

Data in Non-ECU Race Vehicles

Vintage, Spec Miata/Boxster/BMW and More!



Host:

Roger Caddell

AiM Sports - National Training Manager

Co-Host:

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[aimsports.com](https://www.aimsports.com)

Tuesday Feb 9th, 2021

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SPEED SECRETS
Virtual Track Walk



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& ASSOCIATES
HIGH PERFORMANCE DRIVER DEVELOPMENT

- Krause & Associates LLC at Virginia International Raceway - Premier AiM Dealer Since 2010
- Vintage/Historic Race Car Specialist, SVRA, HSR, Goodwood Revival, LeMans' Classic, Masters Historic Racing, PCA Club Racing, BMWCCA Club Racing, NASA, SCCA, WRL, AER and More!
- 5 Time AiM Sports Webinar Co-Host!



Peter Krause

Krause & Associates
High Performance Driver Development

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In The Beginning...

Back When Carbs and Ignition Points Ruled
and Wheels Were Made of Wood!



Data acquisition was truly in its infancy in 1968. Here is Mark with the instrumentation roped into the passenger seat of the Camaro at the General Motors proving grounds (see page 103). *Donohue Collection*

Data in Non-ECU Race Vehicles

In The Beginning

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A Racer's Data Journey

James Colborn's Data Journey Story



I have had three data "journeys;"

- **2010-2013** - 1998 BMW E30 (PRO3 Spec). Started with an AiM Solo, had this actual device for at least 10 years!

Then, with no ECU or CANBUS, I went to an MXL Pista with throttle, brake (front and back), rpm, oil, water (both pressure and temp). This helped me transition from driver development with GPS only to driver inputs.

- **2013-2017** - BMW Spec E46 (2001 E46) that had ECU/CANBUS Data.

Still used my AiM Solo but had all the channels. Also added SmartyCam HD that changed my world! Got very spoiled on channels and data.

- **2019-2020** - Went back to an AiM Solo 2 for Formula Ford (1988 Van Dieman).

Missed my additional channels and I added all analogue channels via an EVO4S. RPMs, Brake Pressure, Throttle Position, Oil Pressure, Water Temp. Most recently, I've added Tire Pressure Monitoring Systems. Next investment will be Steering Input (likely 2021 season).

Interestingly, I forget that I'm not looking at ECU/CANBUS data in my Formula Ford.

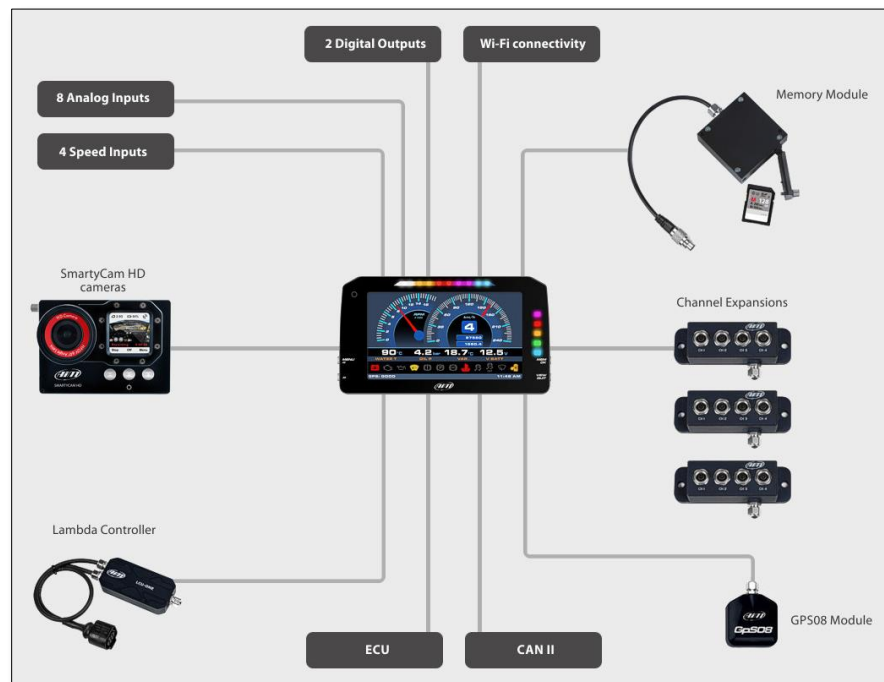
It's just data and it's reliable.



How Do We Get Data?

Many Different Data Sources Are Available

- GPS Derived Data
 - GPS_Speed
 - Lap Timing
 - GPS_Lat/Long Accelerations
- Analog Data
 - Temp/Pressure Sensors
 - Driver Input Sensors
 - Many More!
- Digital Data
 - RPM Sensors
 - Speed Sensors
- Video
 - SmartyCam HD Video
- Vehicle Data Streams
 - OBDII
 - CAN
 - K-Line
 - Serial



Data in Non-ECU Race Vehicles

How Do We Get Data?

Comparison When Adding Sensors



INPUT CHANNEL TABLE

Input (Channel)	AiM Solo Window Snip	AiM Solo DL	AiM MXL2 MXG
GPS Speed	✓	✓	✓
GPS Longitudinal G Force	✓ (GPS calculated)	✓ (GPS calculated + accelerometer)	✓ (GPS calculated + accelerometer)
GPS Latitudinal G Force	✓ (GPS calculated)	✓ (GPS calculated + accelerometer)	✓ (GPS calculated + accelerometer)
RPM	✗	✓	✓
Throttle Position	✗	✓	✓
Steering Position	✗	✓	✓
Coolant Temperature	✗	✓	✓
Oil Temperature	✗	✓	✓
Oil Pressure	✗	✗	✓
Fuel Pressure	✗	✗	✓
Fuel Level Adaptor needed if stock cluster not in place¹	✗	✓	✓
All Four Wheel Speeds	✗	✓	✓
Brake Switch	✗	✓	✓
Brake Pressure	✗	✗	✓
Optional Additional Sensors	✗	✗	✓
Connection to SmartyCam HD	✗	✓	✓

NOTE: Additional sensor and module options for MXL2 | MXG include, fuel pressure, Lamda (A|F ratio) module, linear suspension sensors, brake and tire temperature sensors. CANBUS will also provide additional data such as check engine or ABS usage indicator signals.

INPUT SOURCE CONFIGURATION GUIDE

Color Code	Description	Comments Setup
	Built In Unit	Turn the unit on and these channels will be logged
	CAN Connection to Vehicle	Data provided by SE46 ECU (setup instruction below)
	Separate AiM Sensor Required	Separate sensor needed to log this data channel
	Plug & Play	Connect to Solo DL/MXL2/MXG for power and data

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Comparison When Adding Sensors

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If You Have Questions

Simplest Solution for Older Cars

AiM Solo2 - No Vehicle Data Stream Info



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Data in Non-ECU Race Vehicles

Simplest Solution for Older Cars

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We Have Answers!
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If You Have Questions

Great Data/Video Solution

AiM Solo2 DL and SCHD



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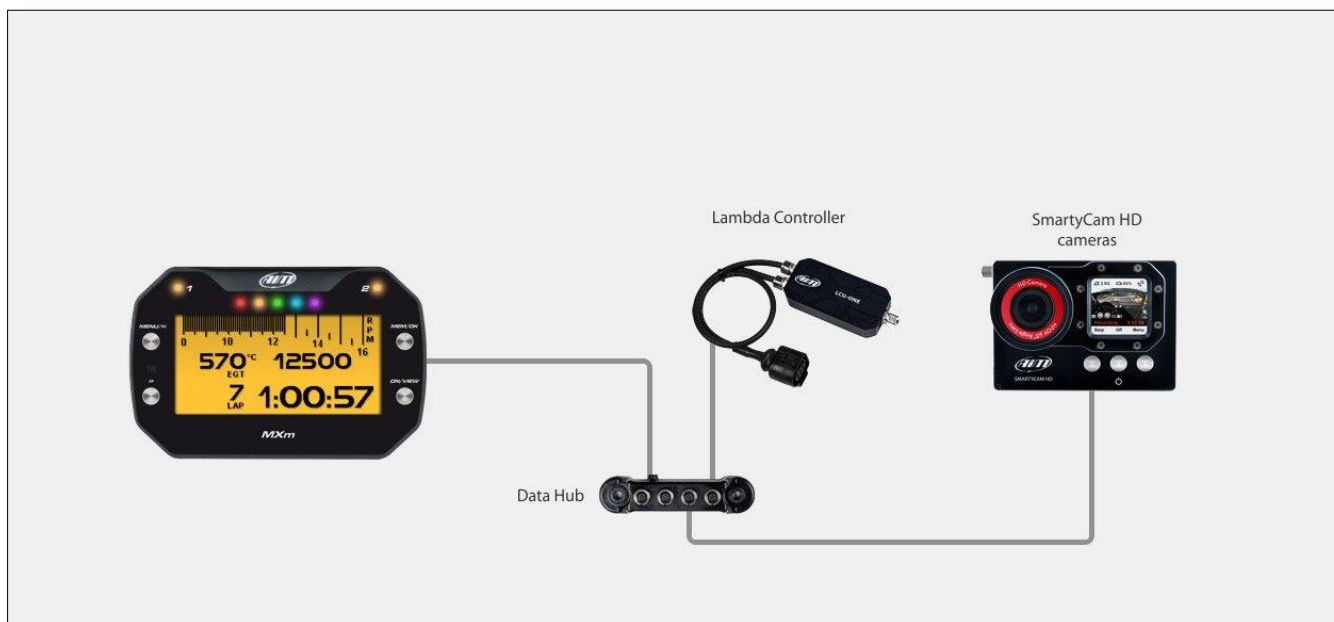
Data in Non-ECU Race Vehicles

Great Data/Video Solution

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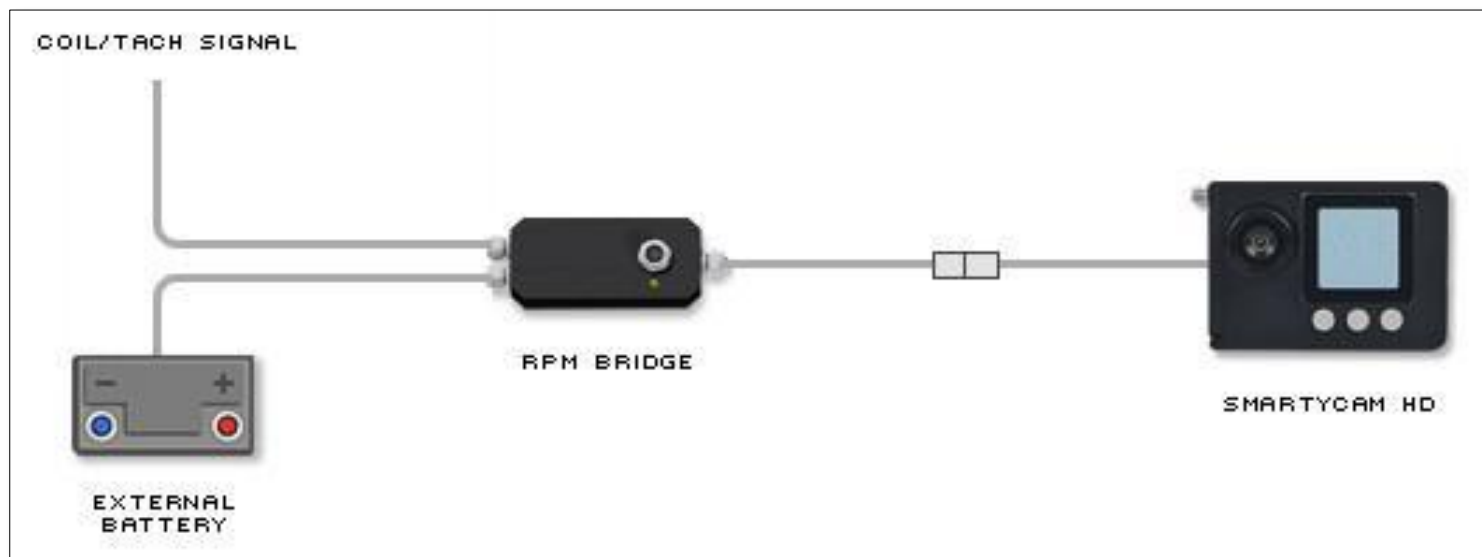
We Have Answers!
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The Next Step - AiM MXm



- Up to Four Analog Sensors
- Driver Performance Sensors - Throttle Position and Brake Pressure
- Vehicle Health Sensors - Oil Pressure and Water Temperature

Video IS Data



- Simple video review with data overlay can be EXTREMELY valuable, even more so with Race Studio 3 Analysis Beta
- In some series, data loggers may be banned, so use an “Intelligent” camera!
- AiM Sports offers a great video add-on to historic competition vehicles, especially for those with integral loggers that don’t have video or use GPS

SmartyCam HD Video and RS3A

You Can Still Learn A Lot!



- With just the SmartyCam HD Video, we can review and compare multiple laps including data from the “Money Channels”
- Measures are restricted to channels streamed to the SCHD, refreshed more slowly than the logger but still of great value



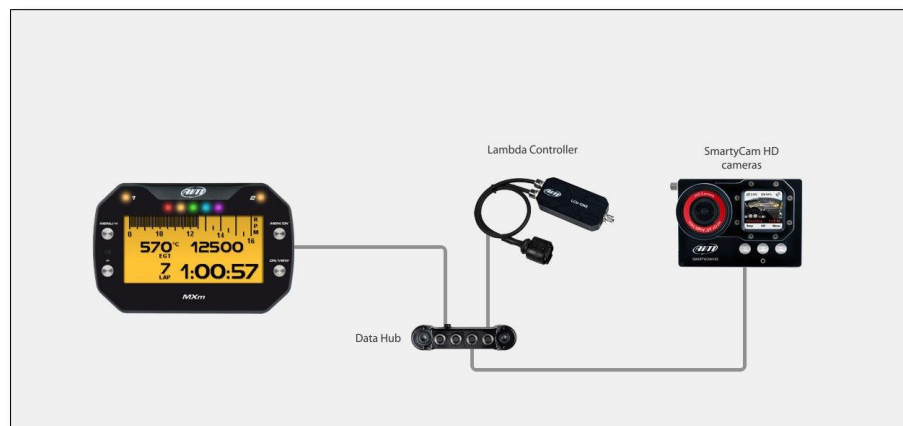
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Data in Non-ECU Race Vehicles

SCHD Video and RS3A Data

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AiM Proprietary CAN Network



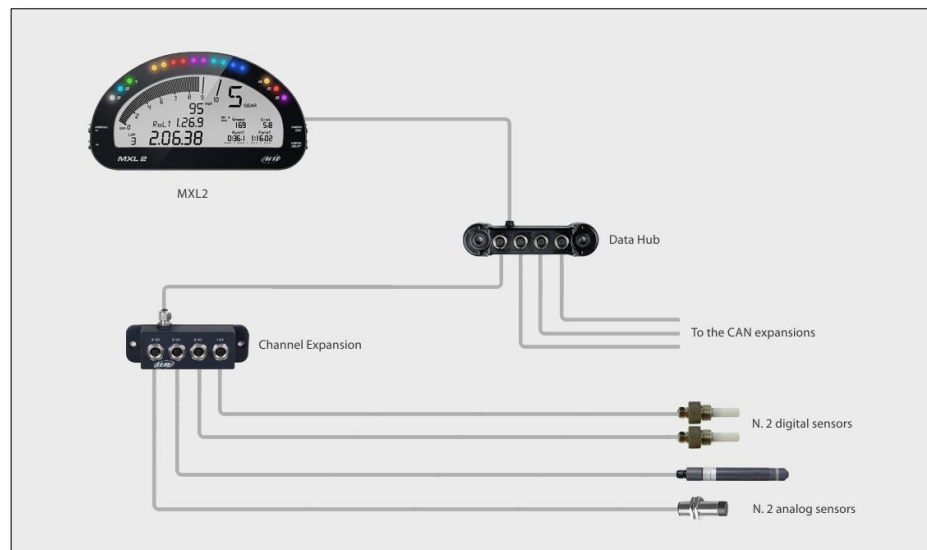
- AiM Sports proprietary CAN network is distinct and separate from any external Vehicle Data Stream
- The AiM Sports proprietary CAN network is designed and used to connect AIM Sports devices together without concern of other devices on the network. This network can be easily extended in several different ways
- Power and information is shared by all AiM Sports devices by proprietary cabling. Networked devices can be: Data Loggers, Displays, GPS, SCHD's, Expansions, etc.

Selecting and Adding Sensors

To an AiM Sports Data System



- Every sensor that comes through the most sophisticated vehicle data stream from modern vehicles can be realized on non-ecu race vehicles
- Sensor packages are generally divided into either Driver/Rider Improvement and/or Vehicle Health and Engineering



What Sensors for Non-ECU Vehicles?



Just About Anything You Need!

Many data analysis experts say you can achieve about 80% of the data analysis needed without Vehicle Data Streams and a basic number of sensors.

With some planning and an expandable data system, you can add more sensors as they help you analyze your data deeper and help you go faster!

- Engine RPM; Aids In Gear Selection and Tracks Over-Revs
- Driver Performance; Throttle Position and Brake Pressure
- Vehicle Health; Oil Pressure, Water Temp (Oil Temp, if Air Cooled)
- Wheel Speeds; for Traction/Braking Slip
- Lambda, Air/Fuel Ratio
- Other Major Subsystem Temps and Pressures, Including Coolant Pressure
- Suspension Displacement for Ride Height, Pitch, Roll, Splitter and Wing Height
- Tire Temps, Tire Pressures



Throttle and Brake Sensors



1973 Porsche 911



1959 Lola Mk1



NB Spec Miata

- Throttle Position Sensor – Rotary or String Pots, or Proximity Sensors
- Throttle Sensor Wire Connection - Available For BMW E36 M3, Spec Miata NB (1.8L) and C5 Corvette

Data in Non-ECU Race Vehicles

Throttle and Brake Sensors

Engine Oil Pressure Sensors



Spec Boxster Temp Sensor Replaced
With a 996 Temp/Pressure Sensor



Use Flexible Braided
Line From Engine
Block to Pressure
Sensors to Dampen
Vibration and Shield
From Heat



For NA Spec Miata,
AutoMeter Part
Number 2269 - 1/8"
NPT to 1/8" BSPT
Adapter Will Allow
Easy Install in OEM
Location

For Even Greater Reliability,
Use Solid State Sensors

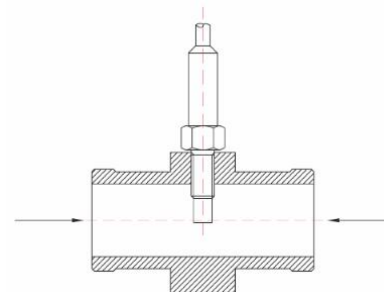
Data in Non-ECU Race Vehicles

Engine Oil Pressure Sensors

Other Temperature Sensors



Use Inline AN M-F (with sensor port)
On Oil/Trans/Differential Cooling Lines



If Coolant Temp Sensor Cannot Be
Installed in Thermostat Housing,
Use Inline Tube (with sensor port)



Just Adding Temp Sensors
To The SmartyCam Stream
Can Pay Big Dividends

Discreet Solutions - Classic Race Cars



GS-Dash



EVO4S

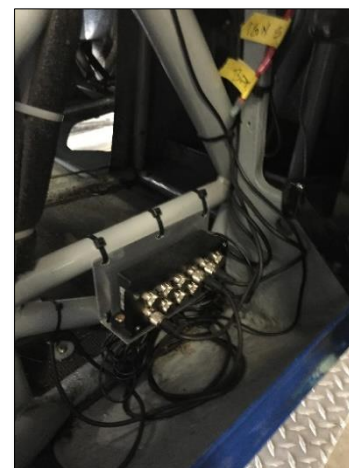


EVO5

GT350, BT-29, Zink Z10, Boss 302, G4



Discreet Solutions - Classic Race Cars



Data in Non-ECU Race Vehicles

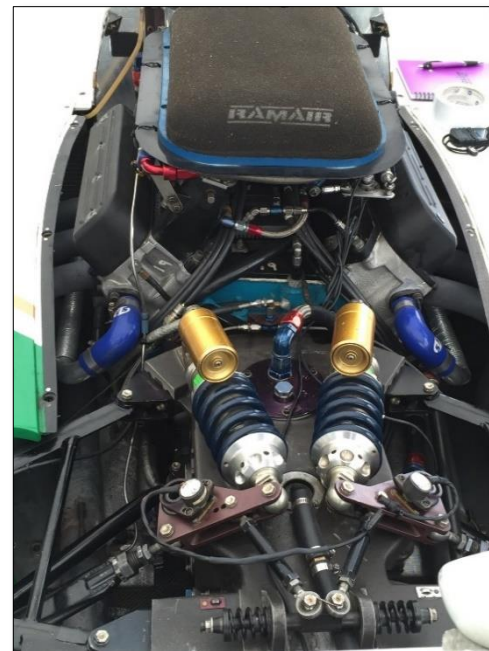
GT350, BT-29, Zink Z10, Boss 302, G4



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T-97/20 Lola-Buick Indy Lights



Great Installs in Non-ECU Cars



- **Lola T298**
RPM Bridge, GPS, and SCHD
- **Porsche 356**
Solo2 DL with RPM
- **Porsche 914/6**
EVO4, G-Dash, and SCHD
- **Porsche 911 RSR**
MXL2 and SCHD
- **Lola/Buick T97/20 Indy Lights**
MXL2 and SCHD GP
- **Tiga Sports 2000**
EVO5, GS-Dash, and SCHD
- **Spec Miata**
EVO4S, GS-Dash, and SCHD
- **BMW E36 M3**
MXP and SCHD
- **Boss 302 x2**
EVO4S, GS-Dash, and SCHD
- **Shelby GT-350**
Solo2 DL with RPM and SCHD
- **Spec Boxster**
MXG and SCHD
- **Spec Boxster**
MXm and SCHD

LearnFast™ E-Training Videos



Currently 145 Videos and Growing

YouTube www.youtube.com/aimdata

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Vintage, Spec Miata/Boxster/BMW and More!

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- All New 2020 - 21 Webinar Videos
 - Software Updates with Race Studio 3
 - Pre-Calculated Gear Position Function
 - Configuring WiFi Communication
 - Customizing AiM Device Logos
 - Race Studio 3 Basic Configuration - Part 1
 - Race Studio 3 Basic Configuration - Part 2
 - **I Have Downloaded my Data, Now What - Part 1*
 - **I Have Downloaded my Data, Now What - Part 2*
 - GPS Lap Insert
 - Data Views
 - Measure Units
 - Sort Channels
 - Test Properties
 - Per Lap Color
 - Export Tests
 - Channel Reports
 - Setting Time
 - Track Mapping
 - Selection Criteria
 - Sensor Calibration
 - Conditional Alarms
 - Gear Position
 - Firmware Update
 - Solo Configuration
 - Transmit Tracks
 - Gps Manager Overview
 - New GPS Track
 - Webinars
- * Most Popular and Recommended*

Adapting Your Learning Style
You Don't Know What You Don't Know!

Host:
Roger Caddell
AIM Sports - National Training Manager

Co-Host:
James Calhoun
AIM Sports - National Training Manager

aimsports.com Tuesday Feb 2nd, 2021 LearnFast™

Webinar Series
Bringing Data Support and Training to You

Data Download Options
In Race Studio 3

March 31st, 2020

www.aimsports.com 1.800.718.9090

Additional Materials

LearnFast™ E-Training Videos

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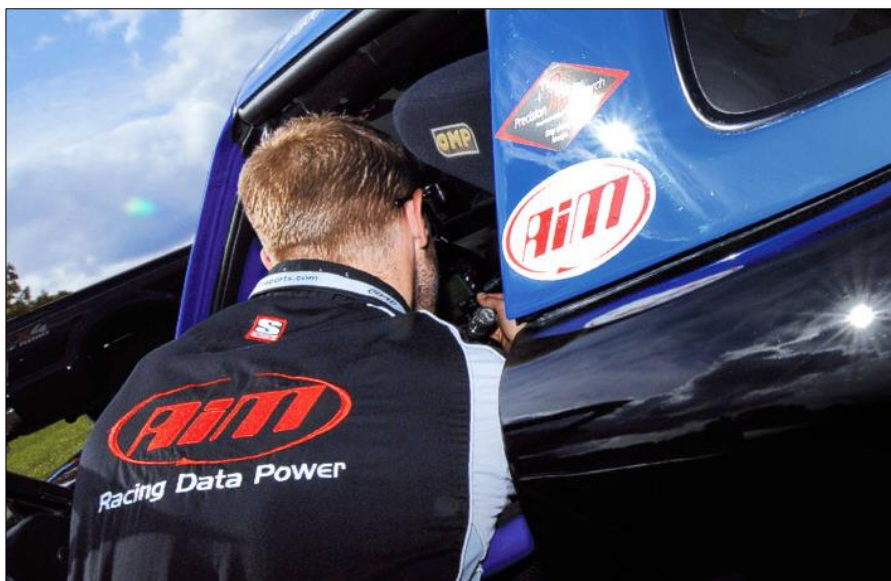
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Customer Support



AiM Sports Technical Support Staff Regularly
Attend Races and Other Events

Look For Us At An Event Near You
Or Call Us At **800.718.9090**



Customer Support

At An Event Near You!

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Race Studio 3 Analysis

Software Release - Update #7



Host:

Roger Caddell

AiM Sports - National Training Manager

Co-Host:

Emiliano Bina

AiM-Sportline - Software

Next Webinar: Tuesday February 16th, 2021 - 10:00am Pac/1:00pm East

Next Webinar Topic

Race Studio 3 Analysis - Update #7

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