force from the front-mounted engine to the rear wheels.

The drawback of front-wheel drive for a sports car is that the engine and drive-train mechanism get concentrated in the front of the car, making the car nose-heavy and creating an unequal weight distribution between front and rear. The front tires then have the responsibility of both steering and accelerating/ braking, making it difficult for sports cars to maintain ideal weight balance.

However, front-wheel drive has come a long way and has even been used in some race cars. A good example of the advance in front-wheel drive technology is the Honda Civic hatchback, which delivers impressive performance and is capable of outperforming second-tier rear-wheel drive sports cars.

Something to be careful about with front-wheel drive is that it's easy to induce understeer. If you continue to understeer throughout a race course, the front tires will become very hot and begin to lose their traction. Thus it's important to master the proper steering and acceleration techniques. Some other advantages to front-wheel drive include decreased tendency to spin, and better traction on wet surfaces.



FRONT ENGINE/ REAR-WHEEL DRIVE

FR stands for front engine/rear-wheel drive.

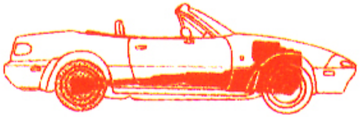
- With its weight-balance advantage, rear-wheel drive remains a popular choice for sports cars.

Although most cars today have front-wheel drive, rear-wheel drive still offers a big advantage in weight balance. In addition to having a nearly ideal 50-50 weight distribution between front and rear, the rear-wheel drive uses the front tires for steering and the rear tires for accelerating and braking. This divides responsibility between the front and rear, putting all four tires to good use.

This gives rear-wheel drive a huge advantage in handling and control. It offers the greatest room for improvement in driving, and maneuvers such as drifting become possible.

If you've mastered the fundamentals of driving, rear-wheel drive gives you the ability to control the car at will, leading to a more enjoyable driving experience. By using all four tires evenly, you also decrease the chance of one tire overheating during long continuous driving.

Other advantages of rear-wheel drive include the absence of sudden changes in handling and very slow drop-offs in speed.



BASIC DRIVING TECHNIQUES

MID-ENGINE/ REAR-WHEEL DRIVE

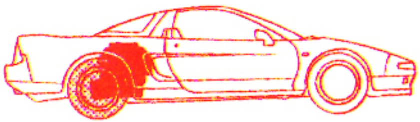
MR stands for mid-engine/rear-wheel drive.

- Positioning the heaviest part of the car, the engine, near the car's center maximizes the car's cornering ability.

As anyone who has seen a Formula One race car knows, cars built for speed have their engines mounted midship. With the front of the car relatively light, steering becomes very sharp and direct. Because the engine is near the rear axle, power from the engine gets transmitted to the road with little wasted energy. Mid-engine cars also have a high resistance to losing control even during hard braking.

Although mid-engine cars offer many advantages, they are difficult to drive. Mid-engine cars demand a mastery of fundamental driving techniques such as weight transfer. Although they have excellent cornering characteristics, it's easy to become nervous about the consequences of making a mistake during cornering.

If you master the advanced driving techniques, you'll be amazed at the speeds you can reach with a mid-engine sports car. For experienced drivers, mid-engine is definitely the way to go.



FOUR-WHEEL DRIVE

Every car has four wheels.

- It's more efficient to transfer the engine's power to four wheels rather than two.

Although in the old days a car had either front-wheel brakes or rear-wheel brakes, today all cars come equipped with four-wheel brakes. Cars today equipped with four-wheel drive deliver good traction even on slippery surfaces such as snow and other bad road conditions.

Four-wheel drive is effective for sports cars that run on paved surfaces or dirt, and it is used almost exclusively in rally racing. There are also sports cars in circuit racing and mountain pass racing that use four-wheel drive. Four-wheel drive becomes more effective with more powerful engines.

One drawback behind four-wheel drive is the complicated mechanism necessary to distribute power evenly to all four wheels and to keep the wheels synchronized during cornering. This is particularly troublesome in cars that have a tendency to understeer.

But recent advances in four-wheel drive technology such as electronic control have increased handling performance considerably. This performance coupled with the traction offered by four-wheel drive creates a powerful combination. On wet surfaces, four-wheel drive clearly outperforms two-wheel drive and even offers performance equal to mid-engine/rear-wheel drive.

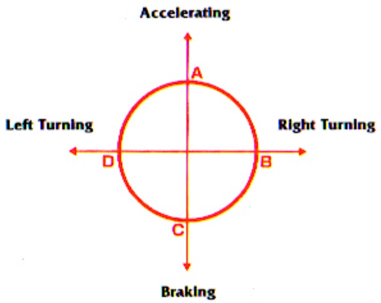
TIRES

Tires are a car's direct link to the road. No matter how powerful an engine or how superior a car's suspension may be, nothing else matters unless the tires are up to the challenge.

- The most important piece of equipment on a sports car is said to be its tires.

Whether it's accelerating, braking, or turning, all racing actions depend on the traction between a car's tires and the road. This traction (or friction) has two components, a straight-line component and a lateral component, illustrated by the friction circle on this page. The vertical line represents the friction associated with acceleration and deceleration; the horizontal line represents the friction of left and right turning.

If the forces acting on a car exceed the traction between the road and tires, the car will start slipping. This limit where slipping begins is represented by the friction circle. Everything within the circle is less than the car's limit.



When a car starts slipping, you'll hear familiar skidding sounds. Slight skidding noises indicate that the car is right at the limit of the friction circle. Loud skidding noises mean that the car's limits have been exceeded. Of course, to drive as fast as possible, you must be able to drive the car right to its friction limit.

- To brake in the shortest distance possible, you must use the tires' gripping ability all the way to point C. Any point within the circle does not take full advantage of the tires' traction capacity. Anything outside the circle induces slipping and potential tire locking, greatly increasing braking distance.

- If you exceed the car's turning ability, which is represented by the horizontal axis in the figure, the car may not respond to the steering wheel and may go into a spin.

It gets a little more difficult when discussing the areas of the friction circle which do not lie on the vertical or horizontal axis. This is because once you leave either of these axes, the forces acting on the tires become a combination of both acceleration/deceleration and turning.

Actions such as braking while turning right or accelerating while turning left are represented on the friction circle by areas that do not lie on the vertical or horizontal axis. Our previous example of applying the brakes to 100% of the tires' traction capacity took us to point C on the figure. If while braking we were to turn the car to the right just a little, we would now move from point C to a point still on the friction circle a bit closer to point B. Thus, our braking ability would decrease slightly while turning as opposed to braking without turning.

- If the friction circle represents 100% or our total traction capacity and we use 10% of that traction to turn right, then we would only have 90% traction available for braking.
- If we use 100% traction for braking, then 0% is available for turning. In other words, you would not be able to turn at all.
- If you want to turn slightly while braking, you must ease up on the brakes a little to avoid using them 100%. The same logic applies for turning while accelerating.

In race car driving, it is most common to accelerate/brake and turn in combination, thus creating a variety of forces on your tires. To drive as fast as possible, you must push your car continuously to its performance limit.

BASIC RULE

Always remember to use the tires' traction all the way to the edge of the friction circle.

BASIC DRIVING TECHNIQUES

WEIGHT TRANSFER

Now that we've impressed upon you the importance of pushing your tires to the edge of their performance envelope, you should know that this performance envelope is not always constant.

- The performance envelope will change continuously depending on road conditions, tire quality and driving technique.

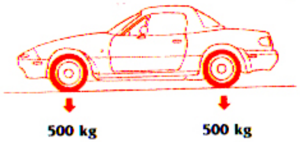
A simple example to illustrate this point is the difference in tire traction depending on the road conditions. There is a clear difference in traction on an asphalt road and on a dirt road, with the asphalt road providing a much larger friction circle. Even with the same asphalt road, the traction will change dramatically depending on whether it is dry or wet.

As for tire quality, sports tires provide much greater traction than normal tires. The size of a tire also affects traction, with a larger contact surface area between tire and road providing greater traction.

Driving techniques such as weight transfer also affect the tires' road gripping ability. A car's weight is supported by its four tires. If a car weighs 1000kg and its weight is distributed evenly between front and rear and left and right sides, then each tire supports 250kg. This of course only applies to a car at rest.

As a car begins to move, this weight distribution changes. For example, a car at rest viewed from the side will appear level. But once the car begins to accelerate, its tail will sink down. If the brakes are applied, the nose will dip. This is due to the weight transfer occurring in the car.

Even weight distribution at constant speed or at rest.



At rest, the front and rear tire sets each support 500kg. During acceleration, however, weight is transferred to the rear. If the load in the rear increases to 600kg, the load in front decreases to 400kg. This weight transfer can be felt when driving. If you step on the gas, your back gets pressed against the car seat. If you step on the brake, your body leans forward.

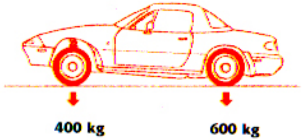
Depending on the weight transfer that occurs in a car, each tire's traction will change. As more weight is transferred to a tire, its traction also rises. To illustrate this example, think about a pencil eraser. The harder you rub it against a piece of paper, the greater the friction between the eraser and paper. If a car supporting 500kg on the front tires at rest decelerates so that the front load increases to 600kg, the traction of the front tires will rise accordingly. In terms of the tires' friction circle, think of the circle increasing in size. If the load in front increases 20% from 500kg to 600kg, then the surface area of the friction will also increase 20%.

By using the weight transfer that occurs in a moving car, you can do things like stabilize the car or drive faster.

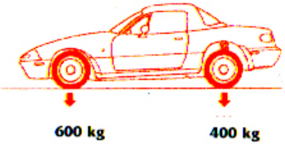
BASIC RULE

Always be aware of how much weight is being carried by each of the car's four tires.

Weight transfer to rear during acceleration.



Weight transfer to front during braking.



CORNERING

WEIGHT TRANSFER TECHNIQUES

The trick to driving fast in circuit racing and on winding roads is cornering. (For straightaways, all you need is to go full throttle in the correct gear.) This section discusses the quickest ways to enter and exit a corner connecting two straightaways.

- To corner as fast as possible, you must use weight transfer techniques while using 100% of the tires' traction.

ENTERING A CORNER

As you turn the steering wheel to enter a corner from a straightaway, the fastest way to enter the corner is to use the maximum traction available from the front tires. To raise the traction capacity of the front tires, use the brake to shift the weight of the car forward.

As you turn the steering wheel to enter a corner, apply the brakes lightly. If you stop braking before you turn the steering wheel, all the weight that had shifted forward during braking will shift to the rear again, thus reducing the traction of the front tires. It will take practice to get a feel for braking just the right amount.

BASIC RULE

When cornering, apply the brake while turning the steering wheel.

As was explained earlier using the friction circle, if you apply the brake too hard, all of the front tires' traction will be used to stop the car, leaving no traction for turning the car. You should use 100% of the tires' braking ability in the straightaway before the corner to slow the car down, and right at the end, with the brake still lightly pressed, you should begin to turn the steering wheel. This maneuver will take time to learn.

To repeat, you must not suddenly release the brake as you enter a turn, but instead you must apply light pressure to the brake pedal. If slamming the brakes were rated a 10, then the amount of pressure you need to apply during a turn is about a 3 or 4 (although this will depend on the situation). By keeping the brake lightly applied during a turn, the weight of the car remains shifted forward, which results in better front tire grip and hence an easier turn. Only after the car has turned sufficiently should you begin to release the brake and then accelerate to exit the corner.

If as you enter a turn you immediately spin out, this is due to either too much weight being shifted to the front or the car is traveling too fast. If there is too much weight transfer to the front, you must release the brake a bit sooner. If the car's speed is too fast, then you must begin applying the brake a bit sooner before entering the turn.

EXITING A CORNER

Once you enter a corner properly, the next step is to prepare to accelerate out of the turn into the straightaway. The trick here is how early you are able to begin accelerating. However, it isn't just a question of randomly going full throttle. You must employ weight transfer techniques to use 100% of your tires' traction capacity.

By entering a corner and turning, you destabilize the car. Another way of looking at it is that you are purposely creating a situation where the car is susceptible to spinning out. If you were to continue to keep the steering wheel turned, the car would most likely spin out. Right before the car begins to spin out, you want to stabilize the car and accelerate out of the corner.

The point where you would like to start accelerating is right about at the apex of the corner (explained in "Cornering Line" beginning on pg. 18) or just a little before it. The apex will depend on factors such as the size of the corner, as you'll read in the explanation.

So how do you stabilize a car that is just about to go into a spin? Since a spin occurs when the lateral force acting on the rear tires exceeds its traction capacity, you must increase the grip of the rear tires. This can be done by accelerating and shifting weight to the rear of the car. In other words, by stepping on the gas you can stabilize the car.

The difficult thing is knowing exactly how much to accelerate. This will depend on whether the car is rear-wheel or front-wheel drive. For rear-wheel drive, if you accelerate too much, the traction demanded in the straight-line direction on the rear tires will increase, resulting in the sum of the straight-line and lateral components exceeding 100% of the friction circle limit. This will cause the rear tires to slip and the car will instantly go into a spin. This maneuver requires getting a feel for how much weight is being shifted to the rear without overloading the rear tires' traction capacity. The best way to approach this is to accelerate lightly to shift the car's weight to the rear to stabilize the car, then gradually open the throttle to exit the corner as fast as possible.

Another mistake that beginners make is to accelerate too much without turning sufficiently, thus causing understeer and increasing the path the car takes through the corner. By not turning sufficiently, you will not destabilize the car enough, thus leaving plenty of traction available for the rear tires.

By accelerating at this time, you transmit the available traction in the straight-line direction. The car is able to accelerate quickly, shifting the weight to the rear, causing the front tires to lose their grip. Thus even though the steering wheel may be turned correctly, there is not enough traction on the front tires to turn properly, leading to understeer.

If this occurs, you must increase the time you have the steering wheel turned while applying the brake. If this doesn't work, this means that the entry speed into the corner is too slow. Increasing speed should make it easier to turn.

With front-wheel drive, even if you accelerate suddenly the car will not spin out. Because the increase in power will only lead to a loss of traction in the front tires, at worst this will only cause understeer. Therefore the most important factor for being able to exit a corner quickly with front-wheel drive is how to avoid understeer and open the throttle as much as possible.

The technique for turning into a corner and destabilizing a car is the same for front-wheel drive as rear-wheel drive. Lightly accelerating the car will re-stabilize the car. By returning the steering wheel to center in accordance with the degree of curve in the corner, you will slowly reduce the amount of lateral traction used in the front tires and continue to increase its straight-line traction.

In both front-wheel and rear-wheel drive, you will get 100% traction performance by always keeping in mind the distribution of a tire's lateral and straight-line traction components. If you are using nearly 100% of a tire's traction capacity, any sudden acceleration/braking or wheel turn will easily result in exceeding the tires' performance envelope.

BASIC RULE

When exiting a corner, the most important thing is to shift the car's weight to the tires that will require the most traction.

CORNERING LINE

ROUNDING A SIMPLE CORNER

The fundamental rule of cornering is said to be "out, in, out." This means to take as wide a turn as possible to cut down cornering time. A car should enter a corner from the far side of the lane, gradually edge towards the inside of the lane, and then exit the corner on the outside of the lane. The point at which the car comes closest to the inside of the lane is known as the apex.

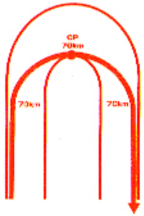
BASIC RULE

The apex must be as close as possible to the inside lane of the corner.

If you fail to fully reach the inside part of the lane, this will increase the distance you must travel and slow down your cornering time. If you are trying to direct the car to the inside but the car won't respond, this is probably a case of under-steer. Where should you try to apex when you enter a corner? The image you have in your head will determine the line you take.

Ordinarily, the wider the turn you make in a corner, the higher the cornering speed you will attain. For a simple corner as in figure A, the ideal cornering line will be a perfect circle. This will provide the fastest cornering time for the corner portion only.

Figure A

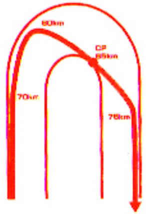


However, if you take into consideration trying to achieve the fastest lap time in a circuit race, it is advantageous to have a higher exiting speed from the corner as you head into a straightaway. An example of an often used cornering line is shown in figure B.

Although the illustration is a bit exaggerated, the entry turn into the corner is taken slowly to create a very tight turn. This allows the final half of the corner to be taken with a wider turn, enabling earlier acceleration. Compared to a cornering line that is a perfect circle, the exiting speed is higher for figure B.

A common term used in race car driving to signify a high exiting speed is "slow in, fast out." The apex here is a bit further along the corner than for figure A, and is the most effective means of creating a wide exiting line.

Figure B



CORNERING S TURNS

Emphasis on high exiting speeds pays dividends for **S** turns and multiple cornering. As shown in figure C, the unbroken line represents the line taken emphasizing a higher exiting speed, with each apex coming deeper into each corner. The dotted line represents the line in which the corner is taken at a perfect circle. It is clear to see that the unbroken line would produce higher exiting speeds around each corner.

It's important to always think ahead of the optimum cornering line to maximize the exiting speed for each corner. It is desirable to enter the second turn of a multiple-corner turn from the outside of the lane. To accomplish this, the first corner must be taken with a sharp turn, otherwise the car will drift to the outside.

It is also important not to gather too much speed around the first corner, to enable the car to remain on the furthest left-hand side of the lane as it enters the second corner.

Figure C

BASIC RULE

Always plan on how you will set yourself up for the following corner.

BASIC DRIVING TECHNIQUES

ADVANCED TECHNIQUES

INDUCING DRIFT

Inducing drift with tires sliding across the road not only looks good, but for the driver there is no better feeling. The basics of inducing drift start with mastering weight transfer, the technique common to all race car driving skills. If you want to drive as fast as you can and look cool doing it, you'll want to learn how to induce drift.

To drive as fast as possible, you must get the most performance out of your tires and master the technique of weight transfer. The basics of inducing the drift maneuver are based on the same principles. Sliding the rear tires while staying in control not only looks awesome, there is no greater thrill for the driver.

Allowing the rear tires to go into a slide is oversteer. If the rear tires slide too much, the car spins out. Drift is that state where the car is manipulated with the steering wheel and throttle to continuously maintain a state of oversteer.

As was described in an earlier section, when the lateral and straight-line force components acting on a tire exceed the tires' traction capacity, the tire suddenly loses its grip on the road. However, if the traction capacity is exceeded by only a small margin, the car will not spin and the driver can still maintain control.

Although it is difficult to express accurately in numbers, if the force components are approximately 101% or 102% of the traction capacity, the driver will still be able to maintain some control without the car going into a spin. If the force exceeds 105%, maintaining control becomes exceedingly difficult. The driver can control the car in this situation by using the throttle to adjust the straight-line and lateral components of the tires' traction. In other words, while the car is in a state of oversteer, the driver can control the car to further induce oversteer or conversely, slowly correct the oversteer while still moving forward.

The driver can continuously adjust the tires' traction to dip to about 98% or exceed 100% while still maintaining control of the car. If weight transfer techniques are employed with skilled handling, controlling oversteer will become a snap, allowing you to induce beautiful drifts.

THE FIRST STEP: SLIDING

The first step in inducing drift is to purposely oversteer the car. Unless you are able to make the rear tires go into a slide, inducing drift is impossible. The best place to practice is a wide open area, preferably on a road surface with a low friction coefficient, such as a dirt road or wet surface. This will make it easier to slide the tires and will cause less wear and tear on the car and tires.

The easiest car to practice with is a rear-wheel drive car. The same techniques are used for mid-engine/rear-wheel drive cars, but control is a bit trickier. This discussion will continue based on a rear-wheel drive car.

The easiest way to slide the rear tires is from a stopped position. Turn the steering wheel all the way to the left or right and floor the accelerator to get a quick start. The power transmitted to the rear tires will exceed the straight-line traction capacity of the tires. Because the steering wheel is turned, the rear tires will also lose their lateral traction, causing the car to move opposite the direction in which the steering wheel is turned. This is the first step in mastering the technique of using the throttle to exceed the traction capacity of a tire.

Once the car starts moving in the opposite direction, you'll probably naturally turn the steering wheel the other way to counter this effect. By repeating this process a number of times, you'll get the feel for exactly when and how much a car will start sliding. You will then develop the skill of knowing when to counter-steer before the car goes out of control.

You've created oversteer from a stopped position. Now you'll do it while moving, starting at a very slow speed such as 10 or 20km/h. Turn the steering wheel and open the throttle suddenly. If you're driving a manual transmission, release the clutch, rev the engine, and engage the clutch again. This type of rough handling will make inducing tire spin easier.

Drift becomes a little more apparent now that the car is moving. If the car is traveling too fast, it will be harder to make the tires slide. By now you've probably gotten the feel for how to purposely create oversteer and make the car drift.

ADVANCED TECHNIQUES

SPIN TURN

Now you're going to practice using the parking brake to do a spin turn. Up until now, you've practiced creating oversteer by traveling at low speeds and then accelerating suddenly. Now you'll drive at high speed and brake, creating oversteer while still cornering smoothly. The easiest way to practice is to set up some pylons or other non-damaging object as a target point for the spin turn.

The first step is to practice a 180-degree turn using a pylon. Accelerate toward the pylon, then brake as you approach it. As the weight shifts to the front, begin turning the steering wheel as if to enter a corner.

As the car begins to turn, pull the parking brake swiftly with force. This should make the rear tires go into a slide. By pulling the parking brake, the rear tires will lock up, thus exceeding the tires' traction capacity. Lateral traction is also lost, inducing slip. When pulling the parking brake, you must disengage the clutch, otherwise the tires will not lock and the engine will stall.

As the rear tires begin to slide, engage the clutch and open the throttle. This will make the rear tires slip using the throttle. With this combination, the car will turn 180 degrees. As the rear tire traction slowly returns and you accelerate out of it, you've done your first spin turn. Of course this isn't as easy as it sounds, so you'll have to get the hang of it through practice.

If you're not able to make the rear tires slide with the parking brake as you enter the turn, this means that the rear tires are not locking. This is either because of a lack of weight shifted forward, or just bad timing. Make sure that enough of the car's weight has shifted forward and the car has started turning sufficiently before you pull the parking brake. Even small 1600-cc engine cars weigh about 1000kg, so it will take a little bit of time before the car actually starts turning.

Although at first you may get nervous and do things too quickly, after a while you'll get used to it and notice that you can perform the maneuver in a smooth, coordinated manner. Make sure you time the parking brake just right, and make sure you keep it engaged long enough. Experiment also with your entry speed, making sure that you are traveling fast enough. With practice you're sure to get this move down pat.

It's important to address problems with using the throttle. If the oversteer doesn't continue long enough and you're unable to turn, it's probably due to bad timing. You've got to allow the car to turn sufficiently before opening the throttle. If the car goes into understeer, this means that the rear tire traction has been restored and the car is trying to move forward. In this situation you need to open the throttle more to create slippage in the rear.

If your car goes into a spin, this means you're at the doorstep of a successful spin turn. All you need to do is slightly adjust your actions. The combination of creating slip with the parking brake and throttle is a delicate and important one.

As you get accustomed to these maneuvers, you'll be able to combine them to do things like compensate for insufficient parking brake slip with added acceleration slip, and vice versa. You'll also naturally get accustomed to turning the steering wheel one way and then the other quickly to produce the desired effects on the car. After you get comfortable with the different techniques, doing a spin turn around a pylon will become easy. You can use the same techniques to do a 360-degree turn.

BRAKING DRIFT

When you think about it, using the parking brake to make the rear tires slide is a pretty drastic maneuver. Another technique that resembles this is called shift locking. Here, the driver purposely downshifts and engages the clutch at a very high RPM, thereby locking the rear tires.

This technique may be difficult to use for a 180-degree turn around a pylon, but for cornering at higher speeds where you can use 2nd or 3rd gear, it becomes easier to employ. It becomes quite obvious that drivers attacking corners at the highest speeds will easily spin out if they're not careful. Basically, the faster you travel, the easier it is for the rear tires to slip. Applying only the slightest of pressure with the parking brake at the right time in a corner can cause the car to go into oversteer.

Although it's easy to start sliding at high speeds, it's the quickness and precision of the subsequent counter-steering and throttle work that determine a successful drift. As the car's speed increases, it becomes exponentially more difficult to control sliding. That's why it's a good idea to master the basics with repeated practice of pylon spin turns.

If you thought using the parking brake or downshifting to cause drift was difficult, you're now about to enter another dimension of difficulty with braking drift. Only the brake is used here to cause weight transfer and subsequent rear tire slip. In order to induce slip in the rear, there must be ample speed in cornering and the appropriate amount of weight transfer. The trick is to apply the brake gently for an extended period.

As was described earlier, the car takes a certain amount of time to react to any action, so it pays to be patient. As weight is shifted from the rear to the front and the rear tire traction cannot overcome the centrifugal force acting on it, the tires begin to slip. To prolong this slip, open the throttle a generous amount.

For high speed cornering, the throttle is used to transfer weight to the rear and stabilize the car. The acceleration here obviously must exceed that amount. Drift is maintained by controlling the throttle and the steering wheel. When you're drifting, it feels as if the car is sliding laterally while maintaining forward progress. Add skillful counter-steering to prolong the sliding and you've got yourself one powerful drift!

FAINT MOTION

Let's say you're riding a bicycle. Before turning to your left, for example, you would first lightly turn to the right before swinging into the left turn. This slight lean in the opposite direction makes turning easier.

The same holds true for cars. By first transferring weight to the right side of the car, the force of this weight naturally returning to center is used to help make the left turn. This technique is called faint motion, and is used to obtain the highest speeds in **S** turns and rally racing where there is low road traction and the front tires slip easily.

Faint motion can also be used for drift. To maintain drift at high speeds, instead of using the parking brake or downshift locking, or when only brake drifting is insufficient, faint motion can provide a good alternative. Upon entering a corner, first turn the steering wheel in the opposite direction of the corner, then quickly turn the steering wheel into the corner. Using this technique repeatedly, you can sustain drift even in straightaways.

As your skill level rises and you are able to combine various techniques, you'll be able to produce a number of different types of drift. All that remains is how much you're able to excite the fans in the stands.

THE ULTIMATE: INERTIAL DRIFT

If you're now able to induce both braking drift and faint motion drift, then there's no question that you've got some driving skills. And although being able to show fans in the gallery a cool counter-steering move or a long controlled slide is part of the fun, the true test of your skill as a master drifter lies in the ability to pull off inertial drift.

What is inertial drift? It's where you don't use any of the techniques described previously. Instead, you enter a corner at high speed, exceeding the lateral traction capacity of the rear tires and causing them to naturally slide laterally while still maintaining control of the car.

In addition, not only does the car slide laterally, but by controlling the throttle you must keep the car moving forward to maintain its cornering speed. Ideally, the steering wheel will be slightly counter to the direction of the corner, so even while the car is cornering, the steering wheel remains near center. If you can master this maneuver, you're truly cornering at the highest speeds possible.

Inertial drift is not only beautiful in its technique, but is also the fastest way to corner, thus combining two important aspects of race car driving.

How do you induce inertial drift? Enter mid to high speed corners at the highest speed possible, bordering on going too fast. If the car goes into understeer, you must work on turning the car earlier.

Once you've sufficiently turned the car, you need to use the throttle to barely exceed the tires' traction capacity and increase the cornering speed. You don't want to floor the accelerator to create oversteer. Instead, you want to accelerate slightly to create centrifugal force just great enough to exceed the tires' traction capacity so that both the front and rear of the car start sliding.

You should have the steering wheel in a slight counter-steer position as you use the throttle to keep the car moving forward with all four tires sliding. This is the best way to reach the highest speeds around a corner.

Because you will be traveling at very high speeds during inertial drift, having the proper mindset is very important to mastering this maneuver. As you round the corner and prepare to exit, keep your line of vision set far ahead of you with the determination to make it through to the end of the corner while maintaining control. The only way to develop the confidence to complete the turn without losing control is through repeated practice.

As you become more familiar with drifting, you will realize that this is the only method available to truly reach the highest cornering speeds possible. What this means is that to become a truly fast race car driver, you too must master the technique of drifting.

UNDERSTEER AND OVERSTEER

If you're turning the steering wheel but the car won't turn in that direction, this is due to **understeer.** If you turn the steering wheel and the car turns more than you expect it to, in other words it spins out, this is **oversteer.** Neutral steer is the condition where neither understeer nor oversteer is evident. Ability to stay in neutral steer will inevitably lead to fast cornering times. This section discusses why your car is going into understeer or oversteer and what you can do to remedy the situation.

ONE

Q: I've heard that skilled drivers will enter a corner at 60km/h, so I tried cornering at the same speed. But when I turn the steering wheel, the car doesn't turn.

A: This is probably due to insufficient weight transfer. When you apply the brake, the car's weight will shift forward, increasing the traction of the front tires. If you turn the car with the weight shifted forward, the car should turn. Even though you may be traveling at the same speed of 60km/h, there is a big difference in turning ability depending on whether the car's weight is shifted forward or not. If you find yourself in understeer, the safest countermeasure is to relax without applying the brake or throttle. As the front tires begin to regain traction, the car should begin to turn properly.

TWO

Q: I turn the steering wheel while applying the brake just like it says in the manual, but the car doesn't turn.

A: Unlike situation ONE, if the car is understeering even if you are applying the brake while turning the steering wheel, this means that you are applying too much pressure to the brake pedal. Most of the tires' traction capacity is used in the forward direction, leaving insufficient traction laterally to turn the car. As you are turning the steering wheel, you need to lighten up on the brake. Most likely you are also entering the corner too fast. Give yourself a little more breathing room and apply the brake a little earlier. This should lead to more positive results. If you're already deep into the corner and the car is understeering, it's best to take your foot completely off the brake. If you keep pressure on the brake with the tires locked, the car will just continue to move forward. It might be a little scary, but gather some courage and release the brake to lower the traction used in the forward direction to less than 100%. This will enable the car to gain some lateral traction to make the turn. The car should now stop moving forward and start turning. If you're driving a front-wheel drive car, the engine will stall if the front tires lock up. In this situation, even if you release the brake, the tires may not unlock. When you disengage the clutch and then re-engage it, the tires should unlock and the engine should restart. There is a chance that this may not work if the road is wet, in which case you need to disengage the clutch and turn the engine over to restart it.

THREE

Q: I opened the throttle as I was getting ready to exit the corner, but the car just veered to the outside.

A: This problem was discussed in the section on exiting corners. For both front-wheel and rear-wheel drive, if the car understeers when you accelerate, the best remedy is to release the throttle. As the weight which had been transferred to the rear shifts forward, the steering wheel should begin responding again. However if the car decelerates too quickly, the rear tires may lose too much traction and slip, which will cause the car to go into a spin. The moral is to release the throttle not suddenly but slowly.

FOUR

Q: For some reason, I'm not able to turn and approach the apex of the turn. My tires are not slipping either.

A: If your tires still have not reached their traction capacity and the car is not turning enough, the problem is simply that you need to turn the steering wheel more. This is a common problem for beginners, but it also happens to advanced drivers when they get nervous and fail to turn the wheel sufficiently because of a loose grip. The best advice is to get a feel for your surroundings, settle down, and assume good driving posture.

FIVE

Q: I spin out as I start to enter a corner.

A: This is due to excessive weight being shifted to the front of the car, resulting in oversteer. One way to remedy this is to turn the steering wheel in the direction opposite of the turn, in other words, counter-steer. When oversteer occurs, the rear tires are traveling outside of the path taken by the front tires. Counter-steering compensates for this by turning the front tires to the outside as well. Although people will instinctively counter-steer when oversteer occurs, this move won't be mastered properly without plenty of practice. If the counter-steer is applied too long, as soon as the rear tires regain their traction the car will start moving in the opposite direction of the corner. The car will be traveling very fast, so this will make restoring the car in the right direction even more difficult. Counter-steer should be applied quickly and in the right amount. As soon as the car has recovered, the steering wheel must be returned. Getting the feel for this will simply require time and practice. During counter-steer, the throttle must be manipulated simultaneously. To increase the traction of the rear tires, the throttle must be opened to transfer weight to the rear. As described earlier in this manual, for rear-wheel drive cars, it is important that the throttle be opened gently, or else the traction capacity of the rear tires will be exceeded, causing the car to go into a spin. For front-wheel drive cars, however, it's preferable to open the throttle as much as possible to re-stabilize the car quickly.

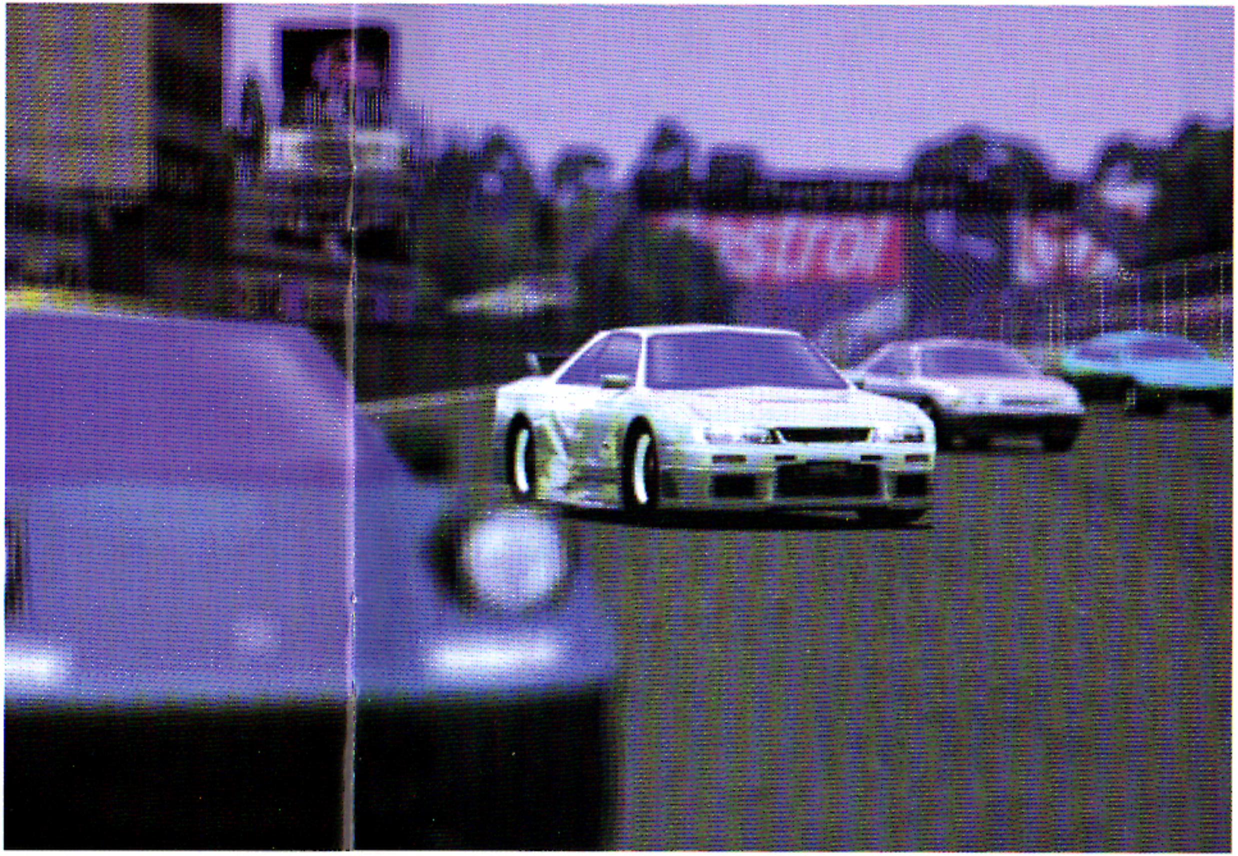
SIX

Q: I was rounding a long corner without any problems when the rear tires started to slide.

A: If it's not a case of the throttle being opened too much on a rear-wheel drive car, then it's probably because the car's cornering speed is too fast. The centrifugal force acting on the car will exceed the lateral traction capacity of the rear tires, causing them to slide. You could say your driving is a bit too aggressive. If you can solve this with a bit of counter-steer, then you're close to the fastest cornering speed possible. If you must counter-steer for a long time or if the car spins out, then this is clearly a case of over-steer. Slow down a little bit and see if that isn't the perfect speed for that corner. Try the tips in problem FIVE as well. The one thing to avoid is to tense up and suddenly take your foot off the accelerator. If this happens, the weight transferred to the rear will shift forward, causing the rear tires to lose traction and the car to spin out instantly.

NOTES

CAR MODELS



Name	Grade	HP	RPM (HP)	Lb. Ft.	RPM (Lb. Ft.)	Drive Train	Class
TOYOTA							
Starlet	Glanza V	133	6400	116	4800	FF	C
Corolla Levin	BZG	163	7800	119	5600	FF	C
Sprinter Trueno	BZG	163	7800	119	5600	FF	C
Corona Exiv	200GT	177	7000	141	4800	FF	C
Celica	SS-II	177	7000	141	4800	FF	C
Celica	GT-FOUR	251	6000	224	4000	4WD	A
Mark II '92	Tourer V	276	6200	268	4800	FR	A
Mark II '92	Tourer S	177	6000	174	4800	FR	B
Chaser	Tourer V	276	6200	278	2400	FR	A
Chaser	Tourer S	197	6000	188	4000	FR	B
Soarer '95	2.5GT-T	276	6200	268	4800	FR	B
Soarer	2.5GT-T VVT-i	276	6200	278	2400	FR	B
MR2	G-Limited	177	7000	141	4800	MR	B
MR2	GT-S	242	6000	224	4000	MR	A
Supra '95	SZ-R	222	6000	210	4800	FR	B
Supra '95	RZ	276	5600	318	3600	FR	A
Supra	SZ-R	222	6000	210	4800	FR	B
Supra	RZ	276	5600	318	3600	FR	A
MA70 Supra	GT Turbo Limited	237	5600	253	3200	FR	B
JZA70 Supra	Twin Turbo-R	276	6200	268	4800	FR	A
AE86 Corolla Levin	GT-APEX	128	6600	110	5200	FR	C
AE86 Sprinter Trueno	GT-APEX	128	6600	110	5200	FR	C
Castrol Supra	GT	656	6800	512	6800	FR	—
NISSAN							
Fairlady Z	Version S 2by2	227	6400	201	4800	FR	B
Fairlady Z	Version S Twin Turbo 2by2	276	6400	286	3600	FR	A
Fairlady Z	Version S 2seater	227	6400	201	4800	FR	B

Name	Grade	HP	RPM (HP)	Lb. Ft.	RPM (Lb. Ft.)	Drive Train	Class
Fairlady Z	Version S Twin Turbo 2seater	276	6400	286	3600	FR	A
R32 Skyline '89	GT-R	276	6800	260	4400	4WD	A
R32 Skyline '91	GT-R	276	6800	260	4400	4WD	A
R32 Skyline	GT-R Vspec	276	6800	260	4400	4WD	A
R32 Skyline	GT-R Vspec II	276	6800	260	4400	4WD	A
R32 Skyline	GT-R NISMO	276	6800	260	4400	4WD	A
R32 Skyline	GTS-t Type M	212	6400	195	3200	FR	B
R32 Skyline	GTS25 Type S	187	6400	170	4800	FR	C
R32 Skyline	GTS4	247	6400	195	3200	4WD	B
R33 Skyline	GTS25t Type M	249	6400	217	4800	FR	B
R33 Skyline '95	GT-R	276	6800	271	4400	4WD	A
R33 Skyline '95	GT-R Vspec	276	6800	271	4400	4WD	A
R33 Skyline	GT-R	276	6800	271	4400	4WD	A
R33 Skyline	GT-R Vspec	276	6800	271	4400	4WD	A
S14 Silvia	Q'S	158	6400	139	4800	FR	C
S14 Silvia	K's	217	6000	203	4800	FR	B
S14 Silvia '95	Q's	158	6400	139	4800	FR	C
S14 Silvia '95	K's	217	6000	203	4800	FR	B
S13 Silvia '91	Q's 2000cc	138	6400	132	4800	FR	C
S13 Silvia '91	K's 2000cc	202	6000	203	4000	FR	B
S13 Silvia '88	Q's 1800cc	133	6400	117	5200	FR	C
S13 Silvia '88	K's 1800cc	173	6400	166	4000	FR	B
Primera '90	2.0Te	148	6400	137	4800	FF	C
Primera '95	2.0Te	148	6400	137	4800	FF	C
180SX '95	Type X	202	6000	203	4000	FR	B
180SX	Type X	202	6000	203	4000	FR	B
180SX	Type S	138	6400	132	4800	FR	C
Pulsar '91	GTI-R	227	6400	210	4800	4WD	B
Nismo	GT-R LM	661	7600	467	7100	FR	—

Name	Grade	HP	RPM (HP)	Lb. Ft.	RPM (Lb. Ft.)	Drive Train	Class
MITSUBISHI							
GTO '92	SR	222	6000	203	4500	4WD	B
GTO '92	Twin Turbo	276	6000	315	2500	4WD	A
GTO '95	SR	222	6000	203	4500	4WD	B
GTO '95	Twin Turbo	276	6000	315	2500	4WD	A
GTO '95	MR	276	6000	315	2500	4WD	A
GTO	SR	222	6000	203	4500	4WD	B
GTO	Twin Turbo	276	6000	315	2500	4WD	A
Galant	VR-G Touring	148	6500	132	5000	FF	C
Galant	VR-4	276	5500	268	4000	4WD	B
Eclipse	GT	227	6000	213	2500	FF	B
FTO '94	GR	168	7000	137	4000	FF	C
FTO '94	GPX	197	7500	148	6000	FF	B
FTO	GR	177	7000	141	4000	FF	C
FTO	GPX	197	7500	148	6000	FF	B
FTO	GP Version R	197	7500	148	6000	FF	B
Lancer	EvolutionIII GSR	266	6250	228	3000	4WD	A
Lancer	EvolutionIV GSR	276	6500	260	3000	4WD	A
Mirage	Asti RX	173	7500	123	7000	FF	C
Mirage '92	Cyborg R	173	7500	123	7000	FF	C
GTO	LM Edition	613	7000	467	6500	4WD	—
HONDA							
Prelude '93	Si	160	6000	156	5000	FF	C
Prelude '93	VTEC	190	6800	158	5500	FF	B
Prelude	———	195	6800	156	5500	FF	B
Prelude	SH	195	7200	156	6500	FF	B
Civic	Sedan	127	7800	107	7300	FF	C
Civic	3-Door	106	7800	103	7300	FF	C
Civic	(Racer)	182	8200	118	7500	FF	C

Name	Grade	HP	RPM (HP)	Lb. Ft.	RPM (Lb. Ft.)	Drive Train	Class
del Sol '93	S	102	6800	98	5200	FF	C
del Sol '93	Si	125	7800	106	7300	FF	C
Civic '91	CR-X Si	108	7600	100	7000	FF	C
Civic 93	3-Door	125	7800	106	7300	FF	C
Civic 93	Sedan	125	7800	106	7300	FF	C
Accord	Sedan	170	6800	165	5500	FF	C
Accord	Wagon	145	6800	147	5500	FF	C
ACURA							
NSX '91	———	270	7300	210	5400	MR	A
NSX '93	———	270	7300	210	5400	MR	A
NSX	———	290	7300	224	5300	MR	A
NSX	Type S	276	7300	224	5300	MR	A
NSX	Type S Zero	276	7300	224	5300	MR	A
Integra	GS-R	170	7600	128	6200	FF	B
Integra	Type R	195	8000	130	7500	FF	B
NSX-R	LM GT2	626	8200	405	8200	MR	—
MAZDA							
Eunos Cosmo	13B Type-S CCS	227	6500	217	3500	FR	B
Eunos Cosmo	20B Type-E CCS	276	6500	297	3000	FR	B
Lantis	Coupe 2000 Type-R	168	7000	132	5500	FF	C
Eunos Roadster '89	NORMAL	118	6500	101	5500	FR	C
Eunos Roadster '90	V-SPECIAL	118	6500	101	5500	FR	C
Eunos roadster '92	S-SPECIAL	118	6500	101	5500	FR	C
Eunos Roadster	NORMAL	128	6500	116	4500	FR	C
Eunos Roadster	V-SPECIAL	128	6500	116	4500	FR	C
Eunos Roadster	S-SPECIAL	128	6500	116	4500	FR	C
FD Efini RX-7 '91	Type R	261	6500	217	5000	FR	A
FD Efini RX-7	Type RZ	261	6500	217	5000	FR	A

Name	Grade	HP	RPM (HP)	Lb. Ft.	RPM (Lb. Ft.)	Drive Train	Class
FD Efini RX-7	Type RB	261	6500	217	5000	FR	A
FD Efini RX-7	Touring X	261	6500	217	5000	FR	A
FD Efini RX-7	A spec	261	6500	217	5000	FR	A
FC Savanna RX-7	GT-X	202	6500	199	3500	FR	B
FC Savanna RX-7	Efini III	212	6500	203	4000	FR	B
Demio	GL-X	99	6000	94	4500	FF	C
Demio	GL	99	6000	94	4500	FF	C
Demio	LX G Package	82	6000	80	4000	FF	C
RX-7	LM Edition	597	7600	416	7600	FR	—
SUBARU							
Alcyone	SVX Version L	237	6000	228	4800	4WD	B
Alcyone	SVX S4	237	6000	228	4800	4WD	B
Legacy	Touring Sedan RS	276	6500	250	5000	4WD	A
Legacy	Touring Wagon GT-B	276	6500	250	5000	4WD	A
Legacy '93	Touring Sport RS	247	6500	228	5000	4WD	A
Legacy '93	Touring Wagon GT	247	6500	228	5000	4WD	A
Impreza	WRX-STi Type R	276	6500	253	4000	4WD	A
Impreza '96	Sedan WRX	276	6500	242	4000	4WD	A
Impreza '96	Sedan WRX-STi ver. III	276	6500	253	4000	4WD	A
Impreza '96	Wagon WRX	237	6000	224	4000	4WD	A
Impreza '96	Wagon WRX-STi ver. III	276	6500	253	4000	4WD	A
Impreza '95	Sedan WRX-STi ver. II	256	6500	228	5000	4WD	A
Impreza '95	Wagon WRX-STi ver. II	256	6500	228	5000	4WD	A
Impreza '94	Sedan WRX	217	6000	206	3500	4WD	A
Impreza '94	Wagon WRX	256	6500	228	5000	4WD	A
Impreza	Rally Edition	585	7600	410	7100	4WD	—

Name	Grade	HP	RPM (HP)	Lb. Ft.	RPM (Lb. Ft.)	Drive Train	Class
ASTON MARTIN							
DB7	Coupe	335	6000	266	3000	FR	A
DB7	Volante	335	6000	362	3000	FR	A
DODGE							
Viper	RT/10	450	5200	491	3700	FR	A
Viper	GTS	450	5200	491	3700	FR	A
Concept Car	———	220	6000	—	—	FR	A
CHEVROLET							
Corvette '96	Grand Sport	330	5800	341	4500	FR	A
Corvette '96	Coupe	330	5800	341	4500	FR	A
Camaro	Z28	285	5200	325	2400	FR	A
TVR							
Cerbera	———	350	6500	320	4500	FR	A
Griffith	500	340	5500	351	4000	FR	A
Griffith Blackpool	B340	335	5500	365	4000	FR	A

MODIFICATIONS

MODIFICATION PARTS

MUFFLER AND AIR FILTER

Sports Muffler and Air Filter

Consists of a genuine sports-type air filter and sports muffler. This pair works well with turbo engines. It's great for beginners new to turbo tuning. In normally aspirated engines, torque at low RPM may become a bit weak, but torque output will be improved at high RPM.

Semi-Racing Muffler and Air Filter

Combination of a competition air cleaner with polyurethane sponge filter and high-performance muffler with low friction exhaust that works most efficiently at high RPM. This is best suited for high-output turbo engines. For use in normally aspirated engines, the engine will require appropriate tuning to accommodate this muffler and air filter combination.

Racing Muffler and Air Filter

This air filter is designed specifically for racing with an air funnel featuring a higher intake efficiency than the semi-racing air filter. The straight muffler is designed for race cars running at high RPM. This is best suited for engines tuned for peak performance. Torque will drop off considerably at low RPM, so this set must be used with the engine specifications and gear ratio carefully considered.

BRAKE

Sports Brake Pad

Carbon metallic brake pads provide stable stopping power even during extended racing. Initial stopping power and non-fade characteristics are much better than those of normal brake pads. These brake pads can be used for endurance racing.

Brake Balance Controller

This special part controls the anti-lock braking system, and can be used to adjust the balance of the braking power distributed between the front and rear brakes. By strengthening the front brakes, this part gives the car a tendency to understeer. By strengthening the rear brakes, this part results in a tendency to oversteer. If the rear brakes are strengthened too much, the car will tend to spin out easily.

COMPUTER

ROM Tuning

By providing elementary tuning, ROM tuning allows you to revise the program of the engine management system, adjusting such components as the engine ignition timing and air-to-fuel mixture ratio to achieve greater power. After replacement of the air filter and muffler, this computer can help beginners complete a basic tuning of turbo-engine cars.

TUNING NORMALLY ASPIRATED ENGINES (NA TUNING)

Normally Aspirated Engine Tuning I

Adjustment of the ignition timing and valve timing, and increase of the compression ratio by thinning of the gaskets results in increased power for normally aspirated engines. The exhaust manifold must be replaced to accommodate these adjustments. This will increase high-end power while maintaining low-end torque.

Normally Aspirated Engine Tuning II

Higher compression ratios are obtained with high compression pistons and re-formed head surfaces. Other changes include a new camshaft and strengthened valve springs, resulting in even higher output than in stage I tuning. Although low-end torque will decrease a bit, the increase in high-end power will be significant. The engine management computer must be reset to accommodate these new specifications.

Normally Aspirated Engine Tuning III

In addition to the adjustments of stage II tuning, the weight of the valve system is reduced significantly. The pistons, cam, valves, connection rod, and springs are replaced with higher quality material designed for high RPM. The cam is designed specifically for racing with high lift and valve overlap characteristics. The compression ratio is increased to its absolute limit. Because this tuning is geared for maximum power, the characteristics of the power band are optimized only for mid to high RPM.

Port Polishing

The inner surface of the intake port is finely ground down to reduce air flow resistance and increase engine response. Although the power increase will be relatively small, this is considered a necessary adjustment for a normally aspirated engine.

Increasing Displacement

The cylinder bore diameter is widened and the crankshaft and connecting rod are adjusted to increase the stroke displacement, resulting in increased exhaust volume. This will lead to greater torque at all RPMs.

Engine Balancing

Engine friction is reduced by balancing the pistons and connecting rod and using a high-precision, fully-balanced crankshaft, resulting in higher revving and increased power. The RPM limiter is reset.

GEAR BOX

Close Ratio Transmission

The gear ratios from 1st gear to 5th gear are very close together. This replaces a normal transmission and its assembly. Rounding various types of corners while still maintaining a broad power band becomes possible with this transmission. It is particularly recommended for normally aspirated engines.

Super Close Ratio Transmission
The gear ratios here are even closer than in the close ratio transmission. This modification is best suited for cars customized with a very narrow power band. Be aware that this transmission will demand constant shifting up and down. For engines with powerful torque characteristics, this type of transmission may not be ideal when considering the power loss that occurs when shifting up.

Racing Support
This service replaces all of the current gears with racing-designed gears, including the final gear. Gear ratios can be adjusted precisely for specific cars and race courses.

CLUTCH

High-Capacity Single-Plate Clutch
With this clutch, shifting gears will feel different than with a normal clutch. When shifting up, there will be a much more direct feel to the gear change.

Twin-Plate Clutch
Featuring twin plates, this clutch kit is designed for high-torque high-power cars built for racing. Slippage during up shifting is reduced, resulting in better acceleration.

Triple-Plate Clutch
With three clutch plates, this clutch kit features better torque transmission and an even more direct feel during gear changes. It is best suited for the highest-performance engines.

FLYWHEEL

Sports-Type Lightweight Flywheel
This flywheel is constructed from chrome molybdenum for light weight. As a result, the engine will run easier and acceleration will also improve slightly. Beware that engines with weak torque characteristics may stall going up inclines.

Semi-Racing Flywheel
This flywheel is even lighter than the sport-type flywheel. The engine will run even easier, and acceleration will improve slightly. Beware that engines with weak torque characteristics may stall going up inclines.

Racing Flywheel
This is an ultra-lightweight flywheel designed specifically for racing. Engine response and RPM falloff both become very pronounced. Beware that engines with weak torque characteristics may stall going up inclines.

DRIVE SHAFT

Carbon Drive Shaft
This is a lightweight drive shaft made from carbon composite materials. Because the drive shaft is situated between the differential gears and engine, it has about as much influence on car acceleration as the flywheel. This carbon drive shaft will improve acceleration characteristics.

INTERCOOLER

Sports Intercooler
This air-cooled intercooler reduces the temperature of intake air compressed by the turbo charger. Even with the same turbo booster pressure, by reducing the intake air temperature, the power output will increase proportionally with the reduction in volume of the cooled air. This is a required modification for turbo engines.

Racing High-Capacity Intercooler
This part lowers the temperature of the intake air in the turbo booster, thus increasing power. As the capacity of the intercooler increases, the ability to reduce the intake air temperature also increases, but in turn the engine response time becomes slower. This high-capacity racing intercooler is best suited for engines with high maximum booster pressure.

TURBO KIT

Turbine Kit I
This turbine kit uses a high-flow compact turbine that will increase high-end power without sacrificing torque at low to mid RPM. Turbo lag is minimal, making this a well-balanced modification suitable for all race courses. This kit includes metal gaskets, oil cooler, heavy duty oil pump, and other high-endurance parts.

Turbine Kit II
This turbine kit combines peak power at high RPM while delivering balanced performance at low to mid RPM. Compared to turbine kit I, low-end torque will be a bit weaker, but from mid to high RPM the power output will be substantial. In addition to high-endurance parts such as metal gaskets, oil cooler, and heavy duty oil pump, this kit includes a fuel pump, injector, and computer.

Turbine Kit III
This turbine kit focuses on peak power delivery for 0 to 400 meter acceleration. Compared to turbine kit II, the power band shifts up toward high RPM. This turbine kit is best paired with a close ratio transmission. To get the most out of this turbine, the camshaft is also replaced. In addition to high-endurance parts such as metal gaskets, oil cooler, and heavy duty oil pump, this kit also includes a fuel pump, injector, and computer.

Turbine Kit IV
This is a large-size turbine kit designed specifically for maximum horsepower output at high RPM. It is particularly suited for races like the Maximum Speed Challenge. To get the most out of this turbine, the camshaft is also replaced. In addition to high-endurance parts such as metal gaskets, oil cooler, and heavy duty oil pump, this kit also includes a fuel pump, injector, and computer.

MODIFICATIONS

SUSPENSION

Sports Suspension Kit

Easy to handle even for beginners, this suspension kit can be used anywhere from the street to the race circuit. The front and rear shock absorbers can be adjusted to three different settings. The camber angle can also be adjusted. This kit features multi-chamber low-pressure gas shock absorbers, with three adjustable settings.

Semi-Racing Suspension Kit

This highly adjustable suspension kit is recommended for intermediate drivers. Compared to the normal setting on the sports suspension, this kit features much harder settings for the spring rate and shock damping. Car height in both front and rear can be adjusted to millimeter units. The damping adjustment has five settings. The camber angle is also adjustable. This kit uses a single-chamber high-pressure gas shock absorber.

Racing Support

Not only can the car height and damping setting be adjusted, but the spring rate can also be adjusted to any desired specification, making this service strictly suited for racing. All aspects of the suspension can be adjusted.

STABILIZERS

Street-Use Heavy-Duty Stabilizers (Soft)

This stabilizer is designed to reduce roll (lateral shaking) of the car. Roll can be controlled independent of the car's pitching characteristics. Used effectively, this stabilizer can reduce lateral weight transfer without reducing weight transfer in the straight-line direction. Stabilizer bars are available separately for front and rear.

Racing Stabilizers (Medium)

This stabilizer is comprised of a torsion bar spring to reduce car roll. Normally as the spring rate is increased to harden the suspension, not only will the lateral roll decrease but so will the straight-line pitch characteristics, making weight transfer difficult during braking. This stabilizer will reduce only the lateral roll. The setting here is harder than the soft stabilizer described above.

Racing Stabilizers (Hard)

This is the stiffest stabilizer bar of the bunch. However, increasing the stiffness of the suspension does not necessarily equate to faster driving. Pick something that feels right to match your style of driving.

TIRES

Soft/Soft

This four-tire set consists of high traction, soft rubber compound tires for both front and rear. The soft rubber compound provides good grip, but wears easily. This is best suited for sprint races.

Hard/Hard

This four-tire set consists of hard rubber compound tires for both front and rear. The traction here is not as good as soft rubber compound, but the tires are more durable, making them suitable for endurance racing.

Hard/Soft

This set consists of hard rubber compound tires in the front and soft in the rear. Because traction is better in the rear, the car will naturally have a greater tendency to understeer. This is a good choice for high-power rear-wheel drive cars that have a tendency to oversteer.

Soft/Hard

This set consists of soft rubber compound tires in the front and hard in the rear. Because the traction is better in the front, the car will naturally have a greater tendency to oversteer. This is a good choice for front-wheel drive cars that have a natural tendency to understeer.

Note: Tire wear will only occur in endurance racing and two-player races. (This option can be set on the Option menu.)

RACING MODIFICATIONS

Weight Reduction

Reduce the weight of your car by removing unnecessary parts and substituting parts made of lighter materials. Reducing car weight has many advantages such as improving acceleration, cornering ability, and brake performance, as well as increasing tire life.

Racing Modification

You can completely modify your car to racing specifications by customizing the car shape and using different part materials. This includes modifications impossible to achieve with ordinary modifications, including large weight reduction, change in tread depth, and fender modification to accommodate large-diameter tires. This does not include any modifications to the car engine.

MODIFICATIONS

RACES

RACES

GRAN TURISMO MODE RACE/CHAMPIONSHIP OVERVIEW

CLASS	GRAND PRIX NAME	REQUIRED LICENSE
Spot Race	Spot Races (five total)	None
GT League	Sunday Cup	B Class
	Clubman Cup	A Class
	Gran Turismo Cup	A Class
	Gran Turismo World Cup	IA Class
Special Event	FF Challenge	B Class
	FR Challenge	B Class
	4WD Challenge	B Class
	Lightweight Battle Stage	B Class
	Anglo - Japanese Sports Car Championship	A Class
	US - Japan Sports Car Championship	A Class
	Anglo - American Sports Car Championship	A Class
	Megaspeed Cup	A Class
	Normal Car World Speed Contest	A Class
	Hard-Tuned Car Speed Contest	IA Class
	Grand Valley 300-Km Endurance Race	IA Class
	SS Route 11 All-Night Endurance Race	IA Class
	SS Route 11 All-Night Endurance Race II	IA Class

Note: "IA Class" stands for International A Class.

CARS ELIGIBLE FOR LIGHTWEIGHT SPORTS CAR CHALLENGE

• Starlet	Glanza V	• Mirage	Asti RX
• Corolla Levin	BZG	• Mirage '92	Cyborg R
• Sprinter Trueno	BZG	• Integra	GS-R
• AE86 Corolla Levin	GT-APEX	• Integra	Type R
• AE86 Sprinter Trueno	GT-APEX	• Civic	Sedan
• FTO '94	GR	• Civic	3-Door
• FTO '94	GPX	• Civic	(Racer)
• FTO	GPX	• del Sol '93	S
• FTO	GP Version R	• del Sol '93	Si

GRAN TURISMO MODE RACE/CHAMPIONSHIP OVERVIEW

LEVEL	ELIGIBLE CARS UNMODIFIED[1] / MODIFIED[2] / RACING[3]	OTHER RESTRICTIONS
Beginner	0 / 0 / 0	None
Beginner	0 / 0 / 0	None
Intermediate	0 / 0 / 0	None
Intermediate	0 / 0 / 0	None
Advanced	0 / 0 / 0	None
Intermediate	0 / 0 / 0	Front-wheel drive cars only
Intermediate	0 / 0 / 0	Rear-wheel drive cars only
Intermediate	0 / 0 / 0	Four-wheel drive cars only
Intermediate	0 / 0 / 0	See eligible cars below
Advanced	0 / 0 / 0	Japanese and British cars only
Advanced	0 / 0 / 0	Japanese and American cars only
Advanced	0 / 0 / 0	American and British cars only
Advanced	0 / 0 / 0	None
Professional	0 / X / X	None
Professional	0 / 0 / X	None
Professional	0 / 0 / 0	None
Professional	0 / 0 / 0	None
Professional	0 / 0 / X	None

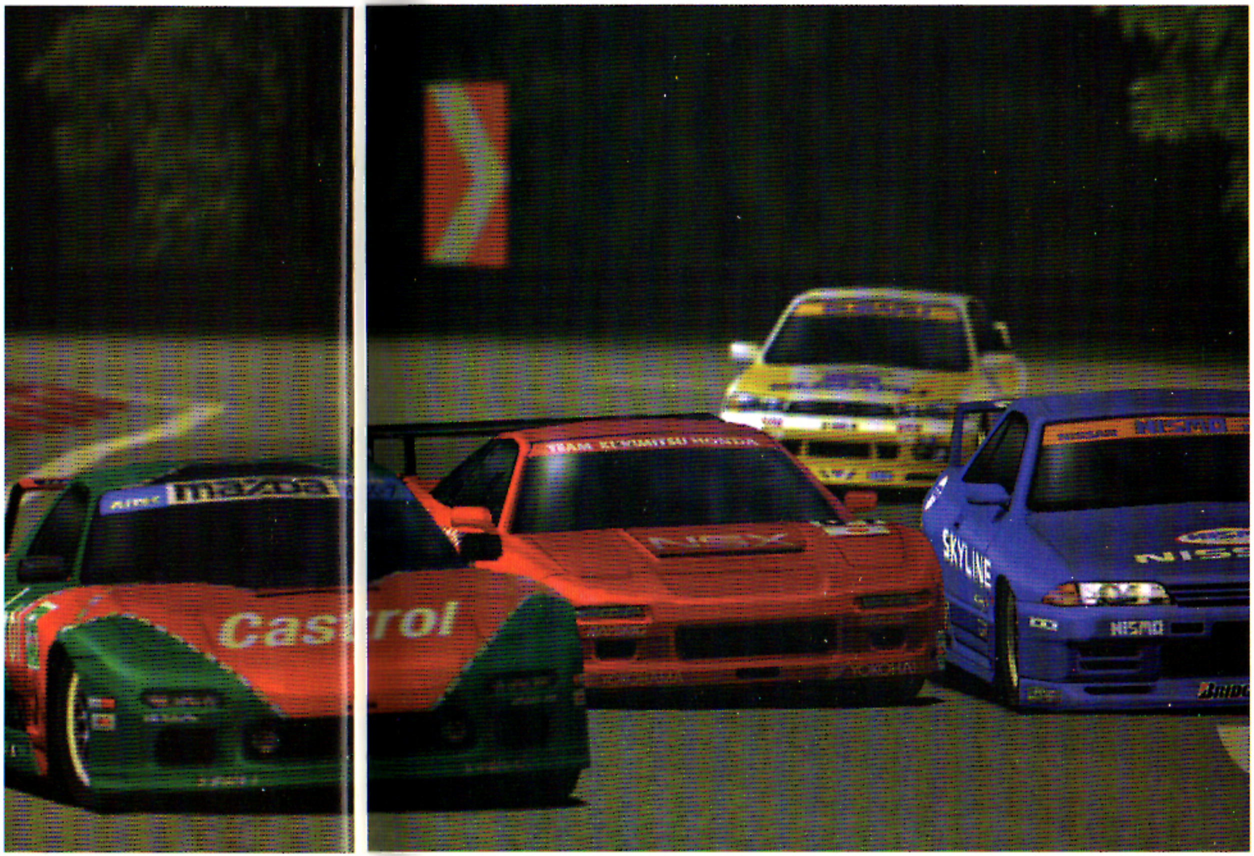
0 = Eligible X = Not eligible

1. An unmodified car is defined as a car that does not use any modification parts, maintaining all of its original parts.
2. A modified car is defined as a car that uses any modification parts.
3. A racing car is defined as a car that has undergone racing modification at a racing shop.

• Civic '91	CR-X Si	• Eunos Roadster	NORMAL
• Civic '93	3-Door	• Eunos Roadster	V-SPECIAL
• Civic '93	Sedan	• Eunos Roadster	S-SPECIAL
• Eunos Roadster '89	NORMAL	• Demio	GL-X
• Eunos Roadster '90	V-SPECIAL	• Demio	GL
• Eunos Roadster '92	S-SPECIAL	• Demio	LX G-Package

RACES

COURSES

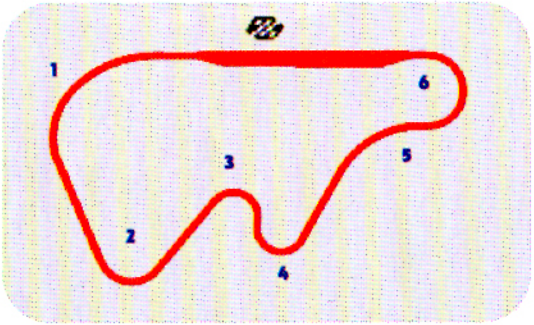


HIGH SPEED RING

As its name implies, High Speed Ring is one of the fastest tracks in the game. A knowledge of drifting will benefit you greatly, as well as allow you to achieve the fastest times. Following are some helpful hints on how to race High Speed Ring to perfection.

TURN 1

This is a sweeping left turn that can be taken at full speed. That's right, step on the gas at the starting line, and don't let up. Keep your car on an inside line throughout the turn. The final portion of the turn is a little sharper, so make sure to exit the turn towards the outside.



TURN 2

By the time you hit this turn, you will be at max speed. If you have not yet mastered the art of drifting, it is essential that you enter this turn wide to the right, and brake to roughly 125 mph. Execute the turn at roughly 100 mph. Time your turn so that the apex is in the middle of the corner. At the apex, step on the accelerator and exit the turn wide.

TURNS 3 & 4

This is the first **S** turn you will come in contact with. To maneuver through these turns effectively, and to maximize exiting speed, it is essential to take the first turn sharply, otherwise the car will drift to the outside.

It is also important not to gather too much speed around the first corner. This will enable the car to remain on the furthest side of the lane as it enters the second turn. Keep in mind that the apex of each turn should come deeper into each corner.

Step on the brakes at the third overhead sign leading up to the turn. Bring your speed down to roughly 100 mph. Make sure you start this turn wide, with vehicle speed at roughly 75 mph. Stay to the inside of the turn. This will set you up for the next turn. Keep speed at 75 mph and enter the next turn wide. Once at the apex, step on the gas and accelerate out of the turn.

TURN 5

This is a very mild turn, and should be used to set up the sixth and final turn. Take this turn on the inside without letting off the accelerator. This should put you in perfect position for the final turn.

TURN 6

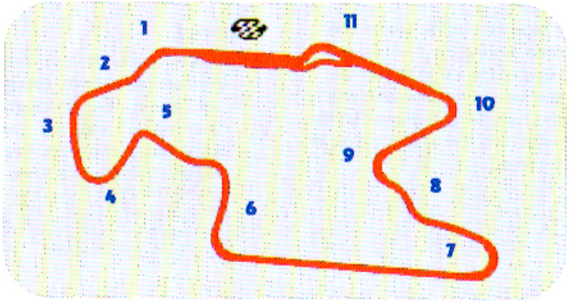
You will enter this turn with a great deal of speed. Brake enough to get your speed down to roughly 90 mph. Start the turn wide right, and then accelerate at the apex. Keep accelerating and exit the turn wide.

TRIAL MOUNTAIN

Trial Mountain is the first course to test your racing prowess. A knowledge of drifting is a must, in order to race this course properly. Here are some helpful hints on racing this course.

TURNS 1 & 2

These first two turns can be taken at full speed. Jump on the accelerator at the starting line and don't let up. Make sure you exit the last turn wide, so you're properly set up for the next turn. Start this turn wide to the right and brake just enough to get traction. Accelerate through the rest of the turn.



TURN 3

Step on the brake right in front of the tunnel and slow the car to roughly 60 mph. In order to take this corner properly, you must drift through the turn.

TURN 4

Slow the car to roughly 55 mph and drift through this turn.

TURN 5

When you come out of this turn, make sure you don't go wide. Prepare for the next corner. Your speed should be roughly 87 mph.

TURN 6

Make sure you stay on the right hand side when you enter the tunnel. Run diagonally through the tunnel – right to left. When you exit, you should almost scrape your car against the left wall. Ideal speed through this turn is 87 mph.

TURN 7

You will be carrying a great deal of speed when approaching this turn. Slow the car down to roughly 60 mph, and start the turn wide right. Make sure the apex is in the middle of the turn, and accelerate the rest of the way through the turn.

TURN 8

This is another little **S** turn. Do not let off the accelerator through these turns.

TURN 9

Brake to roughly 70 mph, and drift through this turn.

TURN 10

Make sure you start this turn wide right. Brake to roughly 62 mph and drift through the turn.

TURN 11

You will be carrying a great deal of speed through these last turns. Approach the first turn wide right and brake to roughly 106 mph. As with all **S** turns, make sure the apex occurs later in each turn (see pgs. 18-19.) This will maximize exit speed.

GRAND VALLEY EAST

TURN 1

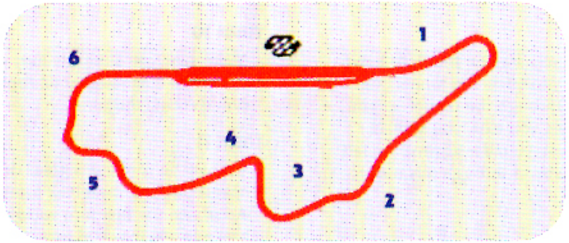
Take the first left turn on the inside at full throttle. This puts you in position for the next turn. When approaching the next sharp turn, look for the second big sign around the corner. As soon as you see it, brake to roughly 60 mph. You should already be in an outside position. Once you reach the apex of the turn, accelerate out.

TURN 2

Go through this left/right/left turn at full throttle. Allow the car to drift on the right hand turn so that you end up on the left side going into the final left turn.

TURN 3

Approach this turn wide left. Brake to roughly 50 mph, and apex in the middle of the corner. Stay to the inside to set up for the next turn.



TURN 4

Step on the brake at the second sign and slow down to 50 mph. Take a wide approach and cut the turn in.

TURN 5

You will have a great deal of speed when entering this turn. Brake to roughly 95 mph, and take an outside/in approach.

TURN 6

Try not to decrease speed too much in this turn. The ideal speed is roughly 85 mph. It is essential to keep your speed when entering the next straightaway.

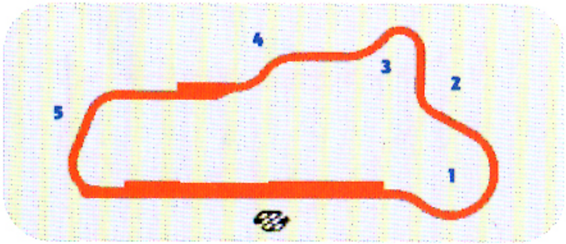
CLUBMAN STAGE ROUTE 5

TURN 1

Before you hit the tunnel, slam on the brakes. This should allow you to accelerate through the rest of the turn. Try to stay as close to the left wall as possible, setting yourself up for the next turn.

TURN 2

If you executed the last turn properly (wide left), you should be in great position for this next turn. Take this turn at full throttle, keeping to the inside.



COURSES

TURN 3

Start this turn wide right. The apex should be in the middle of the turn, and accelerate wide out of the turn.

TURN 4

This **S** turn can be taken at full speed. Be careful, the road narrows after this turn.

TURN 5

Approach the first turn wide right and slow down to 94 mph. Stay to the inside for the next turn. Take the next turn at roughly 75 mph and exit wide for max speed. This is important for the next straightaway.

COURSES

NOTES

SOFTWARE WARRANTY

Sony Computer Entertainment America (SCEA) warrants to the original purchaser of this SCEA product that this Game Pak is free from defects in material and workmanship for a period of ninety (90) days from the original date of purchase. SCEA agrees for a period of ninety (90) days to either repair or replace, at its option, the SCEA product. You must call 1-800-345-SONY to receive instructions to obtain repair/replacement services.

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