PRO-FLO® 4

ELECTRONIC FUEL INJECTION

Quick Start Guide & E-Tuner User's Manual

Edelbrock®

TABLE OF CONTENTS

General Mobile Device Recommendations..... 1

E-Tuner Home Menu Overview..... 2

Bluetooth Pairing.....3-4

Quick Start Guide 4-5

Setup Wizard: Naturally Aspirated 5-9

Setup Wizard: Forced Induction 9-13

Advanced Tuning Menus.....14-22

ECU & MAP Settings.....22-23

E-Tuner Gauge Displays..... 24

Edelbrock E-Tuner Display Definitions..... 25

Pro-Flo 4 Naturally Aspirated Tuning Guide.....26-27

Pro-Flo 4 Forced Induction Tuning Guide.....28-30

Please visit the Edelbrock Support Forum for the latest Pro-Flo 4 news and important updates:

https://forums.edelbrock.com/

GENERAL MOBILE DEVICE RECOMMENDATIONS

The Edelbrock EFI E-Tuner app is compatible with most Android and IOS based Smartphones and tablets. However, due to slight variations in device specifications and operating systems, some devices may work better than others, and in rare cases, some devices may not function at all. Any device that is known to be "incompatible" or "problematic" will either be specified on the App Store page or will fail to download.

NOTE: *All information in this guide is also available in app by pressing the help icon* *in the upper right hang corner.*

Device Types:

Smartphones (5" – 6") or Tablets (7" – 8")

Screen Resolution should be at minimum 1024 x 600 pixels.

NOTE: *Screens sizes in the 3" - 4" or 10" - 12" range, or screens with lower resolutions are supported but not recommended for the E-Tuner App.*

Bluetooth

It is recommended that the Mobile device has at least Bluetooth 2.0 or higher.

NOTE: *Not all devices with Bluetooth may communicate properly with the Edelbrock ECU.*

WI-FI / Data (3G/4G)

Wi-Fi or a Data Plan will be necessary for downloading the E-Tuner app from the App Store and for downloading any updates that may be released.

To Download or Update the App

Open the App Store and search for "Edelbrock E-Tuner PF4". This will require a Google or Apple Account, if one is not set up, follow the on-screen tutorial to do so.

Edelbrock may periodically push out updates to the app. It is highly recommended to download these updates as they will include vital improvements as well as bug fixes.

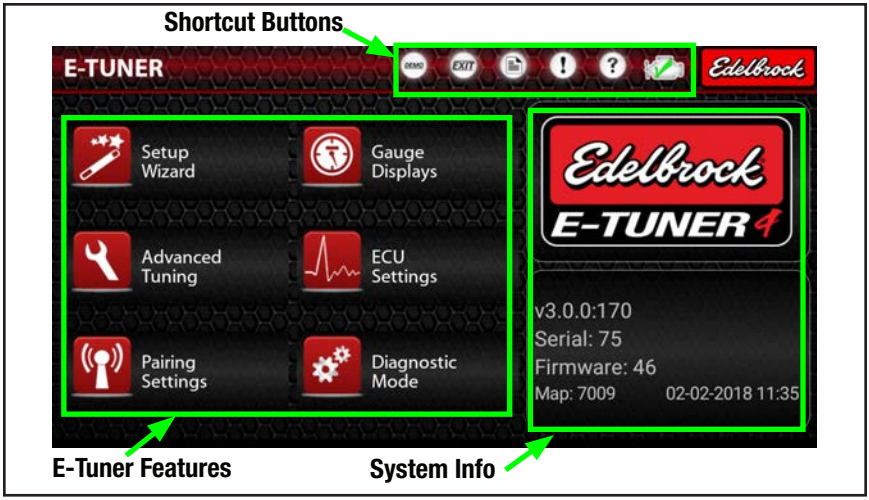
To check for updates, go to the App Store or the Edelbrock website.

Starting the Edelbrock E-Tuner App:

From your mobile devices Home Screen, find the Edelbrock E-Tuner icon and select it. The icon may be on a different part of the home screen, or select the "All Apps" icon and find it in that menu.

E-Tuner Home Menu Overview

The E Tuner APP and Tablet are for setting up, tuning and troubleshooting the Pro-Flo 4 EFI system. The Tablet does not have to be permanently used for the EFI system to operate.



All of the E-Tuner's functions can be conveniently accessed directly from the main menu.

E-Tuner Features

Setup Wizard - Initiates E-Tuner's step-by-step guide to selecting & loading a proper base calibration for your specific engine combination.

Advanced Tuning - Provided to make modifications beyond the basic settings that were configured during the initial setup of the Pro-Flo 4.

Pairing Settings - Use this menu to pair an Android device with the Pro-Flo 4 ECU.

Gauge Displays - Displays essential parameters to monitor proper Pro-Flo 4 performance.

ECU Settings - Contains all the functions related to saving and restoring the ECU's map and firmware settings.

Diagnostic Mode - Diagnostic Mode can be used to help determine if a sensor is unplugged, damaged or otherwise reading outside of its expected range. If the vehicle runs poorly, check the status of each of the parameters on this page.

Demo Mode - Use to preview the main E-Tuner app features without being connected to the ECU.

System Info - This screen will display the system info when connected to an ECU (Serial #, ECU Firmware, Map, EFI System, and App Version).

Main Menu Shortcut Buttons - Exit, Installation Documents, Warnings, Help, and Connection Status.

The HELP icon provides detailed information regarding the selected menu page currently in use.

Pairing Settings:

The ECU must be paired to a Tablet or Cell Phone and powered ON before attempting to connect. All ECU connections can be managed from the E-Tuner's Pairing Settings menu.

Bluetooth Pairing:

To pair your Bluetooth enabled Tablet or Cell Phone follow the pairing instructions below. E-Tuner will search for a Pro-Flo 4 ECU that is within a "discoverable" range. This discovery range should be as close as possible, within 10-15 feet of the ECU for best results. However, this can vary between different smartphones, tablets, and vehicles. The chances of successfully pairing will decrease if the bluetooth device is too far away from the ECU or if the signal is too weak.

To Pair with an ECU:

- Turn the ignition to the ON position to power on the ECU.
- Press ECU Search and wait for your ECU to be listed. Pro-Flo 4 ECU's are identified by their six digit serial number: PF4 SNXXXXXX.
- Select your ECU and press OK to start connecting.
- The top of the screen will flash yellow and the hourglass icon will spin while the app tries to connect.
- If the pairing and connection are successful, the app will show a green check mark icon. Once connected, the Setup Wizard (see Quick Reference Guide) can be used to configure the ECU with a calibration specific for your engine configuration, watch the Gauge Displays to monitor the system, or change settings in the Advanced Tuning Section

Connecting to the ECU, After Pairing:

It should not be necessary to repeat the pairing procedure once the pairing code has been entered and the Android device and the ECU are connected. NOTE: If the ECU is deleted or unpaired, it will be necessary to revisit the Pairing Procedure menu before any further communications can be made.

The **Connection Button** is to start or stop a connection with the ECU when the system is powered on. This is shown in the upper right-hand corner of the menu, next to the Edelbrock Logo.

Connection Button

To Start Connecting to an ECU: Key ignition power on and press the connection button while a RED X icon is shown. This icon will turn into a rotating hourglass and a yellow bar will flash at the top of the screen until E-Tuner is connected. This icon will turn into a GREEN check mark when E-Tuner is connected with the ECU.

To Stop a Bluetooth Connection: Press the GREEN check mark icon. The icon will return to a RED X. This may take a few seconds to disconnect.

Bluetooth connection will also be stopped each time the app is closed. If the flashing yellow bar is active on the menu, the Connection Button can be pressed to open a popup with quick access to the **Pairing Settings Menu**.

Notes on how the E-Tuner connects to the ECU:

- During a key OFF event, the ECU requires 10 seconds to fully shut down. The GREEN check may continue to display for a few seconds before becoming a RED X.
- If the ECU was connected with the E-Tuner app and a different app is toggled to, E-Tuner will try to reconnect the next time the app is resumed.
- If the app is having a hard time connecting, the best recommendation is to turn the ignition off and wait until the RED X appears and then turn the ignition back on.
- If the ECU is turned off while the app is connected, the Bluetooth connection must be reestablished by pressing the RED X.

QUICK START GUIDE

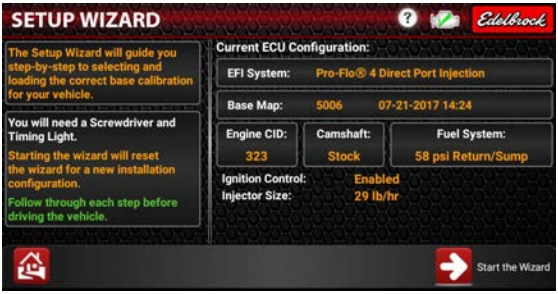
Please follow these steps to use the Setup Wizard. Your Tablet or Cell Phone must first be paired with the ECU before using the Setup Wizard – see Page 15.

TOOLS NEEDED

- Flat tip screwdriver
- Timing light (for engines with distributors only – not required for LS engines)

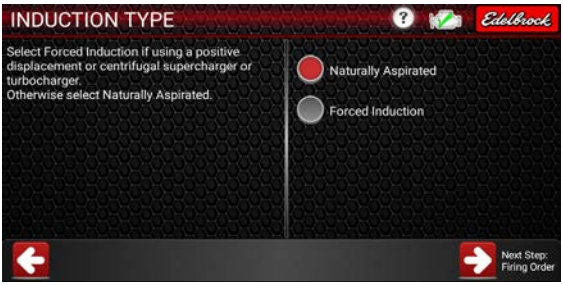
1. Power on the phone or tablet that will be paired with the ECU and verify it is adequately charged.
2. Find the E-Tuner App. icon on the home screen and tap it to launch the E-Tuner App.
3. With the ignition switch turned ON, tap the engine icon with RED X to connect the ECU. The title bar across the top of the screen will flash yellow indicating that the device is attempting to communicate with the ECU. Once E-Tuner connects to the ECU, the engine icon will show a GREEN check.

4. Tap the Setup Wizard icon. Once the Wizard opens, tap the Start the Wizard right arrow.



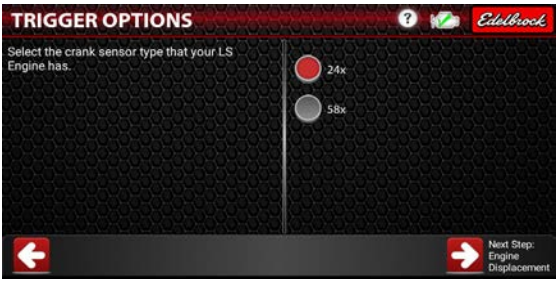
SETUP WIZARD FOR NATURALLY ASPIRATED

1. Select the engine's induction type. If Naturally Aspirated, continue with the steps below. If Forced Induction, go to Page 8. Tap Right Arrow to continue.

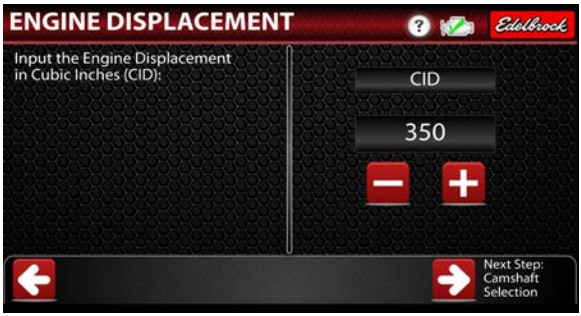


2. Select the engine firing order for your application. Tap Right Arrow to continue.

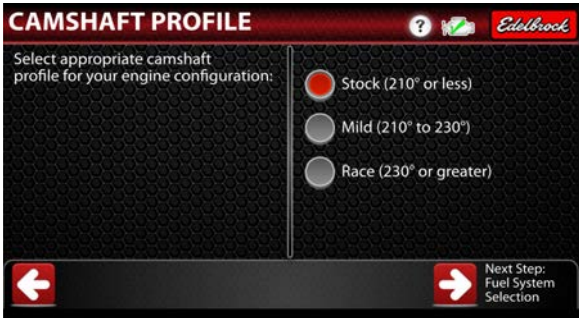
2b. If engine is Chevy LS, choose trigger type: 24x or 58x. Tap Right Arrow to continue.



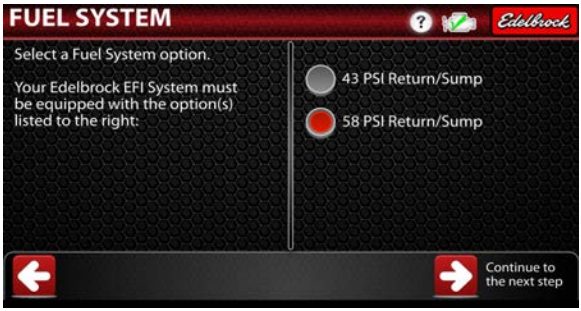
3. Use the "+" and "-" buttons to enter the displacement of your engine. Tap the Right Arrow to continue.



4. Select the proper camshaft profile. Please refer to the cam card included with your camshaft, if applicable. Tap the Right Arrow to continue.

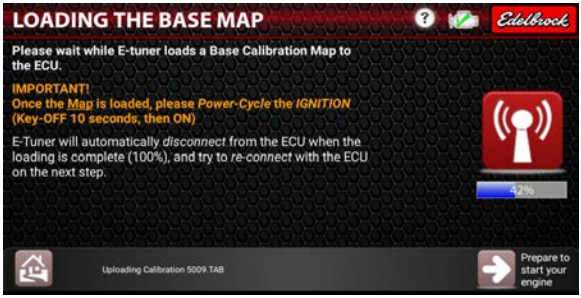


5. Select the fuel pressure being used. Refer to Setup Wizard Map Matrix in the back of the kit installation instructions for proper fuel pressure setting for your configuration. Tap the Right Arrow to continue.

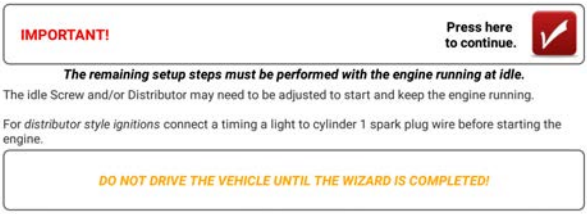


6. Select the injector size included on your kit. Displayed fuel injector flow sizes vary depending on available base calibrations for your configuration. The color band on injector body indicates injector size. White=29lb/hr, Green=35lb/hr, Orange=42lb/hr & Blue=60lb/hr. Tap the Right Arrow to continue.

7. The Wizard will automatically start loading a base map. When the map is finished loading, you will be prompted to power cycle the ECU. Turn the ignition switch off, wait for the main relay to click off (approx. 10 seconds) and then turn the ignition switch back on. Tap **OK** to close the popup window then tap the Right Arrow to continue.



8. Read the important warning then tap the check mark to continue. ***Do NOT start the engine or drive the vehicle until prompted to do so.***

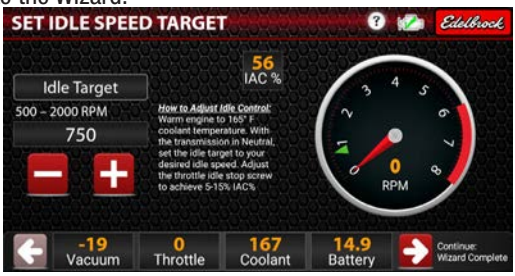


9. For LS engines, skip to step 11. Connect a timing light to cylinder #1 spark plug wire.
   a. Click the Set Base Timing icon to lock the timing at 12° BTDC.

   b. Start the engine and adjust the throttle body screw, as needed, to maintain idle. **Do NOT drive the vehicle yet.**

   c. With a timing light, rotate the distributor until the ignition timing shows 12° BTDC, then tighten down the distributor clamp.
   d. Tap Unlock Timing and continue to let the engine warm up to 165°F. Once engine is fully warmed up, tap the Right Arrow to continue.

10. Set Idle Speed Target to desired RPM.
   a. If engine temp is above 165°F, use the "+" and "-" buttons to set the Idle Target to desired RPM.
   b. Once Idle Target RPM has been set, adjust the throttle body idle screw until the IAC % reads 5-15%. NOTE: If the Throttle value goes above 1% during idle screw adjustment, the IAC control may shut off. Power cycling the ECU (ignition switch off, wait 10 seconds for main relay to click off, ignition switch back on) will reset the TPS to 0%.
   C. After Idle Target RPM and IAC position have been set, tap the Right Arrow to complete the Wizard.

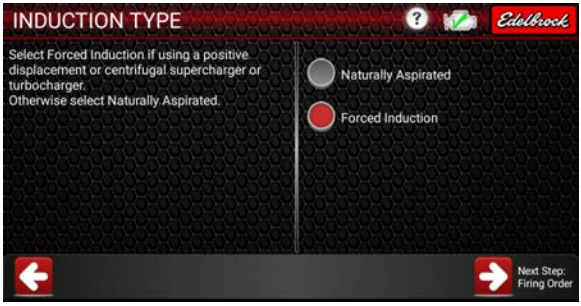


11. The Setup Wizard is now complete and the vehicle can now be driven. It's highly recommended to put the vehicle through various loads and conditions to help the system learn.

TIP: *The key to driving your vehicle initially with the Pro-Flo 4 EFI System is to employ smooth slow throttle transitions and accelerations. Try to drive the vehicle in a manner that covers all conditions, such as: light load, heavy load, high RPM and low RPM. See page 30 for additional tuning recommendations.*

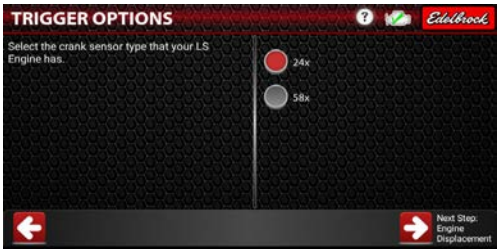
SETUP WIZARD FOR FORCED INDUCTION

1. Set Induction Type to Forced Induction and tap the Right Arrow to continue.

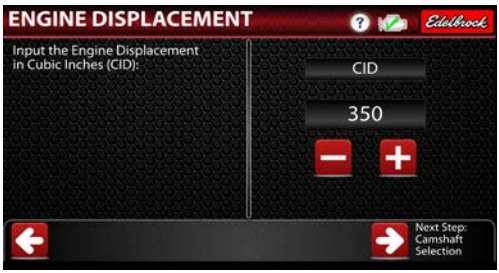


2. Select the engine firing order for your application. Tap Right Arrow to continue.

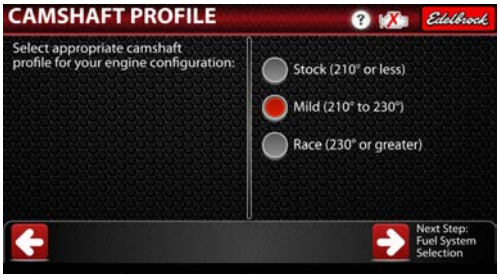
2b. If engine is Chevy LS, choose trigger type: 24x or 58x. Tap Right Arrow to continue.



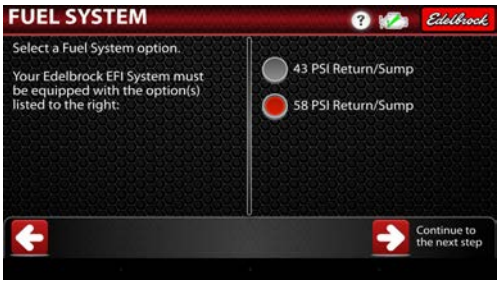
3. Use the "+" and "-" buttons to enter the displacement of your engine. Tap the Right Arrow to continue.



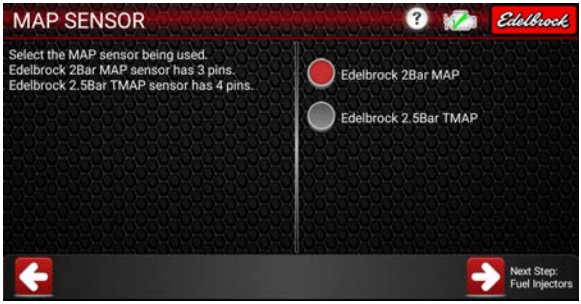
4. Select the proper camshaft profile. Note that Forced Induction base calibrations are configured for Mild or Race cams only. Tap the Right Arrow to continue.



5. Select the fuel pressure being used. Refer to Setup Wizard Map Matrix in the back of the kit installation instructions for proper fuel pressure setting for your configuration. Tap the Right Arrow to continue.

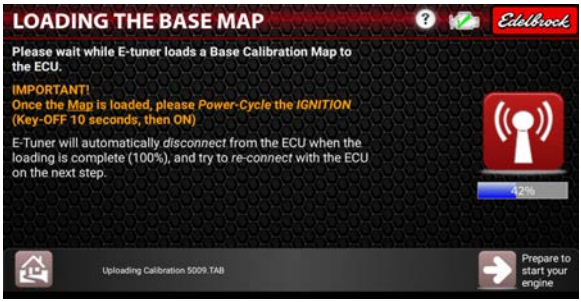


6. Select the MAP sensor being used. The Edelbrock 2-Bar MAP sensor has 3 pins and the Edelbrock 2.5-Bar TMAP sensor has 4 pins. Tap the Right Arrow to continue.

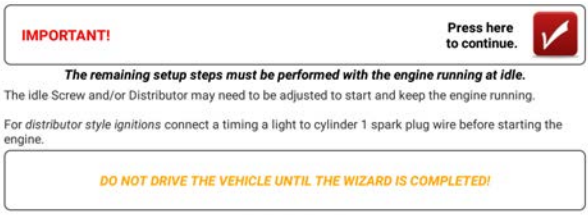


7. Select the injector size included on your kit. Displayed fuel injector flow sizes vary depending on available base calibrations for your configuration. The color band on injector body indicates injector size. Blue=60lb/hr. & Red=80lb/hr.. Tap the Right Arrow to continue.

8. The Wizard will automatically start loading a base map. When the map is finished loading, you will be prompted to power cycle the ECU. Turn the ignition switch off, wait for the main relay to click off (approx. 10 secondvs) and then turn thve ignition switch back on. Tap OK to close the popup window then tap the Right Arrow to continue.



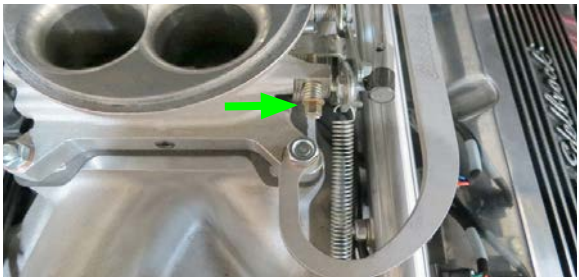
9. Read the important warning then tap the check mark to continue. Do NOT start the engine or drive the vehicle until prompted to do so.



10. For LS engines, skip to step 11. Connect a timing light to cylinder #1 spark plug wire.

a. Click the Set Base Timing icon to lock the timing at 12° BTDC.

b. Start the engine and adjust the throttle body screw, as needed, to maintain idle. **Do NOT drive the vehicle yet**.



c. With a timing light, rotate the distributor until the ignition timing shows 12° BTDC, then tighten down the distributor clamp.

d. Tap Unlock Timing and continue to let the engine warm up to 165°F. Once engine is fully warmed up, tap the Right Arrow to continue.

11. Set Idle Speed Target to desired RPM.
    a. If engine temp is above 165°F, use the “+” and “-” buttons to set the Idle Target to desired RPM.
    b. Once Idle Target RPM has been set, adjust the throttle body idle screw until the IAC % reads 5-15%. NOTE: If the Throttle value goes above 1% during idle screw adjustment, the IAC control may shut off. Power cycling the ECU (ignition switch off, wait 10 seconds for main relay to click off, ignition switch back on) will reset the TPS to 0%.
    c. After Idle Target RPM and IAC position have been set, tap the Right Arrow to complete the Wizard.

12. The Setup Wizard is now complete and engine tuning can commence. Refer to the Forced Induction tuning guide on page 28 .

ADVANCED TUNING MENUS

Air Fuel Ratios

Pro-Flo 4 has user settable Air Fuel Ratio (AFR) targets for four different engine load zones: Idle, Cruise, Acceleration, and Boost.

IDLE load zone is active when TPS is less than 2% and engine speed is less than 1400 rpm.

CRUISE load zone is active when TPS is 2% or more but less than 50% and engine speed is greater than 1400 rpm.

ACCELERATION load zone is active when either TPS is more than 50% or MAP is more than -7.5 InHg.

BOOST load zone is active when MAP is more than +0.8 PSI.

The default values provided in the base calibration are good starting points that should perform well for most applications. **A lower AFR target is richer and a higher AFR target is leaner.**

Default AFR Targets
Idle 13.4
Cruise 13.9
Acceleration 12.8
Boost 11.6

AFR Target Tuning Guidelines

Idle AFR Target - Suggested Range: 13.0 - 14.7
Some larger displacement engines with larger camshaft profiles may require a richer idle (lower the AFR target). Observe idle quality when making adjustments. Idle set-point can also have some effects on light throttle cruise and tip-in performance. Typically try to run as lean an AFR target as practical to maintain best engine response, driveability and fuel economy.

Cruise AFR Target - Suggested Range: 13.0 - 14.0
Adjust Cruise AFR set point for smoothest steady state cruise performance. The target can be leaned out slightly (higher AFR) for increased fuel economy. If this set-point is too lean, it can cause a stumble under acceleration as well as hunting and an increase in coolant temperature while cruising.

Acceleration AFR Target - Suggested Range: 12.0 - 12.9
For NA engines, Acceleration load state is same as being at WOT. For forced induction engines, Acceleration load state is higher engine load without being in boost. For Acceleration AFR targets, it is recommended to start more conservative with a richer (lower) AFR target.

Boost AFR Target - Suggested Range: 11.0 - 11.9
For forced induction engines only. When in boost, a richer AFR target is required to help cool and control combustion to prevent detonation. This is especially true when running pump gas.

Fuel Modifiers

Manually add or subtract fuel to the main fuel map to help reduce AFR corrections. Fuel Modifier adjustments can be made globally or individually to each of the four engine load zones: Idle, Cruise, Acceleration and Boost.

For Fuel Modifier changes to be most effective, it's suggested that Self-Learning be turned off and cleared.

To Make A Global Fuel Modifier Adjustment

1. Tap the Self-Learn Enabled button to turn Self-Learn OFF (RED X). Tap the Clear Self-Learn button and select YES to clear the Self-Learn fuel map.
2. Run the engine in the Idle, Cruise and Acceleration load zones to see what the average Short Term Fuel Trim (Short FT) value is.
3. Raise (+) or lower (-) the Global modifier value to match or be close to the observed Short FT value. Doing this will change all 4 Fuel Modifiers at the same time.
4. Make small changes and monitor the engine's performance before re-adjusting the Global modifier.

The objective is to adjust the Global modifier until the Short FT values start reducing to be near zero percent. If no further changes are needed, re-enable the Self-Learn and Press OK exit the page.

When necessary, Fuel Modifier tuning beyond a global adjustment may be made to the individual engine load zones.

To Make An Individual Fuel Modifier Adjustment

1. Tap the Self-Learn Enabled button to turn Self-Learn OFF (RED X). Tap the Clear Self-Learn button and select YES to clear the Self-Learn fuel map.
2. Run the engine in only one of the individual engine load zones to see what the average Short Term Fuel Trim (Short FT) value is. Monitor the status of the GREEN light that indicates which engine load zone is active.
3. Raise (+) or lower (-) the specific engine load zone modifier value to match or be close to the observed Short FT value. Doing this will only change the specific engine load zone being adjusted.
4. Make small changes and monitor the engine's performance before re-adjusting the specific engine load zone modifier.

The objective is to adjust each engine load zone modifier until the Short FT values in each engine load zone start reducing to be near zero percent. It is recommended to start fine tuning in Idle first then move to the Cruise, Acceleration and Boost zone afterwards. Adjust the corresponding modifier, observe the engine performance, and make re-adjustments as necessary until you are satisfied with how the engine is running in all load zones.

Acceleration Fuel

Acceleration Fuel is a fuel enrichment function that will inject additional fuel into the engine during rapid throttle openings. This feature operates on the same principle as a carburetor acceleration pump.

To Adjust Acceleration Fuel Modifiers
Increase (+) and decrease (-) the Pump Shot and Shot Duration to the desired values.

PUMP SHOT (%)
Adjustment range: -100 to 100%
Controls the amount of additional fuel that is injected for acceleration enrichment. If the engine stumbles, pops, or exhibits sluggishness on initial throttle opening, adjust the Pump Shot to improve the acceleration performance.

NOTE: *Pump Shot is a GLOBAL modifier. Acceleration fuel added via this parameter will be added to ALL temperature ranges. If you would like to add extra Acceleration Fuel to a specific temperature range, press the Advanced button towards the bottom left.*

SHOT DURATION
Adjustment range: -5 to +5
Specify the amount of time (duration) the Acceleration fuel event will last. If the engine accelerates initially then stumbles, or lays down, adjust the Shot Duration.

DECEL FUEL CUT (rpm)
Adjustment range: 1000 to 6000 RPM
Specify the RPM threshold for fuel cutoff on deceleration. If the engine RPM is greater than the specified fuel cutoff RPM AND the TPS reads 0% the engine will cut fuel to the injectors and enter Deceleration Fuel Cutoff (DFCO). During DFCO the observed AFR will go LEAN, fueling will be restored when the RPM drops below the threshold.

Accel Fuel Tuning Tip
It is best to not tune the Accel Fuel values until the ECU's Self-learn function has had sufficient time to properly adjust the base fuel map. Make small changes and allow plenty of time between changes to properly evaluate positive or negative results.

The ADVANCED tab opens a page for more refined Acceleration Fuel calibration.

Acceleration Fuel vs Water Temperature
This menu will allow for fine tuning of the Acceleration Fuel. Increase the amount of Acceleration Fuel by the indicated percentage while within one of seven specific coolant temperature ranges. The currently operating breakpoint will be indicated by the green LED. Once the LED is no longer visible the engine is fully warmed up.

To Adjust Acceleration Fuel vs Water Temp
Raise (+) and lower (-) the percentage of extra Acceleration Fuel added during aggressive acceleration events and throttle openings. Remember that acceleration fuel adjustments from this page are only active while the coolant is within the specified range. If the vehicle stumbles, pops, or exhibits sluggishness on initial throttle opening adjust the Acceleration Fuel at the current temperature breakpoint.

Cold Start Enrichment

For cold conditions or when the engine coolant temp is below 165°F, the amount of fuel delivered can be adjusted to help the engine start and remain running during warm up. This modifier has no effect once the engine is warmed up.

Increase (+) and decrease (-) the Cold Start percentage to adjust fueling when the engine coolant temp is cold. The objective is to get Short FT value to be as small as possible.

The ADVANCED tab opens a page of options provided for further calibrating the Cold Start Enrichment

Cold Start vs Water Temperature

This menu will allow for fine tuning of the engine's fueling while it warms up. The fuel injection amount can be increased or decreased by the indicated percentage while within one of six specific coolant temperature range in order to achieve the desired target AFR. The currently operating breakpoint will be indicated by the green LED. Once the engine coolant temperature reaches 165°F, the engine is at operating temperature and additional enrichment is no longer needed.

Adjusting Cold Start vs Water Temp

Increase (+) and decrease (-) the percentage of Cold Start Fuel Enrichment. Doing so will adjust the amount of fuel being injected to help the engine run as it warms up.

Crank Fuel

The Crank Fuel modifier will set the amount of extra fuel that is sprayed while the engine is trying to start (cranking mode). This function takes affect during both warm & cold starting conditions.

The ADVANCED tab opens a page of options provided for further calibrating the Crank Fuel vs Water Temperature

Crank Fuel vs Water Temperature

This advanced function adjusts the cranking fuel contribution at various water temperatures. A larger value increases cranking fuel, a smaller value will decrease the cranking fuel. An indicator light will illuminate during key ON indicating the Coolant Temperature range currently active. For adjustment of Crank Fuel above 165 degrees Coolant Temperature use standard Cold start page.

SELF-LEARN SETTINGS

Set Self-Learn Speed

Select between FAST, MEDIUM, and SLOW learn speeds. Typically FAST learning is ideal for new installs. Once the vehicle has been driven through various load/RPM conditions AND the observed AFR correction is within +/- 5% it is advised to set the Learn Speed to MEDIUM or SLOW.

Self-Learn Minimum RPM

Sets an RPM threshold under which the ECU's Self-Learning function will be disabled.

Closed-Loop Minimum RPM

Sets an RPM threshold under which the ECU's Closed-Loop functionality will be disabled.

Warning: *While the Closed-Loop function is disabled the Self-Learn function is also implicitly disabled.*

Base-Timing

Setting the Base Timing is important for accurate ignition control with the Pro-Flo 4 system. Proper Base Timing ensures that the commanded ignition timing advance value in the ECU is the actual ignition timing advance value applied to the engine.

NOTE: *Base timing is already set for LS engines and is non-adjustable.*

Base Timing Procedure

1. Connect adjustable/dial-back timing light, put inductive clamp around #1 spark plug wire and loosen the distributor hold-down clamp.
2. Start the engine and let it idle.
3. Launch E-Tuner app and connect to ECU via Bluetooth.
4. Go Advanced Tuning>Base Timing and press Set Base Timing. This will lock the ignition timing to 12 degrees BTDC.
5. Using timing light, rotate distributor in either direction until timing mark aligns with 12 degrees BTDC. Tighten the distributor clamp and recheck timing with timing light to make sure it has not moved.
6. Press Unlock Timing. This will re-enable the standard ignition timing control function.

The Base Timing setup procedure is now completed. The ignition timing can now be adjusted electronically from the Spark Control menu to adjust your initial timing, total timing as well as vacuum advance and boost retard.

Spark Control

Pro-Flo 4 features a simplified ignition timing advance mapping function that consists of four main components:

- **IDLE SPARK**
- **ADVANCE START**
- **TOTAL SPARK**
- **TOTAL SPARK RPM**

Raise (+) and lower (-) the setting values to adjust the spark curve.

Idle Spark

Distributor default: 15°
LS default: 12°
This value represents the ignition timing advance applied at idle. Idle Spark timing can be adjusted in 0.25 degree increments.
Typical values: 17°- 25°

Advance Start

Distributor default: 1200 RPM
LS default: 1000 RPM
This value represents the RPM at which the ECU will start advancing the timing towards the Total Spark value. Advance Start can be adjusted in 50 RPM increments.
Typical values: 1000-2000 RPM

Total Spark
Distributor default: 36°
LS default: 22°
This value represents the TOTAL (maximum) ignition timing advance that the ECU will advance towards as engine speed is increased above the Advance Start value. This is the final ignition timing advance that is applied at 0" InHg or 0 PSI boost (before vacuum advance or boost retard timing adjustments are applied). Total Spark can be adjusted in 0.25 degree increments.
Typical values: 20° - 38°

Total Spark RPM
Distributor default: 3000 RPM
LS default: 4500 RPM
This value represents the RPM at which Total Spark is applied. The ECU will stop advancing the ignition timing once at this RPM. The ignition timing will be held at the Total Spark value for all engine speeds above the Total Spark RPM setting. Total Spark RPM can be adjusted in 50 RPM increments.
Typical values: 3000-5000 RPM

Vacuum Advance/Boost Retard
The Vacuum Advance and Boost Retard timing control functions round out the Pro-Flo 4's simplified ignition timing advance mapping function. These two ignition timing modifiers adjust the ignition timing relative to the engine's manifold pressure to give full 3D ignition mapping.

In **VACUUM**, the ignition timing is advanced to increase the engine's torque output in lighter loads.

In **BOOST,** the ignition timing is retarded to prevent knock when cylinder pressure is high.

Vacuum Advance
Raise (+) and lower (-) the value in 0.25° increments.
Adjustment range: 0.0° to 10.0°
Default value: 5.0°
Vacuum Advance is applied linearly from no advance at 0 InHg to full advance at -30 InHg.
If Vacuum Advance is set to 10° and manifold pressure is -15 InHg, 5° of timing advance will be applied.

Typically run as much Vacuum Advance as practical without inducing detonation.

Boost Retard
Raise (+) and lower (-) the value in 0.25° increments.
Adjustment range: 0.0° to 3.0°
Default value: 2.0°

Boost Retard specifies the amount of ignition timing to pull out per 1 psi of boost.

If Boost Retard is set to 2.0° and manifold pressure is 10 PSI, 20° of timing retard will be applied.

Typically start out very conservatively by pulling out too much timing in boost and then slowly REDUCE Boost Retard to find best power without inducing detonation.

IT IS HIGHLY RECOMMENDED THAT FORCED INDUCTION ENGINES BE TUNED ON A DYNO IN ORDER TO PROPERLY SET BOOST RETARD.

Idle Tuning

The engine must be running and fully warmed up (coolant temp >165°F) with the TPS value showing 0% before the Idle Target RPM can be changed. If TPS value is not 0%, with your foot off the throttle pedal, turn the ignition switch off and allow the ECU to completely shut down (main relay must click off) and then turn the ignition switch back on. This allows the ECU to perform its TPS autozero procedure. Repeat this process as necessary until TPS shows 0%.

Wait for the **Idle Target Status** to indicate that it is OK to Adjust the Idle Target. When the indicator is ready, adjust the Idle Target to your desired idle RPM speed. Once you have selected your desired idle speed, the IAC% should indicate anywhere from 5-15%. It may be necessary to adjust the mechanical idle screw in order to achieve these numbers. Opening throttle blades reduces IAC%, closing throttle blades increases IAC%

The Idle Target cannot be adjusted while the engine is warming-up. The ECU will automatically control and adjust this target during engine warm-up (coolant temp <165°F). During cold starts and as the engine warms up, the Idle Target RPM will be higher than normal as the ECU is trying to maintain a fast idle to help the engine warm up. Once coolant temp reaches 165°F, the Idle Target will stabilize to your desired idle speed rpm.

Notes on Idle Target Adjustment

The value displayed for the Idle Target will ALWAYS reflect the current Idle Target RPM that the ECU is trying to achieve.

For hot restarts, the IAC may open to flare the idle RPM higher than normal before gradually settling back down to your desired Idle Target RPM.

During hot restarts or if the engine stalls, please wait for the Idle Target to come to its lowest value before attempting to adjust the value again.

Once Idle Tuning is complete, it is good practice to Reset Self-Learn (located in the ECU Settings menu). If at any time the idle speed becomes unsteady or “hunts”, it may be a result from a bad correction value in the Self-Learn table. Resetting the Self-Learn should help fix those issues.

Limiters

Pro-Flo 4 offers two different limiter functions: a Rev-Limiter and a Boost Cut Limiter.

Boost Cut is for Forced Induction engines only; the Rev-Limiter applies to all engines.

Rev-Limit (RPM)

The Rev-Limit function will cut-off fuel and spark to the engine to safely limit engine speed to prevent engine damage from an over-rev condition.

The Rev-Limiter set-point is adjustable from 3000 to 8000 RPM.

You can raise (+) and lower (-) this value in 50 RPM increments.

Boost Cut (PSI)

The Boost Cut Limiter function will cut-off fuel and spark to the engine to safely limit manifold pressure to prevent engine damage from an overboost condition.

The Boost Cut Limiter set-point is adjustable from 5 to 20 psi.

You can raise (+) and lower (-) this value in 1 PSI increments.

Set to max value to disable Boost Cut.

NOTE: *Boost Cut Limiter will become active when manifold pressure is greater than limiter set-point for more than 1/2 second. Once Boost Cut Limiter is active, manifold pressure must be less than limiter set-point AND TPS must be less than 25% before limiter will deactivate*

Fan Controls

Raise (+) and lower (-) the desired coolant temperatures to trigger when the radiator cooling fans turn ON.

Two independent radiator cooling fan set-points are available. Cooling fans will be activated when coolant temp reaches these set-points and will shut off automatically when the coolant temp drops 10° below these set-points.

NOTE: *Typical configuration is that Fan 1 will be turned on first at a lower temp and Fan 2 is set to turn on at a slightly higher temp. Example: Fan 1 on at 190°, Fan 2 on at 200°.*

Refer to the Pro-Flo 4 Installation Instructions for fan wiring diagrams and instructions. A relay must be used to power radiator cooling fans! Do NOT connect the fan output wires from the ECU to the fans directly! This will damage the ECU!

On/Off

In some scenarios it may be necessary to enable/disable these functions for proper tuning and/or troubleshooting. Press each button to turn each of the functions ON or OFF.

A **GREEN** light indicates the function is enabled and a **RED** light indicates the function is disabled.

Idle Control

During normal operation, the ECU's Idle Control function will actively open and close the IAC and advance and retard the ignition timing to try and make the engine speed the same as the Idle Target RPM. By disabling Idle Control, the IAC will only follow its commanded base position based on coolant temp (more open when coolant temps are cold, closes as engine warms up) and ignition timing feedback will cease.

Self-Learn

During normal operation, the ECU's Self-Learn function will apply the Short Term Fuel Trim closed loop AFR correction values to a secondary fuel map that allows the system to correct the base fuel map over time. If Self-Learn is disabled, the system will continue to operate using the base fuel map and closed loop AFR correction only. The ECU will NOT save any closed-loop correction values to the Self-Learn fuel map.

Closed Loop

During normal operation, the ECU's Closed Loop AFR control function will add or subtract fuel from the base fuel map in order to meet the current AFR Target. Disabling Closed Loop will cause the engine to run entirely off of the base fuel map only without AFR correction. Self-Learning relies on Closed Loop feedback thus if Closed Loop is disabled, Self-Learn is disabled as well.

Fuel Sump PWM

Intended for use with the Edelbrock Fuel Sump only! This function will Pulse Width Modulate (PWM) the Edelbrock Fuel Sump to run the fuel pump at lower speeds during times of lower fuel demand to reduce fuel system temperatures. If you are having issues with fuel boiling while using the Edelbrock Fuel Sump try enabling PWM. If you are NOT using the Edelbrock Fuel Sump, make sure that this option is DISABLED (RED).

ECU & MAP SettingS

Reset

Reset Self-Learn

This function will clear out the Self-Learn table in the ECU. This is particularly useful if you are experiencing stuttering or surging during certain driving conditions. When the Self-Learn table is RESET the vehicle will need to be driven through various Load and RPM ranges to ensure optimal vehicle drivability.

Tap the Reset Self Learn button and then tap YES at the warning prompt.

Reset ECU Modifiers

This function will reset all the Advanced Tuning settings to their default values. It is strongly recommended to save ECU settings before restoring to defaults.

Tap the Reset ECU Modifiers button and then tap YES at the prompt.

Back Up

This function will allow the user to save a copy of the base map in use by the vehicle's ECU. If you would like to change maps at any time it is recommended that you save a backup copy of the map that was previously in use. After loading a base map from the Setup Wizard it is recommended to save a backup of this map as well.

Before saving a calibration, the ignition switch must be on but the engine must be off. Tap the READ button to start saving the cal. When saving is complete, name the cal and tap SAVE.

Save ECU Settings

This function will allow the user to save the Self-Learn Table as well as the current values for all user set Modifiers on the Advanced Tuning pages. It is recommended to save a backup of the ECU Settings after the vehicle has been allowed time to learn and the correction displayed at the tablet is within +/-5%. Please note that ALL saved settings and maps will be saved to the My Maps folder and can be re-loaded to the ECU using the Restore options.

Before saving ECU Settings, the ignition switch must be on but the engine must be off. Tap the READ button to start saving the settings file. When saving is complete, name the file and tap SAVE.

Restore

Load Map

If you received a custom ECU map from Edelbrock or you would like to load a new base map without using the Setup Wizard use this option to load it into the ECU.

Before loading a map, the ignition switch must be on but the engine must be off. Tap the Load Map button, select the appropriate cal file directory (My Maps, Pro-Flo 4 or Other Calibrations), select the appropriate cal file, select the Induction Type, Firing Order and MAP Sensor and then tap LOAD.

Restore ECU Settings

Load previously saved ECU configuration settings from this menu. This will restore all the values from Advanced Tuning settings and the Self-Learn fuel map.

Before loading ECU Settings, the ignition switch must be on but the engine must be off. Tap the Restore ECU Settings button, select appropriate .LRN file and then tap LOAD.

Load ECU Firmware

In most instances a firmware change is only necessary after a significant update release. Unless instructed to do so, firmware updates are typically not required. Always follow any supplemental instruction guides.

Before loading ECU Firmware, the ignition switch must be on but the engine must be off. Tap Load ECU firmware button, select appropriate .HDR file and then tap LOAD.

NOTICE!

The ECU requires 10-12 seconds to fully shut down during a key OFF event. During this time, the IAC valve locates its “home” position. If a rapid key OFF-ON is performed the idle speed at startup may be momentarily unstable.

Files can not be saved or loaded when the engine is running.

Always power cycle the ECU (key off 12 seconds, then key on) after loading a map or firmware file to apply new changes.

When flashing firmware, always make sure the Bluetooth connection is stable and consistent before attempting to load a firmware file. It is recommended to use the E-Tuner app while being as close to the ECU.

E-TUNER GAUGE DISPLAYS

The E-Tuner app features 3 different gauge displays to monitor live engine & ECU sensor data. In order to view data you must first be connected to the ECU (GREEN checkmark).

E-Tuner Display

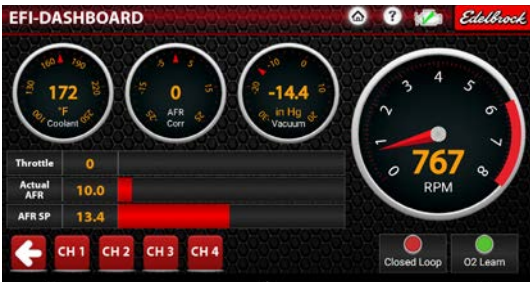
This display is most suitable for users who are new to the Pro-Flo 4 EFI system and want to familiarize themselves with how the main components and sensors work together.

Digital Display

This page displays all parameters used by the Pro-Flo 4 system and is useful for keeping an eye on multiple system parameters or for help while troubleshooting.

EFI Dashboard Display

This display offers several different layout options rather than an all-in-one view. All information and data shown is the same as the other display pages. To switch between different layouts, press the different channel buttons.



EDELBROCK E-TUNER DISPLAY DEFINITIONS

RPM: The current engine speed will be displayed here in units of Revolutions per Minute (RPM). On circular tach gauges, the current Rev-Limit setting will be shown as a thick RED arc along the outer edge of the gauge. The Rev-Limit can be adjusted by going to Advanced Tuning>Limiters>Rev-Limiter. If the engine RPM reaches the Rev-Limit, the gauge will be highlighted in RED until the RPM drops below the limit.

Manifold: Displays the amount of pressure inside the intake manifold. The amount of "negative pressure" or vacuum is measured in units of inches of Mercury (InHg). The amount of "positive pressure" or boost is measured in units of Pounds Per Square Inch (PSI).

Coolant Temp: Displays the engine's coolant temperature at the location of the coolant temperature sensor, in units of degrees Fahrenheit. Many functions of the Pro-Flo 4 ECU reference this measurement. Functions such as Fan Control, Cold-Start, Self-Learning, and Idle are influenced by the coolant temperature.

Battery: Displays the system's current voltage as measured at the ECU. Good indicator of the general capability of the vehicle's charging system. Typical values should be between 12.5 - 14.0 V.

Throttle: Displays how much the throttle blades are open inside the throttle body. The ECU reports throttle position as a percentage of open throttle. Please note, that at Idle, the Throttle should read 0%.

Air Temp: Displays the temperature of the engine's incoming air charge. Air Temp channel can also give a good estimate of the under the hood temperature.

Fuel Press: Displays the system's fuel pressure as measured at the fuel rail. A drop in fuel pressure during hard acceleration may indicate a fuel supply issue. Typical values should be between 40-45 PSI or 55-60 PSI.

Idle Target: Displays the current Idle RPM Target. The Idle RPM Target when at operating temp (>160°F) is set in Advanced Tuning>Idle Tuning. When the engine's coolant temp is cold (<160°F), the Idle RPM Target will be increased to help the engine warm up more quickly and will eventually decay down to the regular Idle RPM Target.

IAC %: Displays how open or closed the IAC (Idle Air Control) motor is. The IAC% channel should be used as a tool for properly adjusting the idle screw to set the base idle speed. A lower value indicates that the IAC is having to supply little additional air to help the engine idle. A higher value indicates that the IAC is having to supply a lot of additional air to help the engine idle and that the idle screw may need to be increased. Ideally, the idle screw should be adjusted so the IAC% is 0-15% with the engine at operating temp.

AFR: The Air Fuel Ratio is measured by the wideband oxygen sensor and is displayed as AFR gasoline (Stoich 14.7). Higher values are leaner and lower values are richer. The lowest possible value that can be sensed is 11.0. A value of 10.0 will be displayed any time the sensor is warming up or not ready to report accurate AFR readings. Note that when Decel Fuel Cut Off is active, AFR will report full lean – this is normal and expected.

AFR SP: The Air Fuel Ratio Set Point is the AFR value the ECU is trying to achieve. This value is set in the Air Fuel Ratios menu from the Advanced Tuning section. The AFR SP will change as the engine is operated in the different engine load zones.

PRO-FLO 4 NATURALLY ASPIRATED TUNING GUIDE

The following is a guideline to driving procedures that helps assist the self-learning function of the Pro-Flo 4 EFI system. Please note that there is never really a time when the self-learn function is actually complete. The system is always adjusting for various weather, road load and engine functions that may affect engine performance. A good indication of self-learn progress is the amount of Short FT % being applied under various driving conditions. As the self-learn progresses Short FT Corr % should reduce to values near 0%. In order for the self-learn function to actually correct a specific load point the engine must actually drive through that specific point.

The best procedure for assisting self-learn is to first verify that all functions of the EFI System are properly installed and functioning correctly.

Warm the vehicle to operating temperature (165 F degrees)and verify that both the O2 learn and Closed Loop indicators are lit. Drive the vehicle in an ordinary manner and observe the Short FT Corr % values. If at any point the vehicle does not run accordingly, observe the Short FT Corr % values. If the value exceeds 10%, try holding the Throttle steady so the vacuum and RPM remain steady at the point of issue. The Short FT Corr % value should reduce and the engine should begin to run better. Try to revisit the Vacuum and RPM points around the point of issue to help compensate. Try to avoid fast erratic throttle movement when assisting self-learn. If issue is severe and corrections exceed 15% see Fuel Modifiers Page.

Continue driving the vehicle, when road conditions safely permit try running the engine through various load and RPM points. For example:

- Steady Highway driving consistently varying throttle and RPM.
- Low gear light slow acceleration from low to high RPM.
- High gear light acceleration from low to high RPM.
- High gear slow steep hill acceleration.
- Hard acceleration from low to high RPM.

As the vehicle is driven, AFR Corrections should reduce. When performance is acceptable, save the Map and ECU Settings (ECU Settings) and slow the Self Learn setting to medium or slow (Advanced Tuning_Air Fuel Ratios_Advanced).

NOTE: *Do not make any adjustment to the Acceleration Fuel initially. Allow the self-learn adequate time to apply corrections to the base calibration prior to making any Acceleration Fuel adjustments.*

WARNING: *WOT conditions must be performed on a closed track in a controlled environment.*

Short FT: Stands for Short Term Fuel Trim. This is the percentage of fuel that the closed loop AFR correction function has added or subtracted from the base fuel injection amount to achieve the desired target AFR at any specific moment. As the vehicle is driven through various load and RPM conditions, the Self-Learn function will apply and save these values to the Long Term Fuel Trim (Long FT) map and this value will decrease. Ideally, Short FT values will be less than +/-10%. If Short FT values are more than this, apply Fuel Modifiers as necessary to reduce the closed loop AFR correction amount.

Long FT: Stands for Long Term Fuel Trim. This is the percentage of fuel that the Self-Learn table has "learned" and is being added or subtracted from the base fuel injection amount to try and maintain the target AFR at any specific moment.

Injection: This value is the amount of time, displayed in milliseconds, that the fuel injectors are open to deliver fuel. For the same load and RPM, a higher Injection value should result in a richer AFR and a lower Injection value should result in a leaner AFR.

Inj Duty: Displays the Injector Duty Cycle value. Injector Duty Cycle is a comparison of the injector on time versus the current engine cycle time and is shown as a percentage. As engine RPM increases, the engine cycle time decreases as does the available injection time. All Pro-Flo 4 systems are configured with injectors sized to support the advertised power level at no more than 85% injector duty. Injector duty values greater than 85% indicate that the fuel supply setup is marginally capable of supporting the current power level. If injector duty is greater than 85% when at WOT and max power, consider raising the fuel pressure slightly. If more fuel pressure does not help to significantly reduce injector duty, larger fuel injectors may be required.

Spark Adv: Displays the current ignition timing value being applied to the engine in degrees before TDC. The ignition timing curve is set in the Advanced Tuning>Spark Control. When in idle mode, the ECU will rapidly advance and retard the ignition timing to control idle speed thus fluctuation in Spark Adv are normal.

Status Indicators

O2 Learn: When indicator light is GREEN, Self-Learn function is active and Short FT values are being written to the Learn fuel map. The "learned" values are then applied as a Long Term Fuel Trim which can be monitored by looking at the Long FT read out. For Self-Learn to be active, Closed Loop Correction must be active and engine coolant temp must be >165°F. The indicator light will be RED if these conditions are not met or if Self-Learn has been turned off in the On/Off Options.

Closed Loop: When indicator light is GREEN, the ECU is actively controlling fuel corrections using the Closed Loop Correction function. When the indicator light is RED, the ECU is in Open Loop mode and no AFR corrections will be made. Closed Loop will be off for up to 30 seconds after the engine has been started as the O2 sensor warms up. After the O2 sensor has fully warmed up, the Closed Loop indicator will turn GREEN. Note that Closed Loop will turn off during periods of rapid throttle movement and during deceleration.

Fan 1/2: When indicator light is GREEN, the corresponding fan output has been turned on to trigger a cooling fan relay. If cooling fans aren't triggered on, the indicator light is RED. Note that the fan outputs are only turned on when the engine is running.

PRO-FLO 4 FORCED INDUCTION TUNING GUIDE

When tuning a FI engine, attention must be paid to ensuring that AFRs are on track with the desired target AFR and a proper ignition timing advance value must be found that gives best power without incurring knock. While most NA street engines are fairly easy to tune because they're more tolerant of AFR and timing variances, FI engines have a narrower range of acceptable AFRs and timing advance in boost and detonation and engine damaged can occur if not properly tuned. Use of a dyno is highly recommended when tuning a FI engine. If not comfortable with the tuning requirements necessary to safely tune a FI engine, seek the help of an experienced tuning professional.

The following is a general FI tuning guide that may be used to familiarize one with the typical FI tuning process on a dyno. A generally safe approach is to start out by running overly conservative ignition timing while fueling adjustments are made and then once AFRs are satisfactory, start introducing more ignition timing advance to optimize engine power.

Forced Induction Tuning

Fuel Tuning Concept - AFR Feedback vs Feedforward

When using Pro-Flo 4 with a NA engine, the typical fuel tuning/learn process is that the system is ran using closed loop AFR control and the short term fuel trim values (Short FT in E-Tuner app) are automatically applied to a secondary long term fuel trim "learn" map. Over time, as the secondary learn fuel trim map is populated with values that help correct the AFRs, the Short FT values are gradually reduced until nearly zero. This AFR control process is in reaction to the error between desired AFR and actual AFR and relys on feedback from the system's wideband O2 sensor to gradually correct fueling over time to eventually have optimized AFRs.

FI engines can also be tuned using this same process however, in cases where Short FT values are positive because base fueling is too lean, it's more ideal to quickly correct AFRs proactively using feedforward correction than to rely on the system to react to AFR error using AFR feedback. The reason for this is if AFR feedback should stop working for any reason, AFRs will already be closer to target or slightly rich whereas it would be very undesirable to have an excessively lean AFR in boost which may cause knock or engine damage.

To expedite the fuel tuning/learn process, feedforward fuel trims can be used to get AFRs closer to target without relying on feedback from the O2 sensor or waiting for the secondary learn fuel map to be populated. This is done by monitoring the Short FT values and then adjusting fuel trims to immediately reduce the Short FT value. When running the engine, closely watch the Short FT value. If it is negative then base fueling is already rich and it is safe to allow the system to learn on its own. If Short FT values are positive, use feedforward correction by taking the Short FT value and applying it as Fuel Modifier trim. For instance, if running in the Boost AFR target range, Short FT is +10%, set the Boost fuel trim to +10%. The next time the engine is ran through the Boost AFR target zone again, the feedforward fuel trim will add 10% more fuel ahead of time which should result in a Short FT value that is closer to zero.

Ultimately, the primary objective is to always have AFRs on the richer side with slightly negative Short FT values versus having positive Short FT values because AFRs are too lean.

Initial Fuel Tuning

Set Idle, Cruise and Acceleration AFR targets to desired values. Set base Spark Control settings to values that are commonly used for the type of engine being ran. Run engine in idle, cruise and acceleration load states with Self Learning turned on. Monitor AFRs and Short and Long FT values. Check that engine sub-systems (fuel system, cooling system, oiling system, ignition system, etc) are all functional and free from defects before moving onto making boost.

Boost Fuel Tuning

Set Boost AFR target to desired value. Set Boost Retard to value that will result in very conservative timing when in boost – 2.0°-2.5° per pound of boost is typically a good starting point. Set Boost Cut limiter to be slightly higher than max expected boost value. Start by making loaded pulls or sweeps at less than full throttle to less than max rpm. The tuning process will be to make successive pulls while incrementally increasing throttle to slowly work into boost. For instances, first pull should be made at 30% throttle (this low of a throttle position may not make any boost). The next pull should be made at 40% throttle and then the next pull should be 50% throttle and so on eventually working to WOT. While making these pulls, closely monitor AFRs and the Short FT value. Ideally, Short FT will be a negative value. If Short FT is +5% or more, apply an equal trim in the Boost fuel modifier. If at any point AFRs show significantly leaner than the AFR target and Short FT is a large positive value, immediately lift off the throttle to abort the run, apply appropriate fuel trim adjustments and then try again.

The tuning objective is to have AFRs be on target without having large positive Short FT values. Once boost AFRs and Short FT values are acceptable, boost ignition tuning can be started.

Boost Ignition Tuning

The tuning process will be to increase ignition timing incrementally by reducing the Boost Retard value in small steps in order to find the ignition timing advance value that results in best power. Start out by first having too high a Boost Retard value (2.0°-2.5° timing retard per pound of boost) and then decrease Boost Retard in 0.25° increments while making successive dyno pulls to record torque and power. With Boost Retard set high, the final ignition timing value in boost will be low and measured power should also be low. In most cases, reducing Boost Retard by 0.25° results in the boost ignition timing advancing by 2°. Each time Boost Retard is decreased, make a WOT pull and record torque and power. As Boost Retard is decreased and boost ignition timing advance is increased, measured power should increase significantly. In some instances, power gains of 30-50 hp can be made by reducing Boost Retard by only 0.25°.

Continue to repeat this process of making pulls after decreasing Boost Retard in 0.25° increments until the power gain after advancing the boost ignition timing results in a much smaller power increase. A point will eventually be reached where more boost timing advance does not result in any additional power. The timing advance value at this point is the optimal boost ignition timing for best power. Continuing to advance timing beyond this point may result in knock and engine damage. It may be advisable to increase the Boost Retard by 0.25° to slightly retard the boost timing from peak power in order to increase the safety margin against knock.

Example scenario: Base ignition timing is 30°. First WOT pull is made with Boost Retard set to 2.0°. Engine makes 10 psi of boost. Final timing advance will be 30° - (2.0° x 10 psi) = 10° in boost. Power measured is 600 hp. Decrease Boost Retard to 1.75°. Final timing advance will be 30° - (1.75° x 10 psi) = 12.5° in boost. Power measured is 640 hp. Decrease Boost Retard to 1.5°. Final timing advance will be 30° - (1.5° x 10 psi) = 15° in boost. Power measured is 675 hp. Decrease Boost Retard to 1.25°. Final timing advance will be 30° - (1.25° x 10 psi) = 17.5° in boost. Power measured is 700 hp. Decrease Boost Retard to 1°. Final timing advance will be 30° - (1° x 10 psi) = 20° in boost. Power measured 710 hp. Have now reached point of diminishing returns. Would be safest to go back to a Boost Retard value of 1.25°.

Tuning Tips

Note that engines with big bore diameters may want more timing advance in boost to make best power versus engines with smaller bore diameter.

Once optimal boost ignition timing advance for best power has been found, its advisable to remove and inspect the spark plugs. Typical indicator for proper ignition timing is color change on ground strap that occurs in the middle of the bend. Too much ignition timing will have the color change closer to the spark plug threads and too little timing will have the color change closer to the end of the ground strap.

18	18	9	10	11	12	13	13	13	13	13
19	19	10	11	12	13	14	14	14	14	14
20	20	11	12	13	14	14	14	14	14	14
21	21	12	13	14	14	14	14	14	14	15
23	23	13	14	15	15	15	15	15	16	17
24	24	14	15	15	16	16	17	17	18	19
30	30	17	17	17	19	22	25	27	29	29
32	32	17	17	17	19	23	25	28	29	30
34	34	17	17	17	19	24	26	29	30	31
36	36	17	0	0	0	0	0	0	0	0
3.5	4	4	0	0	0	0	0	0	0	0
5.5	6	6	1	2	3	4	4	4	4	4
6.5	7	7	7	8	9	10	11	11	11	11
13.5	14	14	8	9	10	11	12	12	12	12
15.5	16	16	9	10	11	12	13	13	13	13
17.5	18	18	10	11	12	13	14	14	14	14
18.5	19	19	11	12	13	14	14	14	14	14
19.5	20	20	12	13	14	14	14	14	14	14
20.5	21	21	13	14	15	15	15	15	15	16
22.5	23	23	14	15	15	16	16	17	17	18
23.5	24	24	17	17	17	19	22	25	27	29
30	30	30	17	17	17	19	23	25	28	29
32	32	32	17	17	17	19	24	26	29	30
34	34	34	17	17	17	19	25	28	30	31
36	36	36	17	17	17	19	25	28	30	31
36	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	1
6	1	2	3	4	4	4	4	4	4	4
7	7	8	9	10	11	11	11	11	11	11
14	8	9	10	11	12	12	12	12	12	12
16	9	10	11	12	13	13	13	13	13	14
18	10	11	12	13	14	14	14	14	14	14
19	11	12	13	14	14	14	14	14	14	15
20	12	13	14	14	14	14	14	14	15	16
21	13	14	15	15	15	15	15	16	17	18
23	14	15	15	16	16	17	17	18	19	20
24	17							29	29	29
30	17							29	30	31
32	17							30	31	32
34	17							31	32	33
36	17							31	32	33
3.5	4							0	0	0
5.5	6							0	0	0
6.5	7							4	4	4

Olive Branch, MS 38654
800-416-8628 • edelbrock.com

BROCHURE: 63-35761 . REV 8/25/21

©2022 EDELBROCK GROUP