Tuning and Log View Software
User Manual

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General Software Use

Icons

Description: Sniper EFI software was designed to make navigation simple and easy. Most tuning parameters and software functions can be found by selecting an icon from the toolbar. Detailed instructions of each icon are contained in this manual.

FUEL	SENSORS	SYSTEM	IDLE	SPARK	BOOST	NITROUS	ADVANCED	PIN MAP	SYNC	PC LOG	GAUGES	STRIP CHART
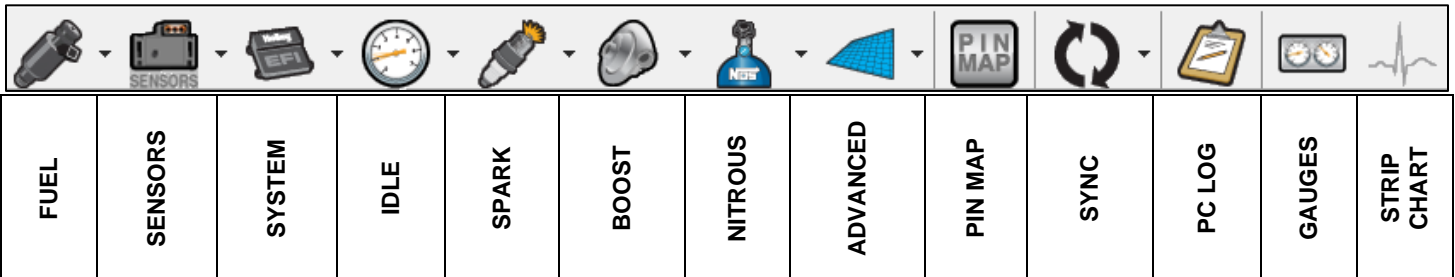
Communication Modes

Description: The ECU and laptop communicate with each other via a USB-Can Dongle (part number 558-443). The system is designed so that checks and balances are performed so that the PC and ECU data are always in sync with each other. It won't allow for ECU and PC data to be mixed or corrupted. There are three "Communications Modes" that can occur between the ECU and the Laptop. This mode is shown at the top of the screen between the "Toolbox" and "Help" options

- **Offline** – Is shown when the ECU is not powered or the USB cable is not connected.

- **USB Link** – Is shown when the ECU is powered and USB connectivity is established (USB-Can Dongle plugged in). However, the user has not chosen to select the "online" mode and the Laptop and ECU are not communicating with each other. Changes made at this time on the laptop, are not being updated in the ECU. Vehicle ignition power does not have to be turned on to indicate "USB Link".

- **Online** – Is shown when the Laptop and ECU are communicating. Vehicle ignition power must be on in order to enter Online mode. At this point changes made with the laptop are real-time updated in the ECU. To enter "Online" mode, simply depress the "USB Link" button with the cursor. At this time, the software checks the data on the laptop (if any is opened) and the data in the ECU. If they are different, the user is given the choice to retrieve the ECU data, or send the PC data to the ECU. Once synchronized, the ECU can be real-time programmed by the laptop while online mode is enabled.

Editing Online/What is and is Not Real-Time Programmable – All "tuning" parameters are editable, real-time in online mode. Certain "configuration" parameters are not editable when on-line. Examples are the Sensor ICF and the Engine and Ignition Parameters section. If an area is not editable on-line, it will be grayed out and will not be editable.

IMPORTANT: In addition to this, many of these grayed out parameters are "initialized" when the ignition key is first turned on. This means that after these parameters are changed (or a new Global Folder is sent with new parameters), the ignition key must be cycled. So, after any of these parameters are changed, OR a new global folder is sent where any of these parameters are different, simply shut the ignition power off, and turn it back on.

Creating an Initial Calibration

There are three ways to create an initial calibration. These are:

1. **Open one of the base Config files** that are included in the software. This is the easiest method for a beginner that has purchased a complete Sniper EFI system.
2. **Create a new Config file** from base Individual Configuration Files.   This is typically desirable when an application "has a lot of features" such as Nitrous, Boost, etc.
3. This is a combination of the first two. First **download a base Global Folder, then add the necessary additional Individual Configuration Files** (such as Nitrous, etc.) using the "Toolbox" feature.

These are described below. These choices will also come up when the software first opens from a main menu.

Downloading a Base Config File

 There are many base calibrations provided with the software. To download one of these base calibrations simply:

1.   Go to "File"
2.   Select "Open Config"
3.   Select "Base Cals"
4.   A description of each Config file can be seen in the "Notes" field by single clicking on the icon
5.   Once you have picked the appropriate config file, Click "Open"
6.   The file will now be loaded on the laptop/PC

Creating a New blank Config File

A blank base Config File can be created. To do so, perform the following:

1.   Go to "File"
2.   Select "Create New Config

Using a Base Config File and Add ICF's:

1.   Perform all steps above for "Creating a New blank Config File".
2.   On the top of the toolbar select "Toolbox" and "Add Individual Config".
3.   Select the ICF directory for the feature you want to add (Nitrous, Boost, etc.) and select "Open".

Advanced Operation

Exporting a Config File to the ICF Library

This is very useful feature for professional tuners, or people that tune more than one vehicle. It allows for an existing Global Folder to be dissected and have its ICF files put back into the ICF Library, and allows each file to be named individually. For example, the Spark ICF could be called "LS2 2 bar". The Boost ICF could be called ".036 Jet Dry Progressive". These ICF's can then be used when creating new Config Files in the future. To perform this:

1.   Load the Config File.
2.   Select "File" and "Export Config".
3.   A window will open. Choose each ICF you want to export by selecting the "Export" box for each.
4.   Name each file as desired.
5.   Select "OK". These files will be created in the ICF library.

NOTE: Never perform any GF modification (ICF addition or subtraction, etc) through Windows File Manager. All such operations much be performed within the Holley EFI software. Doing this in Windows File Manager will corrupt the files.

Importing portions of a saved Config File to an active Config File

This is another useful feature for professional tuners or people that tune more than one vehicle. It allows specific parameters (tables, settings, curves, etc.) to be quickly imported into the active Config File open in the software.

1.   Open the Config File you wish to modify.
2.   Select "File" and "Import Config".
3.   A window will open. Choose the Config File you want to use for importing.
4.   A new window will open. This window contains a directory tree of each parameter within the config file. Bold text indicates there is a difference in that specific parameter between the config you are importing, and the config you are modifying. Grey text indicates that the parameter matches between both config files.
5.   Select the check box next to all parameters you wish to import.
6.   Click "Import" to complete the operation

Import

Select Data to Import
Differences are Bold

- Fuel
  - ☑ **Base Table**
  - ☐ Learn Table
  - ☐ Target A/F Ratio
  - ☐ **Acceleration Enrichment**
  - ☐ Temperature Enrichment
  - ☐ **Startup Enrichment**
    - ☐ **Cranking Fuel**
    - ☐ After Start Holdoff
    - ☐ After Start Enrichment
    - ☐ After Start Decay Rate
  - ☐ Fuel Control
- ☐ Sensor

[Import]   [Cancel]
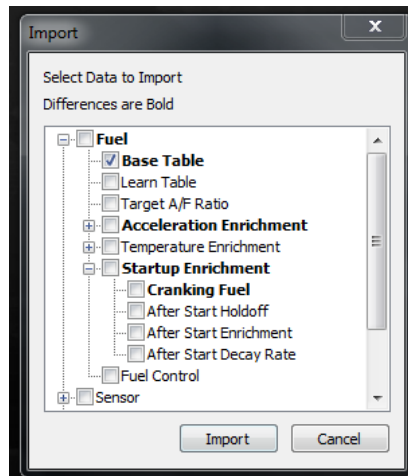
Config Properties

Selecting "Config Properties" from the File menu will allow notes to be saved to the Config File. These notes will then be visible in the "Notes" field when opening a Config File. This is useful tool to help identify differences between multiple Config Files.

Saving and Sending Files

Sending a Config to the ECU

To load/send a Config File to the ECU, perform the following steps:

1. Open a file on the laptop.
2. Turn the ignition power on with the USB Communications cable connected. The Communication mode should say "USB Link".
3. Mouse-click on the "USB Link" button.
4. A "sync" will be performed. If the Global Folder in the ECU is different than what is on the laptop, you will be prompted to "Get from ECU" or "Send to ECU". To send the current Global Folder on the laptop to the ECU, select "Send to ECU". The file in the ECU will be over-written. The Communication mode should now read "Online".

Retrieving a Config From the ECU

To load/retrieve a Global Folder from the ECU, perform the following steps:

1. Open a file on the laptop.
2. Turn the ignition power on. Have the USB Communications cable connected.
3. Mouse-click on the "Online" button.
4. A "sync" will be performed. If the Global Folder in the ECU is different than what is on the laptop, you will be prompted to "Get from ECU" or "Send to ECU". To retrieve from the ECU, select "Get from ECU". The file in the ECU will now reside on the laptop.

Saving a Config

To Save a Global folder as a new name, perform the following steps:

1. Go to "File" and "Save Global Folder As"
2. The Global Folder name that is currently open in the software is automatically populated in the "Global Folder Name" at the bottom of the screen. You can change it if desired. To create a new directory, or navigate to another drive or directory, select the "Choose or Create New Directory" button. To go up one directory level, select the "Go up one level (Parent Directory)" button.
3. Type in the Global Folder name you want to save the calibration as under "Global Folder Name".
4. Select "Save". The Global folder is now created and saved.
5. This file can now be saved by selecting the "Save" button in the top toolbar, or going to "File" and "Save Global Folder".

NOTE: It is highly advisable to always save the initial Global Folder in an unmodified version that you can go back to if the calibration gets tuned incorrectly.

Fuel

Base Fuel

Description: The base fuel table is the primary means of determining how much fuel is injected into the engine. The table has an X axis consisting of engine speed (RPM). The Y axis is engine intake manifold vacuum. 100 kPa is no vacuum which occurs at wide open throttle. Values lower than 100 kPa indicate intake manifold vacuum. Values above 100 kPa will be seen under boost on supercharged/turbocharged engines. The following are approximate values:

75 kPa = 7.5 in. Hg (inches of mercury)

50 kPa = 15 in. Hg.

25 kPa = 22.5 in. Hg

150 kPa = 7.5 PSI of boost

200 kPa = 15 PSI of boost

This table represents either "Volumetric Efficiency" (VE) or "Fuel Flow". Fuel flow units are viewed/used if the "Conversion" checkbox is enabled at the top of the screen. Volumetric efficiency is a ratio of how much air is drawn into the cylinders, vs the swept volume (displacement) of the cylinders. If an engine is 350 cubic inches and it has 100% volumetric efficiency, it means that 350 cubic inches of air enter the cylinders. Engines will have lower volumetric efficiency when the throttle is closed (which creates a vacuum in the intake manifold. Most engines will have between 90-100% volumetric efficiency at wide open throttle (when the throttle isn't restricting airflow). When the throttle is not fully open, an air restriction occurs, creating manifold vacuum, which will lower the VE of the engine (typically down to 35-45% at idle). VE will be highest at peak engine torque.

The base fuel table can also be viewed in "Fuel Flow" in pounds of fuel used per hour (lb/hr). Select the "Conversion" checkbox and the fuel table will be converted to fuel flow. There are benefits to using both fuel flow and VE when tuning, with some of it being what the user is familiar with. When using VE, make sure that engine displacement is properly entered, as this is used in the fueling calculation. Fuel flow will almost always increase as engine RPM and load increases. Most gasoline engines will idle between 4 and 12 lb/hr of fuel. At wide open throttle and peak HP, most typical street engines will require a fuel flow about half of the peak HP (a 400 HP engine will use about 200 lb/hr of fuel). There should never be any sharp changes in any fuel table.

Using some of these guidelines will help perform a sanity check of the base fuel table.

The base fuel table can be tuned using the self-tuning the system offers. If manual tuning is desired, the following keys can be used to adjust a single, or multiple values:

Editing: To edit the graph, click on an area. The following keys are used to raise or lower a value.

Ctrl ↑   - Increases the number 1%

Ctrl →   - Increases the number 5%

Ctrl ↓   - Decreases the number 1%

Ctrl ←   - Decreases the number 5%

Tuning Basics: Holley recommends tuning the Base Fuel Table by enabling "Base Fuel Learn", which will automatically tune the Base Fuel Table while driving or running on the dyno. If manual tuning of the Base Fuel Table is desired, it can be done in open or closed loop with the engine running. Manually adjust an individual cell or area of cells until the desired A/F ratio occurs if tuning in open loop, or adjust until the Closed Loop Compensation and Current Learn value nears zero. When manually tuning, make sure that adjacent cells are smoothed as tuning progresses (best accomplished on the Fuel Graph). Data logging can also be performed and tuning performed off-line. Manual tuning in the idle area can be performed to perfect this area above and beyond what the self-tuning may be able to accomplish.

Tuning Sensitivity: Tuning the Base Fuel Table is best accomplished with the arrow keys versus manual numerical entry. The arrow keys modify a cell based on percentages (1% or 5% increments) which allows either a small or large number to be incremented in the same manner. This is an easy and effective manner to adjust this table. A user will quickly get a "feel" on how much change is required to adjust to the correct air/fuel ratio and whether a 1% of 5% change is required. 5% changes can get a cell close and then 1% changes as the desired target is approached. Be sure to smooth the surrounding cells as the computer interpolates surrounding values and you don't want to create a "valley" or a "peak" on one specific cell.

X and Y Axis Resolution: The X and Y axes can be edited. Note that changing them on a properly performing calibration will "mess up" the calibration, so the axes should be changed before tuning occurs. Resolution can be added in areas that added in areas where

an engine runs, and values removed where an engine may not operate. Make sure to use a good amount of resolution around the idle area, especially on forced induction applications. It is a good idea to use 2/3 of the Y axis for non-boosted and the rest for boost areas.

Graph Button: The "Graph" button shows the Base Fuel table in a graphical mode. When you select the "Graph" button that is located on the base fuel table, it will graph the cells selected. If you highlight a portion of table with the mouse and click the "Graph" button, it will only graph that area, giving more resolution of that area which can be very helpful compared to looking at the whole graph.

Smooth Button: The smoothing button will smooth a group of cells on the base fuel table. Select a group of cells and press the Smooth button. It can be pressed multiple times to continue the smoothing process. Excessive smoothing will "flatten" an area excessively.

Fuel Graph

Description: The Fuel Graph is a graphical representation of the Fuel Table. It can be real time edited just like the Fuel Table. Changes on the graph are reflected on the table and vice-versa. A correctly tuned engine should have a "smooth" graph without peaks and valleys. Note that if an engine is only tuned by the self-tuning, it will only be tuned in actual areas the engine operates in.

When Utilized: The Fuel Graph is typically modified after either manual or Self-Tuning of the Base Fuel Table is performed. It allows for peaks, valleys, or areas that haven't been tuned to be easily visualized and corrected.

Note that changes made during the Self-Tuning process, and shown in the Learn Table will not be shown in the Fuel Graph (or Base Fuel Table), until a transfer Learning to Base" function is performed.

The graph should always be smoothed after performing a "Transfer Learning to Base". Smoothing after Self-Tuning can help areas that were not affected during the Self-Tune process, but may be used during other driving conditions. If this smoothing is not performed, it is advisable to not transfer the learn table.

Frequency of Use: The Fuel Graph will typically be *viewed* on a regular basis during the tuning process. If at any time it is viewed, it is noted that there are areas that need to be smoothed, or offsets made to large areas to speed up the tuning process, they should be performed at that time. When manual or Self-Tuning is completed, the graph should be viewed. The overall graph should have a "smooth" shape. If this is not the case, non-conforming areas can be modified.

Editing: To edit the graph, click on an area. The following keys are used to raise or lower a value.

Ctrl ↑   - Increases the number 1%
Ctrl →   - Increases the number 5%
Ctrl ↓   - Decreases the number 1%
Ctrl ←   - Decreases the number 5%

Looking at the entire 31x31 graph does not allow you to clearly see areas that have to be smoothed, particularly in the idle areas. You can zoom into a smaller portion and view this area in a graphical manner. To do so, go the Base Fuel table (the numerical table), select a block of cells with the mouse cursor, then select "Graph" at the top of the screen. The graph should always be "smooth". When viewed as fuel flow the numbers should never have a decrease in value at a higher RPM or load point. In VE mode the numbers should always increase vertically and mimic the shape of the torque curve horizontally.

Smooth Selected: Smooths the selected cell with the surrounding cells

Smooth All: Smooths the entire graph. Selecting this repeatedly could ruin the table so be cautious.

Tuning Basics: Do not "over-smooth" the Fuel Graph. You do not want to damage correct tuning accomplished during the Self-Tuning or manual tuning process. It's better to be conservative to start.   However, the tuning process can be expedited greatly by modifying areas that need to be increased or decreased, to coincide with areas that have already been tuned. So don't change areas that have been carefully manually or self-tuned, but rather increase or decrease areas that haven't been tuned to blend in with tuned areas.

Learn Table

Description: The Learn Table populates automatically when the fuel learning process occurs. This table can be manually edited if needed (if for whatever reason it is desired to either zero out an area or smooth another). The values reveal "self-tuning" that occurred on specific cells if the self-learning mode has been enabled.   The numbers reflect an offset percentage that is applied to the Base Fuel table in order to comply with the Target A/F ratio. This data is stored in the ECU and is constantly being updated when Fuel Learn is enabled.

Values: Units = Percentage. These values can increase until they reach the user programmed limits on the "Learned Compensation Limits %" table.

When Utilized: Self Tuning should be used whenever possible as it is much easier than having to manually tune an engine cell by cell. There may be some times when it is not advantageous to employ Self Tuning, or at least not during all engine operating conditions. Such examples may be:

1) Engines with extremely large camshafts/overlap may indicate a "false lean" A/F reading at low RPM (below 1200-1600). If this is the case, set the learn parameters so that learning is not enabled below a certain RPM.

2) Engines with short exhaust systems or oxygen sensors placed very close to the end of the exhaust.

3) Very fine tuning of idle: Some engines may have a "finicky" idle that requires manual tuning to create a desirable curve or smoothness that is difficult for Self-Tuning to duplicate. Indications of this need would be a "surging" idle.

Frequency of Use: Self Tuning should be employed for any application to perform Base Fuel Table tuning. However transferring of the learn into the base table should be used very sparingly and only after long periods of learning have been completed.

X Axis: The X axis is copied from the Base Fuel table and is not editable.

Y Axis: The Y axis is copied from the Base Fuel table and is not editable.

Transfer Table: This function transfers the current learn table into the Base Fuel table. Once this action is performed, it can't be reversed. This action should only be performed once all areas of the fuel table have been fully learned. Once the transfer is performed, the user should go into the fuel graph and smooth the entire table. It is advised to zoom into smaller areas of the graph, rather than the entire table as the entire graph does not have the resolution needed. When the transfer occurs, you will be prompted to "smooth the fuel table with the learned values". Typically, it is a good idea to select "Yes", as this will smooth transitions from learned and non-learned areas.

Clear Table: Selecting this will clear the learn table, and will not transfer data to the base fuel table. Perform if for some reason the learned values are thought to be corrupt or not necessary.

Target Air/Fuel Ratio

There are two options on how to adjust the Target Air/Fuel Ratio, either the "simple" method which adjusts an average value for the "Idle", "Cruise", and "WOT" (Wide Open Throttle) areas, or a 16x16 table where individual cells are adjusted.

When one or the other is adjusted, it modifies the other method. To select which option is used change the "Type" to one or the other.

The Target Air/Fuel Ratio table is truly the "tuning" table used when an engine is running closed loop with the learn function enabled. The A/F ratio should be adjusted for maximum power and efficiency as well as safe operation. If searching for maximum fuel economy at one point, you can monitor the Fuel Flow variable at a steady state point. Keep leaning the Target A/F value until either the fuel flow increases or the engine operation becomes unsatisfactory. When tuning on the dyno, alter the Target A/F for maximum (safe) power.

Values: Units = "Air/Fuel Ratio".   Range from 2.0 to 20.0.

Tuning Basics:

- Enter based on the specific fuel used (gasoline, E85), meaning the stoichiometric value is the actual value for each fuel type. Make sure the fuel type is selected in "EFI Parameters" screen. Note that the stoichiometric A/F value for gasoline is 14.7:1 and 9.7:1 for E85.
- "Cruise area" is tuned to maximize fuel economy and drivability. This area is typically 13.5 to 15.0:1 for gasoline engines.
- "Load" and "Wide Open Throttle" need to be tuned for safe and/or maximum power. This area is typically 12.0 to 13.2:1 for naturally aspirated gasoline engines. Boosted engines are typically 11.5-12.5:1
- Do not have any sharp transitions between cells. Blend them together

This table works in conjunction with the base fuel table and has a one to one relationship with the learned cell and that same cell on the base fuel table.

X Axis: Values are taken from the Base Fuel table.

Y Axis: Values are taken from the Base Fuel table.

Smooth Button: The smoothing button will smooth a group of cells on the base fuel table. Select a group of cells and press the Smooth button. It can be pressed multiple times to continue the smoothing process. Excessive smoothing will "flatten" an area excessively

Graph Button

The graph button opens up a graphical view of the target A/F table. This can be edited. The table should be relatively smooth and not have large dips or peaks.

Smooth Selected: Smooths the selected cell with the surrounding cells

Smooth All: Smooths the entire graph. Selecting this repeatedly could ruin the table so be cautious.

Acceleration Enrichment

The "Acceleration Enrichment" tables perform the same function as the accelerator pump on a carburetor. They give a quick shot of extra fuel when the throttle pedal is pressed to eliminate a lean hesitation.

There are several tuning strategies when tuning Acceleration Enrichment (AE) that will end in a similar result. Primary AE fuel addition can be triggered by MAP or TPS based tables and other tables, such as TPS vs. AE, can be utilized. There is no completely right or wrong way. However, some general guidelines are to use the TPS AE as the primary fuel adder for most applications. Applications that are more ideal to MAP based AE applications where the vehicle is very heavy or the gearing very high (numerically low).   These applications may see a large change in MAP with a small change in TPS.

AE vs TPS Rate of Change

Description: Ads additional, momentary fuel based on the rate of change of the TPS. Same function as an accelerator pump on a carburetor.

Values: Units = Lb/hr Fuel

Tuning Basics:

- Only tune when engine is up to operating temperature
- Only tune after the Base Fuel Table is fully tuned
- Watch in online mode to see what area of table is being utilized
- Free rev the engine slow and fast and tune first. Typically, if the engine stumbles it is lean and needs more fuel. It is easy to adjust and see how the engine responds and change accordingly.
- Next, tune under load
- Typically, the curve will be a linear slope
- AE fueling can be reviewed on a data log to see what contribution it provides to fueling and if it's tuning is contributing to a lean condition

Tuning Sensitivity:

- For values below 5, increment by .5.
- For values between 5 and 10, increment by 1.
- For values above 10, increment by 2.
- Most applications will have a value of 1-5 in the first cell and linearly increase to a value of 30-80 in the last cell.

AE vs TPS RoC Blanking Value (Acceleration Enrichment vs Throttle Position Sensor Rate of Change Blanking Value)

Description: This is the threshold of movement/Rate of Change (ROC) below which fuel is not added due to signal "noise". For a TPS, this might be vibration, or "very slow" movement of the throttle during which you would not want added fuel. The default values are moderately conservative and should work on most applications. However, some applications with large throttle bodies might prefer to use a lower AE vs. TPS RoC Blanking value. It is recommended to be very cautious when changing these values, as too low of a value will invoke unwanted added TPS vs. AE fuel, causing the engine to run sporadically, adding extra fuel when it is not needed. When lowering the value, it is beneficial to look at the data monitor and/or data logs at the "TPS RoC" values, and see if there is unwanted activity with either. For just about any application 7 is a good value to use.

AE TPS vs Coolant Temp
Description: Modifies the AE vs TPS Rate of Change Graph based on engine coolant temperature.

Values: Units = "Percentage" of AE vs TPS Fueling. 100% does not change the base table. Numbers above 100% will add that percentage (for example, 150% will add 50% to the base table). Numbers below 100% will decrease the percentage of the base table (for example, 40% will decrease the base table 60%).

Tuning Basics:

- Values as high as 300% are possible at cold engine temps
- Approaches 100% and then possibly less as engine gets to operating temperature
- Tune AE vs TPS table when the engine is warm first and then use this table to adjust at colder engine temperatures

AE Correction vs TPS

Description: Modifies the AE vs. TPS Rate of Change Graph based on throttle position

Values: Units = "Percentage" of AE vs. TPS Fueling. 100% does not change the base table. Numbers above 100% will add that percentage (for example, 150% will add 50% to the base table). Numbers below 100% will decrease the percentage of the base table (for example, 40% will decrease the base table 60%). This value allows changes to acceleration enrichment that *only affects that specific throttle position.*

Tuning Basics:

- Dependent on throttle body design - Large bore throttle bodies may need higher values off-idle
- Typically, table will decrease below 100% at 25-50% throttle and decrease down to 25-50% correction up to 100% throttle opening.

AE vs MAP Rate of Change

Description: Adds additional, momentary fuel based on the rate of change of the MAP sensor.

Values: Units = Lb/hr Fuel

Tuning Basics:

- Only tune when engine is up to operating temperature
- Only tune after the Base Fuel Table is fully tuned
- Watch in online mode to see what area of table is being utilized
- Free rev the engine slow and fast and tune first
- Next, tune under load
- Typically the curve will be a linear slope
- AE fueling can be reviewed on a data log and overlay function to see what contribution it provides to fueling and if it's tuning is contributing to a lean condition.

Tuning Sensitivity:

- For values below 5, increment by .5.
- For values between 5 and 10, increment by 1.
- For values above 10, increment by 2.
- Most applications will have a value of 1-5 at in the first cell and linearly increase to a value of 20-40 in the last cell.

AE vs MAP RoC Blanking Value (Acceleration Enrichment vs Manifold Air Pressure Rate of Change Blanking Value)

Description: This is the threshold of movement/Rate of Change (ROC) below which fuel is not added due to signal "noise". For a MAP sensor, this might be MAP signal movement due to idle fluctuations. The default values are moderately conservative and should work on most applications. However, some engines with large cams and idle vacuum fluctuations may need a larger MAP vs. AE value, due to MAP sensor fluctuations. When lowering this value, it is beneficial to look at the data monitor and/or data logs at the "MAP RoC" values, and see if there is unwanted activity with either. For most applications 15 is a good value to use.

Map AE Time vs Coolant

Description: The length of time it takes for the AE vs MAP fuel to decay from peak value to 0.

Values: Units = milliseconds

Tuning Basics:

- Typically increased at colder engine temperatures
- Use to reduce a lean A/F reading when engine load quickly increases.

Tuning Sensitivity:

- Increase or decrease in increments of 25 to see a change.
- Most applications work well with a range of 100 to 400.

Map AE vs Coolant

Description: Modifies the AE vs. MAP Rate of Change Graph based on engine coolant temperature.

Values: Units = "Percentage" of AE vs. MAP Fueling. 100% does not change the base table. Numbers above 100% will add that percentage (for example, 150% will add 50% to the base table). Numbers below 100% will decrease the percentage of the base table (for example, 40% will decrease the base table 60%).

Tuning Basics:

- Values as high as 300% are possible at colder engine temperatures
- Reduces to 100% and then possibly less as engine gets to operating temperature

Graph

Description: Use the graph to ensure that the desired slopes are achieved and values do not show non-conformities.

Temperature Enrichment

The fuel modifiers allow modification of the Base Fuel table values based on engine coolant temperature and air temperature.

Coolant Temp Enrichment

Description: The basic purpose of the engine coolant modifier is to add enough extra fuel when the engine is cold such that the engine can still maintain the target A/F ratio and run smoothly. When an engine is cold, the burn efficiency is low and extra fuel is required. Engines also may prefer to be run at a richer target A/F ratio as well. That is the purpose of the "A/F Ratio Offset" table. It provides a rich offset to the base target A/F ratio table. When all of these tables are tuned ideally, the closed loop compensation should be minimized which results in best overall operation.

The tuning of the A/F offset and Coolant Temperature Enrichment % then becomes somewhat of a balancing act. If the A/F Offset is increased at a certain engine temperature, the Coolant Temperature Enrichment may need to be increased as well to minimize closed loop correction.

Note that the base calibrations should work fairly well for most applications. However, a person can spend as much time as they want to make things "perfect". Keep in mind the closed loop operation will continually adjust reducing the need for "precise tuning" as compared to an open loop system.

Values: Units = Percentage. Range = 70-200%

Tuning Basics:

- Before tuning this table, make sure that the Base Fuel table is reasonably tuned.
- To tune this table, look at the closed loop compensation value. If it has to add fuel, increase the Coolant Temp Enrichment %. If fuel is being removed, lower the %. Note that this may change as a function of what temperature the engine was started at. Getting the closed loop compensation so that it is about +/- 5% under most conditions will result in a good calibration.
- When an engine is cold, more fuel needs to be added due to several reasons, this table allows for a specific percentage increase or decrease to be applied to the base fuel table value.
- This table works in conjunction with the "A/F Ratio Offset" table below it. If the A/F Ratio Offset table is increased, the Coolant Temperature Enrichment table will require an increase as well.

Tuning Sensitivity:

- Change the values in increments of 1%, unless a large change is needed.

AFR Ratio Offset

Description: A positive value LEANS the target A/F ratio and a negative value RICHENS the target A/F ratio.

Values: A/F Ratio. Range -5.0 to +5.0

Tuning Basics:

•Typically the maximum value needed at cold temperatures would be -2.0
•Inputting too high a value can waste fuel and foul plugs

Tuning Sensitivity:

•Change in increments of .1-.2

Air Temp Enrichment Table

Description: The Air Temperature Enrichment % table is used to add additional fuel based on air temperature. As air gets colder it typically becomes denser, requiring more fuel. This table is beneficial to minimize closed loop correction values.

Values: Units = "Percentage", Range = 0-300%

Tuning Basics:

- Typical values would range from 90% to 115%
- When the air temperature is colder (making it more dense), more fuel is needed to maintain the target A/F ratio. The opposite is true when the intake air is hot.
- Tuning Sensitivity:
- Change in increments of 1%.

Air Temp Enrichment Graph

Description: Use the graph to ensure that the desired slopes are achieved and values do not show non-conformities.

Drag Racing Comments
Every tuner has their own strategies on tuning. However, when bracket racing, it can sometimes be beneficial to make sure there are no Coolant or Air Enrichment variables in play when a vehicle makes a pass. That way, the same amount of fuel is injected pass after pass. However, if no modifiers are used and the engine is run open loop, the base fuel table should be adjusted accordingly for large differences in air conditions. Make sure that it isn't too lean when the air is "good" or too rich when the air is "bad".

Startup Enrichment
Description: The Startup Enrichment tables deal with fueling during engine cranking and immediately after.
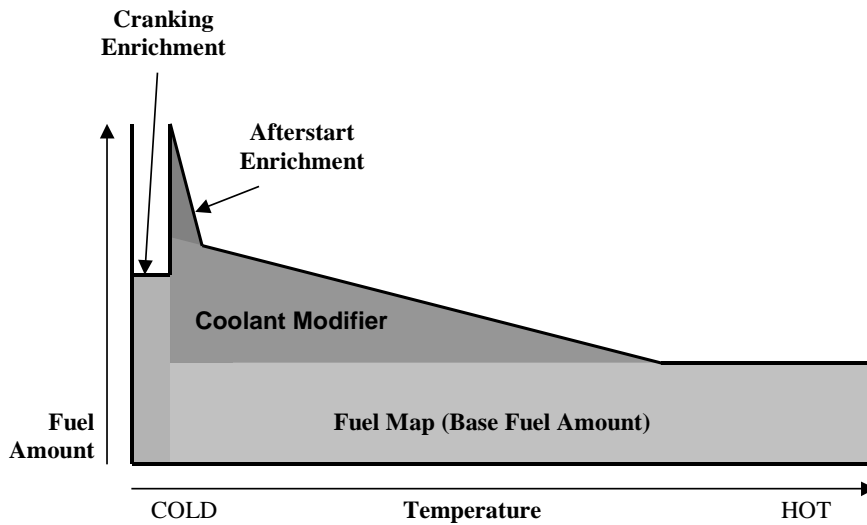
The Cranking Fuel table is the amount of fuel injected while the engine is cranking. The base tables should be fairly close for most applications. If this table is too low, an engine may have extended cranking before starting. Increase the value at that engine temperature and see if the startup improves. If an engine starts and is "loaded up" (too rich) with fuel, these values may have to be decreased. Engines always require more fuel when they are cold.

The After Start Enrichment table modifies the Base Fuel table value for a short period of time after the engine starts. *Once the Base Fuel table is tuned*, if an engine starts and is too rich or too lean for a few seconds, this table can be adjusted to add or reduce fuel momentarily.

The After Start Decay rate is how many seconds it takes for the After Start Enrichment to decay out. This is extended when the engine temp is cold.

Note:
The Enable Fuel Prime option helps with quicker startups. For Sniper EFI applications, the system will inject a single pulse of fuel when the key turns on to wet the intake manifold. The "Fuel Prime Percent" is a multiplier that works off the "Cranking Fuel" Value in the Startup Enrichment table and also varies based on engine coolant temperature. The pulse width of the single shot of fuel prime fuel is based off the Cranking Fuel value as well as the coolant temperature and multiplied by the "Fuel Prime Percent". A value of 150% is usually a good starting point.

Cranking
Enrichment

Afterstart
Enrichment

Coolant Modifier

Fuel Map (Base Fuel Amount)

Fuel
Amount

COLD   Temperature   HOT

Cranking Fuel

Description: Amount of fuel that is injected when the engine is cranking based on engine temperature.

Values: Units = Lbs/hr of fuel. Note: This value is translated into an injector pulse width (based on actual injector flow used) and is then again corrected based on engine cranking speed. The values entered are based on a 200 RPM cranking speed and then corrected for different cranking speeds. This is transparent to the user.

Tuning Basics:

- Simply stated, if an engine needs more or less fuel to start, at a certain engine coolant temperature, raise or lower this table accordingly.
- Note that it is sometimes difficult to tell if a slow start is due to too much or too little fuel. Too much (rich condition) may act like too little. It is best to just go in one direction or the other and try.
- The base calibrations, if used on a similar engine, should be close and not require significant modification.

Tuning Sensitivity:

- For values of 5 - 15, raise or lower in increments of 1 - 2.
- For values of 15+, raise or lower in increments of 3 - 4.

Startup Settings

Clear Flood TPS: Above this value, no fuel will be injected when the engine is cranking/starting. Typically set to 50% or higher

Fuel Prime Percent: The pulse width of the single shot of fuel prime fuel is based off the Cranking Fuel value as well as the coolant temperature and multiplied by the "Fuel Prime Percent". A value of 150% is usually a good starting point.

Fuel Prime Multiplier: The multiplier value is used to add additional fuel during the key on prime shot. This value is used to multiply the fuel prime value by the full value at -40F and is no longer used by 160F. Between -40F and 160F the value is partially used. For example if the multiplier is set at 10 then -40F will have ten times the base prime shot, 40F will have 5 times the base prime shot, and anything 160F or above will have the normal prime shot.

After Start Enrichment

Description: Modifies the Base Fuel table flow based on engine temperature. This fuel is added immediately after an engine starts, and then is decayed out after several times based on programmable parameters. It adds needed fuel after an engine starts when the intake walls are dry and the engine components cold.

Values: Units = Percentage

Tuning Basics:

- Will range from 100% at operating temperatures to up to 250% at cold temperatures.
- Tune only after the Base Fuel table AND the Coolant Temp Enrichment % tables are tuned.
  If an engine is too lean (or rich), immediately after it is started, this table can be modified.
- Look at appropriate data monitor parameters or a data log to see if more or less fuel is needed after startup.

Tuning Sensitivity:

- For higher values (150%+) change in increments of 5 - 10%. Note once an engine is started, you lose the "real" cold start when the intake walls are dry and the engine components cold.

After Start Holdoff

Description: The amount of time after engine starts to when the after start fuel is deployed.

Values: Units = milliseconds

Tuning Basics:

- This table typically does not need to be tuned from the base parameters.
- If this value too large, an engine may stumble before the after start enrichment occurs.

After Start Decay Rate

Description: The amount of time it takes for the After Start Enrichment to decay to zero.

Values: Units = Seconds

Tuning Basics:

- This parameter is used in conjunction with the actual After Start Enrichment value to assist with tuning immediately after an engine starts.
- If an engine is too lean after initial start, the option is to either increase the amount of After Start Enrichment, or lengthen the After Start Decay rate.

Tuning Sensitivity:

- For lower values below 10, adjust in increments of 1-2.
- For values from 10-30, adjust in increments of 3-5.

Graph

Description: Use the graph to ensure that the desired slopes are achieved and values do not show non-conformities.

Fuel Control

Decel Fuel Cutoff

Description: Allows for fuel to be shut off under "deceleration/vehicle coast" conditions for fuel conservation. It typically doesn't offer many "drivability" benefits.   Can be enabled or disabled.

Tuning Basics:

- This shuts off fuel during vehicle coast conditions to save fuel. Occurs when engine RPM is over a specific point and TPS = 0%.
- If used, it is important that these parameters are optimized for a specific vehicle application. If the parameters are not correct, drivability issues such as bucking, or hesitation may occur.

Fuel Control Decel Wait Time:

Description: The amount of time before fuel is cut off after the TPS goes to 0% when the vehicle is at a coast-down condition.

Values: Units = Seconds

Tuning Basics:

- Values are typically .5 to 2.0 seconds.
- It is most difficult to get seamless operation on a manual transmission. Increasing this number can help drivability.

Tuning Sensitivity:

- May tune in .2 second increments.

Fuel Control RPM Added to Idle for Fuel Reactivation

Description: This is part of the equation that determines when fuel will be "turned back on". This number is added to the "RPM Above Idle to Start Ramp" (see Idle Parameters) to determine how many RPM above the target idle speed fuel will be turned back on.

Tuning Basics:

- This value must be high enough so that the engine RPM doesn't "bounce" back and forth between a fuel on and fuel cutoff condition. This is specific to each vehicle and its drivetrain.
- For manual transmissions, a value of 300 would be a good starting point. For automatics, a higher number may be needed.

SENSORS

MAP

Description: Sniper TBI is equipped with an on-board 2-bar MAP sensor.

Scale: 0 - 210

Units: kPa

CTS

Description: Sniper TBI uses a 'GM Calibration' Coolant Temperature Sensor

Scale: -40 - 260

Units: °F

MAT

Description: Sniper TBI is equipped with and on-board Manifold Air Temperature Sensor

Scale: -40 - 260

Units: °F

RPM

Scale: 0 – 20,000

Battery

Scale: 0 – 20 (max recommended operating voltage for Sniper is 18.5 volts)

Scale: Volts

TPS

Description: Sniper TBI uses a 0-5 volt Throttle Position Sensor

Range: 0-100

Units: %

Custom Sensors 1–3

With Super Sniper you have the option of installing up to three additional input sensors. There is a **Sensor Type** drop down that you can select from. Using these dropdowns, the software will automatically setup proper sensor calibration. You may also use the custom 5V option to setup your own sensor. You will need to know your sensor's calibration info if you choose to use this option.

Sensor Warnings

User configurable sensor warnings and colors are used for display purposes only within Sniper EFI software. They currently have no effect EFI functions, or 3.5" touch screen display configurations.

Enable Low Warnings – Enables the 'Sensor Caution' and 'Sensor Warning' data log parameters
Enable High Warnings – Enables the 'Sensor Caution' and 'Sensor Warning' data log parameters
Low Caution
Low Warning
Normal – This is the normal sensor value range between low and high caution values
High Caution
High Warning
Display Min – Minimum gauge display value
Display Max – Maximum gauge display value

Safety Setup

Sensor safeties can be configured to cut ignition or offset timing if the user input value and time limit is exceeded.

NOTE: The Sniper EFI system must be set up to Control Timing and have ECU firmware version 1.0 Build 8 or higher for these safeties to function. For instructions on how to update ECU firmware, visit the Holley Performance YouTube page.

System

Engine Parameters

The Engine Parameters section contains parameters that must be properly filled out for proper engine operation.

Engine

Number of Cylinders: Select for 4, 6, or 8 cylinder engines

Engine Displacement: Enter the engine displacement in cubic inches. Ensure this is correct as it is part of the volumetric efficiency formula used to calculate fuel flow.

Cam Type: Does not affect how the engine runs, this is used by the handheld to display what base tune you started with if you used the wizard.

Ignition

Ignition Type: This must be selected based on the crank signal that will be used. They consist of the following:

- **Coil (-)** – Use if you are *not* controlling ignition timing, and are connecting to the negative side of the ignition coil and *are not using a CD ignition box.*
- **CD Box** – Use if you are *not* controlling ignition timing, and are using a CD (Capacitive Ignition) box such as an MSD. Requires a square wave tach signal.
- **Magnetic** – Use if you are connecting to a magnetic pickup. Does not matter whether ECU is controlling timing or not.
  - Ignition Reference Angle – This is the crankshaft position when the crank position sensor is triggered before TDC. A value of 50-60 is typical.
  - Minimum Signal Voltage – This parameter defines what the signal strength must be for the ECU to recognize it as valid for the crank, cam, and IPU speed inputs. Anything below this threshold is considered background noise. This value can be set between 0 and 5V. The higher the setting, the more noise is rejected and the stronger the signal has to be before the ECU considers it valid. Practically speaking, the sensor's signal at the lowest speed (during cranking for instance) defines how high you can set this. Obviously, if you only have a voltage level of 0.5V during cranking, you do not want to set it to 1V because the actual signal will be ignored. It is advised to start with a value of .35 Volts. If there is a problem picking up a signal during cranking, lower this value .05 Volts at a time until you get reliable triggering during cranking (valid engine speed), then multiply this value by 0.75. If there is a problem with noise causing false pulses, you can try increasing this value.
  - Inductive Delay **-** This value is used such that ignition timing remains on target as RPM increases. If this value is too low, ignition timing will retard vs. commanded timing. If this value is too high, ignition timing will advance vs. commanded timing. Set this value such that the timing does not drift as RPM increases.   It is best to use the "static timing set" function and set the timing to a fixed value such as 30 degrees. Rev the engine up as high as possible (using appropriate caution/safety). Adjust the Inductive Delay value until the timing matches the commanded timing. Make sure you cycle the ignition key after this value is changed, before it is re-checked.
  - Filtering – This selection applies one of two different values to filter out electrical noise. The Base setting is high and should not need adjustment in most cases.
- **Holley Dual Sync -** This is used with any Hall Effect crank position sensor, such as Holley EFI distributors.
  - Ignition Reference Angle – This is the crankshaft position when the crank position sensor is triggered before TDC. A value of 50-60 is typical.
  - Inductive Delay **-** This value is used such that ignition timing remains on target as RPM increases. If this value is too low, ignition timing will retard vs. commanded timing. If this value is too high, ignition timing will advance vs. commanded timing. Set this value such that the timing does not drift as RPM increases.   It is best to use the "static timing set" function and set the timing to a fixed value such as 30 degrees. Rev the engine up as high as possible (using appropriate caution/safety). Adjust the Inductive Delay value until the timing matches the commanded timing. Make sure you cycle the ignition key after this value is changed, before it is re-checked.

Output Setup

Dwell Time: This is dwell value that the points output will maintain.

Enable Dwell Table Checkbox: If enabled, the single dwell time value will turn into 2x4 table with engine RPM for the X axis and MAP for the Y axis. Both axis values are user adjustable. Note that the table will automatically start at 0 RPM and 0 kPa and dwell values will be maintained above the max RPM and MAP values given.

EFI Parameters

EFI System

System Type: Select from the various Sniper listings. This must be correct as it programs the ECU with how many injectors the system has, as well as the number of inputs and outputs.

Fuel Type: Select "Gasoline" or "Ethanol" for the Fuel Type. This tells the ECU what the stoichiometric A/F ratio is of the fuel used. Gasoline is 14.7:1 and Ethanol is 9.7:1. This dictates how the target air/fuel should be configured in the Target A/F Ratio table.

WB02 Sensor: Select whether a 4.9 Bosch sensor is used, or NTK sensor. Incorrect selection will damage the sensor in short order.

Actual System Pressure: Enter the actual system pressure used. Incorrect entry will cause the fueling to be inaccurate. The Sniper EFI integrated regulator is non-adjustable so the fuel pressure software input box should only change if an external regulator is being used – at which point, the software input needs to reflect the actual fuel pressure setting.

Map Sensor: Allows you to select an external MAP sensor for pressure readings. Requires a Super Sniper and a custom input to be used for the incoming MAP sensor signal.

Fuel Injector Information

Rated Flow per Injector: Enter the injector flow value in lb/hr

Rated Injector Pressure: Enter the rated injector pressure in PSI.

> **Note:** Both of these parameters need to be accurate of inaccurate fueling will occur.

Minimum Injector Opening Time: Minimum injector opening value for the injector. This should be set to 1.2 msec for Sniper Injectors

Injector Off Time: The injector off time curve (or dead time) is the duration of time where there is no flow between the time an injector is commanded open and closed. This is specific to every injector as well as the system operating voltage. Pressure also affects this number. The 1x16 curve in the software accounts for varying system voltage

> **NOTE**: This is preset with the proper data in all Sniper calibrations. You should not need to ever touch these values unless you have changed to a different injector.

Basic I/O

Electric Fans

Allows you to set up one or two triggered outputs for fan relays. The on temperature will always be forced higher than the off temperature by the software.

Air Conditioning

A/C Shutdown: This enables the AC output and allows you to setup up the maximum TPS and CTS that the output will be active. Whenever under the max settings the A/C will be active

IAC Kick: Enabling this input will allow for the Idle Air Control motor to automatically make an increase in steps necessary to avoid a momentary drop in idle speed. The number is how much, in percent, the kick adds to the IAC

Enable Fan #1 when A/C is on: Use if you have a cooling fan wired in and want it on whenever the A/C is active.

Secondary Fuel Pump

This can be configured to activate above a certain TPS, RPM, and/or Boost/vacuum level. Note: This output remains active for 5 seconds after the criteria to deactivate have been met.

Description: This option enables various diagnostic channels in a data log. These can be used by Holley Technical Services to help diagnose issues.

Type #1 – Cam & Crank

Type #2 – WBO2

Type #3 – not used

Type #4 – not used

Type #5 – Boost Control

Type #6 – not used

Type #7 – Closed Loop and Learning Enables

Type #8 – not used

Type #9 – not used

Type #10 – not used

Closed Loop/Learn

Closed Loop Parameters

Description: Parameters used to specify when closed loop operation can be disabled based on specific sensor conditions.

Enable Closed Loop: Checkbox to enable closed loop operation. If not selected, engine will never run closed loop and consequently cannot operate in "Learn Mode" as well.

Enable Min Coolant Temp for Closed loop: If enabled, activates this parameter. Below the Engine Coolant Temperature value entered, the engine will not operate closed loop, it will operate open loop.

Tuning Basics:

- The intent of the overall tuning methodology of this system is to operate the engine in closed loop all the time, at every coolant temperature. It is advised that this be the case for most applications.
- Applications that might possibly enter something in this parameter would be race applications that run open loop some or all of the time.

Enable RPM to Enter Closed Loop: If enabled, activates this parameter. Below the Engine Speed value entered, the engine will not operate closed loop, it will operate open loop.

Tuning Basics:

- There are cases where it is necessary to run open loop below a certain RPM. Some examples are:
- Applications that have the sensor mounted close to the exit of the exhaust, such as race cars with short collectors. Until exhaust flow becomes significant enough, outside air will cause a false lean air/fuel reading.
- Applications that have camshafts with a lot of overlap. The overlap can cause a false lean reading at low engine speeds. There are no firm rules if this will be the case, but be aware on engines with large duration and low lobe separation angles that this can occur. If the engine is pouring out black smoke, and the air/fuel ratio is 15:1, this is likely the case.

Enable TPS to Enter Closed Loop: If enabled, activates this parameter. Below the Throttle Position value entered, the engine will not operate closed loop, it will operate open loop.

Tuning Basics:

- Similar to the RPM parameter above, there may be cases when it is desirable to run open loop at idle or low TPS values.

Enable TPS To Enter Open Loop: If enabled, activates this parameter. ABOVE the Throttle Position value entered, the engine will operate open loop.

Tuning Basics:

- Some tuners prefer to operate open loop at WOT. This system can safely be run closed loop at WOT, but it is up to the preference of the tuner.

Advanced Control

Description: This dropdown allows the user to change the "speed" at which the closed loop control operates. Selection "1" would be the slowest of the choices. Selection "5" would be the fastest.

Tuning Basics:

- It should be noted that the selection provided for base calibrations should be a "very good" choice and likely does not need to be modified. A person that does not understand what to look for when changing these values is best to leave them alone.

View Custom

Description: The last dropdown choice in the "Advanced Control" is called "Custom". Selecting this forces the user to input their own Closed Loop PI parameters. This is NOT advisable unless you have a good understanding of tuning PI control systems. If you don't know what "P" or "I" means, it is best that you select one of the other choices in this drop down.

Compensation Limits – Table

Description: Provides limits to the closed loop fueling control. This is an extremely useful table that allows the user to put limits on the closed loop control as desired.

Values: Units = Percentage. Range = 0-999%.

Tuning Basics:

- When an engine is first being tuned, it is desirable to keep the limits large, in order to ensure the closed loop control can add or subtract fuel as necessary during the tuning process.
- Once an engine is tuned, many options exist to still allow closed loop control, but put limits on it if desired such as:
- Do not allow fuel to be added at idle, only subtracted, if the readings are in doubt due to a large camshaft.
- Don't allow much or any fuel to be removed at WOT/high loads, but allow fuel to be added if necessary to account for a fuel system malfunction.
- "Fine Tuning" that can be used for better operation during a decel condition or other examples where limiting closed loop operation can result in a better running vehicle.

Compensation Limits - X Axis

Description: The X axis is automatically scaled from the Base Fuel table X axis.

Compensation Limits - Y Axis

Description: The Y axis is automatically scaled from the Base Fuel table Y axis.

Learn Parameters

Overview: This system can operate in a "Learn Mode". For Learning to be active, the system MUST be operating in a closed loop mode. If closed loop is not operating at a specific RPM or load, Learn will not be active. Also, the coolant temperature enrichment value MUST be at a value of 100 in order for learn to be active.

Learning and closed loop are not "separate" activities. The Learning "works off of the closed loop". Meaning, the learning works to reduce the closed loop value to 0. The closed loop control is very fast and will respond instantly to a deviation from the air/fuel ratio. The learn is intentionally slower than the closed loop response. This is done to eliminate "improper learning" that could occur during transient and other operating conditions. Low engine speeds require an engine to be stabilized in order for the Base Fuel Learning to occur. At higher engine speeds, learning is allowed to occur at a much higher speed.

Learn Enable: Checkbox to enable Base Fuel Learn operation. If not selected, engine will not operate in Learn Mode.

Base Fuel Learn Gain

Description: This parameter is simply how fast Base Fuel Learning will occur. 100% is the fastest allowable and 1% is much slower.

Tuning Basics:

- This value should be set at 100% when an engine is first being tuned.
- You cannot do harm by leaving the learn at 100%
- It is standard procedure that after a base fuel table is fully tuned, the learn is disabled or slowed down. That is up to the tuner.
- For street cars, after the fuel table is tuned, learn can be set at 10-30% to act as a "long term" correction factor to take into account engine degradation or changes to atmospheric conditions.

Enable RPM to Enter Learn

Description: If enabled, activates this parameter. BELOW the Engine Speed value entered, the engine will not operate in Learn mode.

Tuning Basics:

- It may be desirable to leave learn active only at higher engine speeds. The idle area may be "fine tuned by manual methods", and it may be desirable to not have learn modify that area. If so, this parameter will be useful.

Enable TPS to Enter Learn

Description: If enabled, activates this parameter. BELOW this TPS value entered, the engine will not operate in Learn mode.

Tuning Basics:

- Similar to the RPM parameter above, it may be desirable to leave learn active only at higher TPS positions.

Learn Compensation Limits - Table

Description: This table puts limits on how much the system is allowed to learn. The 8 x 8 table allows this to be varied by Engine Speed and Load.

Values: Units = Percentage. Range = 0-999%.

Tuning Basics:

- When an engine is first being tuned, it is desirable to have higher learn limits. This is especially the case at low engine loads, where a base calibration may be off significantly.
- A user can put in different limits for addition and removal of fuel if desired.   If they want to ensure that fuel is NOT removed, put the subtraction value at 0%.

Closed Loop Learn Parameters: Compensation Limits - X Axis

Description: The X axis is automatically scaled from the Base Fuel table X axis.

Closed Loop Learn Parameters: Compensation Limits – Y Axis

Description: The Y axis is automatically scaled from the Base Fuel table Y axis.

Idle

Overview

All of the settings in this area deal with the control of the Idle Air Control motor (IAC). The IAC allows the computer to add or subtract air to maintain the programmed idle speed while the throttle lever remains stationary. Three functions are programmed in this area:

1) Engine Idle Speed

2) IAC Position when the engine is cranking and immediately after it starts

3) IAC Position when an engine returns back to idle

These parameters can be altered such that the engine operates as desired. This is one area of tuning that is very specific to an individual's preferences.

Tuning Idle Speed

Idle Speed

The "Idle Speed" tab is the target idle speed an engine will be held at based on engine coolant temperature. Typically, an engine will idle better at a slightly higher speed when cold, but this doesn't have to be the case.

It is very important that the throttle plates be adjusted to the proper setting so that the Idle Control routines operate properly. To adjust the throttle plates properly, allow the engine to reach operating temperature. With the transmission in neutral, open or close the throttle plates so that the "IAC Position" seen in the data monitor is between 5 and 15%. If it is stuck at 0, the plates are too far open and the ECU can't command the idle speed low enough. If the position is too high, there won't be enough IAC airflow for when the engine is cold or in gear, as well as the other IAC parameters won't be in a proper range.

- ***Important note***: The TPS sensor must read less than 2% for IAC idle control to be enabled. If it is above 2%, the IAC will be forced to its "IAC Hold Position". The Sniper TPS will reset its ZERO position at each key cycle.

IAC Settings

Idle Spark

Description: If the ECU is controlling the ignition timing, Idle Spark control can be enabled. It allows the ECU to vary timing at idle to stabilize the idle.

Tuning Basics:

- Raising or lowering the "P Term" will change the speed at which the timing is allowed to change. Experiment to see what the engine likes best. The "D Term" is used to help minimize overshoot. If you are unsure, just make the D term the same value as the P term to start. Monitor the timing on the data monitor to help optimize what is best for your engine. Understand that if this is enabled, the timing will fluctuate a lot at idle if you are viewing it with a timing light.

IAC Ramp Down

Description:

The IAC Ramp Down parameters control what the IAC does when the engine TPS is moved past and returns back to idle. These parameters are intended to be used such that when the engine returns back to idle, the engine speed can return quickly or "softly". This is up to the preference of the individual. Adjusting these parameters can greatly alter how this occurs. The "IAC Hold Position" is the position the IAC will freeze at when the TPS increases past 0%. For most street applications, this value will typically be between 30-40%. When an engine returns to idle, the IAC will decay from this value until the idle speed returns to target. The point which the IAC ramps back down is dictated by the "RPM Above Idle to Start Ramp". This is typically 600-1000 RPM. The amount of time this ramp takes to decay back to idle is dictated by the "Ramp Decay Time". A time of 3-4 seconds is usually a decent value.

Tuning Basics:

- With the engine at operating temp and in neutral, determine the engine speed where you want to start the IAC ramp-down (for example 1500).
- Set the engine idle speed to this speed (1500 for this example).
- Look at the position of the IAC when the engine is running at 1500. For this example, it is 38 (then set the idle speed back to the normal value).
- Subtract 5 from this value and enter that value for the "IAC Hold Position" (38 – 5 = 33 for this example).
- Subtract the target idle speed from the ramp down speed above (in this example 1500 – 800 = 700). Enter this value (700) for the "RPM Above Idle to Start Ramp.
- Then enter a "Ramp Decay Time" as desired. A larger number will take longer to set the engine back to idle speed, a smaller one will return it quicker.

Performing this method will optimize these parameters.

If these values are not set correctly, it can cause the IAC to not "count down" and return back to idle. If this is the case, either one of the following needs to be done:

- Lower the "IAC Hold Position"
- Raise the "RPM Above Idle to Start Ramp"

NOTE: Before modifying these values, make sure that the steps outlined above in "Tuning Idle Speed" are performed.

IAC Control: Engine idle speed is controlled/maintained by the Idle Air Control motor. The pull down menu contains various IAC speeds that can be selected to suit various engine and camshaft combinations. For most applications, "Sniper TBI" will be the best selection.

Startup IAC Position: The startup IAC position is used to hold the IAC at the "IAC Parked Position" for a certain amount of time after the engine starts. The "Hold Time" is the time that the engine is held at this higher RPM. This is usually about two seconds. The "Decay Time" is the time it takes to ramp the IAC back to a position of zero. These parameters can be adjusted to suit ones preferences.

IAC Parked

Description: This table determines the position of the IAC when an engine is cranking and immediately after it starts.

Tuning Basics:

- If the value is too high, the engine will rev to too high of a level after it starts.
- If the value is too low, an engine may not have enough air to start well and struggle for a second after it starts.
- If either of these problems exists, raise or lower values in this table at the engine coolant temp the problem occurs at.

Spark

Base Timing Table

Description: The Base Timing Table (or simple values) is the main table used to program ignition timing (assuming the system is set up so the ECU is controlling ignition timing). The X and Y axes are user editable if needed. Every engine and application requires a specific timing table for the best operation, so tune accordingly. Timing typically increases as RPM increases and decreases as load increases. Timing is interpolated between values.

Tuning Basics:

- **Type = "Simple"** is the most basic method which adjusts an average value for the "Idle", "Cruise", and "WOT" (Wide Open Throttle) areas. The 31x31 table is display only (not editable) in "Simple" mode
- **Type = "Advanced"** in this mode, the 31x31 table is used rather than the 3 "Simple" input boxes.
- Make sure that the timing values in the idle area are "flat" because varying the timing in the idle area can cause the engine idle to hunt/surge.
- The "Copy Fuel Axes" button will copy the base fuel table X and Y axis values to this table if desired.

Editing: To edit the table, click on or select an area. The following keys are used to raise or lower a value.

Ctrl ↑   - Increases the number 1%
Ctrl →   - Increases the number 5%
Ctrl ↓   - Decreases the number 1%
Ctrl ←   - Decreases the number 5%

Base Timing Graph

Description: Like the base fuel table the "Graph" button that is on the base timing table will graph whatever values are selected on the table. The "Base Timing Graph" tab will always graph the entire table.

Smooth: The Smooth button will smooth the entire table, or just the values selected by the mouse.

Smooth Selected: When viewing the spark graph this Smooths the selected cell with the surrounding cells

Smooth All: When viewing the spark graph this will smooth the entire graph

Editing: To edit the graph, click on an area. The following keys are used to raise or lower a value.

Ctrl ↑   - Increases the number 1%
Ctrl →   - Increases the number 5%
Ctrl ↓   - Decreases the number 1%
Ctrl ←   - Decreases the number 5%

Cranking Parameters

Cranking Timing: This is the actual commanded timing when the engine is below the Crank to Run RPM. Base parameters of 10-15 degrees and 400 RPM are good for 99.9% of applications. The cranking timing parameter is active for any application using ECU timing control.

Crank to Run RPM: Maximum RPM at which the Cranking Timing parameter deactivates

Rev Limiters

Main Over-Rev

Description: The ECU will cut spark at any RPM above the "High RPM" setting

Description: This is generally used as a two-step and must be wired to an ECU input

Launch Retard

Description: This table can be configured to activate with input, or at input release (i.e. activate when trans brake is released) and can be configured to be a function of RPM or Time. The table values are in degrees of retard, so a value of 5 would equate to a 5 degree retard in total timing.

Timing vs Coolant Temp

Description: Allows the addition or subtraction of ignition timing based on engine coolant temperature.

Tuning Basics:

- It may be desirable to add several more degrees of timing when an engine is very cold.
- It may be desirable to remove timing if an engine gets into an operating temperature range that is higher than normal, to help reducing pinging/pre-ignition.

Timing vs Air Temp

Description: Allows the addition or subtraction of ignition timing based on manifold air temperature.

Tuning Basics:

- Can be used on forced induction engines to reduce timing if manifold air temperatures exceed desired levels.

BOOST

BOOST SETUP

System setup

Wastegate type: Sniper supports dual port wastegates only

Solenoid Configuration: Allows you to select whether you are using one or two solenoids as well as if they are Holley or Humphrey solenoids. Dual Holley solenoids are recommended.

Control Method: Boost control is done by using dome pressure. This means that pressure will be adjusted to the top of the wastegate to hold it closed above when the spring would normally open to regulate boost.

Operating Mode: Allows you to select between adjusting pressure based on time or engine speed.

Use Master Input: Acts as an arming switch for the boost system.

Trans Brake/Launch Input

Enabling this input allows you to set a separate pressure target while it is active. It also serves as the input that resets the boost vs time curve. Time is reset when the input is activated and starts counting on release of the input.

Launch Target – When the Trans Brake/launch input is active the boost controller will target this value.

TPS Boost Modulation

Allows the TPS to modify the boost target so that the driver can modulate boost demand by using the throttle. When TPS Based Boost Modulation active the boost target will be zero when the TPS is less than the value of TPS to Start Ramp. Between the TPS to Start Ramp value and 95% throttle the target pressure is linearly interpolated to the target value from the target boost table or the launch target, whichever is currently active. We recommend utilizing the TPS based boost modulation functionality in nearly all applications.

Safety Setup The Boost Safety area allows for a user to set boundaries that the engine must run in or safety action will be taken. You can set maximum boost thresholds as well as lean and rich AFR thresholds.

Safety actions
1) Ignore- nothing happens, the safety feature is effectively turned off
2) Revert to Wastegate – If the safety criteria are met the ECU will turn off the boost control solenoids until TPS falls below 10% for at least 3 seconds.
3) Cut Ignition – When the safety criteria are met a rev limiter will be activated at 2500rpm until TPS falls below 10% for at least 3 seconds.

Dome Control Setup

Solenoid Pressure Source

Use compressor if using the turbo or manifold for your pressure source. If you are using a compressed pressure bottle select fixed and enter the regulated pressure from the bottle as the fixed pressure value in the software.

Controller Setup

P I D – These are preset at values known to work on most applications with dual Holley solenoids. It is recommended not to change the values unless you have a solid understanding of PID tuning. You can go to the Holley website under tech, instructions and read **199R10628** for comprehensive boost control setup**.**

Boost vs Time

This operating mode only has one curve. The units in the table are dome pressure, not boost pressure in the manifold. The input of the **Boost vs. Time** curve is time since the *T-Brake/Launch* input goes from being active to inactive. Because of that, the *T-Brake/Launch* input is necessary to make this operating mode work correctly. When the *T-Brake/Launch* input is active the timer (*Boost Time*) will be at zero and the target boost/dome/duty cycle will be determined by the value you have in the **Launch Target** field. When the *T-Brake/Launch* input goes inactive the timer (*Boost Time*) will start counting up and the output of this curve determines the target dome pressure. If the timer goes past the value of the last support point, the value of the last point will be held. Because the timer will keep

incrementing until the *T-Brake/Launch* input is active and any time beyond the last support point in the **Boost vs. Time** curve will "hold" the boost demand of the last point, you might want to consider putting a safe boost value as the last point in the curve. Remember that the x-axis support points do not have to be linearly spaced.

Boost vs RPM

The units in the table are dome pressure, not boost pressure in the manifold. You may want to use an RPM curve in the event you need to limit boost at low engine speeds because of knock or traction.

Nitrous

General Notes

Before using nitrous, the basic parameters must be set up and the wiring performed. If an input other than TPS and RPM will be used to either activate or deactivate the nitrous (such as deactivating it when on a transbrake), select and define it.

NOTE: If an engine is in a "clear flood" condition, nitrous will not be activated. If you are trying to dry fire test a stage, you must set the "Clear Flood" TPS setting so that it is above the nitrous "TPS trigger" setting.

If feedback from the wideband oxygen sensor is desired to be used to shut the nitrous off in the case of an overly lean or rich condition, set those parameters as well as the time delay before these occur.

If an output is required to trigger an external device, such as a timing retard on a separate ignition box, tie it into the output trigger for the nitrous relay (Output section).

The "Dry Fuel Delay" is used for dry nitrous systems only. It delays the added fuel injector enrichment after nitrous solenoid activation. Unlike wet nitrous systems, most dry nitrous systems have a "rich hit" due to fuel preceding nitrous delivery. This variable can be tuned to eliminate this. 100-150msec is a recommended starting point.

Stage 1 Setup

Activate Checkbox: Must be checked if nitrous is intended to be used.

Disable Checkbox: Used to disable the nitrous from activating, once all the parameters have been configured.

Use Master Enable Input: This is typically used on every application. It is the nitrous "arming switch". Without it, there will be no way to disable the nitrous when it is not desired to be used.

Nitrous Type: The nitrous "Type" can be set up as Dry or Wet and Progressive and Non-Progressive.

> **Wet Nitrous** – "Wet" nitrous indicates that the extra fuel needed when the nitrous is activated will come from a fuel solenoid, plumbed into the nitrous plate or fogger nozzle and metered by a fuel jet. The fuel will NOT be added by the fuel injection system.

> **Dry Nitrous** – "Dry" nitrous indicates that the extra fuel needed when the nitrous system is activated will come through the fuel injection systems, via the fuel injectors. The user programs in how much fuel this will be.   You do NOT use a separate fuel solenoid, so there will only be nitrous plumbed into the plate or fogger nozzle

> **Non-Progressive** – "Non-Progressive" indicates that the nitrous solenoids will come on fully when the nitrous is activated.

> **Progressive** – "Progressive" indicates that the nitrous solenoids will be pulsed, per the user programming. The pulsing reduces the flow, allowing power to be applied over time.

>> 1. If progressive, make sure you are using Holley PN 554-111 to feed power to the solenoid(s) for that stage. This is an electronic module that is designed to properly pulse a high current nitrous solenoid. Do NOT use a standard switching relay to power solenoids that are progressively controlled. If a stage is NOT being progressively controlled, it is acceptable to use a standard switching relay, although the 554-111 can be used for those as well.
>> 2. If either Dry/Non-Progressive or Dry/Progressive is used, be sure that you understand how to properly tune dry nitrous and that the fuel enrichment tables have a proper baseline calibration.

Dry Fuel Delay: Delay after nitrous solenoid activation before added fuel injector enrichment is started. Unlike wet nitrous systems, most dry nitrous systems have a "rich hit" due to fuel preceding nitrous delivery. This variable can be tuned to eliminate this. 100-150msec is a recommended starting point.

Input

Input Checkbox: If it is desired to disable or enable the nitrous with an extra switch/input, select this box. It will then give the option to Enable or Disable the nitrous when this input is active. A typical example when this would be used is to disable the nitrous when at WOT and the transbrake is engaged. Make sure that the input pin is assigned.

> **NOTE:** Do NOT tie this input directly into a high current device such as a transbrake solenoid. Input should be wired to the button side of a tranbrake if relayed. If no relay is used the Holley input protection module (554-128) can be utilized to protect the ECU.

Relay Trigger Output: This output is used to trigger the nitrous relay and must be configured and wired as such. If you need to trigger a low current external item, such as a timing retard trigger on an ignition box, tie into this output.

Activation/Deactivation

TPS Trigger: Below this value the Nitrous will not activate. This value is also used to determine if the car is "pedaled" for the Pedaling Control settings.

Minimum RPM: Nitrous will not be allowed to activate below this engine speed. This is used as both a safety (you do not want nitrous activating at very low engine speeds or excessive cylinder pressure can damage the engine) as well as a traction tuning aid (delaying activation until a certain engine speed).

Maximum RPM: Nitrous will be disabled above this engine RPM. This is most typically used as a safety. You do NOT want nitrous to remain active if the engine hits the rev limiter. So you want the Maximum RPM value to be about 200 RPM below the engine main rev limiter.

Stage Activation Delay: This is typically used as a traction tuning aid. It allows the nitrous activation to be delayed for this amount of time after the other activation conditions are met.

Stage Duration: If enabled, the nitrous will turn off after this programmed amount of time, even while all other activation conditions remain.

Boost Cutoff: The boost cutoff will turn the nitrous off above this boost level. This is typically used to help spool a turbo or help a car leave the starting line quicker and shut the nitrous off at the programmed level.

AFR

Description: The AFR settings allow the nitrous to be deactivated if the air/fuel ratio becomes excessively rich or lean for a programmed amount of time.

Lean Cutoff: If actual A/F ratio becomes leaner than this set point, for longer than the cutoff delay time, the nitrous will be deactivated.

Rich Cutoff: If actual A/F ratio becomes richer than this set point, for longer than the cutoff delay time, the nitrous will be deactivated.

Cutoff Delay: Time that the Rich or Lean Cutoff's must maintain past the target before nitrous is deactivated.

Pedaling Control

Description: These parameters dictate what a specific nitrous stage will do if a car is "pedaled" (TPS deactivating a stage for a short amount of time, then re-activating).

Pedaling Strategy: The choice will dictate what a specific stage timer will do when the car is "peddled". There are three choices available:

1) **None** (Full Timer Reset) – If the TPS drops and disables the nitrous, the timer for that stage will return to the beginning (time = 0). This will reset all time based progressive nitrous and timing retards.
2) **Pause Enabled** – If the TPS drops and disables the nitrous, the stage timer will be "frozen". When the TPS goes back above the activation point, the stage timer will start at the point where it was frozen.
3) **Programmable Restart** – If the TPS drops and disables the nitrous, and then goes back above the reactivation point, one of two things will happen:
    1) If the stage timer is less than the Start Restart Time, the nitrous will restart at the point when the car was peddled, the same as the "Pause Enabled" feature. For example, if the Stage Restart Time is set to 1.0 seconds, and the car is peddled at 0.5 seconds, the timer will restart at 0.5 seconds.
    2) If the stage timer is greater than the Stage Restart Time, the nitrous will restart at the Stage Restart Time value. For example, if the Stage Restart Time is set to 1.0 seconds and the car is peddled at 2.5 seconds, the timer will restart at 1.0 seconds.

Timing Retard

Description: *IF* the ECU is being used to control ignition timing, the timing retard area should be used to retard ignition timing when nitrous is activated.

Retard Hold After Deactivation: The amount of time, on a specific stage, that the stage timing retard value will remain, after the nitrous is deactivated. Timing is usually pulled for about a half second after it is deactivated, to make sure all nitrous is cleared through the engine.

There are two choice when retarding the timing, fixed timing or time or RPM based retard curve.

- **Fixed Timing** - The fixed timing should be used when a single, fixed value is desired to be used when nitrous is activated. To enable fixed timing select the "Enable Fixed Timing" check box, and enter the fixed timing value to be used.
- **Timing Retard Curve** – If the Fixed Timing is not enabled, the retard curve will be used. Select whether this will be based on Time or Engine Speed (RPM). The X axis for time or engine speed can be programmed by the user. This curve can also include power/traction management in with it as well. The "View Graph" button shows the timing retard in a graphical curve that can be edited as well.

Closed Loop Settings

Description: These settings dictate what changes to closed loop operation occur when the nitrous is activated. If none are enabled, the closed loop will occur as it is programmed.

Run Closed Loop to New Target A/F Ratio: If enabled, this will become the closed loop target when nitrous is activated.

Disable Closed Loop: If enabled, when nitrous is activated, closed loop control will be disabled and the engine will run open loop.

Progressive Control

The progressive control table will only show when the nitrous type is selected as progressive.

Strategy Type: The strategy type can be either "Time Based", "RPM Based", or "Boost Based". The X axis on the progressive control will be determined by this selection. Time based would be used for a drag racing application when the nitrous is activated at launch and power needs to be modulated. RPM based could be used for any application where the amount of nitrous needs to be metered based on engine RPM. Boost based would be used on forced induction applications, typically when the nitrous is used to add power when boost levels are low.

Frequency: Adjusts the frequency that the solenoids are modulated at (adjustable from 10-35 Hz). Most solenoids operate most effectively between 10 and 20 Hz.

Added Fuel Enrichment

This table is used when the Nitrous Type is selected as "Dry". This table is user programmed to add fuel (in lbs/hr) when the nitrous is active.

If the Nitrous Type is "Dry/Non-Progressive", the X axis on the table is engine speed. This allows for the dry fuel enrichment to be more precisely tuned based on engine speed.

If the Nitrous Type is "Dry/Progressive", the X axis on the table is Solenoid Duty Cycle. This allows for the dry enrichment fuel to be tuned based on solenoid duty cycle. When the duty cycle is lower, less fuel can be added. Understand that nitrous flow is not exactly linear with pulse percentage. Most nitrous solenoids won't open with duty cycles below 20%, and once they reach 90%, they are at full flow.

Although it does vary, a decent starting point for added fuel would be 40 lb/hr of extra fuel per 100 HP added (flywheel HP).

"Dry Fire" Testing

If you want to make sure the solenoids are activating with the engine not running, set the following:

Minimum RPM – 0

TPS Trigger – Set above zero but below clear flood TPS

MAKE SURE THE NITROUS BOTTLE IS OFF AND PREFERABLY DISCONNECTED!

You can now move the throttle and activate the solenoids to make sure they are activating properly.

Advanced

1D and 2D Tables

Description: The Advanced section allows for very powerful modifications of engine operational parameters.

This area should only be used by advanced tuners that have a full understanding of the capability and operation this area provides. Not having a full understanding of the capabilities this section offers can result in significant engine and/or vehicle damage.

Setup

To use a table, the **Enable Table** checkbox box must be selected. Next enter a description for the **Name** of the table that makes identification of the table easy. This will show up on the Data Monitor and Data Logger as the name entered. This value will be indicative of the table modifier value.

There are options for certain Table Types to inhibit closed loop or fuel learning when that Advanced Tuning table is active. Select the checkboxes for "Inhibit CL Compensation when Activated" or "Inhibit Base Fuel Learn when Activated" to inhibit these operations.

Next, enter the **Table Type**, which will select the modifier.

Note the following nomenclature on these:

- "Offset" – Adds or subtracts a raw value from the modified parameter

- "Multiplier" – Performs a percentage increase or decrease to the modified parameter.

Important Note: If multiple "Multiplier" tables are used for the same function, they will be multiplied together. For example, one might be using a table for E85 compensation and another for fuel pressure compensation. If the final fuel flow is 100 lb/hr, and one table is adding 25% more fuel and the other taking out 10% the math works out to: 100 lb/hr * 1.25 * .90 = 112.5 lb/hr.

Note that how this value affects the parameter is indicated in the software above the graph. The "neutral" value that does not perform any modification is specified.

The following items can be modified:

- **Fuel Flow Offset** – Adds or subtracts fuel to the final fuel flow value.

- **VE Based Fuel Flow Offset** – Adds or subtracts VE% to the final VE value.

- **AE Fuel Flow Multiplier** – Multiplies the final AE Fueling value.

- **Fuel Flow Multiplier** – Multiplies the final fuel flow (no matter what type of fueling strategy is used, whether it be lb/hr or VE based) by this amount.

- **Timing Offset** – Adds or subtracts timing to the final timing value.

- **Target Air/Fuel Ratio Offset** – Performs an offset to the target A/F ratio. NOTE: If this modifier is employed, the final fuel flow value is offset by the ratio of the base target air/fuel ratio, and the offset performed. For example, if the base target air/fuel ratio is 12.0:1, and an offset of -1.0 is performed (effectively richening the target to 11.0), the final fuel flow will automatically increase by 8%.

- **Target Air/Fuel Ratio Multiplier** – Multiplies the Target Air/Fuel ratio by this value.

- **Closed Loop Compensation + and – Overrides** – When this table becomes active, the tuner has the ability to override the base Closed loop Compensation Limits % table with this new value.

- **Target Idle Speed Offset** – Adds or subtracts to the target idle speed value.

- **IAC Position Offset** – Adds or subtracts to the current IAC Position.

- **Boost Offset** – Adds or subtracts to the target boost level. The "target boost" will be either dome pressure or actual boost depending on how the boost control is set up in the software.

- **Nitrous Stage 1 Offset** – This will offset the nitrous percentage by the value entered for the stage specified.

- **Cranking Fuel Multiplier** – Multiplies the base cranking fuel number by this value.

Finally, select the X and Y (for 2D tables) axis parameters. The axis break points are fully user-editable.

Activation

These functions can be activated based on a switched or sensor input. A tuner/user should possess a high level of knowledge to use these functions. If none of the activation conditions are selected, the particular Advanced Tuning table will be active all the time.   Note that each activation table must be set up for every table, even if the activation conditions are all the same.

The **Time Delay to Start,** if enabled will delay the activation of this table when the table is active. This time will be added after all of the **"Activation"** parameters are met.

The **Activation** parameters, if enabled, provide methods of activation conditions for the table. The **Switched Enable** provides a dropdown of choices that allow table activation when they are either in an enabled or disabled state.   Note that some of the dropdown choices can be items that have variable values, not just items that are "on or off". If one of these are selected, they will allow activation whenever they are in an "active" state. The **Advanced Enable** allows table activation by a parameter that allows the user to select the values above/below as well as a deactivation value. If both are enabled, the **AND/OR** value can be chosen to indicate whether one or both conditions have to be active for table activation.

The table/graph is where the particular tuning modifier is edited. 1D tables are shown with a table and graph. 2D tables are shown with a table, with a graph button available. The X and Y axis values may be edited as needed as well.

PIN MAP

Description: The pin map is a central location to view what each input and output of the Sniper ECU are assigned to. Input and Output wires that are not present on the selected system type (System > System Parameters > EFI Parameters > System Type) will be greyed out.

GAUGE PANEL

Description: Each of the 8 gauges are customizable by double-clicking on them. You may then choose which channel it is mapped to, along with customizing the labels, value format, and min/max ranges.

STRIP CHART

Description: The Strip Chart provides live graphical views of all active Sniper parameters. This is incredibly useful for tuning and diagnosing. PC software must be in "Online" mode to use this function.

"E" Icon: This allows each of the eight display panels to be customized. To add a parameter, click and drag it from the left hand list to an empty spot (shown as "---------") on any of the panels. To remove a parameter from a panel, simply click on it and press "delete" on your keyboard. Custom layouts can be saved by choosing "File" and "Save As"

Pause: Pauses the live data stream

Graph xxx Points: There are six options for viewing data

1. Graph 20 points (highest resolution on screen, but minimum time snapshot)
2. Graph 50 points
3. Graph 100 points
4. Graph 200 points
5. Graph 500 points
6. Graph 1000 points (lowest resolution on screen, but maximum time snapshot)

Enable Channel: Checking the left hand check box will show or hide that channel on the strip chart

Y-Axis Labels: Checking the right hand check box will show or hide that channels y-axis label

Scaling: To change Y-axis scaling, right click on the right hand check box and set minimum and maximum values for the y-axis scaling

Customize Strip Chart: Right clicking anywhere on the strip chart will open a list of customization options
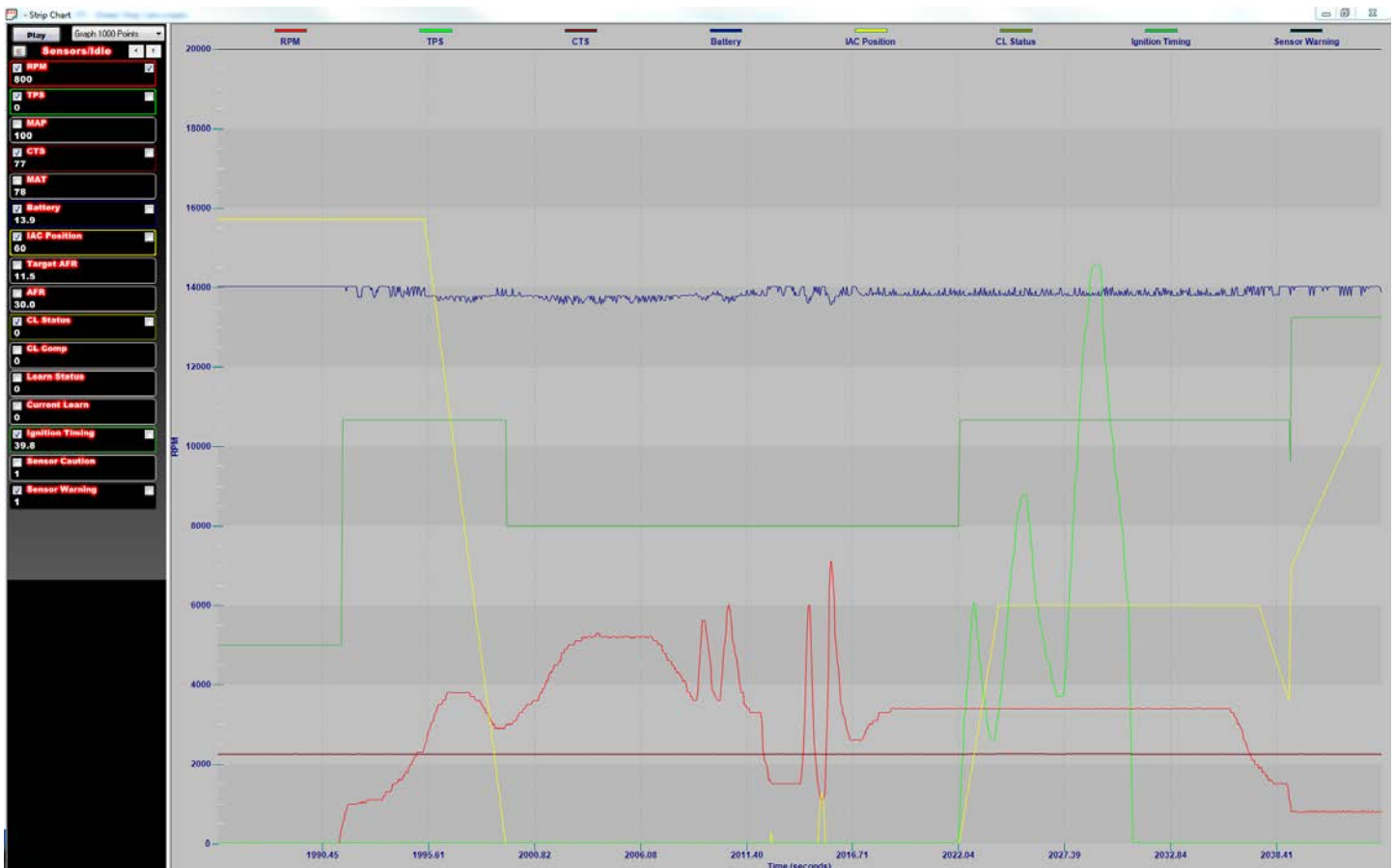
Sample Strip Chart

DATA LOGGING

Data Logger Overview

Holley Sniper systems come standard with powerful data logging capabilities. There are two main types of data logging: **PC Data Logging**, which is performed directly with a laptop computer, and **Touch Screen Data Logging**, which is stored on the SD card in the Touch Screen and later retrieved with the software. Every channel is always logged with both types of logging.

PC Data Logging: The sampling rate is dependent on your computer's speed and logging is started and stopped by simply clicking an icon in the software.

Data can be reviewed numerically and plotted graphically. Two logs can be overlaid and compared together. A zero start point can be established to further assist with tuning.

Touch Screen Data Logging: Logs are started and stopped using the 3.5" LCD Touch Screen and are recorded to an SD card for review in the laptop software.

PC Data Logging

To start PC logging, simply select the logging icon at the top of the screen (appears as a clipboard). This icon will only be active when the ECU is powered and USB communications are established. To end logging, simply select the icon again. At this point you will be asked to enter a file name (and allowed to select or create the directory to store the data). There will be a default name, which includes the date and the time at which the log was started that can be used or changed.

Touch Screen Logging

You can enable logging on the handheld by going to the home screen and clicking on the logging icon. From there you click start log to record and stop log to end the recording. If you do not stop the log before shutting off the handheld the data will be lost. Data is recording to the handheld's SD card which can then be reviewed in the laptop data log viewer.

Basic DL Viewer Operation
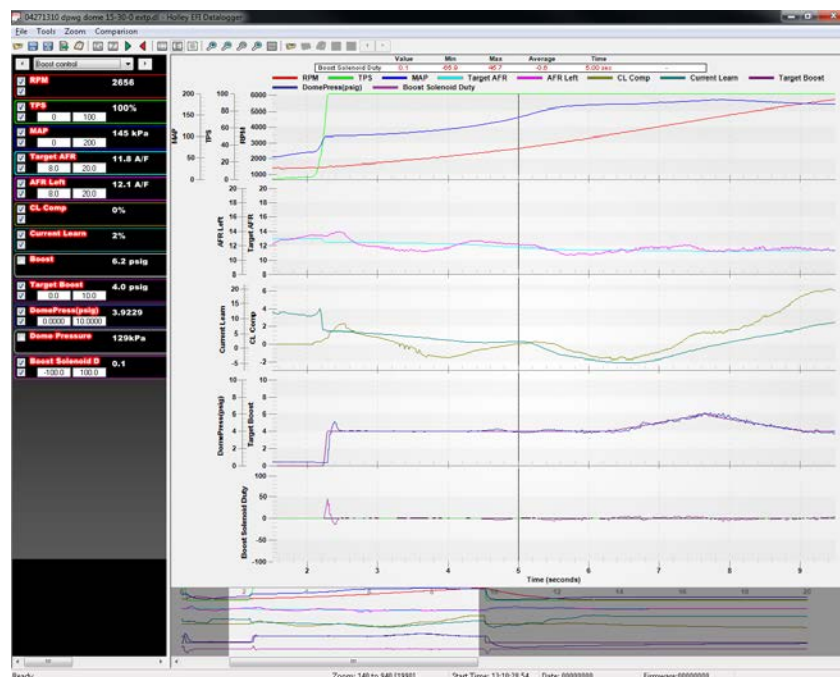
Figure 1

This is a screenshot of the DL viewer in action. You can see in the left pane there is a list of variables from the ECU. This list can be defined and ordered to your choosing. See the section on **Setting Up Log Views** for more detail. You can select which list you would like to see by either scrolling through them with the left and right arrows or by selecting it directly with the view selector dropdown.
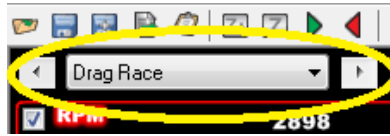
Figure 2

Each variable in the list has parameters to let you control how you see the data. To see the parameters for a given variable, click the variable name in the list.
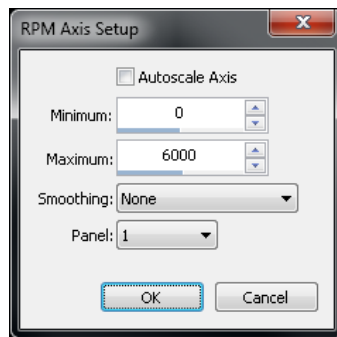
Figure 3

The option for "Autoscale Axis" will let the software automatically set the axis for that variable so that it is "zoomed in" to the range of data for the given DL. This is good and bad. It is good in that you always have favorable visual resolution for a given DL. It is bad in that you do not get a consistent perspective and the feel that comes with that. Sometimes it is desirable to lock the axis values so that it is easy to tell at a glance if a parameter is in a reasonable range or to force consistent axes between variables that should lie atop one another (setpoint vs. feedback for instance). In that case you can uncheck the option for autoscaling and specify the axis values explicitly in the "Minimum" and "Maximum" fields.

You also have the option to apply smoothing to noisy data after the fact when examining data logs. For instance consider these two traces of BARO:
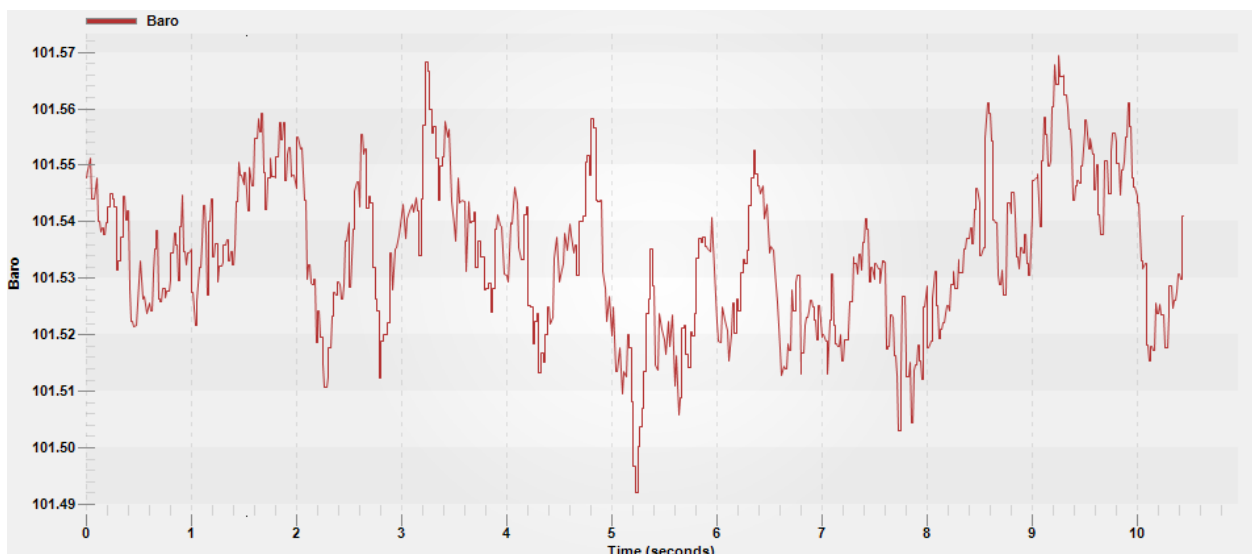
Figure 4 - No Smoothing
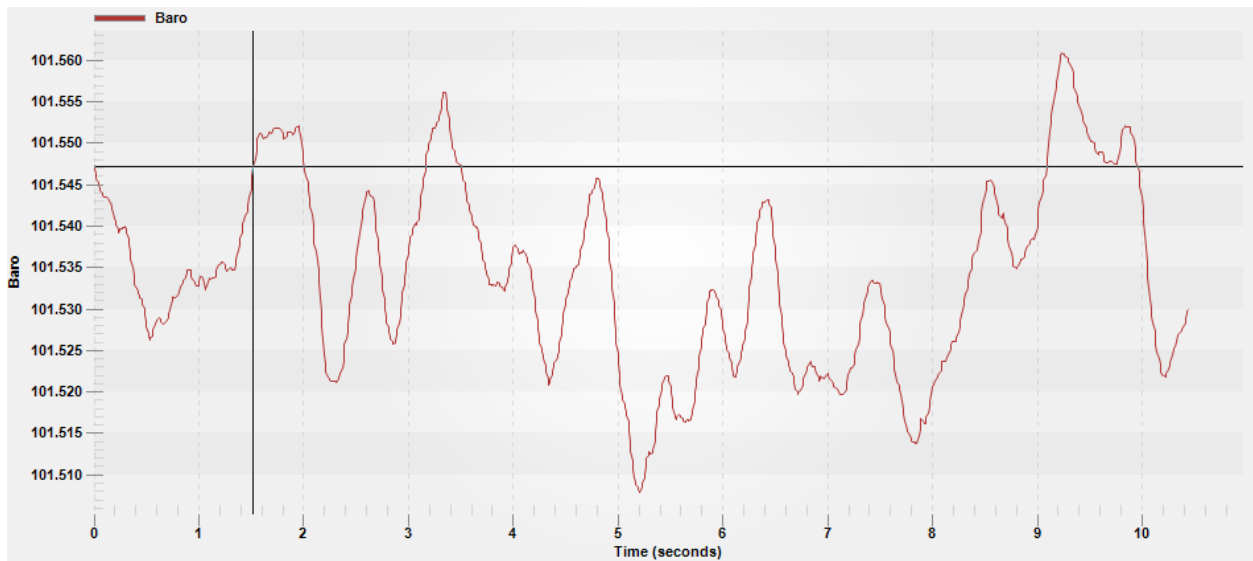
Figure 5 - Smoothing

You have the option of five different levels of smoothing, or of course none at all.

The last parameter in the setup for a given variable is the panel selection. You do not have to use panels at all. You can customize multiple views to switch between to accomplish this, but using panels lets you group variables by function and plot them on one screen so that the traces do not overlap. You can use up to five panels per view. The panels are referred to as 1-5 but are not labeled in the graph pane. For instance, you can be using panels 1, 3, and 5 and it may be mistaken for 1, 2, and 3. You just have to remember which ones you are using or click on a variable name to see to which panel it belongs.
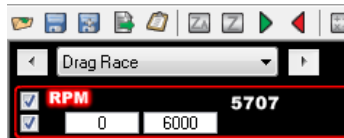
Figure 6

In addition to the parameters available by clicking on the variable name, there are also a few options directly accessible in the box with the variable.

The checkbox immediately to the left of the variable name lets you turn the trace on or off for that variable. If you "hover" over the checkbox you will see that it is called "Graph Channel." This is the main on/off switch for the trace. If you turn it off the corresponding trace in the right pane will disappear along with any axis settings below the variable name.

The checkbox below the "Graph Channel" control is the "Display Axis" control. This is the on/off switch for the axis label, which includes the variable name and the numeric axis labels. It may not be immediately obvious why you would ever want to turn an axis label off, but it is very useful for things that share the exact same axis. For instance, assume you have eight widebands or eight EGT channels. Chances are you will want to plot them on consistent axes, but there is no reason to see all eight once you reconcile them. The axis labels do consume screen real estate after all.

The boxes with numbers that are displayed directly under the variable name are only displayed when the axis is using user defined min/max values. They are not displayed if autoscaling is enabled for that channel. They will still show up if you turn the axis labels off so that you can see the axis min/max values are what you think they are. They are also useful for quick reconciliation if you are trying to keep multiple variables on consistent axes.

The numbers in white immediately to the right of the variable name is the value of the variable at the time defined by the cursor position. The cursor is positioned by clicking on a trace or using the left/right arrows- not by mousing over alone. The graph trace does not have to be turned on to be able to see the numeric value. The value that you see immediately to the right of the variable name is "raw" in that the smoothing/filtering is not reflected in this value. Instead if you want to see the numeric value of the "smoothed" trace you look here:

	Value	Min	Max	Average	Time	
Baro(Filtered)	101.5 kPa	101.5 kPa	101.6 kPa	101.5 kPa	3.17 sec	-

Figure 7

As you can see it will say "(Filtered)" after the variable name to differentiate it from the raw numeric value.

Below this box in the top of the right pane is the graph legend which maps out the colors for the different traces. As a visual cue, the box around the variable name in the left pane is the same color.

Zooming in on a time region with the mouse is an often used and very useful feature. To do this you highlight the area to which you want to zoom by clicking and dragging (not on a trace) the mouse. While dragging the area to be zoomed to will have an inverted color set to let you visualize what you are selecting.

When zooming in to a window of time that is just a part of the whole log a new pane will appear at the bottom of the screen. The point of this is to let you visualize what fraction of the entire log you are zoomed to and when it happens within the log. The extent of the active zoom is defined by the white background while the part of the log that you cannot see is defined with a grey background. The scroll bar at the bottom will adjust to the zoomed region as well, with the "thumb" of the scroll bar assuming the same width as the area of white background. You can then click and drag the thumb to move back and forth through time.

A quick way to unzoom is to use the "Zoom All" control in the toolbar. These zoom buttons are further explained in the toolbar section.

X Axis (RTC) Setup

Minimum: 0.00 sec

Maximum: 100.00 sec

OK   Cancel
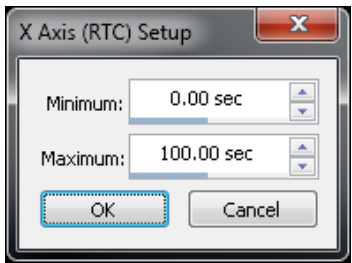
Figure 8

You can also click on the x-axis to explicitly set the zoom limits if you want to set a window by numbers instead of by clicking and dragging. Be aware that there is an x-axis at the bottom of every pane in a multi-pane configuration even though you don't see the numbers. So if you are getting this dialog by accident it might be because you are clicking too close to one of the x-axes.

To scroll through the data, move the cursor over one of the graphed items. The mouse cursor will turn into a "hand" when hovered over a line. At this point click on the line and use the arrow keys to scroll left or right.

Toolbar Features

Data logs are simply files that contain a record of operating conditions that you can review or compare with previous logs. They have the extension DL or DLZ and are viewed with an integrated data log viewer utility. You can launch the data log viewer by clicking "Open Data Log" under the "Data log" entry of the menu bar in the main Holley software. Clicking on the DL or DLZ files in "Windows Explorer" or similar utility will not launch the data log viewer.
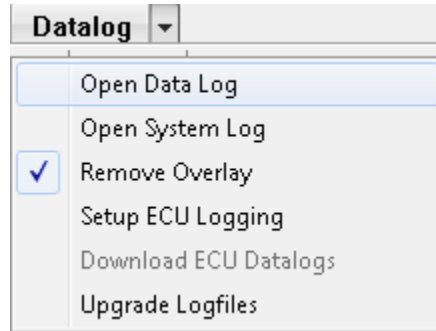

Figure 9

This will prompt you to specify the path and filename of the DL that you want to view. The default path for DLs is \Documents\Holley\HEFI\Data Logs, which will be where internal data logs are copied to and the default location for PC based data logs.

Once the data log viewer opens you can see that it has a text based menu bar at the top and an icon based toolbar directly below. Most features can be accessed in either place. If you are unsure what an icon means you can "hover" over it with your mouse and a context sensitive description will appear.

Because the logs are file based, there are a few features that are common to other programs that store data in files; "Open," "Save," and "Save As."

Figure 10

Opening a new data log will close any DL currently open (which may result in a prompt to save) and bring the data from the specified file into the viewer. Ctrl+O will not actually launch the DL open dialog box. Since you can perform operations on the files when they are open (like deleting data after a specified point or specifying a new zero time), you have the option of saving what you have done. "Save" will store the modified data log to the original file name. This overwrites the original DL and is effectively irreversible. "Save As" will prompt you to specify a new file name so that the original remains preserved.

Figure 11

The next icon in the toolbar is for exporting data in the log to a standard CSV (comma separated variable) format. You can use this if you need to do more advanced processing of the data in a tool like Excel or MATLAB. If you do not know if you need to export a file, you do not need to worry about it. Clicking this will prompt you to specify the name and location of the CSV file that the data log viewer will generate. Very large files can take a bit to export. There is a progress bar, but sometimes Windows can proclaim the Holley software is unresponsive while it is busy exporting.

Figure 12

The icon that looks like a small clipboard launches the "Data log Properties" editor. Every DL has a header that can store notes about the particular log. Some fields, like the Global Folder name and firmware version, are automatically populated when the DL is created. There are predefined places to put common notes like 60 ft times or weather conditions as well as space for user defined notes. The Drag Race tab will also automatically calculate time splits. Remember to "Save" or "Save As" after entering DL notes.
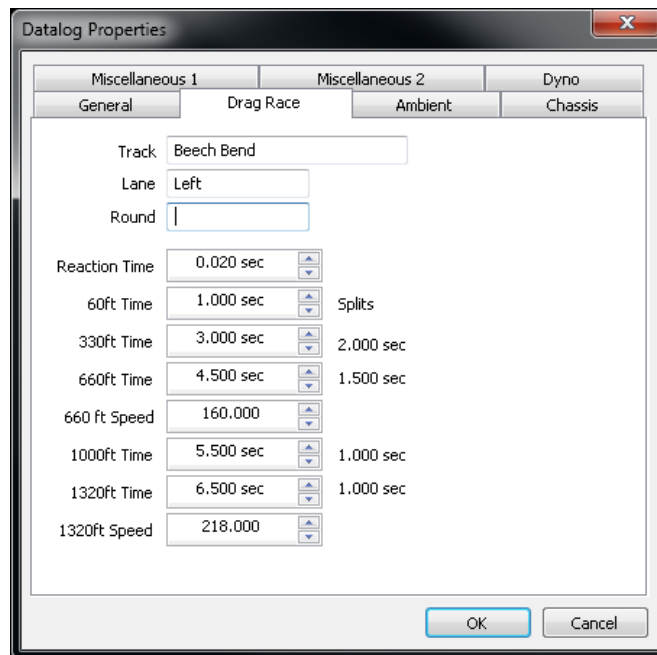
Figure 13

Figure 14

In order to have a convenient basis for comparison you have the option of being able to reset the zero time to a point of your choosing. For instance you may want to find the point of transbrake release to use as a zero time reference. This doesn't throw any data away. Data that is recorded previous to the assigned zero time is simply shifted into the negative time region. The icon with the Z allows you to manually select the zero time. It is easy- you click on the point in the log you want to correspond to t=0 and you click the Z icon. You also have the option to setup conditions to automatically set the zero time. When you hit the icon with the ZA you will be prompted to define a condition by which the zero will be set. After you specify the condition, the software will look for the first time the condition is met and establish this as the new zero time. It will then remember the condition you specified so the next time you hit ZA with a different

DL you can just hit OK. If it does not find a point where the condition is met it will tell you. If the condition is met before you want it too, you can always trim the beginning of the log where the false trigger occurred. This will be covered next.

Figure 15

Many times there is data before and after the main event of interest that you'd rather just toss to save space or to isolate a particular problem in a long log. That is where it is very useful to trim the DL by setting the start and end points. To throw away data before a certain point in the log simply click the first point you want keep and click the green right arrow to "Set Start Point." To throw away data after a point click on the last point you want to keep and click the red left arrow to "Set End Point." By nature these functions will result in a loss of data, so it is advised to save the new DL as a different name to preserve the original data. Remember to save the DL before you start trimming if you have entered notes in the properties box so the notes will be saved with the original data.

Figure 16

Setting Up Log Views – Similar to the Data Monitor Views, the user can set up custom data log configs. Eight views can be customized, each with 16 parameters. There are a two ways to edit the variables that will be in a given view. First, you can click the icon in the toolbar that has the letter E **(Figure 18)**.
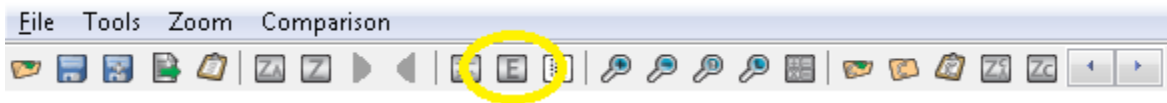
Figure 18

You can also select "Edit Views" from the view selector dropdown **(Figure 19)**.

Figure 19
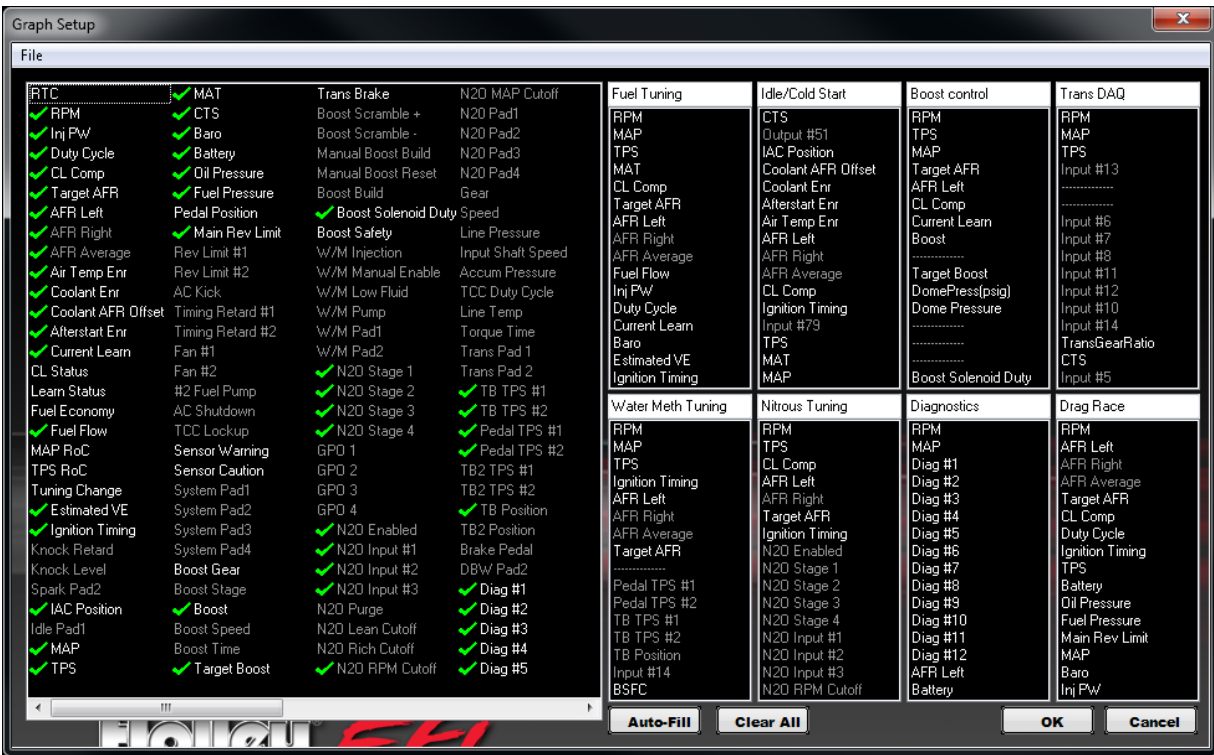
Figure 20

Either one will launch the "Graph Setup" **(Figure 20)** from which you can name and populate views (groups of variables) of your choosing.This you do with a drag-and-drop. In the left pane you can see the defined variables (note that it scrolls at the bottom.) The variables in white text are the ones that are available to view while the ones in grey text do not have valid data associated with them. While you can drag either type to a view list, only the ones in white will be graphable. The variables with green checkmarks beside them are ones that are represented somewhere in a view list. You can have the same variable in multiple view lists (RPM in every one for instance) but a variable can only be in a list once. Although there can be up to 16 variables per view, you do not have to use all 16 slots if you want to keep a given view simple. To remove a variable from a view simply drag-and-drop it somewhere over into the left pane. You don't have to put it back where you got it. After you customize this to your liking you can save the data log configuration via save or save as. Multiple Data Log Configs (.graph files) can be saved for different calibration tasks. Being files they are also "portable" in that you can send a favorite DL config to a friend or vice versa. The default location for storing the DL config .graph files is: \Documents\Holley\HEFI\Data Log Configs.

Figure 21

New to this software version is some X-Y plotting functionality, frequently called a scatterplot. Often when you are scrutinizing data logs, it is helpful to visualize the response of a variable as another variable changes. In other words, instead of plotting everything as a function of time (with the time on the x-axis), it is sometimes useful to plot things as a function of RPM or something like that. Instead of plotting lines as a function of time, you are plotting points and the location of the points is determined by what you select for the "X Axis" and "Y Axis." The shape of the collection of points can give insight into the meaning of the data. For instance if you look at the plots of "TB TPS #1" and "TB TPS #2" vs. time in the normal DL viewer, it is not immediately obvious if things look good **(Figures 31 & 32))**. However, if you do a scatterplot of one versus the other, it is very obvious that there should be a tight correlation and outliers will be obvious.
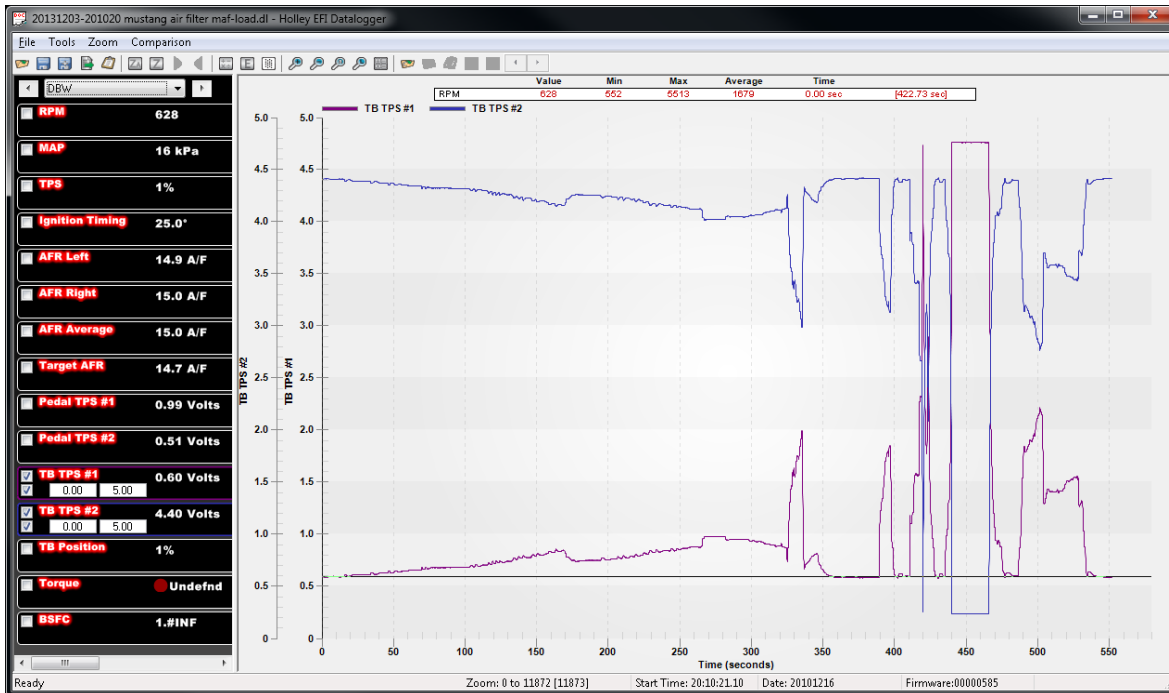
Figure 22
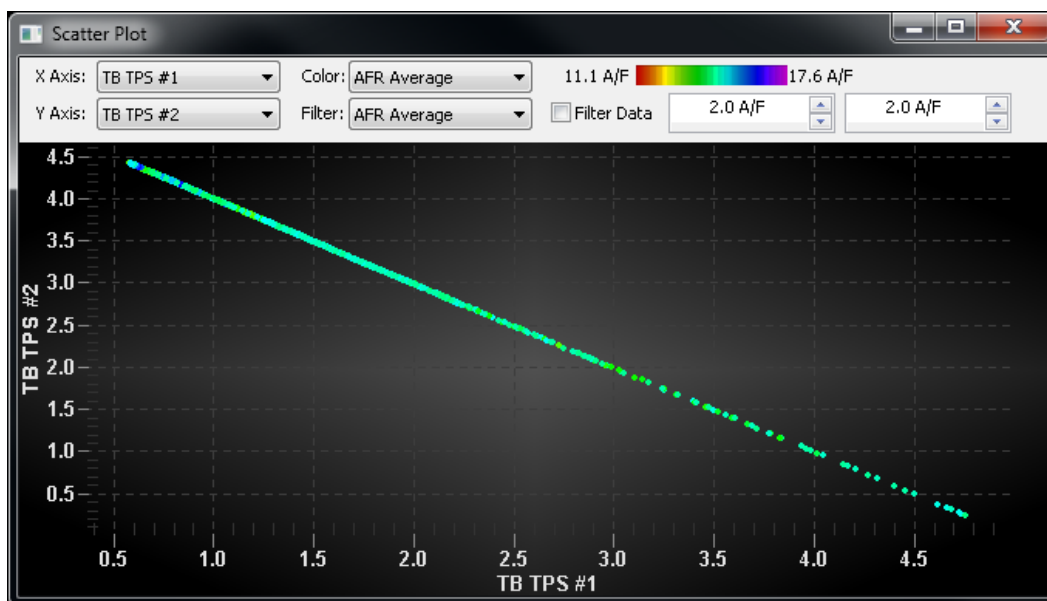
Figure 23

In addition to the location of the points, you can select a variable to specify the color of the points. This can be helpful for identifying problem areas at a glance. For instance, you can use the overlay functionality to visualize where in the maps the engine has operated,

but it doesn't give you an idea of the state of things at that point. The example below is a plot of MAP vs. RPM (like you would see in an overlay) during a mapping exercise. In addition, the color of the points is determined by a calculated channel that is the sum of the closed loop compensation and the magnitude of the learn table at that instant. In other words, the color gives you an idea of how far the base map is off. You can see that during this mapping process, the ECU was pulling reducing fuel at low loads and mid speed/high load, but adding some at high speed/high load and low speed/high load.
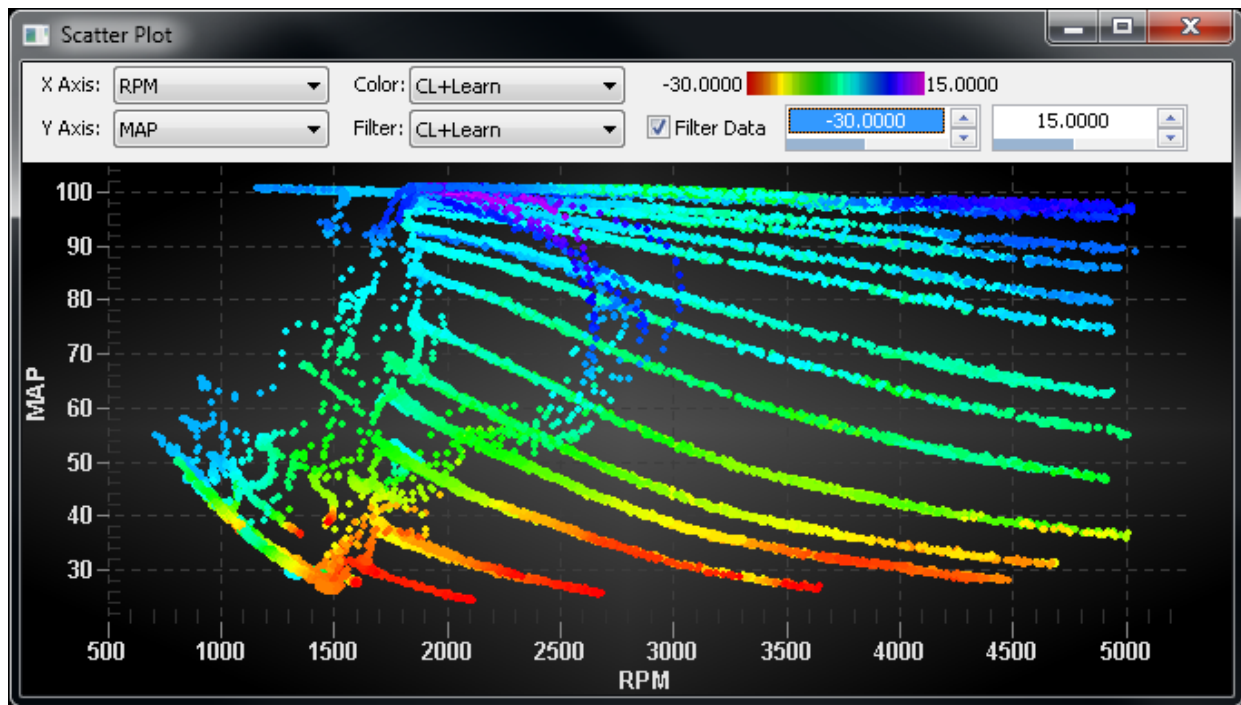
Figure 24

You can also choose which points to plot based on the range of a variable by applying a filter. You specify the filter variable and the range of the filter variable for which you want the points to be plotted. For instance you can setup a calculation AFR*Fuel as a surrogate for airflow. If you plot the product of AFR*Fuel vs. MAP, it may not be too meaningful. Applying a filter however lets you see how the airflow changes as a function of MAP for a given RPM window. In the plots below, the one on the left is with no filtering while the one on the right is only showing the points where the engine speed is between 1950 and 2050 RPM. By being able to visualize the shape of the curve with filtering, you can easily estimate what the AFR*Fuel product would be even at a MAP value for which you do not have data. By extension, you can divide that by your AFR target to estimate what the fuel flow should be.
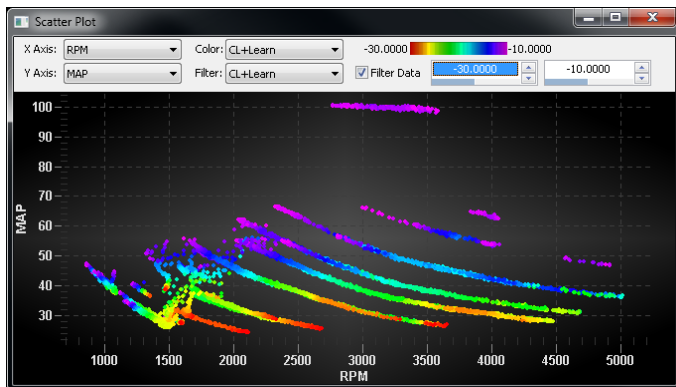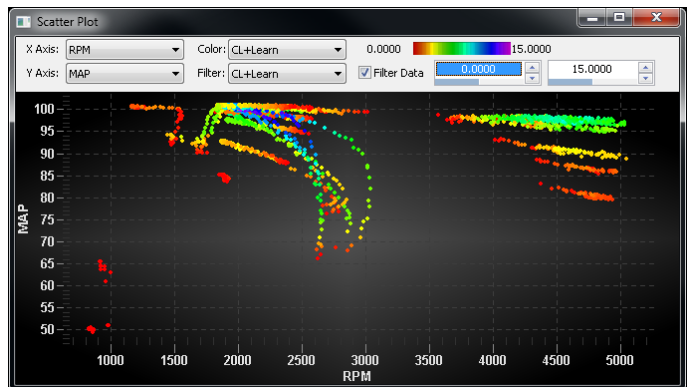

Figure 25
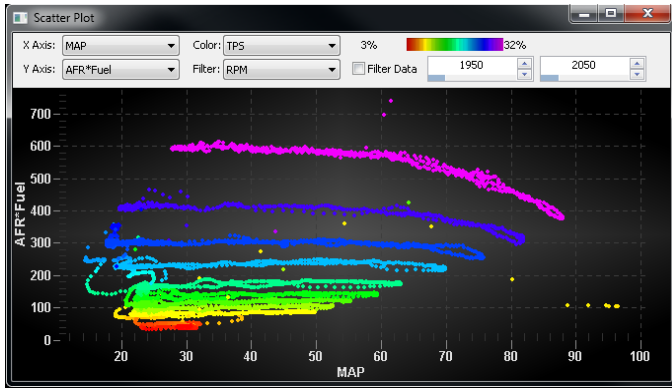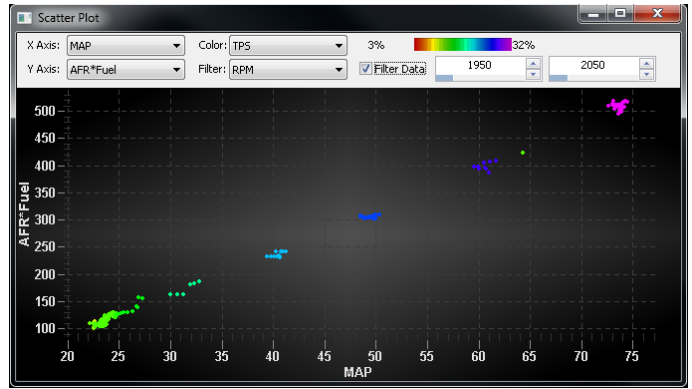

Figure 26

Figure 27

Figure 28

This is a similar set showing AFR*Fuel vs. RPM with no filter followed by the same data with a 48-52kPa filter applied on MAP.
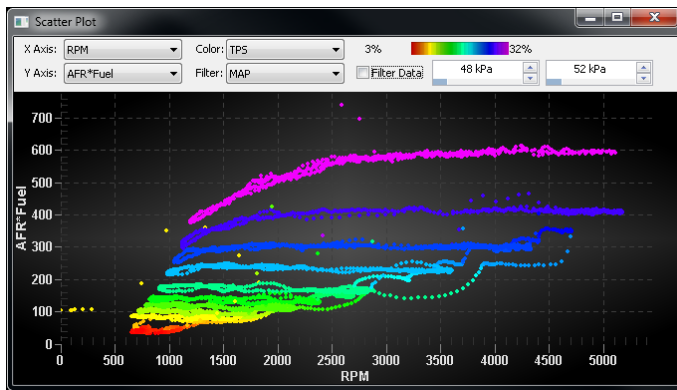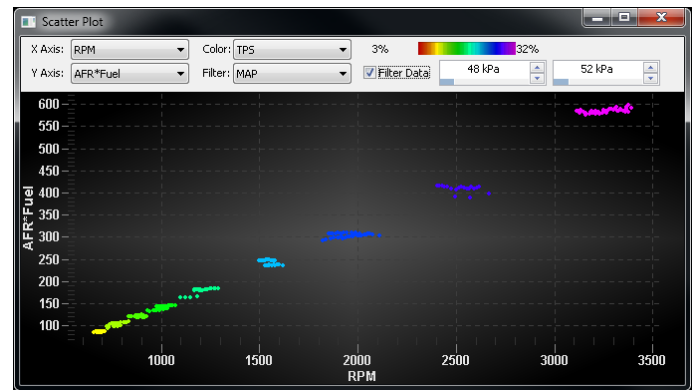

Figure 29

Figure 30

Scatterplots with filtering also help you visualize if the data makes sense based on known relationships. For instance independent of the engine the throttle body will have a certain flow vs. position response under high vacuum conditions (choked flow). The distribution with all of the data is quite thick and does not show a high degree of correlation. However when you limit the data to be plotted to the range for which you would expect choked flow (based on MAP) you can see a much better correlation between flow and TPS.
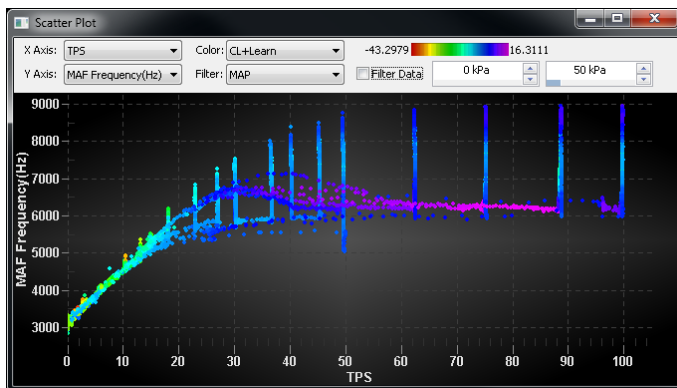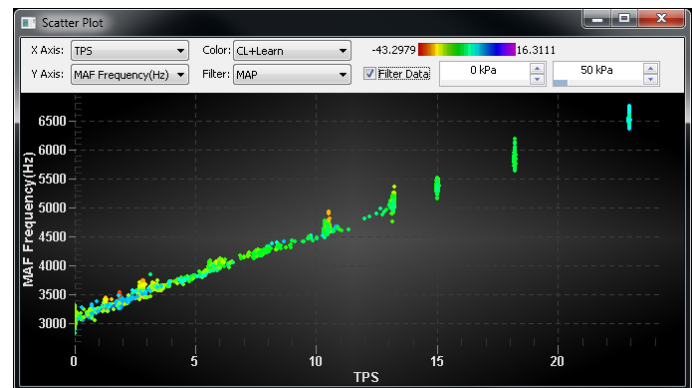

Figure 31

Figure 32

Figure 33

There are four very useful zoom controls represented by magnifying glasses on the toolbar. From left to right they are: ZOOM IN, ZOOM OUT, ZOOM ALL, and ZOOM LAST **(Figure 42)**.

1) ZOOM IN (+) – This takes the current axis range and zooms in to the 20% around the current cursor value. This is an alternative to the click-and-drag zooming.
2) ZOOM OUT (-) – Perhaps more useful than that is the ZOOM OUT feature. Frequently you might zoom in too far with the click-and-drag zooming and you find that you need to "back up" to get a little better perspective of the event under scrutiny, but you don't want to go all the way back to viewing the whole log. When you click the ZOOM OUT icon, it basically doubles the x-axis range, keeping the same center point.
3) ZOOM ALL (A) – This feature simply zooms out until you can see the entire data log. This is the frequent successor of the ZOOM IN episode. You might find it quicker to right click on the background in the right pane and select "UNDO ZOOM." Contrary to the way it sounds, that does not undo the last zoom maneuver- instead it does the same thing as ZOOM ALL.
4) ZOOM LAST (L) – There is in fact a control to revert to the last zoom window. It is the rightmost zoom icon in the toolbar and has an L in the icon to represent last. This is useful to remedy the "oops, too far" or "I didn't mean to zoom" situations. Unfortunately, the results of this can be counterintuitive if you have recently done a ZOOM ALL or a manual x-axis edit.

Figure 34

One "hidden" feature revealed when resizing the left pane (hover over the divider for the pane resizing icon) is some basic statistics on the values defined by time window displayed. So if you zoom in to a time region of interest and click the "Update Stats" icon, the software will evaluate the minimum, maximum, average, standard deviation, start value, end value, and slope of the population defined in the window. In order to not slow down normal zooming and scrolling the statistics are only calculated on demand and are therefore no longer valid when you change the time axis.

Comparison

Two files can be compared on top of each other. This is especially useful for drag racing. First, open a file. Then select "Comparison" and "Compare Data Log".   You will be prompted to open the second log file. Select it and it will be opened on top of the first file. The second compare file will have dashed lines on the graph.
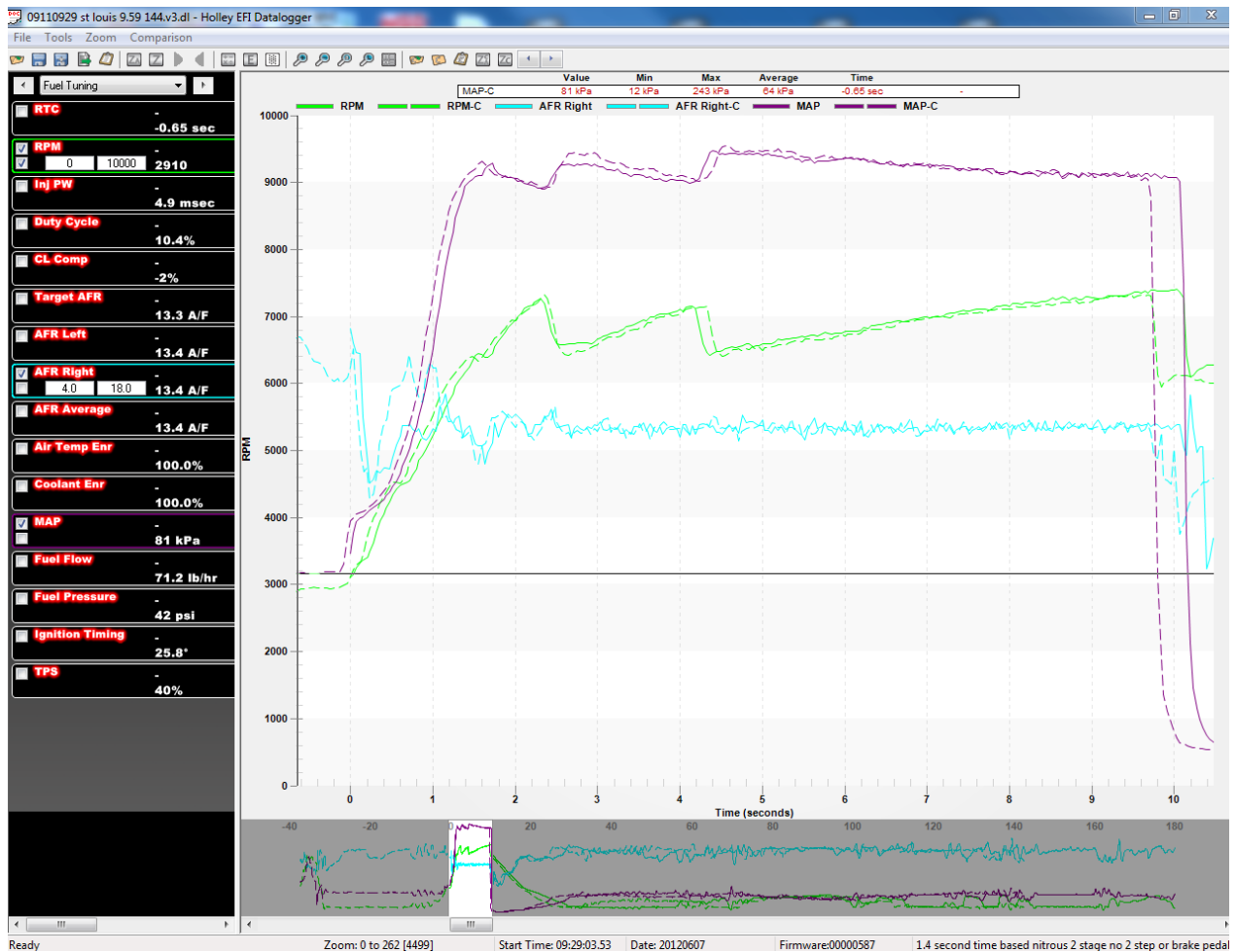

Figure 35

To align both files so they have a common starting point, click the blue left/right arrows at the top of the view and it will move one of the files. If both files don't have a common start time, use TPS, or trans-brake release to align files for a drag racing application.

"Close Comparison" will close the compare file.

Overlay

A very useful feature is the "Overlay" function. This allows for a data log to be "traced" onto the various tuning tables. To use this feature properly, open up the Global Folder that coincides with the data log taken. Then, open up the data log. From the main tuning screen, select "Datalog" and "Activate Overlay". You will have to have both the data log and the various tables open at the same time to perform this function. Move the cursor on the actual data log, and you can watch as to exactly what location this is on that table. To view both the log and file, minimize both views and move them so they can both be viewed. A laptop with higher resolution will work much better.

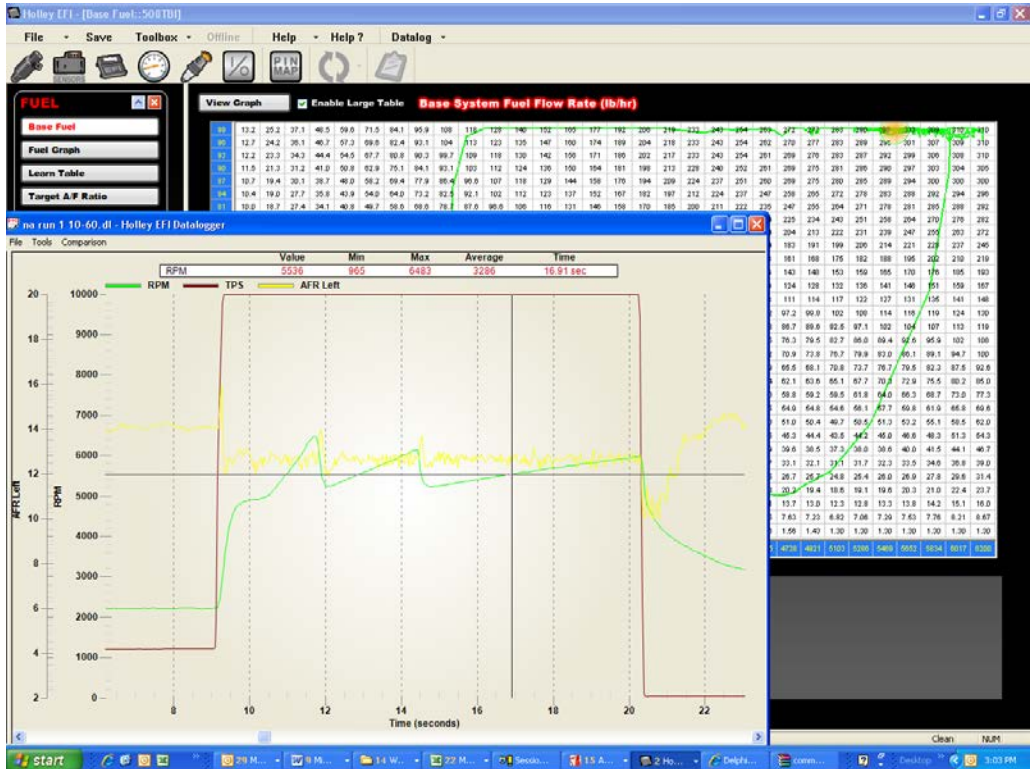To remove the overlay, select "Datalog" and "Remove Overlay".

Figure 36 - Overlay

Additional Tips

The DLZ files can be opened directly with the data log viewer, which will first convert them to the expanded DL format. For very large files this conversion will add some time the first time you open a DLZ and can feel like the software has experienced an error. Windows can even declare that the Holley software is not responding, but it may just be processing the DLZ in preparation of opening. If you go back to open a previous data log and you have the option of opening the DLZ or the DL of the same name, remember the DL will open more quickly since it is already decompressed. If you are archiving data logs, you really only need the DL or the DLZ and compressing with a common PC "zip" tool will save quite a bit of space even when compressing DLZ files.

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