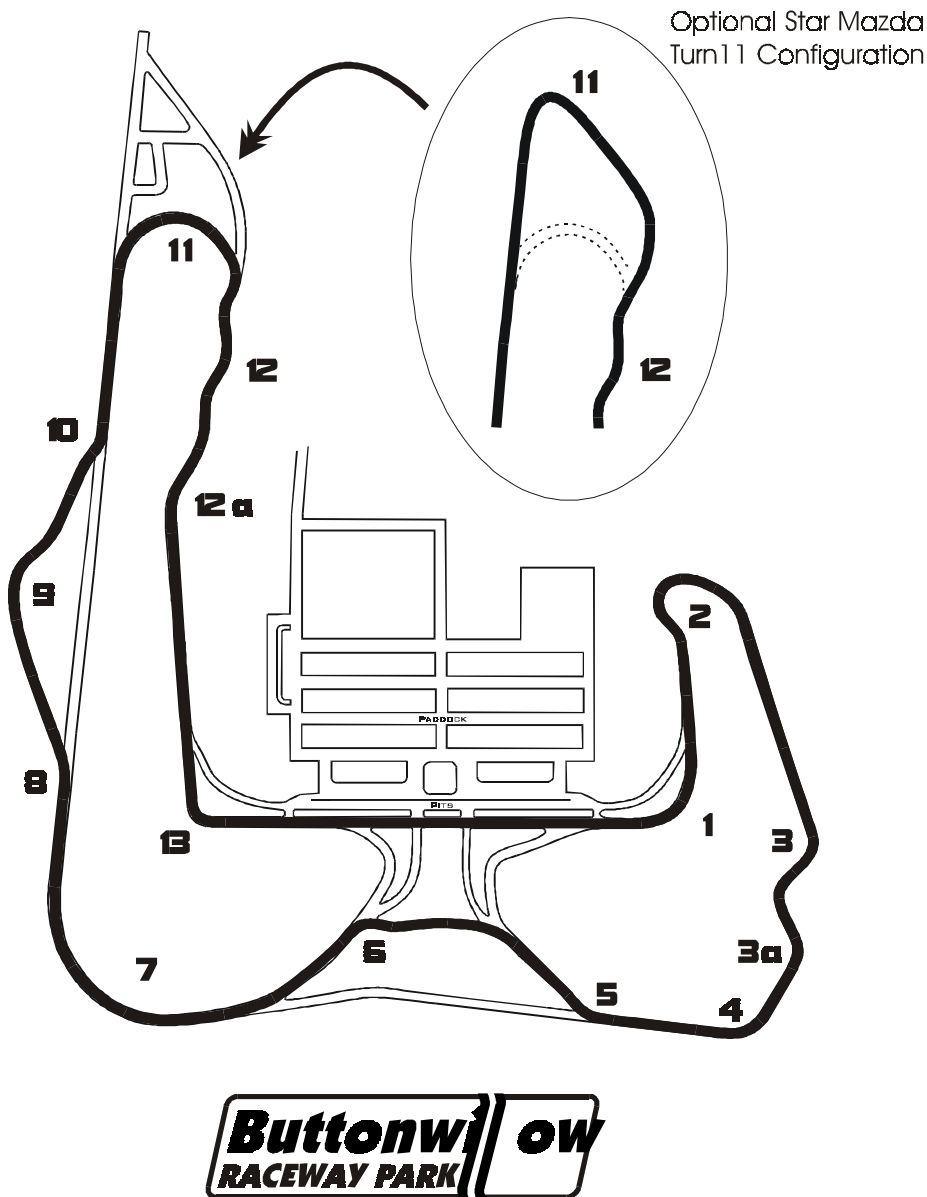


Buttonwillow Raceway Park - Clockwise Direction

*DISCLAIMER: The following information is provided by the Golden Gate Region of the Porsche Club of America as a orientation to this track. It is intended to be used only as a guideline and intended only for use by drivers at GGR events. All drivers are responsible for determining the safest and best approach for themselves and their cars. Under no circumstances will the region, its officers, event organizers, instructors or other members be responsible for any consequences to any driver as a result of completely or partially following the recommendations herein. This exclusion applies to events conducted by GGR as well as other events where drivers may choose to use these guidelines to assist in learning to drive this track.
*



Buttonwillow Raceway Park is owned and operated by the Southern California SCCA. It is in a relatively arid environment and relatively flat. It has been laid out to facilitate a great number of possible configurations. It contains a number of interesting challenges and is marvelously fun to drive. Directions: From the Bay Area, get on I-5 South. You're going almost to Bakersfield. About 12 miles south of the Hwy 46 interchange (Paso Robles to the right, Wasco to the left) you'll find the Lerdo Highway (Shafter to the left). Take this exit, turn right, go one half mile and turn left into Buttonwillow

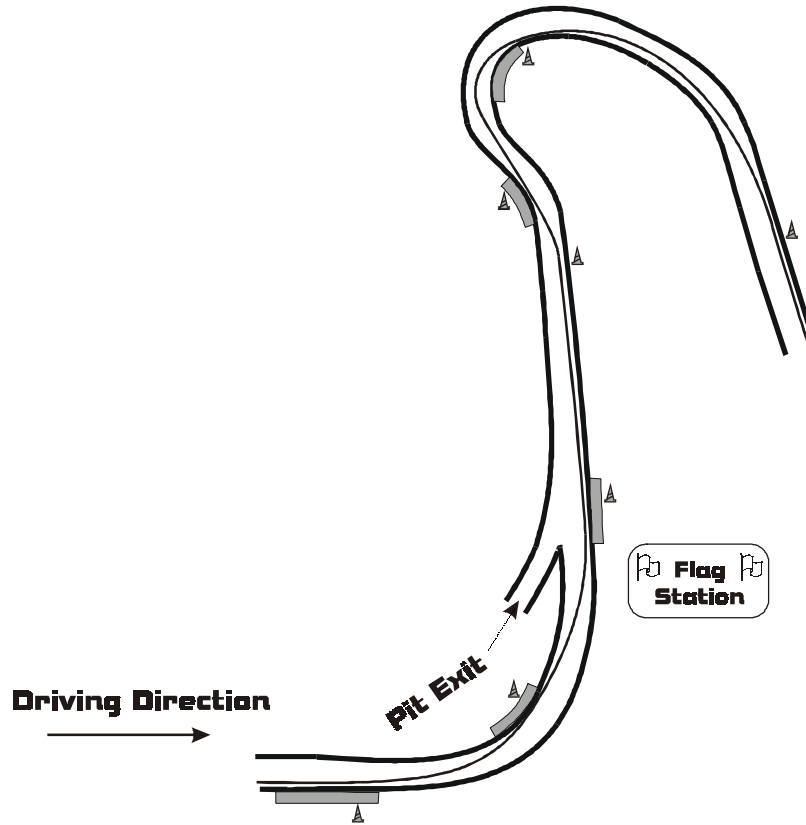
Due to the number of configuration, official track maps offer turn names rather than numbers. This guide will use the numbers as originally assigned by the track. The turns are numbered in the clockwise direction, no matter which way the course is being run.

More than any other California track, Buttonwillow links the various corners together, providing little mental relaxation space for the driver. Many turns, as will be seen, are not so much completed as taken as far as they can until the necessity for dealing with the next turn takes over. This creates a situation in which the preparation for execution of the next corner routinely *must* (not the usual *should*) take place during the previous corner. It is assumed that all apexes are hit correctly within about 3 inches.

The text occasionally indicates likely gear choices as a very general guideline only. The gear chosen will, in many cases, depend not only on the gearing, rev limit and torque curve of the car, but also on driver preference. There are places where higher gears may add smoothness and may make a high-horsepower or low-available-traction car more controllable but at the expense of critical acceleration. Cars with narrow horsepower bands obviously need more careful gear selection; cars with broad torque curves may care less.

The lines described in this document are qualifying or time trial lines. With appropriate adjustments for the specifics of your car, they should produce the fastest lap times available for your driving level.

Turn 1 and Turn 2: “Buttonhook”



Turn 1 is a medium left-hander at the end of the front straight. The corner is flat, with reasonable grip: Speed from the straight will be high, so some braking is needed. The turn can be taken relatively quickly. For most cars, the appropriate braking is not threshold braking, but a gentle dialing-down of the speed, without overloading the front suspension.

Turn-in is 1 to 2 car lengths before the end of the berm on the right. If the right front tire rides on the berm during braking, anticipate a right pull on the steering wheel toward the berm. Finish braking & downshifting to 3rd before you turn in. Trail braking is not suitable here for most cars. Turn-in is less abrupt than you think, so smooth steering inputs are preferable.



Take a reasonably late apex, beyond the mid-point of the apex berm as a short straight follows and you want to maintain speed. You should be able to apply power as soon as the car rotates toward the apex. The inside edge of the track will seem to come out to meet you just after the painted apex berm ends. It is possible to brush the inside tires along this dirt edge.



Past the apex, drift right to a full exit, and keep to the right side of the track to set up for turn 2. You may need to upshift to 4th gear in this short straight.



Turn 2, the "Buttonhook" is an increasing-radius hairpin U-turn to the right that is preceded by a slight kink to the left. If turn 1 is done quickly, two separate braking zones may be required for turn 2. First brake briefly and smoothly along the right edge near the end of the straight between turns 1 and 2.



At the last possible moment the car is rotated slightly to the left, given a very short time to settle, then brakes are applied very firmly.



This puts car on a line to hit an outside apex toward the turn 2 entry. The brakes are applied firmly as the car passes the left-side berm. This is the slowest point on the track and the trickiest braking zone. Most cars need 2nd gear here. Cars with greater power and less stick may prefer to stay in 3rd. The turn-in to the hairpin itself will likely require trail braking.



Be sure to drive deeply enough into the beginning of the turn to avoid making it into an early apex. The line for turn 2 itself is a late apex, starting wide.



As the car is turned it will move up over a small crest and apex about a yard past the end of the inside berm. Once the car is rotated the throttle can be fed in. Do not unwind the steering too quickly after the apex. 3rd gear will be needed before reaching the exit point and, for most cars, 4th gear some time thereafter.



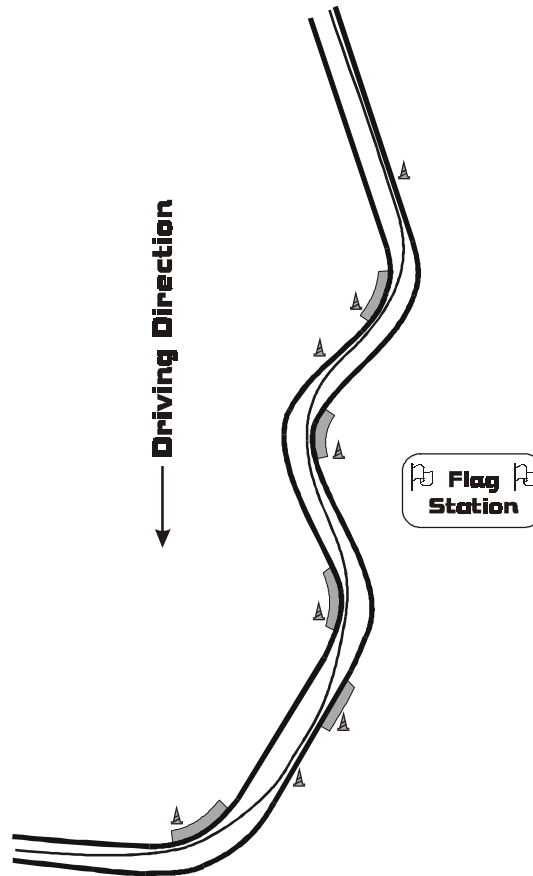
As the increasing-radius turn keeps curving well beyond the apex, a proper exit point is surprisingly far down the track.



The straight between 2 and 3 offers an excellent passing opportunity. Depending upon the passing rules in effect, let by any cars that have grouped up behind you. It is normally possible to let 3 or 4 cars pass during this straight.



Turns 3 and 3a: “The Whoops”, and Turn 4



Turn 3, a sharp right, is the first of three tightly-linked turns. Heavy braking is required before entering this sequence. 3rd gear will be best for most cars. You are braking for all three corners, not just the first one, so entry speed is lower than you might otherwise expect.



The first turn must be taken with an extremely late apex, or the entire sequence gets quite messy. The apex of the initial right turn is so late that it's beyond the apex berm provided.



The car should "exit" this turn to the right of the track centerline to prepare for the left-hander. Done properly the exit and apex are essentially the same point, at the right side of the track, preparing for the next turn.

The next (unnamed) turn is a sharp left, the second of the three tightly-linked turns. This needs a late apex to attempt to get properly set up for 3a. Entry is from as far to the right as the exit of 3 allowed, basically at the right side of the track and somewhat past the end of the right-side berm.



Using the late apex in the un-numbered turn, minimize the exit as much as possible, drifting out to the middle of the track before moving back toward the left side of the track to prepare for 3a. Given the short amount of time available, the amount of movement to the left will not be very great.



Turn 3a, a cresting right, is the third of the three turns. It will not be possible to get more than about two thirds of the way to the left to prepare for 3a. Once the point is reached when turning in must begin, turn toward the apex which is just beyond the crest at the end of the inside berm, and not visible until you are on the crest. This is a medium late apex, but still needs to be treated with caution as the car will be light. Once the apex is reached, it may be useful to slightly unwind the steering momentarily while the car is light to maximize the available grip for acceleration, and then resume steering to the right (as needed to stay on the pavement) as soon as the car settles. Exit fully to the left.



The exit is about a car-length before the end of the long flat berm on the left.

Turn 4, a gentle right, begins immediately upon completing 3a so don't unwind the steering. Most cars will require a slight use of the brakes to adjust the speed downward. It is very important to maximize your exit speed from this corner because it precedes a very fast section of the course. Use the entire width of the track at both entry and exit. Most cars will still be in 3rd gear and should stay there.



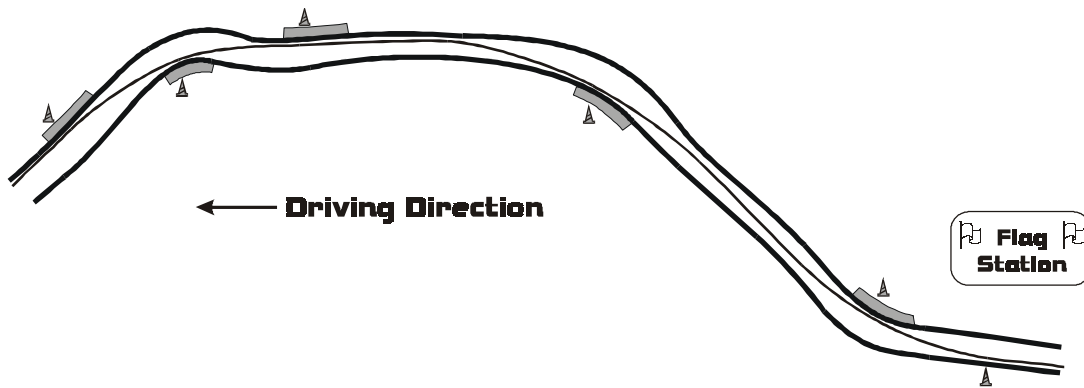
This turn needs a slightly late apex, near the end of the apex berm. Some cars may want a very little bit of trail braking. The exit berm becomes visible from the apex, and can be surprisingly close if too early a line is taken.



Beware of putting a wheel off the back of the exit berm, which may drop off several inches into the dirt beyond. After completing 4 the road will rise slightly, then level out. The shift to 4th gear will likely be needed in this section, even if maximum revs are not yet reached. Shifting later (during or after turn 5) will be uncomfortable.



Turn 5 and Turn 6



This is a very fast two-corner sequence. Turn 5 is a gentle right into the infield. Very little braking is needed here. The turn-in is surprisingly early (since the turn is just a slight dogleg), beginning at about the middle of the entry berm. In most cases little or no braking is needed and a late apex is not required. Enter from the extreme left (where you should be already after exiting turn 4). Except for a slight lift some cars like to assist with turn-in, the turn can normally be taken at full throttle.



A medium apex is reached at about the midpoint of the right-side apex berm. Unless your car is very stiffly sprung, you may drive over the bottom third of this apex berm. This may unsettle lightweight and stiff cars because of the high speed achieved here. Clip this apex as closely as possible within those limitations. As you accelerate through the exit of this turn, do not unwind the steering wheel.



Once past the apex you will exit at the left side of the track and begin to move the car to the right as firmly as possible; you won't get very far. If your speed doesn't require you to exit fully to the left, use that fact to pick up more speed through the next turn by getting further to the right. One way to do this is to maintain a nearly constant steering angle through and after the exit of 5.



The next (unnamed) turn is a gentle left in the infield. A slight lift will set most cars to negotiate this turn. Begin from as far right as you were able to achieve coming out of turn 5, which should be just to the right of track-center. Rolling the car's weight, and therefore grip, from the left tires to the right tires must be done smoothly so as not to result in a spin. As speed increases, your car will have a greater propensity to oversteer, so steering inputs must be correspondingly softened. Keep your eyes as far ahead of you as possible.



The apex for the un-numbered turn should be reasonably late. There is no apex berm. The exit is somewhat pinched off. The closer you can get to a late apex the less close you will come to running out of track before Turn 6. Exit completely to the right on the protruding berm which forms the entry for turn 6.



Turn 6 is a gentle left in the infield. The exit of the previous turns becomes the entry to 6. Most cars will need to brake somewhat. This happens right at the berm protrusion on the right. If the right front tire rides across the protruding berm during braking, anticipate a right pull on the steering wheel toward the berm. Most cars will need to drop back into 3rd gear. Look ahead to the apex and exit. Turn in once you are alongside the entry berm and re-apply the throttle once the car has rotated toward the apex.



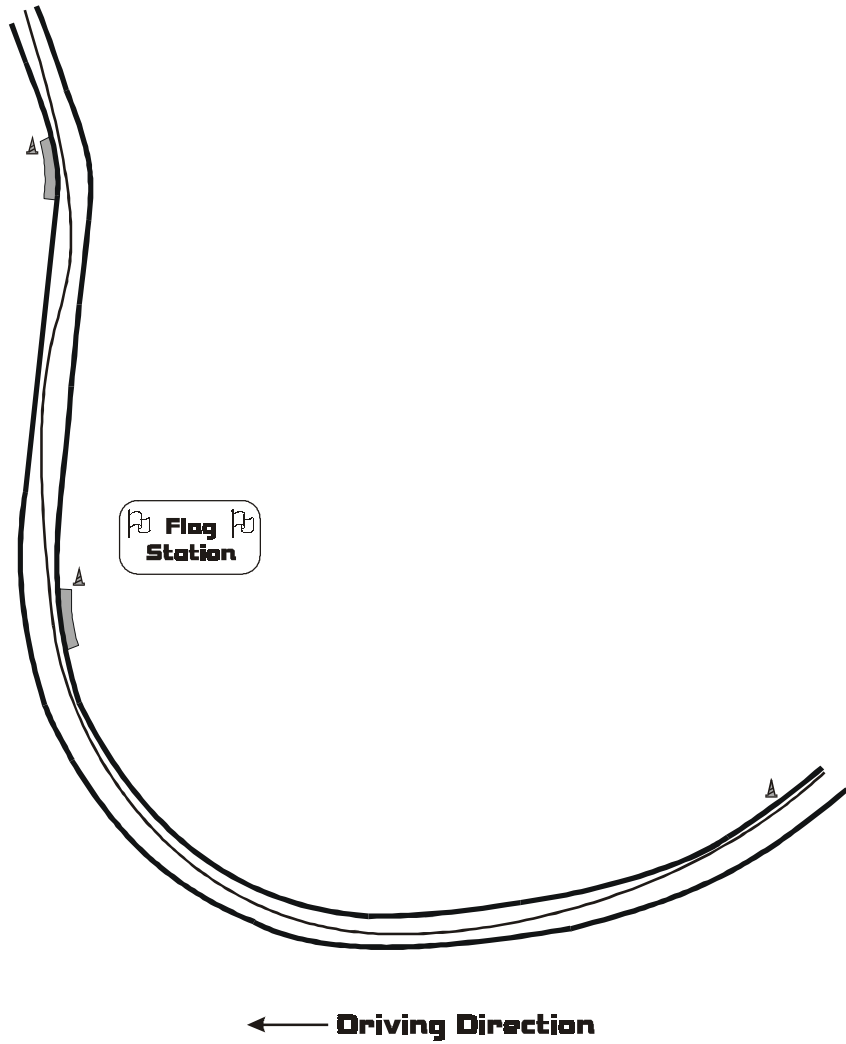
A proper apex will be medium to late and will feel the bump of the rather aggressive berm. However, climbing too much into the berm will unsettle the car more than necessary. Done properly the turn will be taken at full throttle.



Exit completely to the right, then begin moving left to prepare for the next turn. You will make it to roughly the middle of the track before needing to move back to the right into the beginnings of turn 7. 4th gear will be needed at about this point by most cars.



Turn7: "NASCAR", and Turn 8



Turn 7, "NASCAR", is a sweeping, banked right-hand turn.



The first key point is to get onto the sweeper by being reasonably close to hitting an apex as you come out of the infield. This turn is not numbered. You will have a moment in which to glance down at your tach or speedometer. Knowing the proper entry speed for you and your car can be important and lap times are significantly affected by the speed you can carry through turn 7.



Once you reach the entry of the sweeper, you may need to lift off the throttle to get the car to turn in sufficiently. Start looking ahead, way around the turn, for the apex as soon as the car is turned in. Let the car drift up the bank, rising no higher than just past the middle of the track and begin focusing on bringing the car to the late apex. Add as much throttle as possible while holding the car in the middle of the track.



This apex is at the end of the small inside berm. This is a place where small differences make a big difference. Given the recently-added runoff room, this apex can be neutral. If in doubt, be late. Speeds are high here. Due to the high speeds there will be a tendency to give up on the apex if it doesn't appear to be reachable. This leads very quickly to a trip into the dirt at speeds high enough to make the outcome unpredictable. Insist on hitting the apex.



If you attain the apex the car should stay on the track. The car will exit at the extreme left of the track (once you have found the right apex). Once the car has exited on the left, maintain the same steering angle (or more, if you can do it) for an additional few moments to bring the car back towards the middle of the track to prepare for Turn 8, which is a slight kink to the left.



Turn 8

The straight towards turn 8 will sometimes be an appropriate place to let cars pass in slower rungroups, especially if the cars behind are much faster than you and can get by quickly. Depending upon the passing rules in effect, if you have cars behind you, move to the right, ease back on the throttle, and offer them a left pass.

Turn 8 is a gentle left heading up Magic Mountain. In preparation for this turn, move the car as far as possible to the right. On a good lap, it won't be possible to get all the way to the right, you just head there until you have to turn left to make the apex of 8. On a normal lap you will have made it about two thirds of the way to the right.



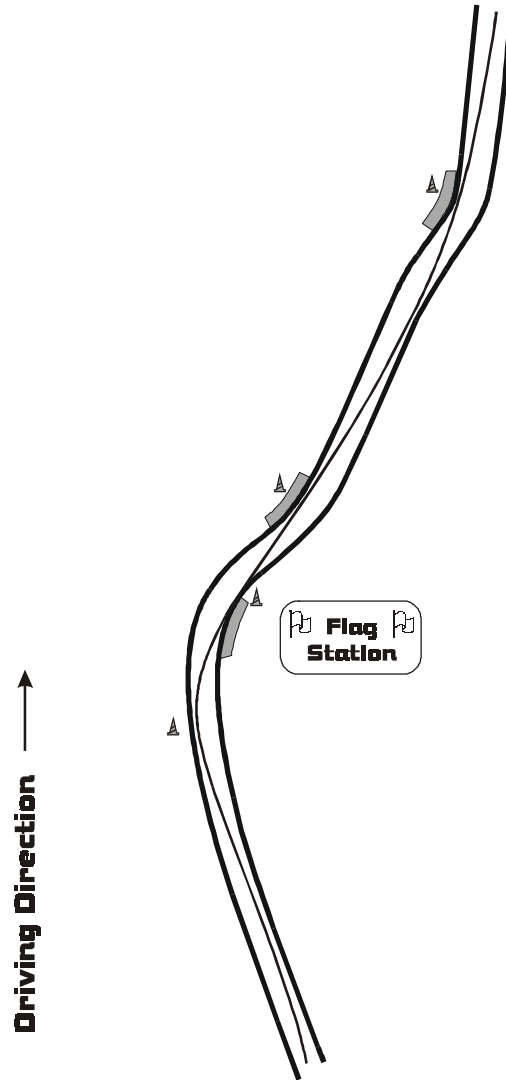
Turn at that point to a latish apex which must be hit, as an early apex here sends the car into bumps and marbles.. Speeds are high and margins are slim.



This will carry the car to an exit on or near the far right. Not to fear, there is time, just barely, to get ready for turn 9.



Turn 9 and Turn 10



Turn 9 is a gentle right on top of Magic Mountain. As you head up the mountain, move the car fully to the left of the track. Strong braking in a straight line and, for most cars, a downshift from 4th to 3rd will be required prior to turn-in. The turn-in is tricky; err on being too late, as long as the apex is actually hit. Once you turn in, you'll be able to see the concrete berm at the apex. It is important to have the car completely turned-in prior to the apex point, since cresting the hill will unload the suspension and reduce the available traction.



The proper line is to get the right front tire fully into the paint and drive it off the end of the berm, which will run it through the dirt just a bit before it gets back to the pavement. The car will be light over the top, and any throttle lift is likely to result in a spin. If the apex is done properly, the car will stay on the track. If too early an apex, or not close enough to the apex, the car will end up in the dirt on the left. If that happens, with care the car may proceed straight to rejoin the track, but this is not a healthy line. Ideally, you will crest the hill drifting only slightly and find yourself traveling in a straight path that carries you just to the right of the exit berm.



The proper exit is near the center of the protruding berm on the left. It is OK to be up to halfway into this berm. Your natural path will carry you to the right of the track (actually the track is turning slightly left and you're just going straight). An up-shift to 4th gear will be needed, and the car should be brought over toward the right side of the track in preparation for Turn 10, a mild left-hander.



Turn 10 is a gentle left onto a short straight. In most cars it can be taken at full throttle in 4th gear. After the exit of 9 move to the right to prepare for 10. About the time you reach the right side of the track it will be time to turn in to 10 ...



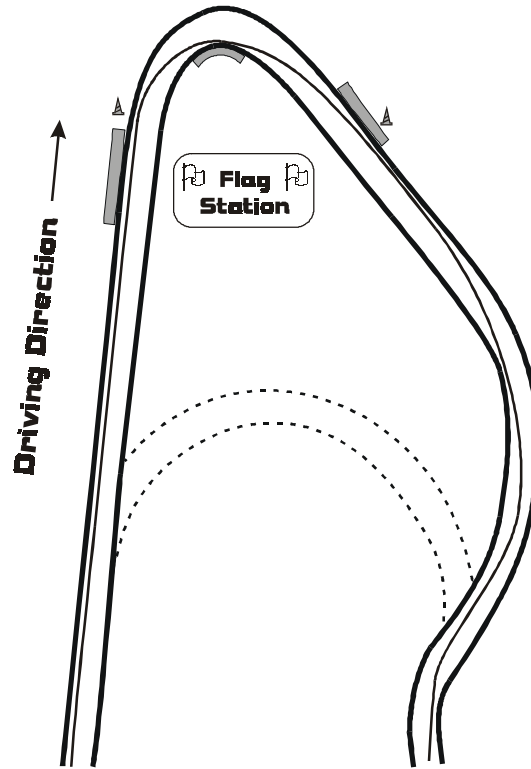
and hit a clean medium-to-late apex (tighter than the photo shown!). You are unlikely to need all of the very wide lane at exit; just let the car float out wherever it wants to and then begin moving it back to the left to prepare for 11.



The straight between 10 and 11 offers an excellent passing opportunity. Depending upon the passing rules in effect, let by any cars that have grouped up behind you. It is normally possible to let 2 or 3 cars pass during this straight.



Turn 11 using the “Star Mazda” option



When the Star Mazda turn 11 is used, the straight after turn 10 is longer, allowing plenty of time to let several cars pass if necessary. The length of track available before entering the esses is also substantially extended, making the esses faster and more challenging.

The Star Mazda Turn 11 is right-hand sweeper of more than 90 degrees, followed by an increasing radius section which leads into the esses. A flag station located on the right side of the track is clearly visible as you approach the turn. The turn uses two apexes, one immediately after braking and turning in, and a second apex later in the long sweeping righthand section.



Heavy braking is required at the end of the long straight, so timing and judgment of proper entry speed are important. Brake very deeply into the turn, resisting the temptation to follow the collection of tire marks deposited by the wheel-to-wheel racers on early lines. The turn is slow and sharp, so some trail braking may be needed to rotate the car.



After turning in, if you have been patient enough, slowed enough, and turned in late enough, you will be able to apply power aggressively and steer for a very late apex, nearly to the end of the smooth, relatively flat berm. Do not settle for a medium or early apex, as you'll run out of exit room. If you do find yourself apexing too early, hug the berm and/or lift partially off the throttle to rotate the car until the end of the berm finally comes into view and a late apex can be made.



After the apex, drift left and exit near the end of the wide, flat exit berm. If an adequately late apex was made, it should be possible to begin unwinding the steering wheel and accelerate strongly down the track. Many cars will need to upshift at this point.



The turn continues sweeping right in a long, lazy arc. Move the car right, across the track to a second apex midway to the entrance to the esses. Full power can be applied throughout this section. Some cars will need to make a short upshift (before reaching redline) just before entering the esses in order to avoid shifting or running out of RPMs in the middle of the fast esses section.



12 & 12A, the Esses

Turn 12 is the esses, which aren't exactly turns. A fairly straight line is available through the first two apexes, provided substantial parts of each berm are used. The esses are driven much faster coming out of the Star Mazda corner than using the previous turn 11 sweeper.

The esses begin at the end of 11 "Star Mazda". They are a series of five berms, alternating from left to right, which you must drive the car through and/or over. This is normally done while maintaining full throttle.

Don't be afraid to use up to half of the apex berms. By driving around (instead of over) the second berm in particular, you will find yourself on a line that completely straightens out the third and fourth berms.



Turn 12A leads onto a small straight. Depending upon the car and the success with the esses, this corner will need no lift, lift only, or very slight braking. Otherwise a standard corner, it begins on top of the last berm of the esses on the right ...



... and should be a late apex, slightly past the berm mid-point

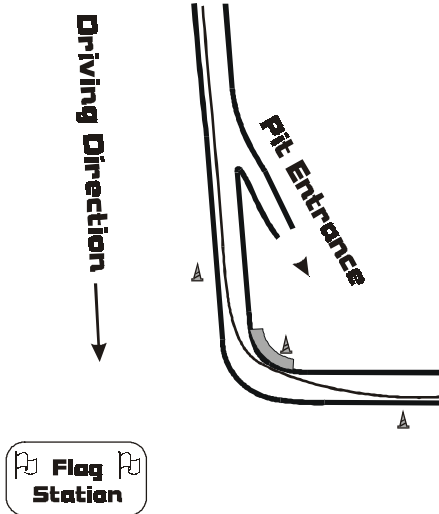


The straight between 12A and 13 offers an excellent passing opportunity. Depending upon the passing rules in effect, let by any cars that have grouped up behind you. It is normally possible to let 2 or 3 cars pass during this straight. Most cars will shift to 4th if they haven't already during or before the esses.

Watch also for cars signaling to exit left into the pits.



Turn 13



Turn 13 is a medium left-hand turn leading onto the main straight. Preparation for this turn requires moderate to hard braking. Pick out fixed reference points on or beside the track surface to locate your braking and turn-in points with consistency. The apex of the turn is slightly lower in elevation, leading to slightly less adhesion than expected as you approach the apex (the ground is falling away), and slightly more adhesion just after the apex as the ground rises. Great care is needed, as a navigational failure at this point risks putting the car into the pit wall along the left side of the main straight.



The proper apex is slightly late, about 1 foot from the end of the inside berm; with greater experience the apex can be moved closer to neutral, but will still be somewhat late.



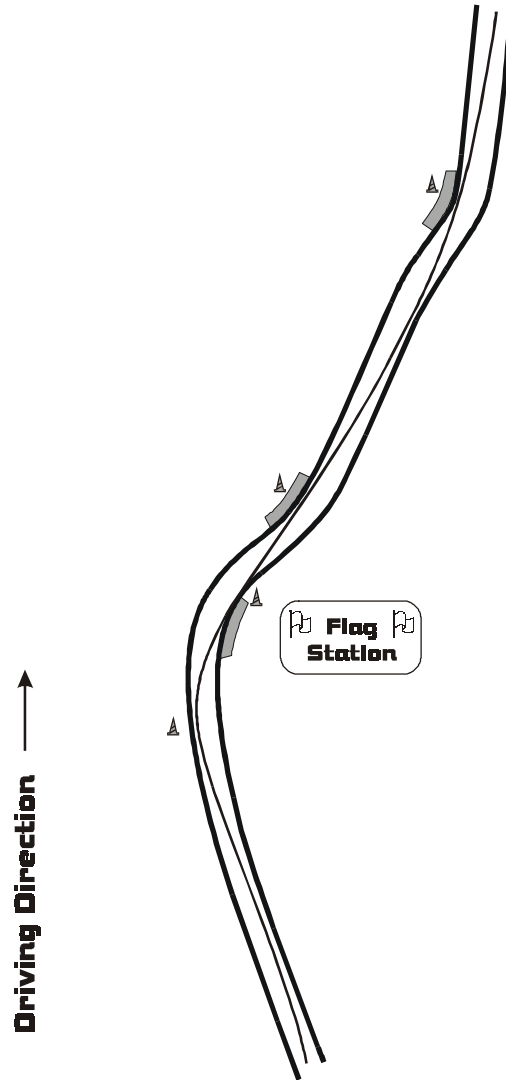
On the front straight, in addition to staying on the throttle and shifting gears let any cars behind you get past. If you need to lift out of the throttle to make this happen, do so. Once the cars that need to pass are safely on their way, turn your attention to your car. Check the gauges (temp, oil pressure, fuel) and note how the car is feeling.



That is one lap of Buttonwillow done clockwise, a marvelously flexible and entertaining track.

Credits: The GGR track driving documents were prepared primarily by Hank Watts (GGR Chief Instructor) and Brad Maker. Hank did the photography and the text first draft; he had the final say about the text and is therefore responsible for it. Brad did the larger amount of work, putting the text, photos and graphics together, graphics parsing and editing, the entire layout and provided input to the text as well. Others contributed to the photography process (Neil Yonk, Fred Nelson, Warren Walker, Evan Williams) and in suggesting modifications and additions to the text (especially John Tavernetti). Source trackmaps were by Trevor Swallow..

Turn 9 and Turn 10



Turn 9 is a gentle right on top of Magic Mountain. As you head up the mountain, move the car fully to the left of the track. Strong braking in a straight line and, for most cars, a downshift from 4th to 3rd will be required prior to turn-in. The turn-in is tricky; err on being too late, as long as the apex is actually hit. Once you turn in, you'll be able to see the concrete berm at the apex. It is important to have the car completely turned-in prior to the apex point, since cresting the hill will unload the suspension and reduce the available traction.



The proper line is to get the right front tire fully into the paint and drive it off the end of the berm, which will run it through the dirt just a bit before it gets back to the pavement. The car will be light over the top, and any throttle lift is likely to result in a spin. If the apex is done properly, the car will stay on the track. If too early an apex, or not close enough to the apex, the car will end up in the dirt on the left. If that happens, with care the car may proceed straight to rejoin the track, but this is not a healthy line. Ideally, you will crest the hill drifting only slightly and find yourself traveling in a straight path that carries you just to the right of the exit berm.



The proper exit is near the center of the protruding berm on the left. It is OK to be up to halfway into this berm. Your natural path will carry you to the right of the track (actually the track is turning slightly left and you're just going straight). An up-shift to 4th gear will be needed, and the car should be brought over toward the right side of the track in preparation for Turn 10, a mild left-hander.



Turn 10 is a gentle left onto a short straight. In most cars it can be taken at full throttle in 4th gear. After the exit of 9 move to the right to prepare for 10. About the time you reach the right side of the track it will be time to turn in to 10 ...



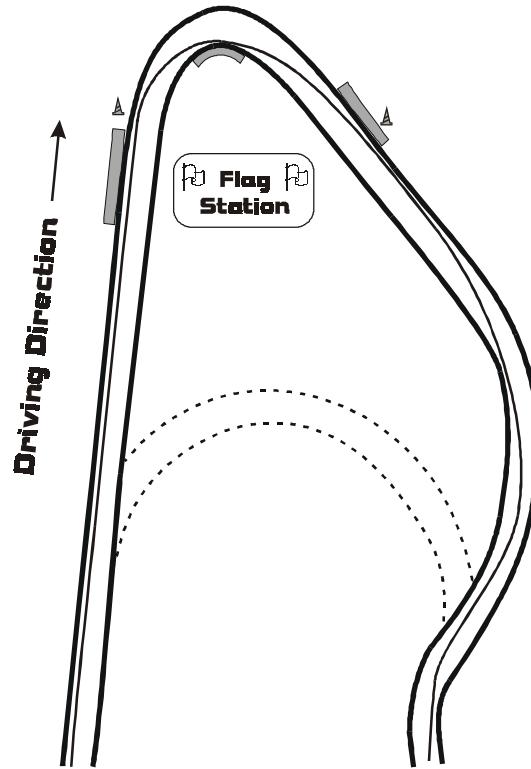
and hit a clean medium-to-late apex (tighter than the photo shown!). You are unlikely to need all of the very wide lane at exit; just let the car float out wherever it wants to and then begin moving it back to the left to prepare for 11.



The straight between 10 and 11 offers an excellent passing opportunity. Depending upon the passing rules in effect, let by any cars that have grouped up behind you. It is normally possible to let 2 or 3 cars pass during this straight.



Turn 11 using the “Star Mazda” option



When the Star Mazda turn 11 is used, the straight after turn 10 is longer, allowing plenty of time to let several cars pass if necessary. The length of track available before entering the esses is also substantially extended, making the esses faster and more challenging.

The Star Mazda Turn 11 is right-hand sweeper of more than 90 degrees, followed by an increasing radius section which leads into the esses. A flag station located on the right side of the track is clearly visible as you approach the turn. The turn uses two apexes, one immediately after braking and turning in, and a second apex later in the long sweeping righthand section.



Heavy braking is required at the end of the long straight, so timing and judgment of proper entry speed are important. Brake very deeply into the turn, resisting the temptation to follow the collection of tire marks deposited by the wheel-to-wheel racers on early lines. The turn is slow and sharp, so some trail braking may be needed to rotate the car.



After turning in, if you have been patient enough, slowed enough, and turned in late enough, you will be able to apply power aggressively and steer for a very late apex, nearly to the end of the smooth, relatively flat berm. Do not settle for a medium or early apex, as you'll run out of exit room. If you do find yourself apexing too early, hug the berm and/or lift partially off the throttle to rotate the car until the end of the berm finally comes into view and a late apex can be made.



After the apex, drift left and exit near the end of the wide, flat exit berm. If an adequately late apex was made, it should be possible to begin unwinding the steering wheel and accelerate strongly down the track. Many cars will need to upshift at this point.



The turn continues sweeping right in a long, lazy arc. Move the car right, across the track to a second apex midway to the entrance to the esses. Full power can be applied throughout this section. Some cars will need to make a short upshift (before reaching redline) just before entering the esses in order to avoid shifting or running out of RPMs in the middle of the fast esses section.



12 & 12A, the Esses

Turn 12 is the esses, which aren't exactly turns. A fairly straight line is available through the first two apexes, provided substantial parts of each berm are used. The esses are driven much faster coming out of the Star Mazda corner than using the previous turn 11 sweeper.

The esses begin at the end of 11 "Star Mazda". They are a series of five berms, alternating from left to right, which you must drive the car through and/or over. This is normally done while maintaining full throttle.

Don't be afraid to use up to half of the apex berms. By driving around (instead of over) the second berm in particular, you will find yourself on a line that completely straightens out the third and fourth berms.



Turn 12A leads onto a small straight. Depending upon the car and the success with the esses, this corner will need no lift, lift only, or very slight braking. Otherwise a standard corner, it begins on top of the last berm of the esses on the right ...



... and should be a late apex, slightly past the berm mid-point

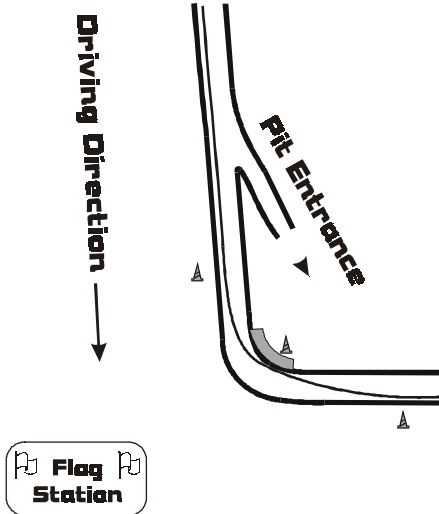


The straight between 12A and 13 offers an excellent passing opportunity. Depending upon the passing rules in effect, let by any cars that have grouped up behind you. It is normally possible to let 2 or 3 cars pass during this straight. Most cars will shift to 4th if they haven't already during or before the esses.

Watch also for cars signaling to exit left into the pits.



Turn 13



Turn 13 is a medium left-hand turn leading onto the main straight. Preparation for this turn requires moderate to hard braking. Pick out fixed reference points on or beside the track surface to locate your braking and turn-in points with consistency. The apex of the turn is slightly lower in elevation, leading to slightly less adhesion than expected as you approach the apex (the ground is falling away), and slightly more adhesion just after the apex as the ground rises. Great care is needed, as a navigational failure at this point risks putting the car into the pit wall along the left side of the main straight.



The proper apex is slightly late, about 1 foot from the end of the inside berm; with greater experience the apex can be moved closer to neutral, but will still be somewhat late.



On the front straight, in addition to staying on the throttle and shifting gears let any cars behind you get past. If you need to lift out of the throttle to make this happen, do so. Once the cars that need to pass are safely on their way, turn your attention to your car. Check the gauges (temp, oil pressure, fuel) and note how the car is feeling.



That is one lap of Buttonwillow done clockwise, a marvelously flexible and entertaining track.

Credits: The GGR track driving documents were prepared primarily by Hank Watts (GGR Chief Instructor) and Brad Maker. Hank did the photography and the text first draft; he had the final say about the text and is therefore responsible for it. Brad did the larger amount of work, putting the text, photos and graphics together, graphics parsing and editing, the entire layout and provided input to the text as well. Others contributed to the photography process (Neil Yonk, Fred Nelson, Warren Walker, Evan Williams) and in suggesting modifications and additions to the text (especially John Tavernetti). Source trackmaps were by Trevor Swallow..