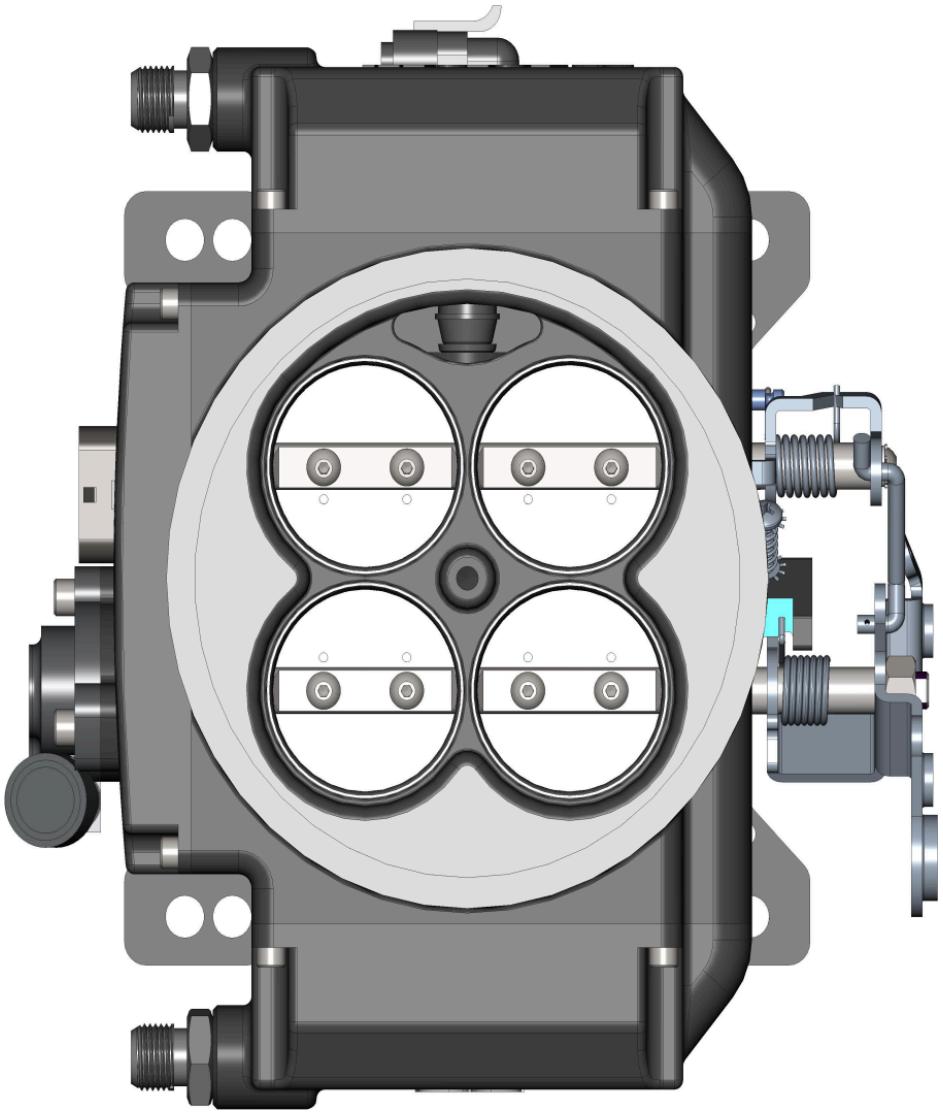
ACESEFI

INSTALLATION GUIDE

Killshot II 4-bbl EFI System



About Us

At Aces, we believe performance should be within reach for every car enthusiast. Born from a passion for hot rod technology, we push the boundaries of EFI innovation—empowering DIY builders and professionals alike. We do it *"For the People"* because we believe that achieving your dreams should never be exclusive.

Our commitment is simple: deliver exceptional products that inspire, at fair prices that make high-performance accessible. Whether it's your first EFI setup or your latest build, we're here to fuel your journey with precision, reliability, and cutting-edge technology.

We don't just build EFI systems—we craft experiences that ignite passion, break barriers, and bring the joy of customization to everyone. Performance should never be out of reach, and with Aces, it never is. Our goal is to give our customers the absolute best value for their money both in the short and long run so that they can look back and be proud that they bet on Aces.

Backed by over 10 years of experience, a history of winning results, and an unwavering dedication to research and development, Aces is built for performance, designed for dreamers, and made for those who refuse to settle.

Built for performance. Designed for dreamers. Made for you.

Table of Contents

Killshot II Overview

The Killshot II 4-BBL EFI System is more than just an upgrade—it's a complete evolution of throttle body fuel injection. Over the past two years, we've gathered real-world feedback from tuners, racers, and street enthusiasts to refine and improve every aspect of the original Killshot system. The result is an EFI system that is more powerful, more versatile, and easier to install and tune than ever before.

If you're still running a carburetor, it's time to ask yourself: Why settle for outdated technology when EFI offers superior drivability, reliability, and performance? Unlike carburetors, EFI systems automatically adjust fuel delivery based on real-time conditions, meaning no more hesitation, no more cold start issues, and no need to constantly re-jet for changing weather or altitude. With Killshot II, you get precision fuel control, improved throttle response, and seamless adaptability, whether you're on the street, track, or strip.

At the heart of the Killshot II is a high-performance ECU that offers 32-bit processing, allowing for faster and more precise engine management. Whether you're running naturally aspirated or boost, this system adapts to your setup, providing accurate fueling and consistent power delivery. It comes equipped with a 3-bar TMAP sensor, supporting up to 27 lbs of boost, making it ideal for forced induction applications.

For those looking to push even higher horsepower, Killshot II supports dual-quad configurations, allowing two units to work together to fuel up to 1200 HP (requires an additional slave unit). Whether you're running a weekend cruiser, a high-compression race motor, or a turbocharged street car, Killshot II delivers the reliability and performance you need.

Maintaining proper fuel pressure is critical for EFI performance. With Killshot II's built-in fuel pressure sensor, you get real-time fuel pressure monitoring, ensuring consistent fuel delivery under all conditions. This means no more external sensors or guessing—just accurate fuel data at your fingertips.

Tuning your engine shouldn't be a guessing game. That's why Killshot II comes with our 3rd-generation 5" HD touchscreen handheld, giving you complete control over your EFI system. With an intuitive interface and Pro PC Tuning Software, you can fine-tune parameters to match your exact performance goals.

- **Self-Learning Capabilities** – While our system will not "self-tune" in the traditional sense, it does offer advanced self-learning fuel strategies. A base tune is selected based on your engine's setup, and the system then refines fuel delivery as you drive. This is ideal for stock to mild applications, but more aggressive setups—such as high-lift camshafts, forced induction, and nitrous—will require manual tuning for optimal performance.
- **Progressive Linkage for Improved Drivability** – Unlike traditional TBI setups that operate more like a digital on/off switch, Killshot II features a progressive linkage for smoother, more linear throttle control. This means better street manners without

sacrificing performance.

Remote-Mounted ECU for Durability – Many EFI systems house the ECU inside the throttle body, exposing it to heat and vibration. Killshot II's separate ECU design eliminates this problem, ensuring better reliability and long-term durability.

Built for Easy Installation and Maximum Compatibility

EFI conversions shouldn't be complicated, and Killshot II is designed for straightforward installation. It fits most 4150-flange 4-barrel intake manifolds, and thanks to its low-profile throttle body design, it's compatible with more air cleaner setups—including drop-base filters.

Additional Features & Compatibility:

- Supports up to 650 HP NA (Naturally Aspirated)
- 4150 Flange – Universal fitment for 4-barrel intake manifolds
- Available in Three Finishes – Black, Polished, and Gold
- Integrated 3-bar TMAP Sensor – Supports up to 27 lbs boost
- Built-In Fuel Pressure Sensor – Real-time monitoring for precise fuel control
- TPS Output – Provides compatibility with other external modules such as trans control, nitrous controllers, etc.
- Standalone or Complete Kit Options – Choose the package that fits your build

With Killshot II, you get the best of both worlds—the reliability of modern EFI with the power and simplicity of a 4-barrel throttle body system. Whether you're upgrading from a carburetor for better cold starts and fuel efficiency, or pushing a high-boost application that demands precision fuel control, Killshot II is built to handle it all.

Parts List

This list applies to standalone systems only and does not include items or exchanges done during promotional periods or offers.

Description	QTY	SKU
Killshot ECU	1	AZ0006
5” HD Handheld (3rd gen)	1	AS2021
5” HD Handheld Holder (3rd gen)	1	DM300
Killshot II Throttle Body	1	AZ0042
Killshot II Main Wire Harness	1	AZ2212
Killshot II Sub-Harness	1	AZ2212-1
Wide-Band O2 Sensor	1	AE1060
Coolant Temp Sensor	1	AE1052
Weld-In O2 Sensor Bung	1	AE1062
Air Cleaner Gasket	1	
Throttle Body Base Gasket	1	
Breather Stud	1	
USB-CAN Cable	1	AH2500
USB-A to USB-C Adapter	1	US1000

Warnings, Notes, and Notices

Important Notes

- This standalone system does not include fuel system components, such as the fuel pump, fuel filters, fuel pressure regulator, and lines. Aces Fuel Injection offers complete kits, which can be purchased separately.
- Designed for classic engines: This system is intended for stock and mild cam, naturally aspirated, boosted, and nitrous oxide engines. Note that it does not *control* boost or nitrous oxide.

Critical Warnings

⚠️ **WARNING!** Aces EFI systems consist of multiple sophisticated components. Failure of a single component does not justify a warranty claim for the entire system. Individual service items are available for replacement of specific components.

⚠️ **WARNING!** To preserve the warranty, these installation instructions must be read and followed thoroughly. Failure to follow instructions can void the warranty and may result in serious injury or property damage.

⚠️ **WARNING!** The oxygen sensors in this kit are designed for use with unleaded fuel ONLY. Using leaded fuel will degrade the oxygen sensor, leading to incorrect oxygen readings and improper fuel delivery.

⚠️ **WARNING!** Failure to follow these instructions may result in an improper installation, which could cause serious injury, death, or property damage. Improper installation or misuse of this Aces product will void all warranties.

⚠️ **WARNING!** RTV silicone sealers can damage oxygen sensors. Ensure that any RTV silicone sealant used is compatible with oxygen sensor-equipped vehicles. This information should be clearly indicated on the RTV package.

⚠️ **WARNING!** Installation, adjustment, and repair should only be performed by a trained mechanic with adequate fuel system experience.

⚠️ **WARNING!** Fuel vapors are heavier than air and can accumulate in low areas, where they may be ignited by sparks or flames, resulting in property damage, injury, or death. Always prevent fuel spills to eliminate this risk.

⚠️ **WARNING!** Work must be performed in a well-ventilated area. Do not smoke or have open flames nearby, as gasoline vapors are highly flammable and can cause explosions.

⚠️ **WARNING!** This installation is NOT for tuning novices! Aces EFI systems allow for complete tuning flexibility. Incorrect tuning can destroy your engine. If you lack experience in engine dynamics and EFI tuning, do not attempt installation. Instead, seek assistance from an Aces-authorized tuning shop or contact Aces technical support.

Calibration Responsibility Notice

Note: All supplied Aces Fuel Injection calibrations, wizards, and tuning information are provided as starting points only. It is the responsibility of the engine tuner to confirm that the calibration is safe for the intended use.

Aces Fuel Injection holds no responsibility for engine damage resulting from the misuse or improper tuning of this product.

1.0 Introduction and System Requirements

This manual, provided by Aces Fuel Injection, outlines the installation process for the EFI throttle body injection system. It includes essential information regarding the throttle body, wiring, and sensors. Please read all **WARNINGS** and **NOTES** in this document carefully, as they contain important details that can help prevent potential issues and save both time and money.

WARNING! Before disconnecting the battery, identify a clean, switched 12-volt ignition source. This source must provide 12 volts during cranking and when the key is in the run position. Always disconnect the battery before performing any work on the vehicle.

NOTE: Some installation and adjustment procedures require an assistant. Ensure an additional person is present for safety reasons.

1.1 Engine Requirements

Before proceeding with the installation, confirm that your vehicle meets the following engine and fuel system requirements:

- The engine is in good mechanical condition.
- Horsepower falls within the 200-650 range.
- The engine configuration is a 4, 6, or 8-cylinder.
- A 4-barrel, 4150-style flange intake manifold is present.
- The vehicle runs on unleaded fuel only.
- Any RTV silicone sealants used on the engine must be sensor-safe.

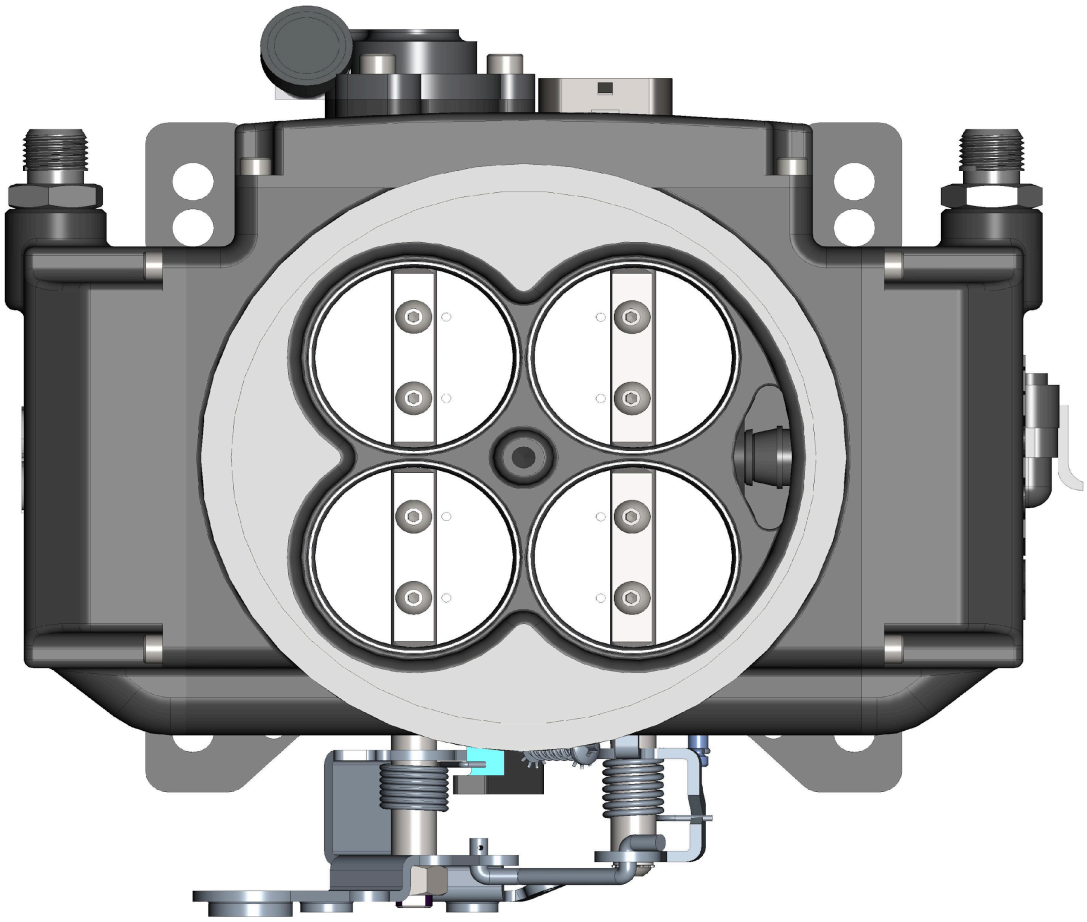
2.0 Installation

2.1 Throttle Body Installation

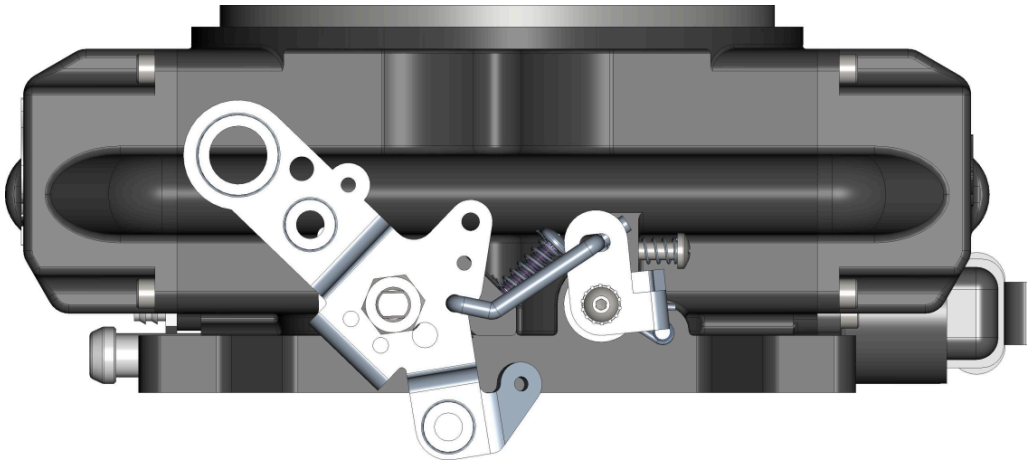
The throttle body features two connectors: one for controlling the Throttle Position Sensor (TPS) and another that manages the fuel injectors, Idle Air Control (IAC), and the TMAP sensor.

The Aces throttle body is designed for a clean and straightforward installation. Its structure ensures ease of mounting, while the external placement of the fuel injection controller prevents exposure to high engine temperatures and vibrations, maintaining stable performance.

NOTE: If you are installing a new distributor, such as the Aces Fuel Injection Blackjack Pro Distributor, you may find it easier to complete the initial steps of that installation before securing the throttle body. This can provide additional space to work.

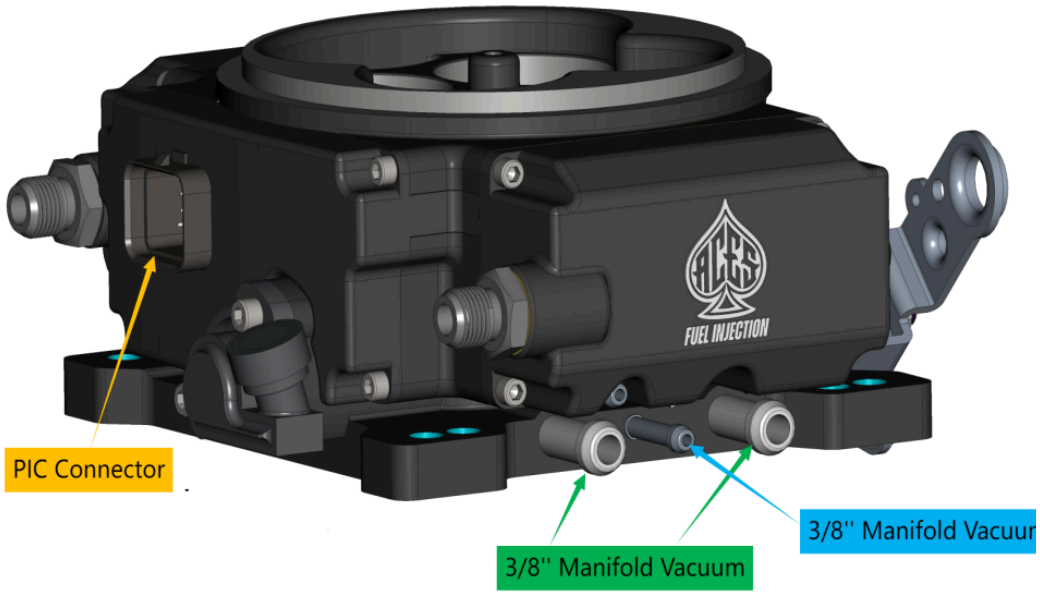


Throttle Body Aerial View



Throttle Body Side View

1) Begin by removing the carburetor or other aftermarket EFI system. As you do so, take note of the vacuum lines and whether they are connected to ported or manifold vacuum. The method for identifying ported versus manifold vacuum varies by carburetor model, so refer to the manufacturer's specifications for your specific carburetor.



NOTE: If the carburetor will remain removed for an extended period, cover or plug the intake manifold with an appropriate material to prevent any foreign debris from entering the engine.

2) Install the new Killshot throttle body using the provided gasket. Secure it in place with the screws or studs that were previously used for the carburetor or EFI system.

3) Reconnect all vacuum hoses, ensuring that any ported vacuum systems are connected to the correct 3/16" port as shown in the instructions. Cap any unused ports with the provided rubber caps.

4) Once the installation is complete, install an air cleaner onto the throttle body.

3.0 Fuel System

A complete high-pressure EFI fuel system is required for the Killshot EFI system. This system operates at a minimum of 43 PSI and functions best with a return-style fuel system. When selecting a fuel pump, regulator, and fuel lines, ensure that all components are designed to handle high pressure.

The following guidelines will help with setting up the fuel system for your Killshot EFI system. If using an in-line fuel pump, a coarse pre-filter must be installed before the pump.

All fuel systems should include a 10-micron post-fuel filter after the fuel pump. Additionally, an EFI-rated high-pressure, vacuum-referenced, bypass fuel pressure regulator is required. The fuel pump must be mounted lower than the lowest part of the fuel tank and as close to the tank as possible. The fuel tank must also be properly vented to function correctly.

3.1 Fuel System Installation Steps:

(Fuel system not included in standalone systems)

1) Refer to the provided diagram for the correct orientation and location of fuel system components.

2) If using an electric in-line fuel pump, mount it as close to the fuel tank outlet as possible using the provided bracket that comes with the fuel system. This placement ensures that the pump primes efficiently, allowing for quicker starts.

3) Install the pre-filter between the fuel tank and the fuel pump inlet. This filter prevents dirt and debris from reaching the fuel pump. Be sure to install it with the arrow on the filter pointing in the direction of fuel flow.

4) Install the post-fuel filter between the electric fuel pump outlet and the throttle body injection (TBI) unit. This should be a 10-micron EFI filter positioned to allow fuel hoses to be routed without kinks or sharp bends. The filter must also be installed with the arrow pointing in the direction of fuel flow.

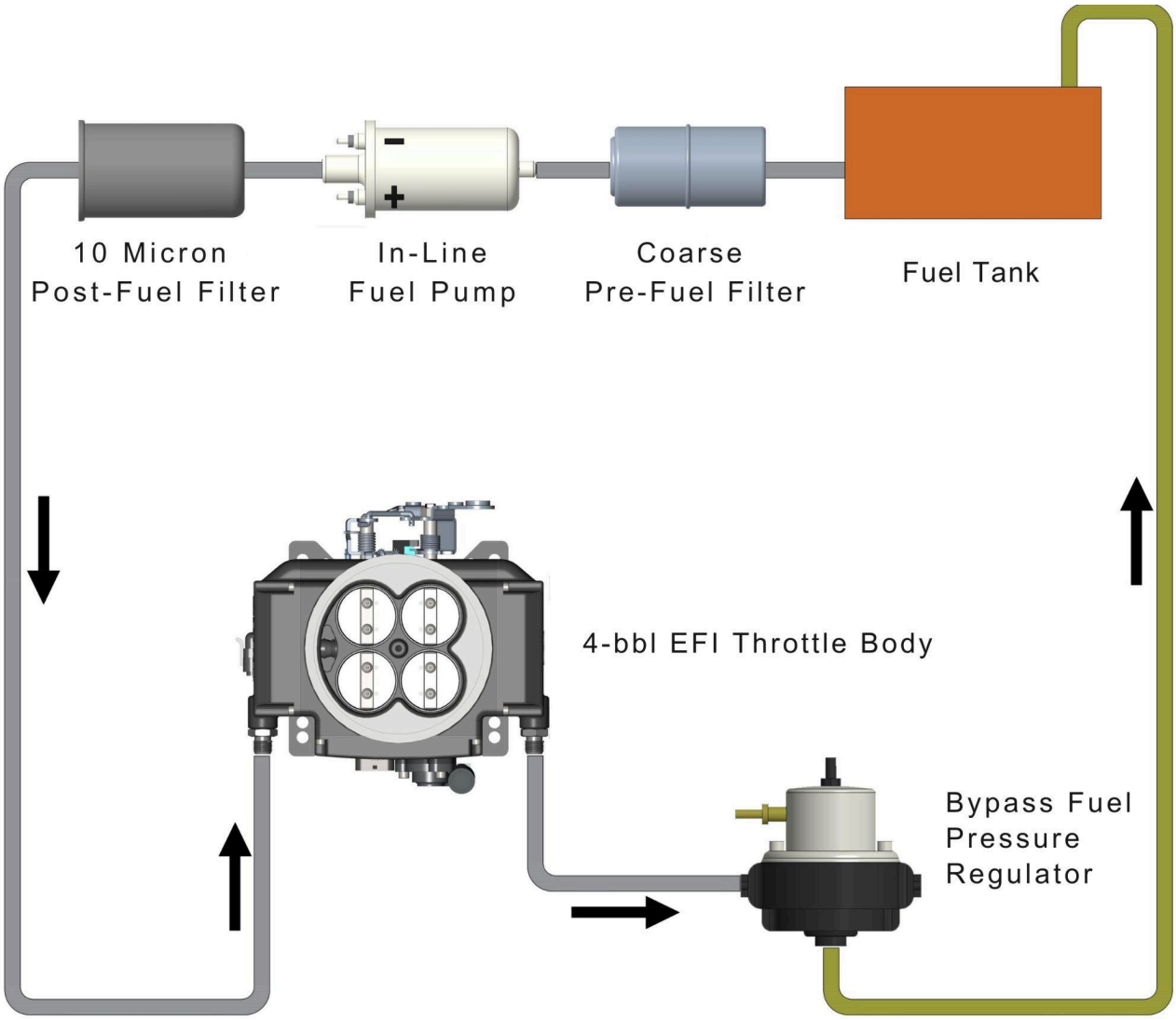
WARNING! Make sure you flush out all of your fuel lines before connecting them or assembling the fuel system. Failure to do so commonly results in debris traveling to the throttle body and clogging the injector(s).

WARNING! Ensure that both fuel filters are installed in the correct direction. Each filter has a flow direction arrow printed on its side. Installing filters incorrectly will result in system malfunction.

WARNING! Some late-model vehicles originally equipped with a throttle body injection system may already have a fuel return line to the tank that can be utilized. However, the return line must not create a pressure restriction. The fuel pressure in the return line should generally not exceed 3-5 PSI. Using a line that is too small or has restrictions may cause tuning issues.

DANGER! Do not use vapor canister lines as a fuel return line. This can lead to fuel leaks, fire, or explosion, potentially resulting in serious injury or death.

DANGER! Proper installation of a fuel return line, if required, may necessitate complete removal of the fuel tank. This task should only be performed by a fuel tank specialist familiar with the safety regulations and precautions necessary for this type of work. If an unqualified person attempts this procedure, an explosion could occur, causing serious injury or death.



4.0 Sensor Installation

IMPORTANT! Before beginning installation, ensure your vehicle is positioned on a stable and level surface. Use only properly rated jacks and jack stands to lift and support the vehicle. Never work under a vehicle supported solely by a floor jack or bumper jack. If available, a two-post underarm lift or a four-post drive-on lift will significantly reduce installation time and effort. Ensure lift locks are engaged before working under the vehicle.

WARNING! Failure to disconnect the AIR pump or improperly positioning the oxygen sensor downstream from AIR injection will result in an extremely rich fuel mixture. This can cause drivability issues and severe engine damage. If you choose to disconnect the AIR pump, check local regulations to ensure compliance with emissions laws in your area.

4.1 Oxygen Sensor Installation Steps:

1) Identify an appropriate mounting position for the oxygen sensor as close to the engine as possible. The sensor should be placed where it can read an average of all cylinders in one bank, typically just after the cylinders merge. For long tube headers, mount the sensor 6”-10” after the collector. Ensure at least 18” of exhaust pipe extends beyond the sensor. If your vehicle has catalytic converters, the oxygen sensor must be placed between the engine and the catalytic converters.

2) Position the sensor at the recommended angle (refer to the diagram) to help prevent condensation from entering the sensor through the exhaust tubing. The sensor can be mounted on either side of the exhaust pipe.

3) Drill a 7/8” hole at the selected location. Then, either:

- Weld the included sensor bung into the hole, ensuring a full weld around the bung for a leak-proof connection.
- Use a clamp-on bung system as an alternative (available for purchase).

Allow the weld to cool completely before proceeding. Once cool, install the oxygen sensor into the bung and tighten securely. Apply anti-seize to the sensor threads to aid in future removal, but avoid contact with the sensor tip.

Additional Considerations:

- The sensor should be installed in or after the collector, as this allows the ECU to take an average reading across all cylinders in a bank rather than from a single cylinder.
- The sensor should not be installed near the open end of the exhaust system. At low engine speeds, free air can enter the exhaust and cause inaccurate readings.
- Ensure there are no exhaust leaks, as any unmetered air reaching the sensor will cause false lean readings. The ECU will compensate by adding unnecessary fuel, leading to poor performance.

NOTE: Never run the engine with the oxygen sensor installed if it is not plugged in and powered by the ECU, as this can damage the sensor. If you need to temporarily plug the hole, use an O2 sensor plug or a spark plug with an 18mm thread.

4.2 Coolant Temperature Sensor Installation

Install the coolant temperature sensor into a 3/8” NPT coolant passage located in either the intake manifold or cylinder head. Be careful not to overtighten, as this could damage the cylinder head or intake.

Before installation, it is recommended to drain some coolant to prevent spillage. Apply thread sealer or a small amount of thread tape to the sensor threads to ensure a proper seal.

IMPORTANT: Do not install the sensor in the thermostat housing or any location that does not experience a constant flow of coolant, as this will lead to inaccurate temperature readings.

Coolant Temperature Sensor

5.0 Boost Reference Port

(For Roots style supercharger only)

Installation Steps:

1) Turn the throttle body upside down. Apply a small drop of Loctite to the plug and install it into the threaded orifice located next to the throttle blades.

2) Identify the boost reference port on the throttle body. This port is positioned at the lower right corner, on the same side as the throttle cable linkage. Remove the existing plug.

3) Install a 1/16” pipe-to-hose fitting into the boost reference port.

The boost reference port on the throttle body should be connected below the supercharger, directly off the manifold. Alternatively, it can be split off from the boost gauge reference line if necessary.

6.0 ECU Mounting and Wiring Overview

The Killshot ECU can be mounted either inside the passenger compartment (preferred location) or in the engine compartment. If installing in the engine compartment, follow these guidelines:

- Choose a mounting location as far away as possible from exhaust manifolds or headers to prevent heat damage.
- Keep the ECU away from spark plug wires, CD ignition boxes, or other electrically noisy devices to prevent interference.

An EFI system relies on a clean and stable voltage source for proper operation. Equally important are the grounding connections, which must be correctly installed to ensure consistent performance.

6.1 Wiring Guidelines:

- The Killshot ECU contains multiple processing units that require a clean power and ground source. The wiring harness must be routed to avoid exposure to dirty power or ground sources.
- Keep sensor wiring separate from high-voltage or “noisy/dirty” components, especially:
    - Secondary ignition wiring (e.g., spark plug wires).
    - Ignition boxes and their associated wiring.
- Ensure that spark plug wires do not come into direct contact with EFI wiring.
- Never bundle or loom EFI sensor wiring together with high-voltage or “noisy/dirty” wiring in parallel. If crossing is necessary, wires should intersect at an angle rather than running alongside each other.

6.2 Power and Grounding:

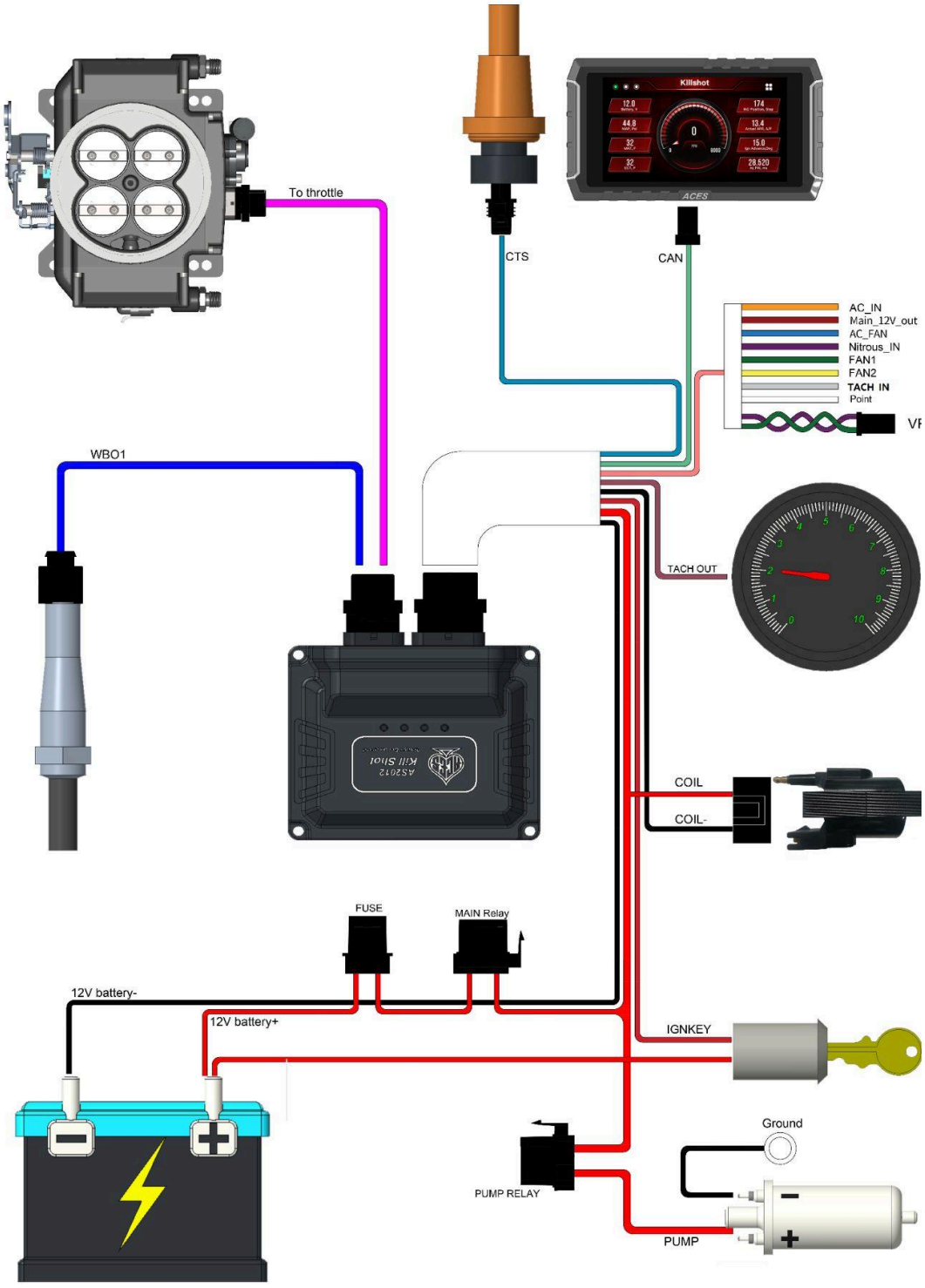
- The main power and ground connections must be made directly to the positive and negative battery terminals—not to any other connection points.
- Ensure the engine has a proper ground to both the battery and chassis.

- All wire connections should be properly crimped and soldered, with quality heat shrink applied over the joints for protection.
- Avoid using T-taps or similar connectors—use proper crimp connectors, solder, and heat shrink for all connections.

Additional Wiring Precautions:

- Do not use the electric fan outputs to power the fans directly. These outputs should only serve as a trigger source for a properly sized relay that matches the fan(s) being used.
- Never splice or share signal wires (such as the Throttle Position Sensor (TPS) signal) between different electronic control units (e.g., "piggyback" systems). This can cause erratic behavior and unreliable sensor readings.

6.3 ECU Wiring Overview



7.0 Wiring Installation

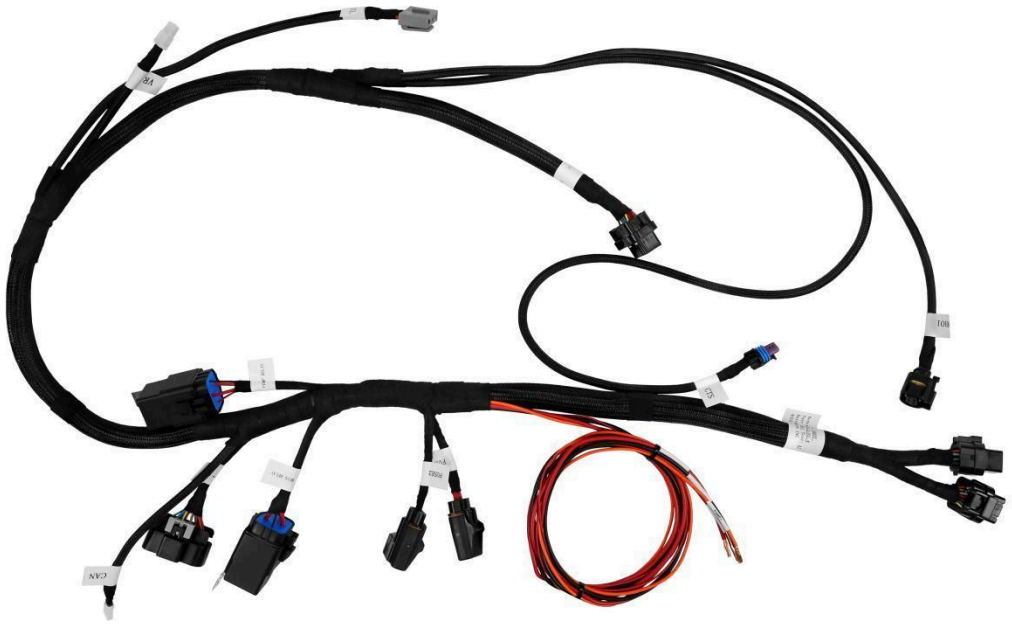
7.1 Harness Routing

If the ECU is mounted inside the interior, the wiring harness must be routed through the firewall into the engine compartment. If no existing access point is available, use a 2” hole saw to create an opening in a suitable location. Install the included 2” grommet to seal the opening and protect the harness.

If the ECU is mounted in the engine compartment, the handheld tuning module cable must be routed to the “CAN” connector on the main harness, located near the ECU’s main connector. To access the handheld module after startup, route the small CAN connector through the firewall to a convenient location.

Connect the PIA and PIB connectors of the main harness to the ECU.

Approximately 22” from the ECU main connectors, a 40A relay is present. This relay powers the fuel injectors and the wideband O_2 sensor heater. Additionally, a fuel pump relay is included to control the fuel pump.



7.2 Sensor Connection

Connect the following components to their dedicated sensors and connectors as shown in the wiring diagram:

- Bulkhead connector

- Coolant Temperature Sensor (CTS)
- Wideband O_2 Sensor (WBO2)
- CAN connector
- Throttle body connector (PIC)

The PIC throttle body connector integrates wiring for the injectors, TMAP, TPS, and IAC. Plug this PIC connector into the corresponding throttle body port.

If using Killshot ignition control, connect the distributor coil connectors accordingly.

Throttle Body Connector

7.3 Ignition Coil (With Timing Control)

The Killshot ECU features a built-in ignition coil driver utilizing a high-performance IGBT chip. Aces recommends using the Blackjack Pro Series Ignition Coil (PN AC2008), which delivers 90mJ of spark energy with a 3ms dwell time—all without requiring a CDI box. This setup enhances cold starts, idle stability, and fuel economy.

If the harness and ECU are configured for timing control, connect the coil connector to the AC2008 ignition coil.

NOTE: Canister style coils are not recommended as some will not work with timing control.

Ignition Coil Connector

7.4 Loose Wires

The following loose wires in the main wiring harness must be connected as specified for all systems:

IGNSW (Red): Connect to a clean key-on/cranking +12V power source that is active when the ignition is on. Verify with a voltmeter that this source also provides power when the engine is cranking, as some sources do not.

- Located approximately 20” from the ECU connectors.
- DO NOT connect to a "dirty" source like an ignition coil.

12V Battery + (Red): Must be connected directly to the positive battery terminal. This wire supplies power to the fuel pump and injectors and is protected by a 20A fuse in a sealed fuse holder.

- The fuse holder is located about 8” from the ECU connector, with the fuse pre-installed.

Ground (Black): Must be connected directly to the negative battery terminal.

- Using a chassis ground is not recommended as it can cause electrical issues.
- Located approximately 20” from the ECU connectors.

FUEL_Pump (Orange): Provides +12V output to activate a fuel pump.

- Do not use this wire to power pumps that require more than 15A. Instead, use it to trigger a separate relay for high-current pumps and use a 10-gauge wire for the fuel pump’s power feed.
- Ensure the fuel pump has a proper ground connection by running a wire from the negative fuel pump terminal to a solid chassis/frame ground.

7.5 Additional Wires

The following additional wire outputs should be connected as required. These wires are found approximately 23” from the ECU connectors unless otherwise specified.

Tach Out (Brown): Provides a 12V square-wave output for triggering a conventional tachometer.

Tach_In (Gray): Accepts a tach signal from an ignition box or other sources such as a coil negative terminal (Coil-). Required if the ECU is not controlling ignition timing.

Fan1 (Green): Provides a ground output to trigger a relay for a cooling fan.

- DO NOT connect directly to the fan—this wire should control a relay that powers the fan.
- Located approximately 32” from the ECU connectors.

Fan2 (Yellow): Provides a ground output to trigger a relay for a second cooling fan.

- DO NOT connect directly to the fan—this wire should control a relay that powers the fan.
- Located approximately 32” from the ECU connectors.

Main_12V_Out (Red): Provides a 12V power supply from the main relay.

- Located approximately 32” from the ECU connectors.

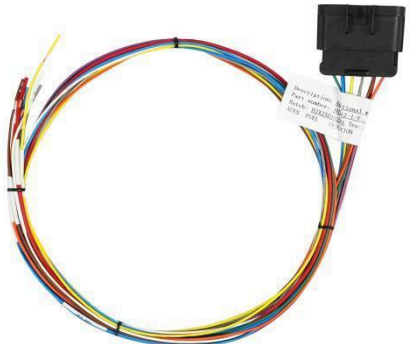
Nitrous_In (Blue): Activates the nitrous oxide system when supplied with 12V power.

Fuel Level (Red): This is a fuel level sensor input with a resistance range of 0-250 ohms or 250-0 ohms, which corresponds to the fuel level percentage in the tank. The sensor operates by measuring the resistance change as the fuel level fluctuates, allowing the system to interpret and display the corresponding fuel percentage.

AC_IN (Orange): This is a 12V input that detects when the air conditioning (AC) system has been activated.

AC_FAN (Blue): This is the air-conditioning fan output, which signals the cooling fan to engage when the AC system is in operation.

Sensor_Ground (Black): Serves as the ground connection for sensors.



7.6 Handheld Controller

The Handheld Controller is used to create the initial calibration, make simple tuning adjustments, and monitor real-time EFI system data. It is recommended to install the controller inside the passenger compartment for easy access.

The handheld device connects directly to the main harness via the “CAN” connector, which is located approximately 23” from the ECU connector.

Once the vehicle is properly set up and running, the handheld controller does not need to remain connected to the system. It can be disconnected and stored when not in use.

For detailed operation instructions, refer to the Handheld Controller section.

7.7 Ignition Wiring - No Timing Control

In a “no timing control” setup, the vehicle may be using an older mechanical points distributor or a more modern ignition system for carbureted engines. In this configuration, another component—such as the distributor or an ignition module—determines when the coil fires. The Killshot ECU needs to receive an RPM signal each time the coil fires to accurately determine engine speed.

- If a CD ignition box is used, the Killshot ECU will receive its RPM signal from the ignition box’s “Tach Out” connection.

- If a traditional dwell-controlled inductive coil ignition system is used (without a CD ignition box), the Killshot ECU will get its RPM signal through the RPM Module, connecting to the negative side of the coil.

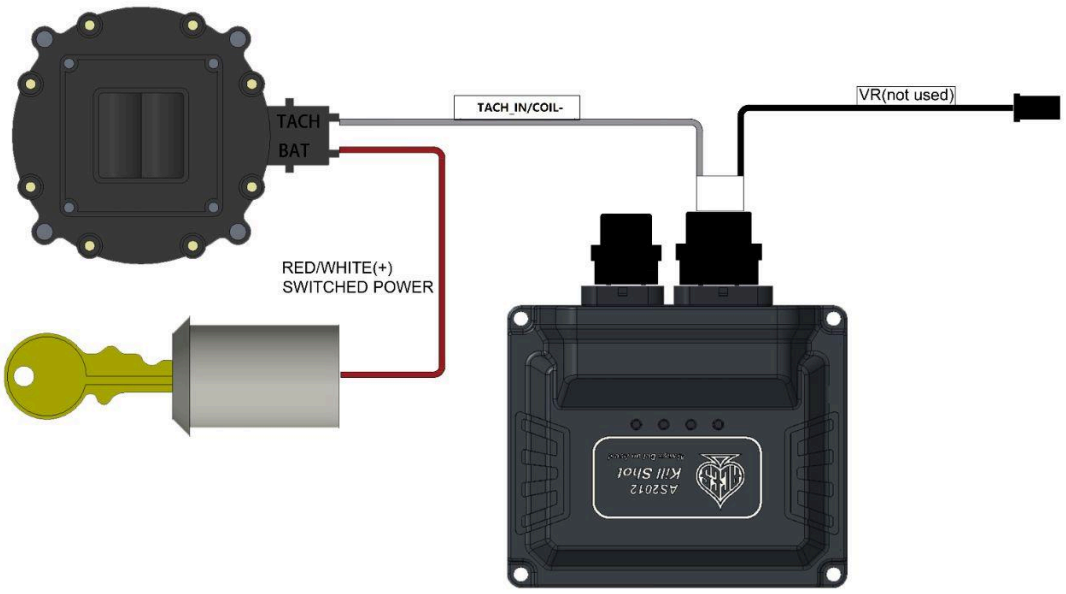
7.8 “Tach_In” Connection

Option 1: Direct Tach_In Connection
The “Tach_In” wire in the Killshot harness receives its RPM signal from another module, such as a CDI box, ignition coil, or another ignition module, and transmits it to the ECU.

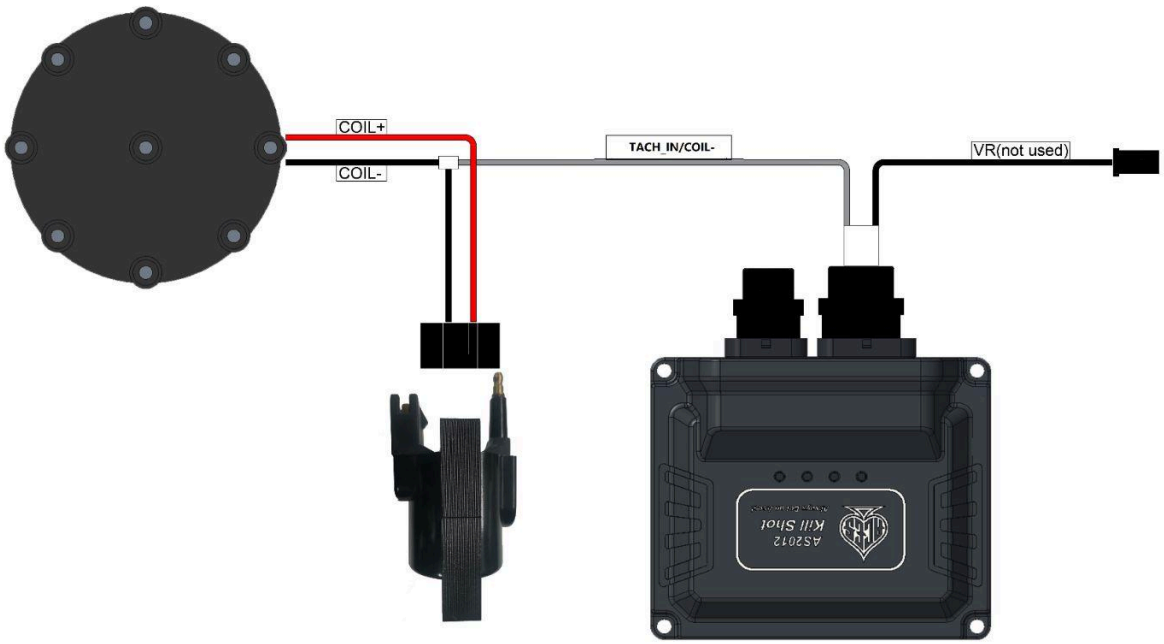
NOTE: When using this input, the EFI will not control the ignition timing. Timing will be managed by the distributor’s initial timing, mechanical advance, and vacuum advance, just as it would with a carburetor.

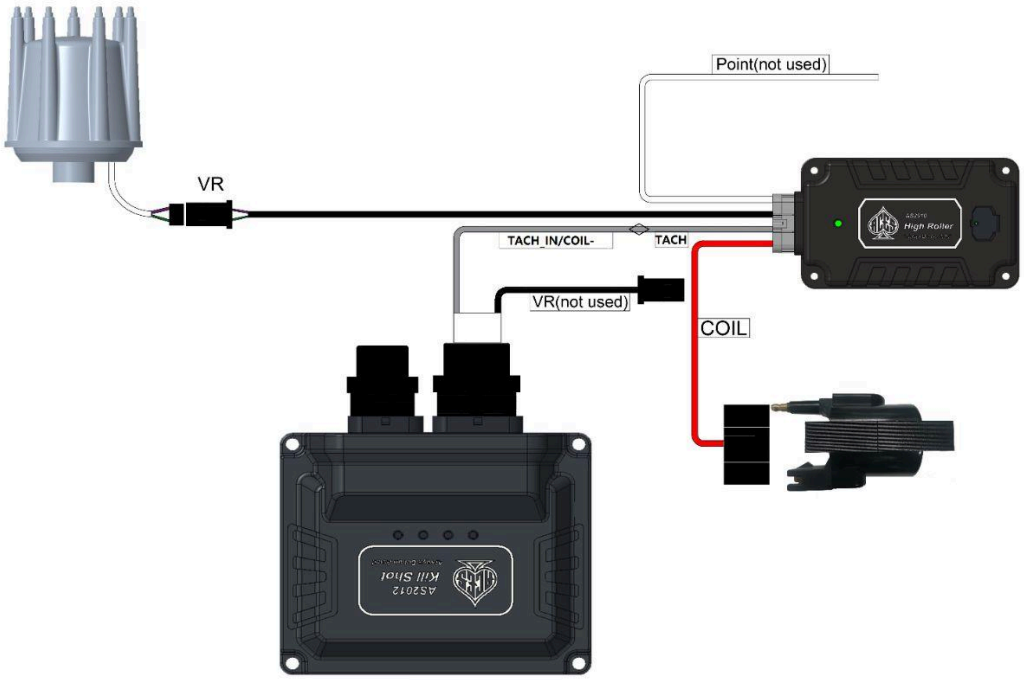
Option 2: Aftermarket Capacitive Discharge (CD) Ignition System
If using an aftermarket CD ignition system (such as Aces High Roller, MSD, or similar systems), the RPM signal must be connected from the “Tach Out” terminal of the ignition system to the “Tach_In” wire of the Killshot ECU. This provides a 12V square-wave signal to the ECU.

NOTE: When using this input, the EFI will not control the ignition timing. The distributor’s initial timing, mechanical advance, and vacuum advance will determine ignition timing, just as with a carburetor setup.

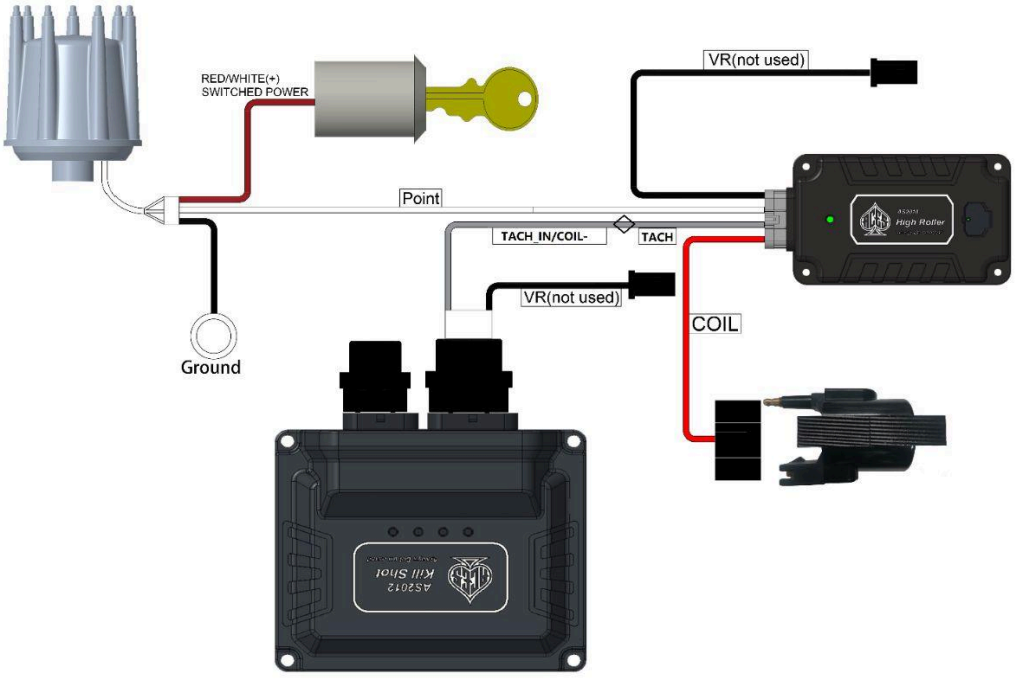

TACH
BAT
TACH_IN/COIL-
VR(not used)
RED/WHITE(+)
SWITCHED POWER

OR


COIL+
COIL-
TACH_IN/COIL-
VR(not used)


Point(not used)
VR
TACH_IN/COIL-
TACH
VR(not used)
COIL

OR


RED/WHITE(+)
SWITCHED POWER
VR(not used)
Point
TACH_IN/COIL-
TACH
VR(not used)
COIL
Ground

8.0 Ignition Wiring for Timing Control

The Killshot EFI system can control ignition timing when used with most common magnetic pickup distributors, such as the Aces Blackjack series or MSD distributors. However, some modifications to the distributor are necessary to ensure proper function.
One critical step is to lock out the distributor's advance mechanism. Failure to do so can result in poor engine performance or even severe engine damage.

8.1 Required Components for Timing Control:

- A locked-out distributor
- A timing light
- (Recommended) An Aces Blackjack Pro Series Billet Distributor with a 2-pin magnetic pickup connector
- A degreed harmonic balancer with a 15-degree BTDC (Before Top Dead Center) mark

8.2 Distributor Lockout and Installation Procedure:

1. Lock out the distributor's centrifugal advance. The distributor must be physically locked to prevent any changes in the relationship between the pickup and paddle wheel due to engine speed or load. Follow the distributor manufacturer’s instructions for the proper lockout procedure.
   (This is a critical step. Do not skip it.)
2. Rotate the engine to 15 degrees Before Top Dead Center (BTDC).
3. Insert the distributor into the engine, but do not tighten it down yet.
4. Rotate the distributor body so that the pickup aligns with the nearest paddle on the paddle wheel. Ensure the paddle is as centered as possible.
   - Later in the installation, the Handheld Controller can be used to fine-tune this alignment if needed.
5. Secure the distributor by clamping it down.
6. Install the distributor cap and mark the center of the #1 terminal on the distributor body for reference.

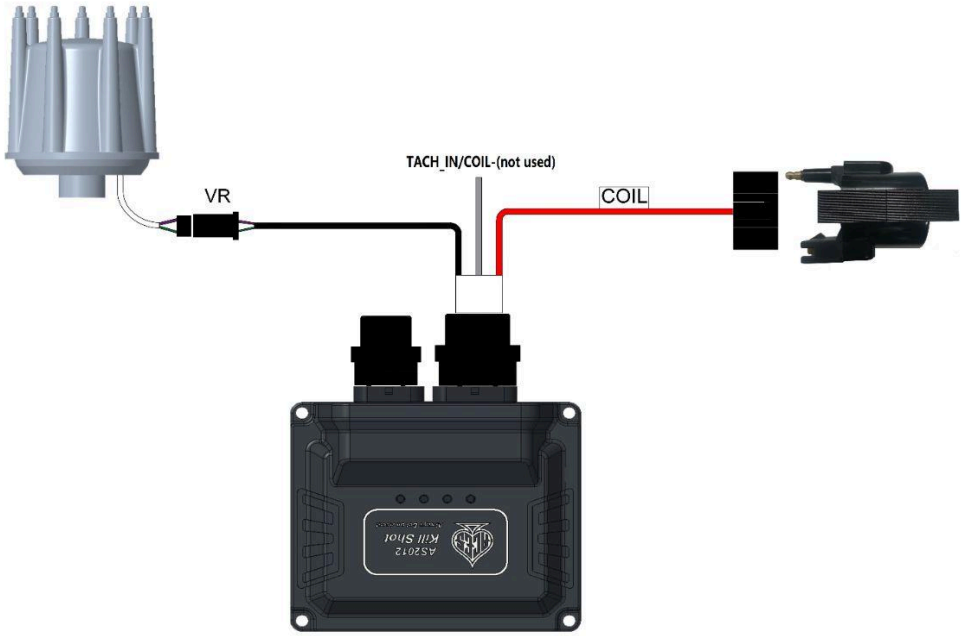
8.3 Direct Drive Coil

The Killshot ECU features a built-in ignition coil driver utilizing a high-performance IGBT chip. Aces recommends using the Blackjack Pro Series Ignition Coil (SKU AC2008) to achieve:

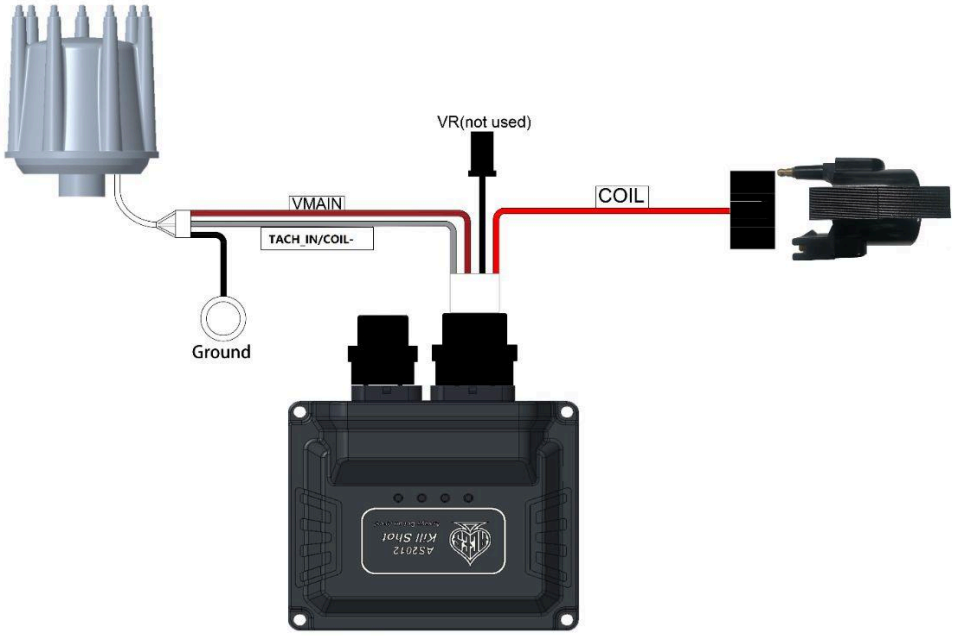
- 90mJ of spark energy
- 3ms dwell time
- Improved cold starts, stable idling, and enhanced fuel economy

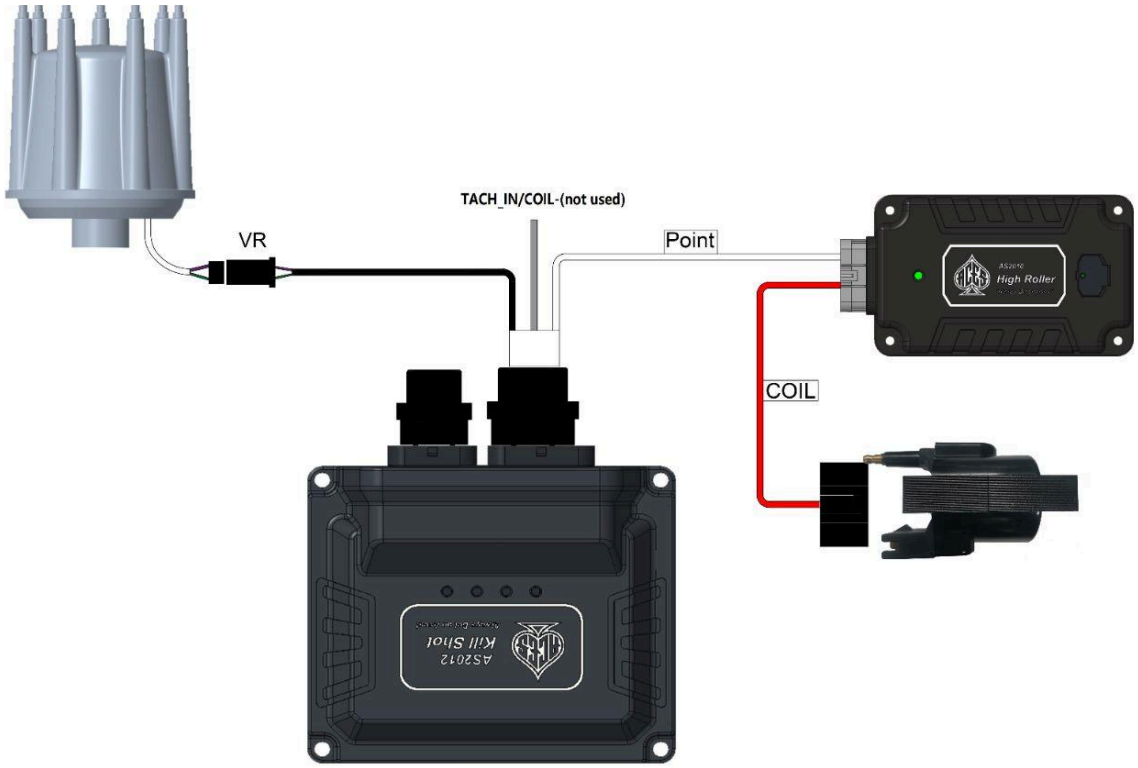
This setup eliminates the need for a CDI box while maintaining strong ignition performance.

The "Point" wire provides an ignition signal from the Killshot ECU to an external module, such as the Aces High Roller CDI box.

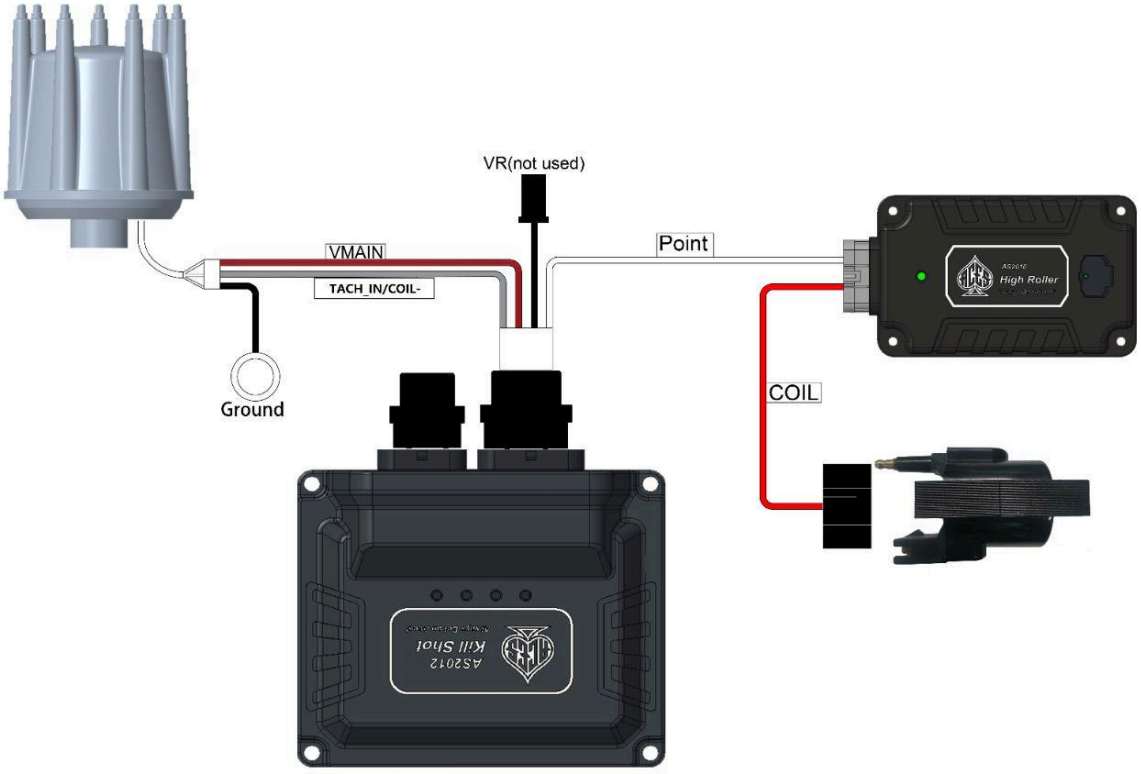

TACH_IN/COIL-(not used)
VR
COIL

OR


VR(not used)
VMAIN
TACH_IN/COIL-
COIL
Ground


TACH_IN/COIL-(not used)
VR
Point
COIL
High Roller
Kill Shot
AS2012

OR


VR(not used)
VMAIN
TACH_IN/COIL-
Point
Ground
COIL
High Roller
Kill Shot
AS2012

9.0 Handheld Controller Navigation and Use

The Aces 5” HD Handheld Programmer is a high-performance tuning and monitoring device designed for seamless ECU interaction. It features a 5” high-resolution (1280x720) HD capacitive touchscreen with an LCD display that provides a vivid, high-contrast interface for easy readability. Powered by a 64-bit RISC-V processor with a 600MHz clock speed, the handheld ensures fast and efficient operation with advanced graphics acceleration for smooth animations, transitions, and real-time data processing.

The handheld communicates with the ECU via CAN bus and includes a Type-C USB interface for programming and other operations. Users can navigate all functions through touchscreen controls or manual buttons, providing flexibility in operation. The built-in DDR controller enhances real-time data handling, while the MIPI display interface ensures high-speed data transmission for clear visuals.

After connecting to the ECU, the handheld enables monitoring and calibration of key system parameters, including:

- Idle speed adjustments
- AFR (Air-Fuel Ratio) targets
- Fuel pump settings

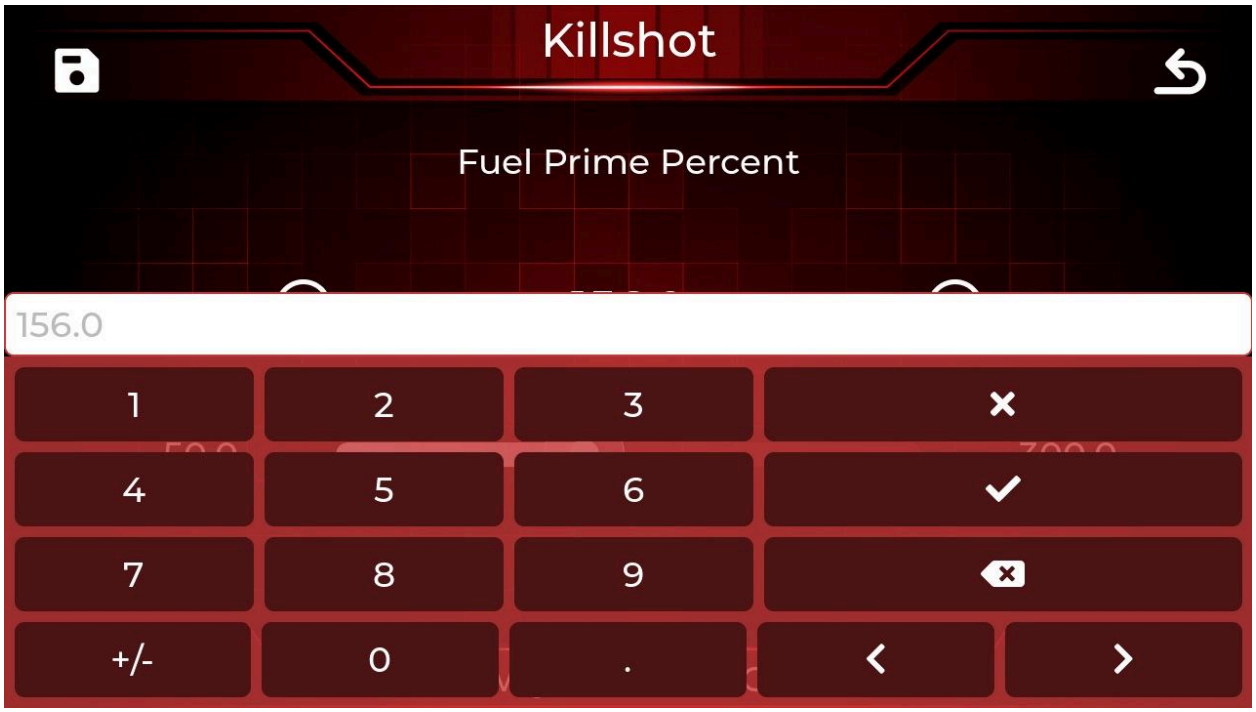
Additionally, the handheld incorporates a GPS speedometer, allowing users to track speed without the need for additional hardware. Its efficient and lightweight software architecture is optimized for high-performance graphics, making it suitable for resource-limited embedded systems. The device is portable and designed for real-time tuning and adjustments, making it a practical tool for both enthusiasts and professionals seeking precise engine control.

9.1 Making Adjustments

Slider Bar: Adjust parameters by either sliding the bar or clicking the “+” and “-” buttons.

- Click “ ” (Save) to confirm the adjustment.
- Click “ ” (Cancel) to discard changes.

Numeric Keyboard: Tap the edit box (e.g., "156.0%") located above the slider bar to open the numeric keyboard for manual input.



2D Graph: Adjust parameters by dragging the red dot on the graph or using the mechanical buttons on either side.

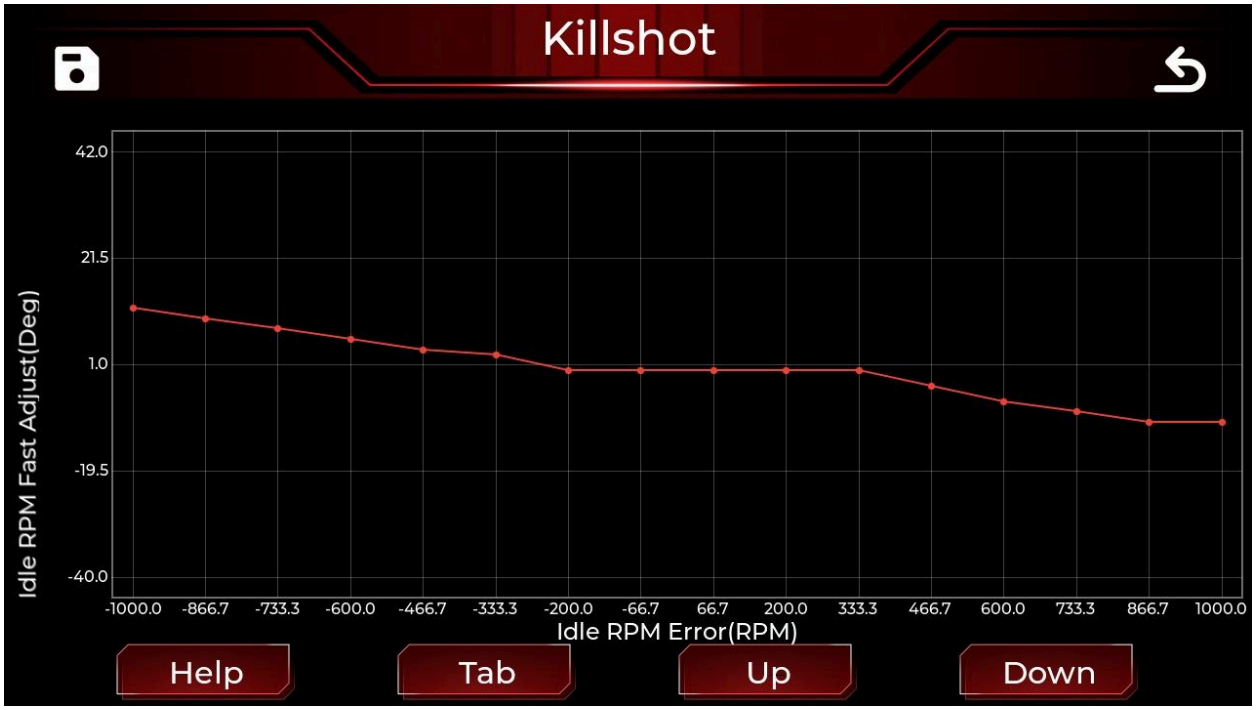
- While making adjustments, the y-axis coordinate value of the currently selected parameter is displayed in the upper right corner of the screen.
- The four side buttons will disappear after a short display period.

Additional Adjustments:

- Click the two mechanical buttons in the lower-left corner to switch the position of the green dot.
- Click the right-center button to raise the green dot.
- Click the lower-right button to lower the yellow dot.
- The y-axis coordinate value of the green dot is displayed in the upper right corner of the screen.

Once the configuration is complete:

- Click “ ” (Save) to confirm the adjustment.
- Click “ ” (Cancel) to discard changes.



Connection

The handheld controller connects to the ECU via the CAN bus. Firmware and program updates can be performed using the Type-C USB interface.

Main Menu

The Main Menu consists of six (6) selections:

1. **Monitor**: Displays a variety of gauge and dashboard layouts for real-time data monitoring.

2. **Tuning**: Allows easy adjustment of various engine parameters.

3. **Logging**: Enables users to select specific data points for logging, allowing better observation of ECU performance.

4. **Files**: Used for saving and loading tuning calibrations. Also provides system information about the ECU and handheld controller.

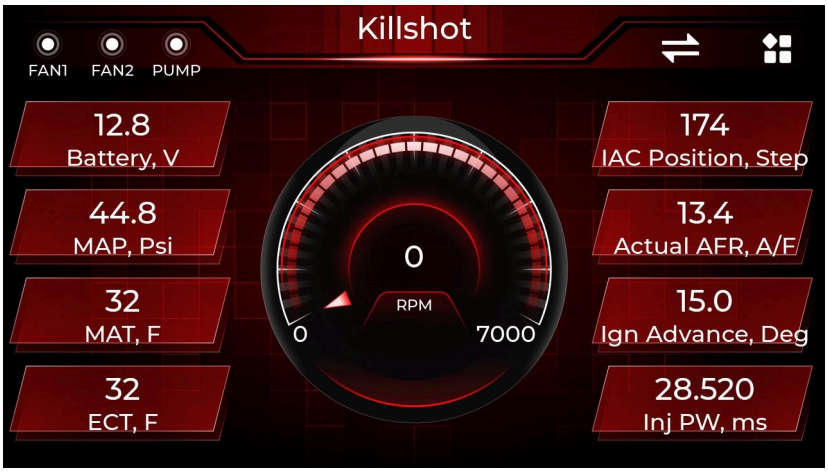
5. **Settings**: Adjusts the backlight brightness, button/touchscreen volume, and displays handheld device information.
   \
6. **Wizards**: Assists with creating a base calibration and performing the TPS Zero Learn function.

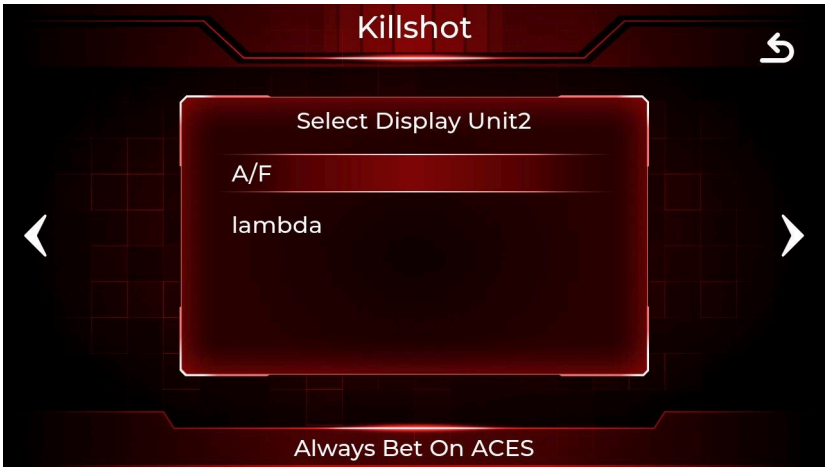
The Killshot EFI system will generate a custom calibration for your engine based on a few simple questions. To begin, select the Wizards icon from the Main Menu.

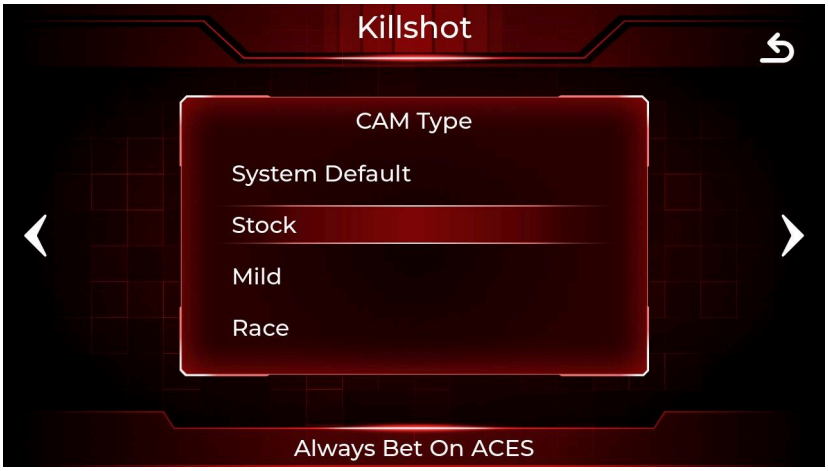
10.0 Running the Calibration (Startup Wizard)& TPS Wizard

The Calibration Wizard and TPS Wizard must be completed prior to starting the engine in order for the system to build a base tune.

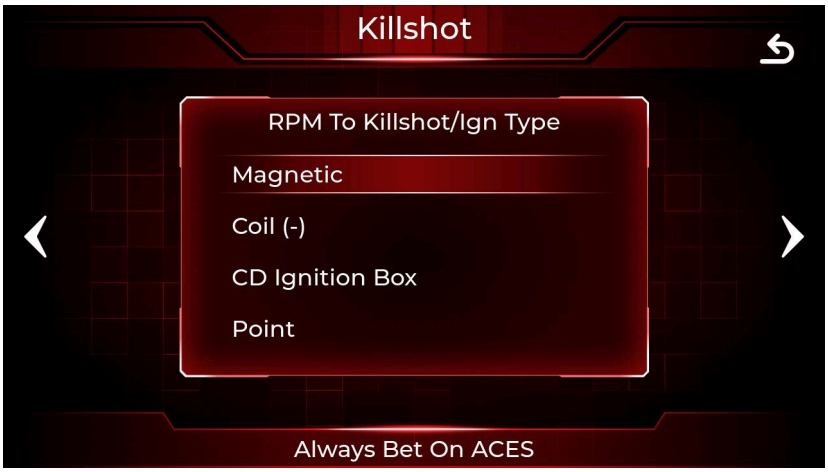
Follow the steps below to start and complete the Calibration Wizard.

	**Select System** Connect the handheld to the wire harness and power up the ECU. Select Killshot
	**Home Screen** Click the “ ” icon in the upper right corner to enter the Main Menu.
	**Main Menu** Click on “Wizards.”

	**Wizards** Click “Start Wizard” to begin initial configuration and set base parameters.
	**Select Display Unit1** Choose to view parameters in either Imperial Units or Metric Units. (e.g. PSI vs. kPa)
	**Select Display Unit2** Choose to view parameters in either AFR values or in Lambda values.

	**Throttle Body Type** Choose “Killshot” for your Killshot II.
	**Camshaft Type** Select your camshaft type: **Stock**: This selection will work well on most applications equipped with stock or “street performance” camshafts. **Mild**: Used for mild profile camshafts. i.e. about 7 PSI vacuum or about 50 KPA **Race**: Rarely used option for very aggressive engine builds. Press “ ” to continue.
	**Dual WBO2 Option** The Killshot only needs one WBO2 sensor and is preselected for you, just click “Only WBOS1” to confirm. Press “ ” to continue.

<table>
<tr>
<td> 
</td>
<td>Force TPS Zero Learn

With your foot off of the pedal, select yes and then press “ ” to continue.</td>
</tr>
<tr>
<td> 
</td>
<td>RPM to Killshot/Ign Type

Select your ignition strategy:

Magnetic: Used for ECU controlled timing with a locked out distributor.

Coil (-): Used with canister coil HEI distributors (no timing control).

CD Ignition Box: Used when running a CDI box (with or without timing control).

Point: Used when running points style ignition.

Press “ ” to continue.</td>
</tr>
<tr>
<td> 
</td>
<td>Number of Injectors

Select “4” for your killshot.

Press “ ” to continue.</td>
</tr>
</table>

<table>
<tr>
<td> 
</td>
<td>Injector Flow Rate

The Killshot II Injectors are rated at 100 lb/hr. You can scroll or click the box to manually enter “100”.

Press “ ” to continue.</td>
</tr>
<tr>
<td> 
</td>
<td>Engine Displacement

Use the slider bar or click on the box to manually enter the total cubic inches of your engine. You can also click “To Metric Units” to input the displacement in liters.

Press “ ” to continue.</td>
</tr>
<tr>
<td> 
</td>
<td>Hot Idle Speed

Use the slider bar or click on the box to manually enter your hot idle speed. This is the target RPM that will be enabled once coolant temperatures are above 160º F.

Press “ ” to continue.</td>
</tr>
</table>

	**Confirm Details** After reviewing all of the details entered in the previous steps, click on " ✓ " to save the configuration to the ECU or click " ✓ " to return to the wizard to modify the configuration. Press " ↩ " if you wish to cancel all changes and return to the main menu.
	Select "Yes" to save the settings or select "Cancel" to go back.
	Click "OK" and turn the ignition off for 5 seconds before turning back on to save the calibration.

11.0 Sensor Verification

IMPORTANT: If any of these sensors do not read properly, DO NOT attempt to start the engine.

Before starting the vehicle, verify that all sensors are reading correctly.

- Turn the key off, then cycle it back on.
- Listen for the fuel pump, which should activate and run for approximately 5 seconds.
- Inspect for any fuel leaks before proceeding.

11.1 Sensor Readings on the Home Screen (Key ON, Engine OFF):

- **Engine RPM**: Should display “0” (RPM will be detected once the engine is cranking or running).
- **MAP** (Manifold Air Pressure Sensor): Should read between 95-102 kPa or 13-14 PSI. At higher elevations, it may read as low as 75 kPa or 10-11.
- **TPS** (Throttle Position Sensor)
    - Slowly press the throttle to wide open; it should read 85-90 at wide-open throttle (WOT).
    - Cable-operated throttle bodies should read 0 when closed.
- **CTS** (Coolant Temperature Sensor): Displays engine temperature. If the engine is cold, it should be close to ambient temperature.
- **Battery Voltage**: Should read 12.0V minimum.

12.0 Startup Engine

At this stage, you are ready to start the engine. Before attempting to start your vehicle with the newly installed Killshot EFI system, Aces recommends following this checklist to ensure a safe and successful startup.

12.1 Pre-Startup Checklist:

1. Double-check all wiring connections, especially:
    - Power and ground are directly connected to the battery.
    - The small Red “IGNSW” wire from the Killshot ECU has power during both Key-On and Cranking.
2. Ensure that the Killshot ECU, fuel pump, fuel lines, and wiring are securely mounted away from heat sources and pinch points.
3. Wideband Oxygen Sensor is installed in the proper location.
4. Check for exhaust leaks—there should be none.
5. Throttle linkage is fully connected and operational from the pedal.
6. Handheld controller powers on when the key is turned to the ON position.
7. The Startup Wizard has been completed on the handheld controller.
8. Fuel pump primes when the key is in the ON position.

9. No fuel leaks are present when the system is under pressure.

12.2 Starting the Engine

When ready, turn the key to the ON position and observe the Handheld Dash to confirm that the Killshot ECU is receiving an RPM signal.

- Crank the engine and check the RPM parameter on the handheld display.
- If the ECU is functioning correctly, the RPM value should register, and the engine should fire, run, and settle into an idle.
- A cold engine may initially idle at a higher RPM (approximately 1200-1500 RPM), depending on engine temperature.

Troubleshooting:

- If the RPM signal is missing, there is likely an error in wiring or system setup.
- For assistance, contact Aces Fuel Injection support at (423) 590-ACES (2237).

13.0 After Startup

Once the vehicle has started, inspect for any fuel or coolant leaks. Allow the vehicle to warm up while checking the following parameters to ensure proper operation:

Key System Parameters to Monitor:

- **Fuel Loop State:**
  - Indicates whether the engine is running in Closed Loop or Open Loop mode.
  - Closed Loop means the ECU is adjusting fuel delivery to maintain the target air/fuel ratio (AFR).
  - The Killshot EFI system is designed to operate in Closed Loop most of the time.
- **Inj Percent (Injector Compensation Percentage):**
  - Shows the percentage of fuel adjustment the ECU is making.
  - Below 100% → ECU is removing fuel.
  - Above 100% → ECU is adding fuel.
  - In Open Loop mode, this value will always remain at 100%.
- **Inj PW (Injector Pulse Width):**
  - Displays the injector pulse width (how long the injectors remain open).
  - Varies depending on engine speed and load.
- **Target Air/Fuel Ratio (AFR):**
  - The desired AFR that the ECU is programmed to maintain.
  - This will change based on engine speed and load.
- **Actual AFR (Air/Fuel Ratio):**
  - The real-time AFR reading from the wideband oxygen sensor.
  - The Closed Loop Compensation should be constantly adjusting fuel delivery to keep the Actual AFR close to the Target AFR.
- **Fuel Learn State (Self-Learning Status):**
  - Indicates the status of the Killshot "Self-Learning" function.

- The system will automatically adjust fuel delivery as you drive.
- Conditions for Self-Learning to Activate:
  - Engine temperature must exceed 160°F.
  - The system must be running in Closed Loop mode.
  - Self-learning must be enabled (this is enabled by default in the base Killshot setup).
- Once the engine reaches 160°F, self-learning should become active.

14.0 Timing Verification

Proper timing verification is essential for ensuring smooth engine operation and avoiding drivability issues. Follow the steps below based on whether timing control is enabled or disabled in your Killshot EFI system.

14.1 No Timing Control

If timing control is disabled, the ECU does not adjust ignition timing.

- Use a timing light to verify that the timing is set correctly for your engine.
- Adjust as necessary based on your engine specifications.
- Proper timing setup is crucial before driving with the Killshot EFI system, as incorrect timing can lead to drivability and idle issues.

14.2 Timing Control

If timing control is enabled, follow these steps to properly position the distributor and configure the ECU:

1. **Position the Distributor**
   - Turn the ignition key to ON to power up the Killshot system.
   - On the Handheld Controller, navigate to:
     Tuning >> Spark >> Basic >> Static Timing.
   - This screen allows you to set the distributor position for proper ECU-controlled timing operation.
2. **Set Initial Static Timing**
   - Start the engine.
   - Set the static timing to 15 degrees BTDC (Before Top Dead Center).
   - Navigate to Tuning >> Spark >> Advanced >> Lock Ignition Timing.
   - Select Lock, then Save.
   - Now, ignition timing is locked at 15 degrees BTDC.
   - Using a timing light, rotate the distributor until you see 15 degrees BTDC on the balancer.
   - Tighten the distributor hold-down clamp once correctly positioned.
3. **Enable ECU Timing Control**
   - Set Lock Ignition Timing to "Unlock".
   - Confirm static timing is set to 15 degrees BTDC.

- Return to the Home Screen—the Killshot ECU will now control ignition timing.

14.3 Idle Speed and Timing Adjustment

The Killshot ECU uses ignition timing adjustments in addition to the Idle Air Control (IAC) to maintain idle speed.

- The ECU can use advanced or retarded timing to help stabilize idle speed.
- Fast Adjust Mode: Uses timing adjustments to quickly respond to idle fluctuations.
- Slow Adjust Mode: Uses the IAC valve to control idle speed more gradually.

Note: When using a timing light, idle timing may not appear accurate due to ECU calculations. However, once the engine is revved above idle, the timing will appear correctly.

14.4 Adjust Timing Settings

- Navigate to Tuning >> Spark >> Basic.
- Here, you can adjust:
  - Idle timing
  - Cruise timing
  - WOT (Wide Open Throttle) timing
  - Cranking timing

14.5 Building a Timing Map

- For building a custom timing map, it is highly recommended to do so using the free Advanced Tuning Software available for download on Aces' website.
- The Handheld Controller's timing map is basic, but a custom map tailored to your engine will significantly improve performance.

14.6 Timing Offset Adjustment

- Use Timing Offset to sync timing at higher RPMs.
- By default, these values are set to 0 in the base calibration.
- Some ignition modules may require adjustments if the actual timing does not match the commanded timing as RPM increases.
- If timing starts to retard at higher RPM, increase the Timing Offset value to correct it.

15.0 Idle Setting

Once the engine has warmed up, you can adjust the idle speed to the desired level.

15.1 Adjusting Target Idle Speed:

1. Select the Tuning tab.
2. Locate the Target Hot Idle Speed setting.

3. Adjust the setting by moving the slider left or right.
4. Click the Save button to confirm the new value or select Cancel to exit without saving.

15.2 Setting the Throttle Plates for Optimal Idle Control

Regardless of whether you change the target idle speed, you must set the throttle plates on the throttle body correctly.

15.3 Checking IAC Position & TPS Calibration:

1. With the engine running, select the Monitor tab.
2. Locate the Idle Screen and check the following values:
    - IAC Position should be between 6 and 20 with the engine in neutral and at operating temperature.
    - TPS (Throttle Position Sensor) should read 0.
3. If TPS does not read 0, you must perform a TPS Zero Learn by selecting:
   Wizards > TPS Autoset.

15.4 Adjusting Throttle Shaft for Proper IAC Position

If the IAC Position is 0:

- The throttle plates are too far open, causing a higher idle speed than the target.
- Solution: Slowly turn the throttle shaft adjustment screw counterclockwise to close the throttle plates until the IAC Position reads between 6-20.

If the IAC Position is Greater Than 20:

- The throttle plates are too far closed, making the IAC work harder than needed.
- Solution: Slowly turn the throttle shaft adjustment screw clockwise to open the throttle plates until the IAC Position reads between 6-20.

If the TPS Position Goes Above 0 During Adjustment:

- The ECU exits idle mode, and the IAC Position locks to a fixed value.
- Solution: Shut the vehicle off, perform a TPS Zero Learn, then restart and continue adjusting.

Once all adjustments are complete, ensure that the TPS reads 0 with the engine idling.

16.0 Self-Learning

At this stage, the system is ready to self-learn and optimize fuel delivery.

16.1 How to Perform the Self-Learning Process:

- Drive the vehicle under varied operating conditions (different engine speeds and loads).
- Start in neutral by slowly revving the engine and holding it at different speeds up to 2500 RPM.

- Then, drive the vehicle, shifting through different gears to help the system learn across a wide range of conditions.
- If the vehicle has an automatic transmission, you can:
    - Put it in gear
    - Hold the brake pedal
    - Apply a small amount of throttle to help the system learn in that range.

16.2 Conditions Where Self-Learning Will NOT Occur:

Self-learning will not take place under the following conditions:

- If engine temperature is below 160°F
- During rapid accelerator pedal movement
- When the accelerator is released and the vehicle is coasting
- If learning is manually disabled in the system settings

16.3 Checking Self-Learning Status:

To verify if self-learning is active, follow these steps on the Handheld Controller:

1. Select “Monitor” from the Main Menu.
2. Choose “Monitors.”
3. Select the Fuel Inj PW icon.
4. The Fuel Learn Status will indicate whether self-learning is active.

Once the learning process is complete, you can drive and enjoy your Killshot EFI system.

Diagnostic LEDs

LED #	Title	Color	Purpose/Behavior
1	Power Indicator	Red	System power indicator
2	Engine Running Indicator	Blue	Engine running indicator. The blinking will become faster as RPM increases.
3	Main Relay Indicator	Red	This is the main relay indicator. When illuminated, the main relay is active and receiving power from the 12-volt key source.
4	Fuel Pump Indicator	Blue	This is the fuel pump relay indicator. When illuminated, the ECU is supplying 12 volts to the fuel pump wire.