ACAS

FOR MEGASQUIRT 3

BY DRAGDYNAMICS.COM

INSTALLATION AND CONFIGURATION

DISCLAIMERS, Trademarks

Drag Dynamics is not affiliated with Megasquirt / Bowling & Grippo Corporation in any way – we just like using their products and developing complementary parts that work with Megasquirt 3.

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Introduction

The ACAS is a sensor designed to help you mange power in situations where chassis angle becomes critical, and there's a narrow margin for a "wheelie" to ruin a pass, or worse – damage your race car. This sensor is specific to Megasquirt 3 EFI systems (Gold Box, MS3Pro Evo/Ultimate, MS3X, MS3 Kit, and a ton of MS3 PNP models) and will not work with any other Engine Control Unit besides Megasquirt 3.

Our goal in designing this sensor was to provide racers with a lower cost, more reliable method of monitoring Chassis angle and then being more able to **do something about it.** Laser Ride Height sensors are expensive and often inconsistent across different track surfaces. Travel sensors won't usually have enough travel to tell the ECU if the chassis angle has become dangerous, in time to respond in a meaningful way.

To that end, we researched OEM and Aircraft Instrument systems to see how they're managing similar problems using Inertia Measurement. We discovered that it's possible to use not just Pitch Angle, but Pitch Velocity to correct a dangerous wheelie situation before it becomes dangerous, and perhaps saving a pass if not saving expensive undercarriage components.

Be sure to check out the dragdynamics.com website, as we will be adding more products and videos on how to set up, and use the ACAS family of sensors.

We feel that the ACAS family of products offer better performance, more options, and creative **new** ways to help you improve your drag racing program, and we thank you for supporting DragDynamics!

Parts Included

1 – ACAS Sensor Module
1 – 4' Wire Harness, DTP Connector assembled – Flying Leads

Operation:

For use with Megasquirt 3 systems only. See "Requirements" section for minimum supported firmware versions.

Chassis Angle:

The ACAS channel 1 output shows Chassis Angle – also known as Pitch. This is the absolute angle of the chassis, unaffected by acceleration or roll (up to 30* roll angle). It uses "fusion data" to give the most accurate position

Pitch Velocity

Pitch Velocity is the Chassis Angle RATE OF CHANGE – If your car is optimized for tracks where a wheelie is a potential problem, Pitch Velocity lets you see the problem long before the chassis angle is too high to do anything about it – potentially saving both a pass, and thousands of dollars of damages from hard landings. This is output on Channel 2.

General Information and Use:

Power Consumption: The ACAS uses 5 volt power and sensor ground directly from your Megasquirt 3 ECU, just like any other 5v sensors. This unit consumes no more than 0.003 amps (30 milliamps) during use. 2 LEDs (Power, and CAN) indicate Processor activity and detection of the Megasquirt 3 CAN network.

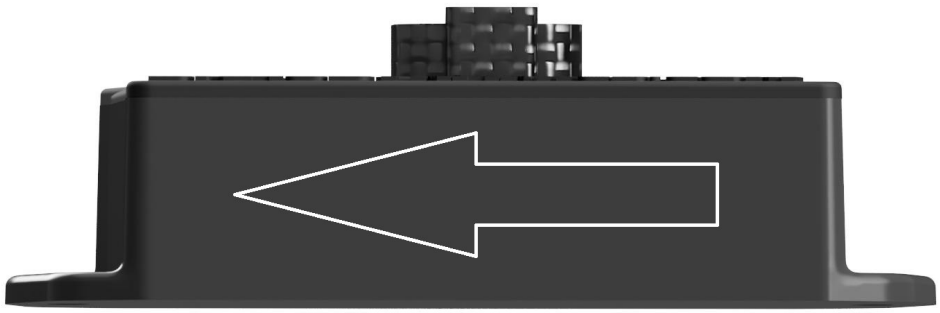
Performance: The ACAS samples chassis orientation and movement at 400khz, and generates CAN data packets at 100 samples per second, the fastest a Megasquirt 3 can receive and store CAN data. This results in a time of .003-.008 seconds between sensor measurement and delivery to your ECU.

Requirements: The ACAS requires your Megasquirt 3 ECU is running firmware Version 1.5.2 release or later.

Environmental: ACAS is designed to work consistently between temperatures of 45* F and 160* F. The unit is encased entirely in Epoxy with a fluid-proof Deutsch connector.

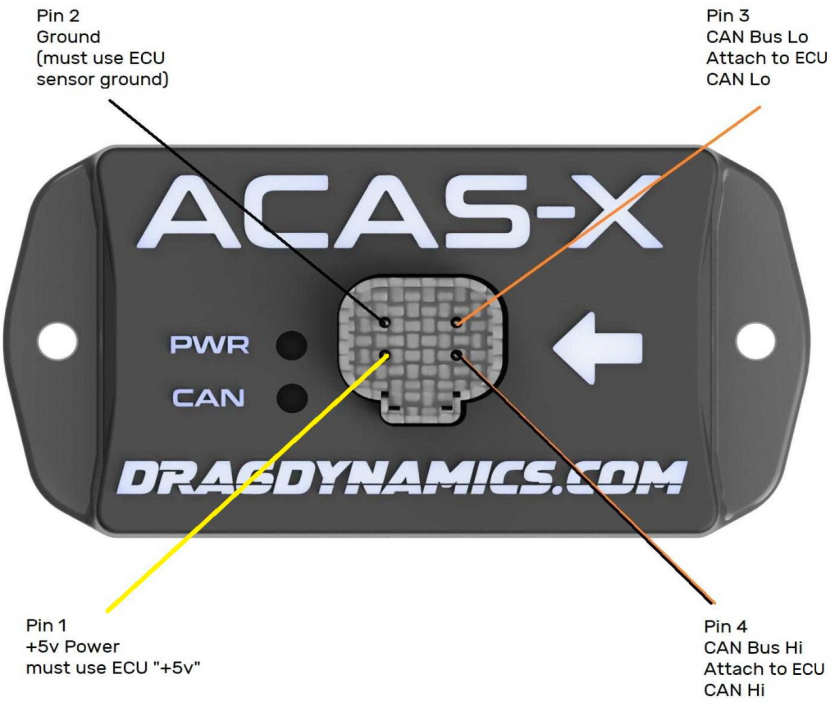
Wiring and Installation

Mounting: Mount the ACAS module on a horizontal surface in your vehicle chassis. The arrow on the top of the module must point in the forward direction the car travels during racing. The unit can be mounted just about anywhere relatively flat and level, but best performance comes from mounting near the chassis pivot (rear axle) as low as possible. The ACAS will self-level each time power is applied, and can be triggered to self-level via CAN bus triggering from your Megasquirt 3 ECU. The closer you have it mounted to level in your chassis (as referenced by gravity when the car sits at racing ride height), the better. The mount can be rigid – unlike other inertia measurement systems, this one will filter high frequency noise from chassis vibrations. The unit can be mounted anywhere temperatures won't exceed 170* F continuous. The unit operates reliably in temperatures as low as 45* F continuous, and uses internal temperature compensation.



Wiring:

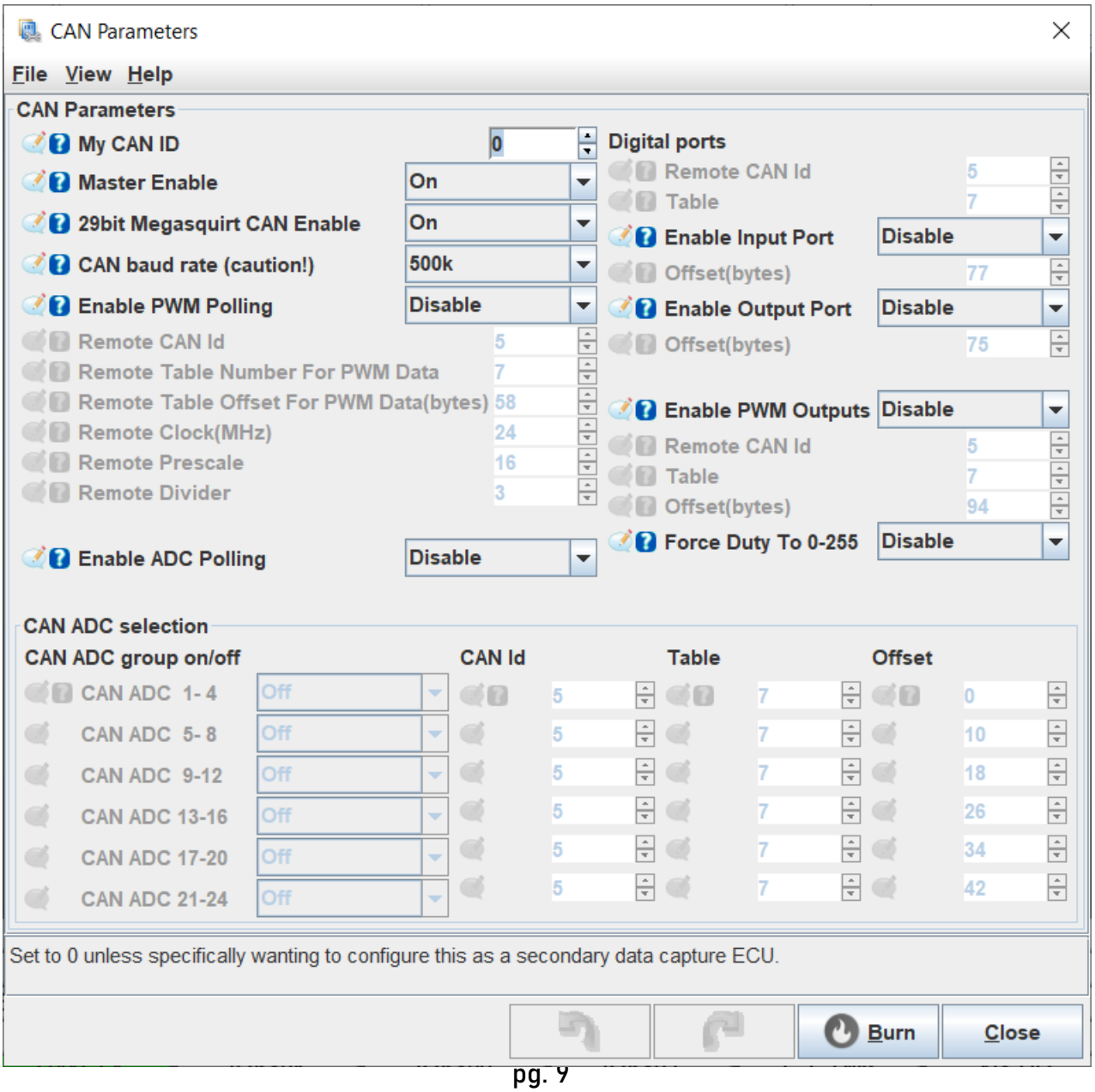
Pin:	Color:	Function:
1	Yellow	+5v Power from Megasquirt 3 VREF +5v circuit. DO NOT CONNECT TO IGNITION POWER
2	Black	Ground – attach to MS3 Sensor Ground circuit. DO NOT CONNECT TO CHASSIS OR BATTERY GROUND
3	Orange	CAN Bus Low. Connect to MS3 CAN Low (also Orange)
4	Orange/Blk	CAN Bus High. Connect to MS3 CAN High (Orange/Blk)



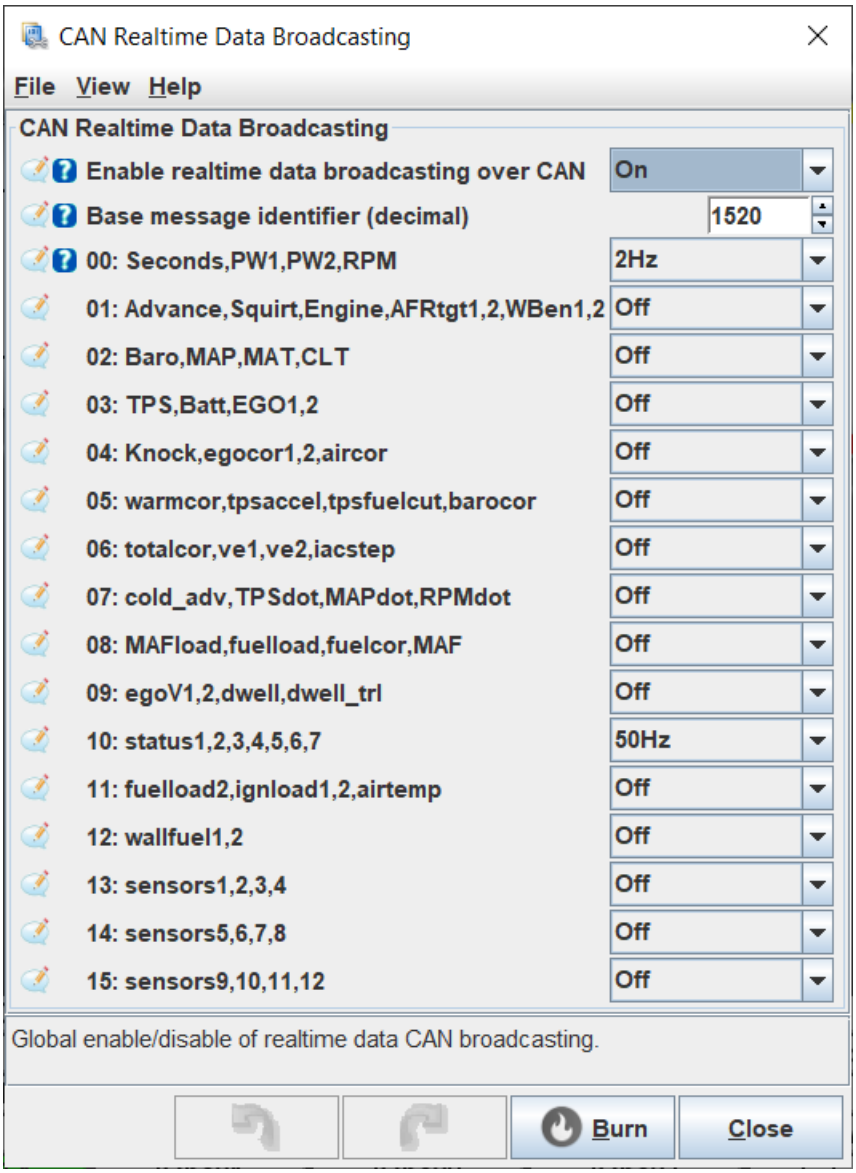
Megasquirt 3 Software Configuration:

CAN Bus Settings

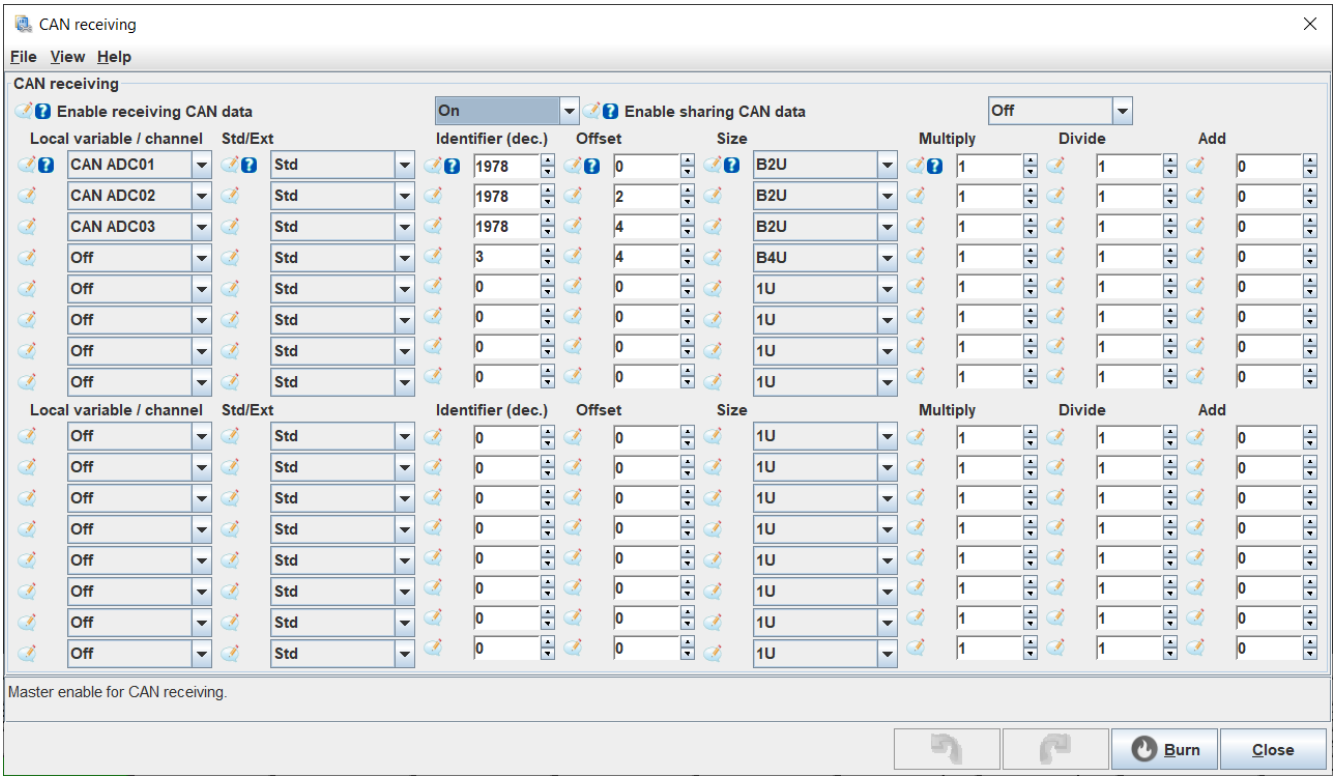
First, enable CAN bus receiving by going to the CAN-Bus / Test modes menu, then selecting “CAN Parameters” and set it up as shown here:



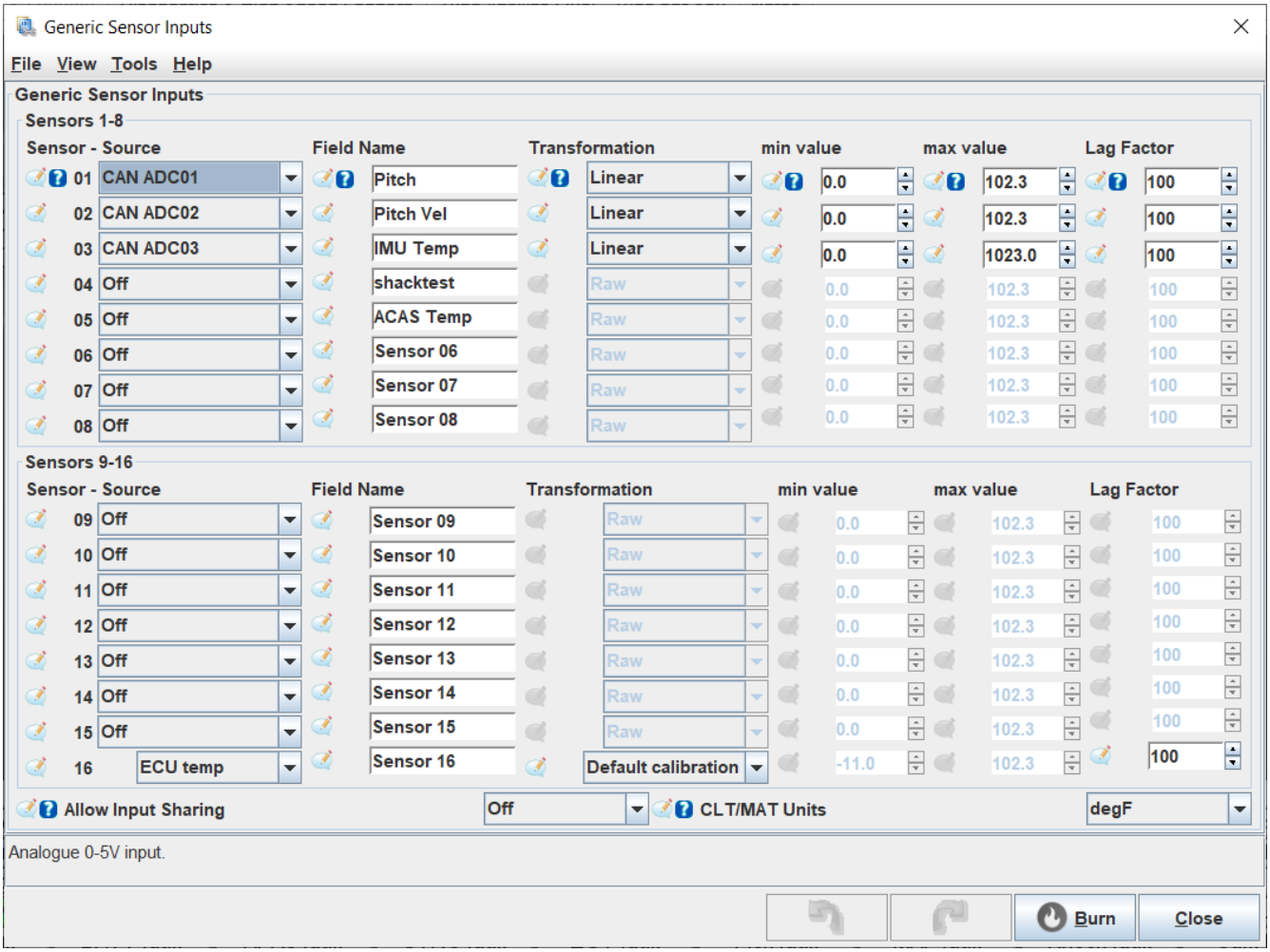
Then, go to CAN-Bus / Test Modes menu, and select “CAN Realtime Data Broadcasting” and set it up as follows. Note that you are enabling packet broadcast for packet IDs 00, and 10. Packet 00 is the “heartbeat” packet that ACAS uses to test CAN connectivity. Packet 10 is the “status” packet that will tell your ACAS when your launch button has been activated, so that it can Zero the sensors before launch.



Next, go to CAN-Bus / Test Modes menu and select “CAN Receiving” and configure it as follows:



Next, go to the “Advanced Engine” menu, and select “Generic Sensor Inputs” and configure that screen as follows. Note that you can use any fields you like (if you already have generic sensors in place) that are unused.



At this point, configuration is complete and you now have available channels Pitch, Pitch Vel, and IMU Temp available for displaying as gauges, or for datalogging, and for using options like Spark Table Blending to manage power.

Zeroing the Sensor, and the Zero Modes

Your ACAS-Xsensor automatically zeros itself when powered up. However, you may want it to zero just before launching the car (using a trans brake input, or clutch switch, for example).

By default, the ACAS-X automatically every time the Megasquirt 3 ECU powers up. Optionally, it can be zero'd whenever the ACAS-X detects an event triggered by the Megasquirt 3 ECU over CAN Bus.

AutoZero

ACAS-X will automatically zero the chassis angle every time power is applied (ignition on) to the Megasquirt 3 ECU. This works great for cars with changing ride heights, BUT it can be a problem if the car is started in staging lanes that are on an incline.

Triggered Zero

This method will read a "trigger" via CAN Bus from the Megasquirt 3, preferably when a trans brake or clutch switch is depressed (but it can be triggered off any event available in the Megasquirt 3 ECU). If you followed the configuration steps above, whenever you activate your LAUNCH input button, the ACAS will detect this over CAN and the blue LED will go OUT for one second, indicating that the sensor has been zero'd and is ready for launch.

If you have difficulty setting this up or troubleshooting, email us at support@dragdynamics.com and we'll get on the phone/remote with you and help you get it working.

CAN Bus Tuning and Performance

Its a good idea to make sure your CAN bus networks are performing their best, so here are some things to consider:

CAN Bus Termination: measure the **resistance** (the Ohms option on your meter) of the CAN bus wires while all sensors are installed and wired, but NOT powered on. The ideal resistance for a CAN network, is 60 ohms. Measure this by probing both CAN bus wires and observing the resistance figure. If the bus measures 120 ohms or higher, it's time to install another terminating resistor. Your ECU manufacturer sells them, or you can just install a 120-ohm, ¼ watt resistor across the two CAN wires yourself. Usually, a terminating resistor is not needed but it's a good idea to check if you're having data dropouts in your logs.

Dragdynamics.com Product Warranty

Limited 3-Year Warranty

Congratulations on your purchase of an ACAS! We stand behind the quality of our products and are pleased to offer you a limited warranty against manufacturer defects and problems. Please read the following terms carefully.

Warranty Coverage: Drag Dynamics, LLC ("the Company") warrants that your ACAS (the "Product") is free from defects in materials and workmanship for a period of three (3) years from the date of purchase, provided that the Product is used under normal conditions and for its intended purpose.

Scope of Warranty: This warranty covers any defects or malfunctions arising from the manufacturing process or materials used in the Product. The Company will, at its discretion, repair or replace the defective Product or parts, or provide a refund, within the warranty period.

Original Purchaser Coverage: This warranty is applicable only to the original purchaser of the Product and is non-transferable. To be eligible for warranty service, the original proof of purchase must be presented.

Exclusions: This warranty does not cover damage resulting from:

- Accidents, misuse, or abuse
- Unauthorized modifications or repairs
- Acts of nature, such as lightning, floods, earthquakes, etc.
- Normal wear and tear

Obtaining Warranty Service: If you believe your Product is defective and covered by this warranty, please email *support@dragdynamics.com* for instructions on how to proceed with the warranty claim. The Company reserves the right to require proof of purchase and may ask for the defective Product to be returned for inspection.

Limitation of Liability: To the extent permitted by law, the Company's liability under this warranty is limited to the repair, replacement, or refund of the Product, and shall not exceed the purchase price paid for the Product.

No Other Warranties: This warranty is the sole and exclusive warranty for the Product, and no other warranties, express or implied, are made, including any warranty of merchantability or fitness for a particular purpose.

Effective Date: This warranty is effective as of the date of purchase and is valid for three (3) years.

Thank you for choosing Drag Dynamics, LLC. We appreciate your trust in our products.