

Rocky Mountain Region - PCA Autocross School Handbook

This handbook and the day's instruction are designed to cover only the most basic subjects and techniques. As you gain experience, you will learn more advanced driving and course assessment skills. At the end of the day you will have been introduced to everything you need to know to be a competent beginning autocrosser. Autocrossing is great fun and an easy activity in which to get started. It is a very difficult sport in which to excel. Championship drivers have spent years getting as good as they are. Stick with it, ask questions, drive a lot, and learn as you go.

A TYPICAL AUTOCROSS EVENT - FROM A TO Z

What follows is the normal sequence of events for a typical autocross:

- Pre-Registration – All RMR-PCA Autocross events strongly suggest on-line pre-registration on our website (www.pcarockymtn.motorsportreg.com) prior to the event. We do accept walk-ups, if the event is not full.
- Arrive Early – There is a lot to do before the event gets underway, and the earlier you get started, the better.
- Sign the Waiver – Everyone who enters the event site MUST sign the insurance waiver.
- Paddock Parking – Take as much room as you need, but use what you take.
- Check In – Proceed to Registration immediately after parking. The line will get long quickly, and the time you spend in line can be put to better use! If you don't check in before Registration closes, you may just get to watch!
- Prepare your vehicle.
- Determine your Run/Work Group and Run Order – Lists available at Registration and in your packet.
- Grid your car when appropriate
- Walk the Course – As many times as you have time for.
- Attend the "Drivers' Meeting – It's **Mandatory!**
- Drive when it's your turn.
- Work when it's your turn.
- Help with Clean Up – When everyone helps, it's much easier, and it goes much faster.
- Go safely and sanely to your Respective Homes – We are often being watched!

PREPARING FOR AN EVENT

Before Leaving Home . . .

Prepare your vehicle:

- Top off all fluids.
- Make sure your tires are in good condition – measurable tread present, no cord showing, and proper inflation.
- Ensure lug nuts/bolts are tight.
- Check your battery tie-down. Batteries must be securely fastened down by an OEM or aftermarket bracket, designed for that purpose. No bungee cord, bailing wire, coat hangers or duct tape allowed!
- Remove all extraneous items – Infant car seats, gym bags, umbrellas, books, CDs, newspapers, Coke cans, etc. Anything that can move around in the car during an autocross run will.

Be sure to pack and bring the following:

- Food, water sunscreen and rain gear – Colorado weather conditions are fickle. Be prepared for anything.
- Necessary tools and equipment – More on this later.
- Car numbers.
- Helmet, clothing and proper shoes.
- Extra motor oil, power steering and brake fluids – If you've prepared your car properly you won't need these, but somebody else may have forgotten.

When You Arrive On Site

- Get to the event early! By -7:30. Even though registration will have a definite closing time, arriving late leaves you very little time for registration (even if you have registered on-line, you still have to check in), getting the car through tech inspection, and walking the course.
- Unpack your vehicle – Remove all loose items from the interior, trunk and engine compartment, including floor mats if they're not secured to the floor, tools, radar detectors, soda cans, fast food wrappers, and everything and anything that could move around when you are out on the course. Plastic bags; will keep your stuff from getting wet, or blown away.

Prepare your vehicle:

- Check/adjust tire pressure – Most vehicles' tires will benefit from the addition of 4-7 pounds of air. This will help keep the tire sidewalls from "rolling over" under the heavy side loads you are about to subject them to. Rear wheel drive cars usually take a few more pounds in the front tires than in the rear. Front and all-wheel drive cars typically take the same amount in the front and rear tires.
- Double check fluid levels – Better safe than sorry.

- Apply car *number*– Be sure your numbers are large enough to be seen by course workers as you are hurrying past them. If using paper numbers, be sure to tape down the leading edge of the paper to prevent the wind from ripping them off the car.

Tech Inspection

Prior to Grid, your car will be given a Technical Inspection. The inspectors will check the following items:

- Tires for measurable tread present, no cord showing.
- Wheels securely attached to the car; lug nuts tightened.
- Battery must be mounted with no chance of coming loose, using a bracket made specifically for that purpose. No bungee cord or baling wire allowed..
- Brake pedal for firmness; proper fluid level.
- No fluid leaks.
- Overall condition of the car.
- Helmet meets the current Snell Rating requirements.
- Car numbers will be legible by Timing and Scoring and course workers while on course.

The Grid

- The Grid is the place you park your car for run sessions.
- Grid your vehicle if you are driving in the assigned session.
- Two-driver cars may be sent out intermittently during the run session. OR, one of you may be asked to work on a corner and be in the following run group.

Course Walks

- Walk the course - Walk the course. Walk the course. Just learning the basic line through the course will suffice if you walk it at least 4 times.
- There are many techniques for walking and learning the course. Try walking the first time just to get the overall "feel" of the course. Where are the straights? Where are the sharpest (slow) turns; the higher speed sweepers?
- On a second walk, look for the apexes - where you want to be close to the cones. Any bumps, changes in surface (i.e., asphalt to concrete), any surface tilt (camber changes) that could upset the car? Pick out braking spots. Determine where to get ON the throttle. If there is a slalom - and there almost always is - pace it off to see if it is evenly spaced or if it gets tighter or looser. Walk it again and try to memorize it as best you can.
- It gets easier with experience. Remember, walking the course is not a social event. Resist the temptation to engage in conversations not related to the course. Don't walk the whole thing only to realize all you did was talk to your buddy . . . with no recollection of what you saw!

Walk the course again!

- Look for the longest straights. Remember that some sections can be deceptive because they look like they are turns when the proper line selection actually makes the driving line more or less straight. If you can keep your foot to the floor, it's a "straight."
- Look for the turns leading on to these straight sections. These are the most important turns - the ones in which you want to maximize your exit speed.

- Determine the point in a turn where you can apply maximum acceleration and plan on how to get the car to that position and pointed the right direction (toward the next gate, or “feature”) when at that point. You may be surprised at how much you have to slow down to be able to position the car in the optimum position to be able to maximize your exit.
- Remember: Slow in, fast out!

Driver’s Meeting:

This is a MANDATORY meeting for everyone participating in the event. No exceptions – no meeting – see the Chief Driving Instructor or Event Chair, before you continue your day.

Important safety information will be briefed during the meeting, as well as announcements concerning the conduct of the day’s event, and information about other scheduled events.

PREPARING TO DRIVE

In The Car . . .

- Adjust your seating position - a little higher, forward and upright than usual – with your back against the seat back, stretch your arms straight out and rest them on the top of the steering wheel. Your wrists should contact the top of the wheel.
- Wear seatbelt tight - give it a twist before latching.
- Both hands on wheel except when shifting. Use 9 & 3 or 10 & 2 hand position.
- NEVER grab the steering wheel from the inside.

While sitting in grid, waiting for your turn to run, do the following:

- Re-check your helmet strap - ensure its fastened snugly!
- Seat Belt/Harness fastened?
- “Drive” the course in your mind.

TIME TO DRIVE (Almost! But first . . .)

Some Driving Basics . . .

- **LOOK AHEAD!** Not straight ahead, but “down-course” - through the next gate or two (or three!). Looking just over the hood makes every turn a surprise, and results in sloooow times!
- Smooth (not slow) application of throttle and brakes. Abrupt application upsets the car. Squeeeze the pedals.
- Transition from throttle-on to throttle-off smoothly.
- Spinning tires is a sign of being too abrupt on the gas.
- When on the gas, push it ALL THE WAY DOWN! (There are some exceptions-explained later).
- Brake in a straight line. Trying to turn at maximum braking may well cause a spin (see page on Traction Circle).
- Braking: To go fast, you must learn how & when to go slow.
- Generally, you should be accelerating or stopping at the maximum possible rate.
- Don’t lock up brakes. ABS is good.
- No ABS?? Use Threshold braking - braking as hard a possible without locking the wheels.
- Use the whole course. Don’t just drive down the center. Generally, you should be close to one edge or the other.
- The proper line through the course may not be identical for every car, but it will usually be close.
- The shortest distance is seldom the quickest way around the course.
- Look where you want to drive. Your hands will follow your eyes. Don’t stare at the cones!

Oversteer and Understeer

Oversteer:

- You turn the steering wheel and the back end wants to come around. (*NASCAR = Loose*)
- Car's tendency to oversteer is greater at higher speeds
- Just lifting off throttle in a turn can cause a spin with rear wheel drive cars.
- In a spin, both feet in - brakes and clutch.
- If you do spin, don't panic. Slow the car until the tires regain traction (usually a dead stop, but not always), get back on course and finish the run.

Understeer:

- You turn the steering wheel, but car turns less than you expect. (*NASCAR = Tight*)
- In low-speed turns with understeering cars, ease off throttle and/or take out some steering input, and BE PATIENT. More gas will not help. Neither will more brakes (the tires are already skidding!)
- Next time, brake sooner and/or harder BEFORE you get to the turn.

Very few cars will ever turn over, no matter how heavy-handed you are.

At most risk is cars with a high center of gravity, stock (soft) suspensions, and on competition tires.

What's A Late Apex And Why Should You Care?

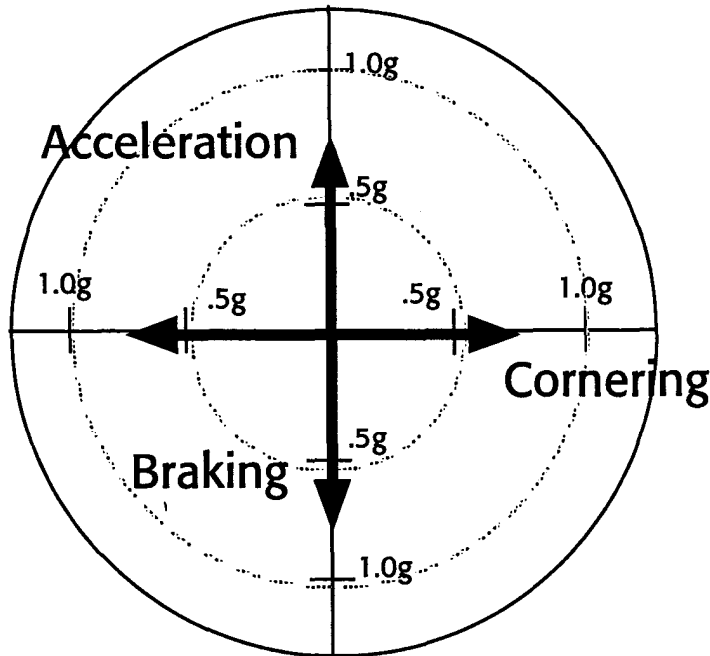
- It is the "safest" way through a turn.
- It results in a higher exit speed. If you exit a turn slowly, you will be slower at every point along the following straight. The longer the straight, the more important your exit speed from the turn leading on to that straight.
- Late apexes helps prevent oversteer as acceleration transfers weight to the rear and helps the rear stick better. (See the graphics on late apexes later in this handout).
- More turning is done BEFORE you reach the midpoint of the turn, allowing you to "stay ahead" of the turn.
- Brake **HARD** in a straight line **BEFORE** you begin to turn.
- After the turn has begun, you may be able to add some throttle.

Should You Always Use A Late Apex?

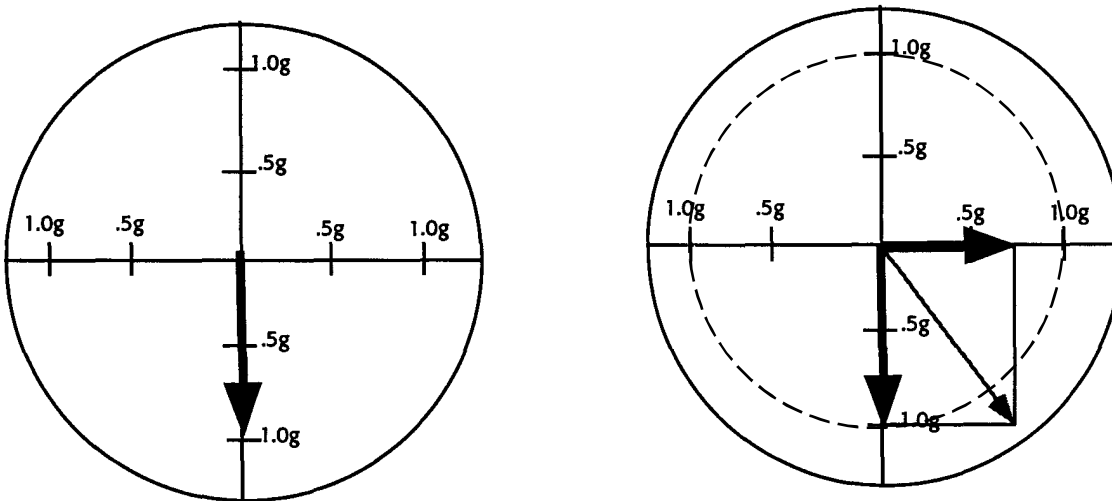
- No. There are some turns in which a late apex would be a bad choice (see the illustrations on linked turns).
- When several turns are linked together, the exit from the last turn leading to a straight is the important one.
- Sometimes there are sections of a course which reward patience. You have to learn how to go slow to go fast. Trying to hurry through a portion of the course that should be driven slowly guarantees you will collect some cones and/or lose momentum.

When things get really slow, worry less about late apexes and concentrate on driving smoothly through that section.

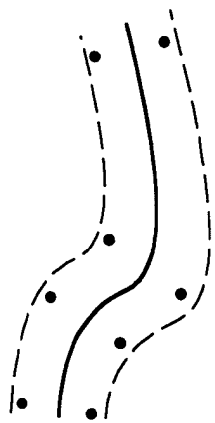
THE TRACTION CIRCLE/SKID PAD



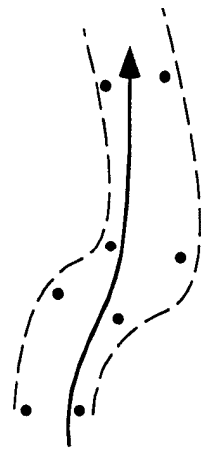
Why can't I brake at the maximum and turn at the same time?



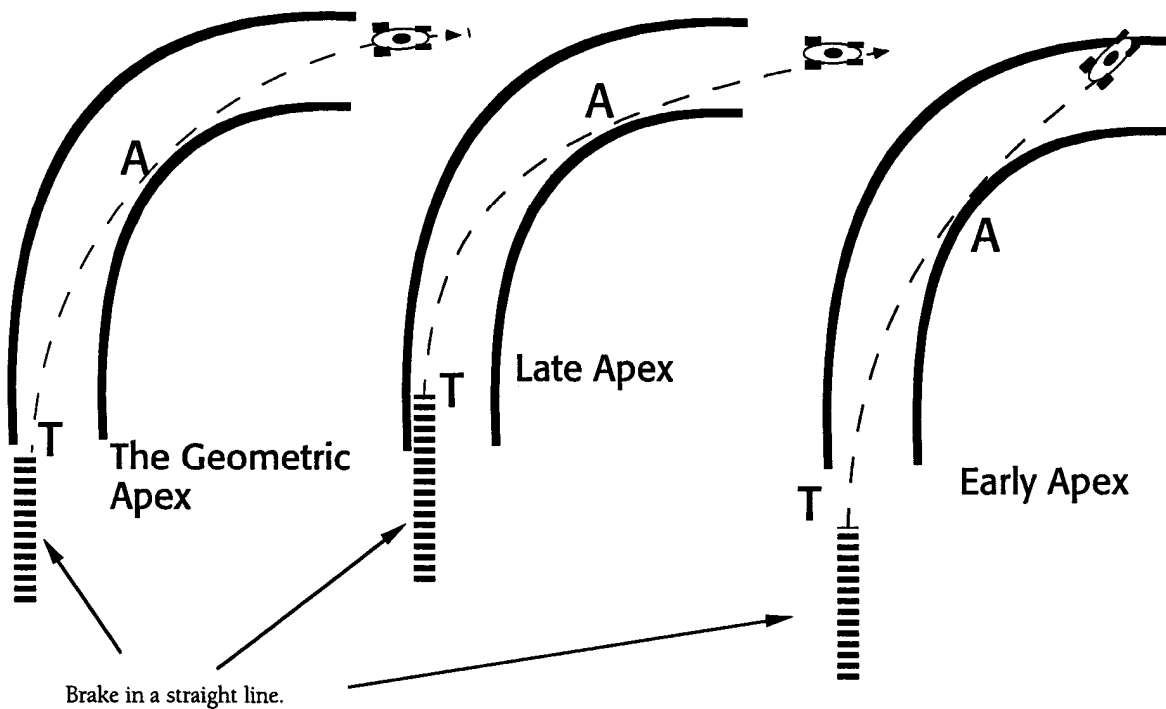
If your tires have the ability to retain their grip at one g, then one g is all they can give. If you are already at their limit of traction (left circle), then attempting to turn would require more grip than they have available. The result can be oversteer (a spin), or understeer (continuing straight ahead, or at least not turning as much as you want). Either way, your times will suffer. Releasing some brake pressure before turning will allow your tires to do some of both. The same is true of accelerating out of a corner. If your tires are at their maximum grip in the turn, attempting to accelerate is futile until you begin to unwind the steering wheel. Learning to blend your braking, turning, and power applications smoothly is essential for improving your times.



The course is not a road.
Don't drive down the
center.



Straighten the
line as much as
possible.



Above are three simple examples of the three basic lines through a 90-degree corner. The T indicates the turn-in point for each. The A indicates where the driving line makes its apex in each example. Note that depending on the actual turn, the difference between an early or late apex can vary from a foot or so to several yards.

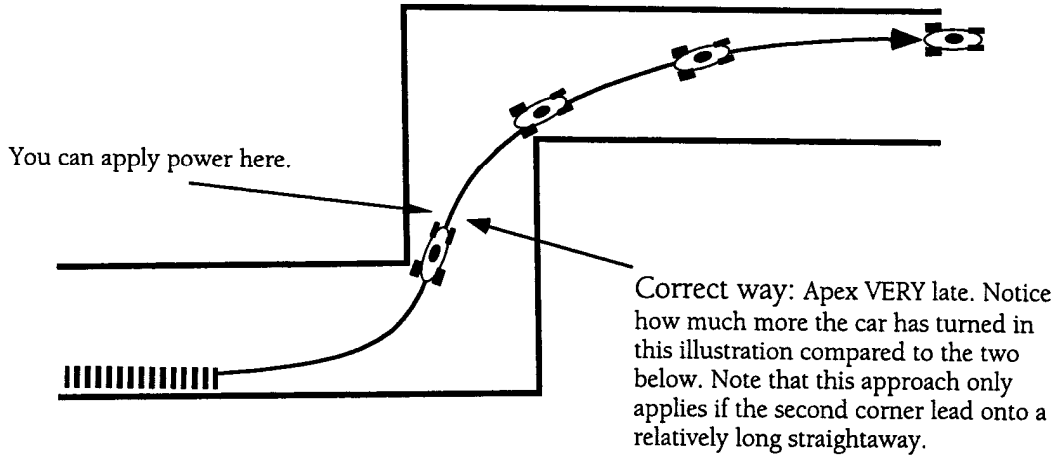
The first illustration is the geometric apex, a constant radius turn. It assumes a constant speed through the turn.

The middle illustration shows a late apex through the same 90-degree turn. Notice how the turn-in point is farther down the straight. The late apex allows you to accelerate much earlier.

The last turn is an early apex and will often cause you to exit the course on the outside of the turn. Your only recourse may be to brake in the turn, possibly causing a spin. Either way, your run will suffer.

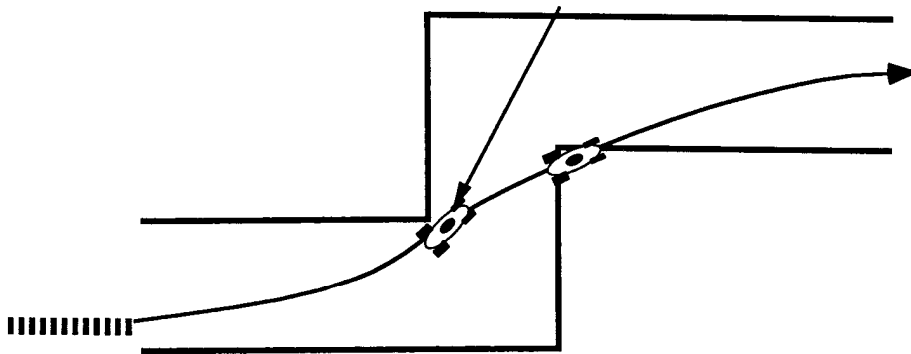
If you are in doubt as to whether to brake later or earlier, brake EARLY. You can move your braking point later on subsequent runs.

Linking turns

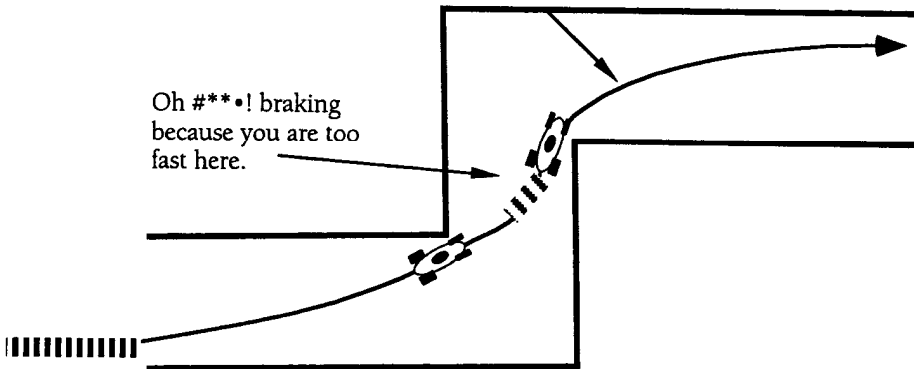


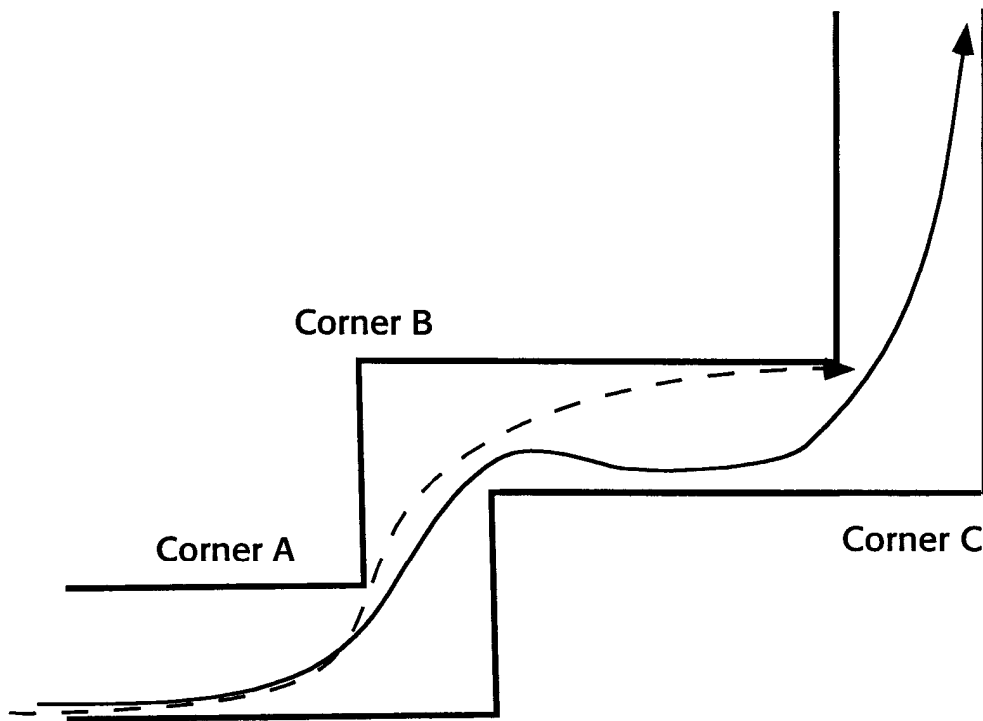
Wrong way:
Apex too early.
Two outcomes:

You apply power where you would have with a late apex and you take out cones or go off course (DNF).



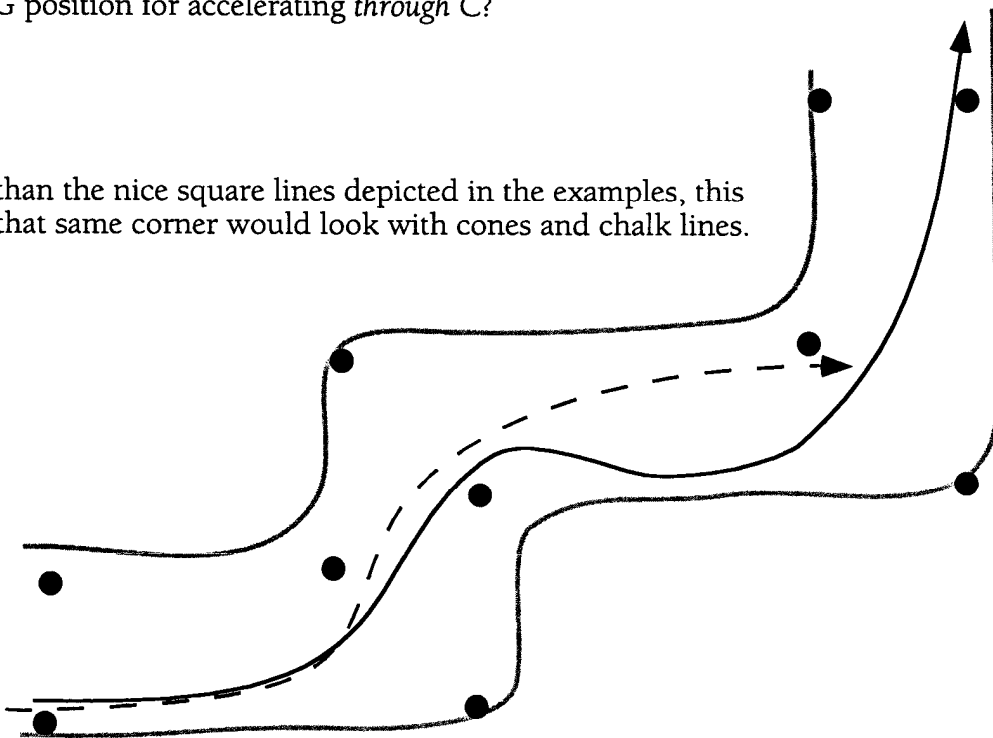
You can't apply power until you get here.



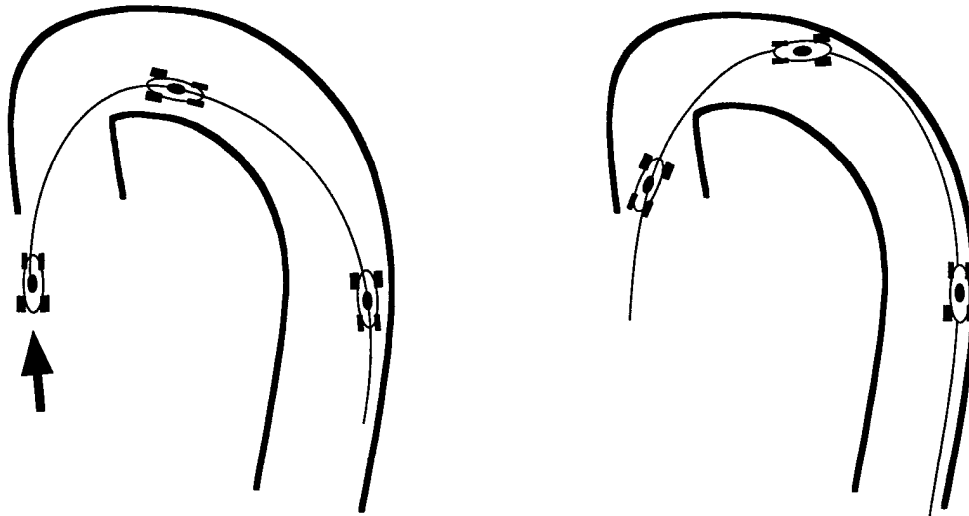


Corners A and B are exactly the same as in the previous three examples. The dashed line is the same as the late apex in those examples - what we just said was the proper line. Since Corner B does not lead on to a straight, but Corner C does. Can you see how the line differs significantly and positions the car for acceleration out of Corner C instead of Corner B? Can you see how a late apex at A places the car in exactly the WRONG position for accelerating *through* C?

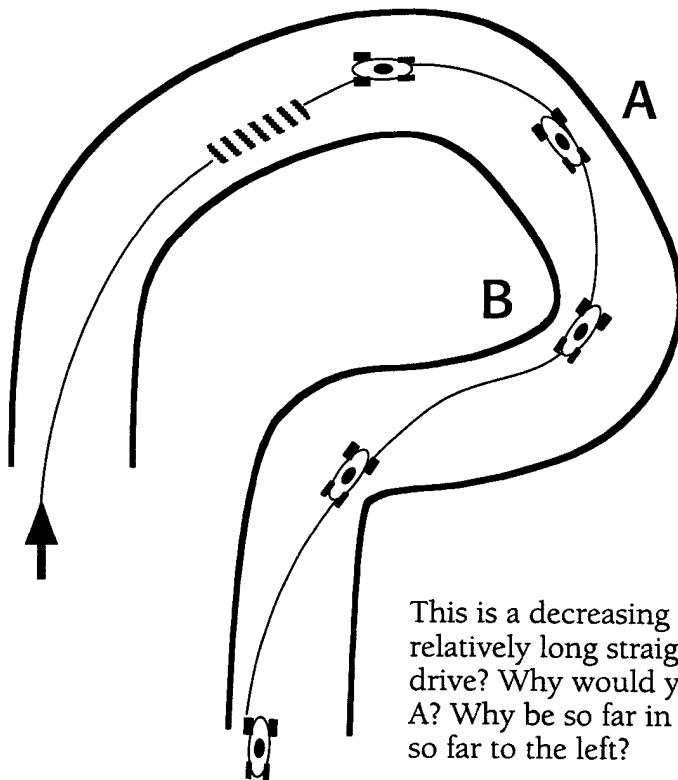
Rather than the nice square lines depicted in the examples, this is how that same corner would look with cones and chalk lines.



Increasing & Decreasing Radius Turns

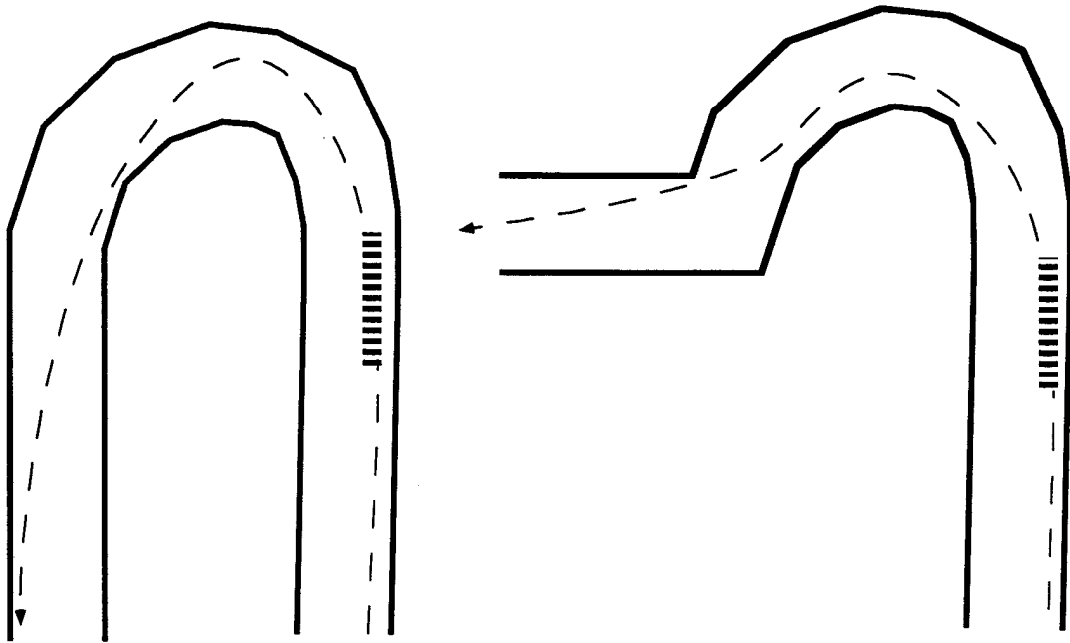


The same turn from two different directions. The left one is an increasing radius, the right is a decreasing radius. Power can be applied approximately at the point of the middle car.

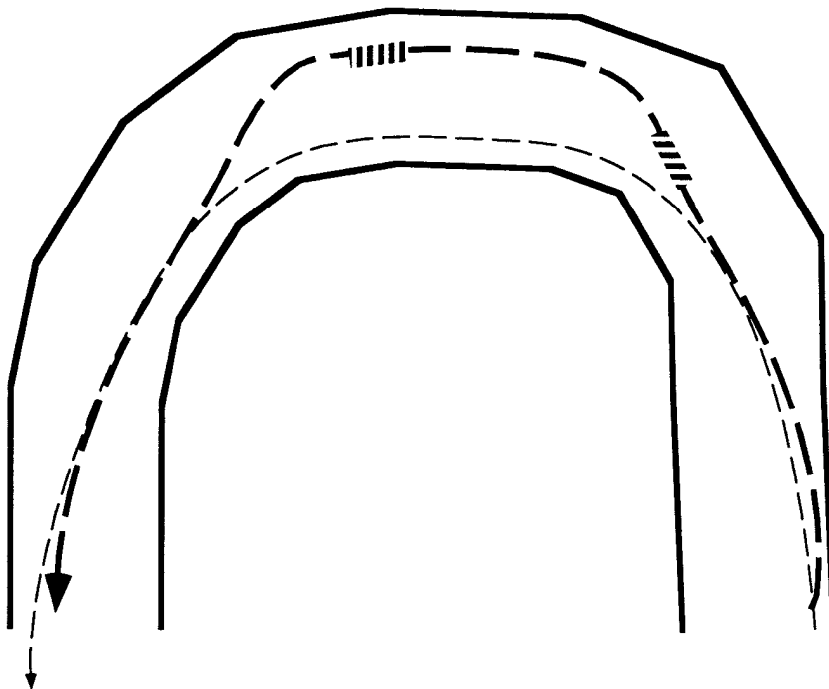


This is a decreasing radius turn leading on to a relatively long straight. Is this the line you would drive? Why would you want to be so far out at point A? Why be so far in at point B? Should you enter from so far to the left?

Hairpins and Sweepers



Hairpins turns are tight turns approaching 180 degrees. If the turn leads to a significant straight, it is probably best taking a late apex as shown at left. If there is not a significant straight after the turn, you are much better off hugging the inside of the turn. In practice, Solo2 courses seldom have a straight long enough to justify maximizing exit speed. In most cases you are better off driving a tighter line, thereby sacrificing some exit speed to minimize the distance driven through the turn.



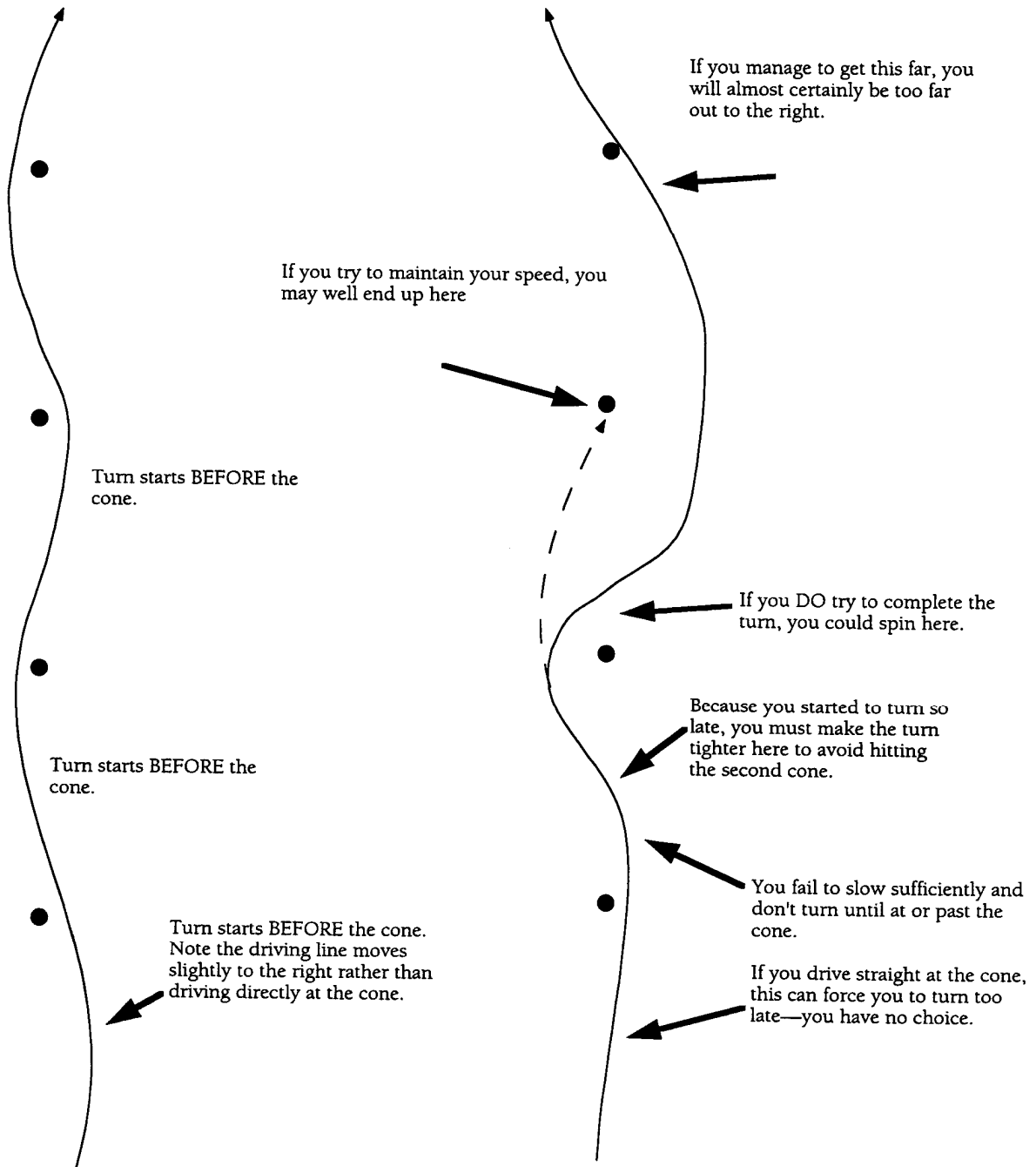
Sweepers are large-radius turns of more than 90 degrees—usually 120 to 180 degrees. Since they can be driven at much higher speeds than hairpins, setting up a late apex often just means you drive a greater distance for no significant increase in exit speed. Hugging the inside is preferable. (Thin dashed line)

Another technique, if the radius is large enough, is to make short straight sections within the sweeper. (Heavy dashed line)

THE SLALOM

Properly done, slaloms can be a graceful dance with your car. It is important to turn slightly earlier than one would think. Waiting until you are even with the cone before you start the turn ensures you will start out "late" and most probably never catch up.

The illustration on the left shows the turns starting just before the car reaches the cone. The slalom at right shows what can happen if you wait to turn until you are beside the cone. The first turn has you going too fast, too straight, too long. By the time you turn, you are past the cone and too close to cone #2 requiring a much sharper turn to the right. This carries you way out to the right and out of position to make the next left. You will either spin or run over the last cone. At the extreme, the car can begin to rock side-to-side as you are forced to turn sharper and sharper to avoid running over the next cone. Should this occur, STOP THE RUN. Slow down and regain control of the car. Your run is already shot, so there is nothing to save - except the car.



TIME TO RUN:

- Be in your car with your helmet on and the engine running when it is your turn. Proceed slowly to the starting point and pay attention to the starter. When you get the go-ahead, get underway within a few seconds. A “drag strip” start isn’t necessary, since your time doesn’t start till you pass the “Start” lights ahead of you.
- Look well ahead (down course) and try to drive the line you imagined during your course walk. If you hit a cone, just keep on going and forget about it. It’s either a penalty or it isn’t and you can’t do anything about it at this point.
- Concentrate on driving quickly and smoothly.
- If you see a red flag waving, STOP THE CAR! This usually means that someone ahead of you has either spun and stalled their car, has gotten lost on course, or is suffering some mechanical difficulty preventing them from keeping on pace. The course worker will either tell you what to do or wave you on. When allowed to proceed drive through the rest of the course at a reduced (but not slow) speed. You will get a re-run, unless you are the cause of the red flag.
- After crossing the finish line, slow down and drive slowly back to your grid spot. Think about what you did well and what you need to improve. Don’t try to correct more than one or two things - even if you can think of ten things you did wrong. Pick out what you think were the one or two worst errors and correct them. You can correct other errors on subsequent runs. Learn something from every run.

Now, go do it again. Quicker this time.

SOME UNIVERSAL TRUTHS

- The car is faster than you are (it’s not the car, it’s you!)
- There is always someone faster than you.
- There is no way to “make up time” on the course. Time lost is gone forever. You can’t go any faster than you can go.
- There is no substitute for seat time.
- Autocrossing is fun, but getting good at it is hard and takes time (see previous bullet). Concentrate before, during, and after each run.

IMPROVING THE DRIVER

- Take instruction.
- Ride with experienced drivers.
- Have experienced drivers ride with you, and ask them for feedback. Be mindful though, that they will likely be honest!
- Walk the course with minimal distractions.

IMPROVING THE VEHICLE

- Understand what modifications will do in terms of performance, as well as class placement.
- Don’t buy “stuff” until you are sure you’re committed.
- Don’t buy “stuff” until you talk to others with similar cars - find out what works (and doesn’t!). Tires, shocks, and wheels provide the most performance gain when you are starting out.

WHAT'S NEXT?

Schools and reading books on driving are all helpful, but the route to improvement is SEAT TIME. Take advantage of the practice session policy that allows you to ride with other drivers, except of course, when you are doing your work assignment.

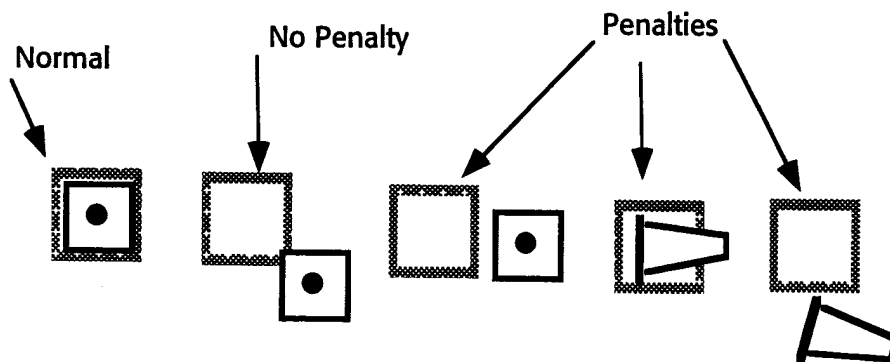
Seek advice from experienced drivers with a similar vehicle.

COURSE WORK AND THE "SPECIALTIES"

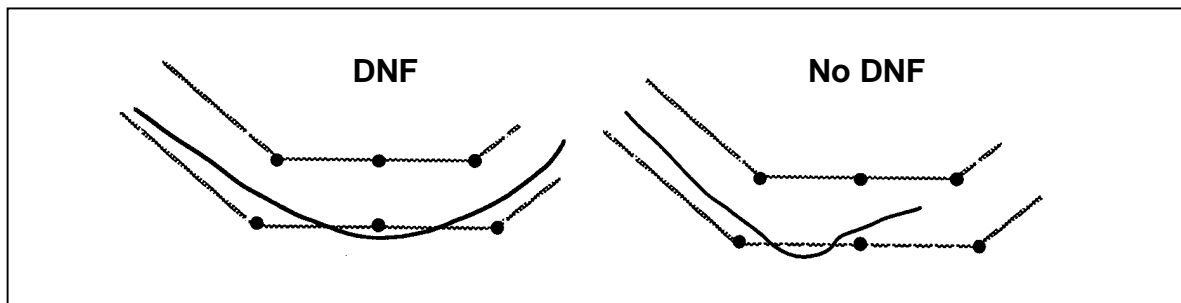
Working the Course

Everyone participating in the event will be required to perform a work assignment. The corner workers' job is to return cones to their proper position when displaced, and correctly assessing any penalties that may result. You will use your radio to call the car number and number of cones down. Each cone will be a 2 second penalty.

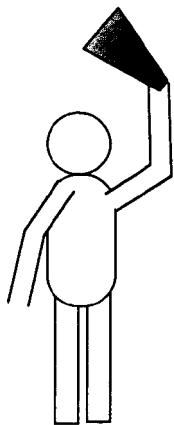
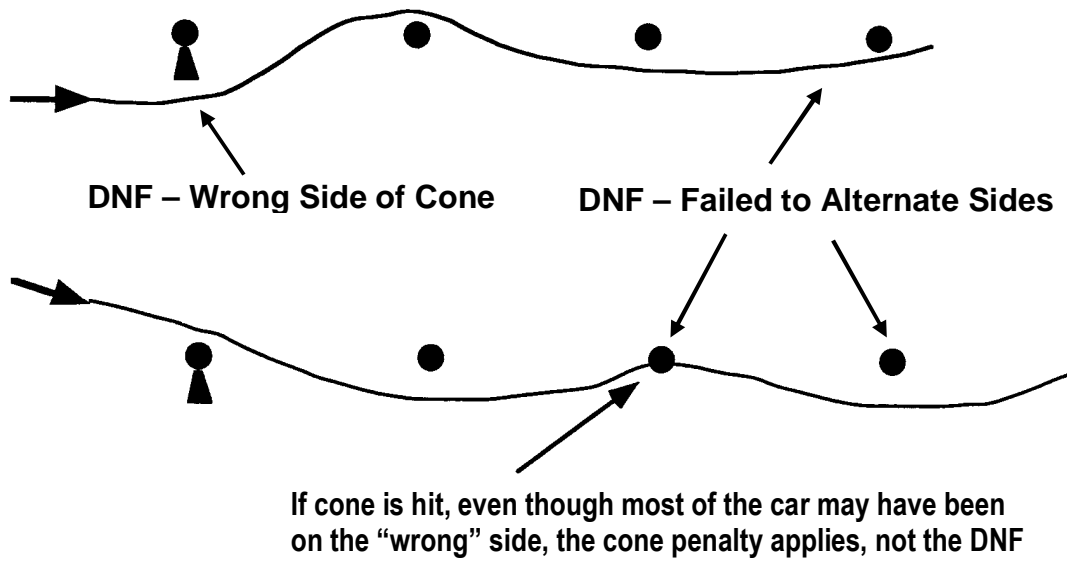
Every cone on the course has a box drawn around it with chalk. The box prescribes the "normal" position for that cone. When a cone is disturbed by a car hitting it, the driver will incur a 2 second penalty (for each cone!) if the cone is either knocked over, or moved *completely* out of its box. If any part of an upright cone is touching the box, there is no penalty assessed. See the figure below for an illustration.



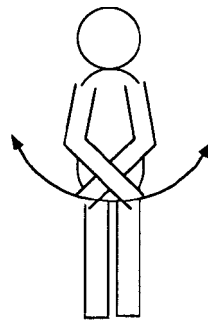
Corner workers will also report any DNF's (Did Not Finish) that occur. A DNF results when a driver fails to follow the prescribed course. Driving outside the chalk line that defines the course lane is permitted, as long as the driver returns to the course before going through the next gate. See the figure below for an illustration.



A DNF occurs in slalom, if the car enters the slalom on the wrong side of a "non-optional" slalom, or fails to alternate sides correctly.



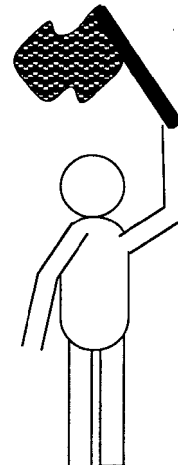
Cone penalty:
Call the timing tech and report the car # and the # of cones down.



No penalty. Call timing tech to report. Or Make the "safe" sign. Cone may have been brushed, but stayed in box.



A DNF.
Call timing tech OR make an "X" with your upraised arms.



If you need to "red flag" a car, wave the flag vigorously to get the driver's attention. Do NOT stand in

Course Working Tips

- Show up for your work assignment on time.
- Do not bring cameras or cell phone on course. The course is a dangerous place to be if you are not paying attention to the cars.

- Learn and follow radio protocol.
- No sitting down while the course is “Hot”.
- Prepare for the weather - take water, sun block, rain gear and appropriate clothing onto the course. During your work assignment, that sunny day could turn into a cold rainy one.
- NEVER turn you back to an oncoming car. As soon as one car leaves your area, another will be on its way. A spinning car can travel quite far off the course.
- Watch the cones, not just the car. It's easy to start watching the car and not notice the cones flying through the air just behind it. Missing a penalty means a subsequent car will see the down (or out-of-place) cone and stop, requiring a re-run.
- Be sure your radio is working and do NOT rest your finger on the transmit button while not talking.
- Move quickly to re-set downed cones, but never, never, NEVER put yourself in a dangerous position with respect to the next car on course. You will have only 25-30 seconds to reach a downed cone, re-set it, and return to your “safe” position. If in doubt, leave the cone and remain well off the course until the next car passes.

Other Work Assignments

Besides corner working, there are a number of other work assignments that you may fill at an event:
These work assignments include:

- Gate – These workers ensure everyone who comes on site has signed an insurance waiver form. This seems like a trivial job, but mess it up, and it could mean we lose our ability to get insurance, which means we can't run any events!! Attention to detail is a must!
- Grid – They ensure that a steady stream of cars is supplied to the starter. The grid chair also needs to contend with multi-driver cars and cars that are granted re-runs for one reason or another, ensuring every driver has a fair and equal opportunity to take their allotted runs. Good organizational skills are a benefit here.
- Starter - One of the more important positions is that of Starter. To keep the event moving, the Starter must keep the cars entering the course at an acceptable interval. And must make sure the conditions are safe.
- Course Design – The course designer is responsible for designing and setting up the course. This job requires both skill and talent, as the best use of the lot must be made to ensure as fair a course as possible for all competitors (something for everybody) while maintaining course design safety standards.
- Tech Inspector – The tech inspectors ensure your car and equipment meets minimum safety requirements, and will check your car numbers are on.
- Timing and Scoring (T&S) – These folks run the timing equipment and record official times, penalties and DNFs. T&S is a place for people who can handle pressure. Please do not approach the T&S area during an event. These folks are very busy.
- Safety – Responsible for the safety of the event, including the entire site, the course, the people and the cars. A high level of integrity and sense of responsibility is required for this position.
- Registration – Runs the Check-in table, collects entry fees and ensures all drivers are licensed. Also schedules and manages the gate workers up to “first car off.”

A FINAL WORD

This handout is by no means comprehensive as it is meant as an introduction only. There are driving techniques that have not been mentioned but are necessary if you are to reach your full potential. You will learn those through additional experience and instruction.