

Installing and Using a Data System

A Year in the Making!



Host:

Roger Caddell

AiM Sports - National Training Manager



Co-Host:

Chloé Lerin

MotoAmerica Data Engineer



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

Tuesday July 26th, 2022

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Chloé Lerin



- Race Data Engineer at MotoAmerica
- AiM Trackside Support Technician
- Powertrain Engineer at Harley-Davidson
- Amateur Motorcycle Club Racer #147
- 10 Years in Internal Combustion Engine Research – Work with Engine Dynos
- Master's in Mechanical Engineering from University of Wisconsin-Madison
- Engineering Diploma from UTT, France



Chloé Lerin

Motorcycle Data Engineer



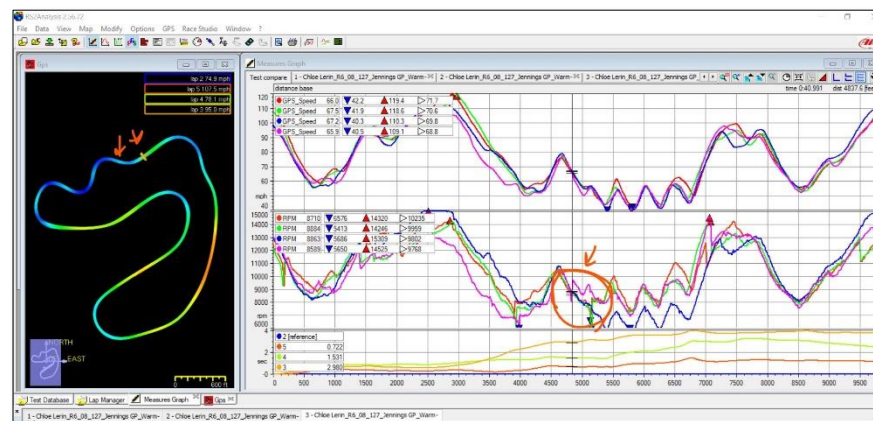
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A Journey into Data

Where it Started

- Gifted myself an AiM Solo2DL
- Started with basics: RPM, GPS Speed
- Worked at MotoAmerica and started with a Solo2, then rider upgraded to MXL2, then added sensors
- Upgraded data system to MXS1.2



Installing/Using a Data System

A Journey Into Data

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The Data Kit

The Essential Sensors for Motorcycle Data Acquisition

Starter Kit:

- MXS1.2 dash: data logging
- 150 mm + 75 mm potentiometers: suspension data acquisition
- 100 bar brake pressure sensor
- "Y" shaped brake lines + sensor mount
- Front potentiometer fork ring
- 2012 R6 ECU... but... ended with the features of the 2008



Future Upgrades:

- TPMS system: Tire pressure and temperature monitoring
- LCU-One Lambda controller: Fueling monitoring
- Smarty-Cam: Data overlay to video
- Rear brake pressure sensor
- Wheel speed sensors



Installing/Using a Data System

The Data Kit

The Challenge

Looking New with the Old

- 2008 motorcycle = no OBDII = **no CAN data** but k-line only
- Stock harness needed TLC
- ECU channels needed for basic analysis:
 - RPM
 - Throttle Position
 - Wheel speed F/R
 - Gear position
 - Engine coolant temperature
- **Initial plan:** Upgrade to 2012 ECU with Flash Tune AiM package
- **Final plan:** Tap directly into RPM and TGS wires



Yamaha protocols

Received channels by EVO4S/SOLO 2 DL are the same for different Yamaha ECU communication protocols, but it is necessary to set the correspondent protocol to the bike model year to be able to correctly receive them.

CHANNEL NAME	FUNCTION
R1 RPM	RPM
R1 WH SPEED	Wheel speed
R1 ECU ERR	ECU Error
R1 WATER TEMP	Water temperature
R1 AIR TEMP	Air temperature

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The Challenge

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Harnesses

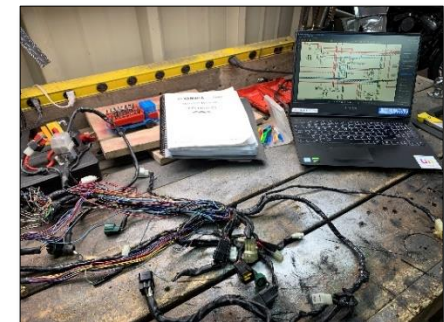
Bringing Data to the Dash

- **Trimmed Stock Harness:**
 - Removed most lights (left a couple for switched power sources), turn signals, horn
 - Removed EXUP servo motor
 - Jumped the side-stand switch
- **Custom Data Harness:**
 - Brake pressure F/R
 - Suspension potentiometer F/R
 - 12 V power
 - CAN input for TPMS
 - 2 speed channels: Wheel speed F/R
 - ECU connection (RS232 changed to k-line)
 - GPS
 - CAN expansion port (LCU-one, Smarty Cam)
 - Analog spares



Custom Data Harness Layout

AiM Sports Custom Harness Trimmed Stock Harness



Trimming the Stock Harness

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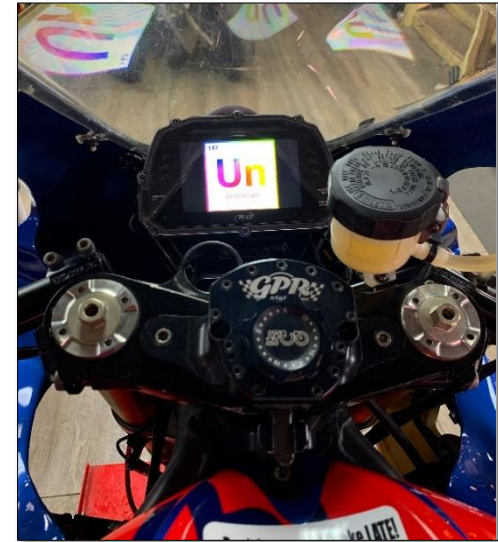
Harnesses

Mounting the Dash

Trials and Tribulations



- **Physical Mounting:**
 - Dash cover from Turn 13 Motorsports, mounts on the 08-R6 hole pattern
- **Changes to Plan**
 - Flash Tune race kit supposed to convert TPS, TGS, RPM etc to RS232
 - Instead of using RS232, rewired the Deutsch connector to take k-line
 - Both 22-pin and 37-pin plugs are needed
 - Stock dash needs to be kept for k-line data
 - TPS and RPM directly from wires



Installing/Using a Data System

Mounting the Dash



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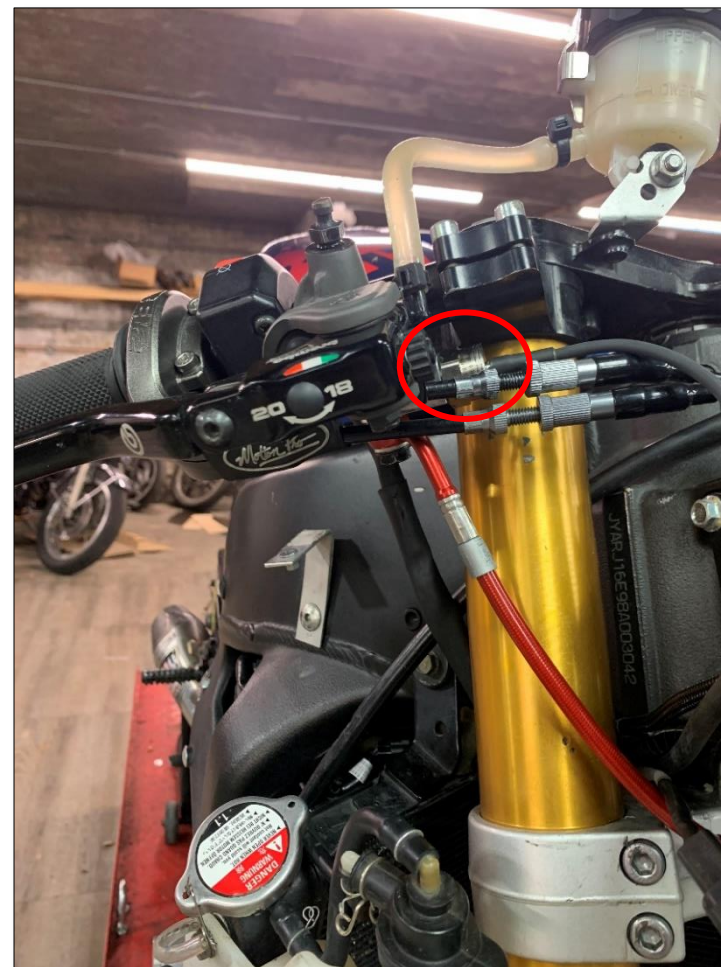
Mounting the Sensors

Forward Sensors

150 mm Fork Potentiometer



Brake Pressure Sensor



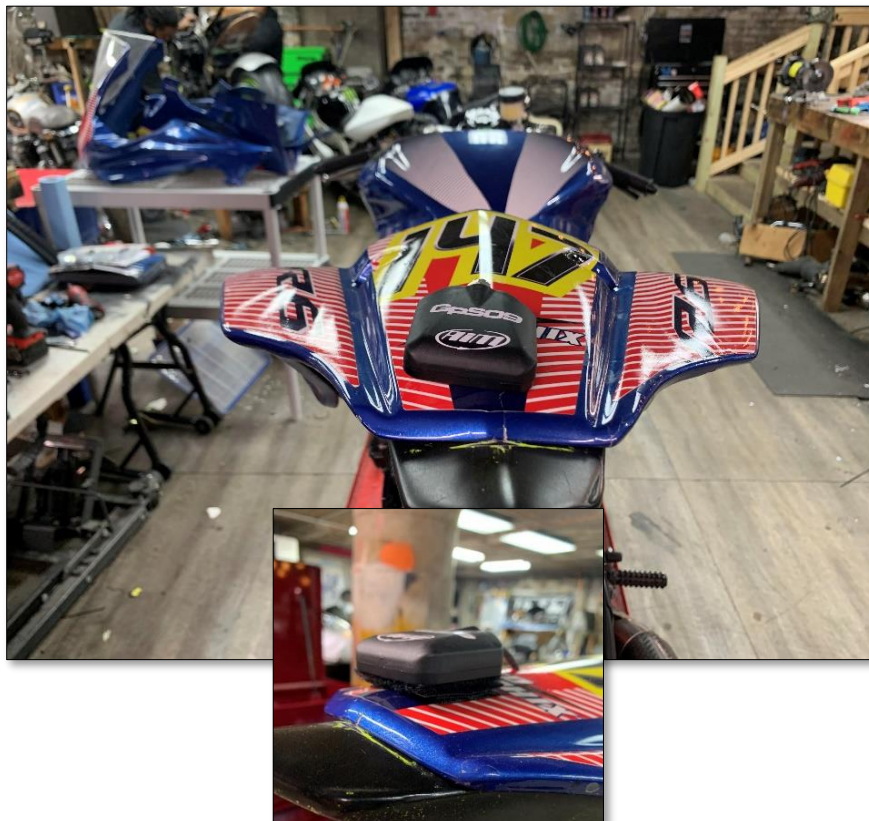
Installing/Using a Data System

Mounting the Sensors

Mounting the Sensors

Rear Sensors

GPS Antenna



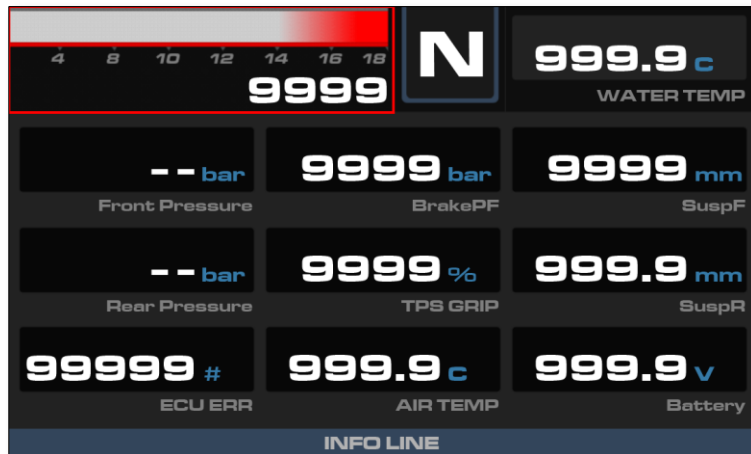
75 mm Rear Potentiometer



Configuration

Channel Setup and Display

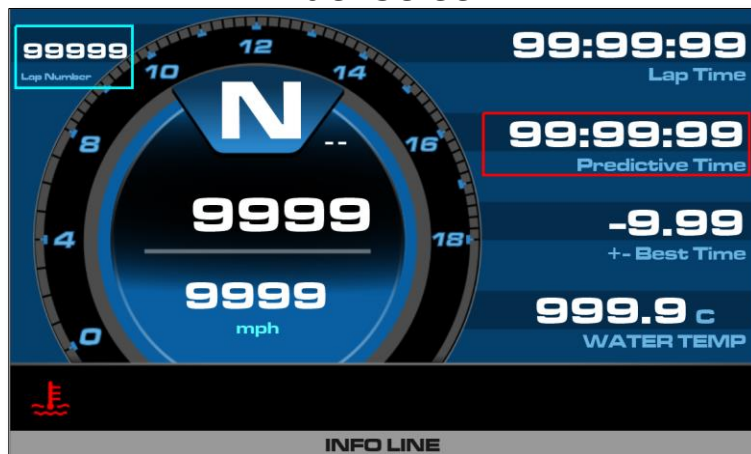
Sensor Screen



Channel Setup

ID	☒	Name	Function	Sensor	Unit	Freq	Parameters
RPM	☒	RPM	Engine RPM	RPM Sensor	rpm	50 Hz	max: 15000 ; factor: /2 ;
Spd1	☐	SPD F	Wheel Spd - Front	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd2	☐	SPD R	Wheel Spd - Rear	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd3	☐	Speed3	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Spd4	☐	Speed4	Vehicle Spd	Speed Sensor	km/h 0.1	20 Hz	wheel: 1600 ; pulses: 1 ;
Ch01	☒	TPS GRIP	Pot Engine Load	Percentage Pot. Calib	%	50 Hz	
Ch02	☐	Ch02	Shock Position - Rear	Position Pot. AutoCal	mm 0.1	200 Hz	max travel: 75 ;
Ch03	☐	BrakePR	Brake Press	0-2000 psi (X05PSA02000P18)	bar 0.1	50 Hz	
Ch04	☐	SuspR	Shock Position - Rear	Position Pot. AutoCal	mm 0.1	200 Hz	max travel: 75 ;
Ch05	☒	SuspF	Shock Position - Front	Position Pot. AutoCal	mm	200 Hz	max travel: 150 ;
Ch06	☒	BrakePF	Brake Press	0-160 bar (X05PSA00160Bx)	bar	25 Hz	
Ch07	☐	open	Voltage	Generic 0-5 V	mV	1 Hz	
Ch08	☐	open	Voltage	Generic 0-5 V	mV	1 Hz	
Acc1	☒	InlineAcc	Inline Accel	AIM Internal Accelerometer	g 0.01	50 Hz	
Acc2	☒	LateralAcc	Lateral Accel	AIM Internal Accelerometer	g 0.01	50 Hz	
Acc3	☒	VerticalAcc	Vertical Accel	AIM Internal Accelerometer	g 0.01	50 Hz	
Gyr1	☒	RollRate	Roll Rate	AIM Internal Gyro	deg/s 0.1	50 Hz	
Gyr2	☒	PitchRate	Pitch Rate	AIM Internal Gyro	deg/s 0.1	50 Hz	
Gyr3	☒	YawRate	Yaw Rate	AIM Internal Gyro	deg/s 0.1	50 Hz	
Accu	☒	GPS Accuracy	GPS Accuracy	AIM GPS	mm	10 Hz	
Spd	☒	GPS Speed	Vehicle Spd	AIM GPS	mph	10 Hz	
Alt	☒	Altitude	Altitude	AIM GPS	m	10 Hz	
OD	☒	Odometer	Odometer Total	AIM ODO	mi 0.1	1 Hz	
Luma	☒	Luminosity	Brightness	AIM Luminosity	%	1 Hz	
Fuel	☐	Fuel Used	Fuel Level	AIM FUEL USED	l 0.1	10 Hz	
Tlog	☒	LoggerTemp	Temperature	Logger Temperature	C	1 Hz	

Rider Screen



Add Channel		28 math channels currently available				
ID	☒	Name	Function	Unit	Freq	
ClGr	☒	Calculated Gear	Gear	#	10 Hz	⚙️
LnCr	☒	BrakePFneg	Brake Press	bar 0.1	50 Hz	⚙️

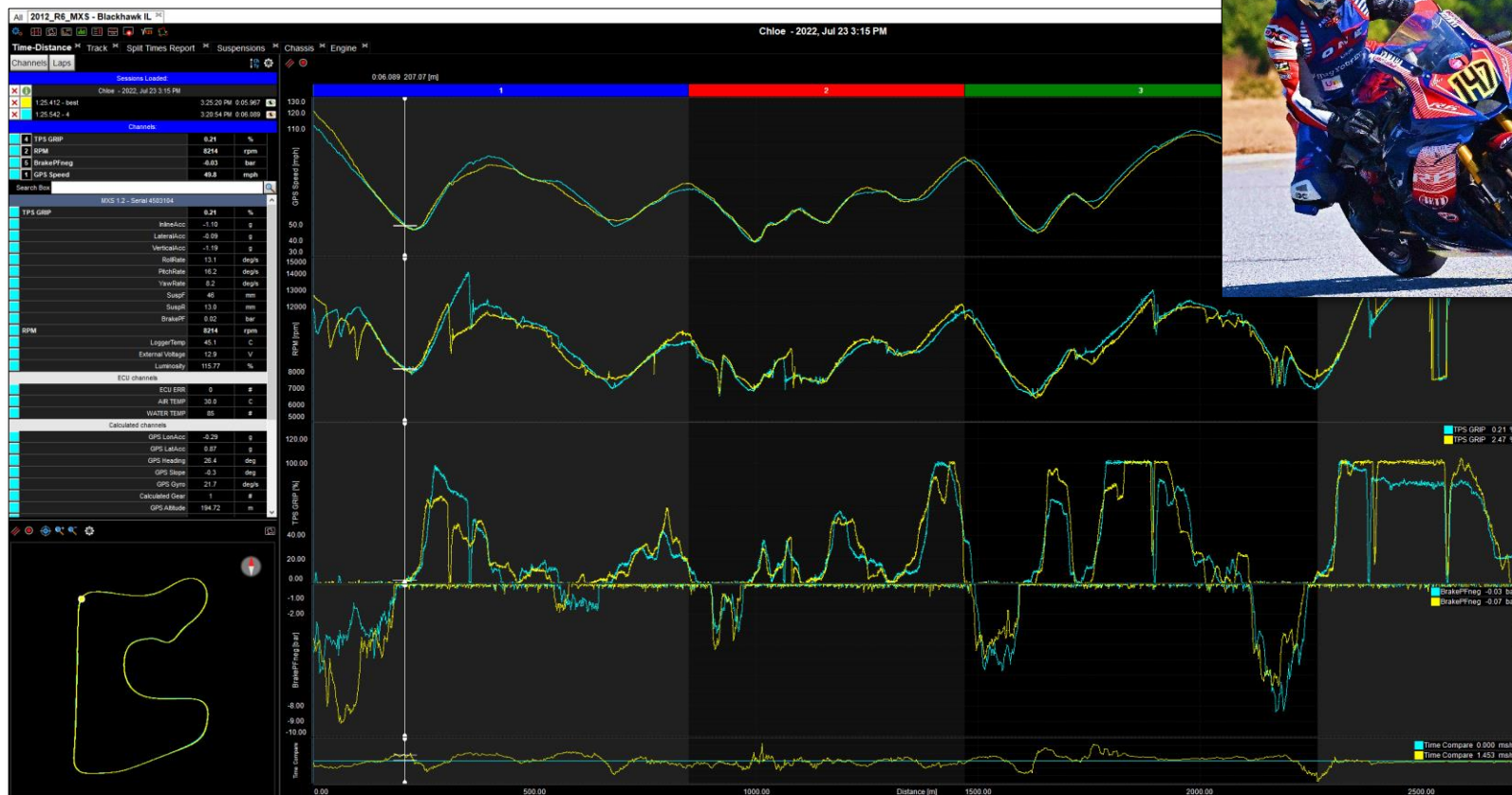
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Configuration

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Riding with Data !!!

First Test on Track



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Riding with Data!

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Acknowledgments

Partners Along the Way

- Mike Jaynes – AiM Sports
- Roger Caddell – AiM Sports
- Robbie Yeoman – AiM Sports
- Matt Romanowski – Trailbrake.com
- Jake Brown, Horton - Turn 13 Motorsports
- Create Milwaukee Moto Collective
- Josh Merrill - Gforce Engineering
- Jason Aguilar – Flash Tune



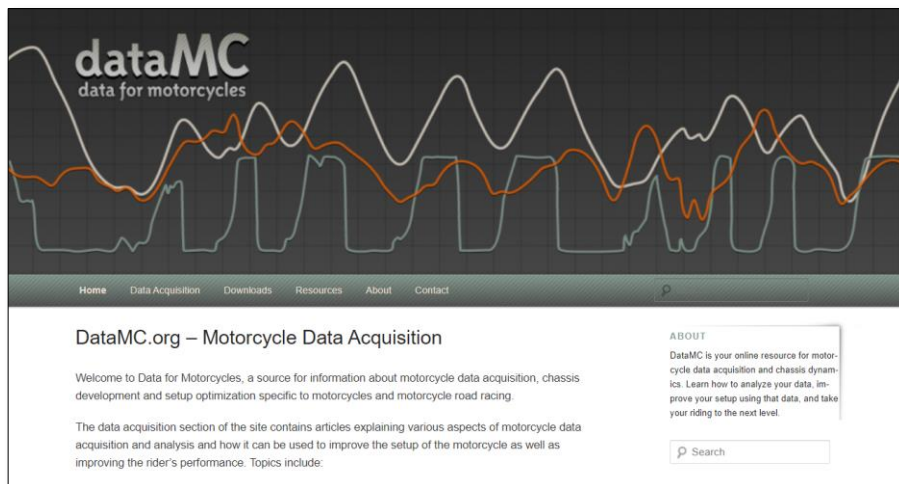
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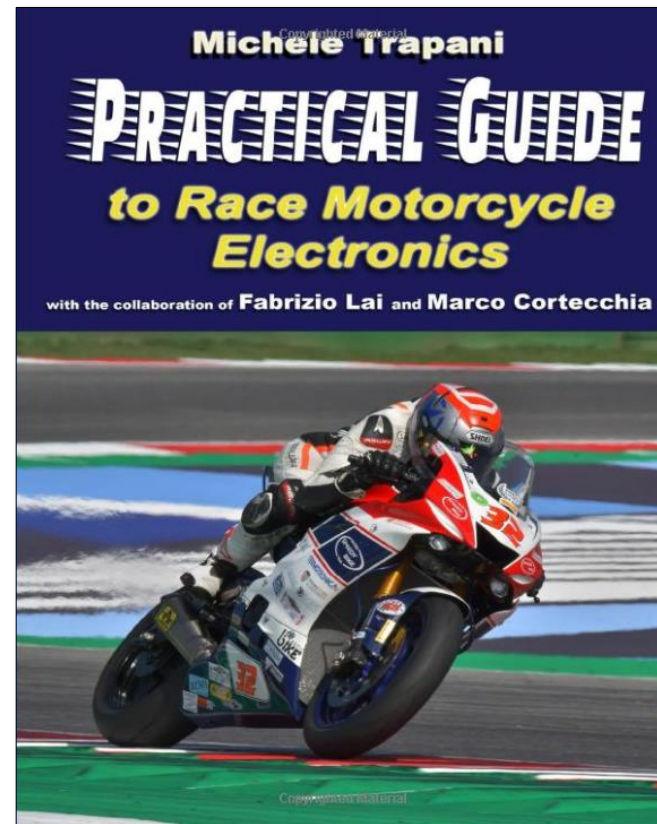
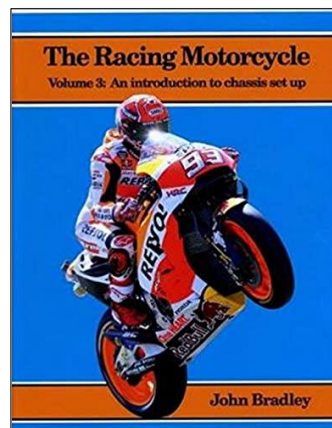
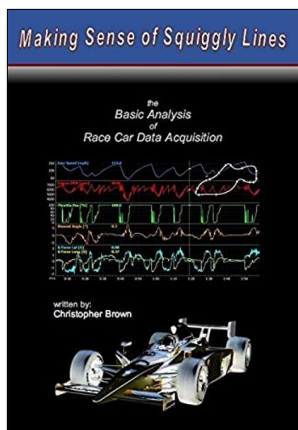
Acknowledgments

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Other Data Analysis Resources



<https://www.datamc.org/>



Installing/Using a Data System

Other Data Analysis Resources

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LearnFast™ E-Training Videos



Currently **214** Videos and Growing

YouTube www.youtube.com/aimdata

#3-26
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If You Have Questions

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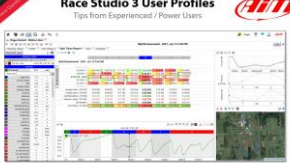

Host:
Roger Caddell
AIM Sports - National Training Manager


Co-Host:
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MotoAmerica Data Engineer


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Tuesday July 26th, 2022
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We Have Answers!
LearnFast™ #149

Race Studio 3 User Profiles
Tips from Experienced / Power Users



Host:
Roger Caddell
AIM Sports - National Training Manager


aimsports.com
Tuesday June 21st, 2022
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Webinar Series

Bringing Data Support and Training to You

Data Download Options
In Race Studio 3

www.aimsports.com
March 31st, 2020
1.800.718.9090

- All New 2020 - 22 Live 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
 - Selection Criteria
 - Data Views
 - Sensor Calibration
 - Measure Units
 - Conditional Alarms
 - Sort Channels
 - Gear Position
 - Test Properties
 - Firmware Update
 - Per Lap Color
 - Solo Configuration
 - Export Tests
 - Transmit Tracks
 - Channel Reports
 - Gps Manager Overview
 - Setting Time
 - New GPS Track
 - Track Mapping
 - Webinars
- * Most Popular and Recommended*

Additional Materials

LearnFast™ E-Training Videos

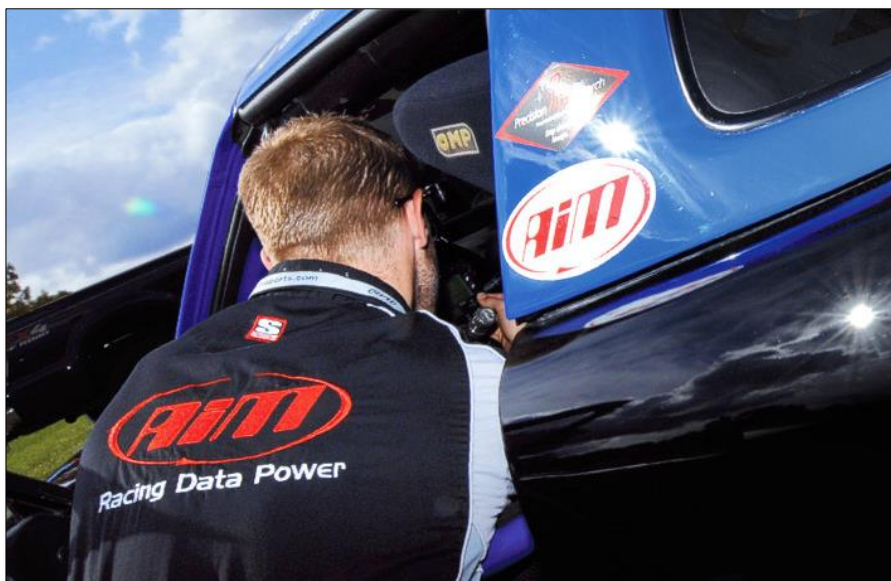
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Customer Support



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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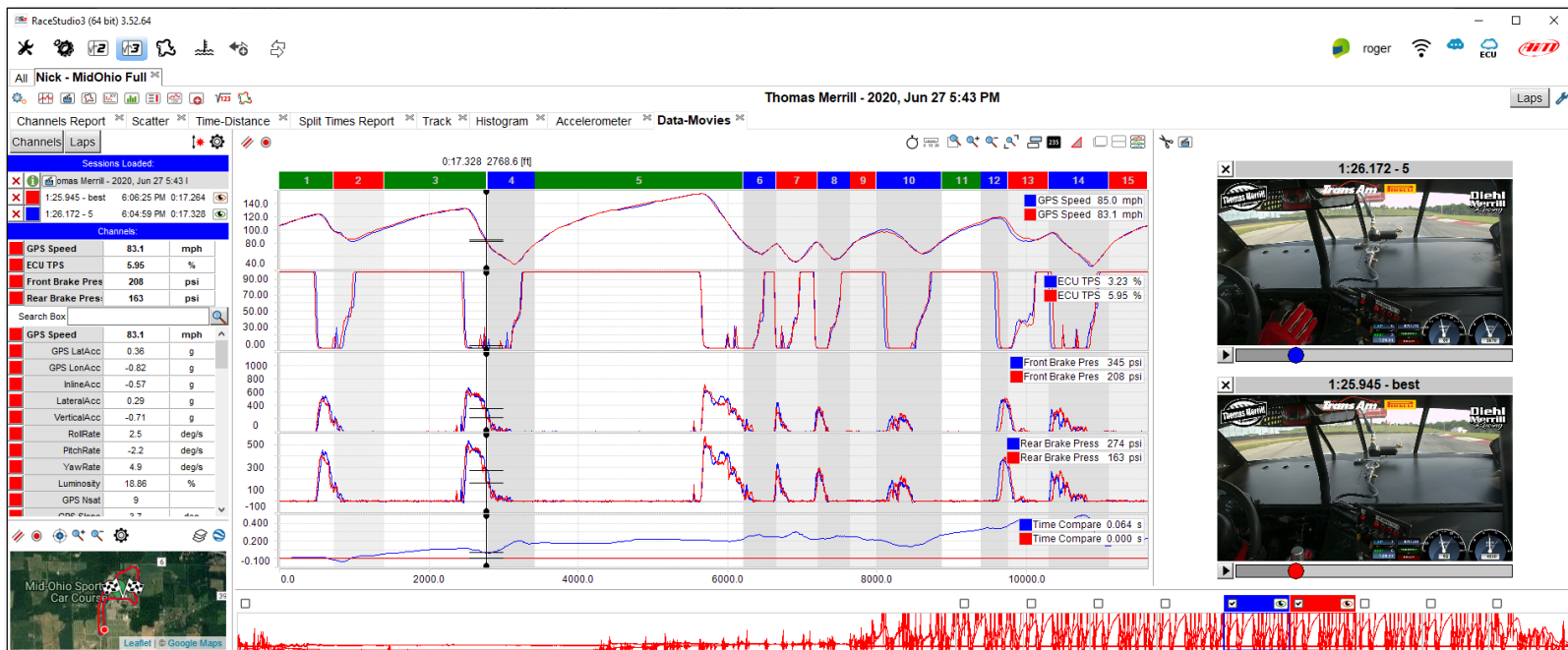


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If You Have Questions

Next AiM Sports Webinar

Aug 30th, 2022 – Last Tuesday of Each Month



Host:

Roger Caddell

AiM Sports - National Training Manager

Co-Host:

TBD

TBD

Next Webinar: Tuesday August 30th, 2022 - 10:00am Pac/1:00pm East

Next Webinar

Last Tuesday of Each Month

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We Have Answers!
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#150

Contact Information



Unicornium-engineering@gmail.com



@enginerdissima

@unicornium_engineering



Host:

Roger Caddell

AiM Sports - National Training Manager
roger@aimsports.com



Co-Host:

Chloé Lerin

MotoAmerica Data Engineer
Unicornium-engineering@gmail.com



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