MAVERICK REGION
porsche club of America

AUTOCROSS:
instruction manual

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How to Design a Course

There are as many autocross course designs as there are autocross days. Every course is different...on purpose. One of the joys of autocrossing is finally getting to design your course and then watching other drivers have fun conquering it. If you attend our Sunday autocrosses regularly, somebody will ask you to help by being in charge of an event and designing a course...you **will** have that opportunity.

There are 2 basic ways to proceed:

- The "paranoid" approach
- The "impromptu" approach

A "paranoid" eventmaster plans everything before hand in agonizing (to other people) detail. There will be a course map drawn to scale, with exact pylon locations, measured in inches! Usually the relationship of gates several hundred yards apart are not too important, but the placement of the pylons in gates, boxes, slaloms, etc are quite important, so the "paranoid" guy or gal wants to be sure that everything is perfect. Often they have setup portions of the course weeks or months in advance and have driven it. They fine tune each part, until it drives just like they want it to.

In contrast, an "impromptu" eventmaster, doesn't think about the course until the morning of the event. The normal technique is to load the pylons in a pickup or big van, position the event master in the back, and drive around the lot. When a pylon seems to be needed somewhere, the eventmaster throws one out. Often it's more random than that, like some fell out, so that's where a strange feature appears. To an "impromptu" guy, the worst thing someone might conclude about them is that they **plan ahead**. They will go to extremes to ensure that no one gets **that** idea! They sometimes drive the course after they set it up and adjust a few pylons...but not always. It sounds strange, but the resultant course can be interesting and challenging. But more often, it's a disaster!

Thankfully, most MR-PCA eventmasters are somewhere in the middle...leaning a little toward the "paranoid"?

There are 2 basic types of courses:

- A "racetrack" course
- A "memory" course

A "racetrack" course is one where the edges of the course are defined by closely-spaced pylons. It takes many pylons to do this, if the course is of any size. An alternate approach is to mark the edges with white paint, with an occasional pylon gate. The "permanent" MineralRing courses, used for the Saturday autocrosses, are of the "racetrack" type. They drive much like small racetracks. But they also are "memory" courses, since they don't use many pylons...you will have to **remember** where the course goes. The first time you drive a Saturday course, you will probably get lost a few times...but you will be given adequate time to find where the course goes. After a few events, since they are always the same, you should have no difficulty locating the course.

In contract, a "memory" course is one where only small parts of the course are defined. These are called "features". There are many types of "features", such as "gate", "offset gate", "box", "christmas tree", "slalom", "chicane", etc. The parts of the course between successive "features" is undefined...the entrants can navigate it in any way they choose. Often, features can be quite a distance apart and it becomes difficult to determine which "feature" is the next one to be negotiated. This gives rise to the "memory" moniker...each entrant must memorize the order in which the "features" are driven, ie, the path the course takes. Most of the Sunday autocrosses will be "memory" courses, to some extent, however, they will all be different in this regard.

A "racetrack" course is simple to design and drive...just snake a 20-30 foot wide path around however you like it, putting pylons every 10 feet. If the course width is significantly wider than the pylon spacing, nobody ever "loses" where the course goes.

A "memory" course is more challenging to design and to drive. It mostly has pylon spacing wider than the width of the course, so the designer has to use skill to keep from losing the entrants on course. After you have been autocrossing for a few years, you will have seen many "features", so when your time comes to design a course, you just select the "features" you like and link them up. If you want to be tricky, you try to confuse the drivers. One common way is to make the course appear "tight", by using lots of pylons in defining one "feature", but really design it to have a simple path (sometimes an almost straight path!) through all the pylons! Another technique is to design a big, fast turn, but loosely define it. Novice drivers will see a series of gates linked by straights...and "square-off" the corners,,,ie, drive it as several "point and squirt" features, where several tight turns are joined by straight sections...they waste a lot of time braking, turning, and accelerating. Even quite high HP Porsches are faster when the turns are big and smooth and the experienced drivers recognize this.

No autocross designer wants lots of DNFs, so it's important to have an experienced autocrosser look over your layout, after it's down on the pavement. Ask them to walk your course without looking at your course map. If they get lost, add or move pylons as required to make it obvious where to go! Some designers like to solve this problem (not having enough pylons to completely define a course) by chalking a line down the center. It's easy...just get some scrap sheet rock pieces and lay down in the back of a station wagon type vehicle and press the sheet rock down on the pavement as the driver negotiates the **correct** course...if the driver fails to follow the right line, the white chalk is tough to erase!

Most course designs are hybrids...neither a pure "racetrack" or "memory" type...but both to some degree.

Both types of courses can cross over themselves, but it's much more common to have a "memory" course do this. It's a technique that lots of eventmasters use to maximize the available pavement. At

the MineralRing, this is not needed...there is more pavement than we have pylons to use...but it's also fun to design and to drive swoopy courses that cross themselves.

There can be optional features, such as a slalom that can be taken in either direction. It's fun (and common) to design a slalom that is much faster if taken in one direction, then see how many people do it wrong. However, if you want a slalom (or any similar feature) driven in a specific way, the common technique is to use a directional pylon...a pylon laid down on it's side, pointing to the correct side. BTW, directional pylons normally don't count if someone hits them...put directional pylons **outside** the normal pylon.

It's possible to design a course that is driven in both directions. You just put a "cul de sac" at the end! This normally requires that you have a "Y" near the other end, to allow separate start and finish areas...but not always...it's quite possible to share a common start/finish line and a common staging/finishing area...one car at a time!

The design of a course will dictate what pylon penalty is assessed when a pylon is hit. The PCRs allow penalties from 1 to 5 seconds (see PCR section D.8.2.3). If your course is very tight and slow, a penalty of 1 second is probably appropriate. On the other hand, if your course is open and fast, a higher penalty should be assigned. The way to decide this is to consider what the effect of hitting every pylon is. If there is a pylon in your design that could allow a much higher speed and/or more favorable line...which would reduce the ET for a driver who hits the pylon (and takes the penalty assigned) more than the penalty, you have too low a penalty. If you don't fix this, your entrants will and the workers unlucky enough to be assigned to the offending pylon(s) will be tired! Either raise the pylon penalty or add multiple pylons at the critical locations.

Regardless of the design, the most important consideration is safety...both for the competitors while on the course and for the workers and spectators. At the MineralRing, there are few hard, physical objects to worry about (such as curbs, light poles, guard rails, etc), so the only things a car might hit is another car, a person, or the timing trailer.

First, design the course so that it is either short enough that only one car is on the course at a time, or long enough that multiple cars can be on course without coming close to each other. A course that crosses itself generally precludes multiple cars being on the course simultaneously.

Second, never make a turn in the course where workers or the timing trailer are where a car might hit them if:

- The car spins out of control
- The driver misinterprets where the course goes and chooses the wrong path
- The car spills some oil and spins
- The car loses a wheel
- The driver dies, falls asleep, faints, blacks out, etc
- The car turns over (it will slide quite a ways on it's roof, as the coefficient of friction is low)

The later ones, in the above list, are **very** unlikely to happen! But don't forget that they **can** happen.

Thus, it's a good idea to keep the course straight when in the vicinity of workers and the timing trailer. Additionally, the rubber hose that senses the cars can be damaged or pulled off the pavement, if a

car turns, accelerates, or stops while on it. Therefore, keep the course straight when going across the start/finish line.

Keep workers **inside** the course, if possible! Put them at the center of turns, where a car will slide away from them. It's more important to keep them safe than to get them close to the pylons they are responsible for...let them run if necessary. Exercise is good for them! If you design a complex course, remember to consider the parts of the course "behind" where the workers are...cars in these sections might pose a hazard?

How to Work a Corner

Everybody that enters a MR autocross is required to work. We usually divide the entrants into 2 groups...one works while the other drives, then they swap. Most people work a "corner". It's not necessarily at a real corner; more often it's just out in the middle of a bunch of cones...you might be responsible for several actual "corners" on the course. The diagrams of the "permanent" MineralRing courses, show the zones of responsibility for each of the 6 worker stations. For Sunday autocrosses, the eventmaster should post a diagram or tell the workers what pylons each station is to watch and replace, when hit. If nobody tells you, work it out so that each group of workers know what to do.

So what do you do when you work a corner? We can divide your duties into several jobs:

- Watch for pylons knocked down
- Put the pylons back in their proper place
- Report the pylons via the radio
- Watch for slow cars, stopped cars, or cars in trouble
- Report the above on the radio
- Listen to the radio
- Wave the flags, as instructed
- Grab the fire extinguisher and put out a fire

Usually, there are 2-3 people at a station and each sort of assumes a role. The most important job is keeping each other safe! Don't clown around when cars are on course...watch the cars! Each worker should look in a different direction...split up your area of responsibility and each of you take a section to watch. Your primary job is "shagging" pylons. The youngest, least senior individual at the "corner" is going to do most of this! Sorry, kids. The only tricky part to putting pylons back, is finding where they came from. If only a single pylon is knocked down and if it is not dragged any distance, the location is usually clear. The pylon locations are marked in several ways, but at the MineralRing, there is usually a white mark (square) in the center, under the pylon. Other times, and more commonly, a white line is drawn around the base of each pylon to mark the location, because the proper location can be determined without lifting the pylon.

However, when several pylons are down and/or they are dragged some distance, it is difficult to find the right places for all of them. At times, there is not enough time to get them all replaced before the next car comes through your area of the course. If you see that you may not be able to replace them correctly in time, you should have the person on the radio, report the situation to the base radio in the timing trailer. They will probably have you (and other workers) stop the next car before they drive the section where the pylons are still down. Let the event organizers make the call! Don't ever wave the red flag, stopping the event on your own, unless it's a real emergency. *[Eventmasters: it's wise to leave a couple of extra pylons at each station, along with the fire extinguisher, flag, and radio.]*

There are 3 important concerns when this happens: first, it's unsafe to have workers placing pylons while a car is driving close by; second, it's unfair to all competitors, to allow any driver to run a modified course during the event...**the course must be the same for each and every run of each and every driver;** third, it's unfair to allow a driver to "practice" on the course, when they will get another run. Some drivers will see the pylon placement problem and stop, with their hand raised out the window. They know that by doing this, they will be allowed to make the run again, without a distraction. Report this to the base radio operator. After all cars have been stopped, you will be instructed to tell the driver to return to the staging area, outside the course or on course at reduced speed.

As you watch cars and pylons, it's important to either make a mental note of each car number, or better, make a **written** list of the car numbers, with the number of pylons hit. If you do this, write **all** the car numbers down as they approach, then add the pylons hit. Don't just write the ones that hit pylons. This way, you will have a chronological list of every car. You might be surprised how often you will refer to this list, as people often can't remember which car hit those pylons a couple of minutes ago. If you just write the ones that hit pylons, you and your co-workers will not remember the car number who hit the pylons sometime during the day. By writing the car number first, before they hit anything, you can be more accurate.

If your assigned area is large, divide the area up and each of you concentrate on a particular group of pylons. If another "corner" is near, communicate with them so both groups understand exactly who is responsible for pylons equidistant from both groups of workers. Two "corners" should not report the same pylon! As a rule, if your worker group did not replace the pylon, don't report it.

Occasionally, a pylon is not knocked down. Does this count? The rule in PCR section D-8.2.3 is: "*If a contestant upsets a pylon or moves it **completely** outside its outline, a penalty will be incurred.*" In the case of a pylon marked with a center mark, the pylon is counted if the **entire** dot is visible. If you have any uncertainty about this rule, ask someone at the drivers meeting to clarify it.

When you are using the radio, never move the "squelch" knob. If you turn it one way, you get constant static; the other way, you never hear anything. It will be adjusted correctly before it is distributed to workers, so leave it alone. When you talk on the radio, follow a structured protocol. Never just chat. It's good protocol to: identify who you are calling, identify yourself, and state your message. For example, "Timing, this is corner 3...car 77 hit one pylon." It's good protocol to also repeat what you hear. In the above example, Timing should reply, "Corner 3, we copy that car 77 hit one pylon." If you transmit information and get no response, suspect that you were not heard or understood and repeat the transmission. Don't be shy! It's your responsibility to be heard...correctly.

If, in the unlikely event of a car fire, take the fire extinguisher at your "corner" and **run** to the car. When you get there, squeeze the handle on the extinguisher, breaking the safety seal. Aim the discharge at the **bottom** of the fire! The most common mistake is to spray the powder on the flames, not the **fuel** that is burning. Spraying the flames wastes the powder. Some cars may have an external battery switch (all race cars are required to have this)...it should be immediately turned OFF. If a car has a massive fuel leak and is on fire, you won't be able to extinguish it! Just get everyone away from the car!

Whoever does not have the fire extinguisher, should get the driver out and away from the car. If they should be trapped somehow (ie, door stuck), break out a window if necessary. The side windows shatter into small pieces and it's possible to get someone out the side window, if a door won't open.

The front windshield doesn't break out as nicely, as it has a plastic layer inside that holds it together, but it can be done.

Working a corner is also an excellent way to observe how other drivers negotiate parts of the course. There are many styles and some are quite entertaining! Check on the posted times and then observe the lines of the better drivers.

How to Do Timing/Scoring

Timing and scoring is one of the most difficult things to do...even more difficult to do correctly. Usually, a select cadre of workers, who understand how the timing equipment works and who work well under pressure and with each other are selected to work in the timing trailer. The work can be very stressful. There is a constant stream of conversation that occurs and lots of details to attend to.

Timing is normally done by 2 people...one operates the computer (types in the car number when a timing event happens) and announces the car #s and times on the PA system...the other person writes the times on the log sheets, adding pylon counts and DNFs as appropriate. Either person can use the radio to comminicate with grid and work stations. Since the log person does not have to announce the times, radio duties normally falls their way.

Posting the times is done by another 2-person team. The raw times (minus any pylon penalties) are written on the log, but the composite times (including pylon penalties) must be written on the posting board by one scoring worker (see PCR section D.8.2.5). A second worker writes the composite time on a small board that is displayed to the driver as they return from their run. The times must be written very legibly on both boards. Be careful with "7" and "9" and "4"...they can look quite similar!

The timer operator should announce the times this way: "Car 99 has a time of 100.123 with 2 pylons." Both the log operator and the posting person will write down "100.123 +2". Occasionally, a pylon that was hit will not be reported until after the car has finished their run. This will necessitate marking out the log and writing the correct pylon count. The posting board can be erased and the pylon penalty corrected.

Normally the pylon penalty is 2 seconds/pylon hit. This is not always the same, and can vary from 1 to 5 seconds/pylon hit. All pylons must have the same penalty (see PCR section D.8.2.3). The eventmaster must assign the pylon penalty and announce what it is. At the end of the event, the posting workers should draw a red box around the best time for every driver. The best time is the best composite time, that is, the sum of the raw time and the pylon penalty, if any. If the pylon penalty is not one, the number of pylons hit must be multiplied by the pylon penalty, before being added to the raw time.

MR uses a specialized timer and computer system. The scope of this manual is not broad enough to completely describe the operation of the timer. If you want a detailed description and explanation, go to the Timer Documentation page. The people who know how to operate it properly, learned by the OJT method...that's "On the Job Training" for you non-military types. If you are forced/allowed to work Timing, you will be given cursory training, then thrown in, to "sink or swim". Actually, it's not **that** bad.

A simplified description follows:

The timer system has several parts:

- o A timer...a little box with switches and connectors
- o A laptop computer
- o A sensor or sensors...an optical, through-beam type

The timer box is a TAG Heuer PTB 605 unit. It is powered by internal batteries. The timer sends a time code to the external computer for each sensor event. It also detects which switch or sensor triggered it and prefaces the time with an appropriate identifier. The interface to the computer is via an RS-232 cable.

The computer system is a laptop unit, running Windows. It has a custom program that accepts the time codes sent by the timer. The computer displays a list of events, with the time and the car# (the car# must be typed in by an operator). Each time event that is received, causes the program to ask for the car#. If an earlier time event for the same car# has been saved, a computed lap time for that car# is displayed.

Occasionally, the computer operator will put in the wrong car #. If it is the first timing event for the car, one method of recovering is to continue to use the same wrong number for this car. Unless the car with this number is also running, the timer won't know the difference. Be sure to put the real car# on the log! If the car with the "stolen" # is also on the course, you have no choice but to stop timng the car and give them another run.

MR normally uses a timer that has a single sensor. It's used at both the start and stop of a lap. The actual timer never starts or stops...it runs all the time. Each sensor event just sends the timer value to the computer. Lap times are computed by subtracting two adjacent times for the car. If multiple cars are on the course, the adjacent times for a specific car will not be sequential. The math involved in subtracting these times is handled by the software in the laptop. All the times are in seconds...no minutes or hours are used. The timer sends times with a resolution of 1/250000 second. The timer can use dual sensors, if needed. In a dual sensor course, separate start and finish lines are used.

The sensor that MR uses is an optical, through-beam type. The optical sensor has two boxes. The transmitter sends a high frequency pulsed light beam to the detector. The transmitter is powered by internal batteries. We have also used "acoustic" sensors in the recent past. The "acoustic" sensor MR uses is rugged, small (won't damage cars badly if hit), and insensitive to false triggering. With both type sensors, some consideration should be given to locating the sensor components carefully, where they will not be damaged (or damage a vehicle, if accidently hit). The optical sensor boxes can be several hundred feet apart and still work properly.

We run cars in run groups, but these run grups are not classes...the classes are intermixed within a run group. All runs will be timed, even those of a Developing Driver with an instructor. However, these runs will not be included when selecting the best time for a DDer. To indicate this, they should be placed in parentheses, on both the log and the posting board.

How to Do Grid

The Grid is the area where cars stage prior to being allowed on the course. Several workers will be assigned to this job. One of these will be the person who signals to each driver when to enter the course. The others will assist, by ordering the cars in staging by anticipated speed...put the faster cars at the front, to preclude having a slow car caught.

We use 2 lines in Grid...the left line is for cars with multiple drivers...the right line is for cars with a single driver. This is true for both the Saturday events (Time Trials) and the Sunday events (Autocrosses).

For the Saturday events, each car enters the course and takes several timed laps (the exact number of laps will be announced by the eventmaster) without returning to Grid (unless there are multiple drivers). Before the event starts, the eventmaster, the Grid workers, and the Timing workers should consult each other and decide how many cars can safely be placed on the course at the same time...and can be timed accurately. If too many cars are out on the course, it can get dangerous. Plus, the Timing workers will not have time to keep up and delays will result.

For the Sunday events, after runs start, all cars will return to the front of the left line after each run. This allows a warm car to complete all runs in a short time period. Before the event starts, the eventmaster, the Grid workers, and the Timing workers should consult each other and decide how the event will be organized. The group must decide how many cars can be running on the course at the same time. Usually 2-4 cars are allowed. A run group size larger than the number of cars on the course should be selected. For example, if 3 cars are to be on the course, a run group size of 4-5 is usually the right size. This allows cars that have run, adequate time to return to Grid and get ready for their next lap.

Before a run group is started, Grid should tell Timing what the car numbers in the group are. Timing will usually write these numbers down on scrap paper...helps them keep track of everybody. Give the car numbers in staged order.

One of the duties of the Grid workers is to check that all cars and helmets have MR inspection stickers. These are easily seen.

How to Walk a Course

Prior to every autocross, it is "opened for walking". Someone will make that announcement and everybody walks around it in small groups. Occasionally, these groups stop and talk. Some people walk it more than once...perhaps they need the exercise?

What's going on here?

Since you are not allowed "practice" laps and a limited number of timed runs, this is the best way to explore the course and get fast times. It allows you to examine the course in detail, to decide how you will drive it, and to get inside the eventmaster's head...to understand what the eventmaster was trying to do (how he was trying to trick you). This would be difficult to do at speed...would take many laps to get the same information that a leisurely Sunday morning stroll around the asphalt gives.

The first few times you walk a course, it won't mean as much to you as it will later. It takes some experience to correlate what you see on foot, to what you see and **feel** in your car later. The proper approach is to always walk the course in such a way that you are in the same position that you would be in if you were in your car...ie, on the L side of gates. It seems like a little detail, but it helps if you load your brain up with reasonably accurate images of the course. If you walk the course in a random fashion, your times will show it.

As an example, if you plan to let your car go in a wide arc between two features, walk that exact path. It lets you see what the feature looks like as you approach and what the pavement is like (ie, little bumps and dips, gravel, grass, etc).

Although, at first you will want to ask experienced entrants (in another class) to show you around the course, afterward, don't walk in big groups. It's difficult for more than one person to be on the correct line! Additionally, a lot of people around you restrict your vision. One or two people is the right number. If a large group is walking together and all are on the "line", they must be in a procession, following each other...visibility is very limited this way!

A very advanced tip: If you are a consistent winner, your competitors will watch you as you walk the course and notice your line through the various features. If you notice them doing this, smile...it's a compliment! Then proceed to walk a funky line! You are probably good enough to beat them anyway...especially when they try to drive it the way you walked it...

Some "features" require a measurement. Always step off slaloms. The spacing of slalom pylons is not always uniform. Some eventmasters will accurately place the slalom pylons...others will just put them out there and let you drivers figure out how to drive through them...still others will intentionally vary the spacing. There are many ways to make a slalom difficult (as if it wasn't difficult anyway!). It can be curved, instead of straight. It can have an increasing interval (you need to speed up as you drive). It can have a decreasing interval (you need to slow down as you drive). Or it can have random spacings (just hang on). How about a curved, varying interval slalom! By pacing off the slaloms, you can determine which of these types it is and somewhat plan your driving tactics.

What to Do Before You Drive

Always consider that the autocross starts **before** you get the starting flag.

After you walk the course, decide if there is any part that could be confusing (ie, you could get lost). If so, draw the course...it will help you remember where it goes. Do this several times if necessary. Professional athletes use a technique called "visualization" to help them compete. Watch as a world-class downhill skier prepares for a run...they will close their eyes and "visualize" the course and their line through it. Often they will move their body as they imagine what they are on the course. You can use this same technique...when you are sitting in your car in line, just relax, close your eyes, and drive the course in your mind. It helps!

Give your car a final check. Make sure that you have removed all loose objects. If you have problems being distracted by hitting pylons, fold the mirrors such that you can't see behind you. If you sometimes hit the windshield wiper switch as you flail to control the car, disconnect something so that the wipers will not come on. Make sure that you have topped off your engine oil...it's quite a distraction to see the oil light flash on! Check your tire pressures again.

Put on your helmet well in advance of the start. Get it comfortable on your head. If you wear glasses, be sure that they are comfortable. Get your seat adjusted properly. It helps to have **tight** seat belts, to hold you firmly in the car...it's difficult to drive when you are sliding around on your seat!

If you watch closely, you'll see mind games being played. The experienced guys all know each other and some of them try to distract their competitors prior to a run. Of course, **you** won't lower yourself to

this level, but you should be prepared for someone to do this to you...if they do, it's a sign that they respect your driving! A good technique to minimize this, is to sit in your car, with the windows up, doors locked, A/C and stereo on, eyes closed, and doing heavy "visualizing". Never respond to **anyone** trying to get your attention just before you run...ignore them! Lower your window (if you want to) just prior to starting. You probably want to turn the A/C and stereo off while on course. If you are tricky, you turn them off after you start...then back on at the end. When they ask you if you intended to run with the A/C on, say "Yes. I drive faster when I'm comfortable and relaxed." This tip works best in the Summer...and with something cultured, like J.S. Bach or Willy.

Position your car in the best place and pointed in the optimal direction **before** you start. Optimal is rarely straight! Think about which direction you want to go and start the correct line before you are given the green flag. Start as far back as they will allow you to.

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