ACAS-X

FOR HOLLEY DOMINATOR, TERMINATOR, HP

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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Parts Included

1 – ACAS-X 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-X 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.

Linear Acceleration

Channel 3 transmits Linear Acceleration. This is the typical "X-Axis" raw data, from the onboard G-Meter. It will be affected by the vehicle's pitch angle during a pass, but it's what most are used to seeing, therefore we included it in the ACAS-X.

Corrected Linear Acceleration

Channel 4 reports a Corrected Linear Acceleration value. This channel is similar to X-Axis on a typical G-Meter, minus the effects of chassis tilt, gravity, and vibration that causes normal X-Axis accelerometer data to become inaccurate or unusable. This helps with pass-to-pass repeatability regardless of chassis angle, surface preparation, etc. This is very useful to measure true acceleration values in cars that require large chassis angles for best performance.

General Information and Use:

Power Consumption: The ACAS-X 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.

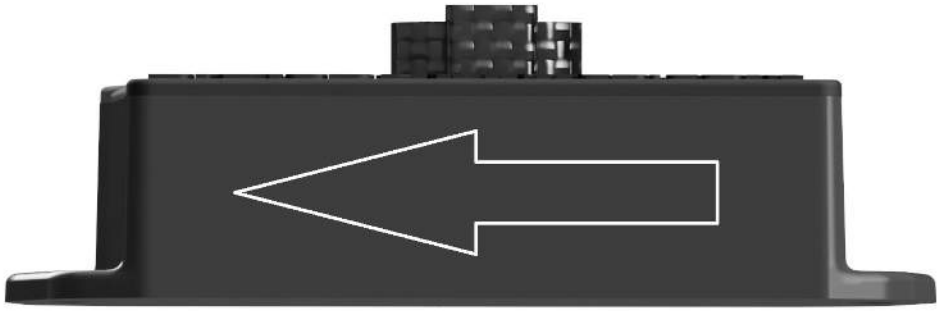
Performance: The ACAS-X samples chassis orientation and movement at 400khz, and generates CAN data packets at 100 samples per second, the fastest a Holley can receive and store CAN data. This results in a time of .008 seconds between sensor measurement and delivery to your ECU.

Requirements: The ACAS-X 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.

Wiring and Installation

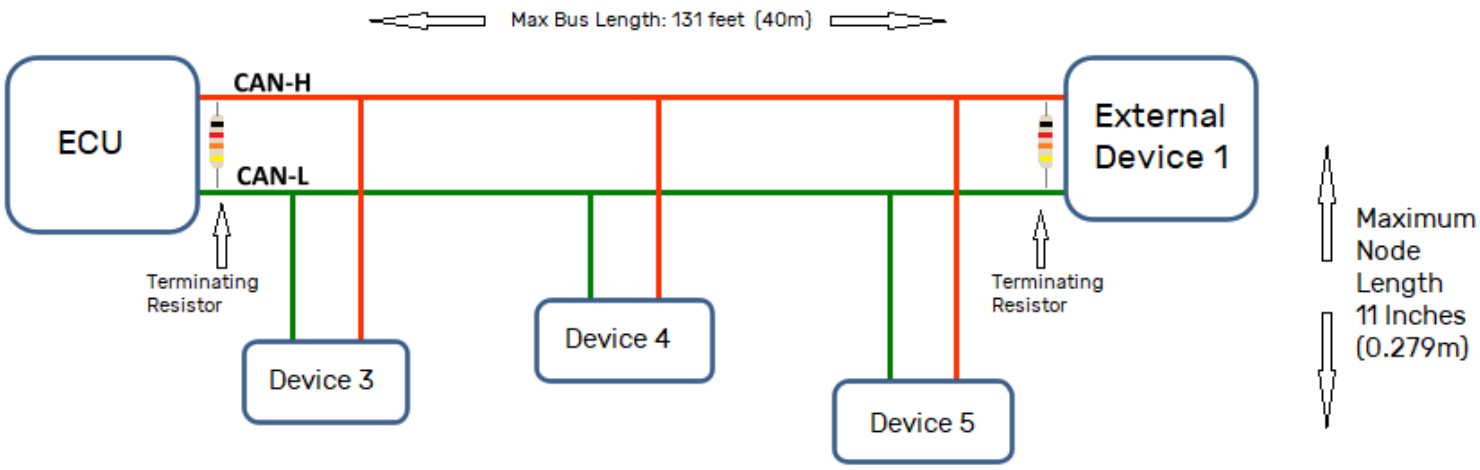
Mounting: Mount the ACAS-X module on a horizontal surface in your vehicle chassis with the text/top facing up. The arrow on the top of the module must point in the forward direction the car travels during racing. The Lid must be facing UP (the sensor cannot be installed upside-down). The sensor can be mounted just about anywhere relatively flat and level.

The ACAS-X needs to be "zero'd" before use. There are 2 options for zeroing the system: (1) Each time power is applied (ECU power up), and (2) whenever the system detects a trigger from the Holley Outputs that is easily configured in your I/O (Outputs) ICF. The closer you have it mounted level in your chassis, 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.



CAN Bus Layout

CAN bus performance is **dramatically** affected by noise problems unless laid out per the following diagram. It's very easy to have a non-compliant layout in your car, be sure to keep your node lengths shorter than 11" and have a **terminating resistor** in or at the devices at each end of the chain. Your ECU is usually terminated internally, and some devices (such as Holley Dashes) are also terminated. The way to confirm correct termination is by measuring the resistance (Ohms) between CAN HI and CAN LO, it should read 60.0 ohms with power OFF when properly terminated.



Wiring:

Pin:	Color:	Function:
1	YELLOW	+5v Power from Holley VREF +5v circuit. DO NOT CONNECT TO +12v IGNITION POWER
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:

I/O Channels

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

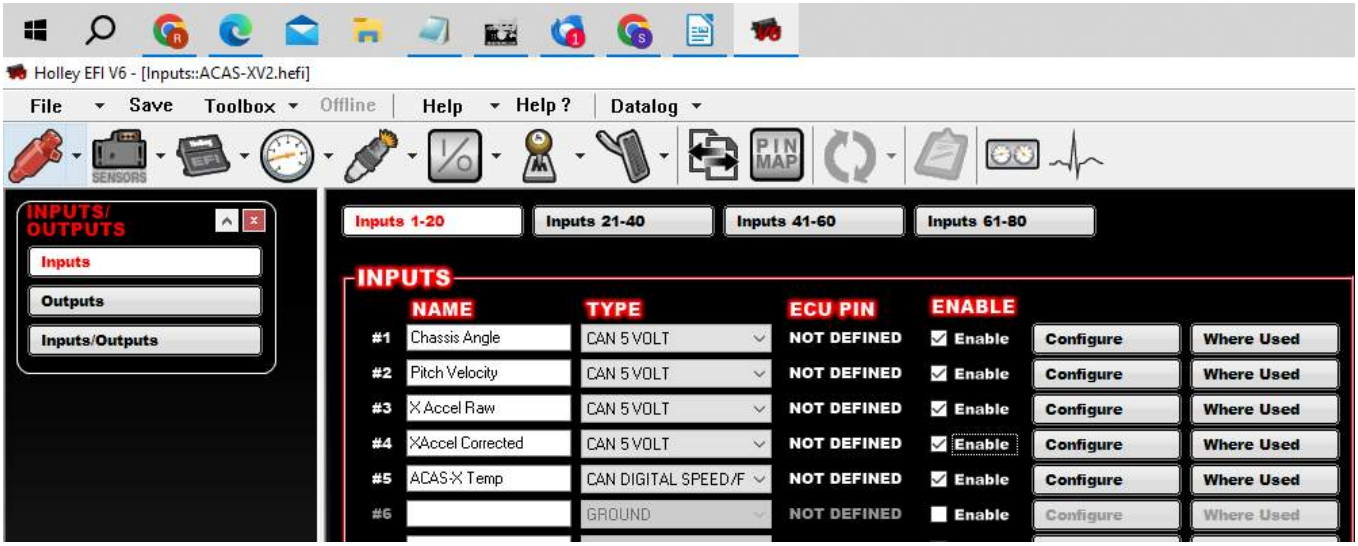


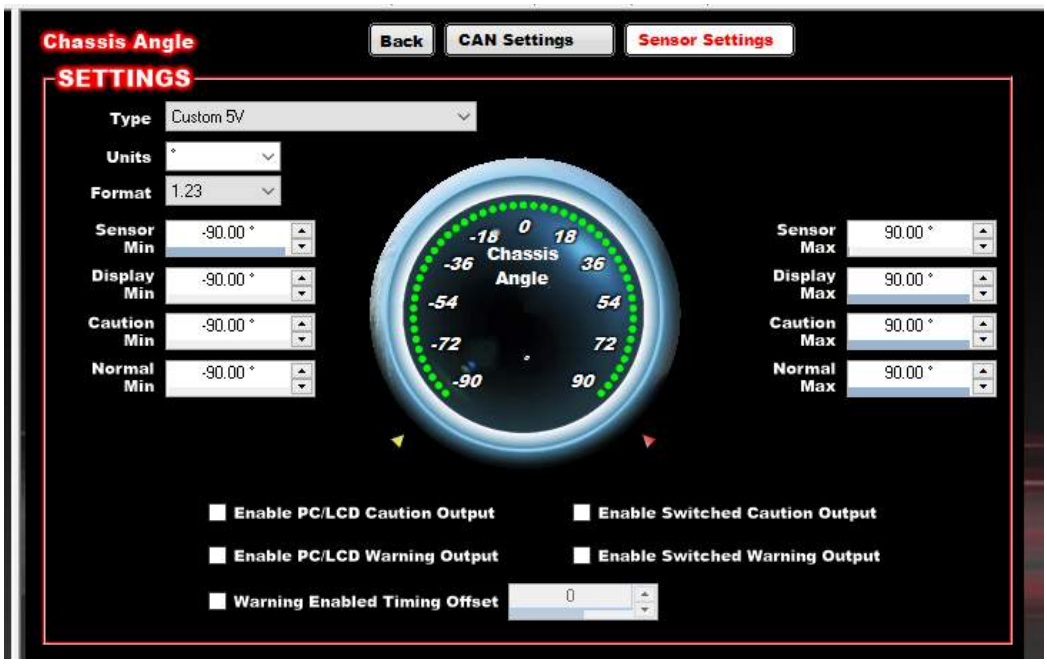
Figure 1: I/O Input Config

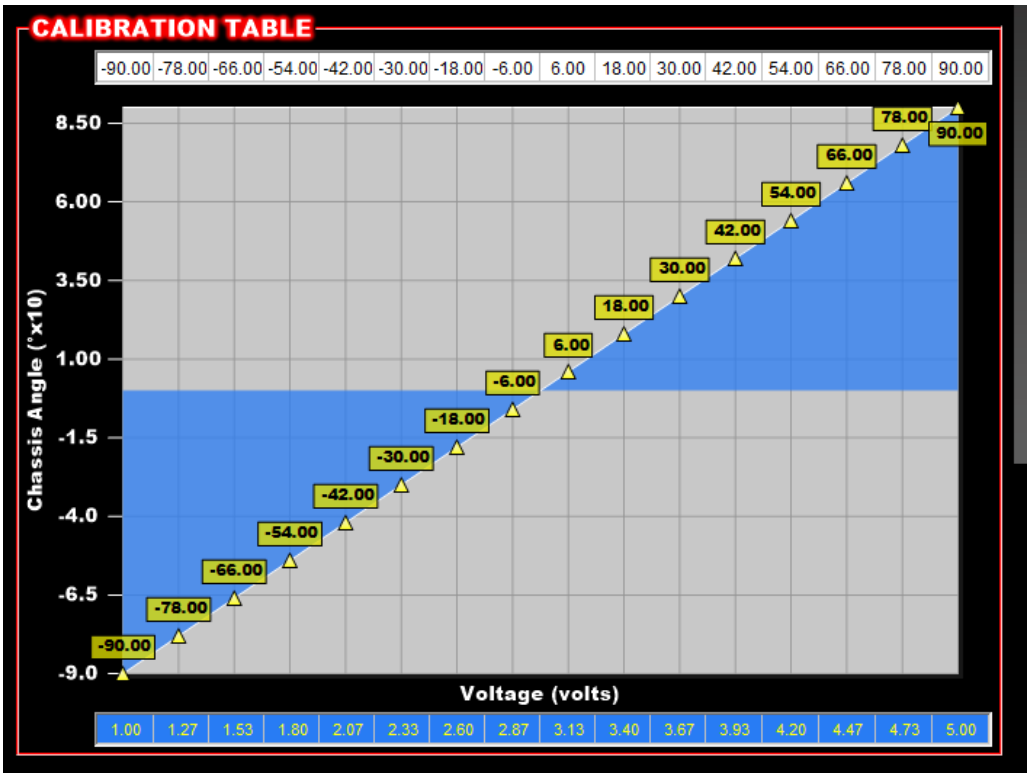
Open the I/O menu, select the Inputs menu option, and create four input channels input as shown in Figure 1: I/O Input Config. The first 4 channels (Chassis Angle, Pitch Velocity, X Accel Raw and X Accel Corrected) are set up as type "CAN 5 VOLT". The 5th channel, ACAS-X Temperature, is configured as type CAN DIGITAL SPEED/FREQ. Be sure to check the "enable" box for each. See figure 1 for a clearer picture.

If you do not see the I/O menu, that means the I/O ICF has not been added to your calibration yet. 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. This has to be performed "offline" and then sent to the ECU.

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.





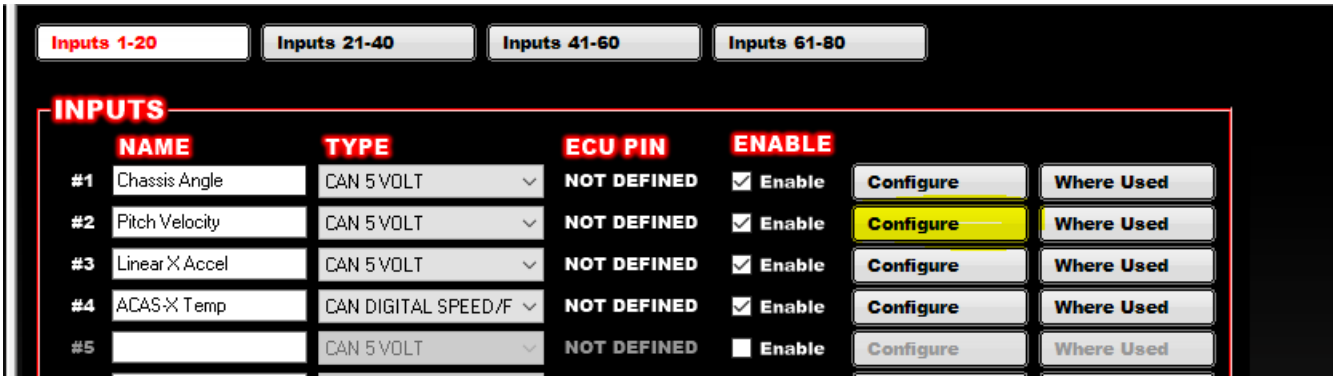
Chassis Angle (continued) CAN Settings

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

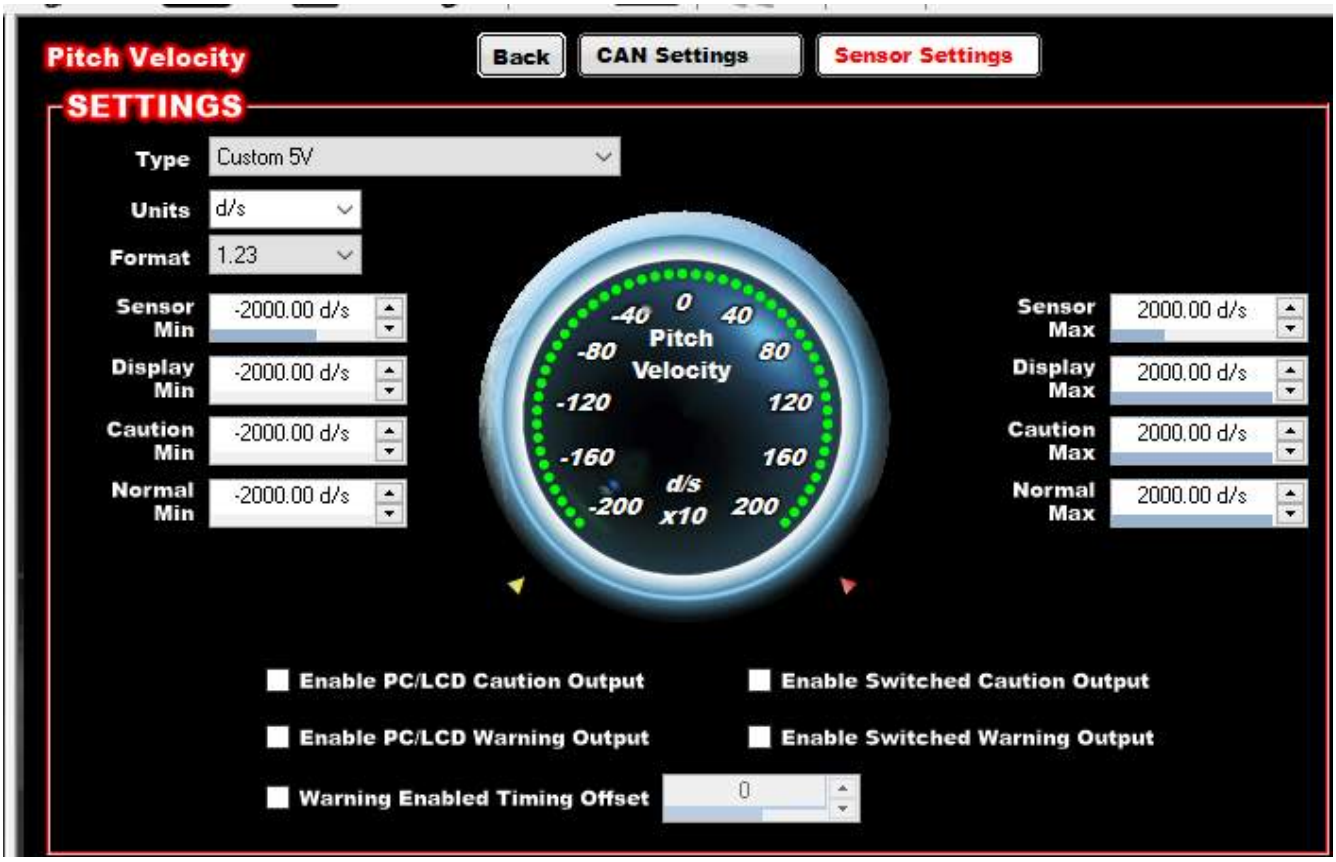
Set up your CAN settings exactly as shown above, EXCEPT you will enter the “CAN Serial” number that’s printed on the backside of your ACAS-X sensor. **This completes setup of the Chassis Angle Channel.**

Pitch Velocity Channel Configuration

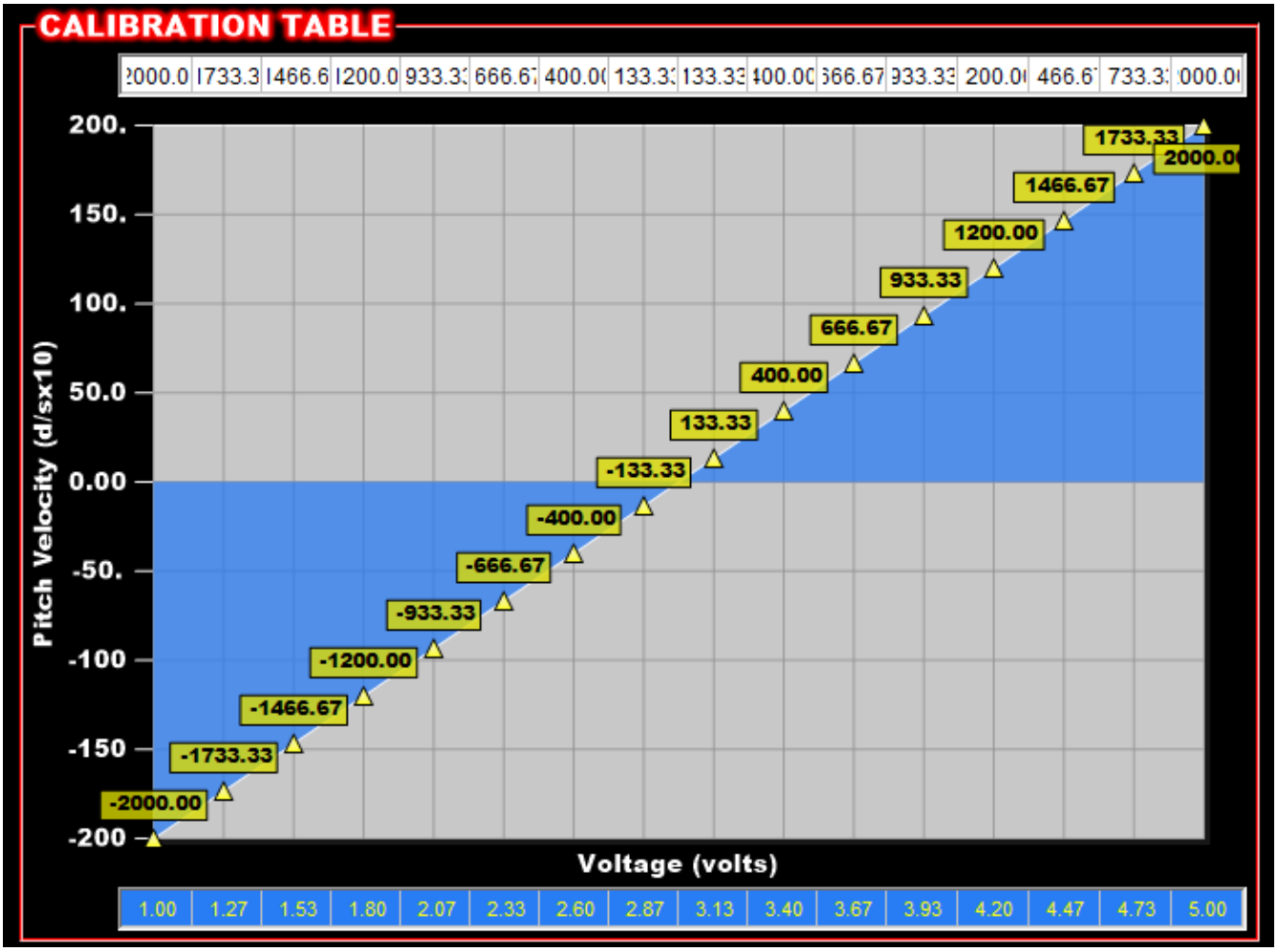
Back at your I/O menu, find the “Pitch Velocity” channel you created and click “Configure.”



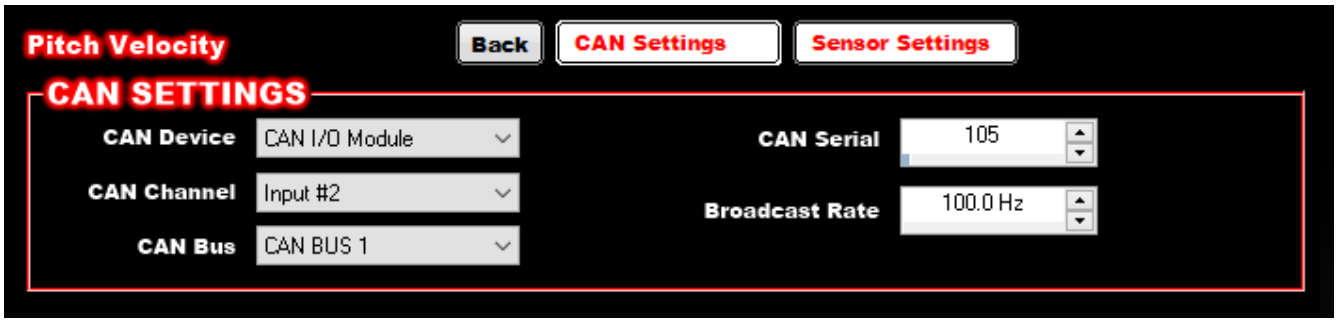
Set your Pitch Velocity Sensor settings as follows: Type= Custom 5v, units = deg/sec, format = 1.23.



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.**



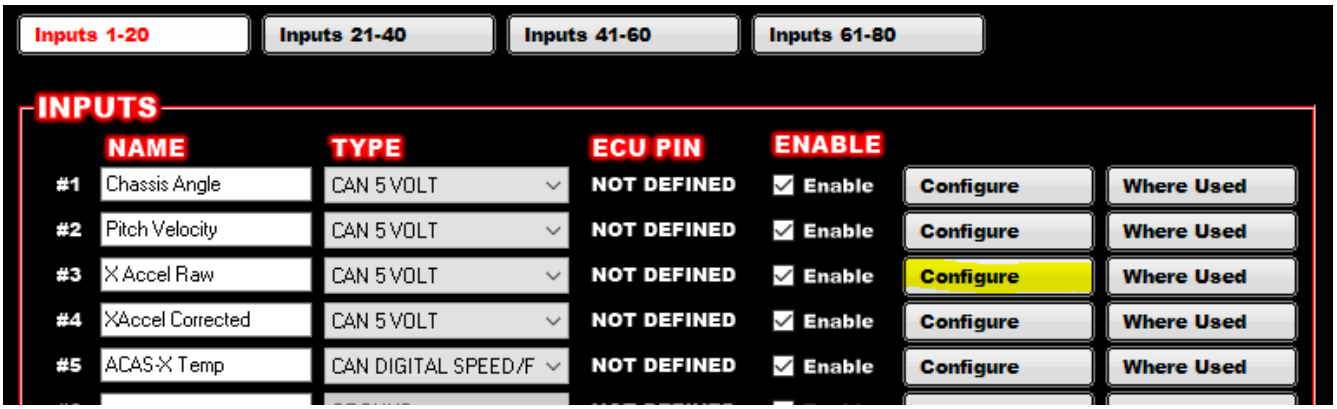
Now go to CAN SETTINGS and configure as follows, **EXCEPT YOU WILL BE USING THE CAN SERIAL NUMBER PRINTED ON THE BOTTOM OF YOUR ACAS-X SENSOR.**



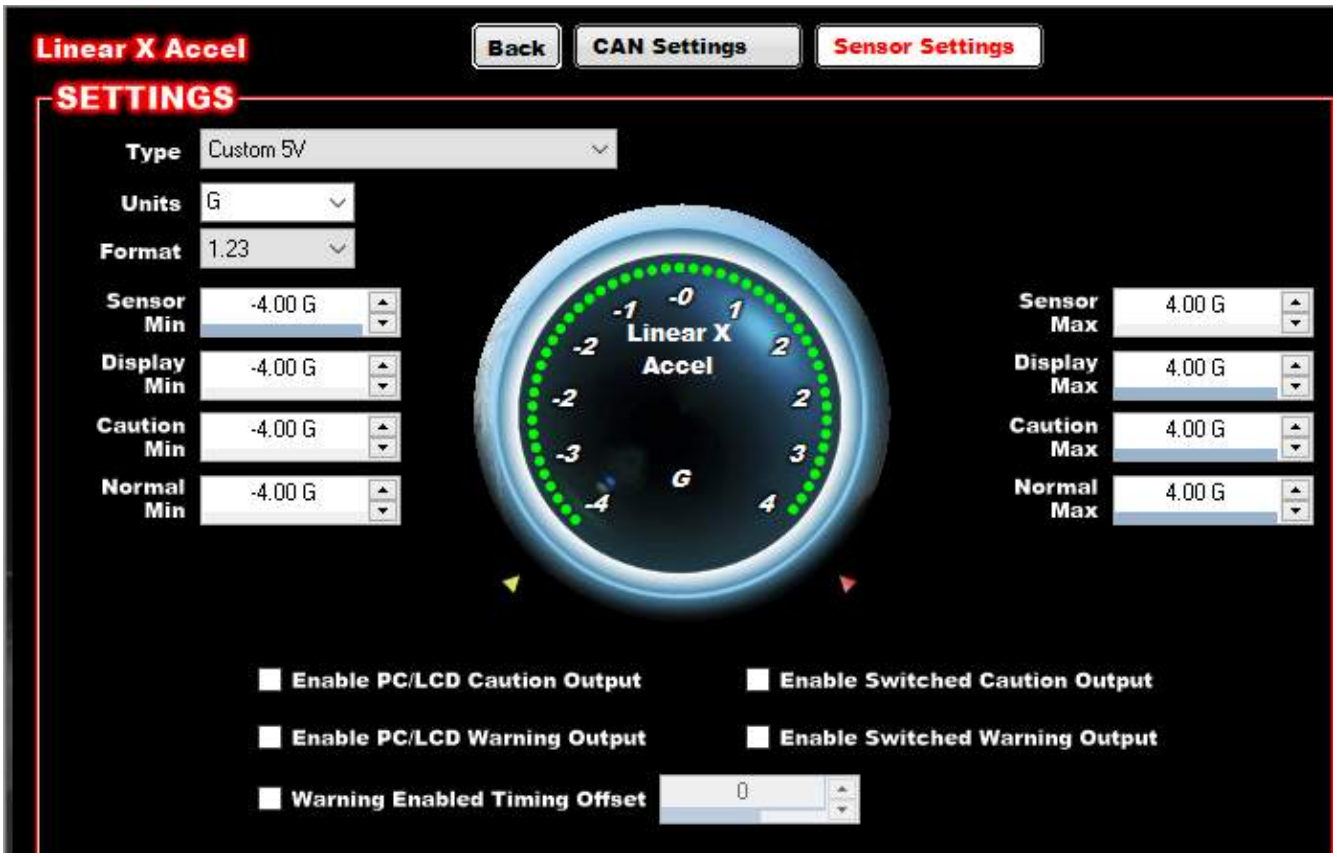
This completes setup of the Pitch Velocity Channel.

Linear Acceleration Channel Configuration

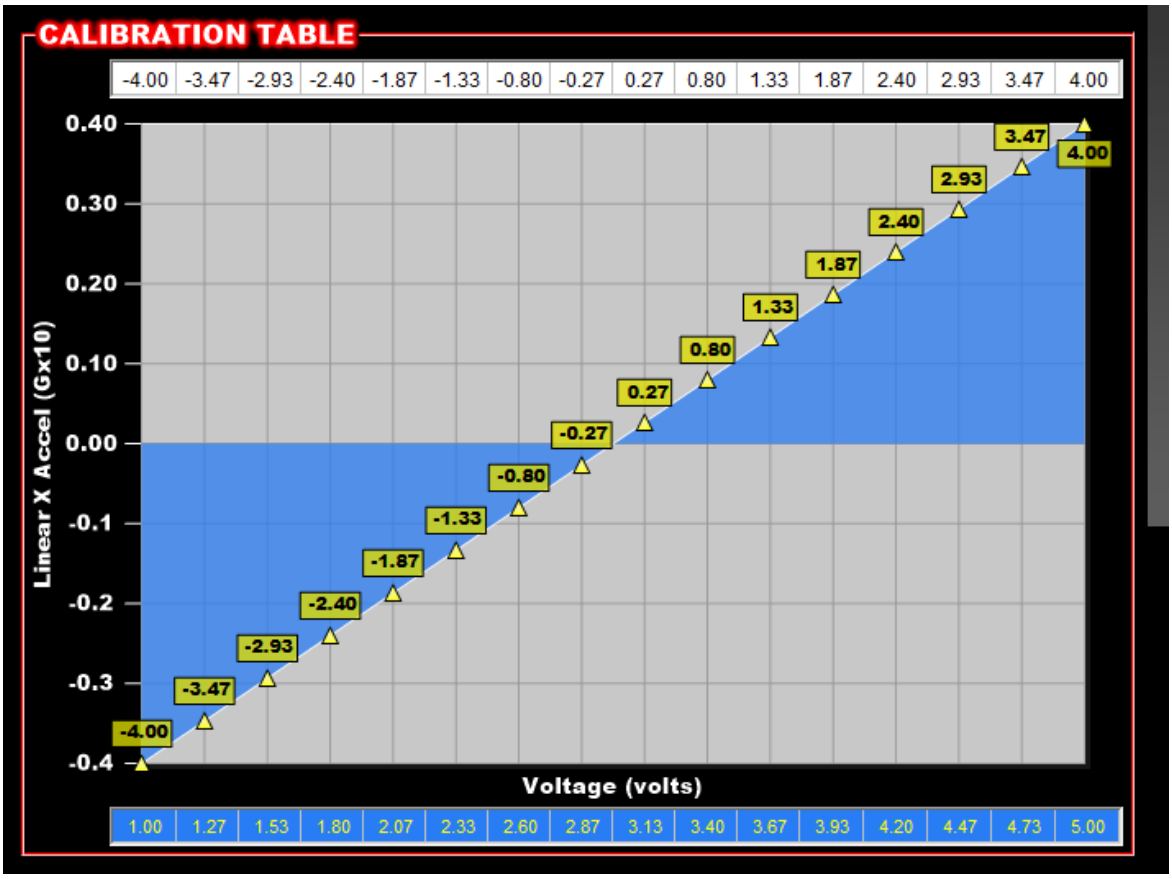
Navigate to your I/O Inputs menu, find the Linear X Accel input and click “Configure”



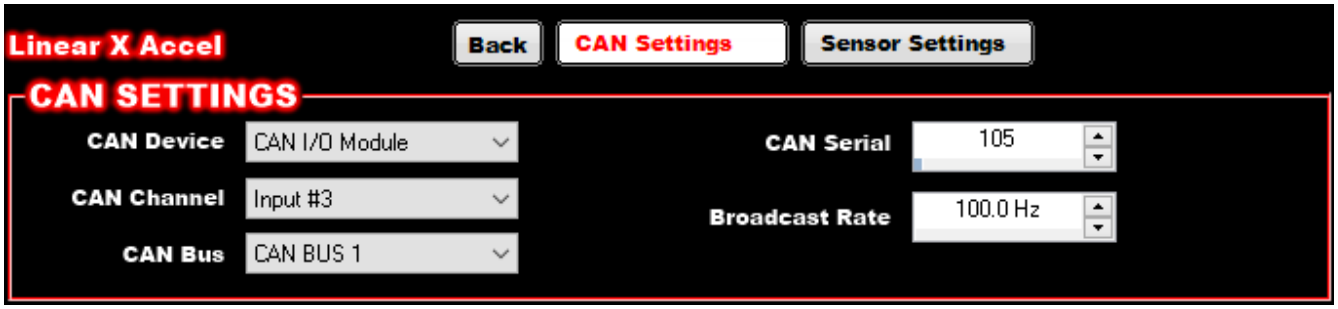
Set up your Linear X Accel sensor settings as follows: Custom 5v, Units = G, Format = 1.23, Sensor min = 4.00G sensor max = 4.00G



Set your Linear X Accel Calibration Table as follows: Gs (Top) row = -4.00 to 4.00, Voltage (bottom) row 1.00v to 5.00v. **Make sure you use 1.00 to 5.00v and -4.00 to 4.00G.**



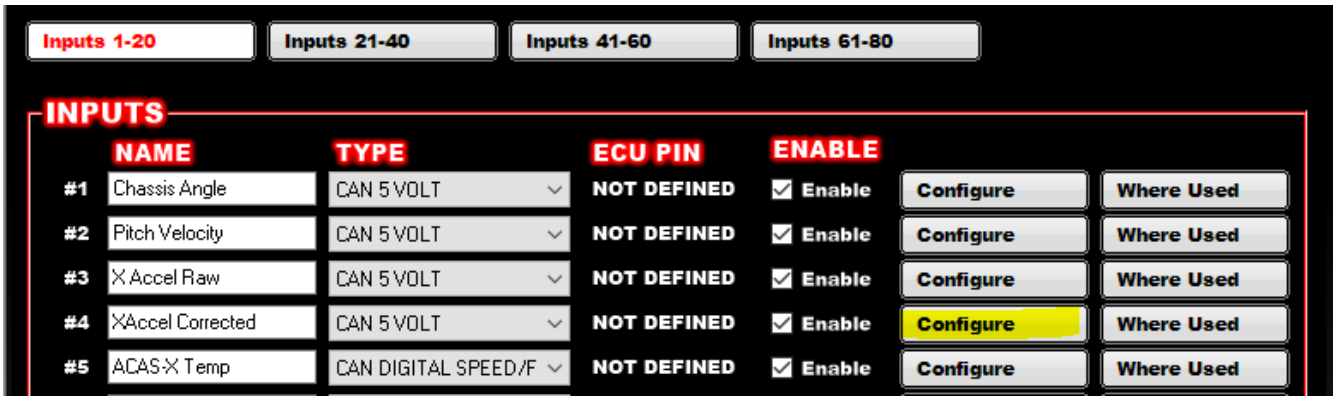
Click on “CAN Settings” and configure the Linear X Accel CAN options as follows: **YOU WILL USE THE CAN SERIAL NUMBER PRINTED ON THE BOTTOM OF YOUR ACAS-X**



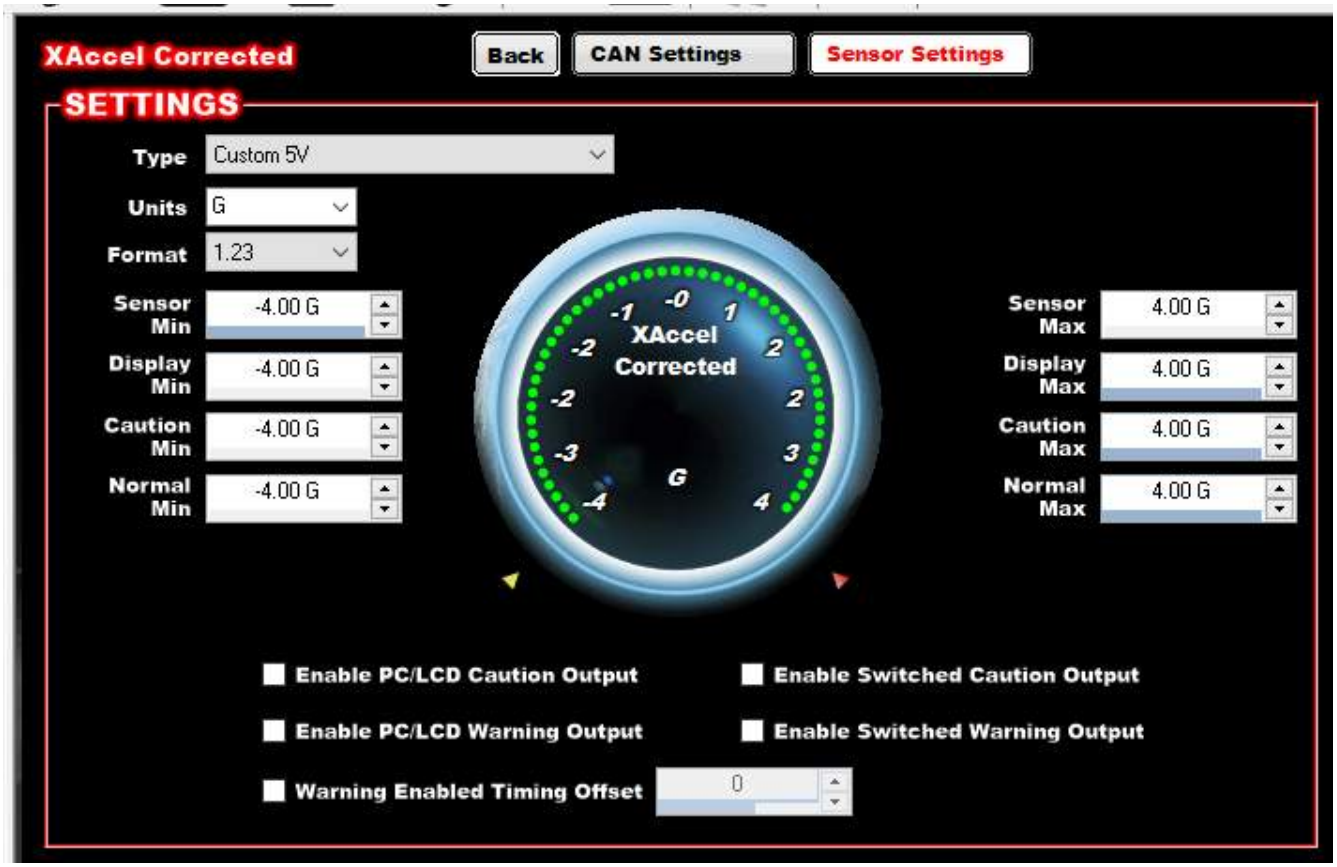
This completes setup of the Linear X Accel Channel.

Corrected Linear Acceleration Channel Configuration

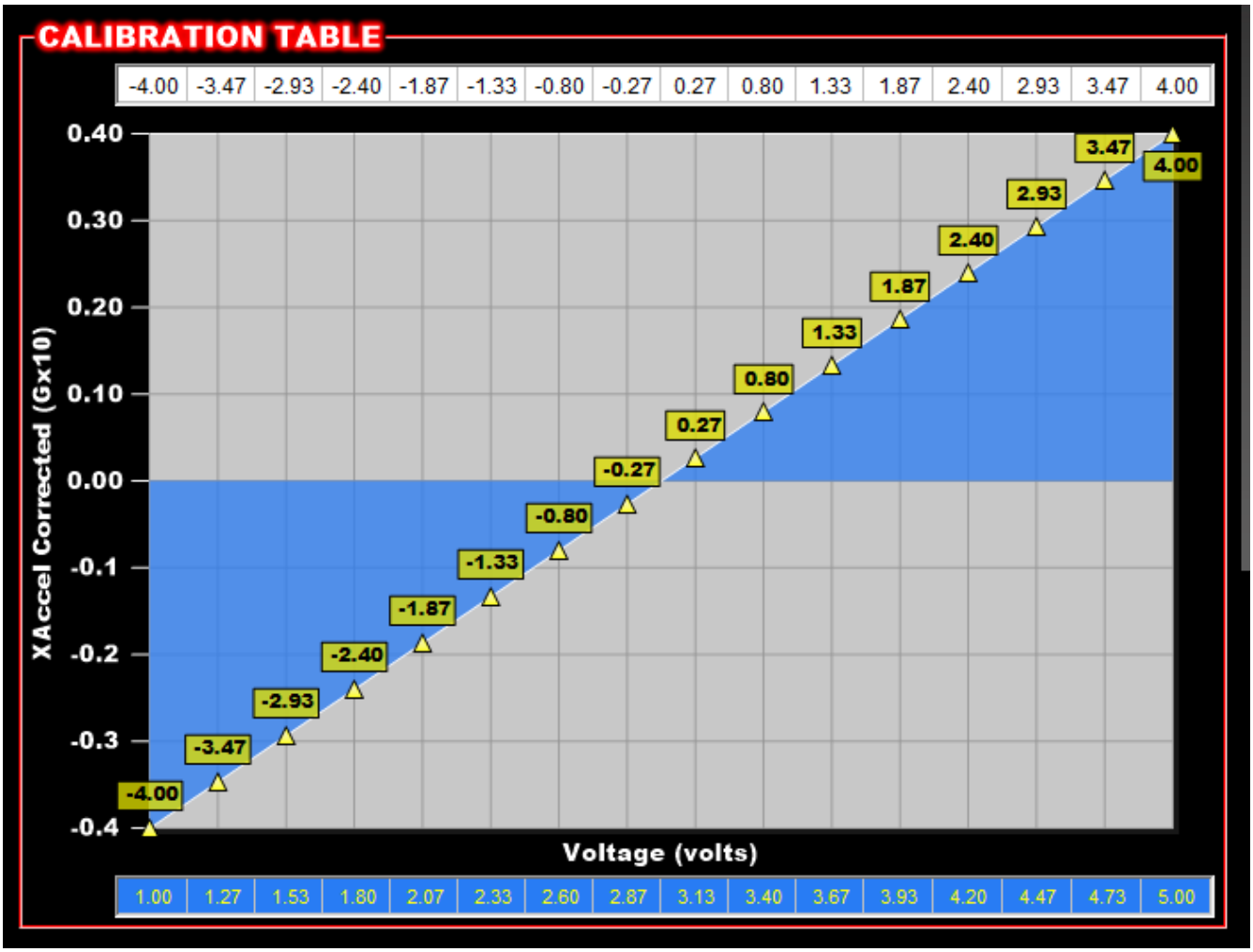
Navigate to your I/O Inputs menu, find the X Accel Corrected input and click “Configure”



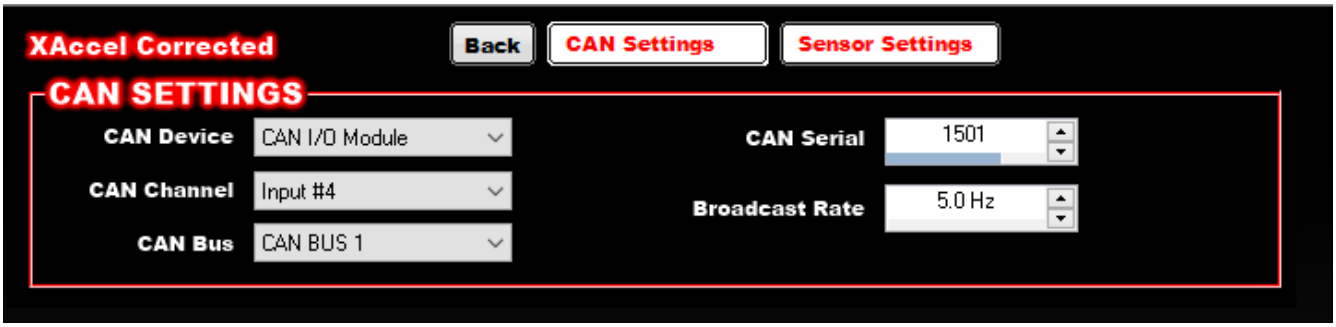
Set up your Linear X Accel sensor settings as follows: Custom 5v, Units = G, Format = 1.23, Sensor min = 4.00G sensor max = 4.00G



Set your Corrected X Accel Calibration Table as follows: Gs (Top) row = -4.00 to 4.00, Voltage (bottom) row 1.00v to 5.00v. **Make sure you use 1.00 to 5.00v and -4.00 to 4.00G.**



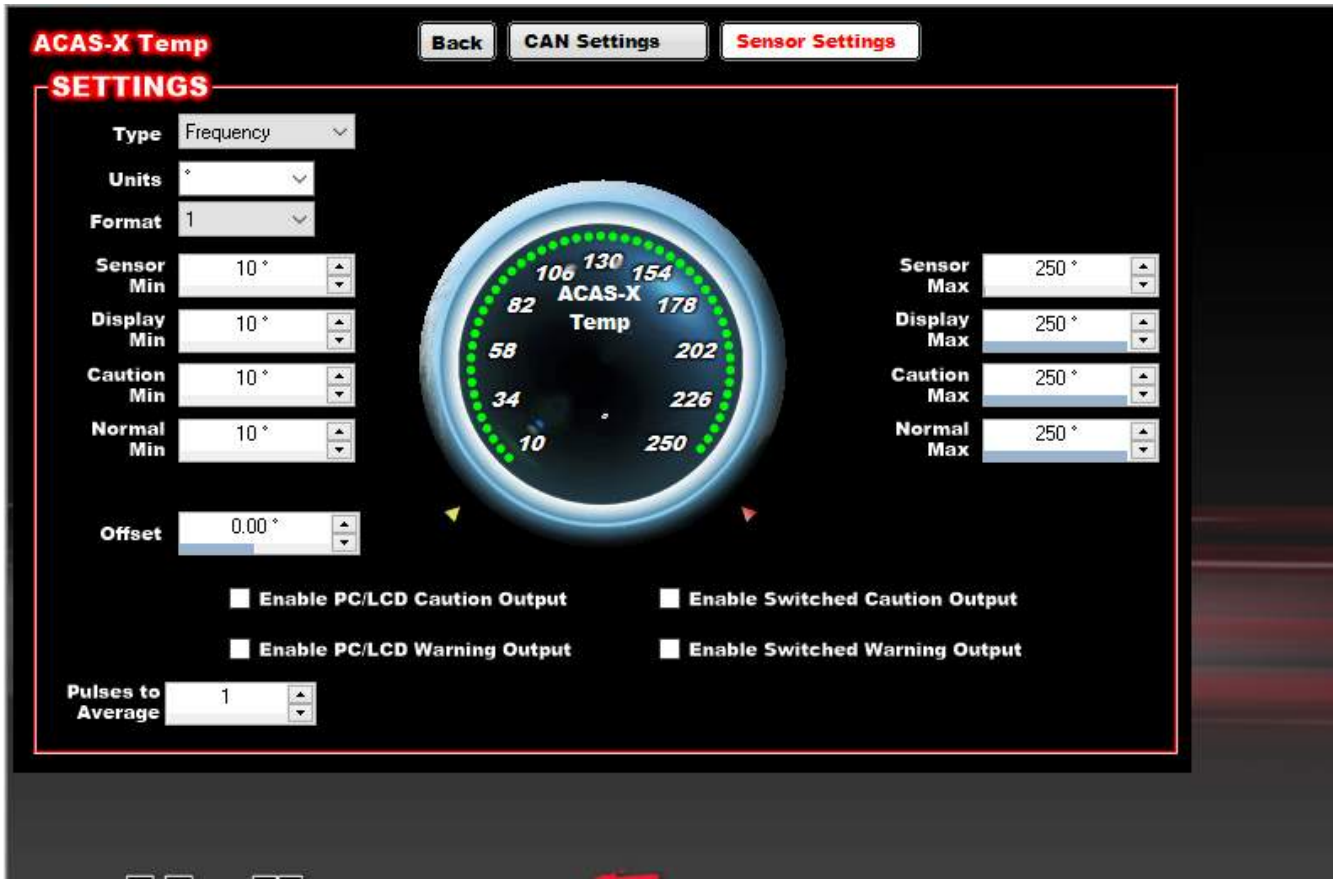
Click on “CAN Settings” and configure the Corrected X Accel CAN options as follows: **YOU WILL USE THE CAN SERIAL NUMBER PRINTED ON THE BOTTOM OF YOUR ACAS-X**

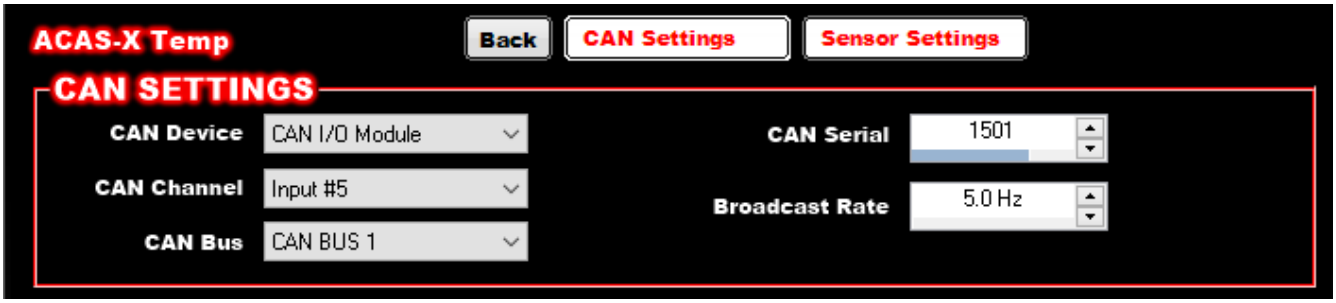


This completes configuration of the Corrected X Acceleration channel of your ACAS-X.

OPTIONAL: ACAS-X Temperature Channel

If you wish to capture the temperature of your ACAS-X 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-X 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.

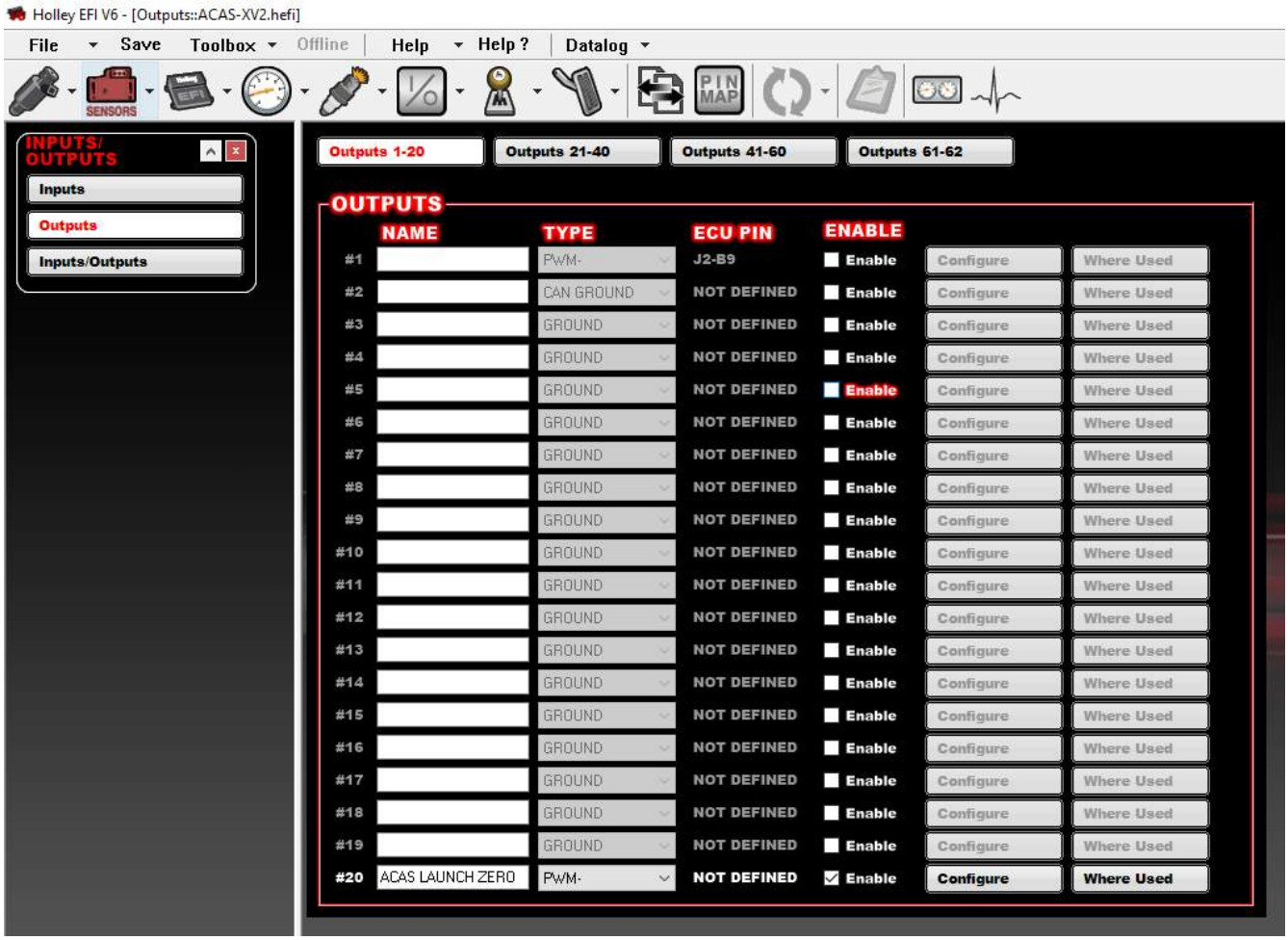
AutoZero

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.

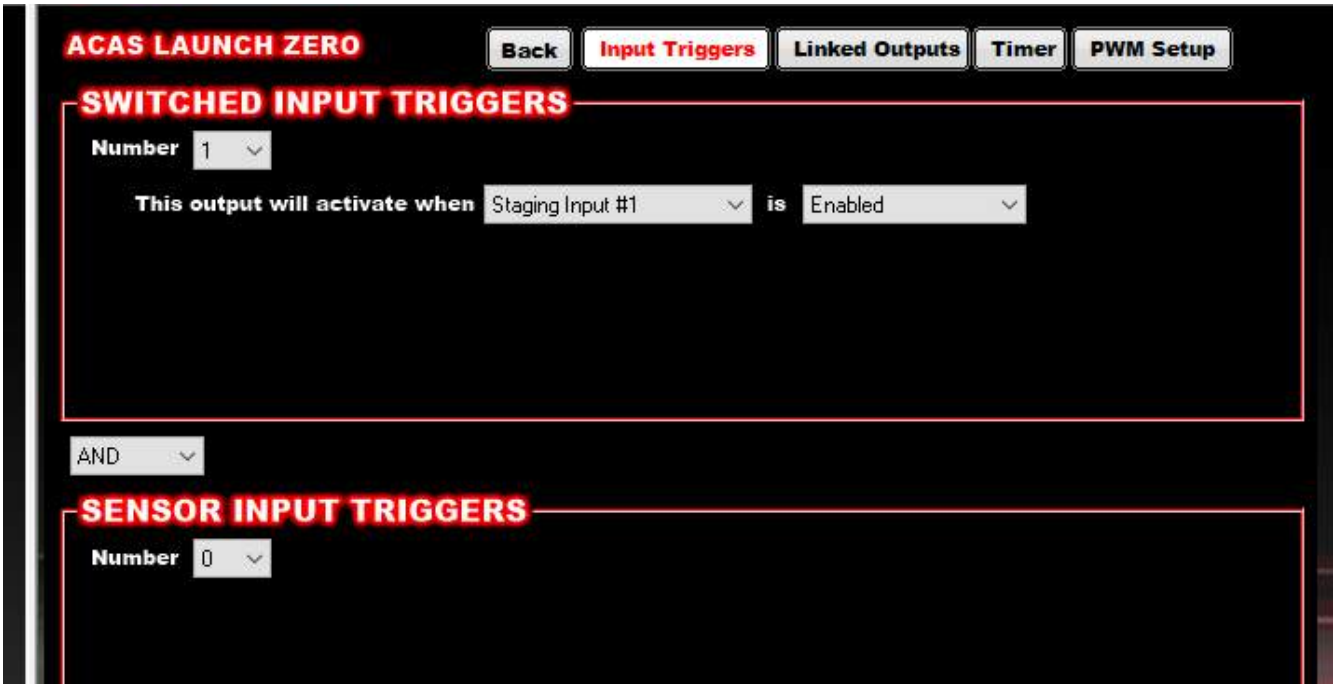
Triggered Zero

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:

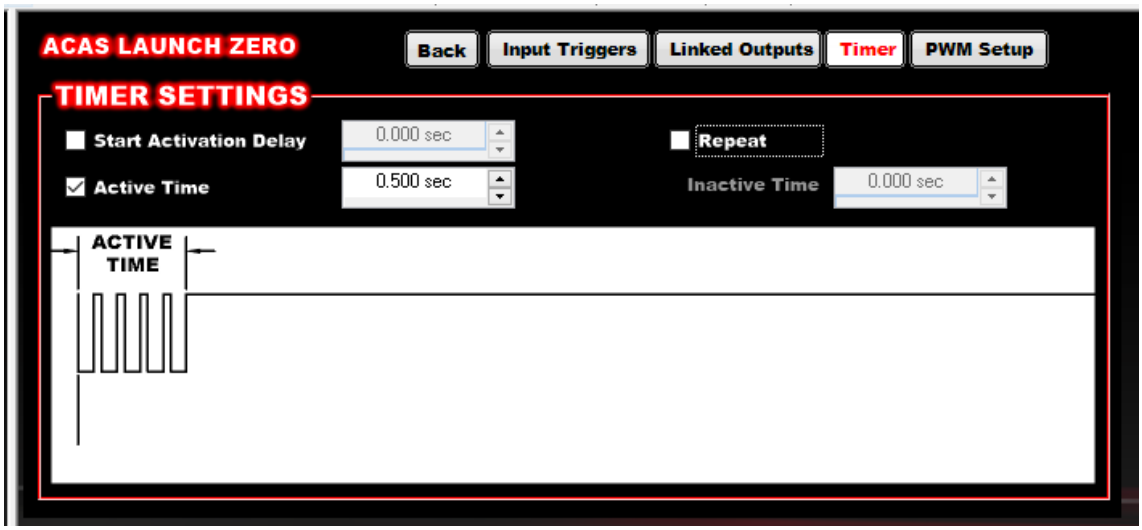
Navigate to your I/O menu, and select Outputs. Making sure you use Output #20, create an output configuration as seen below. Set the Type to PWM-, and check the Enable box.



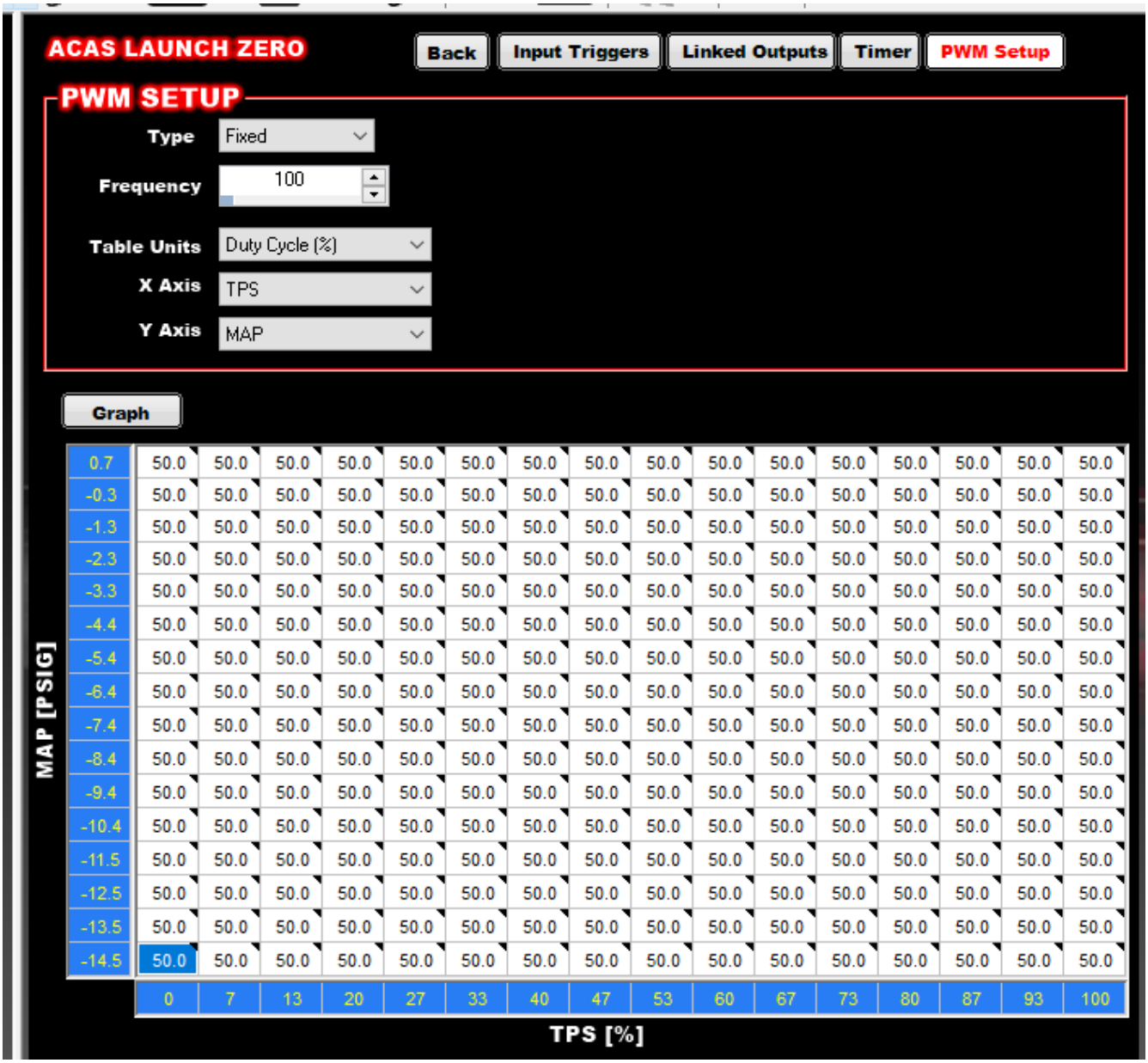
Click the “Configure” button and set up your Switched Input Triggers as seen below. Ideally you’ll want the ACAS-X to be triggered immediately when the button is pressed, so select whichever input you are using (Staging Input 1, or your manually-created trans brake button input), and select “Enabled.” 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:



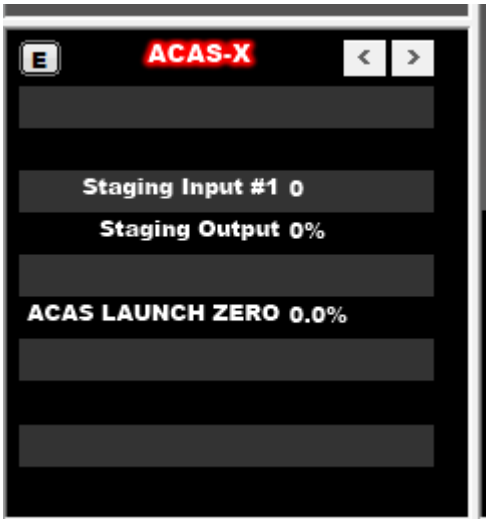
Finally, click on the “PWM Setup” button to set up the actual trigger signal for the ACAS-X. It’s a very specific 100hz, 50% duty cycle message that will trigger the ACAS-X to zero. Set it up exactly as shown in the next image. Note that the X/Y axes do not matter in this application, we left them at 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. If the bus measures 120 ohms or higher, it's time to install another terminating resistor. Most ECU or CAN device manufacturers/retailers sell them, or you can easily install a 120-ohm, ¼ watt resistor across the two CAN wires.

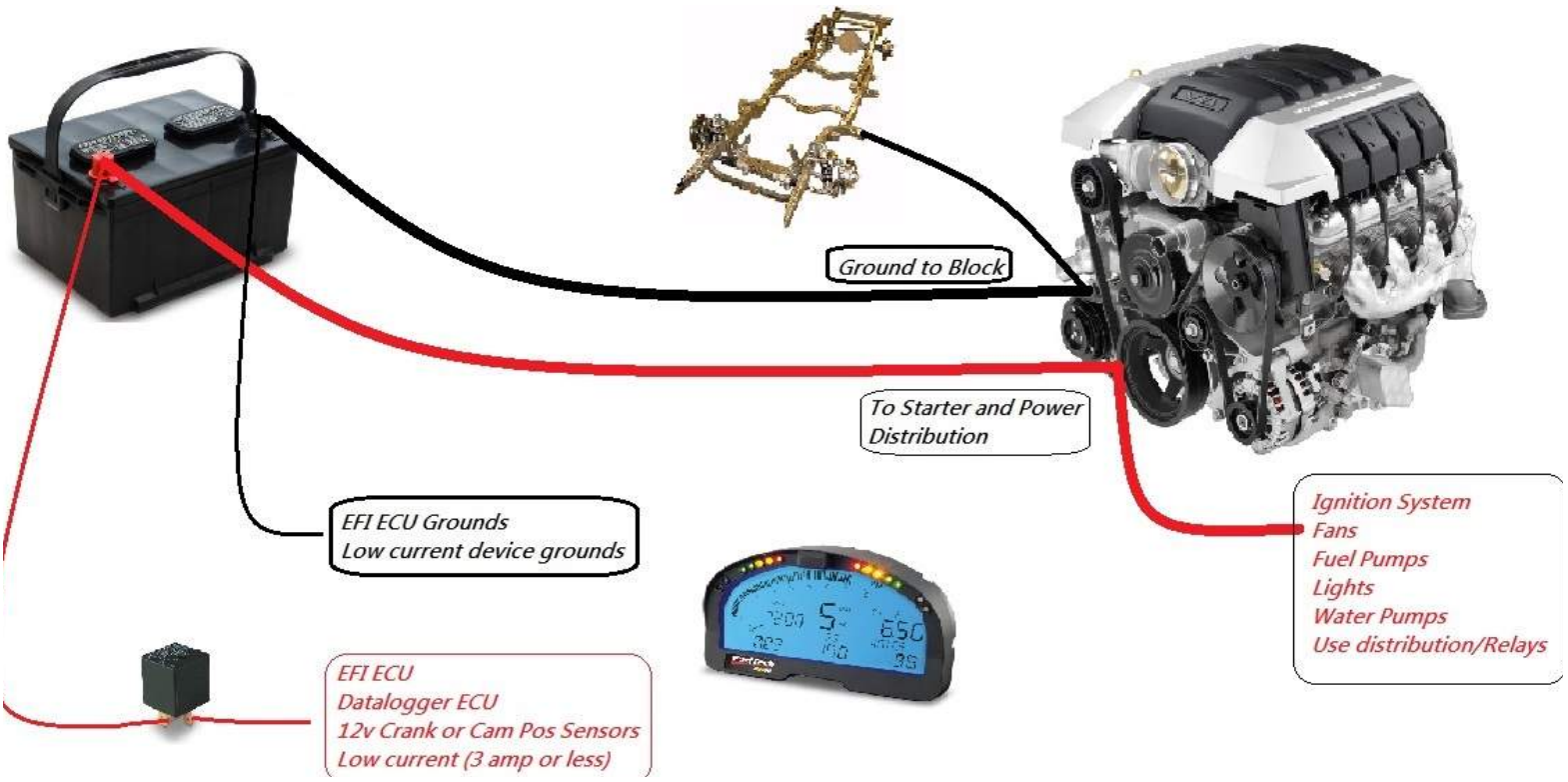
Make sure your node lengths are within specification (maximum 11" for CAN speeds 500kb/s-1000kb/s). It's a good idea to use twisted pair, or manually twist your CAN pair to reduce electrical noise that can interrupt/slow CAN traffic. We've even see Ferrite Cores that snap over your power and CAN wires that reduce or eliminate noise.

Try to use RESISTOR spark plugs whenever possible!! Nonresistor plugs, such as R5671 from NGK, wreak havoc on digital electronics due to high frequency AC voltage that is passed through power, grounds, and signal circuits in the vehicle. Make sure that the engine heads and block have a dedicated ground to battery negative, that is not shared with sensitive electronics (run a dedicated ground for electronics to battery). Use spiral core ignition wires to suppress as much of this noise as possible.

CAN Bus Tuning and Performance (ctd)

Chassis Power and Grounds

If this is a race / offroad or engine swap vehicle, try to arrange your power and grounds such that high current and low current devices have their own paths to battery (both positive and ground), as drawn in the image below. This separates devices that leave noise signatures on their power and grounds, from devices that are sensitive to that noise.



Dragdynamics.com Product Warranty

Limited 3-Year Warranty

Congratulations on your purchase of an ACAS-X! 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-X (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.