ACAS

BY DRAGDYNAMICS.COM

INSTALLATION AND CONFIGURATION

DISCLAIMERS, TRADEMARKS, WARRANTY

Drag Dynamics is not affiliated with Holley Corporation in any way – we just like using their products and developing complementary parts that work with Holley.

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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 Holley EFI systems (Dominator, HP, and Terminator X/XMAX) and will not work with any other Engine Control Unit besides Holley.

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 Holley Dominator, HP, Terminator X/XMAXX 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 Holley ECU, just like any other 5v sensors. This unit consumes no more than .003 amps (30 milliamps) during use. 2 LEDs (Power, and CAN) indicate Processor activity and detection of the Holley CAN network.

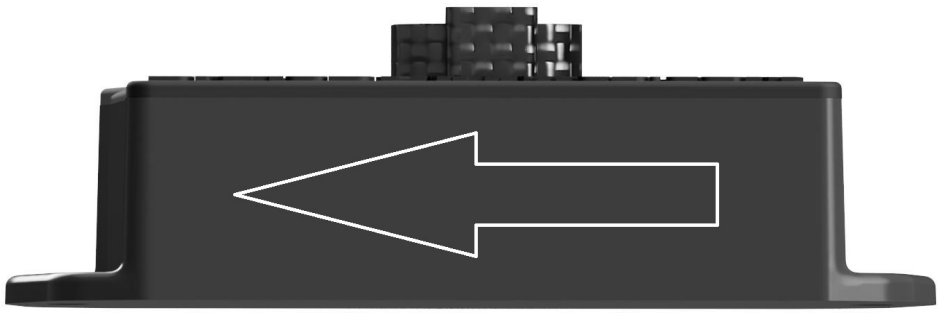
Performance: The ACAS samples chassis orientation and movement at 400khz, and generates CAN data packets at 100 samples per second, the fastest a Holley can receive and store CAN data. This results in a time of .008 seconds between sensor measurement and delivery to your ECU.

Requirements: The ACAS requires your Holley Dominator and HP ECU be running firmware Version 6 Build 220 or later. Holley Terminator X/XMAXX ECUs must be updated to Terminator X V2 build 70 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.

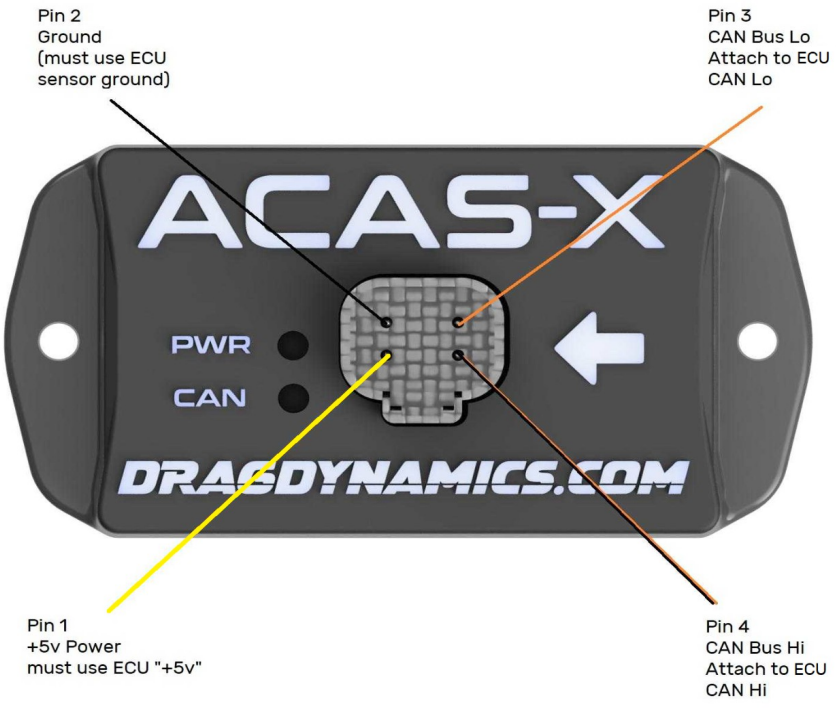
Wiring and Installation

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 that's 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 Holley 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 Holley VREF +5v circuit. DO NOT CONNECT TO IGNITION POWER (12v, 16v etc)
2	Black	Ground – attach to Holley Sensor Ground circuit. DO NOT CONNECT TO CHASSIS OR BATTERY GROUND
3	Orange	CAN Bus Low. Connect to Hollley CAN Low (also Orange)
4	Orange/Blk	CAN Bus High. Connect to Holley CAN High (Orange/Blk)



Holley Software Configuration:

Input Channels

Open a tune file you wish to configure for the ACAS, or download the current tune from your car's ECU.

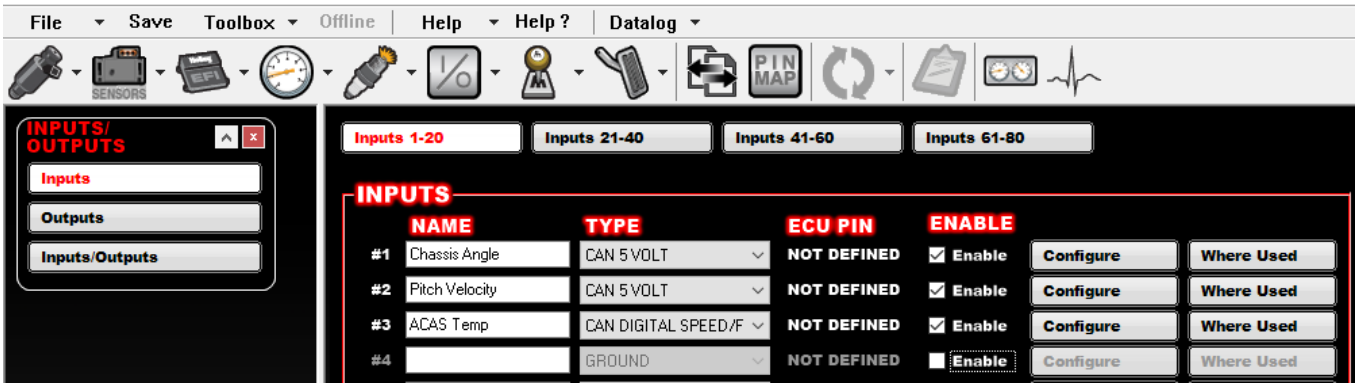


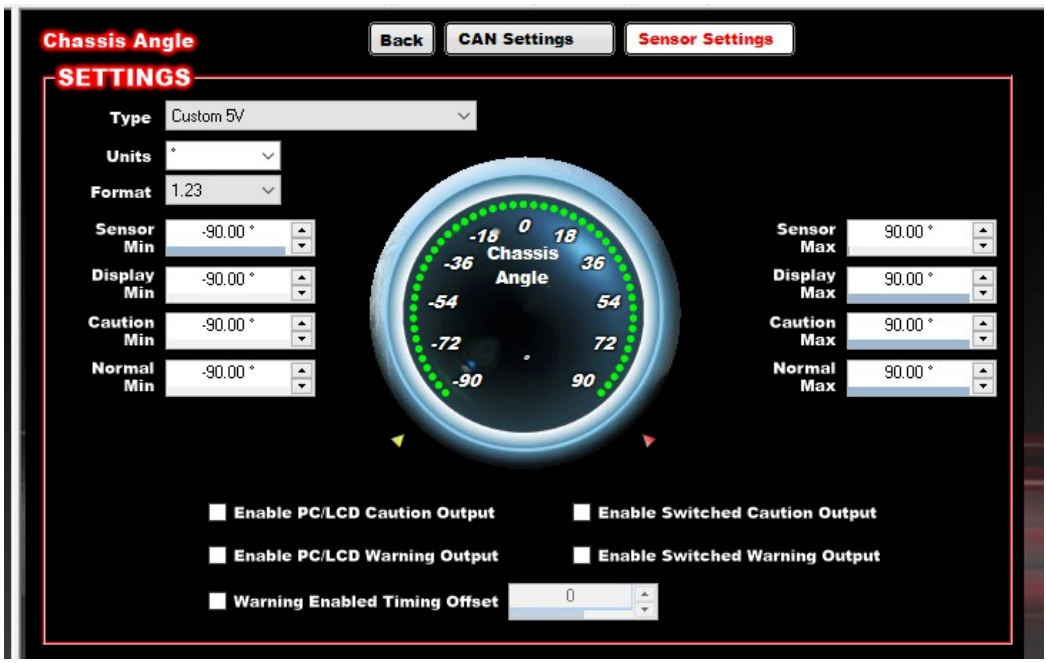
Figure 1: I/O Input Config

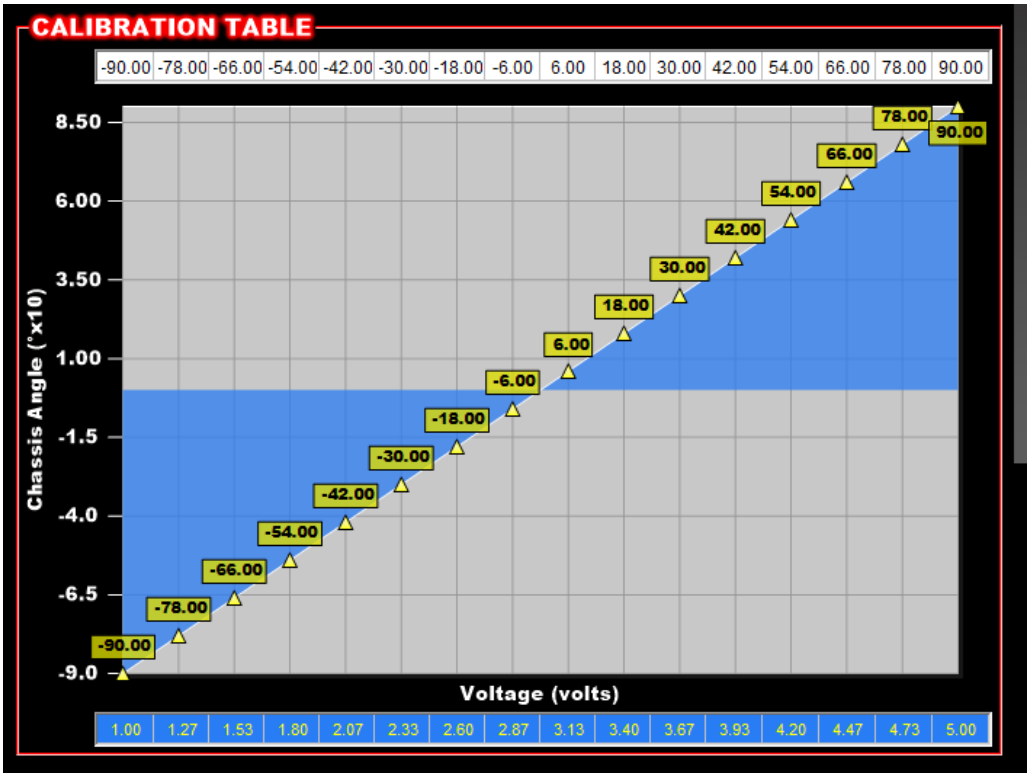
Open the I/O menu, select the Inputs menu option, and create four input channels input as shown in Figure 1: I/O Input Config. The first 2 channels (Chassis Angle, Pitch Velocity) are set up as type "CAN 5 VOLT". The 3rd channel, ACAS Temperature, is configured as type CAN DIGITAL SPEED/FREQ. Be sure to check the "enable" box for each.

If you do not see the I/O menu, add it by going to the Toolbox menu, then select "Add Individual Config". Open the "IO" Folder, and select "Base Config – Blank IO" to add the IO option to your calibration.

Chassis Angle Channel Configuration

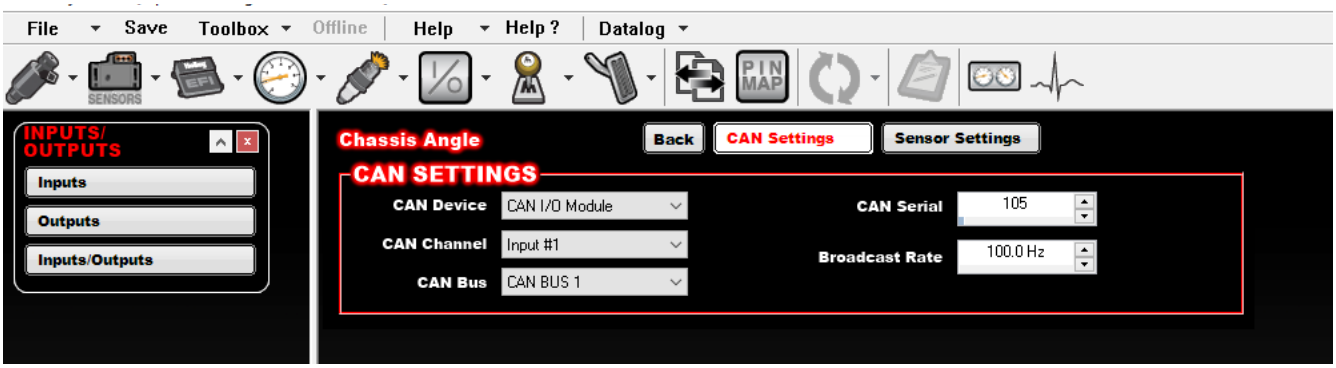
Click the “Configure” button for the Chassis Angle input you created above. Set up the options on this screen as seen in Figure 2. Set the Type to “Custom 5v” - make sure to set the voltage scale from 1.0v to 5.0v, and the calibration table from -90.000 to +90.00. Units should be set to the “degree” symbol.





Chassis Angle (continued) CAN Settings

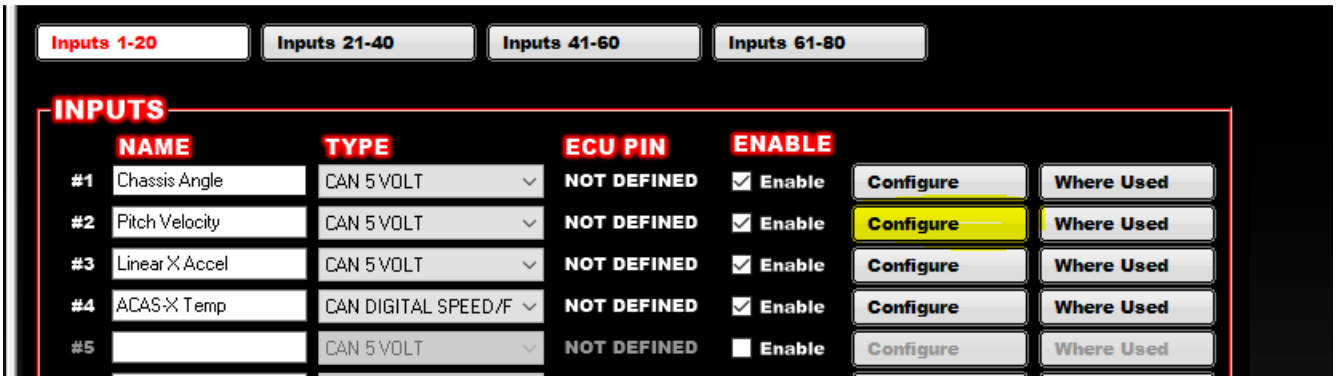
Click on the “CAN Settings” button to set up the Chassis Angle CAN input.



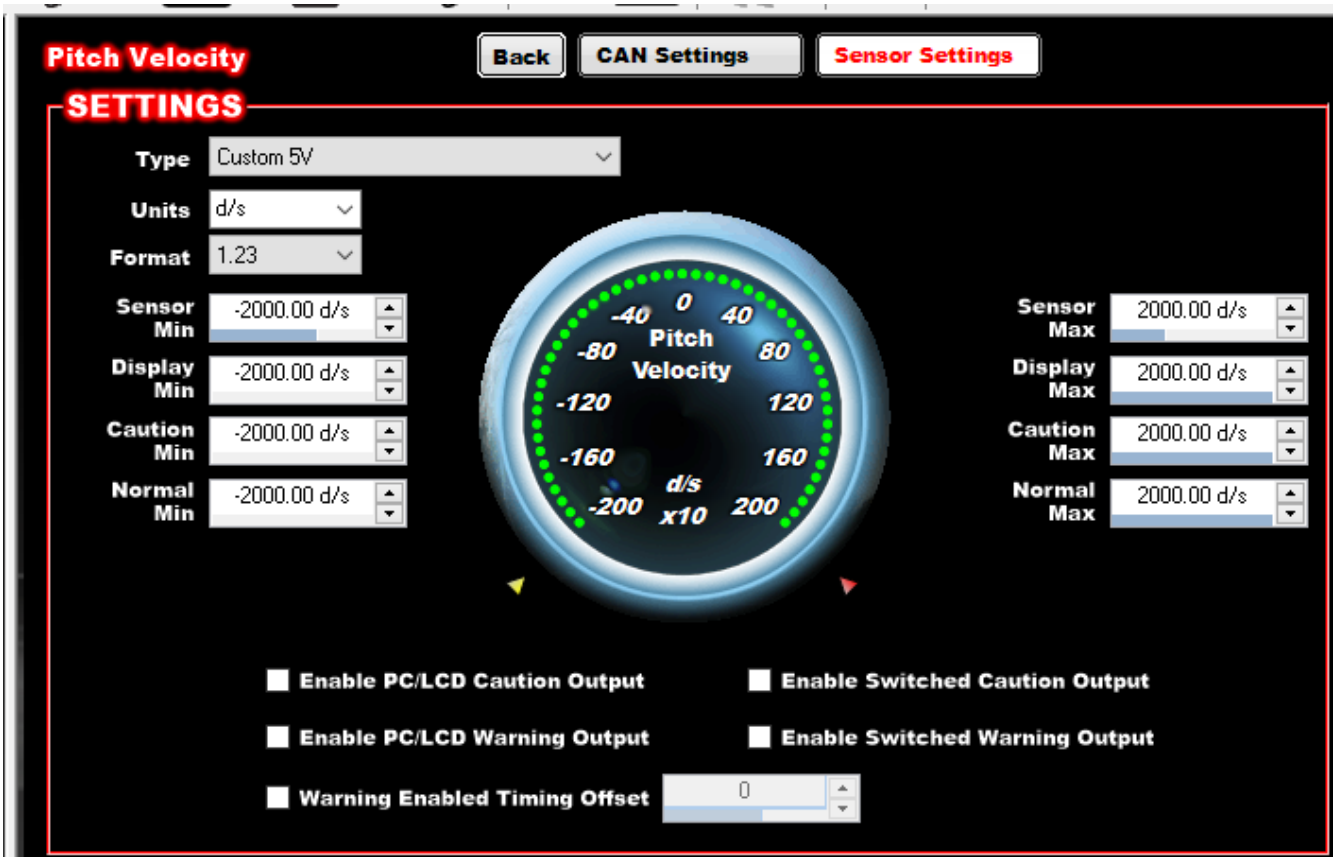
Set up your CAN settings exactly as shown above, EXCEPT you will enter the “CAN Serial” number that’s printed on the backside of your ACAS sensor. **This completes setup of the Chassis Angle Channel.**

Pitch Velocity Channel Configuration

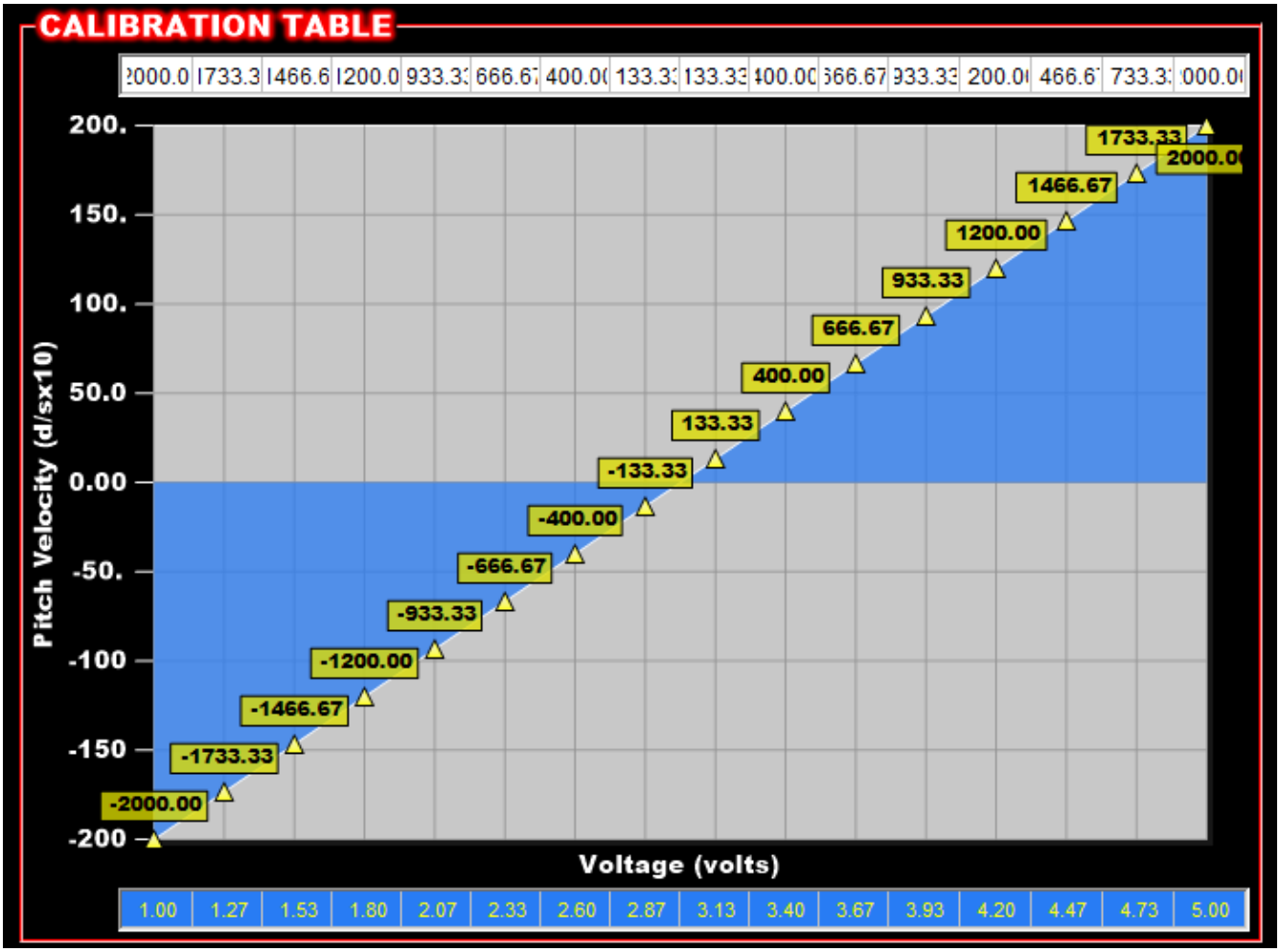
Back at your I/O menu, find the “Pitch Velocity” channel you created and click “Configure.”



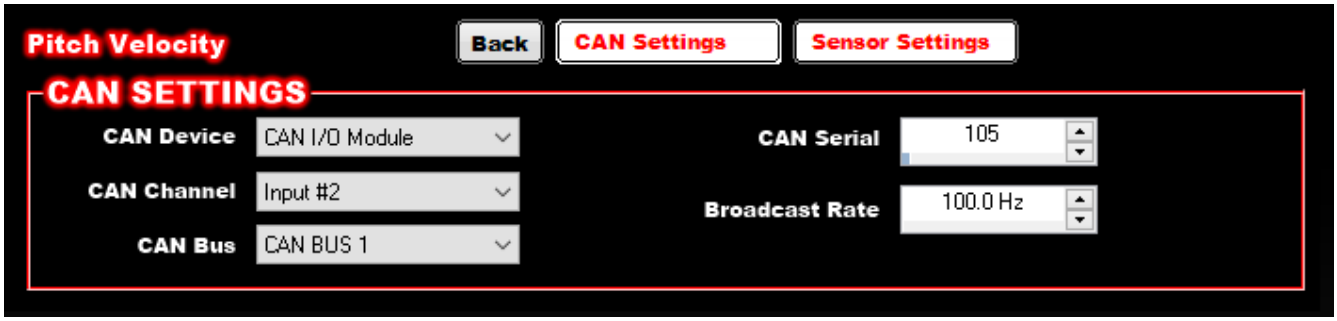
Set your Pitch Velocity Sensor settings as follows: Type= Custom 5v, units = deg/sec, format = 1.23.



Set your Pitch Velocity Calibration Table as follows: Degrees per second (Top) row = 2000 to 2000, Voltage (bottom) row 1.00v to 5.00v. **Make sure you use 1.00 to 5.00v and -2000 to 2000 deg/sec.**



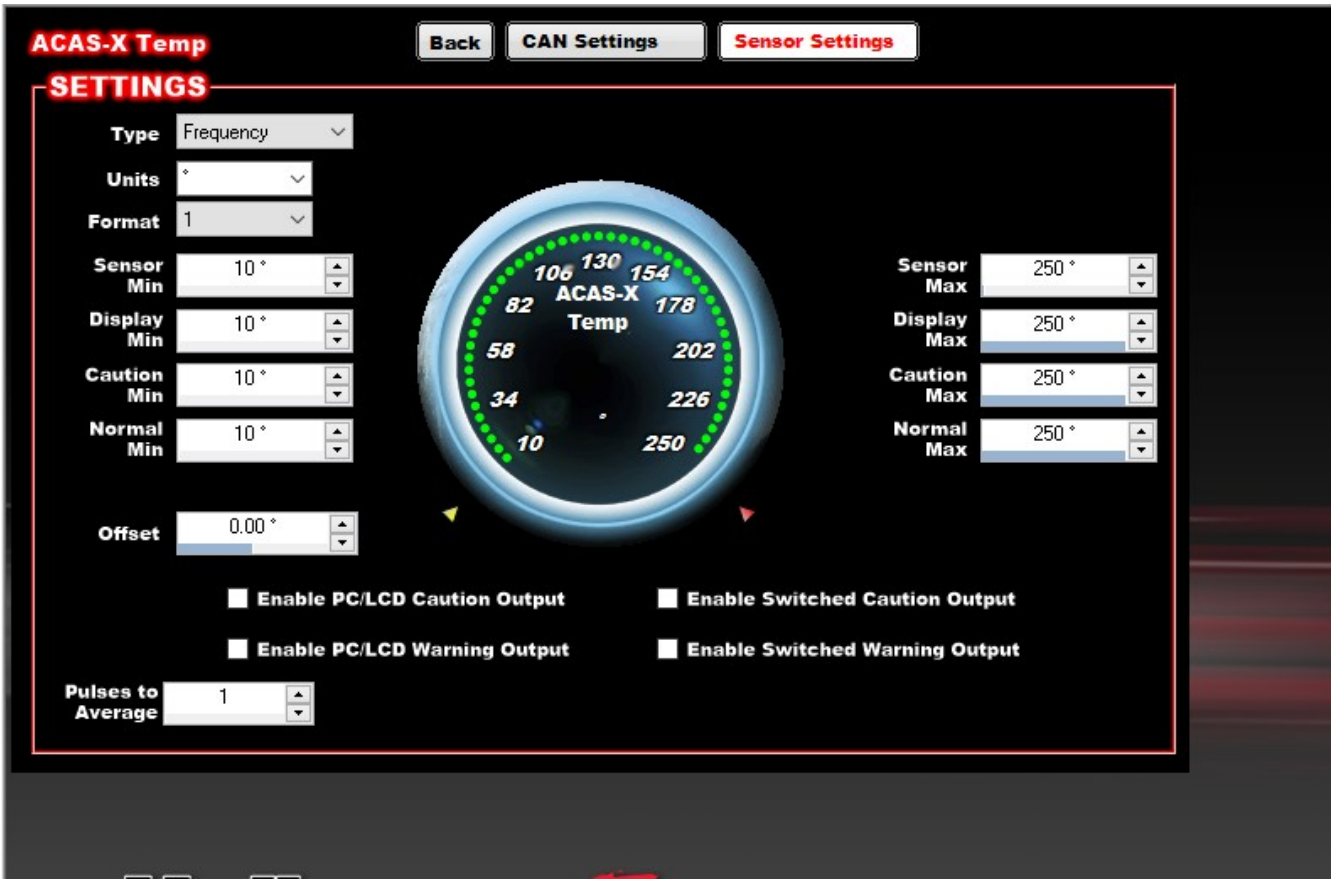
Now go to CAN SETTINGS and configure as follows, **EXCEPT YOU WILL BE USING THE CAN SERIAL NUMBER PRINTED ON THE BOTTOM OF YOUR ACAS SENSOR.**

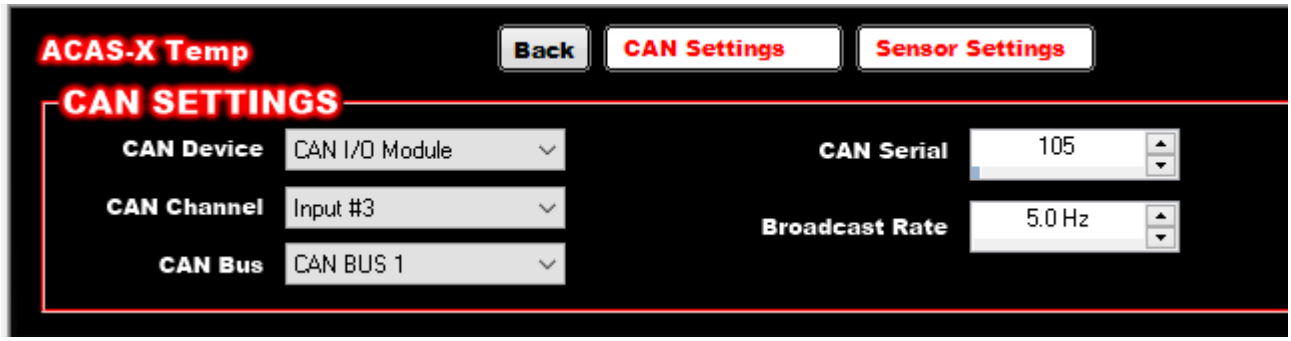


This completes setup of the Pitch Velocity Channel.

OPTIONAL: ACAS Temperature Channel

If you wish to capture the temperature of your ACAS onboard sensors, configure that input as follows. Remember to use YOUR CAN SERIAL ID NUMBER, not the one in the pictures.





This completes setup of the ACAS Temperature Sensor Channel.

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 Holley ECU powers up. Optionally, it can be zero'd whenever the ACAS-X detects an event triggered by the Holley ECU over CAN Bus.

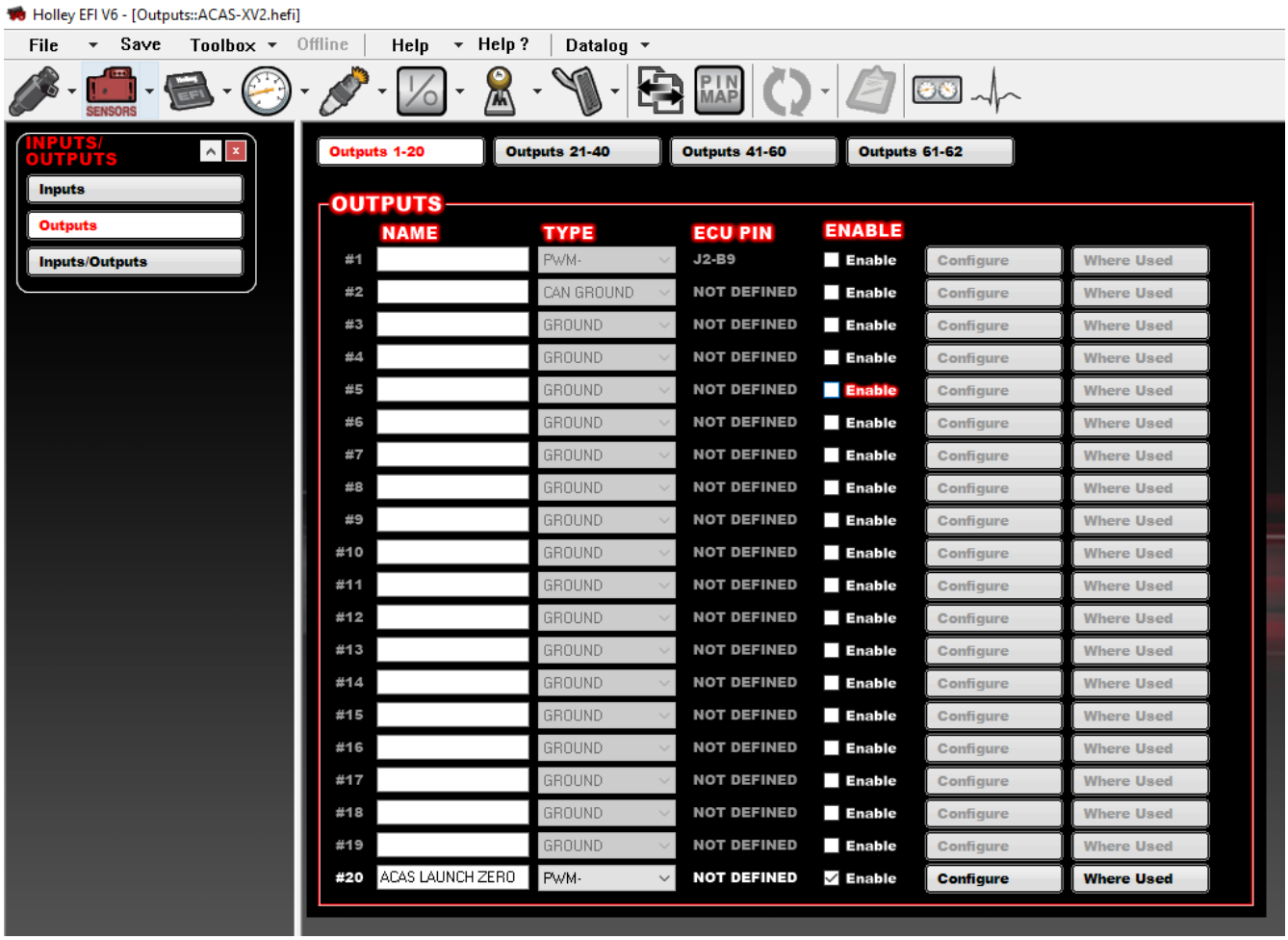
AutoZero

ACAS-X will automatically zero the chassis angle every time power is applied (ignition on) to the Holley 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.

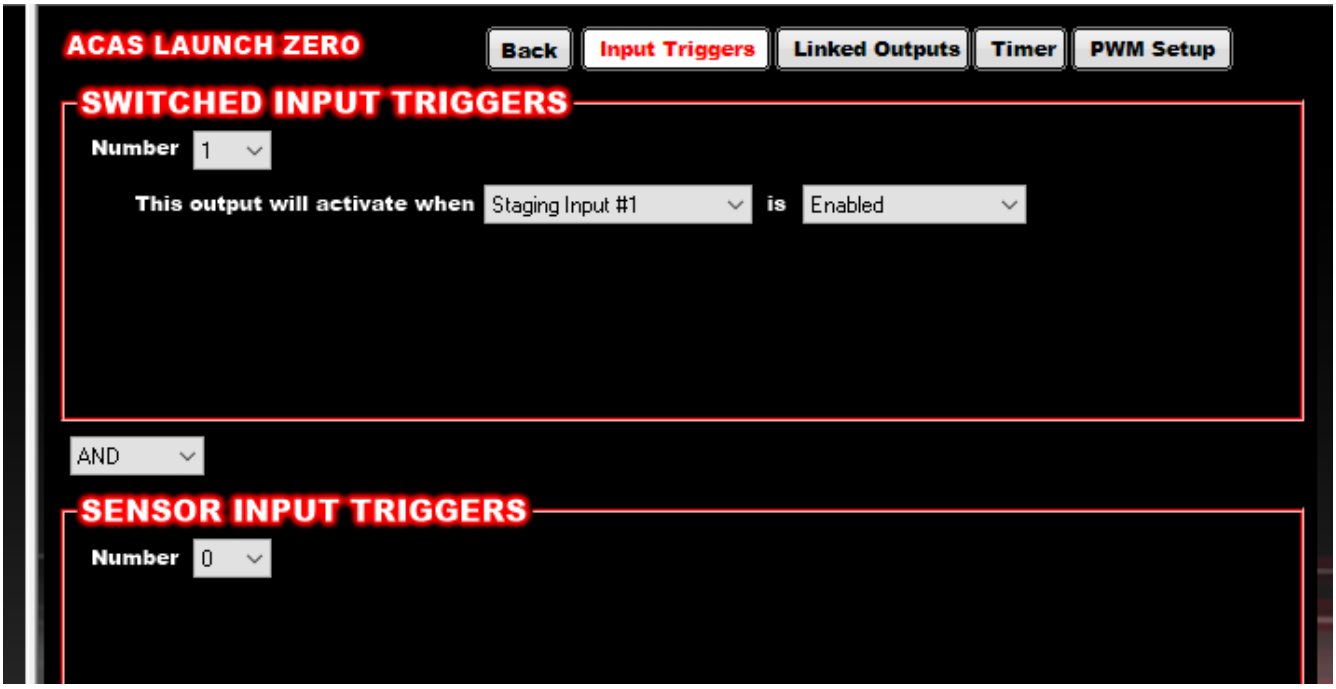
Triggered Zero

This method will read a "trigger" via CAN Bus from the Holley, preferably when a trans brake or clutch switch is depressed (but it can be triggered off any event available in the Holley ECU). How this works is by using I/O Output #20 (**only output #20 may be used, if you have other outputs in this location they'll need moved).** Sending a 100hz, 50% duty cycle signal from Output 20 will trigger an instantaneous Zeroing of the ACAS-X. You can validate this by seeing the blue light flash one time, whenever a CAN Zero message is received. Setup of this method is as follows:

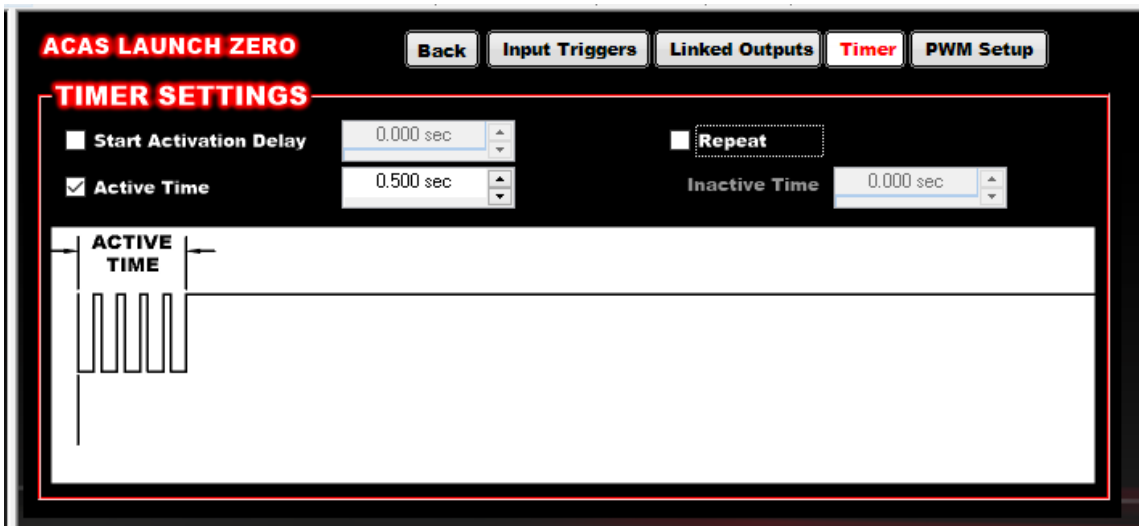
Navigate to your I/O menu, and select Outputs. Making sure you use Output #20, create an output configuration as seen below. Set the Type to PWM-, and check the Enable box.



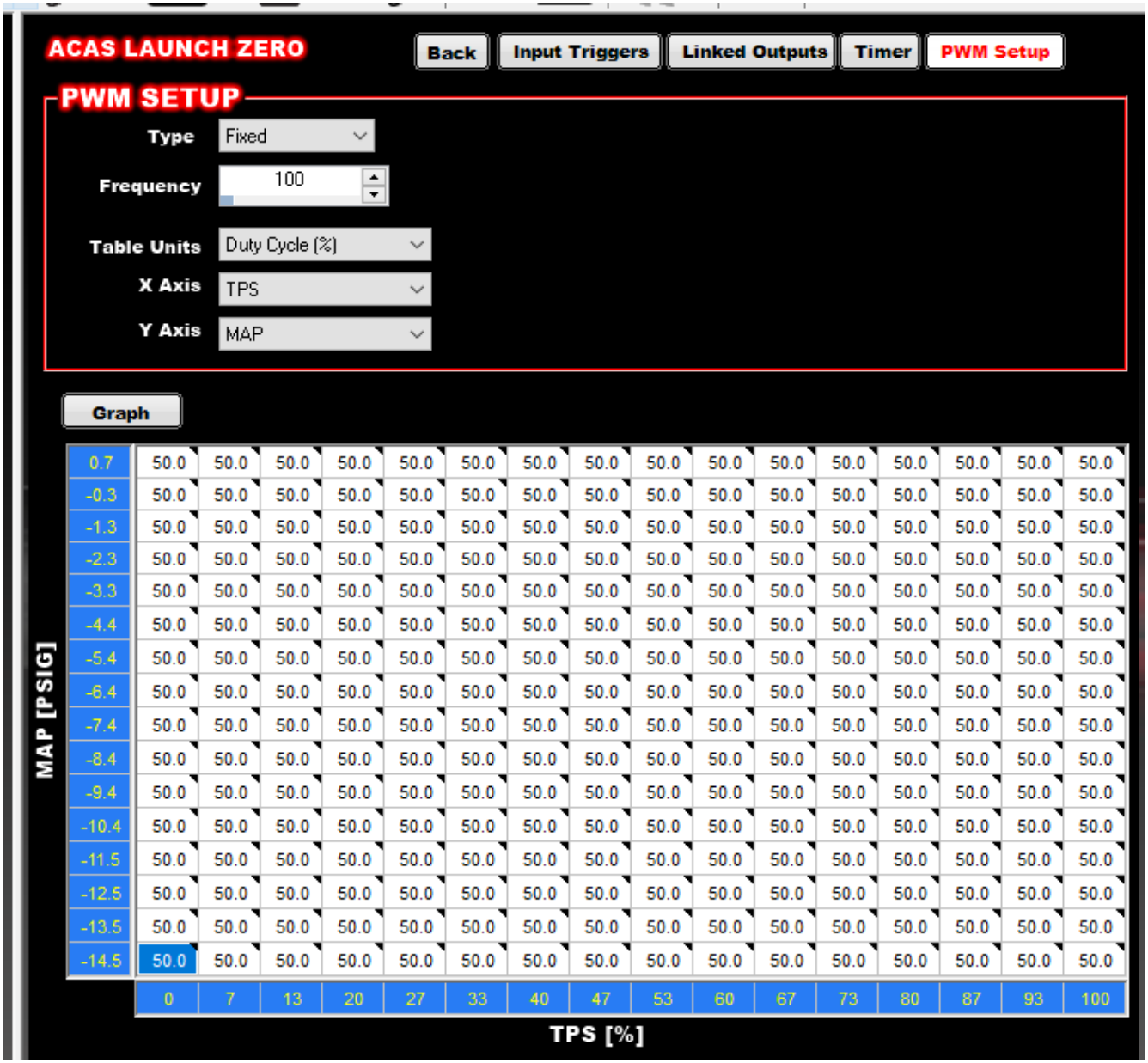
Click the “Configure” button and set up your Switched Input Triggers as seen below. Ideally you’ll want the ACAS-X to be triggered immediately when the button is pressed, so select whichever input you are using (Staging Input 1, or your manually-created trans brake button input), and select “Enabled.” Later, you can add any other logic here if you like, for specialized zeroing of your ACAS-X.



Next, click on the “Timer” button. We set this up so that the Holley sends one brief message to the ACAS-X, not repeating messages. This triggers just one simple Zeroing of the ACAS-X. Set up your timer as seen on the next image:



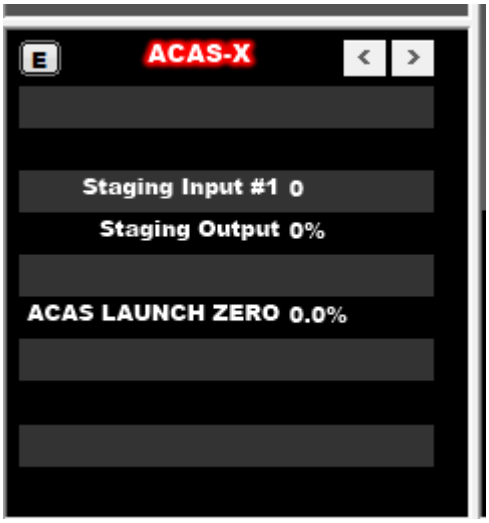
Finally, click on the “PWM Setup” button to set up the actual trigger signal for the ACAS-X. It’s a very specific 100hz, 50% duty cycle message that will trigger the ACAS-X to zero. Set it up exactly as shown in the next image. Note that the X/Y axes do not matter in this application, we left them at the default MAP/TPS. Make sure the table is set ENTIRELY to 50%:



Testing Triggered Zero mode

It's super easy! Watch the Blue light on the ACAS-X. When it receives a message over CAN to zero itself, the blue light will go OFF for 1 second.

Other ways you can debug the triggering, are by setting up your Holley realtime monitor/display as follows:



This lets you observe that the Holley is sending a command (ACAS Launch Zero will show 50% when active, for .5 seconds) to the ACAS-X. At this point you should see the C/CAN light on the ACAS-X go out for 1 second.

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. Holley 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.