



## Avenger ECU & Handheld Setup and Tuning



### Instructions and Tuning Guide 199R10505

**NOTE:** These instructions must be read and fully understood before beginning installation. If this manual is not fully understood, installation should not be attempted. Failure to follow these instructions, including the pictures may result in subsequent system failure.

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## 1.0 INTRODUCTION

Holley Performance Products has written this manual for the installation of the **Avenger ECU & Handheld** system. Please read all the **WARNINGS, NOTES, and TIPS**, as they contain valuable information that can save you time and money. It is our intent to provide the best possible products for our customer; products that perform properly and satisfy your expectations. Should you need information or parts assistance, please contact our technical service department at 1-270-781-9741, Monday through Friday, 8 a.m. to 5 p.m. Central Time. By using this number, you may obtain any information and/or parts assistance that you may require. Please have the part number of the product you purchased when you call.

**NOTE:** This manual is for the setup and tuning of the Avenger EFI system. Installation of the ECU, wiring, Avenger Handheld, and all EFI system hardware (throttle body, sensors, fuel system) is covered in the “Hardware Installation Manuals” included with your system as a separate document.

**NOTE:** No laptop computer is required for the installation and tuning of the Avenger system.

**WARNING!** The **AVENGER EFI** systems consist of a number of sophisticated components. Failure of any one component does not constitute, nor does it justify, warranty of the complete system. Individual service items are available for replacement of components. If assistance is required or if you need further warranty clarification, you can call Holley Technical Service at the number shown above.

**WARNING!** To preserve warranty, these instructions must be read and followed thoroughly and completely before and during installation. It is important that you become familiar with the parts and the installation of the **AVENGER EFI** system before you begin. Failure to read and understand these instructions could result in damage to **AVENGER EFI** components that are not covered by the warranty and could result in serious personal injury and property damage.

**WARNING!** Failure to follow all of the above will result in an improper installation, which may lead to personal injury, including death, and/or property damage. Improper installation and/or use of this or any Holley product will void all warranties.

## 2.0 WARNINGS, NOTES, AND NOTICES

**WARNING!** Once the vehicle is started, make sure that you have no fuel system leaks.

## 3.0 PREVIOUS INSTALLATION REQUIRED

At this point, the installation of your EFI system should be 100 percent complete. The ECU, Avenger Handheld controller, throttle body and intake hardware, all sensors, wiring, fuel pump, regulator and return line, and all other hardware should be installed. The vehicle should be ready to start and run. If this is not the case, refer to the hardware installation manual included with your particular system.

## 4.0 AVENGER INSTRUCTIONS AND TUNING

The Avenger EFI systems are designed to be easy to use for the first time EFI tuner. The instructions are set up in that manner as well. These instructions will not get into detail about EFI theory and operation. They will provide the steps necessary to get you up and running quickly. The Avenger system allows for the user to perform some basic changes to the tuning *if they desire to do so*. The instructions are sequenced to get you up and running so you can enjoy your vehicle, then review some of the parameters that can be adjusted to fine tune your vehicle at a later time if desired.

## 5.0 INITIAL POWER-UP

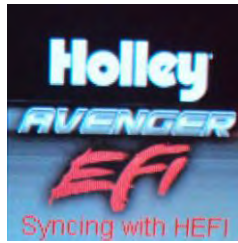
Turn the ignition key to the “run” position. This should apply power to the ECU as well as the Avenger Handheld control module. A “Holley Avenger EFI” screen should appear and should display the following four messages, one after the other:

“Connecting”

“HEFI Connected”

“Syncing with HEFI”

“Synced”



Holley Avenger EFI Screen

**NOTE:** DO NOT ATTEMPT TO START THE VEHICLE UNTIL YOU ARE TOLD TO DO SO IN THE INSTRUCTIONS BELOW.

## 6.0 HANDHELD NAVIGATION & USE

The handheld has a button that allows for navigation on the screen. It can be moved left, right, up, down, and pressed. Pressing the button will select an item, or enter a value.

At the bottom of each screen is a BACK button. You use this to navigate back out through the menus. The MAIN MENU is the "Top Level" item. You cannot back out further than this level. If you go down several screen levels, you must use the BACK button back to navigate back through the levels.



Some people with larger thumbs may find the button too recessed. If this is the case, an adhesive extension button is included in the box with the handheld to raise the button outwards.

The handheld has a micro-SD memory card installed in the side. This card contains specific information that is required for the use of the Avenger product. DO NOT replace this card with another. There should be no need to remove this card for normal use.

## 7.0 MAIN MENU

The MAIN MENU has 5 selections. They are explained in more detail later in the instructions.

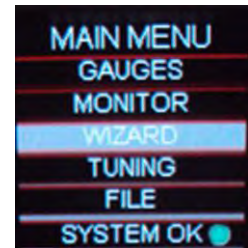
GAUGES – Graphic view of 6 different sensor readings.

MONITOR – Numeric view of sensors and readings

WIZARD – Creates a base calibration and performs throttle position sensor setting

TUNING – Allows for various parameters to be easily adjusted

FILE – Saves and loads files. Also shows information about the ECU and handheld controller



Main Menu

## 8.0 CALIBRATION WIZARD

The first step is to create an initial calibration using the "Wizard" located on the Main Menu.

1. Select the Wizard (Fig 1).
2. Select "Start Wizard" (Fig 2).
3. Select YES to start calibration & NO to cancel (Fig 3).
4. Next, select the type of fuel injection system you are using (Fig 4). Select "Holley TBI" if you have a Throttle Body Injection system. Select "Holley MPFI" if you have a Multiport Injection system. TBI systems have the fuel injectors in the throttle body itself. Multi-port systems have individual injectors in the intake manifold runners.
5. If you selected "Holley TBI" proceed to step 6. If you selected "Holley MPFI", proceed to step 7 below.



Figure 1

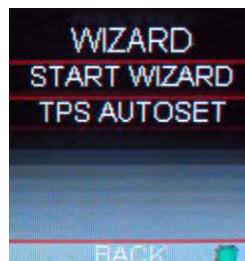


Figure 2

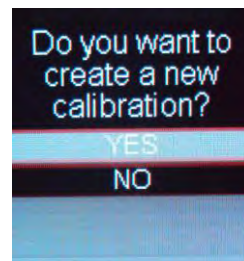


Figure 3

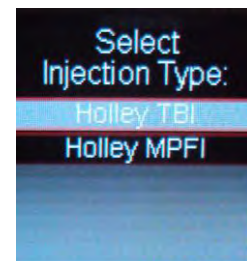


Figure 4

6. If you selected "Holley TBI", select the part number for the TBI system you are using (Fig 5). Proceed to step 8.
7. If you selected "Holley MPFI", select whether your engine is a Small Block or Big Block Chevy (Fig 6). Proceed to step 9.
8. If your engine is up to 409 cubic inches, select "Up To 409 CID". If your engine is larger than 409 cubic inches, select "410 CID and Larger" (Fig 7).

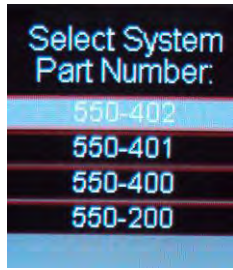


Figure 5

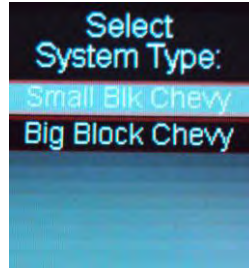


Figure 6

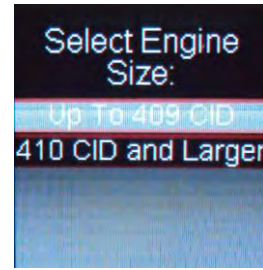


Figure 7

- The next choice should be dictated by the camshaft size and characteristics. If you have no idea, just simply select “Don’t Know” (Fig 8).

The choices are further defined as:

- “Street Strip” – Camshafts with over 225 degrees duration at .050” valve lift (225°@.050”).
- “Mild Street” – Engines with non-stock camshafts that have between 214-224 degrees duration at .050” valve lift (214°-224°@.050”).
- “Factory Stock” – Engine that have a stock, factory camshaft, or aftermarket camshafts that have a duration BELOW 214 degrees at .050” valve lift (below 214°@.050”).
- “Don’t know” – If you have no idea as to what type of camshaft is in your engine, choose this selection.



Figure 8

**NOTE:** If you are not sure of the camshaft size, it is best to select “Don’t know”.

- Next, you need to select whether the ECU will be controlling the ignition timing. Select “Yes” ONLY if you are using a GM small cap computer controlled HEI distributor. This is the only ignition type/distributor that allows ECU timing control using the Avenger system. All other ignition/distributor types must be a standard mechanical advance type used on any carbureted application. If you select “Yes”, proceed to step 11. If you select “No”, proceed to step 12.

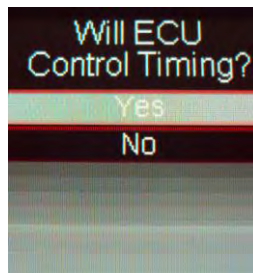


Figure 9

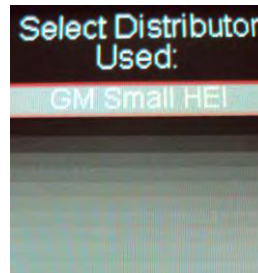


Figure 10

- There is only one selection option which is “GM Small HEI”. Select it and proceed to step 13.

- If you are not controlling timing, you will have the following two choices (Fig 11). It is important the correct item is selected, as well as to double-check that you used the proper input wire when the vehicle was wired.

**“Coil – (neg)-”** - Select this if you are NOT using an aftermarket Capacitive Discharge (CD) ignition box such as a MSD, Mallory, or others. This is for stock, factory inductive ignition coils. Examples would be a factory GM large cap HEI, or a points style ignition with a canister coil. You should have connected the solid yellow wire in the harness to the negative side of the ignition coil when the wiring was performed.

**“CD Box Tach Out”** – Select this if you are using an aftermarket Capacitive Discharge (CD) ignition box such as a MSD, Mallory, or others. When you wired the vehicle, you should have used an ignition adapter harness that had a yellow/black wire that you connected to the “tach out” on the ignition box. Nothing should have been wired directly to the ignition coil.



Figure 11

**NOTE:** If you are unsure of this selection, or wiring, contract Holley tech service. Damage to the ECU will result due to improper wiring.

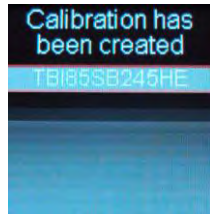


Figure 12

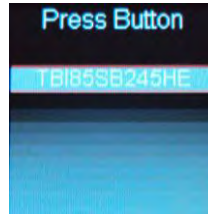


Figure 13

13. After entering the ignition type, your calibration will be created (Fig 12). Press the button on the handheld.
14. Press the button again when asked to do so (Fig 13).
15. If you want to load this file to the ECU, select "YES" (Fig 14). If for some reason you want to exit out, select "NO". Once you select "YES", the file will load. After loading is complete, press the button (Fig 15).

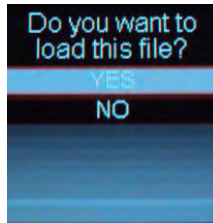


Figure 14

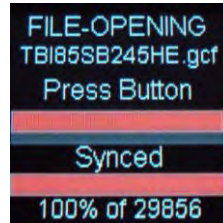


Figure 15

16. At this time, turn the ignition power OFF and turn it back on. This will initialize the new WIZARD file in the ECU.

## 9.0 TPS AUTOSET

The next step is to perform a "TPS Autaset". This must be done with the vehicle ignition power on. **This must be done on a brand new system otherwise the injectors and ignition will not be fired by the ECU.** A TPS Autaset programs the ECU with the full travel/voltage range from idle to wide open throttle for the Throttle Position Sensor (TPS). The TPS Autaset function is found under the "WIZARD" choice under the Main Menu. Select "TPS AUTOSET". You will then be prompted to START or CANCEL this process. To proceed, select START. Slowly depress the throttle pedal to the floor and release two times. Then click DONE on the handheld. If everything is successful, you will see a TPS Autaset Successful message (Fig 16).

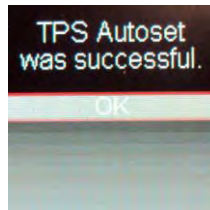


Figure 16

## 10.0 SENSOR VERIFICATION

Before starting the vehicle, verify that all of the sensors are reading properly. At this time, turn the key off, and cycle it back on. At this time you should hear the fuel pump come on and run for 5 seconds. Check for fuel leaks at this time as well.

On the Main Menu screen, select the MONITOR tab. This will bring up various sensor and other parameters. You should see a screen called IDLE. Click the button on the handheld to the right three times. This should bring up a screen called SENSORS. With the key on and the engine off, these sensors should read as follows:

- **MAP** (Manifold Air Pressure Sensor) – Should read from 95-102. At high elevations it could read as low as 75.
- **TPS** (Throttle Position Sensor) – Should read 0. Slowly depress the throttle to wide open. It should read 100 at wide open throttle. If it reads 1-2, you may want to lower the idle screw on the throttle body.
- **MAT** (Manifold Air Temperature Sensor) – reads current air temperature
- **CTS** (Coolant Temperature Sensor) – reads engine temperature. If the engine is "cold", it should read almost the same as the MAT sensor.
- **Battery** – Will read battery voltage. Should be 12.0 volts.

If ANY of these sensors are not reading properly, this must be resolved before the engine is started.



## 11.0 STARTUP

The vehicle should be ready to be started. Open the MONITOR screens from the MAIN MENU. The first screen is called IDLE. Make sure the TPS is reading 0. If it does not, do a TPS AUTOSET, or if it is reading 1-2%, close the idle screw on the throttle body slightly. The RPM should be reading “Stl” which indicates a “stall” condition indicating the engine isn’t running.

Crank the engine and look at the RPM parameter. It should change to “Snc”, indicating the ECU is syncing with the RPM signal for an instant, then show an RPM signal. The engine should fire and run and come to an idle.

If you do not get an RPM signal, there is an error in the wiring or system setup. Call Holley Tech service for advice.

If the engine starts but is idling too low and appears to be struggling for air, you may have to open the throttle body idle speed screw at this time. If you move the screw, you will need to perform a TPS Autoset as done in step 4.0 above.

## 12.0 SETTING IGNITION TIMING

If you are using a computer controlled GM HEI distributor, you must sync up the ignition timing with the ECU. You must have a timing light to perform this. You will possibly need a dial-back timing light or a harmonic balancer that is degreed up to 40 degrees. Open the MONITOR screen from the MAIN MENU screen. On the IDLE screen you will see the ECU commanded ignition timing at the bottom of the screen (called “Ign Timing”). Rev the engine up (CAREFULLY) to approximately 2000 RPM. Note the timing value on the handheld. Using the timing light, turn the distributor until the timing you see with the timing light matches what is on the handheld. Once synced, tighten down the distributor. From this point on, do not turn the distributor. The timing on the handheld should always match the timing on the distributor.

**IMPORTANT NOTE:** The timing at idle (TPS = 0) might be seen to be rapidly fluctuating. This is due to the ECU using the ignition timing to stabilize the idle. This is normal.

## 13.0 AFTER-STARTUP

Once the vehicle has started, look for any fuel or coolant leaks. Let the vehicle warm up and look at some other parameters to make everything is operating properly. Go into the MONITOR and click the button to the right twice until you see the CLOSED LOOP view. You will see the following:

- **CL Status** – Indicates whether the engine is “Closed Loop” or “Open Loop”. Closed Loop indicates that the ECU is adding or subtracting fuel to maintain the target air/fuel ratio. “CLP” indicates Closed Loop operation. “OLP” indicates Open Loop operation. The Avenger calibrations are such that the system should be operating closed loop almost all of the time.
- **CL Comp** – This is the percentage of fuel that the ECU is adding or subtracting to maintain the target air/fuel ratio at any specific moment. A value with a minus (-) sign in front indicates the ECU is removing fuel. A value with no minus sign indicates the ECU is adding fuel. When in open loop operation, this will always stay at 0%.
- **Target AFR** – This is the target AFR (air/fuel ratio) the ECU is trying to maintain. This will vary depending on the engine speed and load.
- **AFR Left** – This will show the air/fuel ratio the wideband oxygen sensor is reading. The Closed Loop Compensation should be adding or subtracting fuel all the time such that the AFR Left should always be close to the Target AFR value.
- **Learn Stat** – This indicates the status of the Avenger “Self Tuning” operation (Learn Status). The system will automatically tune itself as you drive around. There are several conditions that must occur in order for the Self Tuning to occur. The engine temperature must exceed 160 degrees F. The system must be operating in a closed loop mode, and the Self Tuning must be enabled. The base Avenger setups have the Self Tuning enabled. Once the engine reaches 160F, the Self Tuning should be active. The Learn Stat will show “nLn” when Self Tuning is not active and “Lrn” if Self tuning is active.

If any of these parameters are not showing a proper value, find out why before further driving the vehicle.

## 14.0 IDLE SETTING/THROTTLE PLATE SETTING

Once the engine is up to operating temperature, the idle speed can be set to what is desired.

From the MAIN MENU, select the TUNING tab. Then select the BASIC TUNING tab. Move down and select the IDLE tab. You can see what the target hot idle speed is set to. If you are happy with the current value, use the BACK button to proceed back out through the menus. If you would like to change it, click on the IDLE SPEED. This brings up a screen to adjust the idle speed (Fig 17). Move the button left and right to adjust it. Click the button to save the new value or select CANCEL at the bottom to move out of this screen.

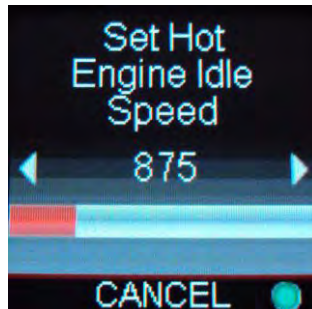


Figure 17

Whether you change the target idle or not, you need to set the throttle plates on the throttle body to an optimal position. To do so, with the engine running select the MONITOR tab. You will see the IDLE screen. Look at the "IAC Pos" value. This value should be set between 2 and 10 with the engine in neutral and up to operating temperature. Also make sure the "TPS" value is showing a value of 0. If it is not, you need to perform a TPS AUTOSET.

If the "IAC Pos" value is showing zero, you must close the throttle plates until it reads a value of 2-10. Slowly turn the throttle shaft adjustment screw on the throttle body out (counter-clockwise). If the IAC position is "stuck" at 0, it is likely that the engine is idling at a higher speed than you have set the target idle speed for. You need to adjust the throttle plates to resolve this issue.

If the "IAC Pos" value is greater than 10, it is a good idea to open (turn the throttle shaft adjustment screw in, clockwise) the throttle plates until the "IAC Pos" value is between 2 and 10. Note that if you open the throttle plates such that the "TPS" position goes above a value of 0, you will need to shut the vehicle off and perform a TPS AUTOSET. Then restart the vehicle and continue adjusting the throttle plates. Once the TPS goes above a value of 0, the ECU goes out of its "idle" mode and will lock the IAC Pos to a fixed value.

When the adjustments are completed, make sure the TPS reads a value of 0 with the engine idling.

## 15.0 SELF TUNING

At this point, it is time to just drive the vehicle and let the system perform its self tuning process. The best way for this is to drive the vehicle under as many different operating conditions as possible. Different engine speeds and loads. Start by slowly revving the engine up in neutral and holding it at different speeds up to 2500 RPM. This will help the system learn these points. Then drive the vehicle, possibly using different transmission gears to learn in different areas. If you have an automatic transmission you may want to put it in gear, and with your foot on the brake pedal, apply a SMALL amount of throttle so that the system learns in this area as well.

**NOTE:** There are several conditions where Learning will NOT occur. They are the following:

- If the engine is below 160 degree F
- When the engine sees quick accelerator pedal movement
- Certain times when the accelerator pedal is lifted and the vehicle is coasting
- If the learn is disabled by the user

If you are interested in seeing if Self Tuning is completed in a certain area, you can look at the following:

- Select MONITOR from the MAIN MENU screen
- Click the button once to the right and view the LEARN parameters
- Look at the "Learn" parameter. It will show a positive (adding fuel) or negative (subtracting fuel) value as Self Tuning is performed
- Look at the "CL Comp" value. Once this value is close to zero, learning is complete in an area.

***At this point you can drive and enjoy your Avenger EFI as it is. Sections 18.0, 19.0, & 20.0 below describe how you can adjust various parameters to further optimize fuel economy and overall performance if desired.***



## 16.0 GAUGE SCREENS

There are some basic “Gauges” that can be viewed if desired. From the MAIN MENU screen, select GAUGES. The first screen shows engine speed and Air/Fuel Ratio. Click the handheld button left or right to view the other two screens which show engine coolant temp (CTS) and battery voltage (BAT) as well as oil pressure (OIL) and fuel pressure (FUEL). Oil and fuel pressure are only shown correctly if you have installed the optional pressure transducers. If you have not done this, ignore these.

There are three “LED’s” in the middle of the gauge screen. They are as follows:

Top LED – “Closed Loop Status” – Blue = Open Loop; Green = Closed Loop Active  
Middle LED – “Learn Status” – Blue = Learn Mode Inactive; Green = Learn Mode Active  
Bottom LED – Sensor Warnings – Green = No Warnings or Cautions; Yellow = A sensor is at a caution level;  
Red = A sensor is at a warning level

**NOTE:** If you move the button on the handheld up or down while viewing the gauges the numeric values will change to any diagnostic codes a sensor might have. Toggle the button up and down to change from “normal” values to diagnostic codes.

## 17.0 FILE SAVING/LOADING

At this point, if you are going to perform changes in the tuning, it is best to save the calibration you have in the ECU. Calibrations can be saved and loaded from the micro SD memory card located in the side of the handheld.

From the MAIN MENU, select FILE. You see the following choices:

DATALOGGING – Used to datalog to the SD card. (**NOTE:** datalog files can only be reviewed on a PC computer)  
LOAD FILE – Loads a file from the SD card.  
SAVE – Saves a file  
SAVE AS – Saves a file to a new file name  
ECU – Shows ECU firmware versions and allows for firmware to be updated.  
HANDHELD – Shows handheld information

SAVE AS – Selecting SAVE AS allows you to save a calibration to any name you choose up to 12 characters. It is always a good idea to save a calibration after you have performed tuning and you are satisfied with how the vehicle operates.

SAVE – Selecting SAVE will save the calibration to its current name.

LOAD FILE – Selecting LOAD file will allow you to load a previously saved calibration to the ECU.

## 18.0 BASIC TUNING

The Avenger systems allow the user to perform some basic tuning changes to help optimize mileage, driveability, and performance. The tuning is split up into “Basic Tuning” and “Advanced Tuning”. The Basic Tuning allows changes to the Air/Fuel Ratio’s the engine runs at and changes to Ignition Timing if a GM HEI is used. The Advanced Tuning is typically not needed, but allows changes to some items that are less commonly used, or require some careful understanding before changing.

From the MAIN MENU, select TUNING, and BASIC TUNING (Fig 18). There are four areas you can modify, FUEL, FUEL LEARN, IDLE, and SPARK (Fig 19). These are reviewed below.

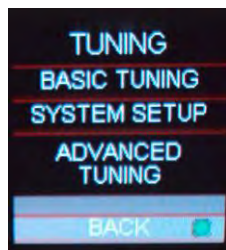


Figure 18

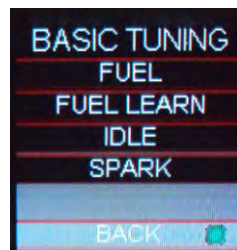


Figure 19

## 18.1 FUEL

Selecting FUEL brings up the following menu (Fig 20):

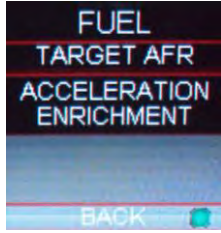


Figure 20

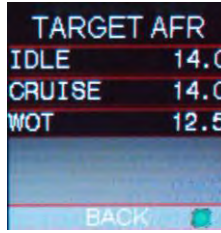


Figure 21



Figure 22

**TARGET AFR:** Allows changes to the Target Air/Fuel ratio at idle, cruise, and wide open throttle (Fig 21). Select the area you want to change, select it, and edit it. The following are typical values and some tuning notes.

Idle Air/Fuel Ratio – Typically between 13.5 and 14.5. Engines with larger cams may need a richer setting for smoothest idle.

Cruise Air/Fuel Ratio – Typically between 13.5 and 15.5. Engines with larger cams may need a richer setting for smoothest operation.

Wide Open Throttle Air/Fuel Ratio (WOT) – Typically between 12.0 and 13.0. Running richer may reduce power. Running leaner may reduce power or cause potential engine damage.

**NOTE:** The Target Air/Fuel setting between IDLE, CRUISE, and WOT is blended together automatically. Consequently, the air/fuel you see on the MONITOR screen, may not be exactly what you set for the settings. Changing these settings raises or lowers the “curve” of that specific area.

**ACCELERATION:** Changes the “accelerator pump” function of the fuel injection (Fig 22). Raising the number increases the amount of fuel added when the pedal is pushed. Lowering the number decreases the amount of fuel added when the pedal is pushed. It is highly recommended NOT to change this until the ECU is allow to perform self tuning for some time.

## 18.2 FUEL LEARN

Selecting FUEL LEARN brings up the following screen (Fig 23):

**LEARN Enable Checkbox:** The LEARN Enable Checkbox turns the Self Tuning “On” and “Off” (Fig 23). If checked, self tuning is performed. Learning should be enabled when an engine is just started and the tuning process is occurring. After the vehicle is driven under various operating conditions, and is running well, it is advised to disable learning, OR slow the Learn Speed to “Slow”.

**LEARN SPEED:** This parameter adjusts how fast the learning process occurs (Fig 23). On fresh startups, it should be set to “Fast” (Fig 24). After the vehicle is driven under various operating conditions, and is running well, it is advised to disable learning, OR slow the Learn Speed to “Slow”.

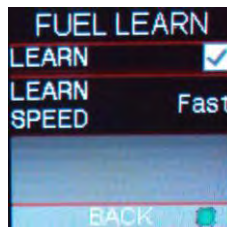


Figure 23

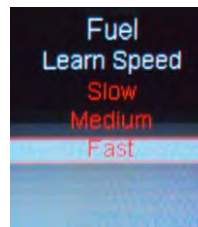


Figure 24

## 18.3 IDLE

Selecting IDLE allows you to change the Target Idle Speed (Fig 25).

**IDLE SPEED:** Adjust the idle speed to what is desired. See section 14.0 on re-adjusting idle speed.



Figure 25

## 18.4 SPARK

Selecting SPARK brings up the following screen (Fig 26):

The ignition timing at idle (Fig 27), cruise (Fig 28), and wide open throttle (Fig 29) can be adjusted (only when using a small cap computer controlled GM HEI).



Figure 26

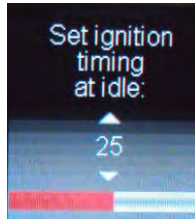


Figure 27

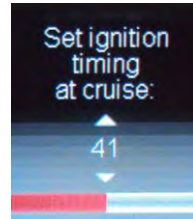


Figure 28

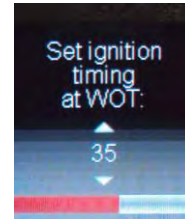


Figure 29

The following are typical values for each:

- Idle Timing – 18-34 degrees is typically used at idle. The larger the camshaft, the more timing is usually used.
- Cruise Timing – 35-48 degrees is typically used when cruising for optimal fuel economy.
- Wide Open Throttle Timing (WOT) – WOT timing is typically between 32-38 degrees.

**NOTE:** Too much timing can cause pre-ignition that can damage an engine. Be cautious when tuning.

**NOTE:** The actual timing between IDLE, CRUISE, and WOT is blended together automatically. Consequently, the timing you see on the MONITOR screen, may not be exactly what you set for the settings. Changing these settings raises or lowers the “curve” of that specific area.

## 19.0 SYSTEM SETUP

The System Setup (Fig 30) consists of three areas described below, INPUT/OUTPUT (Fig 31), ENGINE SETUP (Fig 32), and IGNITION SETUP (Fig 33).

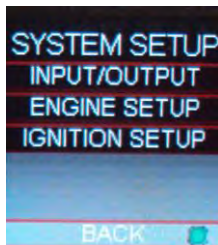


Figure 30

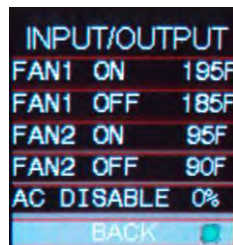


Figure 31

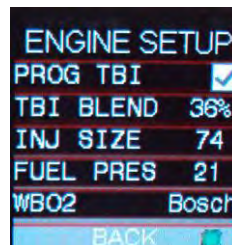


Figure 32

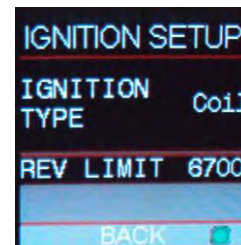


Figure 33

### 19.1 INPUT/OUTPUT

The INPUT/OUTPUT screen allows for the Fan #1 and Fan #2 ON and OFF temperatures to be adjusted (Fig 31). The ON temp needs to always be a higher value than the OFF temp. Use a difference of at least 5 degrees so they aren't cycling on and off. These are ground outputs that should trigger the fan relays. NEVER use them to directly power the fans. The AC Disable value is a TPS value above which a 12 volt output is sent out to deactivate the air conditioning at wide open throttle (Fig 31).

Wiring for both these items is covered in detail in the hardware installation manual for your kit.

### 19.2 ENGINE SETUP

These parameters should all be properly pre-set when you went through the Wizard process. If you change something on your engine, or run a different system fuel pressure or injector size, they can be edited here (Fig 32).

- **PROG TBI** - This should be selected if using a TBI throttle body with progressive throttle linkage. All 4 bbl Avenger TBI systems have progressive linkage. This will NOT be shown if you have selected a MPFI application.
- **TBI Blend** - If using a TBI with progressive linkage, this value is used to start the ramp-in of the secondary fuel injectors as the rear throttle plates open. Enter the TPS when the rear throttle plates start to open. This is typically 36% for a Holley throttle

body unit. The “Check for Progressive Throttle Linkage” must be checked for this box to be enabled. This will NOT be shown if you have selected a MPFI application.

- **Inj Size** – This is the value of the injector static flow rate lb/hr, of the fuel that will be used. If this number is not correct, the fuel injection calculations will not be correct and issues may arise.

**NOTE:** MPFI injector size/flow is calculated at 43 PSI. TBI injector size/flow is calculated at 21 PSI.

- **Fuel Pres** - Enter the actual fuel system pressure of the fuel system. It is important this is entered properly if the fuel flow calculation is to be accurate.
- **WB02** – Selects the type of wide band oxygen sensor used. All Avenger kits come with a Bosch sensor. If the wrong sensor is selected/used, damage will occur to the sensor.

### 19.3 IGNITION SETUP

There are two parameters that are adjustable in the IGNITION SETUP (Fig 33). Ignition input type and engine rev limiter.

**IGNITION TYPE** – Select from three choices:

- **1) Coil** - Use this if:

You are using a stock type mechanical advance distributor with a stock inductive ignition coil. Examples of this would be any older style points distributor, a 1974-1981 GM large cap HEI.

Do NOT use this input if you are using an aftermarket Capacitive Discharge (CD) ignition system such as a MSD, Mallory, or others. The ECU will be damaged if you connect to a capacitive discharge type ignition coil.

**NOTE:** Using this input, the EFI will NOT control the ignition timing of the engine. The timing will be based on the distributor initial, mechanical, and vacuum advance, just like it did with a carburetor

- **2) CD Box Tach Outp** – If you are using an aftermarket Capacitive Discharge (CD) ignition system such as a MSD, Mallory, or others, you need to connect to the “Tach Out” connection or wire these systems provide. This is a 12 volt square wave output.

**CAUTION!** NEVER, NEVER connect any of the EFI wires to the coil on any CD type ignition system. The ECU will be permanently damaged!

**NOTE:** Using this input, the EFI will NOT control the ignition timing of the engine. The timing will be based on the distributor initial, mechanical, and vacuum advance, just like it did with a carburetor.

- **3) GM Small HEI** - Small and Big Block Chevy engines can use a small cap GM HEI computer controlled distributor that was available on factory GM vehicles from the 1980's through mid 1990's. This distributor provides an engine speed signal to the EFI, as well as allowing the EFI to control the ignition timing.

**REV LIMIT** – The rev limiter is only enabled when using a computer controlled small cap GM HEI. It is an ignition only rev limiter. It will not shut fuel off. Enter a value for which you'd like the rev limiter to start.

## 20.0 ADVANCED TUNING

The Advanced Tuning areas are areas that typically won't ever be needed to be changed (Fig 34). However, after getting used to the Avenger EFI system, there may be some fine tuning of various parameters that you'd like to perform.

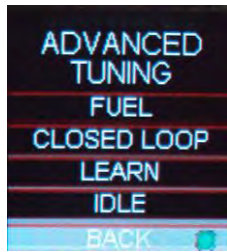


Figure 34

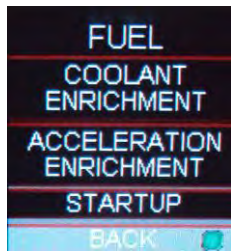


Figure 35

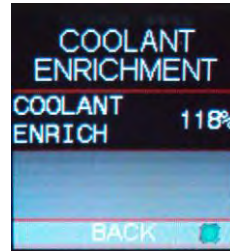


Figure 36



Figure 37



Figure 38

### 20.1 Fuel

These parameters modify various fuel related tuning functions (Fig 35).

#### 20.1.1 Coolant Enrichment

Coolant enrichment is similar to the choke on a carburetor (Fig 36). It adds extra fuel as the engine warms up. Due to the fact that the Avenger systems run closed loop when they are started, there is usually no need to modify this value.

#### 20.1.2 Acceleration Enrichment (Load Based Accel Enrich)

This parameter is another form of adding fuel with the accelerator is depressed (Fig 37). It adds fuel depending on how fast the MAP sensor changes which basically senses a change in engine load. There is typically no need to adjust this parameter except possibly some extreme conditions of vehicles that are heavy and under-powered.

#### 20.1.3 Startup

##### 20.1.3A Cranking

The cranking parameter is how much fuel is injected when the engine is cranking (Fig 38). A different amount of fuel is injected when an engine is cold and warm. Changing this value offsets the entire curve at all temperatures.

##### 20.1.3B Afterstart

The afterstart parameter is fuel that is added for a short time immediately after an engine starts. This value varies depending on engine temperature. Changing this value offsets the entire curve at all temperatures (Fig 38).

### 20.2 Closed Loop

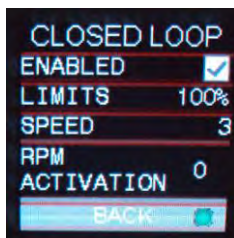


Figure 39

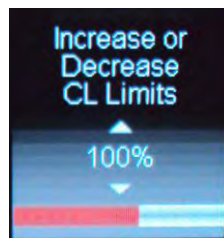


Figure 40

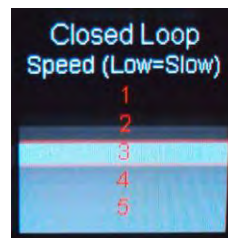


Figure 41

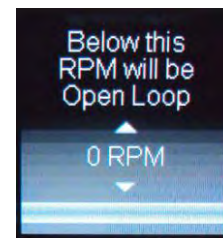


Figure 42

#### 20.2.1 Enabled

This checkbox turns closed loop operation off if it isn't enabled/checked (Fig 39). There is typically no reason to turn off closed loop operation unless you suspect an oxygen sensor problem and want to disable the sensor. Note that Self-Tuning requires closed loop operation to be enabled to function.

#### 20.2.2 Limits

Defines how much percentage of fuel closed loop is allowed to add and subtract (Fig 40). The base limit is set at 100%, but once Self-Tuning is completed, this can be lowered to 25% if desired.



### 20.2.3 Speed

This is the “speed” (gain) at which closed loop operation occurs (Fig 41). This can be set to five levels, 1, 2, 3, 4, or 5. 3 is the base setting and should be good for most applications. 4 or 5 is typically not used as the closed loop speed may be too excessive for certain applications. If the oxygen sensor is installed far back in the exhaust (more than 1 foot back from the collector in long tube headers), a value of 1 or 2 may be needed.

### 20.2.4 RPM Activation

This setting is usually set to zero. If an extremely large camshaft is used (specs only typically found on race camshafts), the overlap sometimes causes a “false lean” reading at low RPM. In these cases, it may be required to put in a value of 1500-2000 RPM so the system operates open loop below this RPM setting (Fig 42).

## 20.3 Learn



Figure 43



Figure 44

### 20.3.1 Limits

Defines how much the Self Tuning is allowed to compensate. This is set to 150% to start. This should typically be left alone (Fig 43 & 44).

## 20.4 Idle

The Idle parameters adjust specific characteristics of how the idle air control motor functions on engine decal and startup (Fig 45).



Figure 45

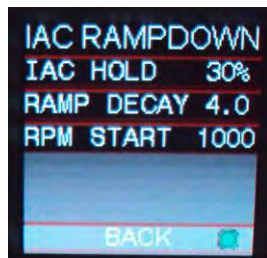


Figure 46

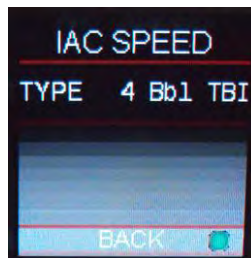


Figure 47



Figure 48

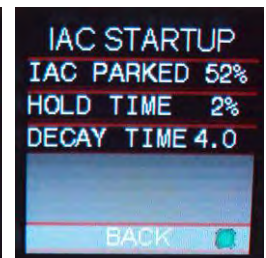


Figure 49

### 20.4.1 IAC Rampdown

The Idle Air Control (IAC) motor is a stepper motor located in the throttle body that controls the idle speed of the engine by metering air. It also operates during engine cranking and when the engine returns back to idle. The settings here can adjust how that functions. The IAC moves from a position of 0% (fully closed, no air added) to 100% (fully open, maximum air flow).

**NOTE:** If you change these settings, you must comprehend the function they perform. Contact Holley Tech Service if you have any questions.

#### 20.4.1A IAC Hold

This is the position the IAC motor will “hold” or “freeze” at when the TPS moves above idle (when TPS becomes greater than 0%). If it is too high, the engine RPM will “hang” and not return to idle (Fig 46).

#### 20.4.1B Ramp Decay

This is the time (in seconds) it takes for the IAC to decay from the “IAC Hold Position” back to a “0%” position (Fig 46). It is a linear decay.



### **20.4.1C RPM Start**

This value is the RPM added to the target idle speed that the IAC will automatically start to ramp back down to idle (Fig 46). If this is too low, the engine RPM will “hang” and not return to idle.

### **20.4.2 IAC Speed**

This dropdown is used to select the type of IAC motor application that is being used (Fig 47). This selection drives the background parameters that control the IAC motor. These parameters have been fine tuned for each of these applications, eliminating the need for the user to perform further modifications.

### **20.4.3 Idle Spark**

Idle spark is a feature active only when the ECU is controlling timing (only when using a small cap computer controlled GM HEI with the Avenger systems). If enabled/checked, the ECU rapidly changes the timing at idle to help maintain a more stable idle (Fig 48).

### **20.4.4 IAC Startup**

These parameters control the position of the IAC when the engine is cranking and immediately after it starts.

#### **20.4.4A IAC Parked**

This is the position the IAC motor will be at during cranking and immediately after the engine starts. If it is too high, the engine will be at too high of an RPM once it starts. Too low and poor starting will result. Note that this is a temperature based table. The value changed in the handheld offsets this entire curve (Fig 49).

#### **20.4.4B Hold Time**

This is the amount of time that the IAC will remain at the “IAC Parked Position %” (Fig 49).

#### **20.4.4C Decay Time**

The amount of time for the IAC to decay from the “IAC Hold Position” back to a “0%” position. It is a linear decay (Fig 49).

# APPENDIX 1 SENSOR DIAGNOSTICS AND STATUSES

The following can appear on the Avenger Handheld in the MONITOR screens as well as the GAUGES screen.

**Wideband Oxygen Sensor Status** – Shows status of wideband oxygen sensors.

Text	Description
...	Signifies that sensor channel is not enabled.
In	First shown for an instant when the system is powered on. Displayed so quickly you will likely not see this.
HO	Sensor is heating.
Cld	Sensor is below calibrated operating temperature. Unit will still read but accuracy may be impacted.
Hot	Sensor is above calibrated operating temperature. Unit will still read but accuracy may be impacted.
UnP	Sensor is unplugged.

**General Sensor Status** – These are shown for the coolant and air temperature, MAP, TPS, Oil and Fuel pressure sensors. If you do not have an oil or fuel pressure sensor installed, you will see this error. It will not cause a problem.

Text	Description
Und	Unlikely failure indicated that a sensor is not properly defined.
Ler	A sensor displaying this can be unplugged, have an open or short circuit, or be otherwise damaged.

**RPM (Crank Signal Inputs) Diagnostics** – The following are shown for the “RPM” parameter which indicates the status of the crank sensor/engine speed input.

Text	Description
Stl	No RPM input detected.
Snc	Signal detected. Position being established.
Nothing	Will show briefly after crank signal and cam/crank positions established. Actual engine RPM will then be indicated.
Err	Cam/Crank input error detected.

**TPS Diagnostics** – The following are shown for the “TPS” parameter.

Text	Description
Err	If you see an error, contact Holley Tech Service.
CaL	TPS Autoset needs to be performed.

**Closed Loop Diagnostics** – Shows status of closed loop operation.

Text	Description
OLP	System is in open loop operation.
CLP	System is in closed loop operation.

**Learn Status** – Shows status of learn mode.

Text	Description
nLn	Learning is not active.
Lrn	Learn is in an active state.

**Switched Inputs/Outputs Status** – Shows status of switched inputs and outputs.

Text	Description
OFF	Input or Output is not active.
On	Input or Output is active.

Holley Technical Support  
270-781-9741

199R10505  
Date: 7-8-10