



**Porsche Club**  

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**Porsche Owners Club**



## **CAR CONTROL AND DRIVER TRAINING MANUAL**

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## ***WELCOME TO THE PORSCHE OWNERS CLUB!***

Judging by the car you have chosen, you are a driver of a special breed, and you are probably no novice when it comes to automobiles.

Remember, however, that, as with any vehicle, you should take time to familiarize yourself with your PORSCHE and its performance characteristics.

Our objective is to instruct you in the basic techniques of car control. This manual along with proper instruction should answer why certain things occur under certain conditions and give you an understanding of the proper procedures to use in order to maintain control of your vehicle.

You are about to learn a great deal about car control and yourself.

**MOST OF ALL, HAVE FUN, AND GOOD LUCK!**

## **SEATING POSITION:**

BE COMFORTABLE! Your seat position should be such that you can reach all the controls (i.e. steering wheel, gear shift lever, all pedals). The back of the car seat, as well as the under leg portion, should make as much contact with you as possible. Next, grab the top of the steering wheel with both hands – do this without stretching. Sit as deeply into the seat as possible in order to maximize your lateral support so that you don't slide about in your seat. With your left foot pressing the clutch to the floor slide the seat forward and lock in place so that the knee is still bent. Adjust seat back so that your elbow has a 90° bend.

## **SAFETY HARNESS:**

All time trial cars use a 5 or 6 point belt system designed to securely hold you in your seat. The lap belt gives you your lateral support. The anti-submarine belt (or crotch strap) prevents you from sliding out from under you lap belt into the underdash area, and the shoulder harness restrains you from striking the steering wheel or windshield in case of impact. These belts must be worn properly. They should not be so loose as to fall off your shoulders or be incapable of holding you in the seat and should not be so tight that they are uncomfortable or cut off blood circulation.

As your track speed increases, you will experience some lateral G forces that will try to push you sideways from your seat. If you are wearing your safety harness correctly, you will stay in your seat and not have to brace yourself with your arms, hands, feet, etc. Always be certain that the buckles of your shoulder harness are in the upper chest region and the lap belt buckle is in the pelvic area to avoid injury in the event of impact.

## STEERING WHEEL/HAND POSITION:

The spokes of your steering wheel should be centered so that when it is pointed straight ahead, the car is doing the same. This will give you the proper reference upon straightening out your car.

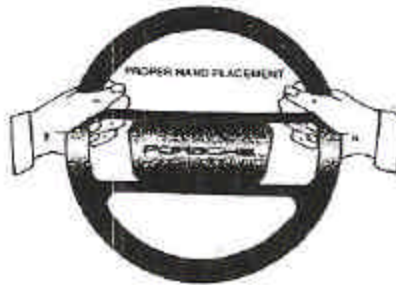
Place your hands on the steering wheel at the 9 o'clock and 3 o'clock positions. Your arms should be bent at a 90° angle. Now, with either hand, grip the top of the steering wheel. You should be able to do so without stretching.

Keep a relaxed grip on the wheel. When you come upon a turning situation that requires a change of hand position, keep your hands on the outside of the rim.

When turning, take your inside hand (i.e. if turning right, use your right hand) and bring it over toward your outside hand, but not past the 12 o'clock position. Start the turn by pulling the wheel with your inside hand while letting it slip through your outside hand. With your hands almost straight across from one another, regrip the wheel with your outside hand and push the wheel through your inside hand.

The end result should be that neither hand should go past the top of the steering wheel at any time for maximum car control.

A “white knuckle” grip will cause your hands and arms to cramp and tire. When that happens you will lose sensitivity to the “road feel” coming through the steering wheel and you may not know what your car is doing.



## SHIFTING:

Treat the shift lever as if it was an egg. **NO “SPEED SHIFTING”, or SLAMMING THE LEVER INTO GEAR.**

Don't grip the lever as if it were the head of a snake, cup it gently in the palm of your hand. Depress the clutch fully, match the revs with a quick “blip” of the throttle if necessary, and move the lever smoothly, precisely and gently.

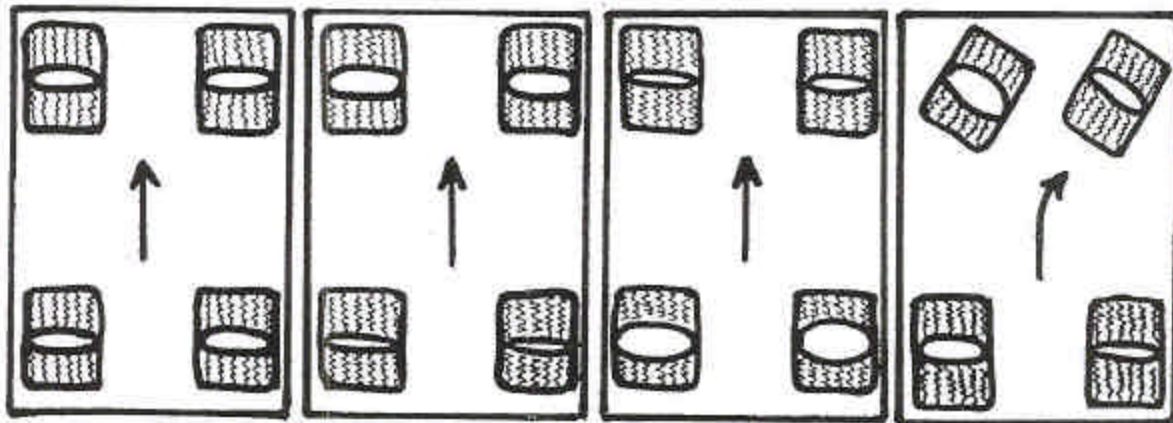
**PRACTICE, PRACTICE, PRACTICE! DON'T RIDE THE SHIFT LEVER! IF THE RIGHT HAND IS NOT SHIFTING, IT SHOULD BE STEERING!!**

## THE FOUR CONTACT PATCHES:

**A CONTACT PATCH** is that part of the tire in contact with the pavement. Control of your car is determined by how well you react to the messages received from these contact patches. Ideally we want to keep all the patches the same size or as close as possible. That would mean that the weight of the vehicle is distributed equally over the car and is properly balanced.

Every time we brake, corner, or accelerate, the contact patches change. When we accelerate, the contact patches grow in the rear and lessen in the front because of the transfer of the vehicle weight to the rear of the car. Under braking, the front tire patches get larger while the rears decrease in size, again because of weight transfer. When cornering, the outside patches grow while the inside patches diminish.

**SMOOTHNESS.** That's the key to car control. Jamming on the brakes, throwing the car into a turn, even accelerating too aggressively may cause the tire patches to change too suddenly or too much and cause you to lose control of your vehicle.



<u>Normal Conditions:</u>	<u>Braking:</u>	<u>Acceleration:</u>	<u>Cornering:</u>
Equal balance. Tire contact patches are equal.	Weight transferred to the front tires. Tire contact patches grow in front and get smaller in rear.	Tire contact patches grow in rear and get smaller in front.	Outside front tire contact patch grows the most, as the inside rear gets smaller.

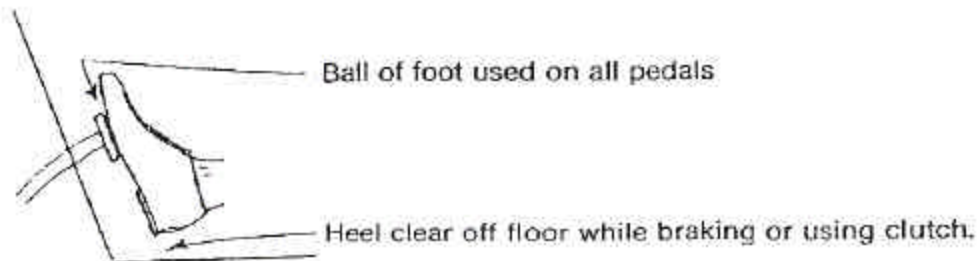
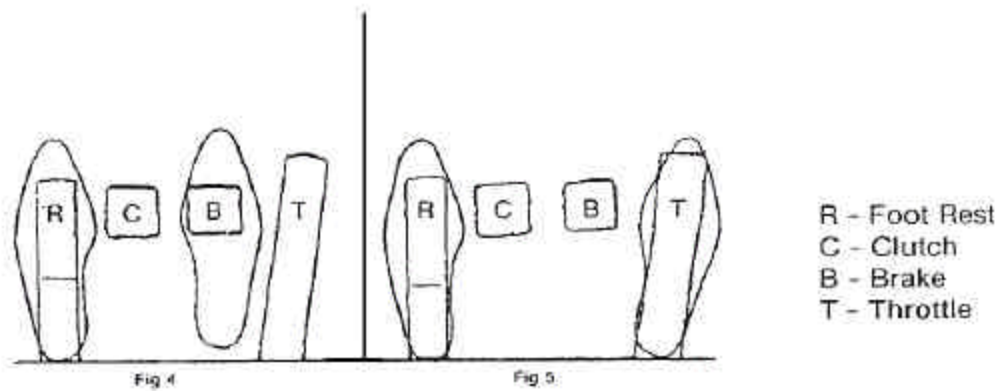
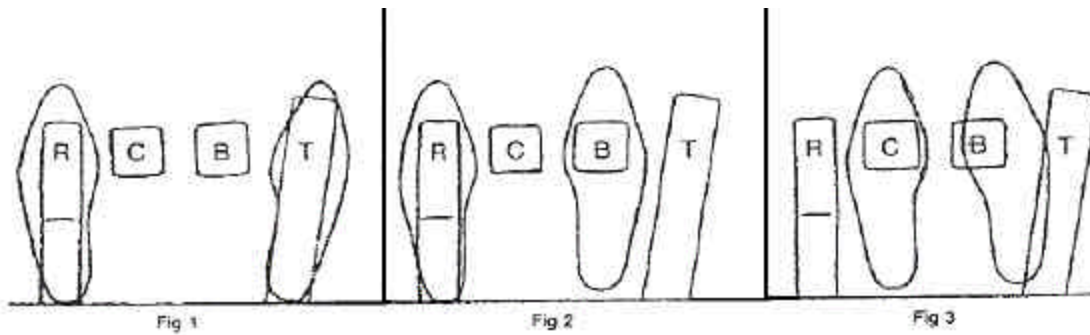
## HEEL and TOE TECHNIQUE:

The Heel and Toe technique is the ability to use three pedals (clutch, brake, accelerator) with two feet. It really should be called “Ball of the Foot/Side of the Foot”. Let’s see why:

1. The objective of “heel and toe” is to be able to brake for a turn, select the proper gear for that turn, do it while braking, and then apply the throttle through the turn for maximum control of your car. While this is a “racing” technique that allows you to downshift while under braking and then go back on power, it is very effective on the street especially in situations where you must be in the proper gear at the proper time in order to perform an evasive maneuver.
2. In a situation that requires braking and a gear change, remove your foot from the accelerator and step on the brake pedal with the ball of your right foot. The ball of your foot gives you the most “feel” and allows you to control the amount of pressure you are applying to the brakes.
3. The brakes should be applied smoothly while increasing the pressure as is needed. Do not jam on the brakes suddenly as this may cause one or more of the wheels to lock up causing a loss of car control.
4. When the speed of your car has been reduced sufficiently to select the next lower gear, depress the clutch with your left foot while applying the brakes with the ball of your right foot.
5. At the moment the clutch disengages, the engine speed will drop to an idle. If you were to change gears now and let the clutch out, the engine may be at 1000 RPM’s while the transmission is turning at 4,000 RPM’s. When the clutch engages something has to give; either you will slip the clutch and cause your car to jerk or you may lose traction to the rear wheels. In either case, you will upset the balance of your car and could lose control.
6. Therefore, just a split second after depressing the clutch and before the engine speed drops too much, roll your right foot over onto the accelerator pedal using the right side of your foot, and while maintaining pressure on the brake pedal, “blip” the throttle.
7. The “blip” will get the engine RPM’s up so that as you change gears and let the clutch out, the engine and transmission will be going the same speed and the gear change will be smooth.

## ORDER OF EVENTS:

- A. Right foot from accelerator pedal to brake pedal (Figure 1 & 2).
- B. Depress clutch with left foot (Figure 3).
- C. Change Gears (Figure 3).
- D. "Blip" throttle just prior to releasing clutch to bring RPM's up (Figure 3).
- E. Engage Clutch (Figures 4 & 5).
- F. Finish braking and step on accelerator (Figures 4 & 5).





## **GENERAL INFORMATION:**

Before going out onto the course, have a checklist for you and your car:

1. Empty your pockets of tools, pens, pencils or anything that might cause discomfort.
2. Use the restroom! A full bladder can become painful and dangerous.
3. Remove dentures, chewing gum or anything that could become lodged in your throat in case of an accident.
4. Check your car: lug nuts, tire pressures, gas, all fluids, etc. Make a check list!
5. Adjust your mirrors before you start onto the course. Know your blind spots. Adjust for a minimal amount of head movement. Being able to see and know what is going on behind and on each side of you can help you make the proper decisions that could be necessary.

Should you have to move your head too much to see what's going on around you, there is a tendency to turn the steering wheel as you turn your head. This may cause overreaction to situations and possible loss of car control.

**AS A RULE OF THUMB: ALWAYS CHECK YOUR MIRRORS BEFORE COMMITTING YOURSELF TO A TURN AND AFTER YOU EXIT EACH TURN.**

# OUT ON THE COURSE:

## COURSE ENTRY

1. When entering the course, wait for instructions from the entry/re-entry person. If they have their hand up holding you for a moment, don't look back up the course, watch the re-entry person until you get the permission to go. Once on the track surface, stay to the same side of the course you entered on, even if it's the slower part of the track, until you have built enough speed and checked your mirrors for a clear track. Then you can move over to the faster part of the course.
2. For the first lap or two, take it easy. Warm up your tires, brakes, engine, gearbox, etc., especially you.
3. Check out the course and the off-course conditions for ruts, embankments, fences, etc. Look for possible safe escape routes.
4. Know the meaning of all the flags. Know where the flag stations and corner workers are located.
5. Always be alert for changes in track conditions. It is sometimes very difficult for the corner workers to see an oil spill or such on the track.
6. Concentrate on the proper "line" into turns, proper apex and proper exit for maximum speed. Take it a step at a time. Speed comes with smoothness and consistency.

## COURSE EXIT

1. At the end of a session or whenever you have made a decision to come in off the course, as you enter the last turn preceding the pit lane or course exit, put your hand out the car window and up in the air to indicate that you are leaving the course and are no longer at high speed. Reduce your speed and come in off the course safely.
2. If possible, stay out of the "racing" line.
3. **Always** stay in the car.

## CORNERING:

Every corner on a track has a maximum speed or limit at which it can be driven. Your ability to find the limits of your car and yourself will determine the speed at which you will be able to negotiate each turn.

We will always be able to go fastest with our foot to the floor and the steering wheel pointed straight ahead. But, as we approach a turn and start turning the steering wheel, we slow down even if we have our foot to the floor! By turning, we have created a sideways load on the car. If we exceed the limit of adhesion (or grip) of the tires, they will begin to travel sideways, “scrubbing” off speed or slowing the car.

Our objective, then, should be, first, to minimize the turn on the steering wheel, and second, to straighten the wheel as soon as we exit the turn and apply maximum power as soon as possible.

The basic idea of taking a turn is to go in slow and come out fast.

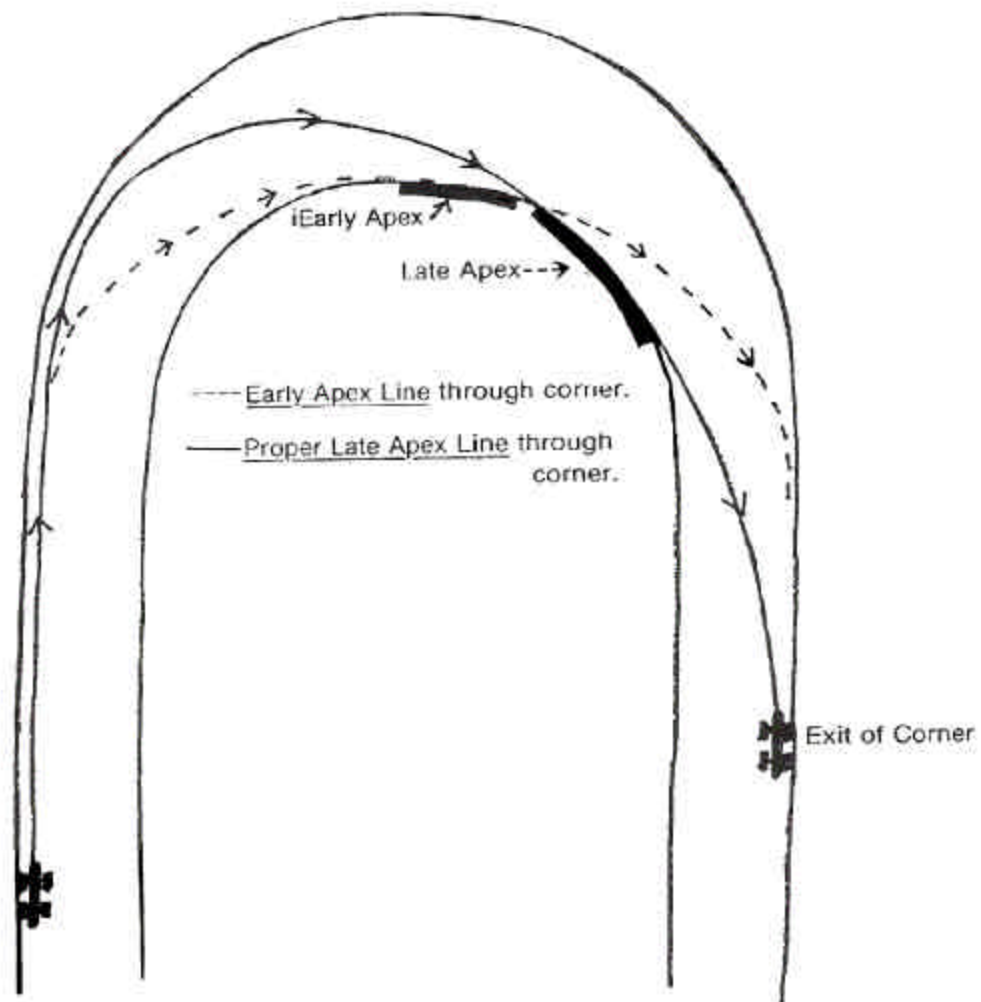
**YOUR EXIT SPEED OUT OF A TURN IS PROBABLY THE SINGLE MOST IMPORTANT FACTOR IN GOING FASTER AND REDUCING YOUR LAP TIMES.**

The proper sequence of events in negotiating a turn are as follows:

1. At your braking point, apply the brakes with the ball of your right foot.
2. Downshift if necessary using the heel and toe technique.
3. Finish braking at the turn-in point of a turn.
4. Now, in the corner itself are three basic parts:
  - A. With proper hand position on the wheel, turn in to the clipping point of the turn and smoothly apply the throttle. (**ENTRY**)
  - B. As the car turns in, apply more throttle without upsetting the balance of the car and clip the **APEX** or clipping point (innermost part of a turn).
  - C. Unsteer the car from the apex and apply full power as soon as possible. Straighten out the steering wheel as quickly as you can as you **EXIT** the turn.

**Remember:** The fastest line is a STRAIGHT LINE. Everything being equal, the fastest driver is the first to straighten out the wheel and the first to apply maximum power.

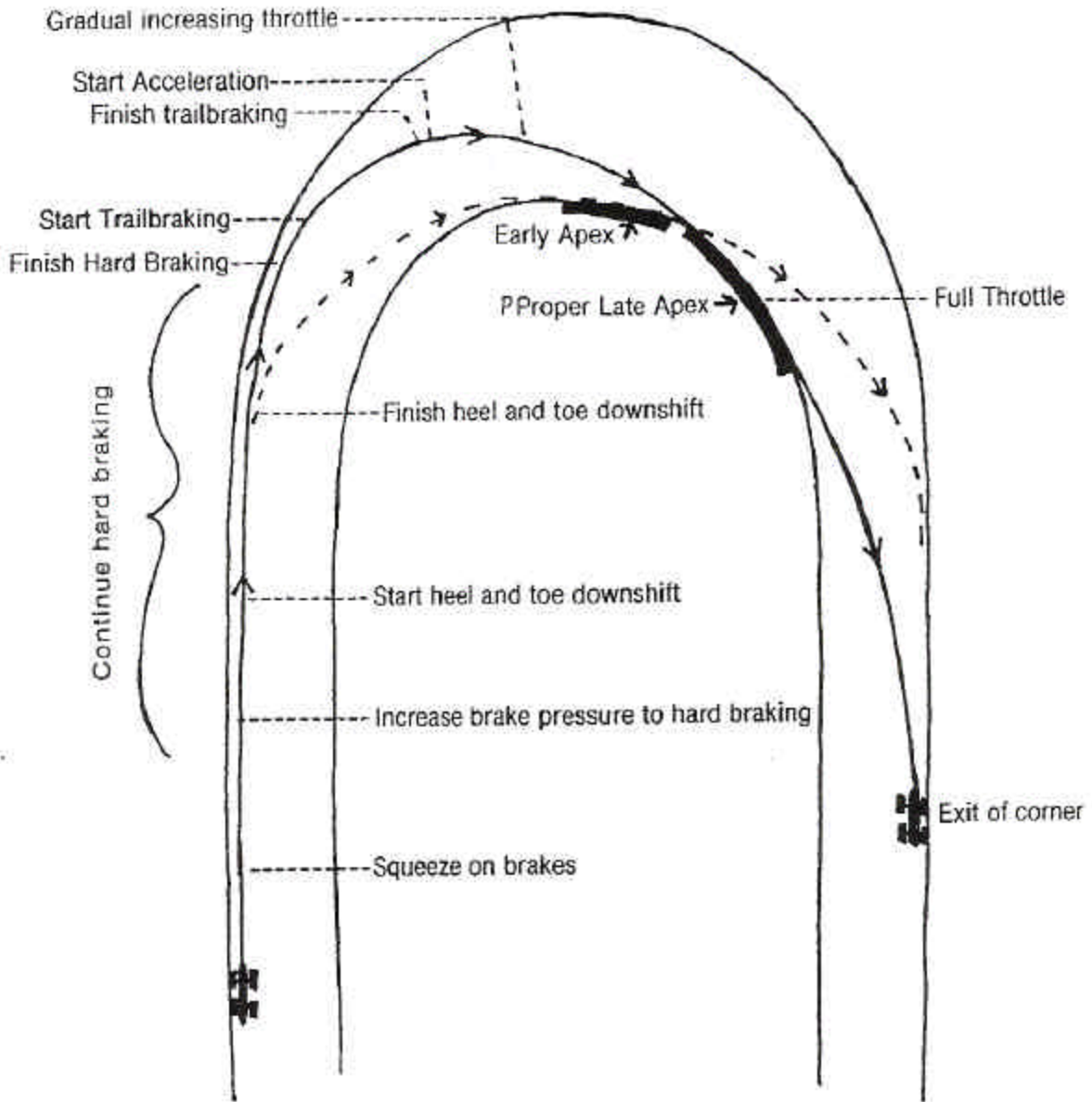
## PROPER ENTRY, APEX AND EXIT OF CORNER:



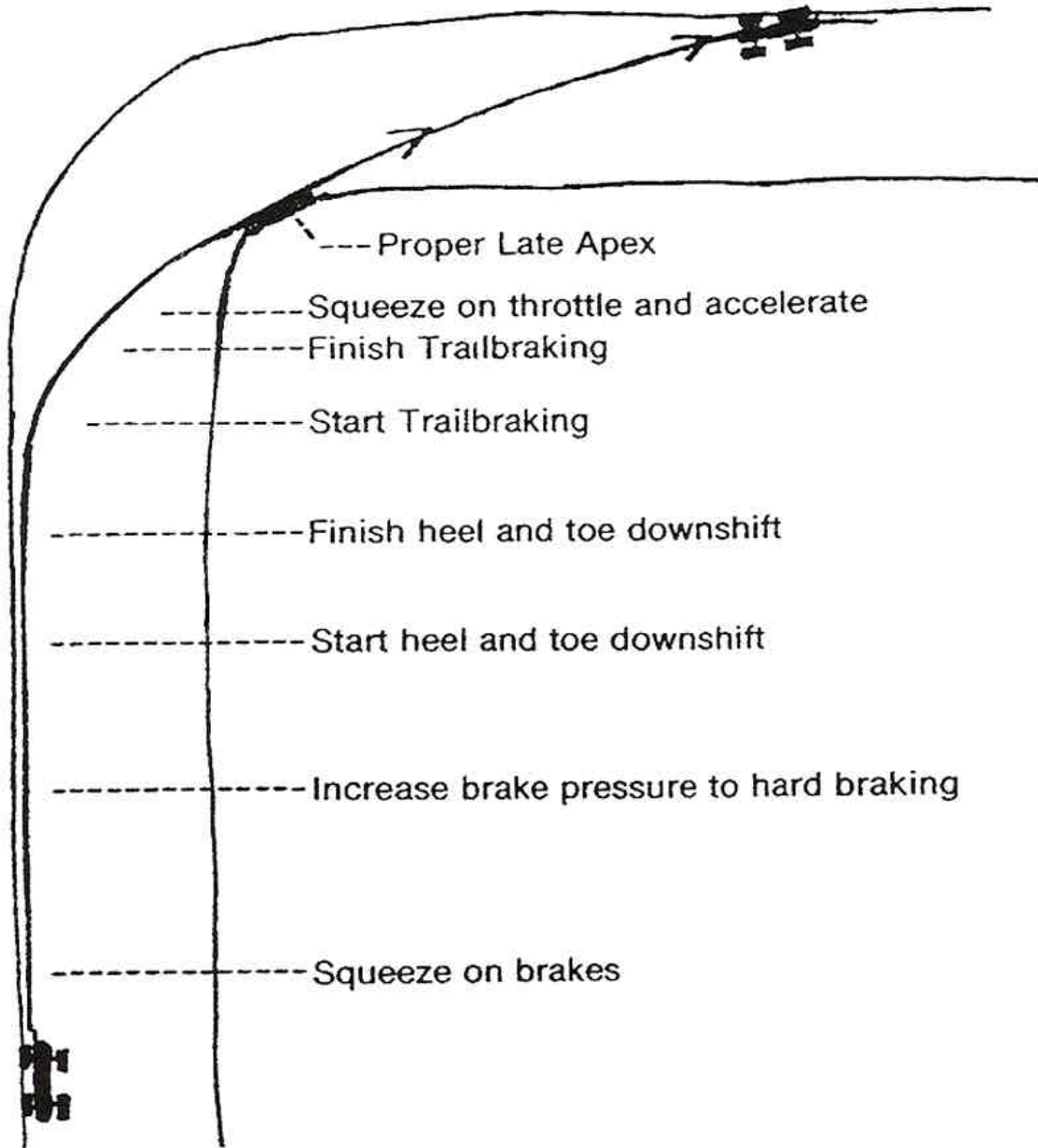
The Early Apex is the usual line through a corner that most people take. It is the shortest way through a corner but not the fastest or most stable.

Proper Late Apex is the fastest way out of a corner and the most stable. The car will get most of its cornering done during the first third of the corner under trailing brake, and therefore you will be able to give it full throttle much earlier and will allow you maximum exit speed. In most cases, you will be able to achieve full throttle around the apex area rather than waiting for the exit area.

# HOW TO WORK A CORNER PROPERLY:



## HOW TO WORK A CORNER PROPERLY (90 degrees):



## TRAILING BRAKE TECHNIQUE:

This is the technique of controlling abrupt weight transfer while cornering.

Before you enter a corner, you squeeze on brakes gently, increase brake pressure, heel and toe downshift, continue trailing brake with progressively less pressure into the first third of the corner, release brake smoothly, apply throttle gently, then progressively harder to accelerate out of the corner.

## EXPLANATION OF SOME GENERAL TERMS IN RACING AND HIGH PERFORMANCE DRIVING

**Apex:** That point in a corner when the inside wheels are at the inside edge of the turn. It may be a long or short distance.

a. If apex is too early, the road will be used up too soon as you exit the corner and /or the throttle cannot be applied as soon as it might for better exit speed out of corner.

b. If the apex is too late, all of the road will not be used and/or maximum power will not compensate for excessively slow entry.

c. The proper late apex is illustrated and discussed on the following page.

**Line of Road Course:** Imaginary path of a car as it maneuvers around a track finding the proper apexes and using the entire width of the road to your best advantage and maximum speed.

**Drifting:** Car has lost traction and is gaining speed, while running out of road.

**Sliding:** Car has lost traction and is losing ground or running out of road.

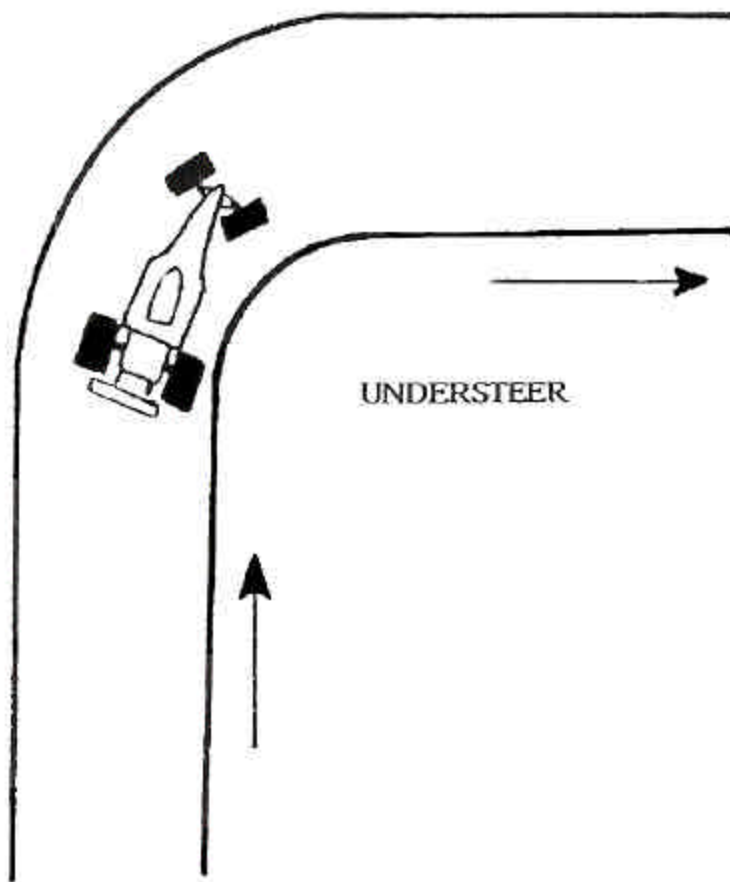
**Drafting:** Following another car very closely, in the "bubble of air" he creates, making it possible for you to achieve a higher rate of speed, lowering your wind resistance. It will also save some fuel. This is also referred to as "slipstreaming".

**Power Slide:** Controlled slide with throttle, maintaining proper line through corner (used mainly on hairpins or slow turns).

### **Camber of Road:**

**Positive Camber:** (a banked corner): Outside tires maintain excellent traction. In the event of loss of traction due to locked wheels or a spin, the car will go downhill.

**Negative Camber:** The road is going away from you, thus causing loss of traction. This may cause a front or rear wheel slide.

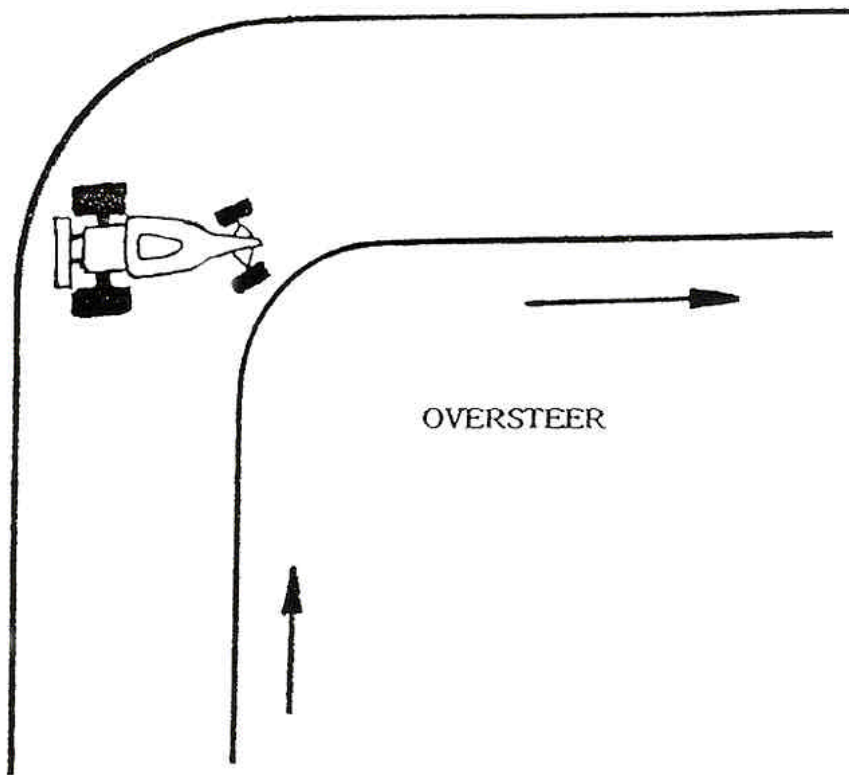


**Understeer**: A car understeers or (“pushes”) when you turn the steering wheel and the car doesn’t turn in as much as you have turned the wheel. It has a tendency to go straight due to lack of traction on the front tires. Understeer can be caused by entering a turn too fast and/or turning in too late or too suddenly.

To correct for understeer, gently let off on the accelerator. This move transfers the weight of the vehicle forward onto the front wheels thereby increasing the size of the front tire contact patch and increasing traction.

Under more extreme conditions, you may even have to apply the brakes in order to transfer a greater amount of weight to the front tires. **DO IT SMOOTHLY!** If you get the front wheels locked up you will lose control of your steering and you will go straight or in the direction of your vehicle’s momentum.





**Oversteer:** A car oversteers (or is “loose”) when, as you turn the steering wheel, the car wants to turn more than what your input calls for. The rear of the car starts to slide out due to loss of traction.

Oversteer may be caused by lifting from the accelerator while turning and/or braking into a turn, especially if either are done too severely. Severe braking while turning, causing the rear wheels to lock up, will create a strong oversteer condition usually ending in a spin.

To correct for oversteer, turn the steering wheel in the same direction that the rear of the car is headed. This is called “reverse lock”. Then gently press on the accelerator to transfer weight to the rear of the vehicle. As the rear of the car comes back into line, straighten the steering wheel and accelerate.

It is very easy to “over correct” an oversteer condition with the end result being that the car will straighten out and then spin the other way. Once you gain traction on all four tires, you will end up going where the front wheels are pointed.

**Neutral Steering:** Our goal is to keep our car in a neutral steering condition at all times so that it is doing exactly what we tell it to do. By having a basic understanding of over/understeer, contact patch and weight transfer, we can balance our car through proper use of the brake and accelerator. ABOVE ALL ELSE BE SMOOTH. IT PAYS!

## **UNDERSTEER AND OVERSTEER** **(Cause and Correction)**

### **Understeer - a front wheel skid:**

Cause: 1. Too much speed in a corner in inherently understeering car (front engine).

Correction: 1a. Correct by easing off throttle half a throttle setting to transfer weight to front wheels, add steering to get proper line back.

Cause: 2. Too much braking causing front wheels to lock.

Correction: 2a. Ease off brakes to get front wheels unlocked (or rolling), add steering to get proper line back.

Cause: 3. Violently spinning front wheels (front wheel drive car).

Correction: 3a. Ease off throttle to stop front wheels from spinning and to transfer weight to front tires, add steering to get proper line back. Then get back on throttle immediately, 1/2 to 3/4 throttle, (adjust as necessary).

### **Oversteer - a rear wheel skid or slide:**

Cause: 1. Too much speed in a corner in inherently oversteering car (rear engine).

Correction: 1a. First add steering quickly into direction rear end is sliding. On dry pavement, add some throttle to transfer weight to rear wheels. When rear end starts coming back, correct steering quickly into opposite direction to counteract second skid. As car comes out of second skid, bring wheel smoothly back to straight and continue on proper line.

Cause: 2. Too much braking causing rear wheels to lock.

Correction: 2a. Come off brakes quickly and add steering quickly into the direction the rear end is sliding. When rear end starts coming back, correct steering quickly again to gain proper line back.

Cause: 3. Violently spinning rear wheels (rear wheel drive car).

Correction: 3a. Ease off throttle to stop rear wheels from spinning, and quickly add steering in the direction the rear end is sliding. When rear end starts coming back, quickly add steering again to gain proper line back.

If on wet pavement, correct steering very quickly with full lock (as far as the wheel will turn) into the direction the rear end is sliding, ease off throttle and stay off brakes altogether, letting the sidewalls scrub off speed and gain adhesion. Keep correcting steering wheel until slide is caught and you can gain proper line back.

## PASSING PROCEDURES:

1. If you are the car being passed:
  - A. As you approach a turn and you wish to let a faster car by, signal the driver to pass to your left and make sure you give him enough room to make the pass safely. **Never signal a pass and then race the passing car to the corner!** Check your mirrors before turning in to the turn to make certain there are no other cars also attempting a pass.
  - B. If you want to let a faster car by on the exit of a turn, ideally you should move to the right and allow the overtaking car to pass to the left. Signal if you can but maintain control of your vehicle.
  - C. It is always advisable to communicate with the other driver through the use of hand signals, but your first concern should be to maintain control of your car and if you need both of your hands on the steering wheel to maintain that control, then don't signal.
  - D. When in doubt, **maintain your line!** The overtaking driver will get by safely if **you maintain a predictable line.**
2. If you are the overtaking car, you have the responsibility of making a safe pass. However, good sportsmanship dictates that all drivers in a passing situation have the responsibility of giving each other "racing room" to complete a safe pass.

## IF YOU GO OFF COURSE:

1. With an off course mechanical, pull off the track surface as far as possible and away from any oncoming traffic. **Do not get out of the car. Do not work on your car!** Signal a corner worker as to your need of a tow truck.
2. If you lose control of your car and merely go off course, once you regain control proceed toward the track surface, place your arm in the air to inform the corner worker that you are ready to enter the track. Wait for instruction from the corner worker. As you enter the track stay on the same side you entered from so as to not cut in front of other traffic. If there is no corner worker to assist you in re-entry to the track, then check for oncoming traffic and enter on your own. Use good judgment!
3. ALWAYS STAY IN THE CAR.

## **BE PREPARED:**

Thorough vehicle preparation gives a driver the confidence to develop the skills we all enjoy practicing at our events. This preparation not only includes familiarity with the applicable rules and allowances for your class, but, more importantly, a complete inspection to assure that all systems are performing correctly.

P.O.C. tech inspection (prior to every event is primarily a safety inspection which will uncover gross discrepancies, but should not be substituted for your own preparation inspection. **You** must take the time to thoroughly examine your vehicle in order to assure yourself of optimum performance and safety.

The following is a checklist of some of the areas you might wish to cover in your inspection. Please feel free to add any other important areas you may discover.

### **ENGINE**

- Fresh oil and check level
- Clean air filter
- Check battery level & connections
- Check motor mounts
- Check for loose bolts & wires
- Check all hoses and lines
- Check brake fluid
- Check coolant level
- Check exhaust system mounts

### **FRONT SUSPENSION**

- Check all mounts and bushings
- Check sway bar mounts and adjusters
- Check shock mounts, seals and adjustments
- Check brake pads, rotors & lines
- Check bearings, steering play and mounts
- Re-torque lug nuts, tape wheel weights, remove hub caps
- Inspect tire tread and sidewalls
- Check alignment settings

### **REAR SUSPENSION**

- Check bolts and bushings
- Check swaybar mounts and adjusters
- Check shock mounts, seals, adjustment
- Inspect brake pads, rotors and lines
- Re-torque lug nuts, tape wheel weights, remove hubcaps

### **INTERIOR**

- Check fire extinguisher
- Inspect safety harness and cotter pins
- Check seat brackets
- Check pedal travels
- Remove loose objects

### **EXTERIOR**

- Remove windshield wipers
- Check all trim attachments
- Check hood and deck closing mechanism
- Tape all non-essential lights before entry to pre-grid
- Apply proper numbers and classification ID

## GLOSSARY

### **STEERING & HANDLING**

Reaction time – the time it takes a driver to respond to some indication of a need for a response (approximately .25 to .50 seconds).

Center of gravity – The point within a car where it is exactly balanced in all directions.

Weight transfer – The transfer of weight from one side or end of a car to another side or end upon acceleration or braking.

Lateral resistance – The side force generated by a tire during cornering.

Slip Angle – The angle between the direction a tire is pointing and the direction it is rolling while negotiating a turn.

Lock – A turn of the steering wheel.

Sawing – An incorrect procedure noticeable by rapid oscillation of the steering wheel by the driver while turning into a turn.

Head Lean – Leaning the head excessively while negotiating turning type maneuvers.

Understeer – A condition during cornering in which the car wants to go straight even though the steering wheel is being turned into a turn.

Plow or Push – Slang for excessive understeer.

Oversteer – A condition during cornering in which the car wants to turn into the corner more sharply than the steering input and the rear end starts to break loose. Also called an over-reactive car.

Loose or Hanging it Out – Slang for purposefully driving with oversteer. A sort of controlled rear end skid.

Neutral Steering – When the car is neither over or understeering and maintains traction on all four wheels.

Dead Pedal – A resting or bracing area immediately to the left of the clutch pedal. It is useful during hard cornering.

Drift – Driving in a controlled skid while the car is gaining speed.

Skid – To force the tires to slide rather than roll when braking, or to slide sideways.

Spin – Uncontrolled skid

## **GLOSSARY** continued

### **STEERING & HANDLING** continued

Scrubbing – Greatly reducing the vehicle speed by causing the wheels to skid rather than roll.

Broad slide – A controlled sideways slide greatly reducing vehicle speed.

Throttle Steer – Applying throttle to induce rear steering action. Also called “Power Oversteer”.

Feathering – Gentle application of throttle pedal pressure.

Heel & Toe – Ball of the foot and side of the foot operation of brake and accelerator.

### **ENGINE & TRANSMISSION**

Power Curve – Relative horsepower available at each engine RPM.

RPM – Engine revolutions per minute or “Rev’s”.

Over-rev – To run the engine at a greater RPM than is desirable or healthy for the engine.

Lug – Operating the engine at too low an RPM requiring too much accelerator (flooring the gas pedal).

Torque – The engines ability to produce twisting force.

Max Torque – The maximum torque value attained and the RPM at which it occurs.

Shift Point – The RPM at which one shifts (up or down a gear).

Red Line – Maximum useable RPM. Operation above this value will produce less power and/or cause engine damage.

Upshift – Changing from a lower to a higher gear.

Downshift – Changing from a higher to a lower gear.

Double Clutch – Depressing the clutch as the shift lever passes through the neutral position. Could help to extend synchro life.

Riding the Clutch – Driving with the clutch partially engaged or slipping.

Clutch Slip – Allowing the engine to race with the car moving slowly (i.e., holding a car on a hill by slightly engaging the clutch).

## GLOSSARY continued

### **ENGINE & TRANSMISSION** continued

Riding the Shift – Driving with one hand resting on the shift lever.

Accelerate – Increase vehicle speed.

Decelerate – To decrease vehicle speed.

### **TIRES & BRAKES**

Contact Patch – Small area of the tire in actual contact with the ground.

Coefficient of Friction – The ratio of the force a tire can generate to its load, typically ranging from zero (ice) to one (paved surface).

Traction – A tire's ability to adhere to a road surface. Also a function of weight and contact patch.

The Limit – The maximum forward, rearward or sideways force at the tires while accelerating, cornering or braking.

Wheel Spin – To spin the wheels while accelerating. Also “burning out” or “peeling out”.

Pumping the Brakes – Modulating the brake pedal to regain pedal height. Not a good sign!

Cadence Braking or Modulating – Actually modulating the brake pedal pressure to maintain threshold braking.

Stabbing the Brakes – Sudden forceful application of the brakes causing skidding. Mis-applied cadence braking.

Engine Braking – Using the brakes at maximum capacity (just short of skidding) to slow the car.

Trailing Brake – Using a low and then decreasing brake pedal pressure going into and partially through a turn in comparison to the complete release of the brake before turning in.

Braking Point – A designated point on a course usually at a fixed distance from a turn at which you begin application of the brakes.

Stopping Distance – The minimum distance required to stop a car usually including driver reaction time.

Rolling Resistance – The force required (as in pushing a car) to make a tire roll.

## GLOSSARY continued

### **TIRES & BRAKES** continued

Balance – The relationship between the load on each wheel and their ability to turn, brake and apply power. Equal balance or neutral is best.

### **ROADS & CURVES**

Radius – The distance from the center of the circle to the vehicle on that vehicle's path.

Geometric Apex – The middle part of a turn.

Clipping Point – Apex, or that point along a curve where a car should actually touch the inside of the road.

Early Apex – When the clipping point or apex occurs before the planned clipping point. NOT DESIRABLE!

Late Apex – Counter to that stated above. MORE DESIRABLE!

The Line – The best possible path through a course, all factors considered.

Entry Point – That point at which one begins a turning maneuver.

Turn-In-Point – Same as above.

Exit Point – The desired path at the point of exit of a cornering maneuver.

Off-Camber – When the road slopes away from the inside of a turn.

Straights – Those portions of a course in which no turns occur.

Constant Radius – When the arc of a turn remains constant.

Decreasing Radius – When the arc of a turn gets sharper and sharper.

Increasing Radius – When the arc of a turn becomes wider and wider.

The Esses or "S's" – Two or more connected curves or turns which alternate in direction.

Slalom – Weaving through a series of designed markers, cones or obstacles.

Chicane – A tricky "kink" in the roadway. Somewhat like "esses's".

Hairpin Turn – A very sharp 180° turn occurring in little more than two roadway widths.



## FLAGS:



**WAVING YELLOW FLAG - Signals an immediate hazard on course**

**DRIVER:** slow down now, change line, be prepared to stop NO PASSING

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**STANDING YELLOW - Signals cautions for potential hazard**

**DRIVER:** slow down, be alert, NO PASSING

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**SLIPPERY CONDITIONS (OIL) - Signals oil, water, etc. on track**

**DRIVER:** slippery conditions require caution, reduce speed

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**PASSING - Signals a potential passing situation**

**DRIVER:** check rear view mirror for overtaking car; give hand signal and prepare to be passed

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**MECHANICAL PROBLEM - Signals a possible malfunction of a car**

**DRIVER:** slow down, drive off line and exit course into pits, proceed to Black Flag Station for inspection.

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**FURLED BLACK - Signals warning of driving infraction**

**DRIVER:** discontinue present driving or face open Black Flag

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**OPEN BLACK - Signals a driving infraction**

**DRIVER:** proceed immediately to the pits via designated course exit and report to the Track Steward at Black Flag Station

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**WHITE-RED CROSS - Signals a service or emergency vehicle is on track**

**DRIVER:** use caution and prepare to avoid vehicle when observed, look for Waving Yellow at turn previous to vehicle

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**RED - Signals an On-Track Emergency**

**DRIVER:** slow down smoothly after checking rear view mirror, pull over and stop. Remain belted-in, ready to drive

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**CHECKER - Signals the end of last lap and begins Cool Off Lap**

**DRIVER:** proceed to the pits via the designated exit at reduced speed

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**GREEN - Signals the course is clear**

**DRIVER:** GO! Course is clear

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**DRIVERS SHOULD ACKNOWLEDGE FLAGS BY A HEAD NOD OR HAND WAVE TO THE WORKER DISPLAYING IT**

## NOTES: