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SN SPEEDNEWS

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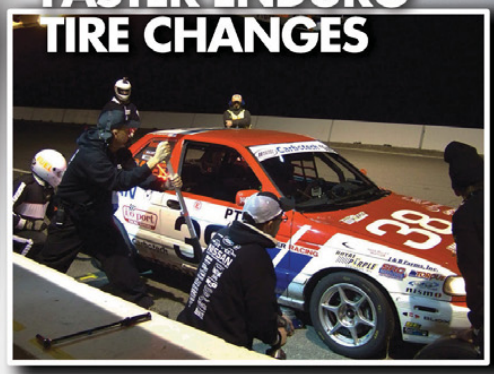


HYPERFEST2014

SPECIAL DATA ISSUE
SOFTWARE TIPS
DATA SYSTEMS

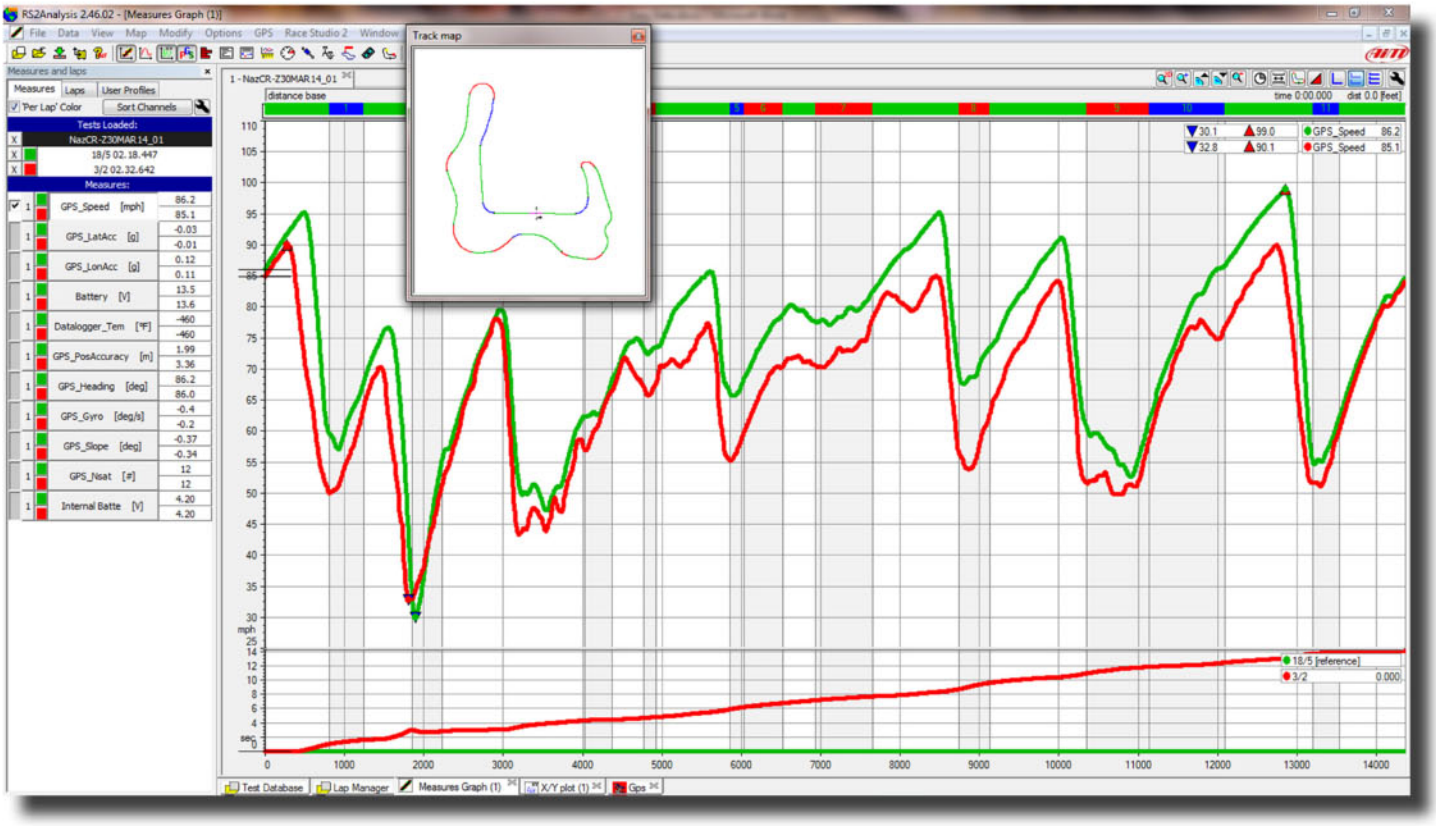
PLUS!

- A RACING **ODYSSEY**
- WATER-**METHANOL** INJECTION **TECH**
- **STUNT** DRIVING **IN** "NEED FOR SPEED"

VOLUME 3, ISSUE 6 JULY 2014

PRICELESS DATA

STORY AND PHOTOS BY NEIL ROBERTS



THE AIM SOLO HAS MADE DATA ACQUISITION A LOT MORE AFFORDABLE. HERE'S HOW TO MAKE GOOD USE OF THE INFORMATION.

Don't guess when you can know. That statement is one of the philosophical foundations of science, engineering and racing. You can learn a lot from studying your history of lap times, recorded by your timing transponder and accessible through MyLaps.com. As great as this resource is, it only gives you two data points per lap, namely your lap time and your position in class. That is not much better than a helper with a stop watch and a clipboard can do. Today's technology is here to give you the data that you need to improve your racing game.

If you are fully aware of how you drive, if you are brutally honest with yourself, and if you have a total recall, you don't need a data system. The rest of us do. Because there are dozens, hundreds, or perhaps even thousands of influences within each lap, it is great to learn what those influences are, and how they affect your lap times. With the Solo lap timer, AiM Sports makes learning in amazing detail about every lap easier than ever. The Solo is affordable, quick and easy to learn and use, robust, and versatile.

The large and crisp display on the Solo can display several types of data to you simultaneously. The most valuable display mode for your qualifying session is the predictive lap time display. It will show you what your lap time will be if you keep up your current pace through the end of the lap you are running now. During

practice sessions, you can focus on individual lap segments by displaying segment times, and there are several other options available for the blue-backlit monochrome display. Its visibility in direct sunlight is good because the LCD display is the same type as a digital wrist watch.

Using only its built-in GPS antenna and data logger, the Solo produces an amazing number of data channels that you can analyze between track sessions and between race events:

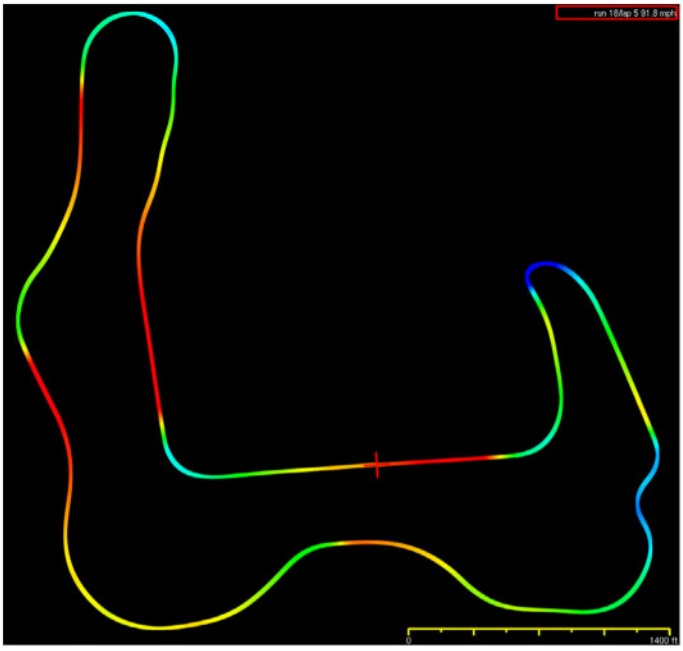
- Lap times
- Segment times
- Lap count
- Speed
- Lateral acceleration
- Longitudinal acceleration
- Heading
- Yaw rate
- Uphill or downhill slope
- Acceleration time to distance

In addition to all of the performance data, Solo logs the supply voltage, internal battery voltage, and logger temperature. Solo also logs its positional accuracy and the number of GPS satellites that it was tracking while the data was acquired. The reported positional accuracy typically varies from 2 to 3 meters, but that is the absolute accuracy of the position measurement on the planet. The differences in racing lines between two laps are much more consistent and meaningful for comparisons. A downloadable database of GPS coordinates for race track start finish lines can be used, or you can define your own timing points.

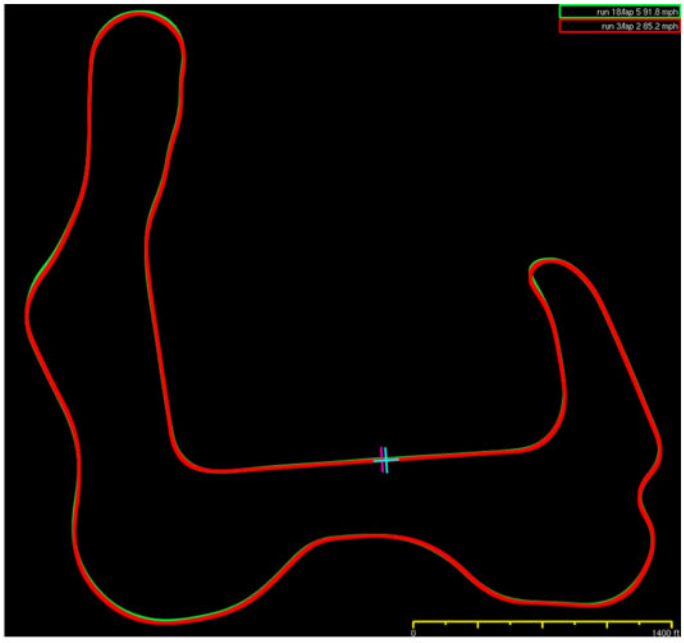
Using all of that data, the included AiM Race Studio Analysis software can produce a highly accurate track map of your actual line during every lap that you run, and overlay any combination of laps that you choose. That will show you how your line varied between laps, sessions, events, or seasons. If you combine the Solo data with an AiM SmartyCam, some of the data will be overlaid on your recorded video as well. The Smarty Cam is somewhat expensive at about $1,000 retail and it can only be used with the Solo DL, not the Solo.

The AiM Solo comes with all of the items shown here to make your experience a satisfying one. A car charger complements the built-in battery and charger, and the USB cable makes downloads to your computer simple. The user manual and analysis software CD will get you up and running quickly. The Solo DL will allow connection to your car's OBDII data stream and a SmartyCam video camera.

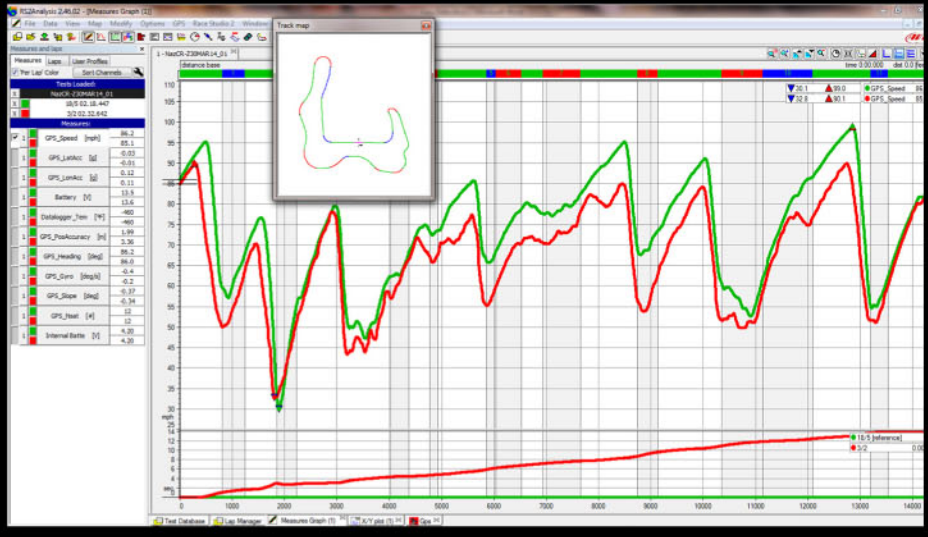
The large, crisp LCD display is easy to see in sun and shade.



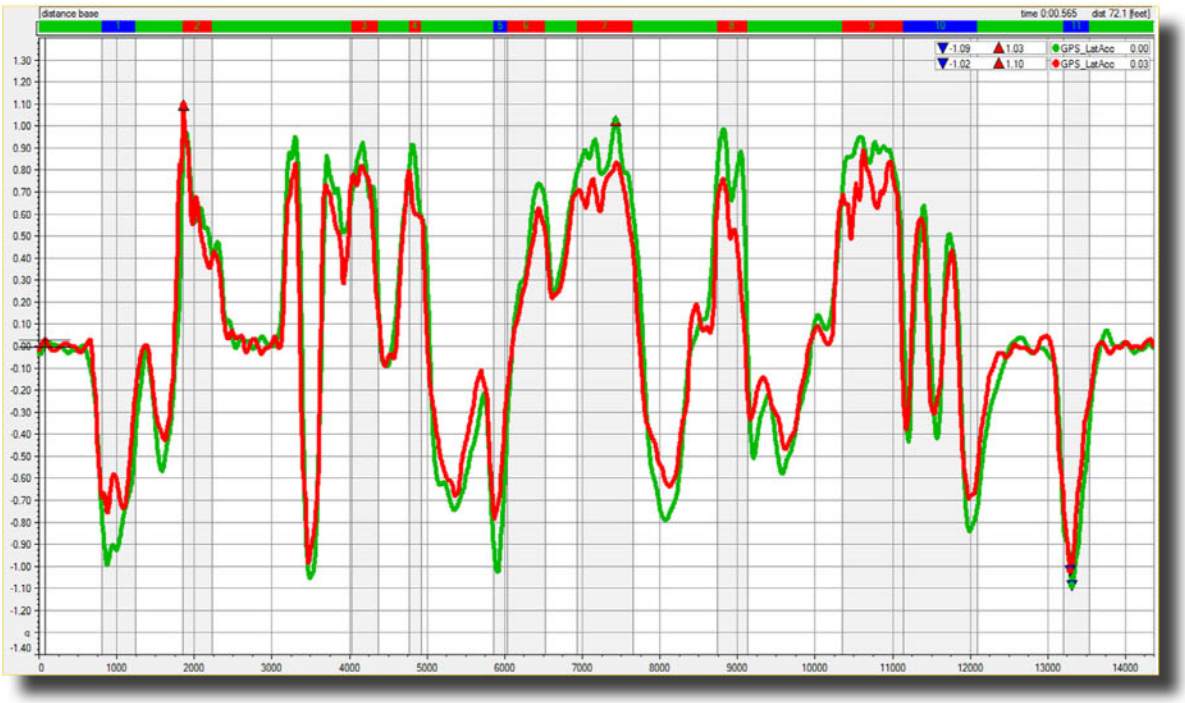
This Solo GPS-generated track map is color coded with speed, so the speed data is easy to see and understand. The speed spectrum colors are in the order of a rainbow, with blue as slow and red as fast.



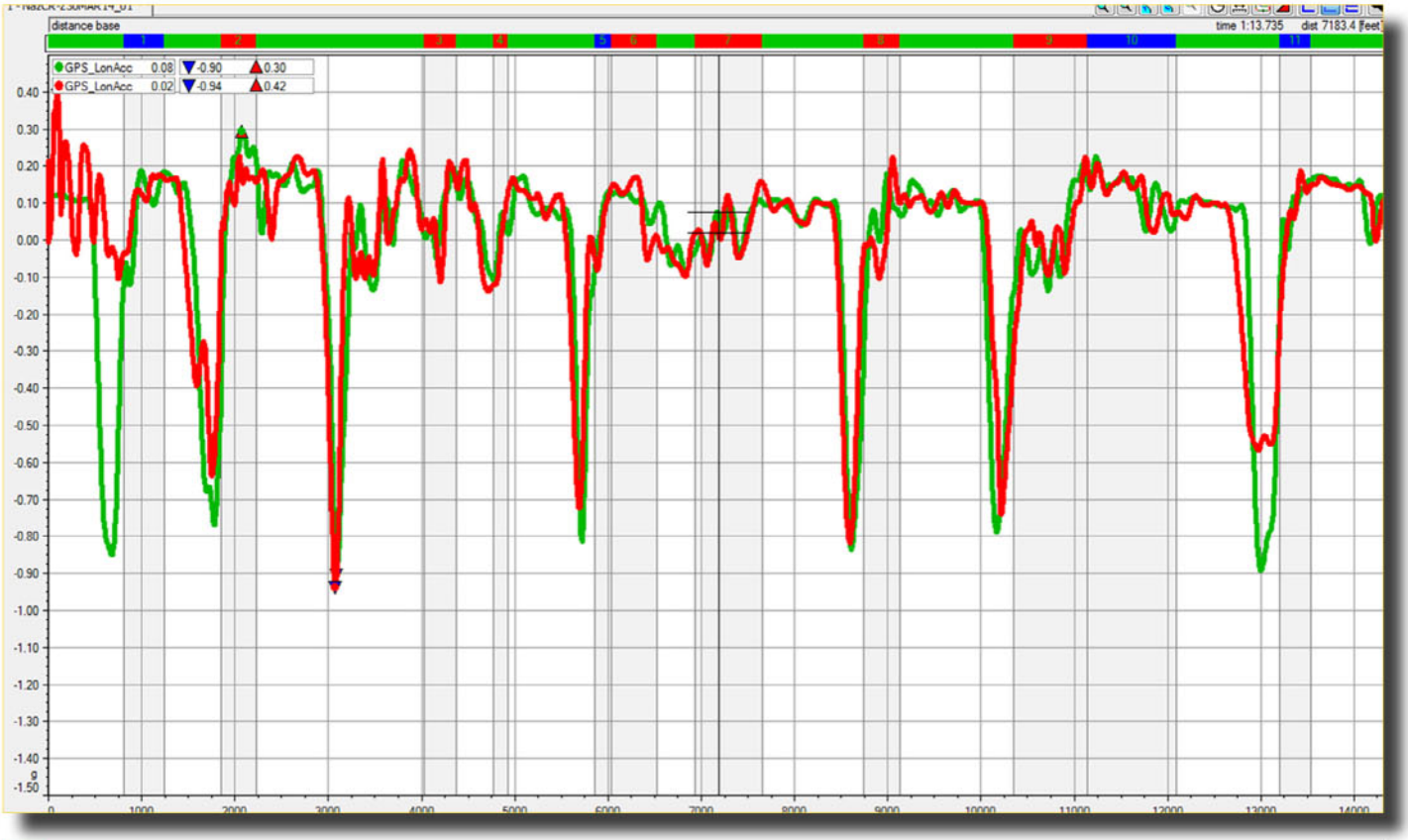
Overlaying maps from two different laps shows differences in lines. This can help you learn why the lap shown in green was faster than the early lap shown in red. The color of each lap is automatically displayed in a different color to make comparisons easy.



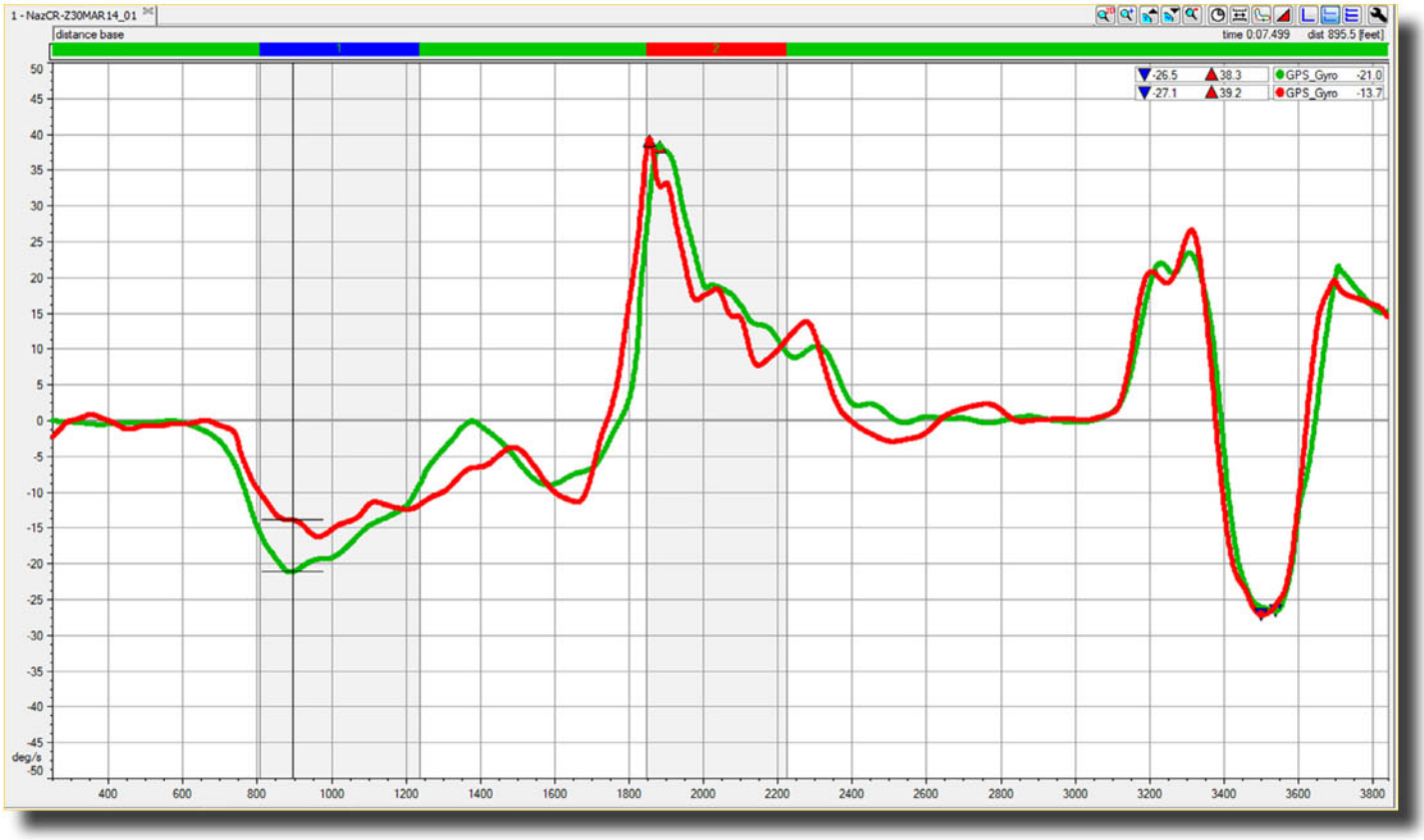
Here is the main display of the AiM Race Studio Analysis software, showing the icons, drop-down menu bar, and display tabs in this versatile and powerful data analysis program. It seems overwhelming at first glance, so just focus on one thing at a time. Soon it will all be familiar and easy. The two speed traces are for different laps that James Nazarian drove on the same day. The horizontal scale is set to distance, so the speed traces are nicely aligned. The two speed traces show that less mid-corner speed in the slowest corner allowed an earlier and stronger throttle application, so the speed down the next straight was faster. The data trace at the bottom of the screen is the difference in elapsed time to each point on the track. This data shows exactly how and where a 7 mph speed difference throughout a lap added up to a 14-second lap time difference. This kind of information is highly valuable for driver development and car setup development.



Lateral acceleration is calculated from the series of GPS position data points that are logged 10 times every second. It is easy to see that during the lap shown in green, Nazarian was using much more of the car's cornering capability than during the lap shown in red.



The longitudinal acceleration comparison of these two laps shows that Nazarian consistently braked later and harder during the faster green lap.



This display shows only a portion of the lap for more detailed analysis. Zooming in like this is very simple in Race Studio Analysis. The data displayed here is the turn rate of the car in degrees per second. Nazarian rotated the car much more quickly at the entry and exit of Turn 1. The crosshair is shown at the peak of the yaw rate, which was 21.0 degrees per second turning to the left. This zoomed-in view shows that the rate of data sampling is high enough for analysis in fine detail.

All of the results graphs shown in this article were logged by a Solo that was suction-cup mounted to the windshield of a car driven by professional factory test driver James Nazarian. The AiM Solo was provided by Veracity Racing Data and the graphs were generated in AiM Race Studio Analysis 2 software.

After using the Solo for a day, Nazarian commented, "It fires right up and has nice functionality compared to other lap timers that I have used. It acquires GPS satellite signals quickly, and it asks if you are at a race track when you get to within a couple of miles of it. The start/finish lines for the local tracks were already programmed into it, and the cigarette lighter power supply meant hands-off ease of use all day.

"My preferred display of segment-based predictive lap times is not the standard display, but it can be configured as a custom display," he continued. "The only negative is that the monochrome display required a bit more focus away from the track to find out if my predicted segment was faster or slower, compared to the color coded red or green values that a color display shows."

The amazing variety and quality

TWENTY YEARS AGO, DATA OF THIS QUALITY WAS NOT AVAILABLE AT ANY PRICE.

of the results that you will get from your Solo gives you enormous bang for the buck. In addition to track events, the Solo is equally useful on open-loop courses like hill climbs and autocrosses, since separate start and finish points are quick and easy to define. Because all of the Solo's data is easy to download to your computer, you can compare your performance between different events at the same track just as easily as you can between two consecutive laps on the same day.

Twenty years ago, data of this quality was not available at any price. Now that GPS and digital technology have placed this capability easily within your grasp, it is worth the small price that it takes to begin learning all that you can from every single lap that you run. When you analyze your data and find and improvement that you can use from now on, knowledge is better than power. SN

RESOURCES:

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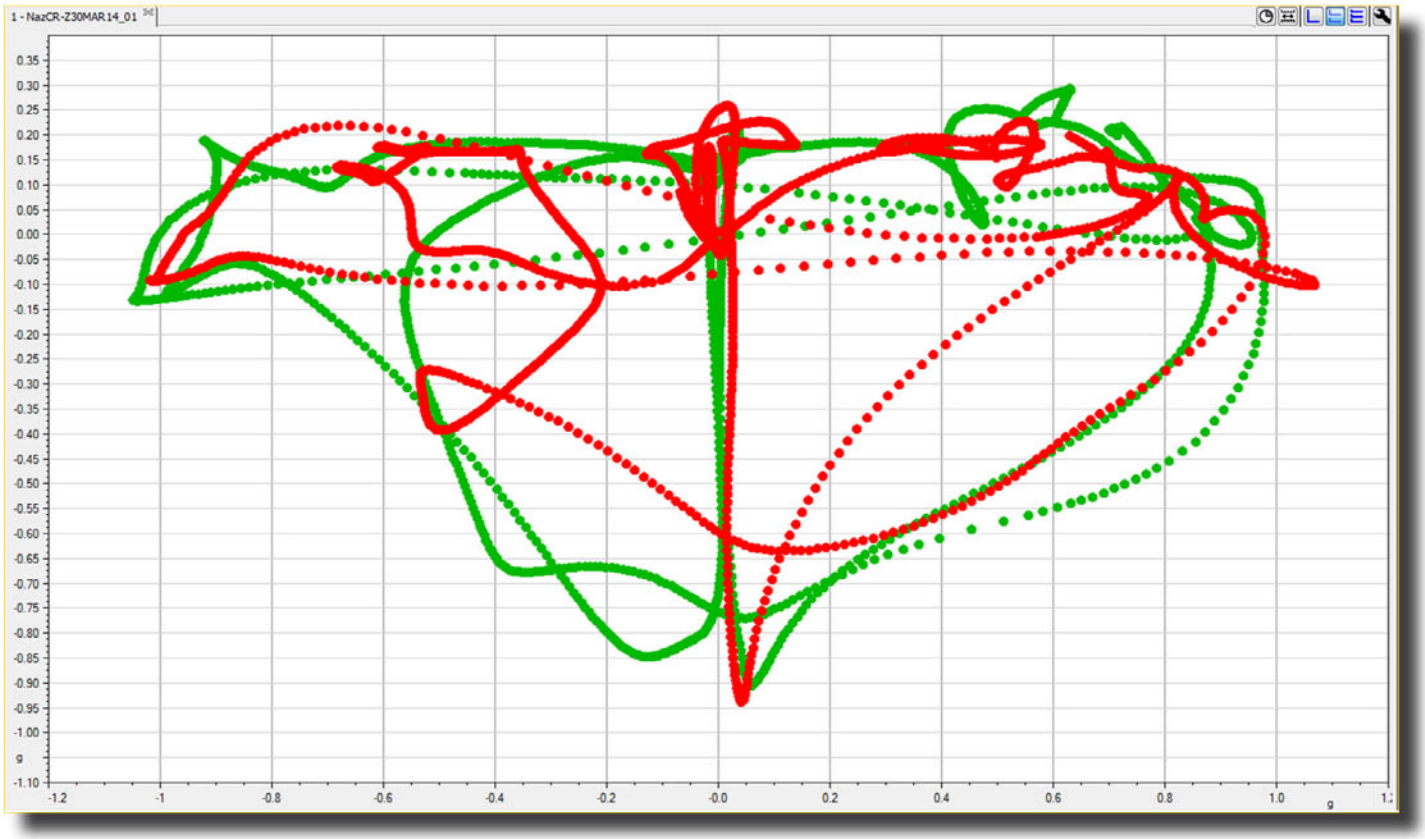
AiM Video Webinars



This is an X-Y type plot showing lateral acceleration on the horizontal axis and longitudinal acceleration on the vertical axis. This is better known as a friction circle plot. Again, this graph was calculated only from GPS data points logged in the AiM Solo. If all of the data points are closer to the outer perimeter of the oval-shaped combined grip limit of the car, then Nazarian used the grip that was available more consistently. More of the red data points are well inside the grip boundary of the car, indicating that Nazarian drove more conservatively on that lap. The data logging rate was constant at 10 points per second, so the distance between dots indicates how rapidly the combined acceleration vector changed magnitude and/or direction. Many data points close together indicate a sustained acceleration, while larger gaps between data points indicate a rapid transition.