

Jeff Wasilko

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- Data User Since 2006
- Time Trial, Sprint, Endurance & Sim Racer
- Leads COM Sports Car Club's Advanced Data Coaching Program



Jeff Wasilko

Miata Racer and Data Advocate

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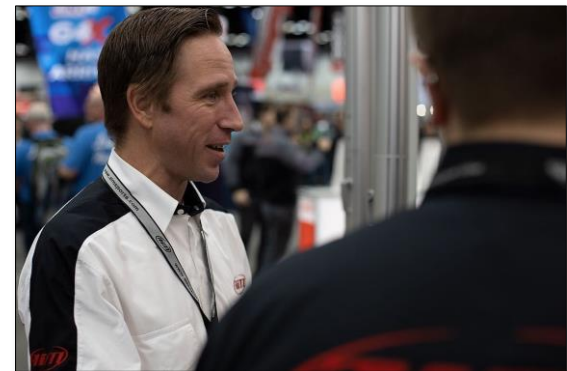
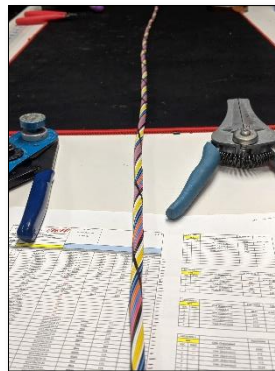
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Robbie Yeoman

AiM Sports Technician
ryeoman@aimsports.com



- AiM Sports Technician Since 2008
- Repair Technician with a Passion for Racing and Electronics
- Creator of Custom Wiring for Data Systems and Chassis
- Many-time Webinar Co-Host



Robbie Yeoman

AiM Sports Technician



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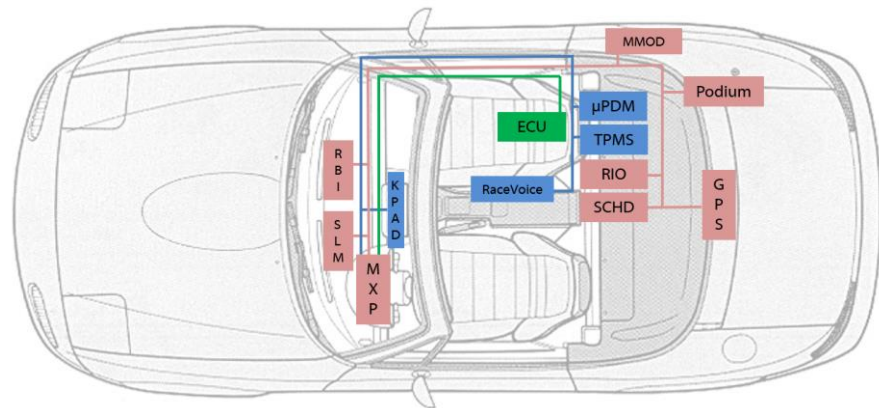
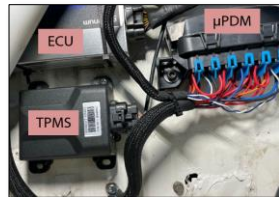
Practical CANbus Basics

in the AiM Sports Universe



What's the Least I Need to Know About CANbus to Use it to do Something Useful?

- A Discussion of CANbus Basics, Using Real-World Examples of Integrating the AiM Sports MXP as a Central Hub with Aftermarket ECU, TPMS, PDM and RaceVoice.
- CAN Stands for **C**ontroller **A**rea **N**etwork. It is a Form of Multiplexed Wiring Designed by Bosch and Allows the Linking of Systems Together so that they can Share Information.



Why CANbus?



- AiM Sports Blazed the Trail With Their Easy-to-Use Private CAN Network Between Dashes, GPS, SmartyCams, Shift Light Modules, Channel Expansions, Memory Modules, etc.
- We're Entering a New World of **Networked** Systems in Race Cars, Powered by *Low-Cost* CAN Devices:
 - Tire Pressure (TPMS) & Tire Temperature
 - ECU & ABS
 - PDM (Power Distribution Module)
 - Automated Driver Coaching & Remote Telemetry (For Car and Driver)
 - Sensors
 - Keypads
- Simplified Wiring
 - 2 Wires for the Network (plus power/ground)
 - Robust
 - Reliable

Why CANbus?



- Data Sharing & Device Interaction
 - Interoperable Between Vendors
- Example of Integrating Multiple Devices Together:
 - Log TPMS Data and Send it to SmartyCam to be Rendered onto the Video
 - RaceVoice Audibly Warns the Driver of Critically Low Tire Pressure (from TPMS) or Oil Pressure (from ECU)
 - PDM can Turn on Brake Light Based on Brake Pressure Sensor
 - Use a Steering Wheel Button to Trigger a CAN Action via AiM Sports RIO02, Autosport Labs AnalogX, or ECUMaster CAN Switchboard



Practical CANbus Basics

Data Sharing & Integration



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AiM Sports and CANbus



- 3 CAN buses on Modern Dashes (MXL2 and Newer):
 - *Private (AiM Sports CAN aka CAN0)*
 - Used for AiM Sports Devices like GPS08, SmartyCam, Shift Light Module, Channel Expansion, Memory Module
 - Devices like Autosport Labs PodiumConnect and RaceVoice in "Listen" Mode
 - These Devices 'Emulate' a SmartyCam
 - *CAN1 (Typically ECU)*
 - ECU Configurations from AiM Sports are not Editable
 - Only Supports a Single Device if Using an AiM Sport's Configuration
 - *CAN2 (Expansion)*
 - Supports Multiple Devices, but....
 - No way (Currently) to Merge Multiple Configurations
- The AiM Sports Dash Becomes the Hub/Router that Links all 3 Together and Enables Data Sharing

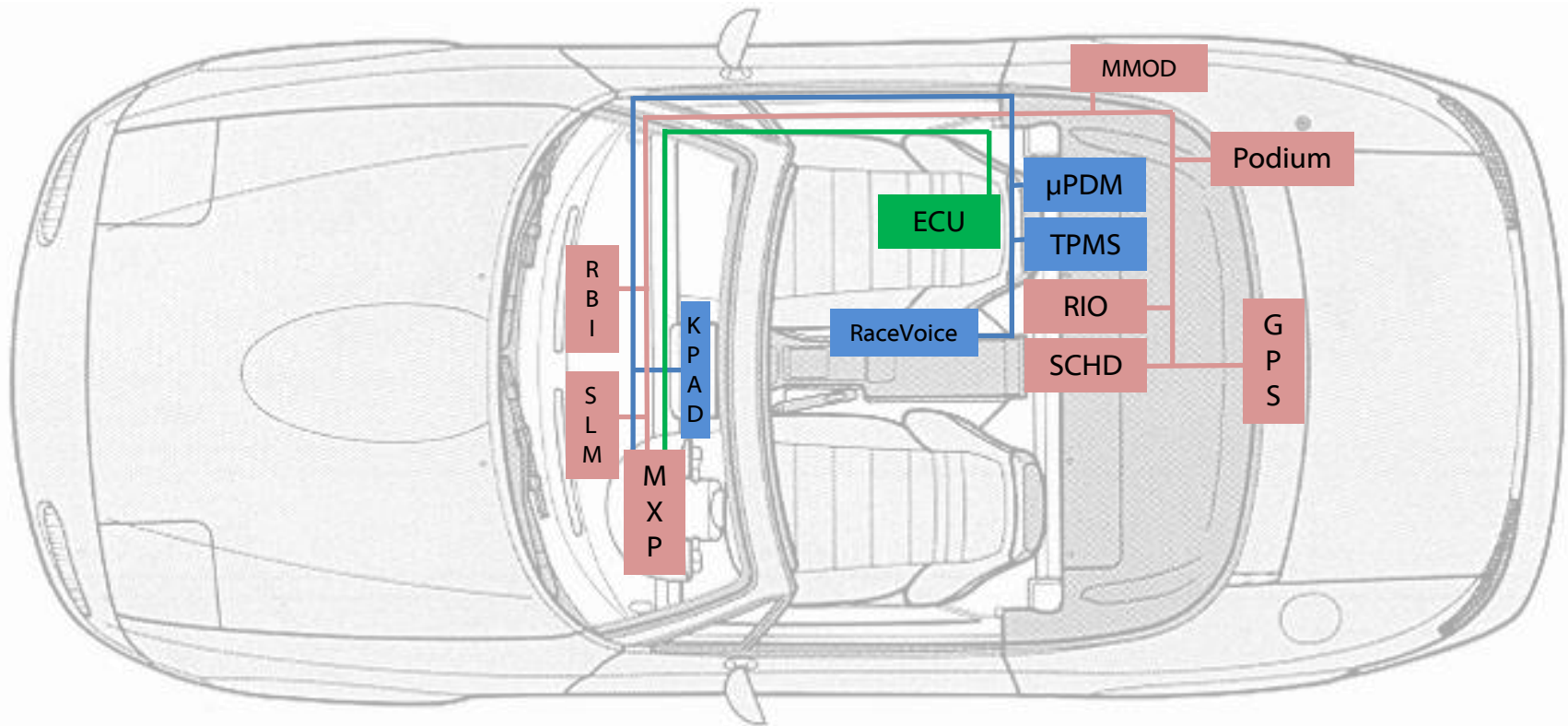
Small Car, Many Devices



Private/CAN0: AiM Sports Devices

CAN1: ECU

CAN2: Expansion



Practical CANbus Basics

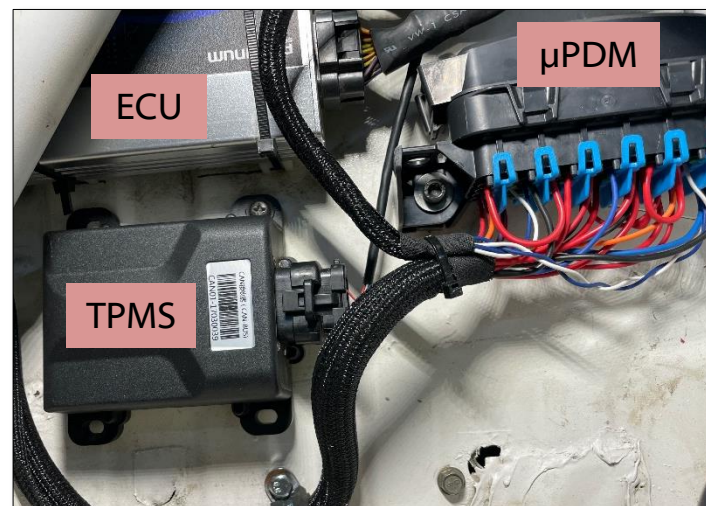
Small Car, Many Devices



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Photo Tour



Status Variables



- Status Variables Create a New Channel that is Either False or True (0/1)
 - Variable can be Logged, and Used in Other Parts of the Configuration
 - Variable can be Sent out to Other CANbus Devices

RaceStudio3 (64 bit) 3.34.06

All AIM CANbus Learnfast Config 1

Save Save As Close Transmit

Channels ECU Stream CAN2 Stream CAN Expansions Math Channels **Status Variables** Parameters Shift Lights and Alarms Trigger Commands Icons Manager Display

Status Variables	Freq	Mem
☒ SV Coasting	10 Hz	☒
☒ SV Brakes	50 Hz	☒

Preview Area

+ Add New Variable still available variables: 17

Modify Status Variable

Name: SV Brakes

Freq: 50 Hz

☒ add to device logged channels

is TRUE when All of the following conditions are true:

Brake Pressure greater than 35 psi

else is FALSE

Save Cancel

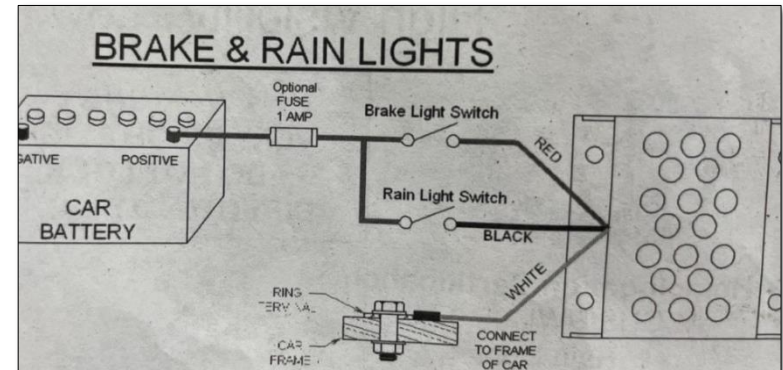
Demo 1



Rain/Brake Light (CAN Output)

- During the Demo, we will Combine a Status Variable with CAN Output
- Via CAN Output to the microPDM, Turn on Brake Light when the AiM Sports Brake Pressure Sensor is over 35 PSI
- microPDM Docs URL:

<https://docs.google.com/document/d/1PiAdeJx2ifKmj8Z6xsvg7D-EscNVLeYQuqlOHanZGVc/edit#heading=h.iz1opmnckphn>



Demo 2



Receive & Log Data from microPDM (CAN2 Stream)

- Vendors Often Provide Pre-built CAN Configuration Files Ready-to-Use
 - But, if you Want More Than One Device on CAN2, Configurations Need to be Merged by Hand
- Our Demo System Already has a TPMS. We will Demonstrate Adding a Button Status and CurrentSense Channel from the microPDM
- microPDM Docs URL:

<https://docs.google.com/document/d/1PiAdeJx2ifKmj8Z6xsvg7D-EscNVLeYQuqlOHanZGVc/edit#heading=h.obu4917br4hg>



CANbus Basics

A Bit Deeper Dive



- Speed
 - 250kbit/sec, 500kbit/sec or 1mbit/sec
- Wiring Basics
 - Two-Wire, Twisted Pair, Balanced
 - Overall Length
 - 40 Meter @ 1mbit/sec
 - Stub Length
 - 0.3 Meter
 - Termination
 - Each End of the bus Needs a 120 Ohm Terminating Resistor
 - Devices May Have a Resistor Built-in. It may be:
 - Fixed (Always On)
 - Hardware or Software Configurable
 - Consider a Hub if Many Devices will be Co-Located
 - AEM/Haltech use Deutsch DTM for Power/Ground/CAN-H/CAN-L (Pinouts are Incompatible, so pick one for yourself)



CANbus Troubleshooting

- Check Speed
 - All Devices on the Same Physical bus Must be Set to the Same Speed
- Check Termination (Resistance Between CAN-H and CAN-L)
 - Should be 60 Ohm
 - If Less than 60 Ohm, too many Terminating Resistors
 - If Greater than 60 Ohm, not Enough
- Check Voltage
 - CAN-L: Fluctuates Between 2.5V-1.5V
 - CAN-H: Fluctuates Between 2.5V-3.5V
 - Good Way to Determine if CAN-L and CAN-H are Swapped
- Isolate Devices
 - CAN hub Makes this Easy



CANbus Troubleshooting

- Status Pages on Dash (to See What's Going on in Real Time)
- 'CAN 101 – Live Webinar with Robbie Yeoman'
 - <https://youtu.be/up10oLlIf7A?t=3289>
Direct Link to Send & Receive Demo (Send From One bus to the Other)
- Community Support, many Groups and Forums

99999 Coolshlirt HI	99999 Rear Defrost 30		999.9 Coolshlirt A	999.9 AIMDash A
99999 Rain Light	99999 ButtonQ4		999.9 AccBus A	999.9 DefrRelay A
99999 AIM Dash	99999 Acc Bus		999.9 CurrentSense05 A	999.9 CurrentSense06 A
99999 Coolshlirt Low				999.9 CurrentSense07 A
—				—
INFO LINE				

LearnFast™ E-Training Videos



Currently 148 Videos and Growing

YouTube www.youtube.com/aimdata

Practical CANbus Basics
in the AiM Sports Universe

Host:
Roger Caddell
AIM Sports - National Training Manager

Co-Hosts:
Jeff Wasilko
Miata Racer and Data Advocate

Co-Hosts:
Robbie Yeoman
AIM Sports Technician

aimsports.com Tuesday Mar 2nd, 2021 LearnFast™

Sensor Installations
Tips, Tricks, and Examples

Host:
Roger Caddell
AIM Sports - National Training Manager

Co-Host:
David Free
AIM Sports - National Training Manager

aimsports.com Tuesday Feb 23rd, 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

- 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*

Additional Materials

LearnFast™ E-Training Videos

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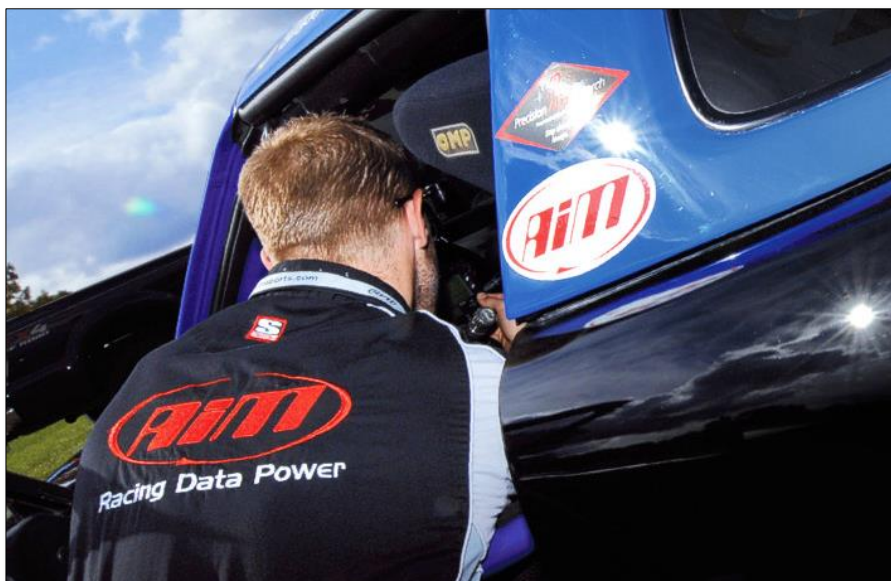
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Customer Support



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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#2-10
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If You Have Questions

AiM Sports Hardware

A Deeper Technical Discussion



Host:

Roger Caddell

AiM Sports - National Training Manager

Co-Host:

Fabrizio Rizzi

AiM Sportline - Hardware Team Manager

Next Webinar: Tuesday March 9th, 2021 - 10:00am Pac/1:00pm East

Next Webinar Topic

AiM Sports Hardware

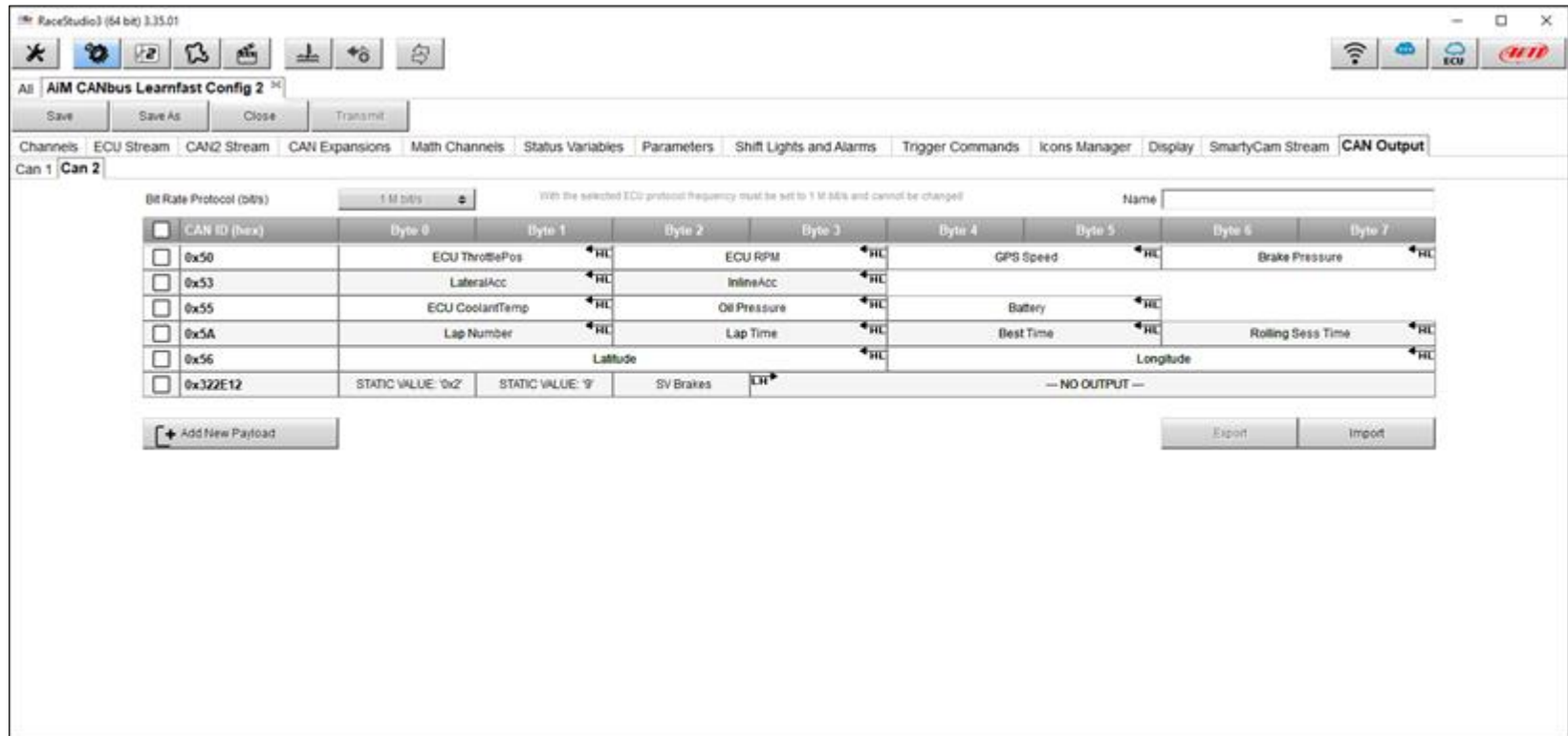
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We Have Answers!
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Contact Information



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