

AEM v96.3 Update for Infinity Series 3 and Series 5 Programmable ECUs

Feature change summary:

See specific Setup Wizard pages for tuning instructions. The following screen shots will highlight the specific areas where changes were made.

1. Increased Boost Target Functionality

The screenshot shows the 'Infinity-506 v96.3' software window. The left sidebar contains a tree view with 'Boost Control' selected. The main content area is titled 'Boost Control' and contains the following text and controls:

There are two 2D base duty tables in the calibration. They are named:

- BoostBaseDuty1 [%]
- BoostBaseDuty2 [%]

These two tables add together so the user can use one table as primary and the second as a trim if desired.

Similarly, there are four 2D boost target tables in the calibration. They are named:

- BoostTargetTable1
- BoostTargetTable2
- BoostTargetTable3
- BoostTargetTable4

These four tables add together.

Both sets of tables allow the user to select from many possible X or Y axis inputs.

Boost Output Enable

Boost Feedback Enable

Base Duty Tables Axis Setup

Boost Base Duty Table1 X-Axis: EngineSpeed [RPM]

Boost Base Duty Table1 Y-Axis: BoostTarget [kPa]

Boost Base Duty Table2 X-Axis: Gear

Boost Base Duty Table2 Y-Axis: AirTemp [C]

The outputs from these two tables are ADDED together to equal the channel BoostBaseDuty [%]!

Boost Target Tables Axis Setup

Boost Target Table1 X-Axis: FlexContent [%]

Boost Target Table1 Y-Axis: Throttle [%]

Boost Target Table2 X-Axis: Gear

Boost Target Table2 Y-Axis: InjPressure [psig]

Boost Target Table3 X-Axis: Gear

Boost Target Table3 Y-Axis: Throttle [%]

Boost Target Table4 X-Axis: AirTemp [C]

Boost Target Table4 Y-Axis: CoolantTemp [C]

The outputs from these four tables are ADDED together to equal the channel BoostTarget [kPa]!

At the bottom of the window, there is a status bar with 'F1 for Tuning Guide', 'v2.96 Build 03/07/2017', and a 'Close' button.

2. New Idle Learning Function

Infinity-506 v96.3

Basic Setup

- Engine
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- Advanced Setup
 - Accel and Decel Fuel
 - Advanced Trims
 - Boost Control
 - Engine Protection
 - Idle**
 - Ignition Coil Dwell
 - Input Function Assignments
 - Knock Setup
 - Lambda Control
 - Launch Antilag
 - Launch Timer
 - Main Rev Limiter
 - Nitrous N2O
 - Rev Limit 2 Step
 - Rev Limit 3 Step
 - Shift Cut
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 - Traction Control
 - USB Logging
 - VVC
 - Diagnostics
- Outputs

Idle

Use the table 'IdleTarget' to set the ECU's desired engine idle speed depending on coolant temperature, and the table 'IdleBasePosition' to set the open-loop idle airflow position. When Idle Feedback conditions are met, the ECU can make closed-loop feedback adjustments to the IdlePosition to minimize the difference between the desired IdleTarget and the measured EngineSpeed.

Idle Activation Criteria

Idle On Below TPS: 2.0 %

When using drive-by-wire, note that this will disable idle feedback based on the APP1 signal.

Idle On Below RPM: 1800 rpm

Idle Feedback Min: -10.0 %

Idle Feedback Max: 10.0 %

- Show Feedback Setup
- Show Idle Ignition Trim
- Show Trims and Offsets
- Hide Idle Self-Learn**

When Idle Self-Learn is enabled, the IdleLearn table will add a long-term trim to the base idle position when idle feedback values are outside the Idle Learn Deadband window. The option 'Idle Learn Gain' is a multiplier for adjusting the IdleLearn amount. Idle Learn Min/Max define the maximum allowed values for the IdleLearn table cells.

Idle Self-Learn Enable:

Idle Learn Deadband +: -2.0

Idle Learn Deadband -: -6.0

Idle Learn Gain: 0.50

Idle Learn Min: -30.0 %

Idle Learn Max: 30.0 %

- Show Stepper IACV Setup

3. New Throttle High Timer Function

Infinity-506 v96.3

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Advanced Setup

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Throttle High Timer

The ECU can modify the target lambda to increase the safety margin during sustained periods of full throttle. The timer 'ThrottleHighTime [ms]' will count up while Throttle is greater than the 'Timer On Above' setting, and count down while Throttle is less than the 'Timer Off Below' setting. The timer 'ThrottleHighTime [ms]' can also be referenced by boost control and ignition trim tables for additional means of increasing safety margin.

Throttle Timer On Above: 99 %

Throttle Timer Off Below: 50 %

LambdaTrim_ThrottleHi is a table for modifying the ECU's LambdaTarget. Note that LambdaTarget is used for both open-loop and closed-loop fueling calculations, so this table should be used to define when the engine should run an extra rich AFR.

ThrottleHighTime [ms]	LambdaTrim ThrottleHi [Lambda]
2000	0.0000
5000	0.0000
10000	0.0000
15000	0.0000
20000	0.0000
25000	0.0000
30000	0.0000

Hide Advanced Setup

The lambda trim can be disabled at low RPM to avoid interfering with engine stability at idle.

Throttle Timer Lambda Trim Minimum Engine Speed: 3000 rpm

Throttle Timer Time Out: 30.000 s
The timer will stop counting when it reaches this value.

Throttle Timer Decay Gain: 200 %
The timer will count down while Throttle is less than the 'Timer Off Below' setting. The option 'Throttle Timer Decay Gain' can be used to adjust how quickly the timer counts down. Setting this to 200% will make the timer count down twice as quickly as it counts up.

4. Simplified Lambda/Wideband Input & Naming Setup

- with option for feedback from AEM X-Series CAN data

Infinity-506 v96.3

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Tuning Preferences

Cam/Crank

Injector Setup

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Advanced Trims

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Engine Protection

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Input Function Assignments

Knock Setup

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Launch Timer

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Nitrous N2O

Rev Limit 2 Step

Rev Limit 3 Step

Shift Cut

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Output

Input Function Assignments

Use the selections below to configure hardware inputs.

Analog 0-5V & Modes | Switches | Speed & Frequency | Temps | Axis

Function	Channel	Pin	Raw	Scaled
Barometric Pressure Sensor Setup	Analog10 [V]	C1-75	0.00	1.00
Coolant Pressure Sensor Setup	Analog11 [V]	C1-74	0.00	0.00
Charge Out Pressure Setup	Analog16 [V]	C1-71	0.00	0.00
Crankcase Pressure Sensor Setup	CCP_Mux		0.00	0.00
Exhaust Pressure Sensor Setup	Analog11 [V]	C1-74	0.00	101.00
Lambda 1 Input	X-Series 1 Lambda		0.00	none
Lambda 2 Input	X-Series 1 Lambda		0.00	none
Gear Position Input Setup	GearRatio		0.00	0.00
ModeSwitch Input Setup	Disabled		0.00	0.00
Traction Control SlipTargetTrim Input Setup	ModeSwitch		0.00	0.00

Pin Out...

Lambda 1 Input

Select Lambda3 to use the 0-5V signal from external devices.
 Select X-Series 1 Lambda or X-Series 2 Lambda to use the digital CAN broadcast from AEM X-Series wideband devices.

Live Data

Raw	Scaled
0.00	N/A

Lambda 1 Input: X-Series 1 Lambda

A calibration table is not necessary when working with X-Series CAN data.
 The ECU will receive the exact message that was broadcast by the device without any voltage offset or scaling errors.

5. Throttle as Input for Additional Tables for Alpha-N use

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Advanced Trims

There are multiple tables that can adjust Fuel, Lambda, and Ignition trims. Use the options below to configure which channels are used as inputs for each trim table.

Show FuelTrim Input Selection

Show LambdaTrim Input Selection

Show IgnTrim Input Selection

Hide Misc Input Selection

The FlexCrankingAdder Table can be used to add injector pulse width during cranking based on flex content.

Flex Cranking Adder Table y-axis: CoolantTemp [C]

The table StagedSplit can be used to manually control the percentage of total fuel volume to be delivered via the primary injectors on staged injection setups.

StagedSplit Load Axis selection: MAP [kPa]

The tables 'Inj1Trim - Inj8Trim' are percentage modifier tables for adjusting fuel delivered to specific injector outputs.

Inj1Trim - Inj8Trim y-axis: MAP [kPa]

CrankVE_Table y-axis: Throttle [%]

IgnTrimAirTemp y-axis: Throttle [%]

IgnTrimCoolantTemp y-axis: Throttle [%]

FI_TimingX Table y-axis: Throttle [%]

6. New Oil Pressure Protection Minimum Engine Running Time option

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Outputs

The ECU can cut fuel and/or spark to prevent engine damage during overboost, low oil pressure, and lean conditions. Use the Engine Protection Wizard to set criteria for which the Engine Protection will respond.

MIL Output

Enable MIL Output

When enabled, the MIL function will be active when a sensor error is detected. This function can be assigned to an output in the Output Function Assignment section.

Sensor error channels include ErrorAirTemp, ErrorBaro, ErrorCoolantTemp, ErrorEBP, ErrorFuelPressure, UEGO_0_Diag_error, UEGO_1_Diag_error, ErrorMAP, ErrorOilPressure, and ErrorThrottle.

Latch and hold MIL Output when triggered

Activate MIL when EngineProtectOut is active

Latch and hold EngineProtectOut when triggered

Overboost Protection

Max Boost Limit 220 kPa
ECU will cut fuel and spark if boost ever exceeds this value.

OverBoost Allowed 100 kPa
ECU will cut fuel and spark if boost exceeds the Boost Target by this much.

Throttle Position Reset 30 %
After BoostCut has been triggered, it will remain active until boost decreases to a safe level and the throttle is decreased below this value.

Oil Pressure Protection

The minimum allowable oil pressure must be defined using the 1D table 'OilPressProtectTable [psig]'. If the measured pressure remains lower than the value in the table for longer than the 'Oil Pressure Protection Activation Delay' time, the ECU will activate the 'Oil Pressure Protection Rev Limit'.

Oil Pressure Protection Enable

Oil Pressure Protection Minimum Engine Running Time 1 s

Oil Pressure Protection Activation Delay 1.50 s

Oil Pressure Protection Rev Limit 3000 rpm

7. Additional Lambda Feedback Conditions

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Lambda Control

Use the Lambda Control wizard to set the Lambda Activation Criteria using min/max engine speed as well as min/max engine load (MAP kPa).

The Advanced Setup allows the user to modify the Lambda PID feedback gains: Proportional (instantaneous error), Integral (sum of errors), and Derivative (error rate of change). Adjusting the feedback gains will affect the response time, accuracy, and stability of the control loop. Gains that are set too small can result in sluggish response to changing AFRs, while gains set too large can result in overshooting, oscillations, and overall system instability.

UEGO 1 Sensor Installed

Lambda Enable

Lambda Feedback Enable

Lambda Feedback Rich Limit 15.0 %

Lambda Feedback Lean Limit -10.0 %

Lambda Activation Criteria

Lambda Feedback Min Speed 800 rpm

Lambda Feedback Max Speed 10000 rpm

Lambda Feedback Min Load 5 kPa

Lambda Feedback Max Load 700 kPa

[Show LambdaFB_P Table Setup](#)

[Show LambdaFB_I Table Setup](#)

[Hide Advanced Setup](#)

Lambda Feedback Proportional and Feedback Integral Gain must be adjusted using the 1D tables 'LambdaFB_P' and 'LambdaFB_I'. The gain can be adjusted per RPM

Lambda Feedback Derivative Gain 0.005

Lambda Feedback After-Start Delay 15 s

Lambda Feedback Max ThrottleRate 100

Lambda Feedback Max WallWetting 20

Lambda Feedback ReArm Time 0.85 s

LambdaTarget Table Y-Axis MAP [kPa]

8. MIL and Engine Protect warning functions can latch and remain on when triggered

