



2

What you might want to know as a first time driver

The rookie chronicles

A new GVC BMW CCA member documents the advice he received in a year of Performance

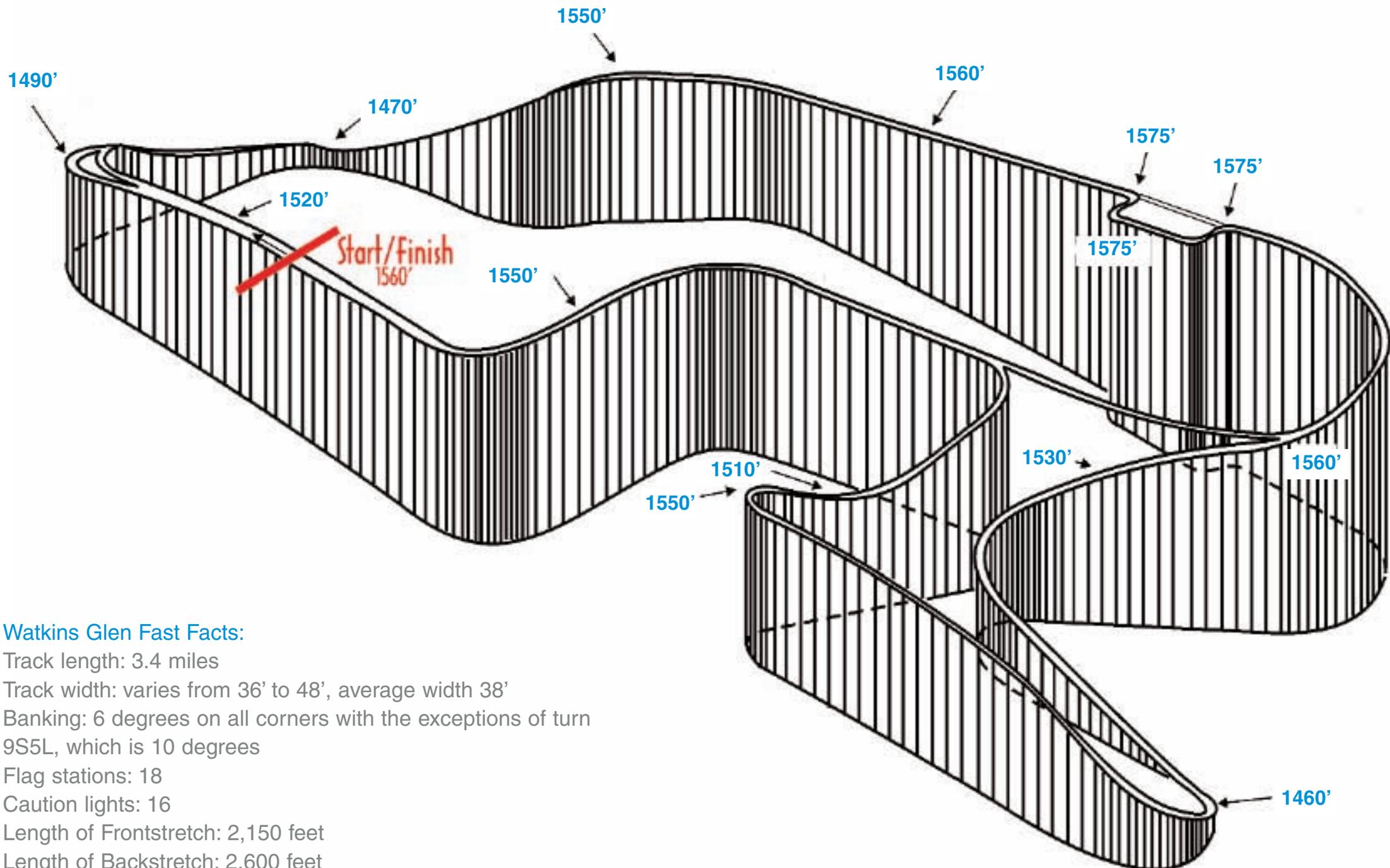
Driving Schools at Watkins Glen, Mosport, and Batavia International Motorsports Park. **Next >**

Part 2 Jeffery Gabel BMW E46 323i + E46 M3





Elevations: While following the driving line through the Esses towards the corner entering “the inner loop”, you will have climbed more than 10 stories. A car going uphill has better traction than a car traveling downhill, and the result is often a high top speed at the end of the back straight. [Next >](#)



Watkins Glen Fast Facts:

Track length: 3.4 miles

Track width: varies from 36' to 48', average width 38'

Banking: 6 degrees on all corners with the exceptions of turn

9S5L, which is 10 degrees

Flag stations: 18

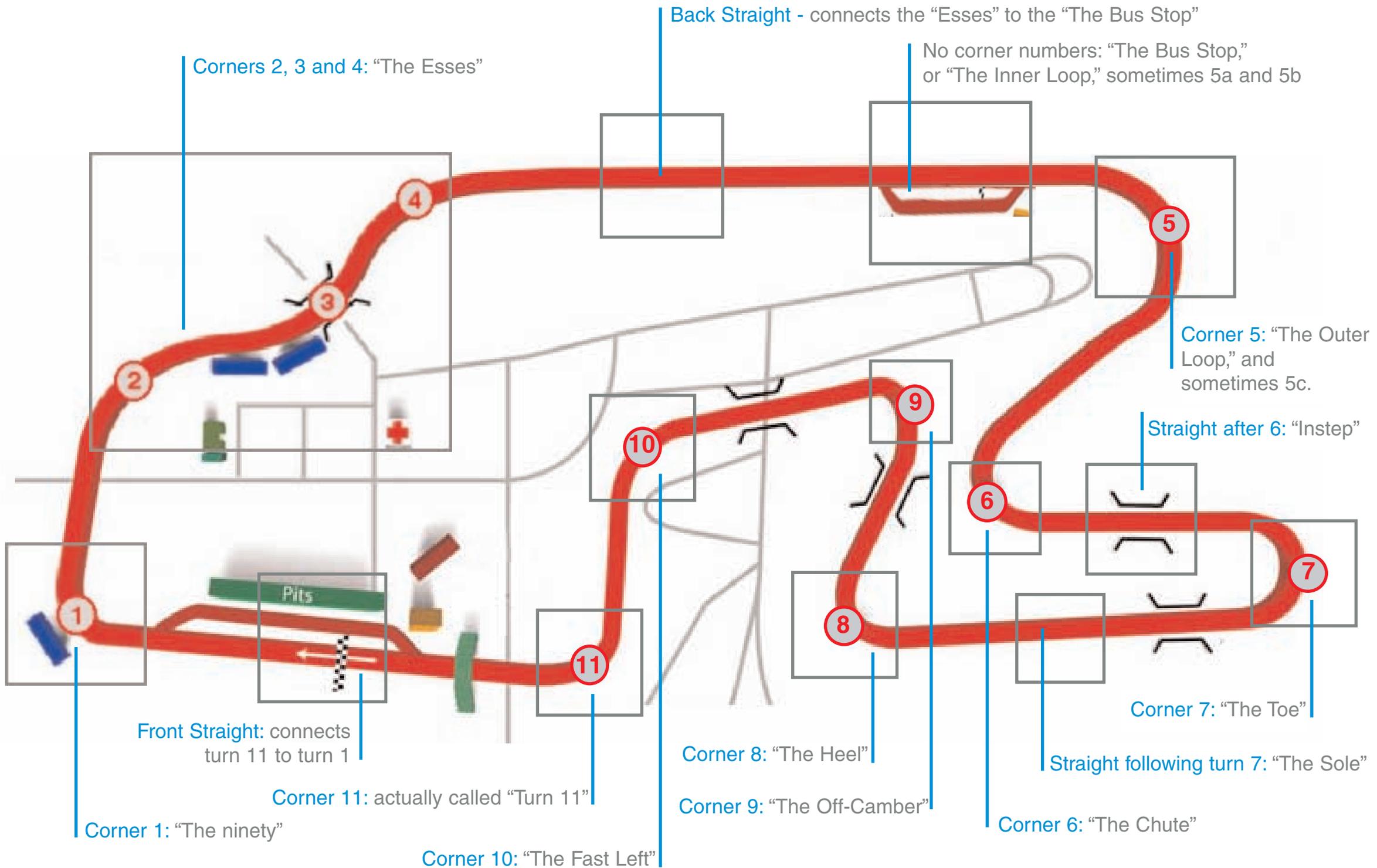
Caution lights: 16

Length of Frontstretch: 2,150 feet

Length of Backstretch: 2,600 feet



A corner by any other name: Over the years, Watkins Glen's traditions have created a series of nick-names for all but one of the corners, and as such, this is a track where only a few people speak in corner numbers. Some areas of the track may be referred to by as many as three different names. Below is a handy translation guide. [Next >](#)





3

Looking Back Through the Esses



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6



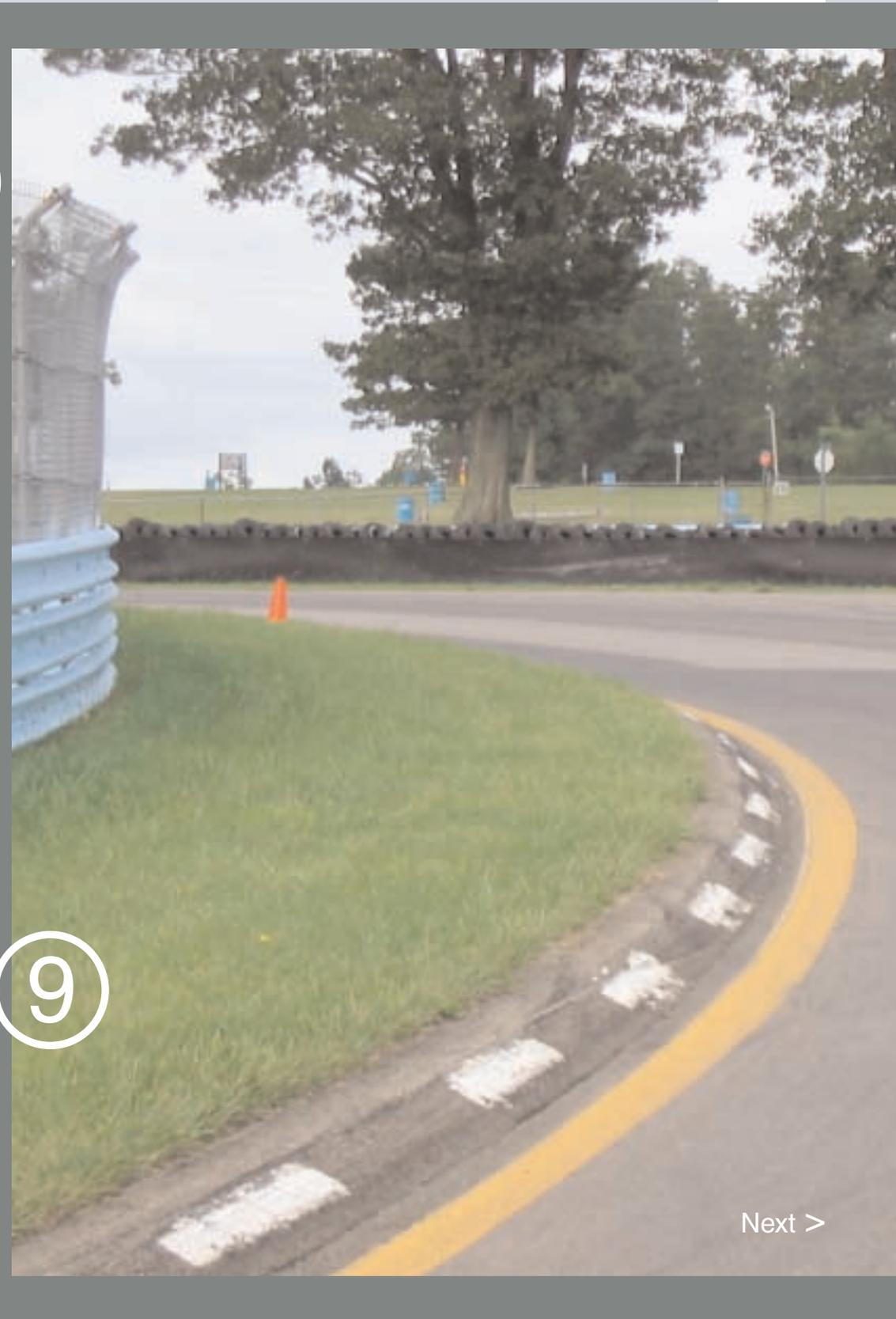
5^B

5^C

Next >



7



9

Next >



Track Notes - Data Acquisition: After returning from the May school, I took some time to jot down personal observations about the track and each corner for my own future use and edification. Jim Dresser compiled track notes by corner as well, and those useful notes will be included in your student welcome packet. [Next >](#) / [Skip All Track Notes - to page 55 >](#)

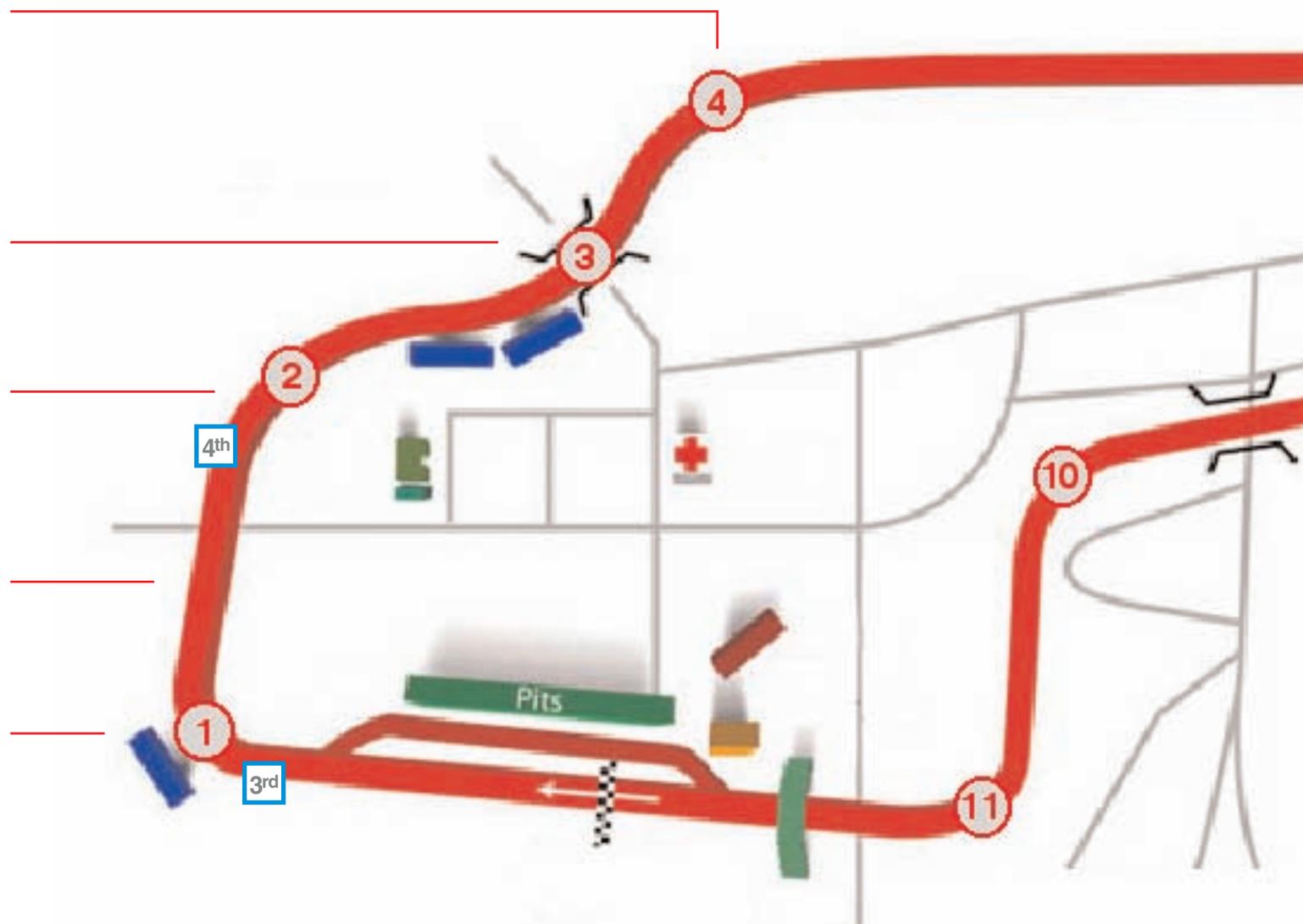
Turn 4: There were 4 cones (May placement) leading through this corner, the apex was the down track edge of the last cone. Don't drift into this apex too early. Come in tight, and then let the car track out to the left side of the course where the track narrows. This is a busy corner, as I have just checked my mirrors, and turned in through the corner at speed, and may be preparing for a point-by.

Turn 3: A gentle shift in the car's weight from left weighted to right weighted at the point before the curbing ends and turns to a yellow stripe on the right side of the track. Looking through the corner towards the blue Armco at the bridge, stay tight to the apex. (I have a relatively poor mental image of this corner, as I am generally looking through the corner to the Armco beyond, and only glancing at the apex as a reference point on the way by.) Exiting turn 3, place the car about 5 feet off the the Armco at the point where the guard rail splits from high to low, setting yourself up for the entrance to turn 4. Check the mirrors now.

Turn 2: Turn in slightly late and full throttle towards the apex, letting the car track out for the approach to turn 3. 6 cones located on the inside corner (May placement,) apex was 2nd cone from the end, looking through the Esses and up the hill. The August school had 1 cone at the apex.

Straight after "the ninety": Throttle wide open. (mostly full throttle from this point through the Esses and down the back straight all the way to the turn in point leading into the "Bus Stop." The only exception is on cold tires, where there is a gentle "lift" off the throttle leading into turn 2, or in the rain, where all speeds are reduced.)

Turn 1, "the ninety": Threshold braking late and hard, straight line, downshift to 3rd, stay 1 foot off the left edge of the track, turn in (smoothly) 6 feet past the turn in cone (May placement,) squeeze on the throttle into the corner, hit the inside lower "rumbel strips" at the apex, throttle wide open (T.W.O.) out of the corner to the track out point - use all of the corner. Speed at the end of the front straight is 110 - 115mph. This is one of the most important corners on the track.



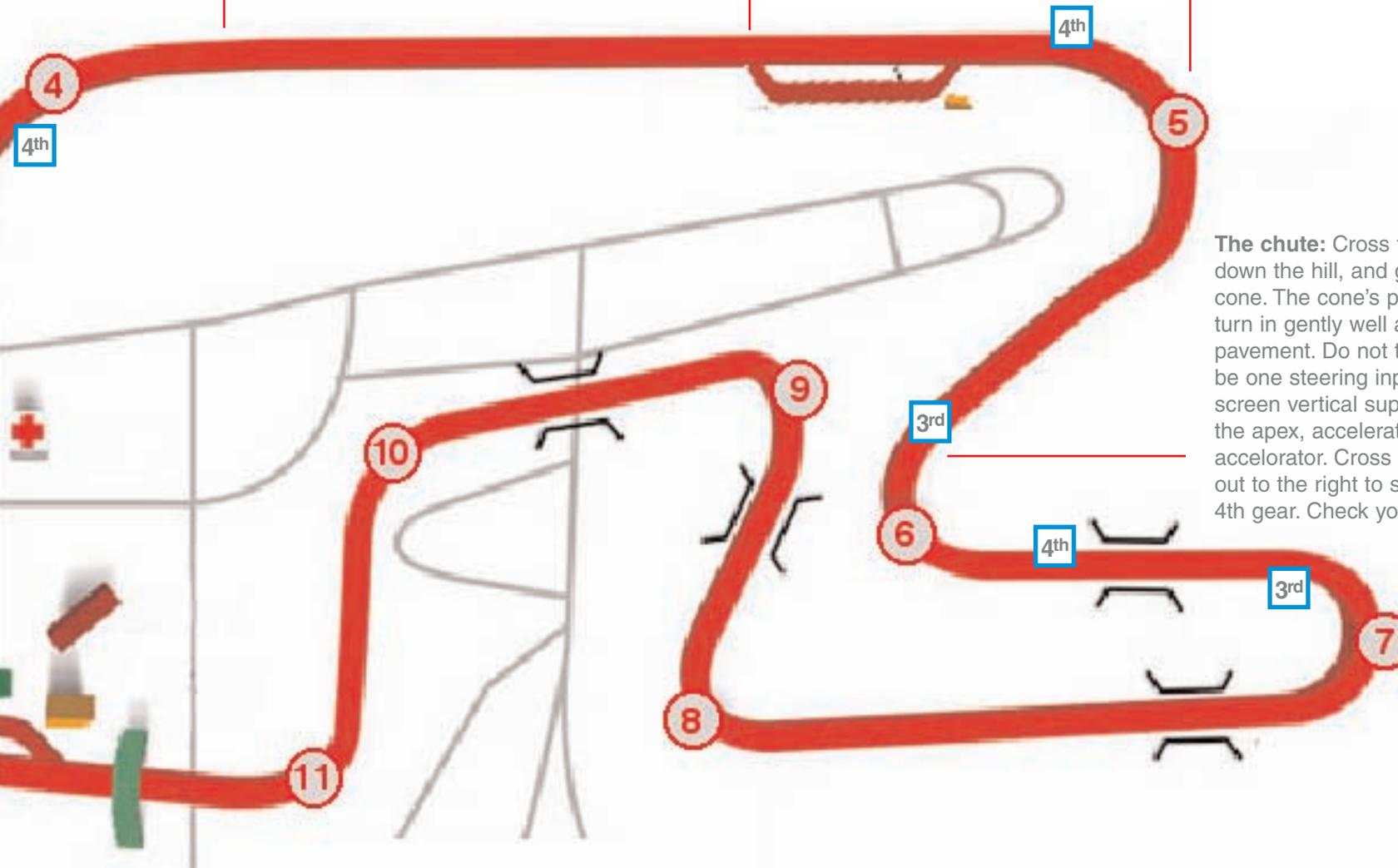


Data Aquisition: Corner by corner track notes, back straight through the chute. [Next >](#)

Back straight: For my car, this is the fastest place on the track at 120mph. Approaching the turn in point for "the inner loop," stay left about 18" from the track's edge, and threshold brake in a straight line. Squeeze on the brakes and ease off quickly. I have, as an alternative, placed my left tires about 4 feet off the left edge of the track with the intent of going further into the bus stop corner after my turn in.

Inner Loop: Start the turn in, and then quickly begin acceleration into the corner. I found myself squeezing on the gas well before the cone on the right side of the corner's entrance, and clipping the rumble strip on the way by. Steady throttle application throughout the corners, looking through the "bus stop" to the apex at the exit. With a deeper entrance, I end up on the outside edge of the concrete, and I exit in a straight line towards the caution light pole at full throttle.

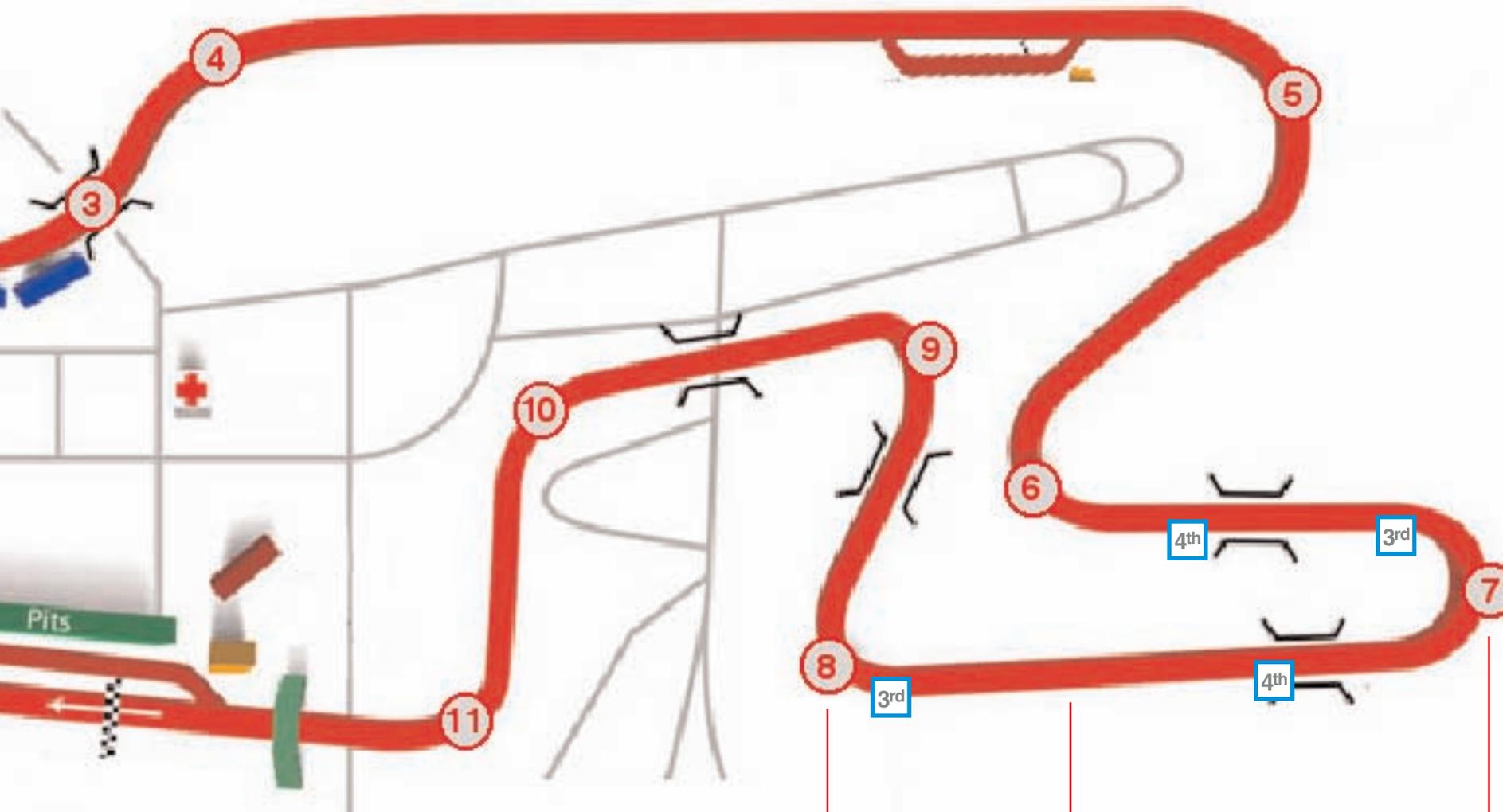
Outer Loop: Track out about 3/4 of the way across the pavement. The track starts to run downhill, and my car starts to feel "a little light" exiting "the Loop" and entering the elevation change of this long corner, but stay on the gas. I would often just slightly ease up on the throttle before starting a gentle turn in to help re-balance and set the car, and then start the serious turn into the downhill apex. A slow and steady application of the throttle, looking through the corner towards the caution light near the track out point at the bottom of the hill, checking for the apex, eyes back to the track out point, and then looking for the apex. Front driver's left tires hitting the outside edge of the concrete. Right before the apex, accelerate through hard to the track out cone point, which is a few feet in front of the caution pole. (May placement) There is a 4 foot bank to this corner. Check your mirrors



The chute: Cross the track in a straight line to the right while accelerating down the hill, and get the car parallel to the track edge well before the cone. The cone's placement is not the turn in point. Stay right, brake, and turn in gently well after the cone staying towards the right side of the pavement. Do not turn in too sharply, this is a late apex. There should only be one steering input. Look through the corner to the first metal catch screen vertical support which is just beyond the track out point, and then at the apex, accelerate, and track out to the right. I steer this corner with my accelerator. Cross to the left side of the track in a straight line after tracking out to the right to set yourself up for "the toe" as you accelerate, and shift to 4th gear. Check your mirrors now.



Data Acquisition: Corner by corner track notes, Toe through Heel. [Next >](#)



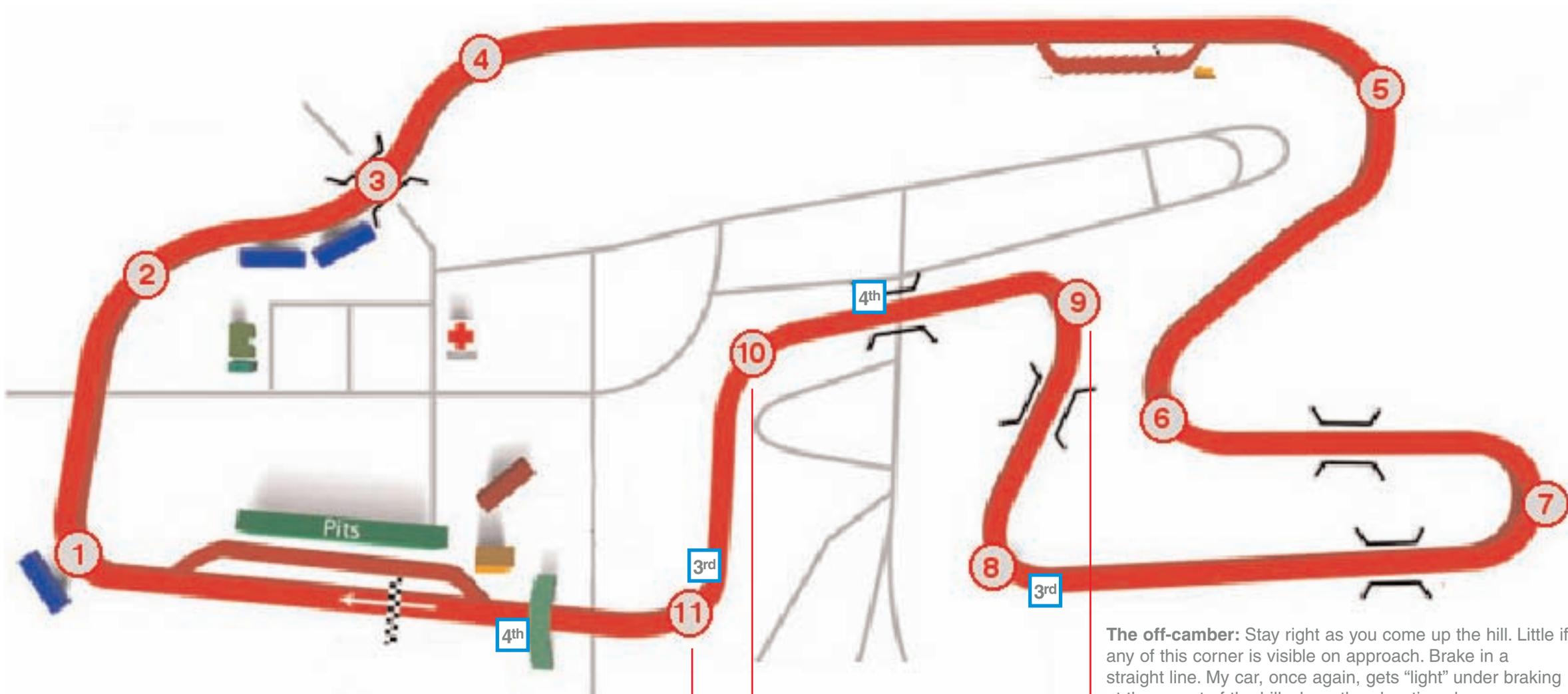
The heel: Threshold brake in a straight line, downshift back to 3rd, and take the turn in point late. This is a reduced radius corner, meaning it is greater than 90 degrees. After the turn in, get right back on the accelerator hard at the apex, and track out. (Should you carry too much speed through this corner and track out too far, dropping your two left wheels off the left side of the track, keep your wheel straight. Do not attempt to pull the car quickly back onto the track with an aggressive steering input to the right.) Start to fade right after the track out point to set your car parallel to the track on the entrance to turn 9.

The Sole: A relatively slow uphill straight, with a total elevation change of 190 feet. Shift back to 4th gear. Stay left to set yourself up for "the heel." (There are locations on the track where I might be passed by drivers, this is spot where I will be passed by cars. My 323i has only 190+HP, so if I'm passing here, it's because I did a better job "in the Toe.")

The Toe: Another late apex corner. Approach and brake in a straight line, and downshift to third. Turn in late with your tires on the outside edge of the concrete. Don't turn in too early or too sharply. One steering input throughout the corner, steady application of the throttle until the apex is seen, and then hard on the gas through the corner to the track out point, maintaining as much speed as possible through the corner. Unwind the wheel so as to not pinch the corner. This corner leads to an uphill straight. Check your mirrors once again. I'm usually at 4500rpm at track out.



Data Aquisition: Corner by corner track notes, Off-Camber through Turn 11. [Next >](#)



Turn 11: Straight line brake, but try not to scrub off all of your speed, as this corner leads to a straight. A gentle brake application to set the car, and then turn in tight to the apex and start the acceleration out of the corner, letting the car track out wide to the left. This corner requires the quickest steering wheel rotation, and I often turn in, and then turn in again. Stay left down the straight. Check your mirrors.

The off-camber: Stay right as you come up the hill. Little if any of this corner is visible on approach. Brake in a straight line. My car, once again, gets "light" under braking at the crest of the hill where the elevation changes, so take care not to trigger your front wheel's ABS under braking. The apex is well through the corner and may not be seen as you start your turn. Don't turn too early. This is the slowest corner on the track, apply one steering input and wait...wait...wait to see the apex, and then accelerate to the track out point. Steer this corner with your feet. Check your mirrors and stay right.

The fast left: As the name implies, this corner may be taken at some speed. Shift into 4th before the corner, and only a slight lift of the throttle prior to turning in, tight to the apex and then hard on the gas out, letting the car drift to the track out point in one smooth arch. Cross the track after the track out point to the left-hand side to set yourself up for turn 11. Check your mirrors.



Mosport, Ontario Canada One Lap equals 2.459 Miles



Next > Skip All Track Notes - to page 63 >





Mosport, Ontario Canada

Next >

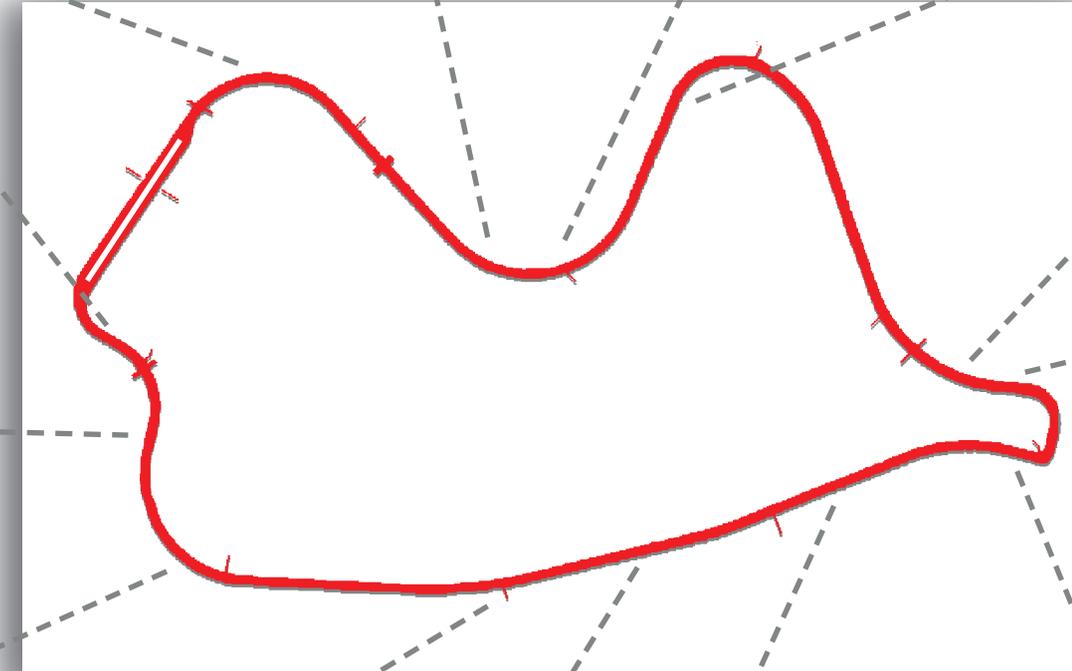




Mosport, Ontario Canada

Next >







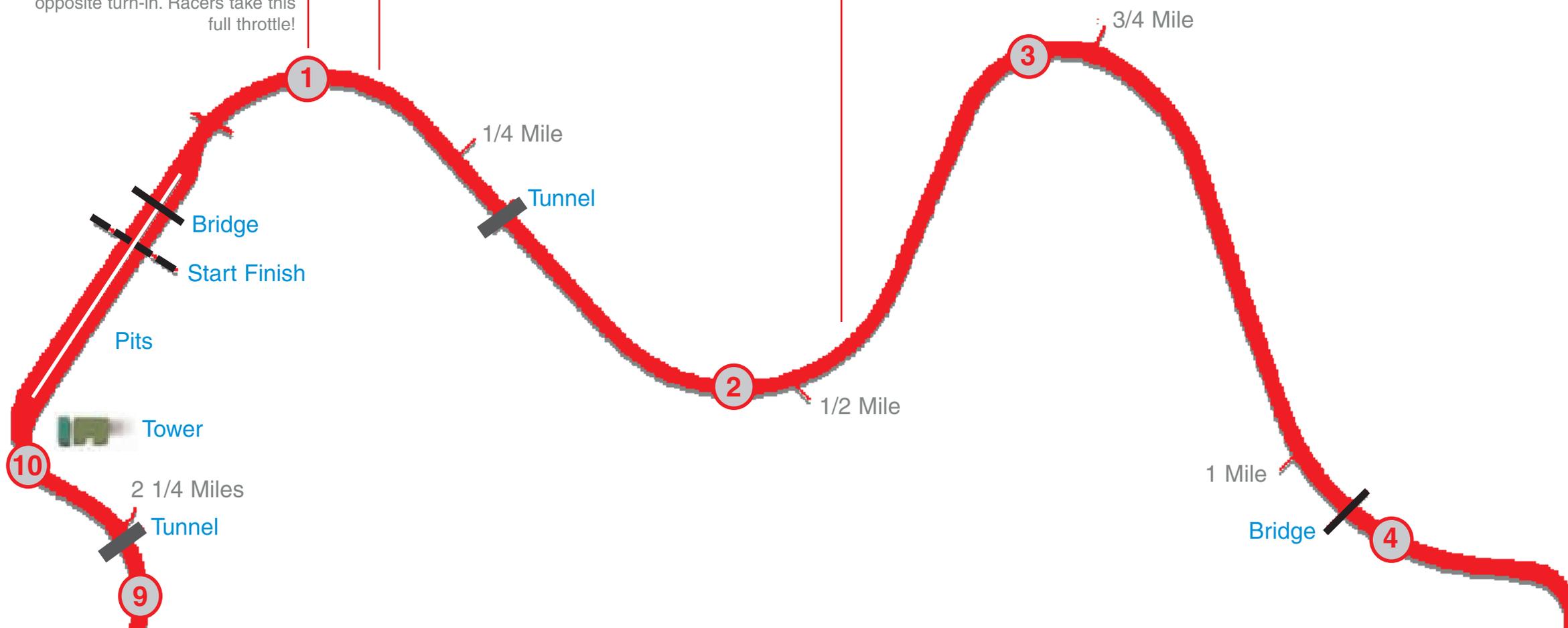
Mosport Track Notes - Data Aquisition: Direction: clockwise. (Written by Blake Nancarrow, August 2001)

[Next >](#) / [Skip All Track Notes - to page 63 >](#)

Turn 1: Light, quick brake in straight line before turn-in to settle down car. A lot of drivers trail brake here; others start braking about 100 metres (300 feet) before the turn in. Turn in so as to not be beyond the middle of the road in the balance zone--it's off camber. This corner is tricky if you apex early--there's a lot of bumps at the exit, the turtles themselves off-camber. You can start to power on as weight transfers to the front left tire. Gravity helps you as you fall into the hill and load transfers to the left-front. Tire wall beyond grass run-off. Happily it's a long apex (several car lengths)--hug it. A 4th gear corner. Marshal station opposite turn-in. Racers take this full throttle!

New asphalt runs from top 1 all the way down through the pit exit into the outer edge of 2. The turtles from the old configuration are still there, now kind of in the middle of the road surface! Turn-in feels about the same, can be made a smidgen sooner. Brake a little less. But now, just as the turtles end at the apex, you can keep the turn dialed in and run close (with 2-4 feet) to the new wall on the new pavement and apex later. This puts the car out 1-2 car lengths later exiting past the really bumpy part of the exit zone. This makes for a bigger and smoother arc therefore corner 1 is much faster. To that end, you carry more speed into 2--be careful. Pit exit & bleed line: There is a yellow bleed line to separate cars at speed on the line on the left from the cars entering the track on the right. Cars entering the track should keep right up to the turn-in for 2. Watch your mirrors!

Turn 2: "Clayton Corner." Blind downhill double-apex. Get to the right side of the track to set up for the turn-in. Start turning in so you're in the centre of the road when cresting the hill. The old white line in the middle of the road is gone now... This takes lots of practice as there are no good nearby visual markers for the turn-in. Touch the gutter at top of hill for first apex, if it doesn't scare you. Then let car drift out (surprisingly far, maybe half-way or slightly more) at mid-point of 2 then apply steadily increasing power going down hill. It points the car and hunkers down, settles the back end. At the bottom of the hill you should find yourself at full throttle. Steering input is almost frozen through this--if anything it tightens at second apex (a slight decreasing radius). Pavement a bit broken up at second apex--don't creep too much further to the left else you're in the grass. If you go off the track do NOT yank the car back on. After the second apex, don't unwind (at same time, don't fight wheel) until after exit--this points you to corner 3's turn-in. Let the car track out very near or touching the turtles. The dip at the end of the turtles is gone. Old meat-shedder wall beyond second apex has been replaced with softer tires--nevertheless don't look at it... 4th gear. Marshal stations near turn-in at top of hill, inside the corner (usually unmanned), and outside the second apex.





Mosport Track Notes - Data Aquisition: Turn 3 and 4 [Next >](#)

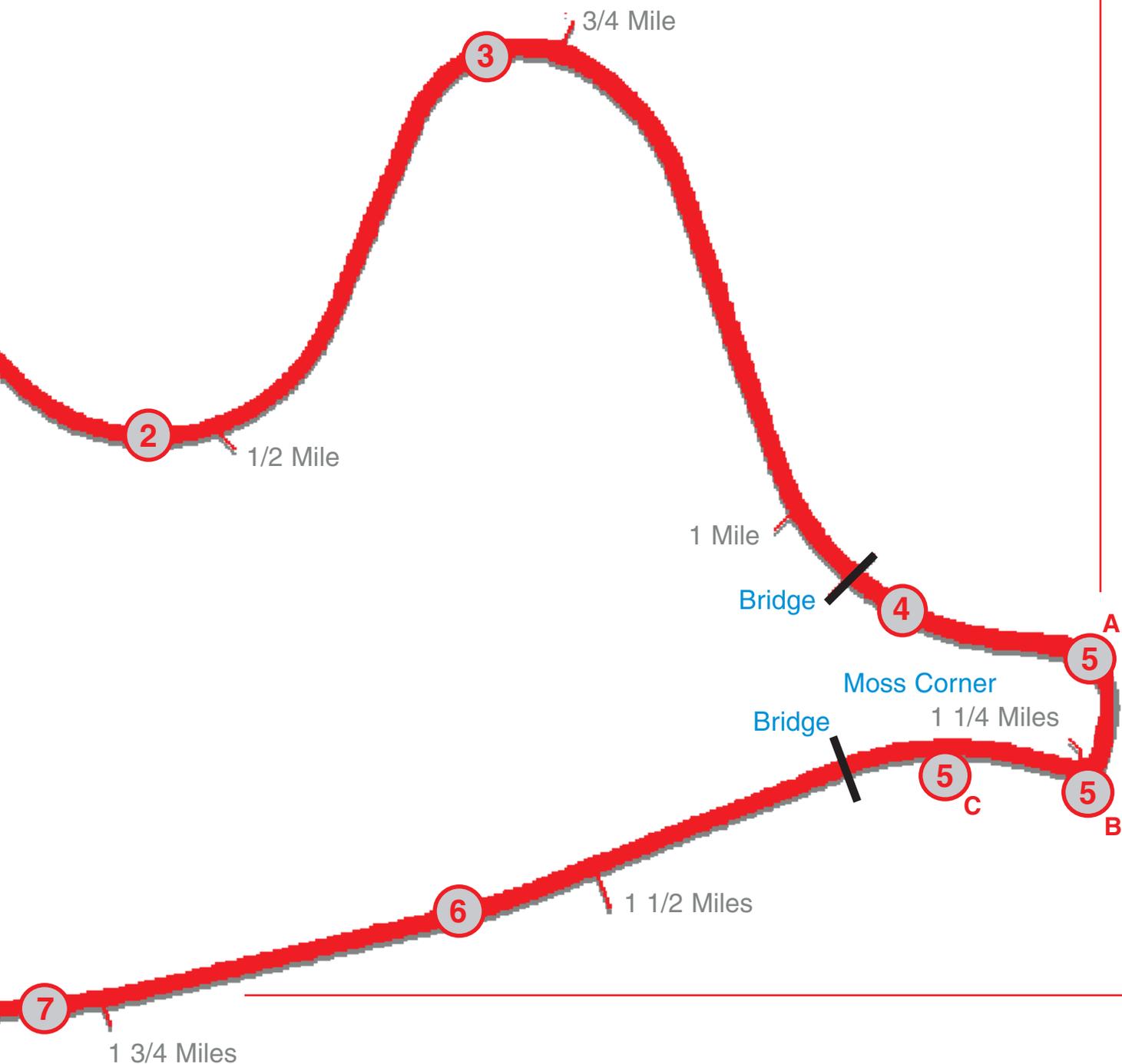
Turn 3: Uphill. Shift down to 3rd. Again, no good markers for turn-in. The "school" line is a late apex; if you take an early one, stay committed and be patient. You might even lift-throttle-oversteer to point you better. Don't force unwinding. There's a pavement change at apex--concrete spots. Keep turn dialled in through the exit to point correctly for 4. Lots of run off after apex. Hanson recommends exiting the corner and getting straight before the turtles! Turtles at apex are smooth; at the exit they're the super bumpy type--you'll knock the ice cubes out of your tumbler. This corner can be done in 4th gear. Some cars may run out of revs in 3rd forcing you to shift in the middle of the exit zone. Marshal opposite apex. Passing zone between 3 and 4--sometimes only advanced students may pass here. Ask your instructor. Try to get passing done quickly so drivers can get back on line.

Turn 4: Stay in the middle of road. Stay away from the right side of road--off camber. Get braking done very early (before the beginning of the downhill) and come off the brakes gently--don't let the back end of the car jitter. Absolutely no trail braking here! Apply steadily increasing power smoothly down the hill. Again, it settles the car, gets more grip in the back end (ordinarily light going down a hill). It's scary but you can be full throttle at the bottom. Don't jab throttle (at top of hill) in a high-powered car (e.g. a C4) so to avoid wheel-spin. This makes 4 the fastest corner on the track. Apex used to be blind but corner "opens up" now with trees removed--people now often turn-in too early. The old overhead foot bridge is gone. If you're into the throttle hard down the hill then, of course, this builds the speed dramatically so you'll need to brake very hard (hardest point at Mosport) into 5a. Turn tight into the apex/exit of 4, you'll be tight to the left edge of the road! Walls bracket track. 4th gear. There's new asphalt at the outside edge of corner 4. We don't use this! This is here for the racers dogfighting through corners 4 and 5. It gives them more room to play. The driving school line is the same: position car mid-track cresting the hill into 4 between the left and right edges, get braking done early (before beginning to fall down the hill) and smoothly (lift off brakes super-smooth), make a late apex of four so to set up for a slightly earlier turn-in for 5.





Mosport Track Notes - Data Aquisition: Turn 5-7 Next >



Turn 5a, 5b, and 5c: Brake very hard in perfectly straight line--don't do anything else. This is the deepest braking on the track. Get into 3rd when revs are down. Gravity will help you as the road, at turn-in, is very steep (climbs approx. 9 metres or 35 feet!). 5a is 3rd gear corner at high speed. If you can get the braking down soon enough, you can power on up the hill which helps stabilize the back end. With the correct turn-in you can almost hold the wheel frozen through 5b ("Moss Corner"). Try to make 5a, 5b, 5c a smooth arc for a low powered cars; high powered (i.e. 400 hp) cars should late apex 5b to get the power down sooner. Many drivers will shift to 2nd between 5a and b. A little tap at 5b turn-in might help the fronts bite. Outside or wide lines in 5A and 5B a bit treacherous with marbles and gravel. Tire-wall between a and b. Marshal between a and b, outside. This 4, 5a, b, c sequence becomes very technical at high speed! 5c is a slight kink to the left

Generally, the track is a full car width wider through A and B. During races this will permit more passing. Given the new wider track, existing elevation changes, the speed which one can carry through here, we saw a number of different lines being tried.

In the classroom a wide line through A (sacrificing the apex) was encouraged, so to set up better for B. In theory, this lets the driver get the car more to the left and straighter for the turn-in of B.

I myself (in a RWD low-powered car) performed a similar turn-in (position and amount) to last year, but made a slightly gentler arc and used the new A apex. I unwound after the A apex to let car track out to the original turtles; then I dialed in a hard turn-in, aiming for the new B apex area, making the apex as late as possible. I squeezed in as much throttle as possible before the apex. The track was slick here from dust, marbles, and new surface material so I was ready for oversteer correction.

An aggressive style (for very advanced drivers) is the use minimal braking into 5A, let the car hop up over the hill, produce a very wide slip angle between A and B, so to point the car into B, then get hard into the throttle through B and power-drift out. Tail-happy cars or slick conditions will result in spins.

Now 5 feels slightly faster than the old configuration. Even a small RPM or speed improvement here will multiply at the top of the back straight.

Turn 6 and 7: Nothing special, just 9° and 16° turns. Low-powered cars labour up the long climb--listen to the radio if you're bored! Marshal between 5c and 6, outside, and at 7. The straight-away ends in a slight hump which was recently lowered or smoothed. Between 5 and 8 is a good time to check the gauges, listen for rattles, and settle yourself down. General passing zone between 5 and 8. Between 7 and 8 is historically called the "Mario Andretti Straight-away," casually called the "back straight."



Mosport Track Notes - Data Aquisition: Turn 8, 9 and 10 Next >

Turn 10: "White's Corner." Slow corner, uphill. Late apex is safe; a very early apex can be bad, scrubs off too much speed, the exit turtles are harsh. A couple of pavement changes, some concrete at the apex, can be very slick in the wet, be ready for snappy oversteer. Aggressive throttle (even in average rear-drive car) can cause wheel- then car-spin. 2nd or 3rd gear. Ordinarily in the dry this corner can be taken remarkably fast with just a brush on the brakes. The turtles at the apex are smooth and show a lot of black from drivers running over them. Exits onto front straight. Marshal before exit, outside.

Again this new pavement at the outside of the track between 9 and 10 permits the car to be positioned a full width left of the former position. This permits a more gradual turn-in and a later (and much safer) apex through 10. This bigger radius makes 10 a faster corner now.

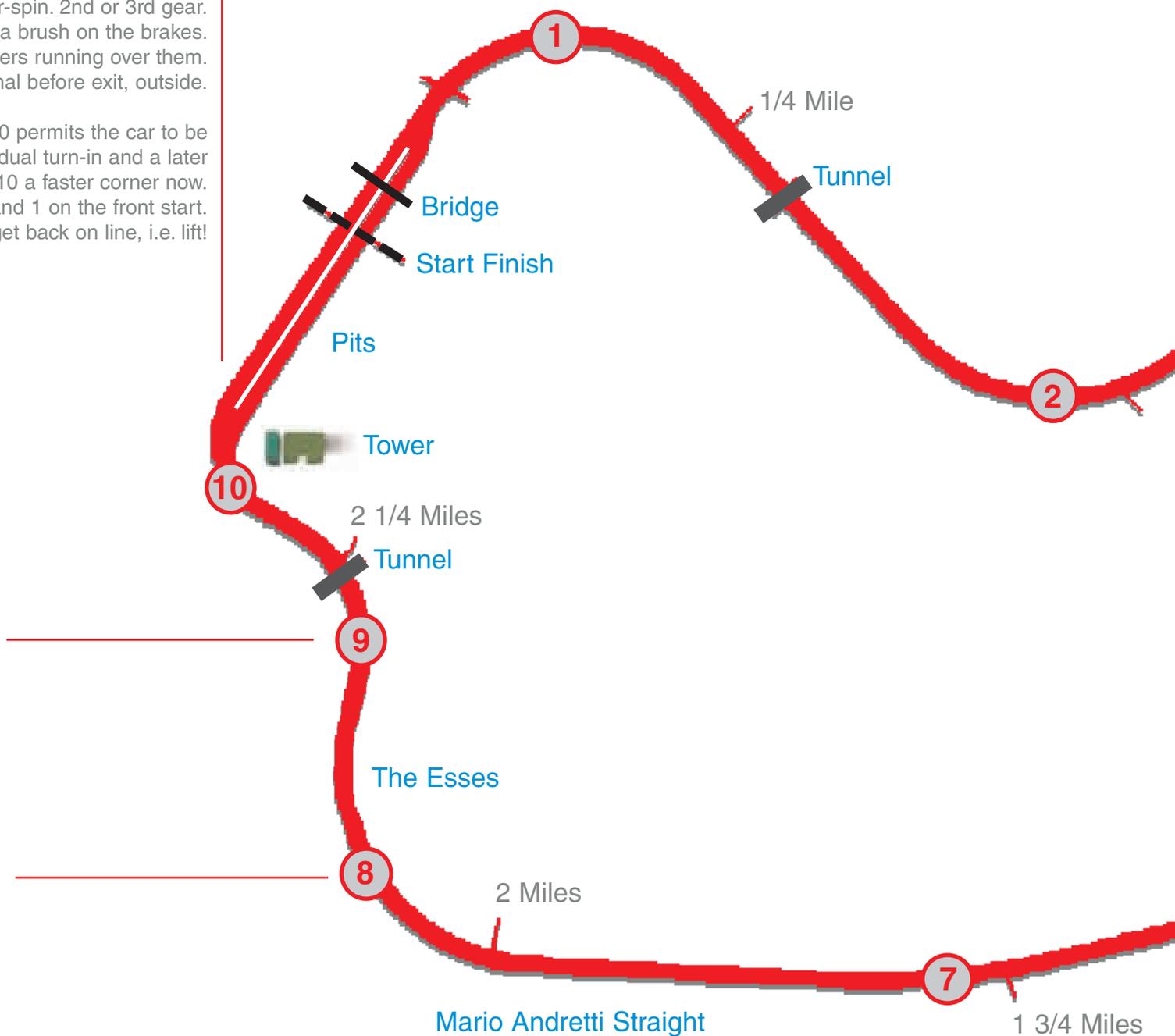
- General passing zone between 10 and 1 on the front start. Try to get passing done quickly so you can get back on line, i.e. lift!

Turn 9: Balance zone can be very slick in wet. In the dry, get hard into the accelerator all the way through the turn (not something you cannot usually do). Small gravel run-off beyond apex. Try to stay to the left after the apex to improve setup into 10. It's okay to swing out a bit right after the apex. Many cars will be run up onto the smooth turtles. 3rd gear. Marshal at apex.

There's new pavement beginning at the apex of 9 running through to the turn-in of 10. This permits an even later apex through 9 so some drivers now delay the turn-in for 9.

The pavement was torn up here early in the year so harder concrete patches have been laid down through the apex. Be careful on these in the wet.

Turn 8: A long sweeper, slightly uphill. You can carry a lot of speed through here (more than initially you think), take it at 4th gear. Huge (new gravel) run-off beyond turn-in and apex. Short hard brake after the hump--ease off the brakes smoothly. Some drivers take this quite wide while others turn in well before the corner and get in tight on the turtles to make a much bigger arc. The "school line" apex is quite late--after 2/3rds of the corner. Look ahead. In acceleration zone of 8, add a little burst of power to point into exit of 8. Try to get parallel and real close to right edge, in fact, you can run off the edge of the turtles after apex of 8. Brake medium in straight line at exit and get smoothly but quickly into 3rd gear. Then immediately turn in for 9. Corners 8, 9, and 10 are a combo, 8 and 9 called "The Esses."





The 3 series - "It will take you to places not found on any map." (copy from an early 3 series print ad) [Next >](#)



the heart of the marque



1968 - 1976 **E114** (the 2002)



1977 - 1983 **E21** (the first 3)



1984 - 1991 **E30**



1992 - 1998 **E36**



1999 - 2005 **E46**



2006 - **E90**



“Es”: commonly used “E” designations for BMW models.
(This is not a complete listing, and years refers only to the U.S. production by title year.)

E3 - 2500 3.3 Li

E9 - 2500CS 3.0CSI

E12 - 5 Series up to 81

E21 - 3 Series up to 83

E23 - 7 Series up to 87

E24 - 6 Series 77 to 89

E28 - 5 Series from 82 (2nd generation)

E30 - 3 Series from 84 (2nd generation)

E31 - 8 Series

E32 - 7 Series 88-94 (2nd generation)

E34 - 5 Series 89-95 (3rd generation)

E36 - 3 Series from 92 (3rd generation)

E38 - 7 Series from 95 (3rd generation)

E39 - 5 Series from 97 (4th generation)

E46 - 3 Series from 99 to 05 (4th generation)

E52 - Z8 Roadster

E53 - X5 from 99

E60 - 5 Series from 04 (5th generation)

E63 - 6 Series from 04 (2nd generation)

E64 - Convertible E63 6 Series

E65 - 7 Series from 02 (4th generation)

E66 - Long Wheelbase E65 7 Series

E83 - X5 from 04

E85 - Z4 Roadster from 03

E81 - 1 Series (future model)

E90 - 3 Series from 06

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“Until you’ve had at least a dozen schools, you don’t need to be concerned with more horsepower.”

Advice I agree with - but didn’t take

Modifications: While I have made a handful of modifications to increase the horse power and torque in my BMW, it is apparent that the factor limiting my speed on the track is not the car, but rather, me, the driver. My 323i is now capable of speeds (on paper, and in a straight line) in excess of 147 mph. I, however, am not. To reach any kind of speed on the back straight at the Glen requires the driver to carry speed from the previous 3 turns into the straight, and possess the ability to reach the max top speed before braking deep into the corner entering the sharp right hand turn into the inner loop at the end of the straight. That ability only comes from confidence, experience and practice, and less from carbon fiber or software. With that in mind however, I’ve still made a few modifications.



The Evoll cold air intake kit can be installed in about an hour with simple hand tools.

Eurosport Evoll / Carbon Fiber Intake Systems: Factory specs dictate a fairly restrictive airbox to cut down on noise as well as emissions. The easy thing to do is to bolt on a free-flowing cone style air filter onto your intake bellows. [Next >](#)





While the cone filter has more surface area and allows more air in, it's also not shielding the filter element from heat. Hot air is less dense than cold air, so we want as much cold air as we can get into the engine. It's not uncommon for people to actually lose horsepower by bolting on a cone style filter because they get heat-soaked air from behind the radiator. A heat shield is thus required. This keeps the hot air out and ducts all the cool air directly to the filter element where it can do it's job. The filter stays behind the headlights where it was intended. This makes it easy to maintain as well as keeps it out of water and debris that can be a problem with other intakes that re-located the filter element into the bumper.

My cold air intake system, sometimes referred to as CAI, features an "e glass" heat shield with a heat transfer coefficient 50 times lower than aluminum, and a carbon fiber intake with a 100 times lower heat transfer coefficient.

I combined the cold air intake package with the Conforti Shark injector software. Both are pretty easy DIY Saturday afternoon type installations that yield noticeable increases in performance, (in theory.)

+21 HP / +17 ft. lbs torque with Shark injector

(The HP and Torque gains claimed are the manufacturer's dyno results, I have not verified the HP gains at the rear wheel on my application, and am therefor skeptical of the claimed addition.)

Stock 323i 184 HP + additional 21 with Shark and Evoll CAI = **205**

Stock 175 ft. lbs of torque + 17 with Shark and Evoll CAI = **192**

The Evoll CAI lets the engine breath, and you can actually hear the engine sucking in air at 4500rpms. If you want a really quiet luxury sound to your car, avoid this upgrade. At times, the car will emit a whistling sound as air passes through...(cont. next page) [Next >](#)

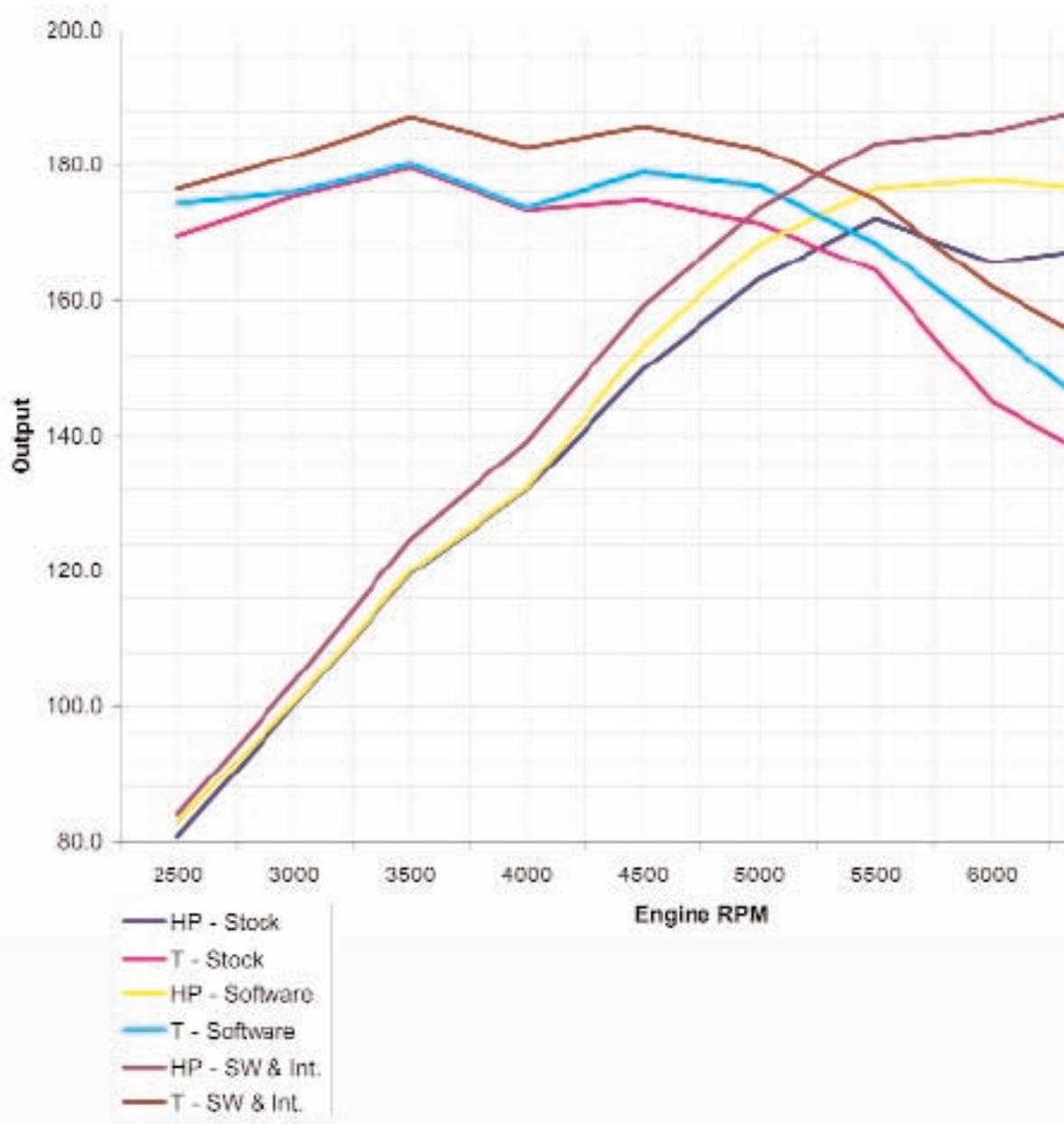




the air sensor that is in the path of the airflow. I don't really mind the sound, as it lets me audibly know how and when everything is working. (But then again, I drive around town in a four point harness.)



The shark provides an increase in the factory rev-limit, re-maps the throttle, fuel and spark, as well as the acceleration enrichment, transition fueling and VANOS control as needed to optimize the vehicle for operation on premium fuel on all OBD II 6 Cylinder BMWs.



Shark Injector: The software upgrade from Conforti, or the Shark injector, is an upgrade I would have skipped if I didn't own a 2000 E46 323i. The 323i's M52TU B24 engine of that year had power and torque left in the engine to extract with the software. The 325i or 330i of the next year had a M54 B30 engine that delivered more horse power per liter (2.5 and 3.0) than the M52 in the 323i that it replaced - with a displacement of 182 inches as compared to the M52s 171. As such, the M54 engines delivered greater horsepower. The Shark Injection software upgrades for the M54 engine is the same cost, yet improves the engine performance by only 4 or so horsepower. The Shark software and CAI in a 323i adds 21 horsepower, (claimed.) Conforti Performance Engine Software provides an increase in power by altering:

- fuel enrichment,
- cam timing
- ignition timing
- and is specifically for use with premium, 91 or 93 octane gasoline.

Benefits: Horsepower Gains, Torque Gains, Fuel Re-maps, Higher Rev limiter, No Top Speed Governor
NOTE: Requires Battery Charger to install

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“There are no fast cars,
only fast drivers.” Ross Bently



My 323i- Specifications

Year: 2000**Mileage:** 42,167**Exterior:** Silver - Titanium**Interior:** Black Leather**Body Style:** Sedan / E46 "Entwicklung" Development**Number of Doors:** 4**Stock No:** 50652A**Curb Weight:** 3219lbs. Factory Weight / 3153lbs.**Wheelbase (in.):** 107.30**Length (in.):** 176.00**Width (in.):** 68.50**Turning Diameter (ft.):** 34.40**MPG:** 29 MPG Highway, 25 MPG City**Octane:** 91 (93)**Fuel Capacity:** 16.6 gallons

(gallons remaining after warning lamp illumination: 2.1)

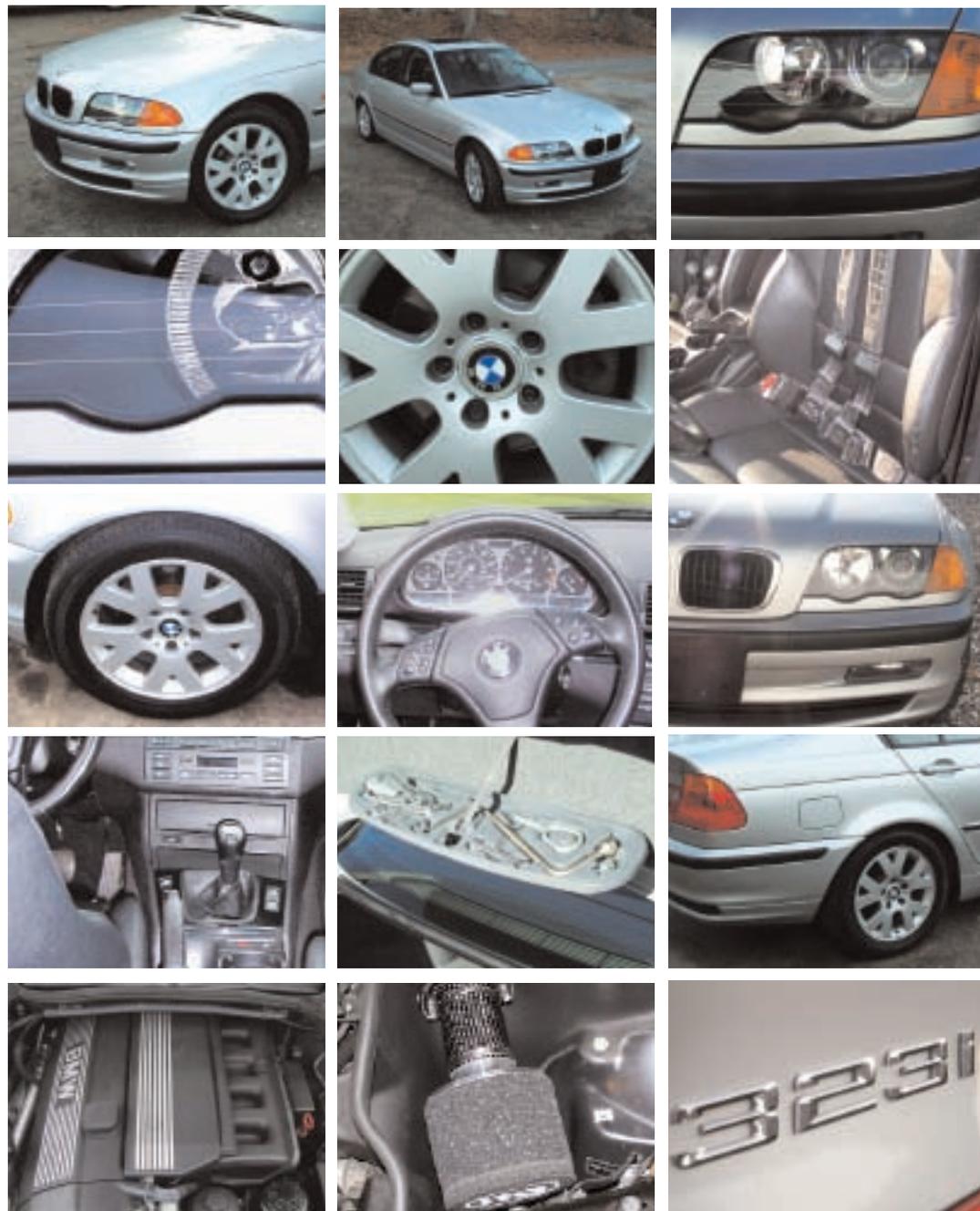
SummerTires: Bridgestone Grand Touring Summer

Turanza ER30 - 255/50Z/R16 - 92W

Winter Tires: 205/55QR16 Bridgestone Blizzak WS-50 mounted on 7 spoke 16x7 Silver Painted Powder Coated Borbet Type CA rims, 1pc. LP Cast, 5-120 bolt pattern, 22.5 lbs. each, +40mm wheel offset.**Transmission and Engine:** Manual 5 Speed, 2.5L - 6 Cylinder, 24V, Fuel Injected, DOHC, Getrag Transmission M52 TU B25 (323) with a dual-resonance intake manifold**HP:** 184HP @ 6000 RPM (stock)**HP:** 205HP (modified)**Torque (lb-ft):** 175 @ 3500 RPM (stock)**Torque (lb-ft):** 192 lb-ft (modified)**Number of Cylinders:** 6**Valve Layout:** dohc**Camshaft Drive:** simplex chain**Camshaft Bearings:** 7 each**Valves per Cylinder** 4**Displacement (liters)** 2.494**Valve Timing (IO/IC)** 6°atdc/54°abdc**Compression Ratio** 10.5:1**Fuel** Norm-Sup Plus LF (93 octane)**Power Output (bhp@rpm)** 170/5500 (stock)**Power per Liter (bhp/liter)** 68.16**Power/Weight Ratio (kg/bhp)** 1.04**Torque (mkg@rpm)** 23/3500 (stock)**Torque per Liter (mkg/liter)** 10.01**Mixture Preparation** fuel injecti

Next >





Description: Sport suspension upgrade package with tuned front independent suspension, Front strut suspension, Front anti-roll bar, Front coil springs, Gas-pressurized front shocks, Rear independent suspension, Rear multi-link suspension, Rear anti-roll bar, Rear coil springs, Gas pressurized rear shocks, 4 wheel disc brakes with front and rear vented discs, 11.3" front- 10.9" rear brake rotors, Inline 6 Cylinder longitudinal engine, (Getrag B+24v 2.5L - 152.2cu.in. I-6 DOHC SMPI) Electronic ignition, Aluminum engine block & head, Double VANOS variable valve control, Variable intake manifold, 80amp alternator, 80 amp hours (Ah) battery, 3.07 axle ratio, Stainless steel exhaust, Power sunroof, Tinted glass, Side, Front, Rear OEM body sport ground effects mouldings, Fog/driving lights, Compact disc player, Air conditioning, AM/FM Radio, Stereo control and cruise control in steering, M3 - 3 Point steering wheel option with tilt, Aerocomposite halogen headlamps, Electronic stability traction control, Bolstered sport front bucket seats, Leather, tilt-6-way adjustable driver seat with manual reclining, manual height adjustable, manual fore/aft, 6-way adjustable passenger seat, Rear bench seats, 2 adjustable rear head restraints, Seatback storage nets, Fixed lumbar, Speed-sensing assisted power steering, Power door locks, Power windows, Trip odometer, Tachometer, 4-wheel anti-lock braking system with 4 ABS channels, 16"x8" split flat cross spoke rims, Inside under cargo mounted full-size spare tire on alloy split flat cross spoke rim with (Pirelli OEM) Tire, Interval rain sensitive wipers, Rear defroster with exterior temperature auto-on sensor, Dual airbags, Dual door mounted side airbags, Curtain front and rear overhead airbags, Airbag occupancy sensor, Front height adjustable seatbelts with 2 front pre-tensioners, Ignition disable security, Side impact bars, Floor mats, Remote mirrors, The 323i has no interior electric trunk release.

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Safety

"At some stage in your development, you may have to overstep your known capabilities. I strongly urge that you pick that spot carefully."

Jim Clark, 1966

(Limerock, April 23rd, 2004)

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Safety - harnesses:

[Schroth Rallye 4 Quick Fit Harness for E46 3 Series BMW](#)

The Rallye 4 is the most popular belt used by participants in BMW CCA Driver's Schools in the US and by BMW Advanced Driver's Skill training in Germany. National BMW CCA Driving School Guidelines strongly recommend "equal-restraints" for both driver and passenger. GVC BMW CCA Chapter requires equal-restraints, meaning what you install for yourself, you install for your instructor.



[The flip-side of Schroth Rallye 4s. Two schools of thought:](#)

Schroth, or any other brand of 4 point harnesses hold the driver in a firm upright position against the seat in corners, and help prevent "submarining"- the tendency for a driver to slide under their lap belt in an crash incident. The belt's two shoulder harnesses reduce upper body twisting, and many find that the two padded shoulder straps make one "part of the car," and thus reduce the fatigue often associated with fighting Gs in tight corners.

Conversely, you should not be surprised if you instructor refuses to wear them, and instead opts for the 3 point standard lapbelts. One of the disadvantages of a 4 point harness installed in a street car without a roll cage is that in the event of a roll-over, the driver is anchored in a full upright position. Should the roof of the car collapse, the driver's head and neck can not move down in the cabin to prevent injury from the imploded roof. While there are many instructors with these belts installed in their own cars, there appear to be an equal number who dislike this harness system without a full cage installed. [Next >](#)





Safety - HANS [Next >](#)





Safety - HANS:

[HANS, Head And Neck System](#)

The basic concept: In an impact, the shoulder harnesses restrain the drivers torso, but only the neck restrains the head. The HANS device reduces the “whipping action” of the head; keeping the drivers head from being pulled away from the upper body.

With a HANS, the forces stretching the neck in a frontal collision are typically reduced by 80%. In frontal impacts the tethers restrain the the head’s forward movement while the torso and HANS device are restrained by the shoulder harnesses. The HANS must be used with the Schroth Rally 4 PRO harness which follows the HANS yoke contour to a single locking mechanism, and not the standard Schroth Rally 4 harness which attaches to the lapbelt on either side of the lap buckle.

HANS or other head and neck restraint systems are not required for drivers schools. Most drivers simply wear a “horse collar” style neck support for comfort and safety.

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Red Mist? If you hear an instructor warn you about the red mist, what they are referring to is the tendency for drivers to make bad decisions. These lapses in judgment can be attributed to:

- Fatigue
- Ego
- Overconfidence
- Lack of experience
- Dehydration

No one can do anything to control your ego, but you.

But remember to:

- Drink plenty of water
- Get plenty of rest.
- Don't drive if you're overheated, or believe you're having trouble concentrating.

If you are too tired to have some fun, you are too tired to be a safe driver. Don't think you have to drive every lap to get your money's worth. If you find that you cannot concentrate, sit out a session. The track will still be there later and you'll have more fun if you are able to focus. [Next >](#)



Red Mist in Action: It all happens real quick.





Drivers may be financially liable for the physical damage they cause to the track property including reimbursement for fire equipment discharged, Armco repair, and fluid clean up.





Standard 3 point seatbelts: You want to make sure they're fastened as tightly as possible. On some older BMW cars you can fool the inertia system into locking, if you lower the seat back, set the belt and then raise the seat back up, the belts will remain locked in that position. It might not work for your car, but it's worth a try. Ask your instructor for help. There are additionally aftermarket belt locks that may be purchased to hold the lap and shoulder belts in the tightened position. These devices connect on the belts above the seatbelt's connection point to the car. The belt is tightened via the shoulder strap, and then the belt is locked down with a manual locking mechanism.

Safety-helmets, ratings and fit: Your helmet must bear a Snell "SA" or "M" 2000 or later rating. The "M" stands for "Motorcycle," while the "SA" refers to "Special Applications."

The Difference Between Snell & DOT Ratings:

Snell Standards - The Snell rating is a more stringent rating, and is completely voluntary, meaning that helmet manufacturers can choose whether or not they wish to meet Snell's advanced safety guidelines. GVC BMW CCA requires Snell certification. A Snell certification is more than simply high "standards", it is based on actual testing of actual helmets, and is thus a better indication of potential protection in the event of an "incident."

DOT Standards - The DOT rating simply indicates that a manufacturer believes that its helmet meets the basic DOT standards, without any actual testing on the helmets themselves. In that sense, DOT ratings are fairly easy to come by, and virtually anybody can make and sell a helmet with a DOT sticker. Fortunately, DOT personnel periodically buys helmets and sends them to independent labs for testing to assure that they actually do meet the standard. The results are posted on the NHTSA website in a pass/fail form. You might be surprised to learn that more than half of all helmets recently tested with the DOT sticker on them actually failed DOT's lab tests. [Next >](#)





Measure your head - Determine the circumference of your head by wrapping a flexible tape measure around the widest part of your head, generally the area one-inch above the eyes and ears. Measure a few locations above and below that spot. As follows are the typical conversion of circumference to helmet sizes. Check the size charts of the make of your helmet before purchase, as some manufacturers sizes are slightly different.

X-SMALL 6 3/4" - 6 7/8"

SMALL 7" - 7 1/8"

MEDIUM 7 1/4" - 7 3/8"

LARGE 7 1/2" - 7 5/8"

X-LARGE 7 3/4" - 7 7/8"

XX-LARGE 8" - 8 1/8"

XXX-LARGE 8 1/4" - 8 3/8"

XXXX-LARGE 8 1/2" - 8 5/8"

To find the best fit, I would recommend that you try-on a helmet one size smaller and larger than what the chart indicates. While you can buy helmets on-line, I think it's best to try them on in person. Most helmets, once purchased, may not be returned, so if it doesn't really fit once it arrives in the mail, you'll be stuck with it. Helmets are generally non returnable because they are intended to be used once - while your head is in it. If a helmet is dropped or banged against anything, it is "used." Helmets are designed to absorb the energy of impacts by deforming, and therefore destroying the future structural strength of the helmet. This damage is usually not visible, and mail order helmet shops can't be certain what has happened to the helmet when out of their control.

Helmets must fit snugly, but not painfully tight. While holding the chin-straps outside of the helmet, pull it down over your head. A proper-fitting helmet will feel snug with fairly even pressure around the sides and top of your head. On most modern helmets the inside comfort lining is designed to be a little extra snug at first, but after several hours of driving, it quickly forms to match the shape of your head. As a rule, the helmet should not be able to move around on your head without pulling on your skin, and should not be able to twist from side to side. When you try on a helmet, attach the chin strap and jerk your chin downward. The top opening near the visor of the helmet should not slide forward on your brow. Most people make the mistake of buying a helmet that's too large.

[Next >](#)





Safety

Painting your helmet: During the winter months in upstate New York, Watkins Glen is closed, and it's generally too cold in my garage to play with the car. To maintain my driving enthusiasm, I thought it might be fun to paint my helmet. This is a time consuming and laborious process. If you don't have some free time, you might not want to attempt this project. I am an artist (of sorts) by trade, so I looked at the helmet as a blank canvas awaiting some personality. While the results have overtones of "boy racer," I must admit that I found the project fun.

If you are going to tackle this yourself, you'll need a few things. A good de-greaser, acrylic enamel paints in an arisol form (no lacquers), acrylic primer, acrylic clear coat, a good low tac masking tape in a few sizes, 600 grit wet-dry sandpaper, frisket, Q-tips, cotton balls, an X-acto blade, an assortment of screwdrivers, and fine line automotive masking tape - should your design require it. Automotive paint supply stores carry almost all of the supplies required. [Next >](#)





.01 - sanded and masked, side view

.02 - sanded and masked, back

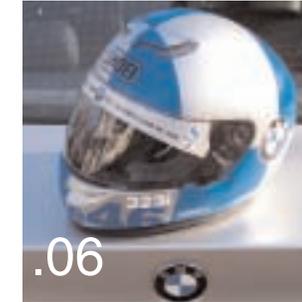
.03 - sanded and masked, bottom

.04 - primer coat

.05 - finish coat, still masked

.06 - finished with clear coat

.07 - 1 of 3 BMW roundels



Safety [Painting your helmet](#)



.01 Remove the face shield, vent covers, and everything and anything that you can get off without damaging it. Remove all the interior ear and chin padding that you can un-snap.

If the original surface is undamaged, you can "sand" it using a scotchbrite pad (the industrial type sold to body shops) or 600 "wet", not dry, grit automotive refinishing sandpaper. Chips or deep scratches, should be filled with autobody repair putty and sanded smooth. You may be able to sand out a scratch, but you run the risk of creating a flat spot that will show up later.

[Next step >](#) / [Skip all steps >](#)



- .01 - sanded and masked, side view
- [.02 - sanded and masked, back](#)
- .03 - sanded and masked, bottom
- .04 - primer coat
- .05 - finish coat, still masked
- .06 - finished with clear coat
- .07 - 1 of 3 BMW roundels



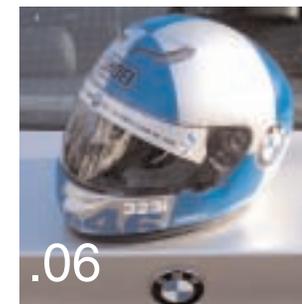
Safety [Painting your helmet](#)



[.02](#) Mask off all areas not being painted with good quality painters masking tape and/or wax finish paper. Take care not to undermask. Details will require trimming with an X-acto knife, and details on a helmet become very, very noticeable. Everything shows. Everything. The rubber that commonly runs around the bottom of the helmet may be separated gently from the helmet's shell with the aid of a small flat edged screwdriver. The masking tape may then be slid behind the rubber and folded over the front to for a suitable mask. On some helmets, this trim may be removed without damage, on others, the rubber is glued firmly in place. It is difficult and time consuming to attempt to order individual replacement parts for a helmet. Sand the helmet shell until it is dull in appearance, removing the sheen from the original clearcoat. This will provide the primer with a suitable surface. [Next >](#)



- .01 - sanded and masked, side view
- .02 - sanded and masked, back
- .03 - sanded and masked, bottom**
- .04 - primer coat
- .05 - finish coat, still masked
- .06 - finished with clear coat
- .07 - 1 of 3 BMW roundels



Safety [Painting your helmet](#)

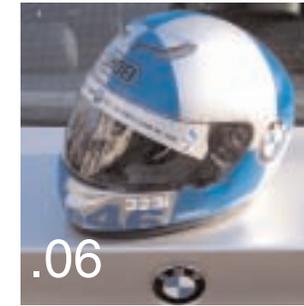


.03 Design details: If the design has hard edge elements, such as stripes or lettering, you will need to lay these out with tape or an appropriate masking material, and probably cut them out with an x-acto knife. If multiple colors are planned, plan on double masking. Do any markings on tape. Lead on the helmet shell contains oils that will create a problem later. **Paint:** Automotive base-coat/clear-coat system are best, but most require an airbrush system or air gun most do it yourself users won't have. Acrylic enamels may be used, although not as desirable, and are widely available in a traditional "rattle cans." Your local automotive paint store may be able to custom mix any color you desire, and fill an arisol can with the acrylic enamel paint mix.

I selected a silver helmet to match my car's color, with the "roundel blue" from the BMW logo as my second color. Never use lacquers, as they will destroy the shell of your helmet, and render it unsafe, and thus, useless. [Next >](#)



- .01 - sanded and masked, side view
- .02 - sanded and masked, back
- .03 - sanded and masked, bottom
- .04 - primer coat**
- .05 - finish coat, still masked
- .06 - finished with clear coat
- .07 - 1 of 3 BMW roundels



Safety [Painting your helmet](#)



.04 Prime the shell in several thin coats allowing dry time between, and lightly re-sand.

Fill any screw holes with toothpicks or Q-tips, and fill vent holes with cotton balls. To prevent paint from entering the inside of the helmet, fill the helmet with paper, and cover the bottom with a cut piece of cardboard.

Paintbrushes are verboten.

Avoid touching the paint surface with your fingers at any time. [Next >](#)



- .01 - sanded and masked, side view
- .02 - sanded and masked, back
- .03 - sanded and masked, bottom
- .04 - primer coat
- .05 - finish coat, still masked**
- .06 - finished with clear coat
- .07 - 1 of 3 BMW roundels



Safety [Painting your helmet](#)



.05 Paint the helmet after priming in a dust free environment with proper ventilation.

Within 24 hours clear coating must take place. There are acrylic enamel clear coats as well. Don't overclear. Three to four coats should work fine, and 10 is not better than 5.

When the clear coat is dry (several hours) reassemble and enjoy.

[Next >](#)



- .01 - sanded and masked, side view
- .02 - sanded and masked, back
- .03 - sanded and masked, bottom
- .04 - primer coat
- .05 - finish coat, still masked
- .06 - finished with clear coat
- .07 - 1 of 3 BMW roundels



Safety [Painting your helmet](#)



.06 The “e46 and 323” letters and numbers are cut vinyl, with the blue to match the roundel and paint color. The visor sun shield is a metallic silver paper that matches the helmet’s base color, then run through an inkjet printer for the lettering, and then covered in a clear packing tape to protect the surface from water and wear. The stickers came in the boxes with some of my car upgrades. I scanned them, and then resized and color matched them to the roundel blue, and then printed them on Avery Brand sticker stock off my home inkjet printer. Once printed, they were covered with clear packing tape, and “die-cut” to size with an X-acto. Some sticker stocks contain adhesives that will damage the helmet’s surface, so take care. [Next >](#)



- .01 - sanded and masked, side view
- .02 - sanded and masked, back
- .03 - sanded and masked, bottom
- .04 - primer coat
- .05 - finish coat, still masked
- .06 - finished with clear coat
- [.07 - 1 of 3 BMW roundels](#)



Safety [Painting your helmet](#)



[.07](#) The Roundel logos on my helmet were purchased as an aftermarket part from a motorcycle shop in Utah. I am fortunate that BMW makes motorcycles, and that the logos are nicely painted on aluminum in two different sizes that are convex to accommodate the helmet's shape.

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A poem for troubled times:

“If you start to spin, put both feet in”

Slides are most often caused by trailing throttle oversteer (turning into the corner with the brakes applied, or lifting off the accelerator while in the corner), power oversteer, or when a driver drops two wheels off of the pavement, panics, and overcompensates with steering inputs so that when the tires do find grip, they propel the car violently to the opposite end of the track. The correct response to any slide should be to position the feet “for both feet in.” This means that as soon as the driver realizes the slide is going to become a spin, both brake and clutch pedals should go immediately to the floorboards. A spinning car without brakes will move erratically across the track as the four wheels alternately gain and lose traction. Cars following will find it very difficult to avoid. If the brakes are locked the car will still spin, but its trajectory will be straight and predictable (and roughly 70% of braking efficiency will be retained). Cars with ABS (Anti-Lock Braking Systems) will most often react erratically anyway, but the brake peddle should still be put to the floor. The clutch is pushed to the floor to keep the engine running and to reduce strain on the drive-train (and perhaps prevent yet another spin) if the brakes are released while the car is still moving. Also, with the engine running the driver will be able to more quickly move the car if needed. It is a wise practice to mentally count to 5 after a spin is completed before releasing the clutch and brake. After driving at track speeds for 15 minutes, the human brain often incorrectly interperates 10 miles per hour as being completely stopped. Should the driver still be moving when the clutch and brake are then released, the car may stall or drift into the track line. The rule is simple: In a spin, brakes and clutch to the floor boards, stop, count to 5, and then attempt to get out of the line safely.





Safety

Flags: Flags exist to allow those controlling the event to communicate with individual drivers as they circuit the track. They will be displayed at flag stations, the locations of which you should learn immediately on the first session out. The flag marshals are volunteers, and are there for the same reason you are, they love driving. It is critical that you remember what the flags mean, and how they are used.

It is likely that not all the flag stations will be “manned” on a given weekend. There are 18 flag stations along the track at the Glen. Your instructor may ask you after you have passed a flagger’s location to describe how many workers were at the last station, and even what they were wearing as a test for your attentiveness. You will be graded on your evaluation on your ability to recognize these stations and their instructions, but more important than the grade is the safety, habit, and practice of watching these stations. [Next >](#)



Red



Red flag: If you see a red flag at any station, pull to the side of the track and make a safe stop as quickly as possible, bearing in mind that there might be other cars who have not seen the flag coming up on you. Pull to a location where you may be seen by a corner worker and stop your car off the driving line. The red flag means there has been a serious incident. Wait for a green or yellow flag to proceed.

Black



Black flag: If a black flag is displayed and/or pointed at your car, acknowledge it with a wave or flash of the headlights. Proceed at a reduced speed and preferably off "line" around the track to the pits. Wait in the pits for an official to tell you what the problem is and how to proceed. Directed at you, this flag means you're doing something somebody doesn't like.

Standing black flags displayed at all stations indicate that there is a track problem and the session is being suspended. In this case: Exercise caution, check your mirrors, reduce speed, NO PASSING, and proceed to pit lane. If time permits, the cars may be staged and re-released onto the track when the problem is resolved

Green



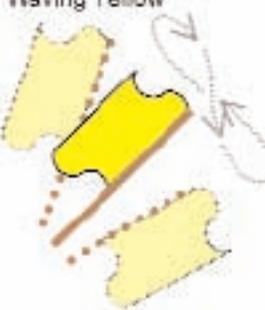
Green flag: This flag indicates that the track is open. The green flag indicates a clear course, as does the absence of any displayed flag.

Standing Yellow



Standing yellow flag: The standing yellow condition indicates that there is a car, emergency vehicle, worker, or some other obstacle (even an animal) in an area close to the line, or in an area where cars may leave the course, but there is no obstruction of the line. Standing yellow may also serve as advance warning for a waving yellow flag at the next flagging station. Exercise caution, check your mirrors, reduce speed if necessary. NO PASSING from the flag to past the next flag station not displaying a yellow flag.

Waving Yellow



The waving yellow: The waving yellow indicates that the line is partially or completely blocked by a car, cars, emergency vehicles, workers, or a combination of all of these. Drivers must be prepared to leave the line--perhaps leave the track surface or even stop--in order to avoid becoming involved in an accident.

Exercise extreme caution, check your mirrors, reduce speed. NO PASSING from the flag to past the next flag station not displaying a yellow flag. [Next >](#)



White



White flag: Often seen with a red or yellow, this flag means that there is a slow moving vehicle on the track. It could be another car, a wrecker or an ambulance. Watch in front and behind. Waving white may be displayed to indicate that the slow moving vehicle is immediately ahead.

Debris



Debris flag: Oil, car parts, debris, or roadkill has been deposited on the track and a slippery or otherwise hazardous condition exists at this corner. Exercise caution, check mirrors and assess the track condition at this station. Typically, the debris flag will be displayed for one or two laps and then taken in. This does not mean that the debris or oil has been removed. It is expected that all drivers will now understand the conditions at the corner and will continue to negotiate it in a safe manner. The debris flag redisplayed at the same corner means that a new hazard exists.

Meatball



Mechanical: Also known to as the “Meatball,” this flag means that there is a problem with your car. Check your gauges, look for smoke in your mirrors and report to the pits immediately. If you see smoke, or observe that you oil pressure is low, move your car well off line.

Passing



Passing flag: The passing flag is a reminder to check your mirrors. In the corner worker’s opinion, you are, or will soon be, overtaken by a faster car. This flag is not a command -- you are not required to let the car pass at the next or any subsequent passing zone. This flag may be waved to indicate that a car is actually in the process of overtaking you. This flag is displayed at the corner worker’s discretion and is used liberally, especially to help break up ‘trains’ of traffic that can form in slower run groups. Typically, only corners immediately before legal passing zones are instructed to display this flag.

Checkered



Checkered flag: This flag means that the session is over. Take a cool-down lap and enter the pits. (On your cool down lap, take the time to thank your corner workers as you pass with a wave out your window) [Next >](#)





1.



2.



6.



3.

Things you will need - What to bring

Most serious students at drivers schools have learned several important lessons:

- You can have lots of fun just being at the track.
- You'll have even more fun with the right equipment.
- SOMEONE at the track is bound to have the right tool or part for virtually any problem. Get to know as many people as possible. Be friendly. Say thank you, and you'll be surprised at how helpful people can be.
- The amount of stuff you want to take to the track will expand to fill the available space.

Heres a brief list:

1. Helmet - with a Snell SA 1995 or later rating. "M" or "SA" rated. Helmets currently being sold have an SA 2000 rating. And it should be comfortable.
2. Torque wrench for wheels, correct socket for your lug nuts, torque settings for your car
3. Good tire gauge
4. Spare set of front pads -- It's not likely, but not impossible, that you'll totally trash your front pads. Having a spare set of pads will let you drive home safely. Better yet, install track only pads that can take the heat. I also bring an extra set of front rotors.
5. A full tank of gas - You don't get very good gas mileage running at full throttle all day; some average less than 7 mpg on the track. Track fuel is 101 octane and is incompatible with the 93 octane shark injector software installed in my car. You can get gas at a variety of stations in the town of Watkins Glen, about 10 minutes from the track
6. Lots of drinking water - You'll be surprised how much you will sweat sitting down, and your going to get thirsty.
7. Storage containers to hold your cars contents in the garage (helps keep the small stuff together)
8. Rain coat and umbrella (you will run in the rain)

[Next >](#)



Things you will need - What to bring

9. Lawn chair
10. Sunglasses
11. Window cleaner and paper towels - it's good to see well. Bugs die hard at 120 mph.
12. Tape. Duct tape or painters tape. Some drivers like to tape up their headlights. I think this is a nod towards the early days of road racing when drivers routinely bumped into each other, knocking out the headlight lenses. It was polite in those days to spare the corner workers the trouble of cleaning up your glass by taping up you lamps. Other drivers tape the front of their car and rear view mirror fronts to protect them from debris and bug impacts.
13. Pen/paper
14. Watch or clock (not for timing your runs)
15. A camera
16. Extra T-shirts (you'll probably get sweaty)
17. Cooler stocked with lots of water and/or Gatorade plus snacks (Absolutely NO ALCOHOL of any kind will consumed by ANYONE during run sessions, but feel free to have a cold one after the last session).
18. Brake fluid - it's good to be able to stop
19. 3 quarts of oil - check your oil between every run
20. Hand cleaner
21. Hat (sun protection and helmet head.)
22. Sunscreen

Thing you won't need, but may want - Track Junkie Extras

The list of equipment track junkies can bring to the track is almost endless. Some of the more popular items are:

1. Comfortable driving shoes - thin soled with minimal edges are best
2. Driving gloves - soft palms to help grip the wheel even when your palms are sweaty, and a better grip in the rain after your hand has been out the window for a point by.
3. 3-ton car jack and flat board to place it on
4. More tools
5. Set of track wheels with R-compound rubber
6. Canopy for shade [Next >](#)





Check before the first session:

1. Top up levels of coolant, brake fluid, and engine oil. And stating the obvious ... to top up the fluids, you'll need to bring these along also.
2. Check that the radiator is free of leaves or trash. Running at full throttle 90+% of the time for 30 minutes is a severe test of your cooling system, and you don't need leaves blocking air flow.
3. Check that you have at least 50% remaining brake pad thickness both front and rear.
4. Consider bleeding the brakes. You'll usually eliminate an air bubble or two and firm up the brake pedal.
5. If you use Rain-X on your windshield, thoroughly clean (using alcohol, soap & water, or Windex etc) the area where you'll be sticking any car number. If you don't, expect it to blow off on the track, assuming you can get it to stick to the windshield in the first place.

Before EACH driving session:

- Check wheel lug nut tightness (but not while wheels are hot).
 - Check the oil level.
 - Check the tire pressure
1. Recheck fluid levels before every session.
 2. Check the condition of your tires before every session.
 3. Re-torque lug nuts before every session. I haven't had any problems, but I've heard reports that the lug nuts on aluminum wheels can loosen under track conditions, and at my first school, a car had to enter the paddock to tighten a lose wheel.
 4. Run a warm up lap every session to bring the motor and tires up to temperature. Don't push the motor to high rpm until water temperature is "normal". It is helpful to stage your car 10 minutes before the start of a run-group, and start your engine to bring it to temperature.
 5. Make sure you air conditioner and the A/C compressor are off. You don't want the additional heat load on the cooling system, or the hp loss.
 6. Keep your eye on the temperature gauge.
 7. Make the last lap of every session a cool down lap, with minimum braking to let air flow cool your red hot rotors. [Next >](#)





Before EACH driving session:

8. Park your car on a level spot at the end of the session and do **NOT** engage the emergency brake. If you clamp the rear brake pads on scorching hot rotors, you'll likely either deposit pad material on your rotors or warp them.
9. After every session, raise hood to let the motor cool without cooking other under-the-hood components.
10. Remove the plastic center caps from your wheels. The brakes will get hot enough to melt the plastic, and they'll roll off into the weeds alongside the track somewhere, lost forever. The same applies if you have plastic covers over the lug nuts - remove them.
11. If you do feel you're losing the brakes on the track, either the pedal going soft (boiling brake fluid) or reduced stopping power with a firm pedal (overheated pads), immediately back off. Either run a cool down lap and resume, or run a cool down lap and come in.

E Each BMW body style is assigned a two digit number preceded by "E". The E stands for "Entwicklung", the German word for development.

Are We Having Fun Yet? If you have any problems communicating with your instructor, let them know. Chances are that they just don't recognize what you need. Everyone is different. If you need lots of feedback, make them aware of that fact. If they're talking too much or not giving you any positive reinforcement, say something. If you are not getting the kind of help you need or not having any fun, ask the classroom instructor about getting a new instructor.

Most first timers are anxious to ask for another instructor, but don't be shy. If you have a great instructor let them know. If you want someone else, do it at the end of the first day. Whatever you do, don't go away wishing you had spoken up. Just make sure you do it in a mature adult fashion. (If you're having the same problem with a second instructor, re-examine your actions and see if the problem is you.) [Next >](#)



Sometimes you think you can actually see “the line” on the track. But be warned. The black tire marks leading through corners are the result of drivers attempting to tighten their line or make corrections, oversteering with profound steering inputs, and laying down rubber. The ideal line will most likely be just inside of the dark marks on the track through the turn. So, yes, you can use these marks, but just don’t follow them, they are in fact, off line. [Next >](#)



Something you definitely don't need: You won't need driving gloves or driving shoes to attend a school, and you certainly won't need a fire suite. Many instructors and students however, find some or all of these useful, and for those that participate in club racing, they are required. While I am not a club racer, I for some reason own a suit.

I aquired my fire suit from BMW North America's M3 factory racing team. Team PTG (Prototype Technology Group) sold some of their team clothing on e-bay after having switched sponsors. Listed in the auction were logo emblazoned pit shirts, and - Stand21, 2 layer Nomex driving suits. Stand21 is the famed French fire suite manufacturer that outfits many of the Formula 1 teams. Their suits are very well made but are also very expensive when purchased new. Thanks to a rather favorable e-bay transaction, I own a suit.

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BMW and PTG Prototype Technology Group has been BMW's primary U.S. motorsports research and development team for the BMW M3 since 1995. In 2004, the team fielded three BMW M3s in the GT class of the Rolex Sports Car Series, sweeping the Manufacturer, Driver and Team championships.



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Since 1995, in nine seasons, BMW Team PTG has won five sports-car manufacturer championships for BMW, five team titles and four driver championships.

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Autocross: The modern autocross has its roots early in automotive history, when gas, and even steam powered vehicles participated in public challenges designed to demonstrate the automobile's versatility and maneuverability. These evolved into “gymkahnas,” which tested the diverse abilities of the driver more than the car. The modern autocross tests the ultimate performance of both, against the clock, in an intense and demanding series of gates and turns through cones, or in the case of “BIMP” (Batavia International Motorsports Park), a very narrow track with tight and twisting turns. In such an event the difference between first and second place is very often measured in hundredths, and sometimes thousandths of a second.

At BIMP, you will run the course one and a half times, through a series of corners and elevation changes including two large uphill corners called “monzas.” In some of circumstances you may find yourself on the track experiencing understeer, oversteer, TTO and secondary weight transfer slides. You will have the ability to drive with instructors if you wish, or invite an instructor to sit in with you on your run. **Next >**







You will be penalized for every cone that is hit and knocked out of the box in which it is placed.

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Credits and Thanks:

[Doug Hood](#) - for almost everything, but mostly for answering every little question with enthusiasm and a genuine love of the sport

[Randy](#) - from Phoenix Imports for tech-inspections and sound mechanical advice

[Dave Nichols](#) - BMWCCA 123194 Tarheel Chapter

[Jim Dresser](#) - Webmaster and Driving School Student Contact

[Mel Dillon](#) - for council dispenced at BIMP

[Patty Perkins](#) - Chief Instructor

[Pete Read](#) - '88 M5 - from the unofficialbmw.com forum for his information on brake fluid

[Dave "Big Dog" Nichols](#) - for his sound advice to a new driver

[Goeff Atkinson](#) - my first instructor

[Cyber Pete](#) - for his BMW CCA GVC Batavia 4/17/2005 pics

[Matt Russell](#) - for taking the time to photograph the C run group while at the Toe at the fall school (photo credits: cover shot and page 5)

[Steve Crabb](#) - co-worker and fellow BMW GVC CCA member and zealot

[My Wife](#) - just because

[Phil Abrami](#) - from the Boston Chapter for his wisdom on tires

[Dr. Karlheinz Lange](#) - from Geschichte des Motors for E46 323i information

[Will Z, "Cookie"](#) ,and every other instructor that let me sit in with them for drives on instructor track days

[Gary](#) - from TSX Sports

[Stu Sax](#) - for beverages at The Seneca Lodge

[Randy Young](#) - for some track tips from an Audi owners perspective

[Doug at Digidids](#) - for some track pics at the toe, cover shot copyright Digidids

I have attempted to publish information that is accurate and factual. If along the way, you find an error, or have an alternative view on a subject covered, please let me know. I have intentionally omitted specific subjects, such as oil weight advice or track tire sizes, because there are so many different valid perspectives - and no single agreed upon recommendation.

