AMP EFI ms3pro PLUG & PLAY

QUICKSTART GUIDE

FORD COYOTE PNP HARNESS

MS3PRO EVO+ HC

Version 1.01

Thank you for your purchase and your support of American-made products! We designed, built, tested in Georgia this harness to perform reliably in a wide range of applications—from a stock motor swap in a vintage muscle car to serious racing setups. If you have any questions regarding your installation, please contact us at support@ampefi.com

This Quick Start Guide outlines the installation process, basic configuration, and testing procedures, concluding with engine startup for the MS3Pro EVO+ HC ECU & Ford Coyote PNP Harness. For more detailed information, please refer to the MS3Pro EVO+ User Manual available on our downloads page at https://www.ampefi.com/downloads/

Parts Included:

- **Ford Coyote PNP Harness**
- **26-Pin Black Center Harness**
- **Coyote Accessories Kit**
  - **Harness – GM-Cable-Throttle, DBW-Throttle, IAT, Alternator**
  - **Connector - O2 Sensor, CanBus, Spare, Fuel / Flex**
- **MS3Pro EVO+ HC ECU**
- **M12 to DB9 Cable**
- **0-150 PSI Digital Oil Pressure Sensor**
- **1/4NPT to 1/8NPT Adapter**
- **GM Open Element IAT Sensor**
- **8’ MAP Sensor Hose**

Optional Items Available:

- **Wideband Controller & Sensor (Options)**
- **ECU Harness Power Bundle (ECU-HRN-PWRBund)**
- **Spare Wire Bundle (Coyote-Spare-WireBund)**
- **Flex Fuel Sensor Package (FFS-wPiggy-PKG)**
- **Fuel Pressure Sensor (LDM-0100PSI-w-Piggy)**
- **Electronic Boost Controller (EBC_Sol_kit)**

Tuning Software Registration

Every MS3Pro ECU purchase includes a **FULL** TunerStudio Registration. Your ECU package comes with a postcard with your ECU's serial number—this number is required to complete the registration process.

To register TunerStudio, scan the QR code or visit https://www.efianalytics.com/ms3pro/ Use the serial number provided, found in the red box at the bottom of the postcard or bottom of the ECU. The registration code is valid for the original purchaser and can be used on up to three devices (dash, computer, etc.). There's no limit on the number of ECUs you can use with the registered version of TunerStudio.

Installation of Tuning Software:

1. **Download the Software:**
   Visit www.TunerStudio.com and download the appropriate version for:
   - Windows
   - Mac
   - Linux

2. **Run the Installer:**
   Once the download is complete, run the Setup.exe file to install TunerStudio

Applications

This harness is specifically designed for the Ford Coyote family of engines. It features factory EV6 injector connectors, factory standard non-logic level coils, and is compatible with either drive-by-wire or GM cable-driven throttle bodies.

Engine Generation Compatibility:

- Early Ignition Coils (2011 - 2/24/16)
    - Generation 1 (2011-2014)
    - Generation 2 (2015-2/24/16)
- Late Ignition Coils (2/25/16 – 2023)
    - Generation 2 (2/25/16 – 2017)
    - Generation 3 (2018 to 2023)
        - **Direct Injection:** REQUIRES DI Pump Block-Off
        - **Crank Sensor:** REPLACE with a Gen 1 or 2 Sensor

Early Coils

Late Coils

Truck Engine Variant:

- **The Coyote PNP Harness is designed for the Mustang Coyote Engine**
    - Firing order: 1-5-4-8-6-3-7-2
- **If using a Truck Coyote Engines (F-150):**
    - **Gen 1 –** Firing order same as Mustang – **No Modification Required**
    - **Gen 2/3 –** Truck firing order: 1-3-7-2-6-5-4-8
        - REQUIRES repining of the harness to match the mustang firing order

Repin Chart

Swap the pins as indicated below (for example, connect Pin 2 to Pin 10 and Pin 10 to Pin 2)

ECU Blue Connector

Pin		Pin
2	⟷	10
4	⟷	11
6	⟷	12
13	⟷	15
16	⟷	26
24	⟷	25

Pre-Installation Directions

Before beginning your installation, please review the following important details:

- **Harness Lead Flexibility:**
  The Coyote PNP harness is designed with an extended lead that exits from the rear of the engine—unlike the factory setup. This design provides flexibility to install the MS3Pro ECU in the most convenient location for your vehicle's layout, such as behind the passenger side kick panel, under the passenger seat, or any other suitable location.
- **Power Connection Preparation:**
  Prior to installation, identify how you will make the necessary power connections with detailed installation instructions on Page 9. The harness includes the following tagged labeled wires:
    - **Ground:** Black 10 Gauge
    - **Coil Power:** Red 10 Gauge, fuse at 30A
    - **TCU Sol:** Red w/ White Stripe 16 Gauge, fuse at 10A
    - **ECU/TCU:** White w/ Red Stripe 14 Gauge, fuse at 20A
    - **Injector:** Red w/ White Stripe 14 Gauge, fuse at 20A
    - **Note:** Ensure that each power wire is properly fused, wiring has been upsized for voltage drop considerations
- **Suggested Tools:** Deutch/Amphenol connectors have been utilized throughout the harness. We supply terminals that can be successfully applied with a wide range of generic crimping tools. To ensure trouble-free connections here are some low-cost options we found.
    - **IWS-16DS**
    - **IWC-1424A**

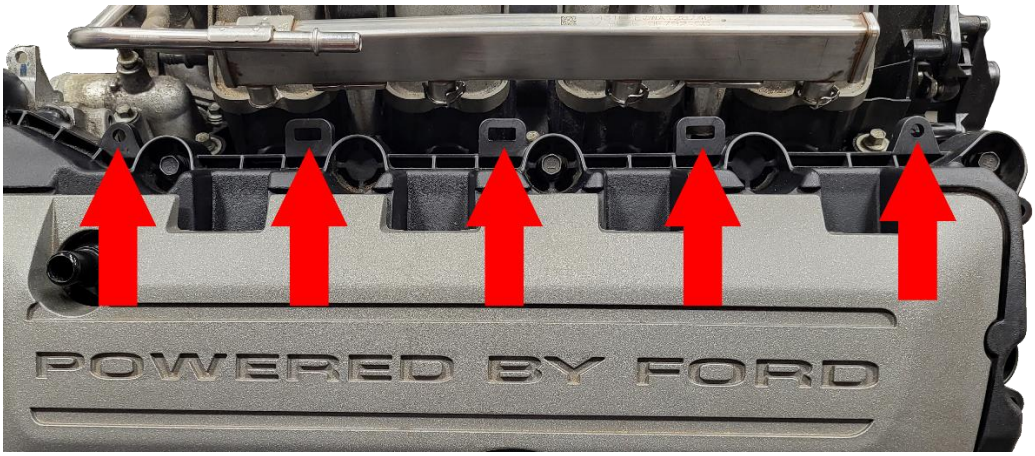
Step-By-Step Harness Installation Directions

1. **Disconnect the Battery**
   - Always begin by disconnecting the vehicle's battery to ensure safety

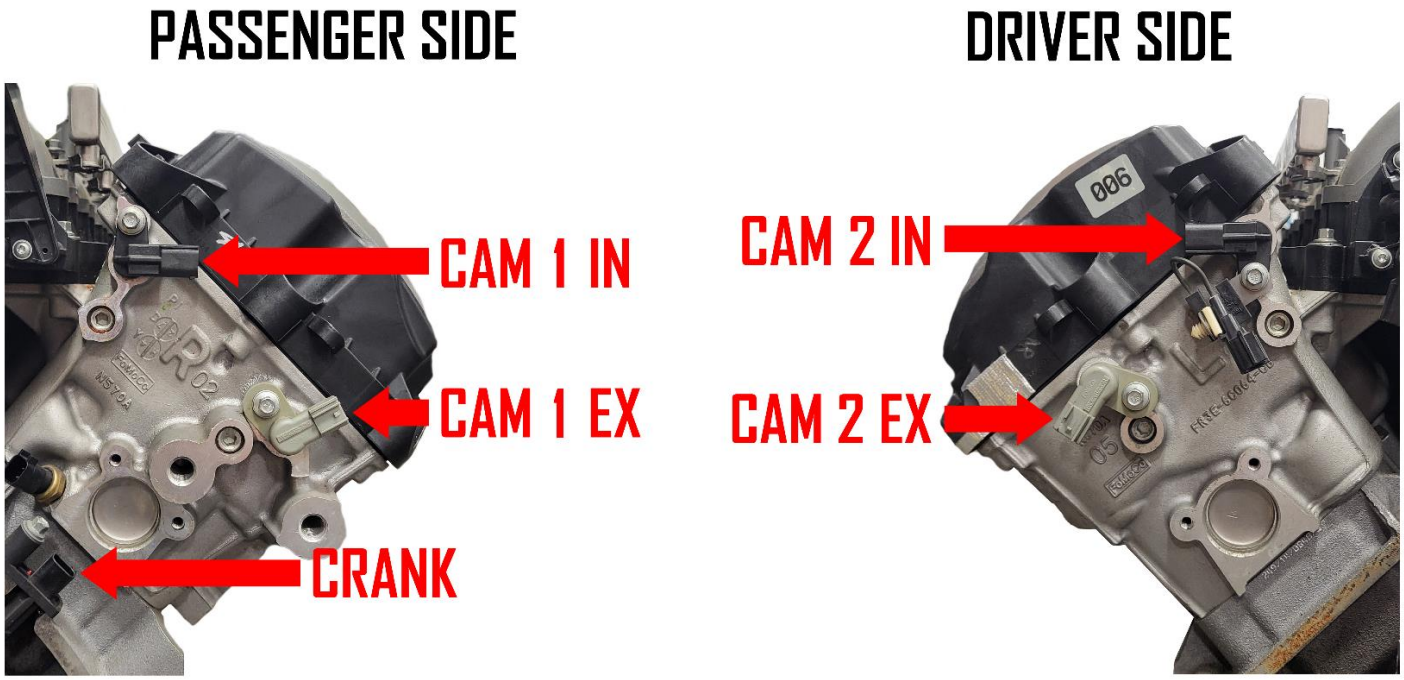
2. **Remove Factory Components**
   - Remove the factory wiring harness and computer from the vehicle, if applicable

3. **Position the Coyote PNP Harness**
   - Drape the main harness over the engine.
   - Using the labeled heat shrink on the Injector/Coil, arrange the harness so:
     - Passenger Side - cylinder numbers 1 - 4
     - Driver Side - cylinder numbers 5 - 8

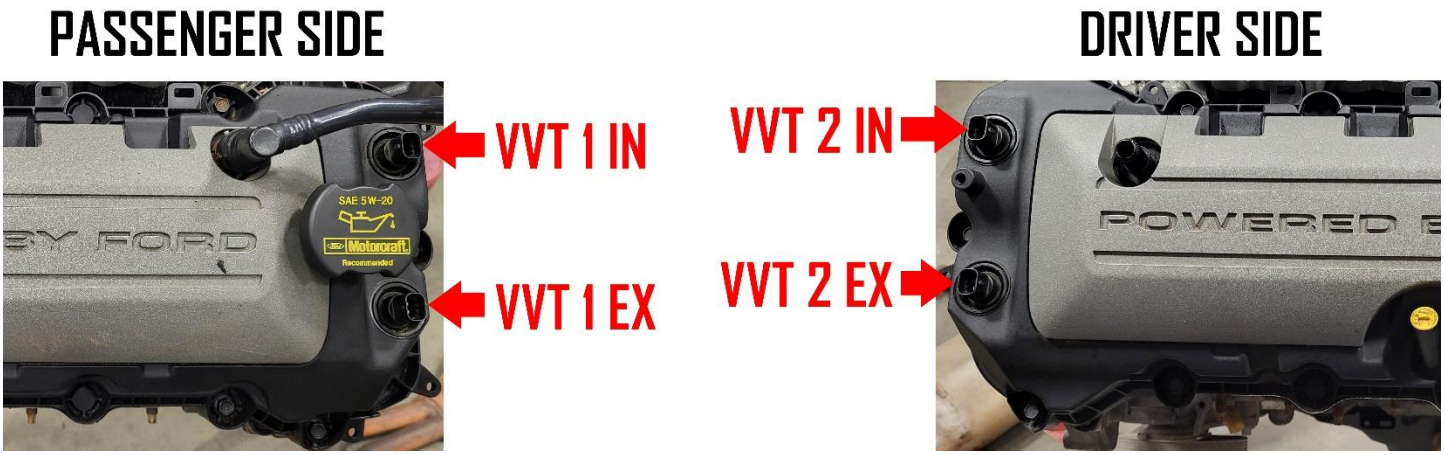
4. **Connect Injector and Coil Wiring**
   - Plug in the injector and coil connectors according to the cylinder numbering
   - Secure the harness to the factory mounting points using zip ties or similar fasteners



5. **Rear Engine Connections**
   - Connect the rear engine wiring as indicated in the diagram below



6. **Front Engine Connections**
   - Connect the front engine wiring as indicated in the diagram below



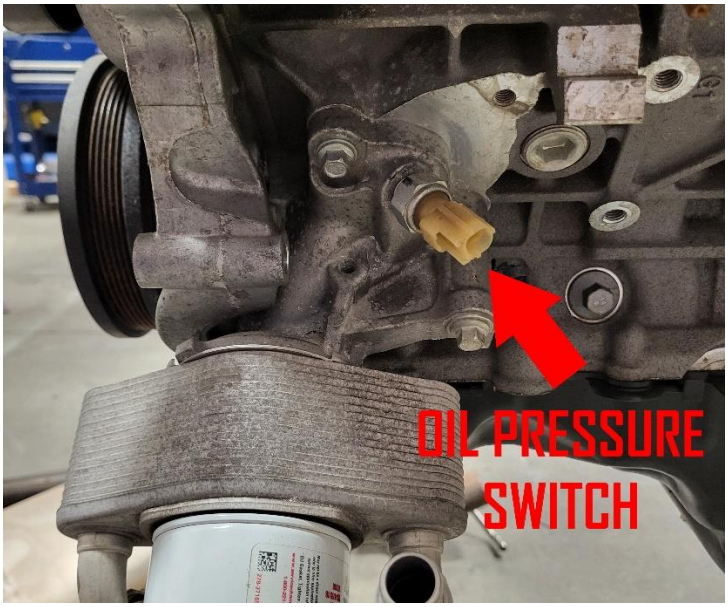
7. **Oil Pressure Switch Replacement**

Replace the factory oil pressure switch with the included 0–150 PSI Oil Pressure Sensor

The factory oil pressure switch is located on the passenger side of the engine right above the oil filter

Install the new sensor using the supplied 1/4" NPT male to 1/8" NPT female adapter

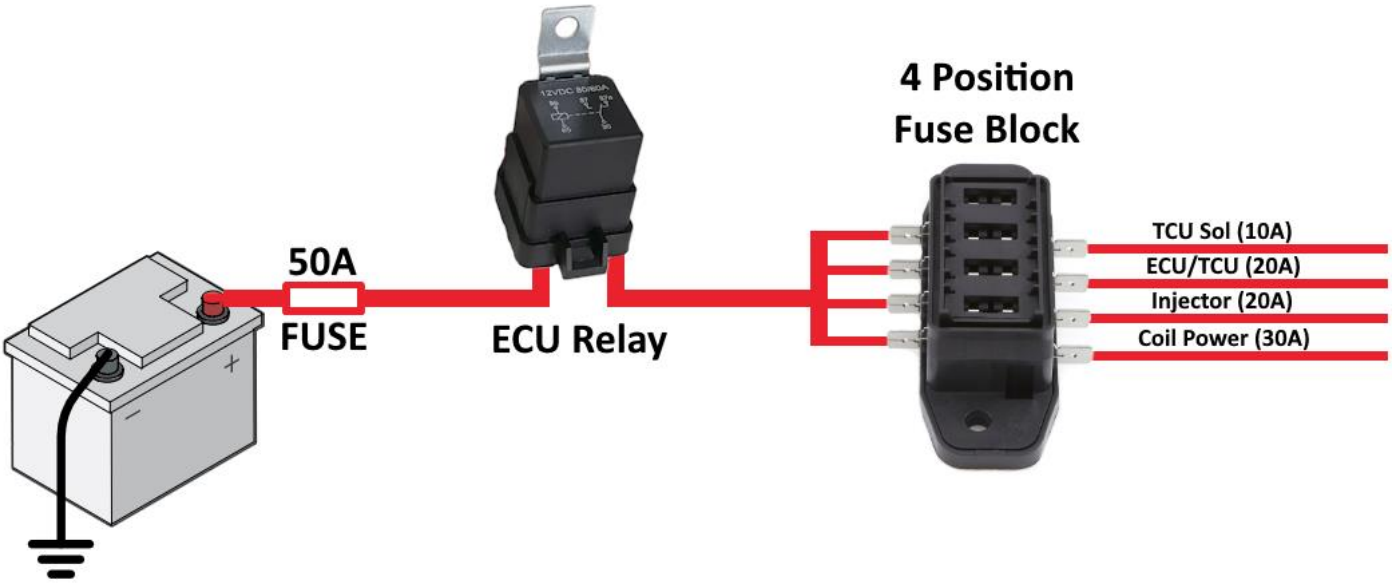
Refer to the image for guidance



8. **Route the Harness Lead/Trunk**
   - Route the long harness through your chosen path in the vehicle's engine compartment
   - Select your ECU mounting location (e.g., passenger footwell or under the seat). If you opt to mount the ECU under the hood, apply a bead of silicone around the rubber enclosure seal for enhanced moisture protection
   - Ensure all components are mounted away from excessive heat sources
   - Use a rubber grommet or seal when routing the harness through the firewall to protect it from abrasion, chafing, and moisture intrusion

9. **ECU Harness Power Connection**
   - Locate the power bundle at the end of the harness, next to the ECU connectors:
     - **Ground:** Black 10 Gauge
     - **Coil Power:** Red 10 Gauge, fuse at 30A
     - **TCU Sol:** Red w/ White Stripe 16 Gauge, fuse at 10A
     - **ECU/TCU:** White w/ Red Stripe 14 Gauge, fuse at 20A
     - **Injector:** Red w/ White Stripe 14 Gauge, fuse at 20A
     - **Note:** Ensure that each power wire is properly fused, wiring has been upsized for voltage drop considerations
   - **OPTIONAL ECU Harness Power Bundle:** Everything you need to power your engine harness— ECU relay, fuse block, wiring for simple installation. Link: **(ECU-HRN-PWRBund)**

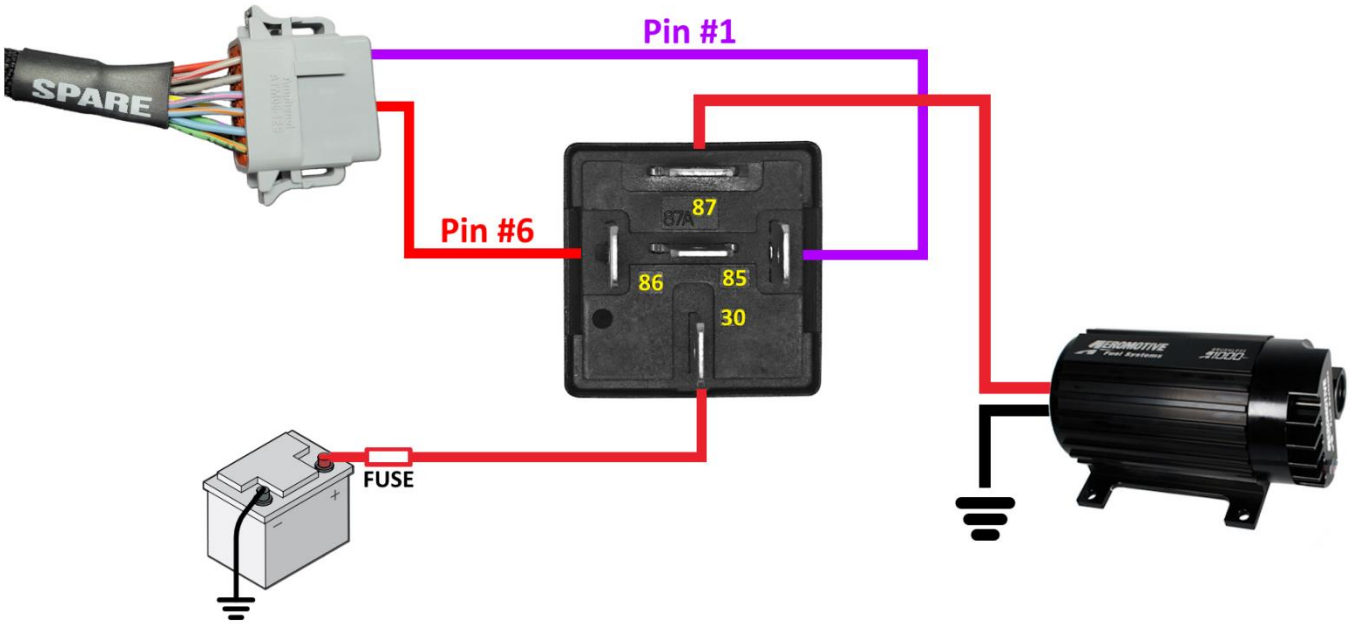
Example General ECU Harness Wiring Diagram



10. Fuel Pump Connection

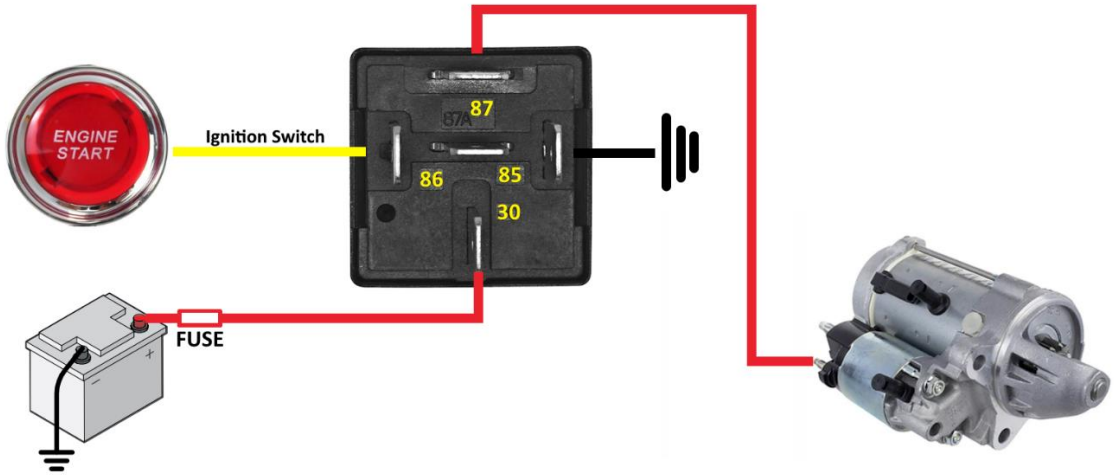
- **Fuel Pump Output:**
  - Located on Spare Connector
    - Pin #1 – Fuel Pump (Purple Wire)
  - Ground activation by the ECU to control the fuel pump relay
  - Supports both ON/OFF and PWM Control
- **Fuel Pump Wiring:**
  - Connect Spare Connector Pin #1 (Fuel Pump Output) to Relay Pin 85
  - Connect Spare Connector Pin #6 (Switched 12V) to Relay Pin 86

Example Fuel Pump Wiring Diagram



11. Starter Connection:

- **Factory Wiring:** use the original factory engine's starter wiring to the Coyote Starter
- **General Wiring:** below is a diagram for wiring the starter in a general racecar application



IAT Sensor Installation

Our Coyote package includes a GM Open-Element IAT Sensor paired with an IAT Harness Installation Package, giving you the freedom to install your sensor wherever it can best measure the incoming air temperature. The most common location is on the air intake tube in a NA or SC application or in the Intercooler in a Turbo application, where the sensor can detect fresh, ambient air before it enters the engine.

The IAT Harness includes the following components:

- **6ft IAT Pigtail**
- **TechFlex Loom**
- **IAT Labeled Heatshrink**
- **2-Pin DTM Connector and Pins**

Installation Instructions:

1. **Install the IAT Sensor:** Mount the supplied GM IAT Sensor in your chosen location (e.g., on the air intake tube)
2. **Connect the Sensor:** Plug the IAT Pigtail into the sensor and route the harness back to the IAT Plug (indicated by the labeled heatshrink) on the Passenger Side branch of Coyote Main Harness next to Injector/Coil #4
3. **Prepare the Wiring:** Trim the wiring as needed to fit your desired routing, then install the supplied TechFlex Loom over the wiring for added protection
4. **Install the DTM Connector:**
    - Strip approximately ¼" from the end of each wire
    - Crimp the supplied DTM Terminals onto the stripped wires
    - Insert the terminals into the 2-Pin DTM Connector according to the following pin slots:

      Pin #2 – Orange Wire

      Pin #1 – Black/White Stripe Wire

    - Secure the connection by installing the supplied lock
5. **Finalize the Installation:** Plug the newly assembled 2-Pin DTM Connector into the corresponding DTM Plug on the Coyote Main Harness

Alternator Installation

Our Coyote package includes Alternator Harness wiring since the alternator can be mounted in multiple locations on your Coyote engine based on your needs.

The Alternator Harness includes the following components:

- **6ft Alternator Pigtail**
- **TechFlex Loom**
- **Alternator Labeled Heatshrink**
- **2-Pin DTM Connector and Pins**

Installation Instructions:

1. **Battery:** the battery must be disconnected
    - **CAUTION! If the battery is not disconnected the alternator wire harness will be fed 12V+ from the regulator**
2. **Connect the Alternator Wiring:** Plug the alternator pigtail from the installation kit into the alternator and route the wiring to the ALT Plug (indicated by the labeled heatshrink) on the Passenger Side branch of Coyote Main Harness next to Injector/Coil #4
3. **Trim and Loom the Wiring:** Trim the wiring as needed to suit your routing requirements, then install the supplied TechFlex Loom and labeled heatshrink over the wiring
4. **Assemble the DTM Connector:**
    - Strip approximately ¼ inch from the end of each wire
    - Crimp the supplied DTM Terminals onto the stripped wire
    - Insert the terminals into the 2-Pin DTM Connector according to the following pin slots:

      Pin #2 - Lt. Green/ Dk. Green Stripe Wire

      Pin #1 - Red Wire

    - Secure the connection using the provided locking mechanism
5. **Finalize the Installation:** Plug the newly assembled 2-Pin DTM Connector into the ALT Plug on the Coyote Main Harness

O2 Wideband Installation

Connect your aftermarket Wideband O2 Sensor(s) using the supplied female connector to the Gray 6-Pin DT Connector labeled “O2 Sensor.” This connector is located at the end of the harness alongside the ECU’s main connectors.

Please refer to the wiring pinout below:

6-Pin DT O2 Sensor Connector

Pin	Wideband Pin	ECU Pin
1.	No Connection	—
2.	Second O2 Sensor Signal	Analog Input 1
3.	Primary O2 Sensor Signal	O2 Input
4.	Wideband Analog (-)	Sensor Ground
5.	Wideband Power Ground	Power Ground
6.	Wideband 12V Power	Switched 12V+ Power

Note: This system is designed to support dual wideband sensors. If you're only installing a single wideband, leave Pin 2 unconnected.

For additional guidance on wiring your Wideband O2 Controller, please refer to the detailed installation guide available at **MS3Pro & MS2 Megasquirt Wideband Installation**.

This resource provides step-by-step instructions and clear wiring diagrams that can ensure the correct and efficient installation of your controller. We encourage you to consult this guide if you have any questions or need extra support during your setup process.

(Optional) Flex & Fuel Pressure Installation

This section outlines the optional installation of the Flex Fuel and Fuel Pressure Sensors, designed to enhance fuel system monitoring and safety features. These connections provide additional flexibility in managing E85/Gasoline fuel types and allow you to monitor fuel pressure for safety and protection features.

6-Pin DTM Flex & Fuel PSI Connector

Pin	Function	Wire Color
1.	Analog Input 3	Lt. Blue/Pink
2.	Sensor Ground	Black/White
3.	5V+ VRef	Gray
4.	12V+ Power	Red
5.	Sensor Ground	Black/White
6.	Digital Input 1 / Flex	Gray/Orange

Fuel Pressure Sensor Wiring Diagram

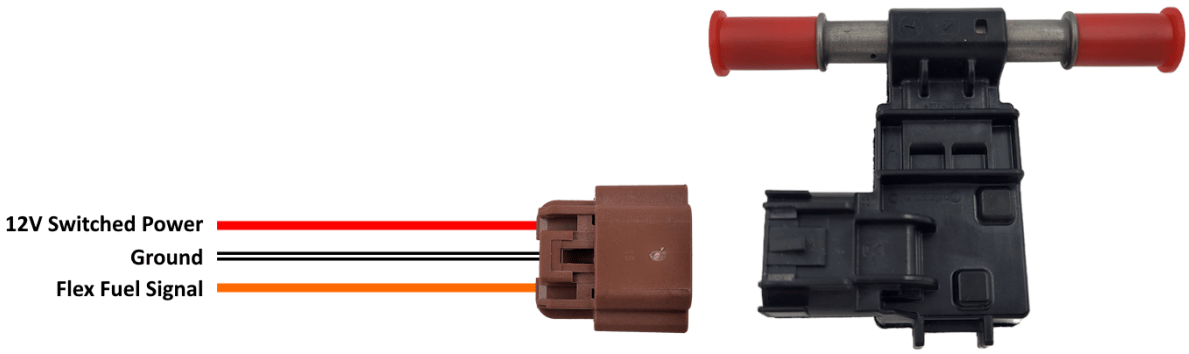
Product

- Fuel Pressure Sensor (**LDM-0100PSI-w-Piggy**)

Wiring

- Pin #1 Yellow Wire – Analog Input 3 (Sensor Signal)
- Pin #2 Black Wire – Sensor Ground
- Pin #3 Red Wire – 5V+ VREF

Flex Fuel Sensor Wiring Diagram



Product

- Flex Fuel Sensor Package (**FFS-wPiggy-PKG**)

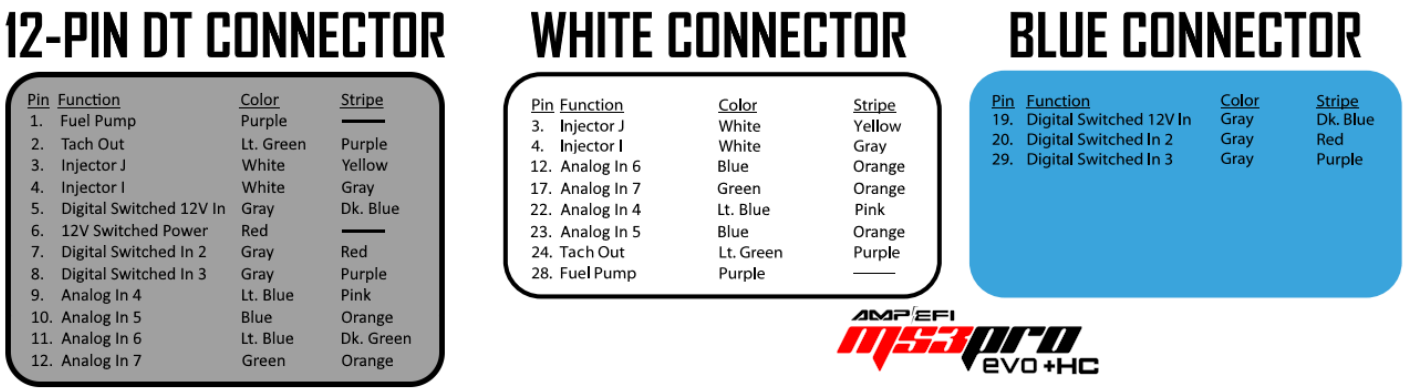
Wiring

- Pin #4 Red Wire – 12V+ Power
- Pin #5 Black Wire – Sensor Ground
- Pin #6 Orange Wire – Digital Input 1 / Flex (Flex Fuel Signal)

Spare Wire Connector - Extra Wires

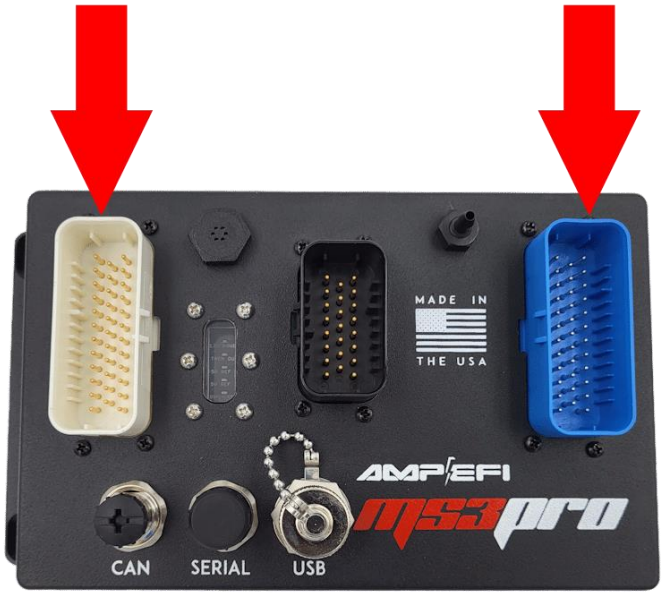
All unused wires to the MS3Pro EVO+ HC are brought out on the Spare - Gray 12-Pin DT Connector: Use these wires for fuel pump, boost control, nitrous, additional sensors, or other inputs and outputs. See the **MS3Pro User Manual** for details on using these connections. All wires on the Spare harness are 20 gauge.

In the picture below, the gray box represents the "Spare" connector where you'll wire your wideband controller. The white and blue connectors shown indicate the corresponding pin locations from the ECU that feed into the "Spare" connector.



Step-By-Step ECU Installation Directions

1. **Connect the White & Blue Harness Connectors:**
   - Locate the White and Blue Connectors at the end of the Coyote Harness
   - Plug these connectors directly into the corresponding-colored ports on the ECU



2. **Install the MAP Sensor Vacuum Line:**
   - Connect one end of the vacuum hose to the MAP Sensor vacuum port on the ECU (red arrow)
   - Route the hose to the Coyote engine's intake and connect or "T" into an available vacuum port
   - Ensure the connection doesn't get pinched going through the firewall and that the hose is routed away from excessive heat sources

3. **Black Center Connector**
   - In the Coyote package, you receive the 26-Pin Black Center Harness, which includes all the remaining I/O available from the ECU

   - This connector provides additional I/O options for advanced configurations, so use it if your application requires extra inputs and/or outputs

Pin	Function	Color	Stripe
1.	PWM Out 5	Lt. Green	Red
2.	PWM Out 4	Lt. Green	Orange
3.	Digital Out 2	Brown	Dk. Blue
4.	Digital Out 1	Brown	Dk. Green
5.	Digital I/O 4	Brown	Pink
6.	Digital I/O 2	Brown	Orange
7.	Analog In 8	Lt. Blue	Purple
8.	**No Connection**	———	———
9.	**No Connection**	———	———
10.	Digital Switched In 5	Gray	Orange
11.	Digital Switched In 4	Gray	Pink
12.	Digital I/O 5	Brown	Red
13.	Digital I/O 3	Brown	Lt. Green
14.	Digital I/O 1	Brown	———
15.	+5V VREF Out 2	Gray	Black
16.	**No Connection**	———	———
17.	Sensor Ground	Black	White
18.	Sensor Ground	Black	White
19.	Sensor Ground	Black	White
20.	Sensor Ground	Black	White
21.	Sensor Ground	Black	White
22.	+5V VREF Out 1	Gray	———
23.	**No Connection**	———	———

4. **Final Checks:**
   - Double-check that all connectors are fully seated and secure

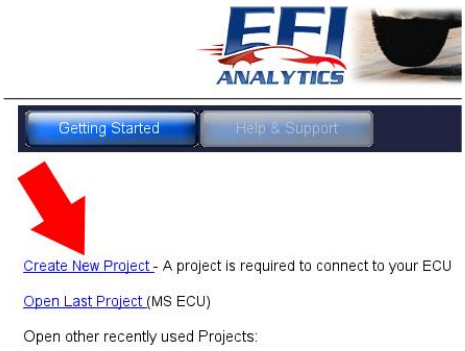
   - Confirm proper routing of both the harness and vacuum line before completing the installation

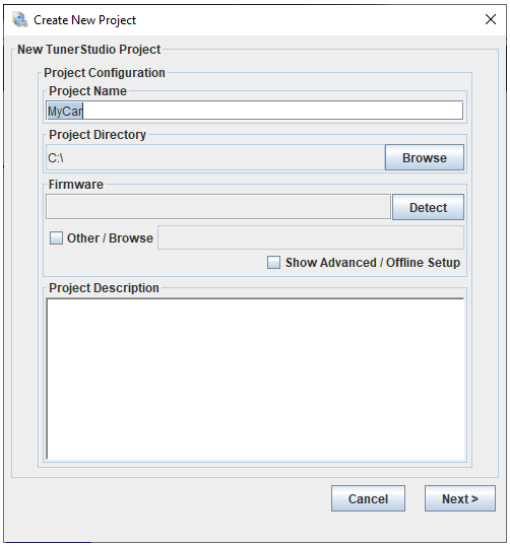
Step-By-Step First Start-up Installation Directions

As mentioned on page 2, you have already claimed your TunerStudio Registration and installed the software. Now, follow these steps to set up your Vehicle Project in the TunerStudio software:

Creating a New Project

1. **Power & Connect the ECU:**
    - Connect the ECU Tuning cable to your laptop using the M12 Serial Cable
    - Turn ON the Ignition to power up the ECU
2. **Launch TunerStudio:**
    - Open TunerStudio and select **Create New Project**. A new project setup screen will appear





3. **Project Configuration Details:**
    - **Project Name:** Enter a name for your project
    - **Project Directory:** You can choose a custom location for storing your vehicle projects. By default, projects are saved in the "TunerStudio Projects" folder within your Documents folder.
    - **Firmware:** Click **DETECT**. TunerStudio will scan and detect the firmware on your MS3Pro. If a definition file is not available, it will automatically prompt you to download one via your internet connection.
    - **Next:** Click "Next" to proceed to the following section
4. **Configuration Settings:**
    - **Oxygen Sensor / Display:** leave default “Wideband – AFR (Default)
    - **Temperature Display:** Select your preferred temperature display (Fahrenheit or Celsius)
    - **Remaining Settings:** Leave the remaining options at their defaults
    - **Next:** Click "Next" to proceed to the following section

5. **Communication Settings:**
    - Validate the test comes back as “Successful”
    - **Next:** Click "Next" to proceed to the following section
6. **Select Dashboard:**
    - **Dashboard:** use our custom default dashboard or select any other dashboard of your choice
    - **Next:** Click "Next" to proceed to the following section
7. **Complete Project Setup:**
    - Your vehicle project setup is now complete
    - TunerStudio will automatically load the pre-configured Coyote Base Tune from your ECU
    - Sensor Validation Check:
        - KOEO (Key On Engine Off) check the below
        - Coolant Temperature (CLT) – this should be reading close to ambient air temperature
        - Intake Air Temperature (IAT) – this should be reading close to ambient air temperature
        - Manifold Air Pressure (MAP) – this should be reading close to 100
    - If your Coyote engine is **100% STOCK**, you can start the engine at this time

Updating Tune for Modified Coyote Engines

Please note that the following guidelines represent common modifications to the base tune and are not an exhaustive list of all tuning adjustments. When updating your tune, consider the specific modifications made to your engine.

Common areas for adjustment include:

- **Injector Sizing:** The base tune is calibrated for factory Ford 34lb injectors. If you have upgraded or changed your injector size, you will need to adjust the REQ FUEL and Injector Dead Times accordingly.
- **Boosted Applications:** Engines with superchargers or turbochargers will require modifications too due to the increased airflow. You will need to scale your VE and IGN tables for this change.
- **Fuel Type:** The stock tune is designed for gasoline. If you are using a different fuel type or fuel mixture, appropriate adjustments must be made to the REQ FUEL and/or Flex Fuel should be setup.
- **Camshaft Changes:** Alterations in cam profiles can affect timing and airflow, necessitating changes to the tune to optimize performance.

Additional Information and Support