



FORD PERFORMANCE

Part Number: M-9000-M50AE

Part Description: ECO 5.0L Power Module

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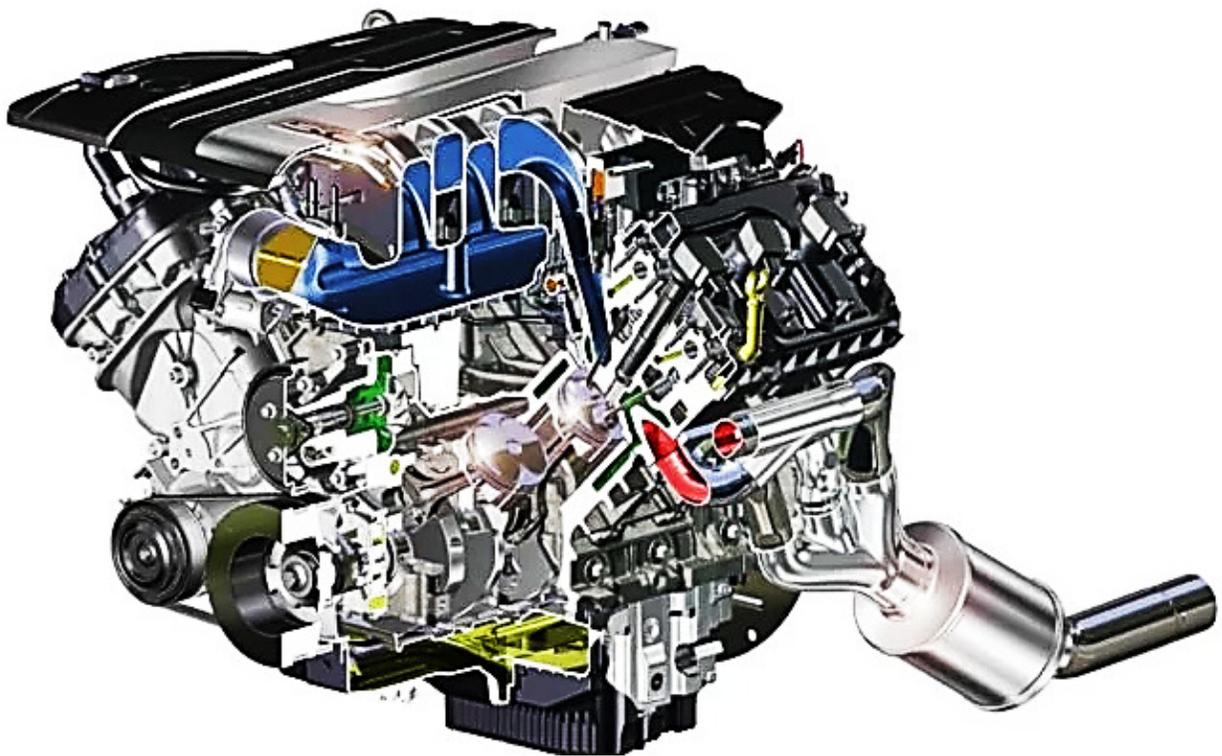
Please visit [www.performanceparts.ford.com](http://www.performanceparts.ford.com) for the most current instruction and warranty information.

**PLEASE READ ALL OF THE FOLLOWING INSTRUCTIONS CAREFULLY PRIOR TO INSTALLATION. IF AT ANY TIME YOU DO NOT UNDERSTAND THE INSTRUCTIONS, PLEASE CALL THE FORD PERFORMANCE TECHLINE AT 1-800-367-3788**

*The use of a vehicle hoist is recommended for this installation. If you do not have access to one, use a hydraulic floor jack and jack stands to safely raise the vehicle.*

**!!!CAUTION: JACK STANDS MUST BE USED ON A LEVEL SURFACE AND BE SECURELY SEATED. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR VEHICLE DAMAGE!!!**

## 2021 ECO 5.0L Drivetrain Installation Instructions





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## 1.0 Introduction

This kit was developed by Ford Performance in order to allow performance enthusiasts the ability to install a 5.0L Gen3 Mustang Crate Engine (Ford Performance P/N: M-6007-M50C) into any pre-1996 Vehicle that originally had emissions equipment up to, and including, OBD I equipped vehicles. This Kit is NOT intended for fitment into OBD II equipped vehicles.

Note: Cruise control is not available with this system. CAN (J1979) protocol compatible gauges will be able to receive a vehicle speed signal from CAN bus circuit. Analog gauges will require either a CAN translator box or a drive shaft speed sensor.

## 2.0 Overview

This booklet provides a step by step guide for the preparation and assembly of the drivetrain, wiring harnesses and supporting components. Please read the instructions thoroughly before starting the installation. If you have any questions, contact Ford Performance Techline at (800) 367-3788.

## 3.0 Included/Possibly required Components

### 3.1 2021 5.0L Gen 3 Engine

- Includes Crankshaft Sensor Ring.

### 3.2 2021 Ford 10R80 Automatic Transmission

- Including the Wiring Harness, Mid Plate, Flex Plate and Hardware.

### 3.3 2021 Mustang GT Spec Exhaust Manifolds with Catalytic Convertors

### 3.4 Starter Motor

### 3.5 Powertrain Control Module (PCM)

- The PCM is the central processing unit for engine operation. Input data/engine operation feedback is provided from each of the engine's sensors connected to the PCM via wiring leads. This input data is used to perform calculations that in turn adjust fuel quantity and spark timing according to varying driver demand (ie – accelerator pedal input).
- The PCM in this Controls Pack has a custom software and calibration dataset which were specifically developed by Ford Performance engineers to provide peak performance and reliability with the 5.0L Gen3 Mustang Crate Engine (Ford Performance P/N: M-6007-M50C).

#### PCM Calibration Application Notes:

- The calibration provided in this PCM works with a mechanically regulated return style fuel system. See Section 8 of this manual for more information on fuel system requirements for this PCM.
- The Air Filter Assembly with Integral Mass Air Flow Sensor included with this kit must be used to achieve acceptable engine performance. Refer to Section 3.6 for more information about Air Inlet System requirements.

**NOTE: Due to the fuel system requirement described above, installation of this PCM in ANY production Mustang vehicle will result in a no-start condition!**

### 3.6 Control Pack Wiring Harness

- The Control Pack Wiring Harness has pre-determined lengths that will dictate the location of certain supporting components as well as the locations of fixed components on the drive train.



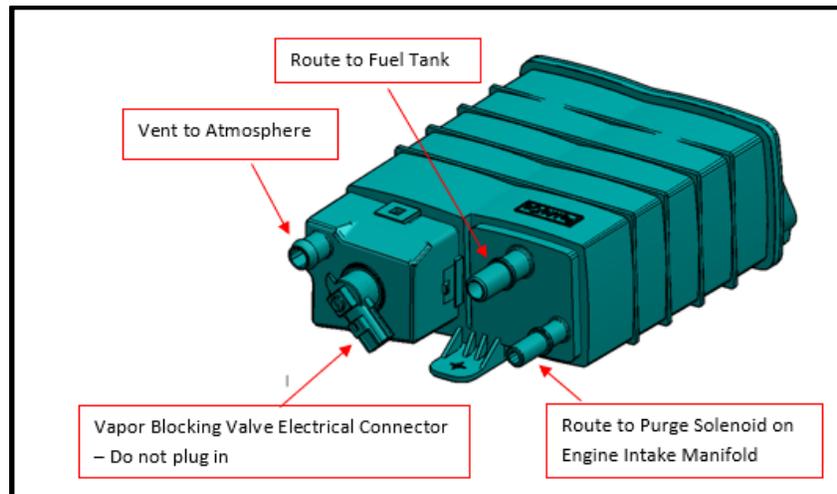
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### 3.7 Accelerator Pedal Position Sensor (APPS)

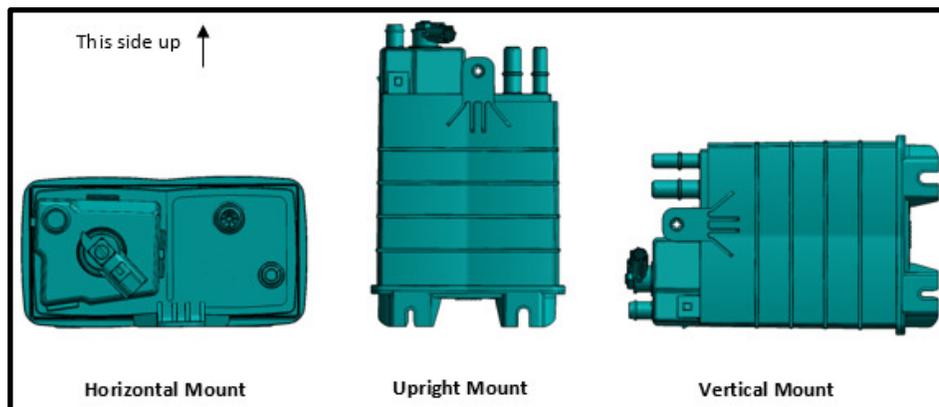
- The Accelerator Pedal Assembly includes a pair of Integrated Pedal Position Sensors (APPS1/APPS2). This pedal has electrical properties designed specifically for correct interface with PCM and is required for proper engine operation.

### 3.8 Evaporative System

- The Purge Solenoid is required to control the flow of fuel vapors from the Carbon Canistor. It is required to be installed for emissions compliance.
- The Evaporative Canister is required to capture the fuel vapors from the fuel tank. There are three vapor line connections on the canister that must be installed:
  - Vent to atmosphere.
  - Connection to fuel tank vent.
  - Connection to Purge Solenoid.



**Evaprotive Canistor Connections**



**Evaprotive Canistor Mounting Options**



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**3.9 Brake Aspirator**

- The Brake Aspirator utilizes a flow of air thru an orifice to increase the vacuum to the Brake Booster. The flow of air from the induction tube to the intake manifold is a specific calibrated volume that is accounted for in the engine control software. The use of the Brake Aspirator is required for proper engine operation.

**3.10 Passive Anti-Theft System Module (PATS)**



- The PATs module is matched to your Powertrain Control Module (PCM) as received. The PCM will not allow the starter to crank the engine without communications with the specific matched PATs module.
- The PATs module stores your hardware configuration for use by the PCM (tire circumference and axle ratio)

**3.11 Ford Performance Pro Cal Flash Tool**

- A programming tool is included in the kit to configure your powertrain.
  - Tire circumference.
  - Axle ratio.
  - Crank Position Sensor profile (also known as the misfire profile learning).

**3.12 Fuel Supply System (Not All Components are Included)**

- See section “8.0 Fuel System” of this manual for Fuel Pump and Regulator requirements.
- A non-adjustable fuel regulator is included (and required for emissions certification)

**3.13 O2 Sensors**

- Two O2 sensors per cylinder bank (1 upstream, 1 downstream) provide wide range feedback to the PCM for closed loop air fuel ratio control by measuring the quantity of oxygen present in exhaust leaving the combustion chamber.
- Each sensor is supplied with a light coating of anti-seize lubricant on its threads. Please use caution when installing as this lubricant will damage the sensor element, so make sure no lubricant comes in contact with the sensor element (tip).
- Tighten to 48 Nm (35 lb-ft).

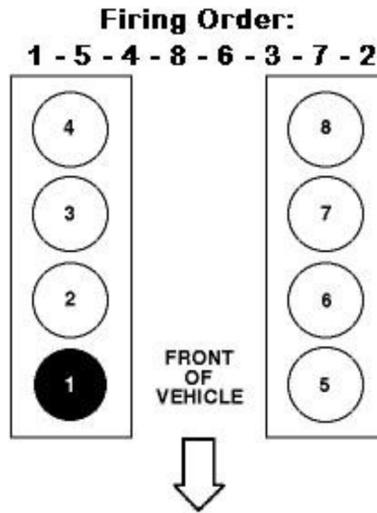
**NOTE:** Do not splice, lengthen or otherwise modify the sensor wiring. Doing so will adversely affect the sensor performance & reliability of the signal. You may lengthen the connector leads from the harness side if necessary, by splicing, soldering and shrink wrapping the splices. The engine harness and controls package is designed to operate with the O2 sensors in the model year 2021 Mustang stock locations. Moving the sensors will not be emissions compliant.



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### 3.14 Plastic Bag of Assorted Items

- Inline fuse.
- Fuse holder.
- 6-way IP pigtail.
- Misc. hardware.





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**3.15 Air Cleaner Assembly with Integral Mass Air Flow Sensor**



- A Performance Induction is included in the kit.
  - Throttle Body and adapter plate.
  - Induction Tube with integrated MAF sensor.
  - Air Filter.
  - Air Filter enclosure.
- You must replace the original Throttle Body that is installed on the engine (as shipped), with the detached unit included in the kit.
- The Induction Tube and Air Filter must be used for emissions compliance.
- The installation of the Air Filter enclosure is optional and may be modified.

**3.16 Ambient Air Temperature (AAT)**



- The AAT must be installed in the vehicle forward of the radiator or other heat exchangers.
- The installation location must be in the flow of fresh air to provide optimum performance as it effects the calculation of the delivered spark and fuel.



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### **3.17 Controls Pack Wiring Assembly**

- Connects to vehicle battery and inline connector on engine harness.
- Contains Ford Performance Power Distribution Box (FPPDB) and High Power inline fuse.
- Electrical connections to Accelerator Pedal (APPS) and Clutch Switch (CBT).
- Wire leads for Ignition Switch & Starter.
- Data Link Connector for reading Diagnostic Trouble Codes (DTCs).
- Check Engine/Malfunction Indicator Lamp (MIL) for visual indication of engine control system fault code presence.
- MIL will stay illuminated when the ignition is ON and the engine is NOT running; therefore this condition does not indicate a system fault; Not all DTCs will cause the MIL to illuminate.
- MIL on stock instrument panel will not work—only the MIL included in this kit will illuminate if a fault exists.

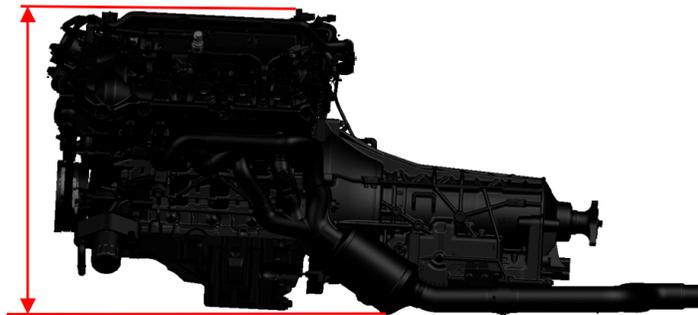
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## 4.0 Pre-Installation of Harnesses and Drive Train

### 4.1 Planning

- Taking a few moments to plan your installation will make the installation and completion of the drivetrain much easier. To assist you, below are the external dimensions of the engine with the exhaust manifolds installed.

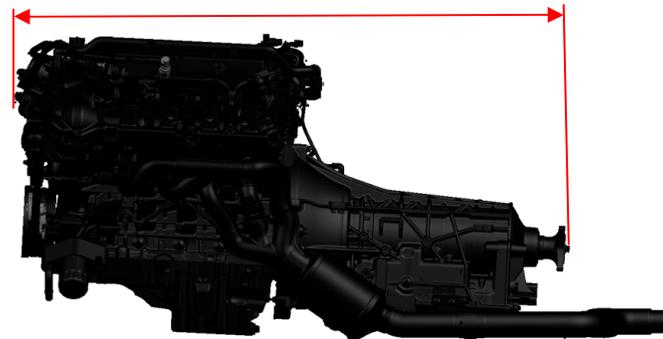
Total Height: 754mm



Total Width (without the AIS): 768mm



Total Length (without the exhaust or AIS) 1370mm:





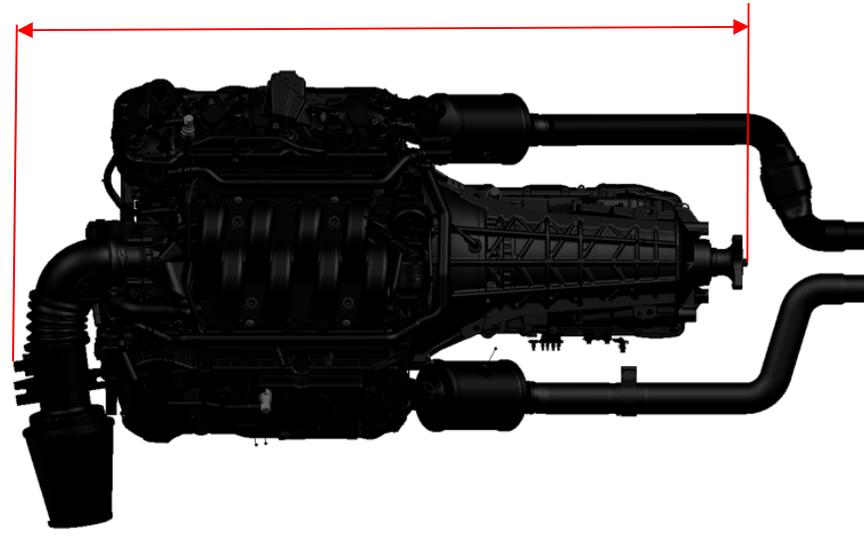
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Total Length with AIS (without exhaust):1520mm



- Mount the Floor Shifter and route the Shifter Cable.
- The Shifter Cable will need to be routed so the cable mounts to the Transmission with the cable end to the front on the left side of the Transmission.
- Decide whether you will install the Engine and Transmission as one unit or separately. Some may find it useful to “test fit” the drivetrain. Should you decide to go this route, this is a perfect opportunity to lay out the electrical system and pre-mount some of those items.

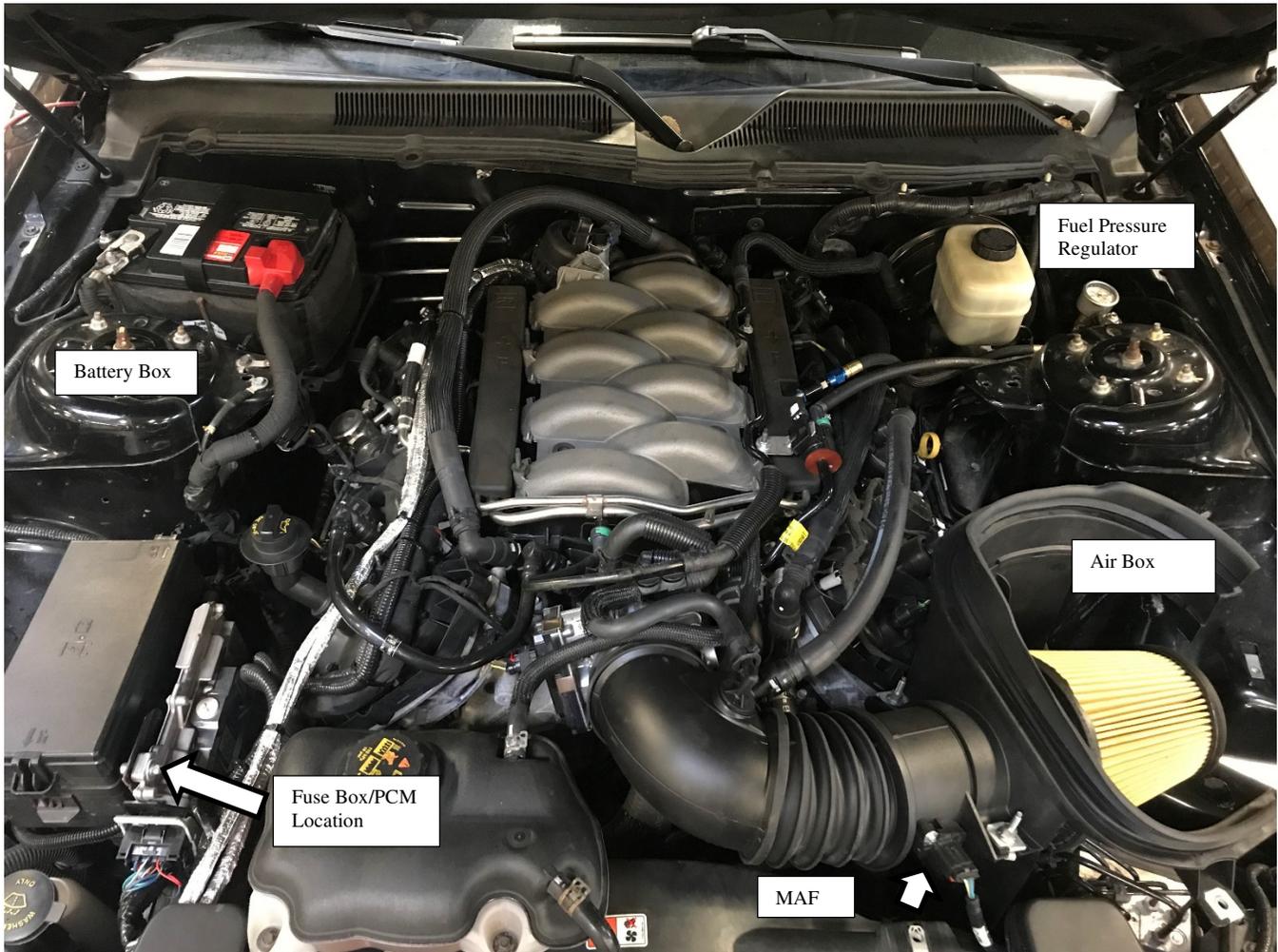


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**Picture shown is for reference only to assist in component placement suggestions**

The following is a list of key factors to consider before any of the installation takes place:

- PCM mounting location is limited by the length of the PCM lead of the Engine Harness (located on the right front corner of the Engine). The PCM Connector Lead measures 22 inches from the lower edge of the right Valve Cover. This will dictate the location of where the PCM will need to be mounted.
- Ford Performance Power Distribution Box must be mounted, in the engine compartment, within 60 inches of the vehicle battery or positive battery post if you have a trunk mounted battery as dictated by the battery+/- ground lead lengths of the controls pack wiring harness.
- Lay out the harness and components first in order to ensure that the wiring leads will reach everywhere you intend them to. This is a good check before you drill any holes or mount any components!
- Plan on a good location to mount the EVAP Canister. Traditionally, they are located under the rear of the Vehicle, close to the Fuel Tank.
- If your transmission tunnel is very tight, decide how you will check your transmission fluid level after the first start-up. You may need to fabricate an access hole to check it from above then, re-seal the hole with a rubber body plug or a removable panel. If you test fit your drivetrain, that will be a good time to determine your needs.



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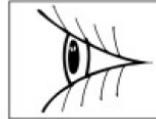
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### 5.1. Assembling the Drive Train

- Remove the Engine (including all the components) from the packaging, and inspect the Engine for damage.



- Inspect the Crankshaft Sensor Ring for damage. If the Crankshaft Sensor Ring has been dropped, or has any visual damage, it must be discarded. A slight bend in any tooth of the ring could result in a “no start” condition as this ring triggers the Crank Position Sensor (CPS).

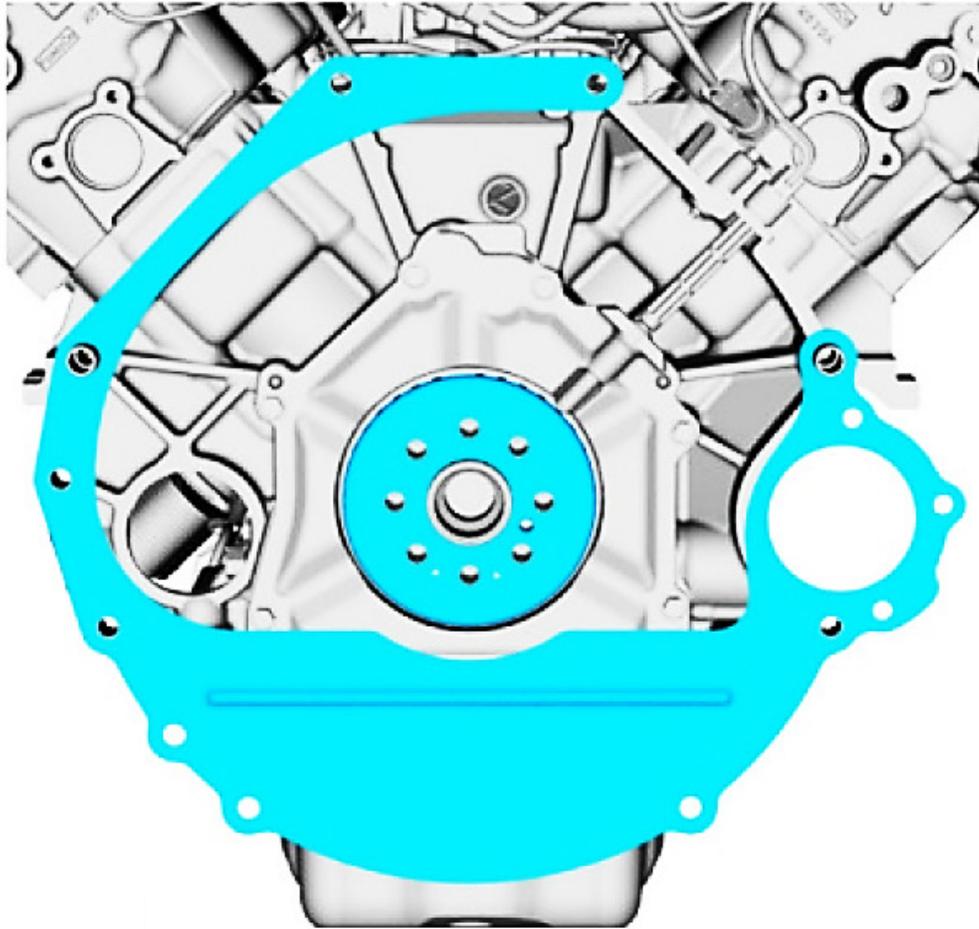


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- Place the Crankshaft Sensor Ring on the Crankshaft being sure the Locator Pin engages the corresponding hole in the Crankshaft allowing all eight (8) bolt holes line up. Install the Transmission Mid Plate on the dowel pins on the Transmission Mounting Flange.



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- Install the Flex Plate. The bolt holes will only line up one way. Tighten the bolts to the torque specification shown listed below in the sequence shown in the diagram.  
*Torque: Step 1 43 lb/ft (58Nm.)*  
Step 2 **Tighten 45 degrees**
- Install the Torque Converter onto the Transmission. Be sure the Torque Converter properly engage the ears on the pump. Failure to do so could result in damage to the Transmission.

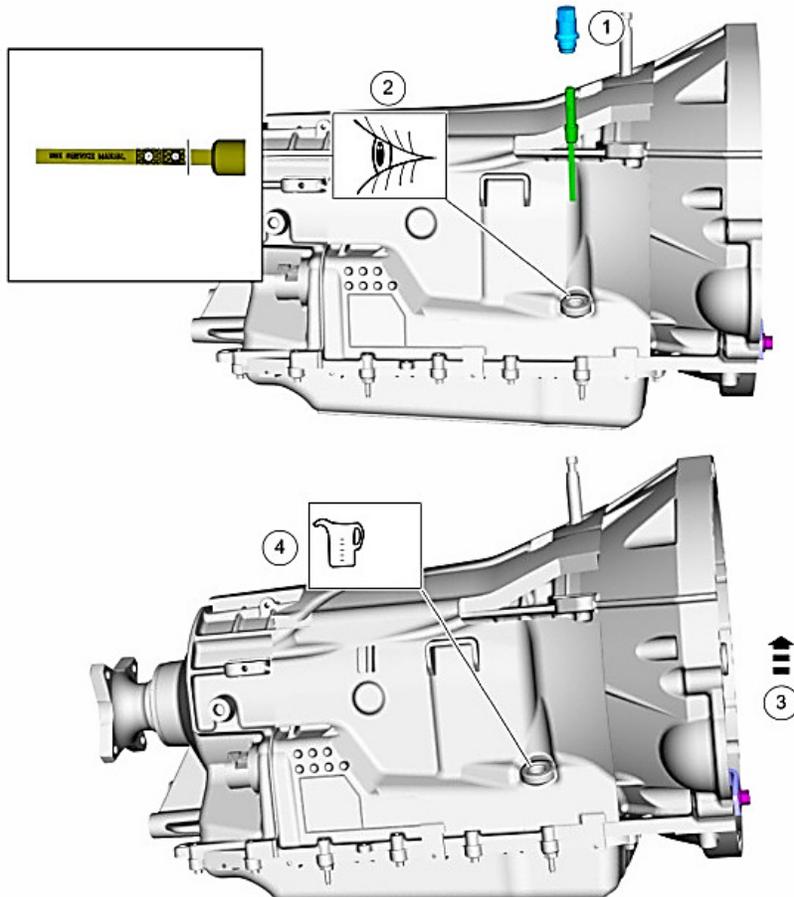
**Note:** the bolts are a onetime use. Do not re-use.



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**IMPORTANT NOTE!!!!**

The Ford 10R80 Automatic Transmission is a “sealed”, non-service unit. There is no Transmission Fluid Dip Stick Tube. Therefore, it is VERY important that you follow the Instructions below to initially fill the Transmission. You will need to check the fluid level AFTER the first start-up. Be sure you allow room in the vehicle to be able to execute the check.

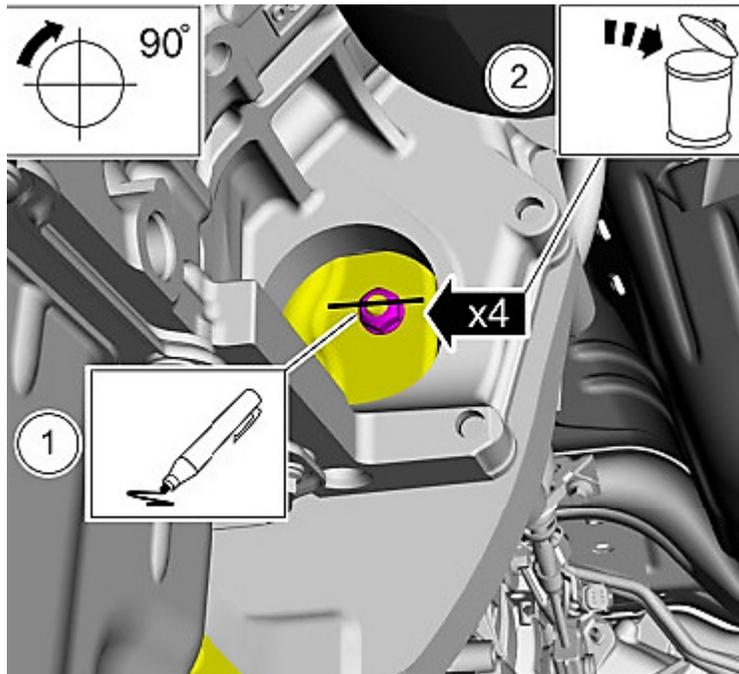
The numbers below correspond to the numbers in the pictures above.

1. Remove the Transmission Fluid Fill Plug, from the Transmission Fluid Level Indicator Assembly.
2. Verify Transmission is filled with Transmission Fluid.
3. Slightly tilt the Transmission rearward.
4. If the Transmission was disassembled, add **12.30L (13 qt)** of Transmission Fluid to the Transmission through the Transmission Fluid Fill Hole.

**Material: Motorcraft® MERCON® ULV Automatic Transmission Fluid / XT-12-QULV (WSS-M2C949-A) (MERCON® ULV)**

Loosely install the transmission fluid fill plug when finished.

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- Turn the engine over by hand until the torque converter mounting hole in the Flex Plate is visible through the service window on the Left side of the Engine Block.
- Again, be sure the Torque Converter is positioned all the way into the Transmission then, align the Transmission up with the Dowel Pins on the back of the Engine.
- Align the Torque Converter Studs with the Flex Plate Mounting Holes.
- Slide the Transmission onto the Dowel Pins and Bolt the Transmission to the Engine.  
*Torque: 35 lb/ft (48 Nm.)*
- Install the four (4) Torque Converter Nuts.  
*Torque: 35 lb/ft (48 Nm.)*
- Test-fit the Transmission Cooler Lines and determine if they need to be modified. If they do, we recommend taking them to a hydraulic line repair facility to have the proper size rubber line crimped on to the tubes before installing them.

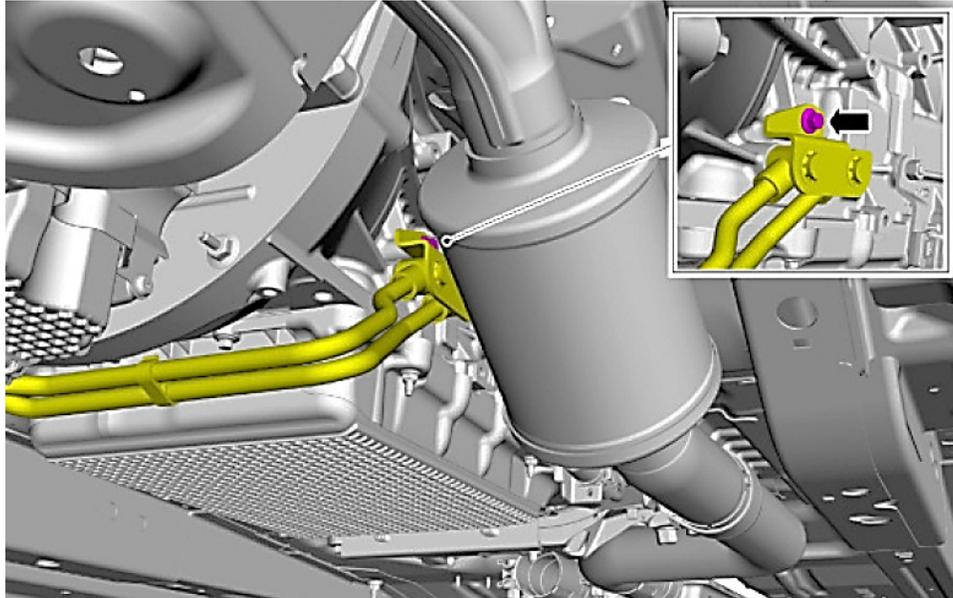


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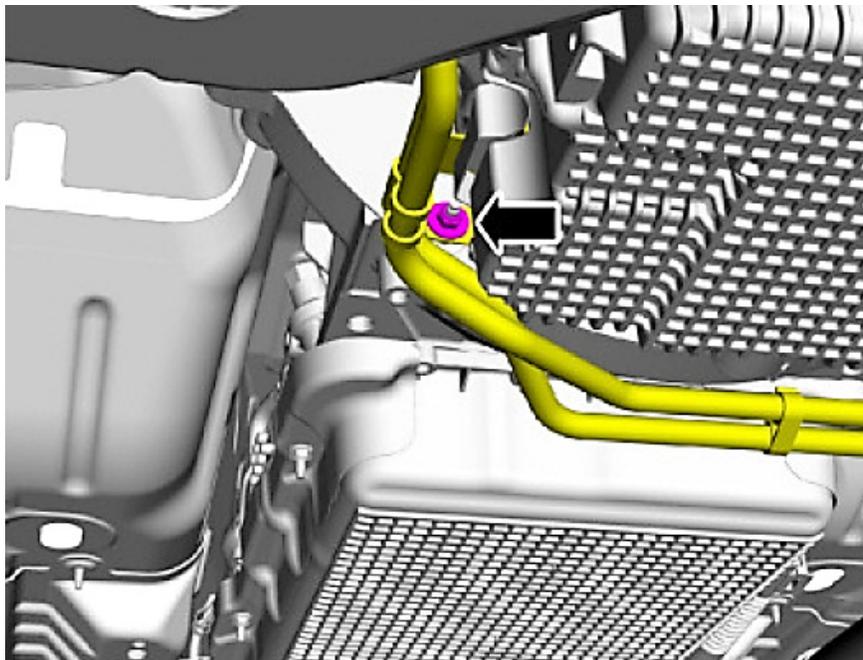
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- Install the Transmission Fluid Cooler Tubes and the new bolt to the Transmission on the forward left side of the Transmission.  
*Torque: 18 lb/ft (25 Nm)*



- Attach the Cooler Lines to the Bell Housing Stud.
- *Torque: 124 lb/in (14 Nm)*

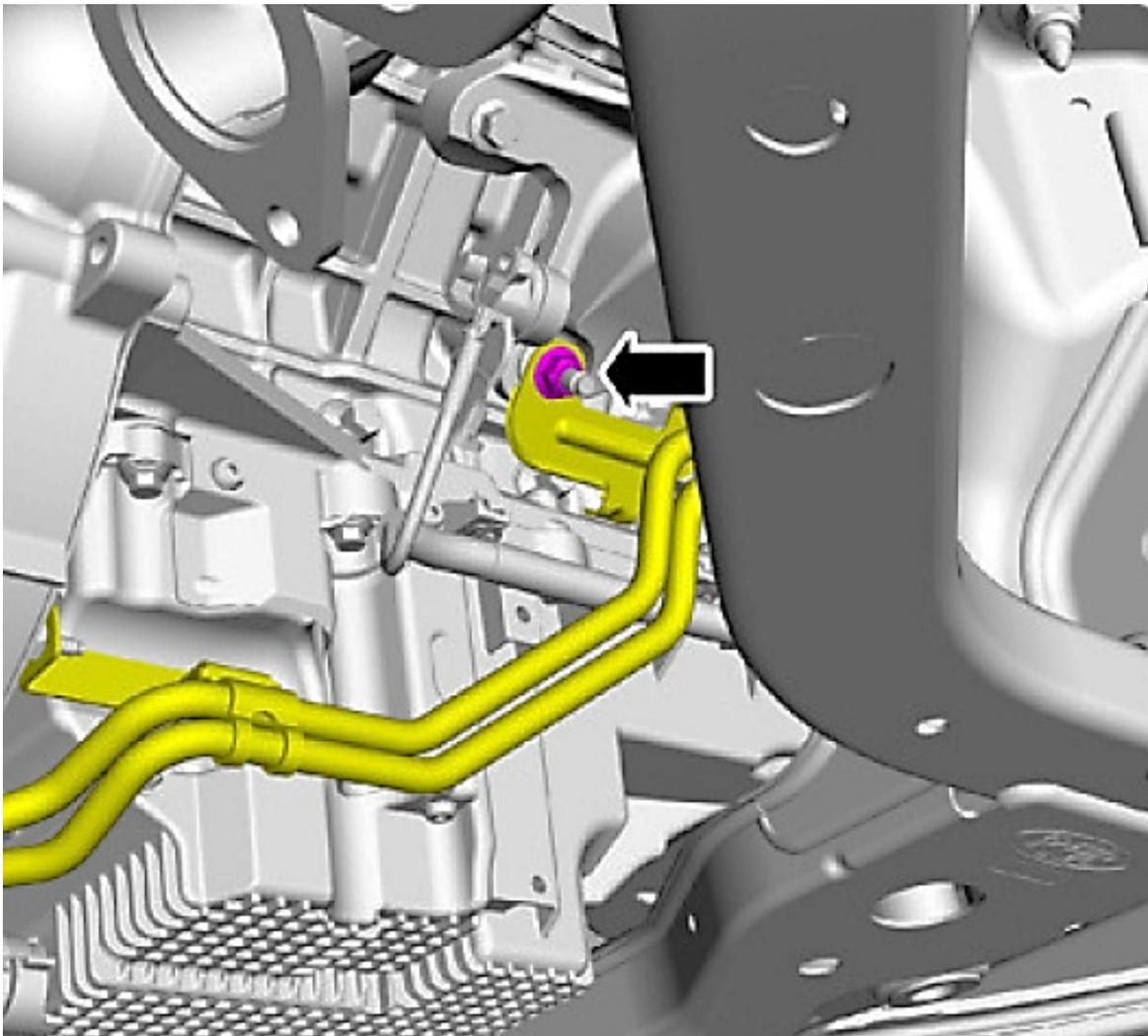


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- Install the Transmission Fluid Cooler Tube Nut.  
*Torque: 35 lb/ft (48 Nm)*

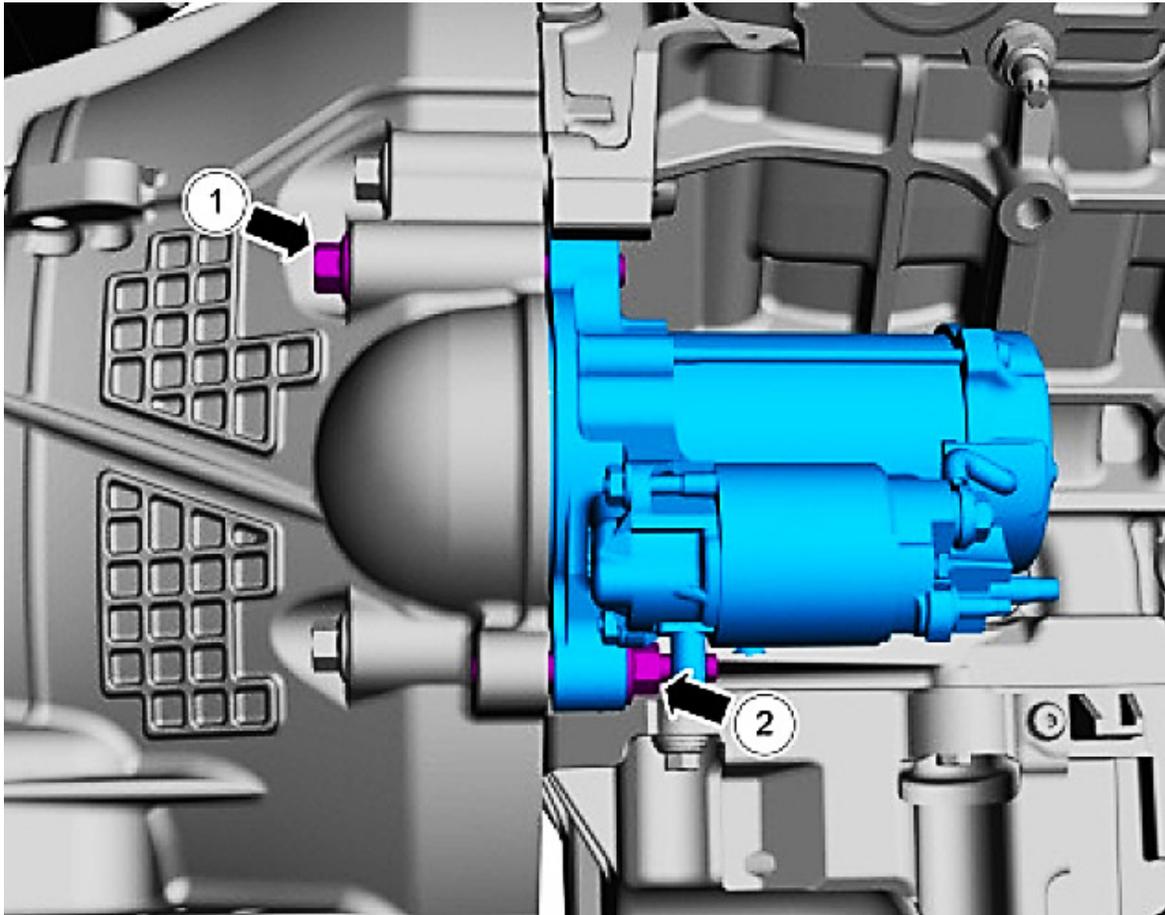


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- Install the Starter.  
*Torque: 35 lb/ft (47.5 Nm)*

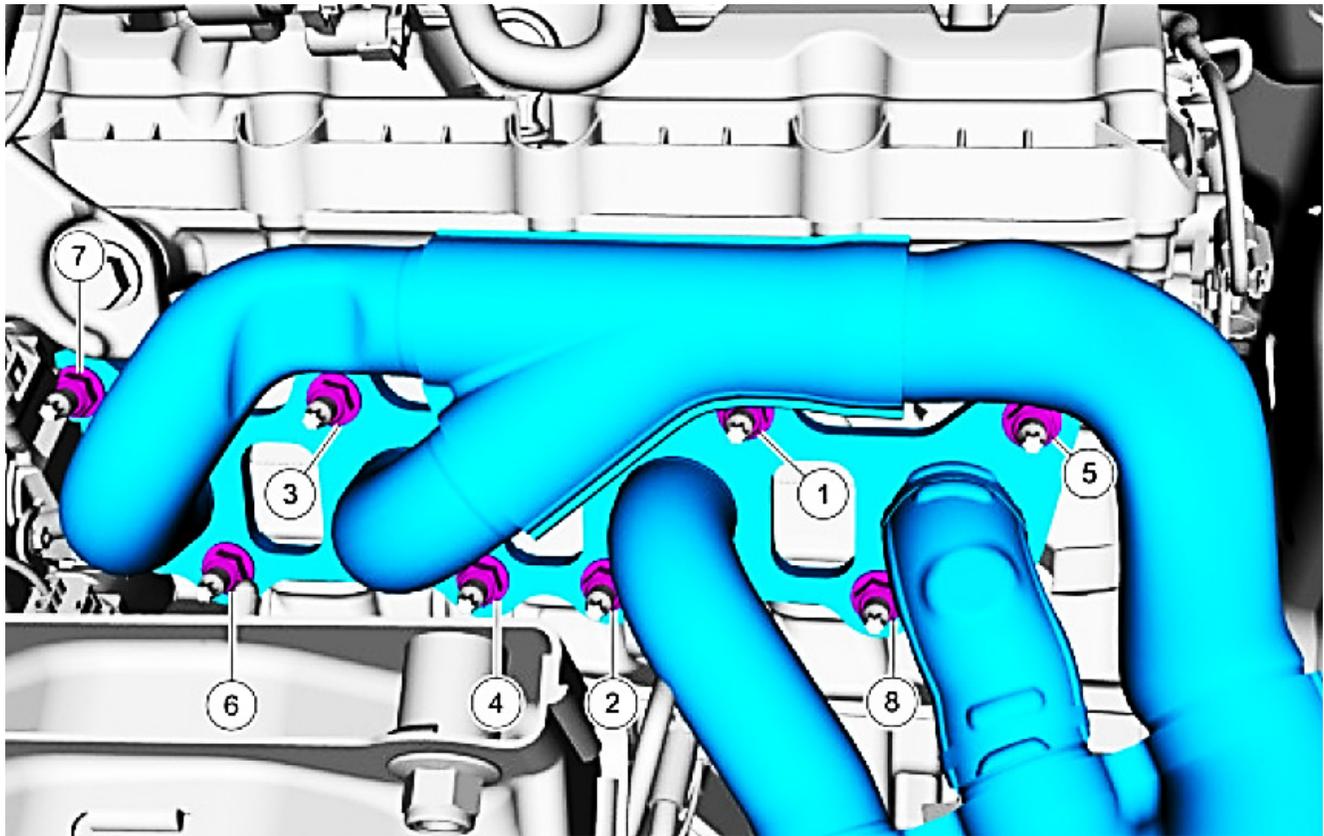


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- Place a Exhaust Manifold Gasket on the Manifold Studs.
  - 1. Position the Catalytic Converter onto the Engine and finger-tight the nuts.
  - 2. Tighten the nuts in the sequence shown.
  - Repeat on the right side.
- Torque: 24 lb/ft (32 Nm)*

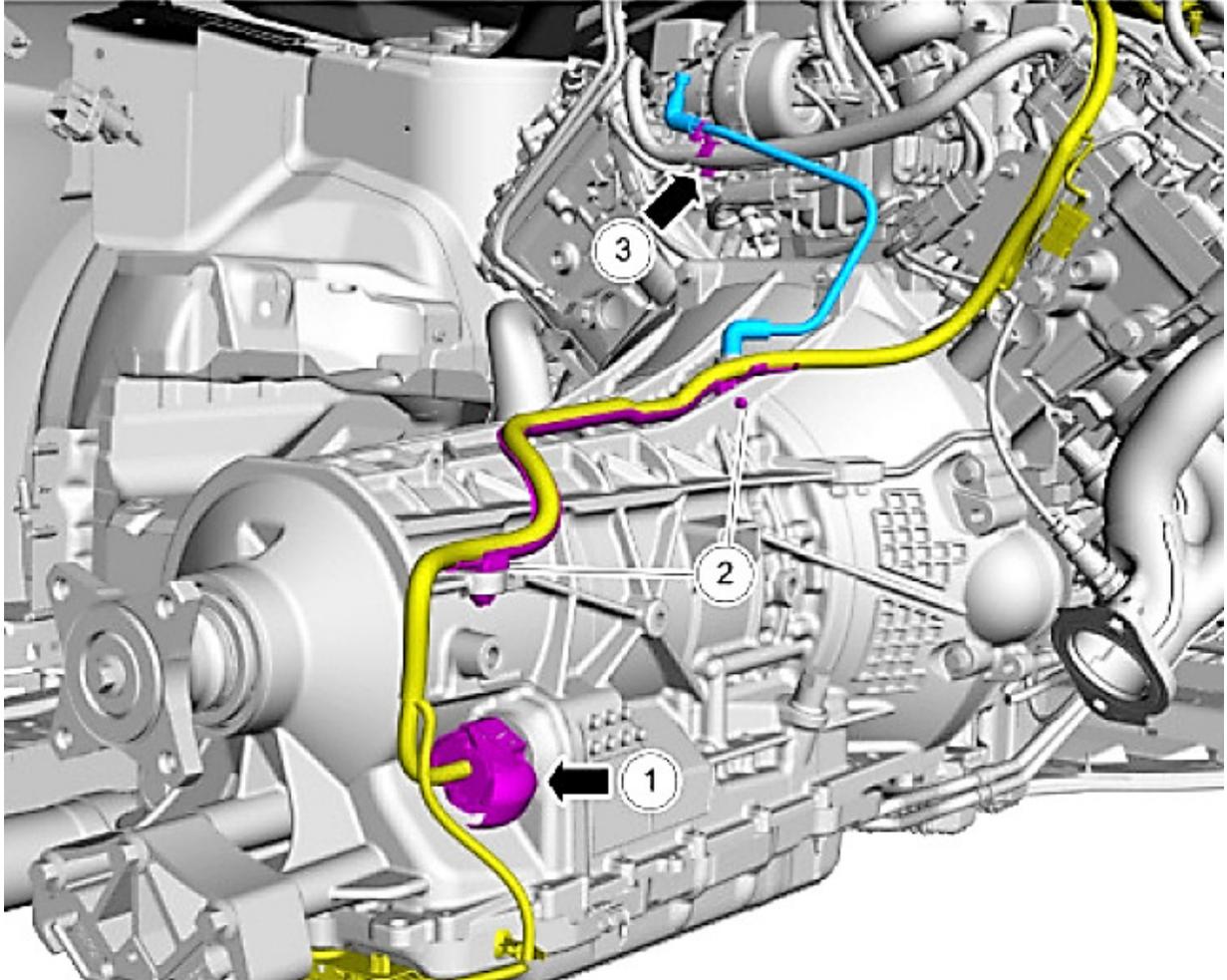


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- Install the Transmission Wiring Harness attaching it to the Transmission Housing as pictured above.



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- Install the Drive Train into the Vehicle.

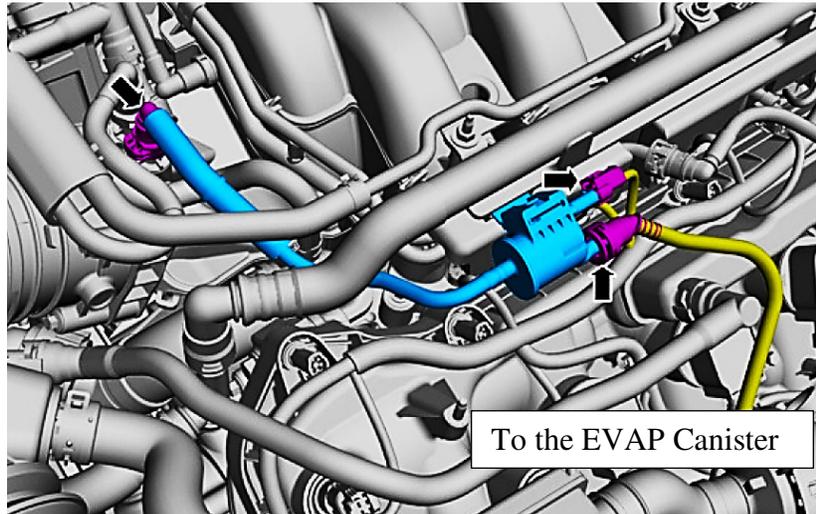


- Install the Brake Aspirator.

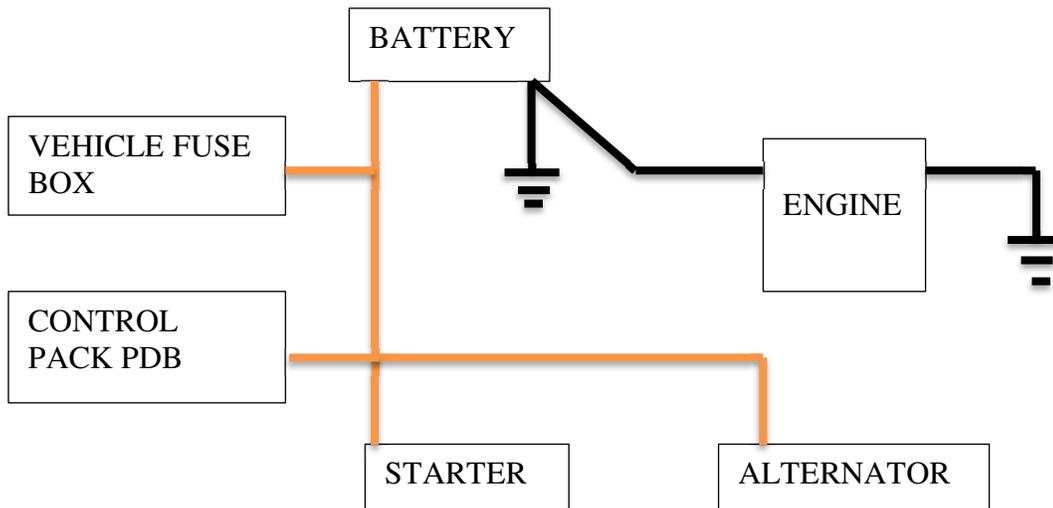
**NOTE: It is very important that this Brake Aspirator is utilized** as it increases the vacuum available to the Brake Booster as well as being important to the tuning in the PCM.



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- If not already present, install the Canister Purge Valve. **The yellow colored hose on the right side of the above photo needs to be run to the EVAP Canister.**
- Connect the Fuel Line from the Fuel Pressure Regulator.
- Connect your cooling system.



### Suggested Battery Cable diagram

- Connect the Battery positive to the Starter and Alternator.
- Ground the Engine to the Chassis.

**NOTE:** Pay close attention to the vehicle grounds. Many times, electrical Issues can be traced back to insufficient ground circuits. Ensuring your vehicle is well grounded now, will save you time and frustration later.

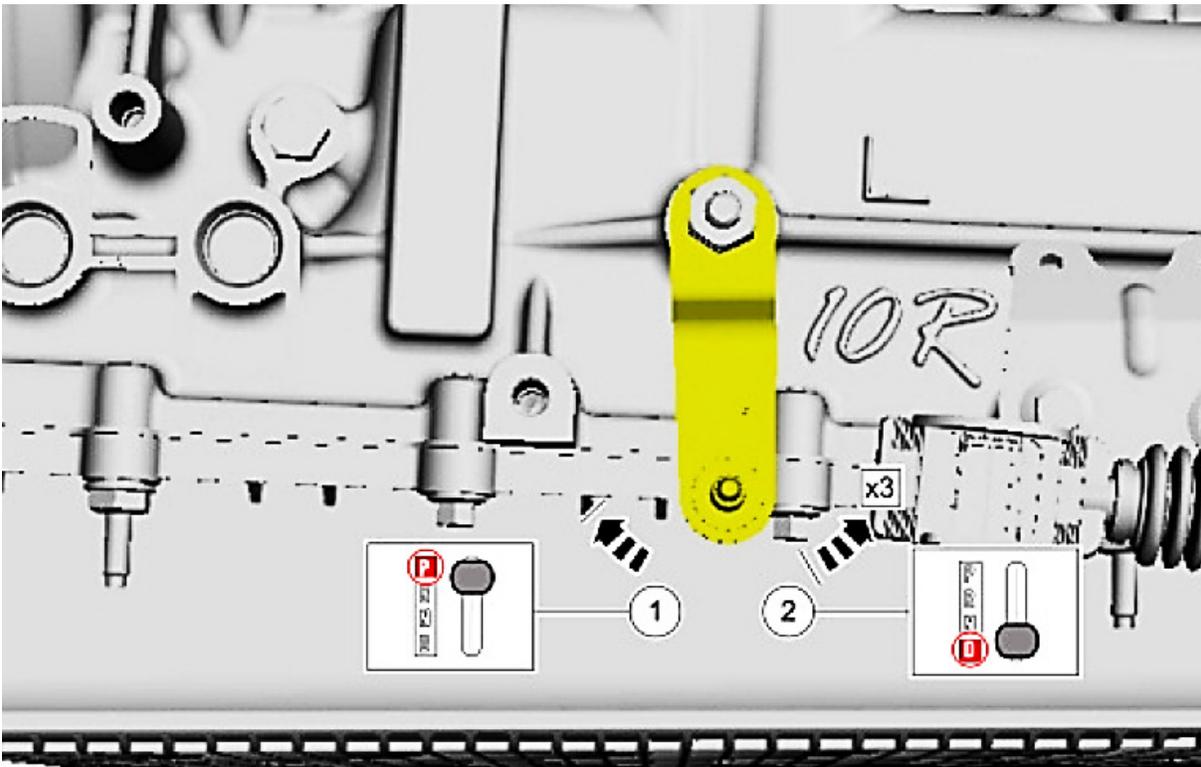


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- **Install and adjust the Shifter Cable**
- Place the Shifter in "D".
- On the left side of the Transmission, find the Gear Selector Lever and push it towards the front of the vehicle until it stops. This will be "P".
- Rotate the Lever rearward three (3) positions. This will be "D".

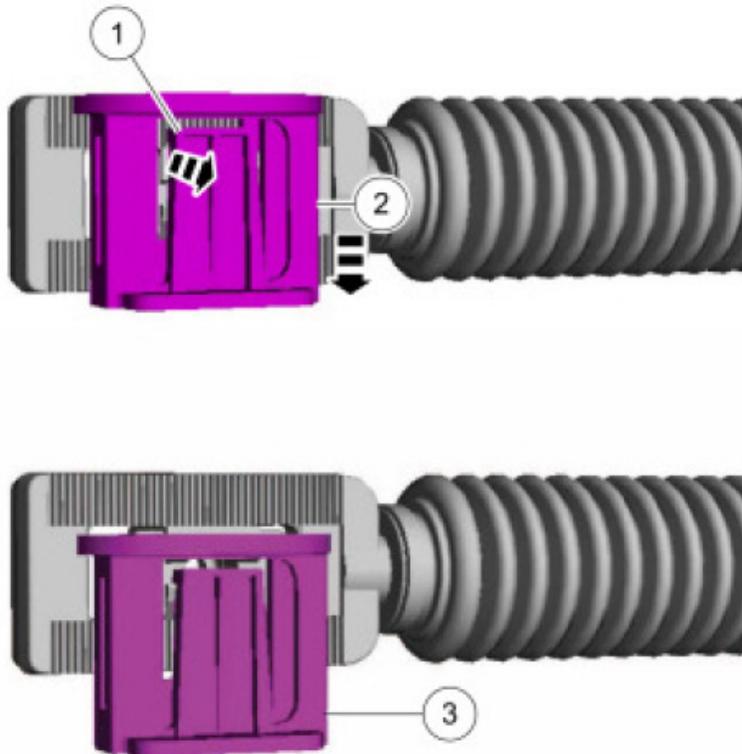


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- Unlock the adjuster.
  1. Gently pry the latch up.
  2. Push the lock tab to slide it down.
  3. Lock tab shown open.

**NOTE:** After locking the adjuster, pull back on the adjuster to make sure it is securely installed.

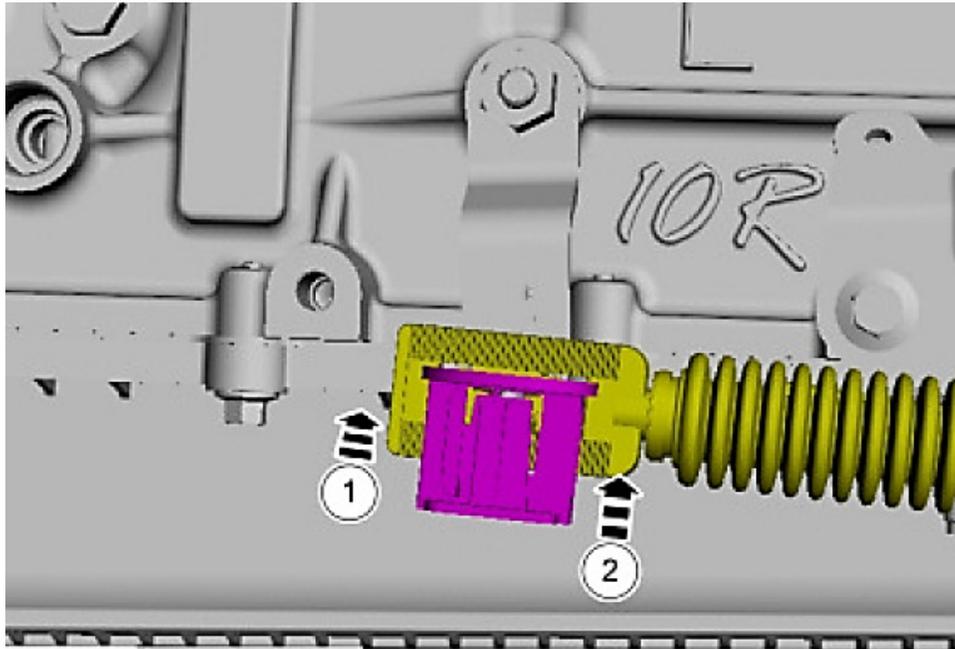


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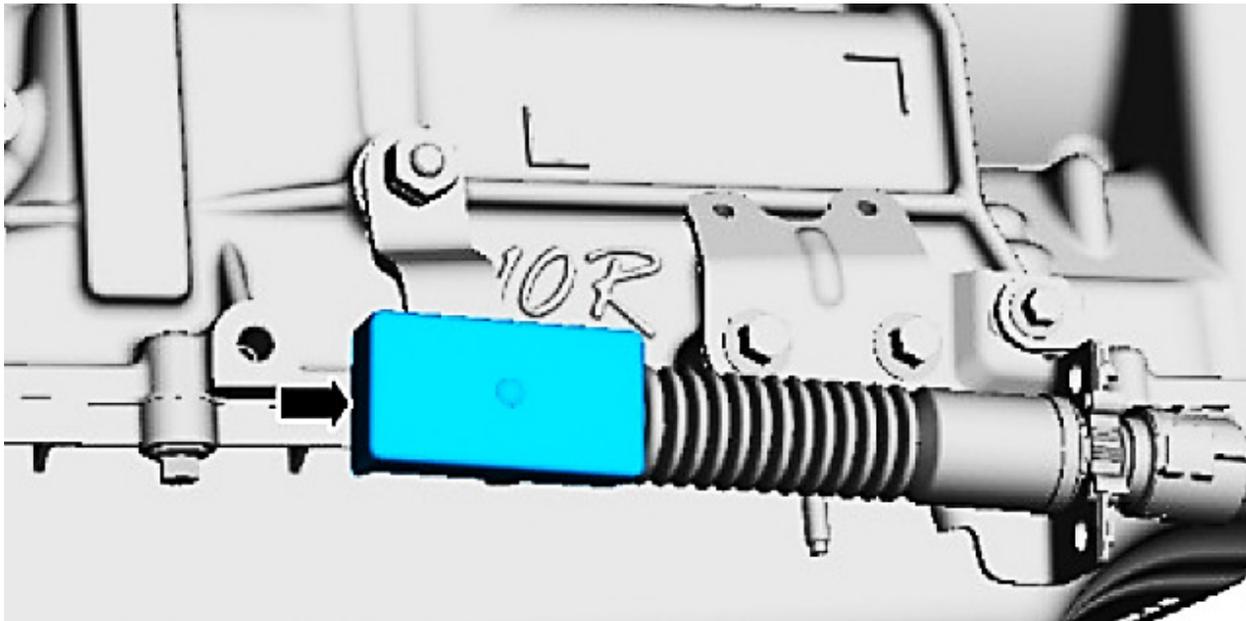
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- Connect and lock the Adjuster.
  1. With the Adjuster lock tab released, connect the Selector Lever Cable end to the manual control lever.
  2. Push the lock tab upward to lock the Transmission Selector Lever Cable Adjustment Lock.



- Install the Heat Shield



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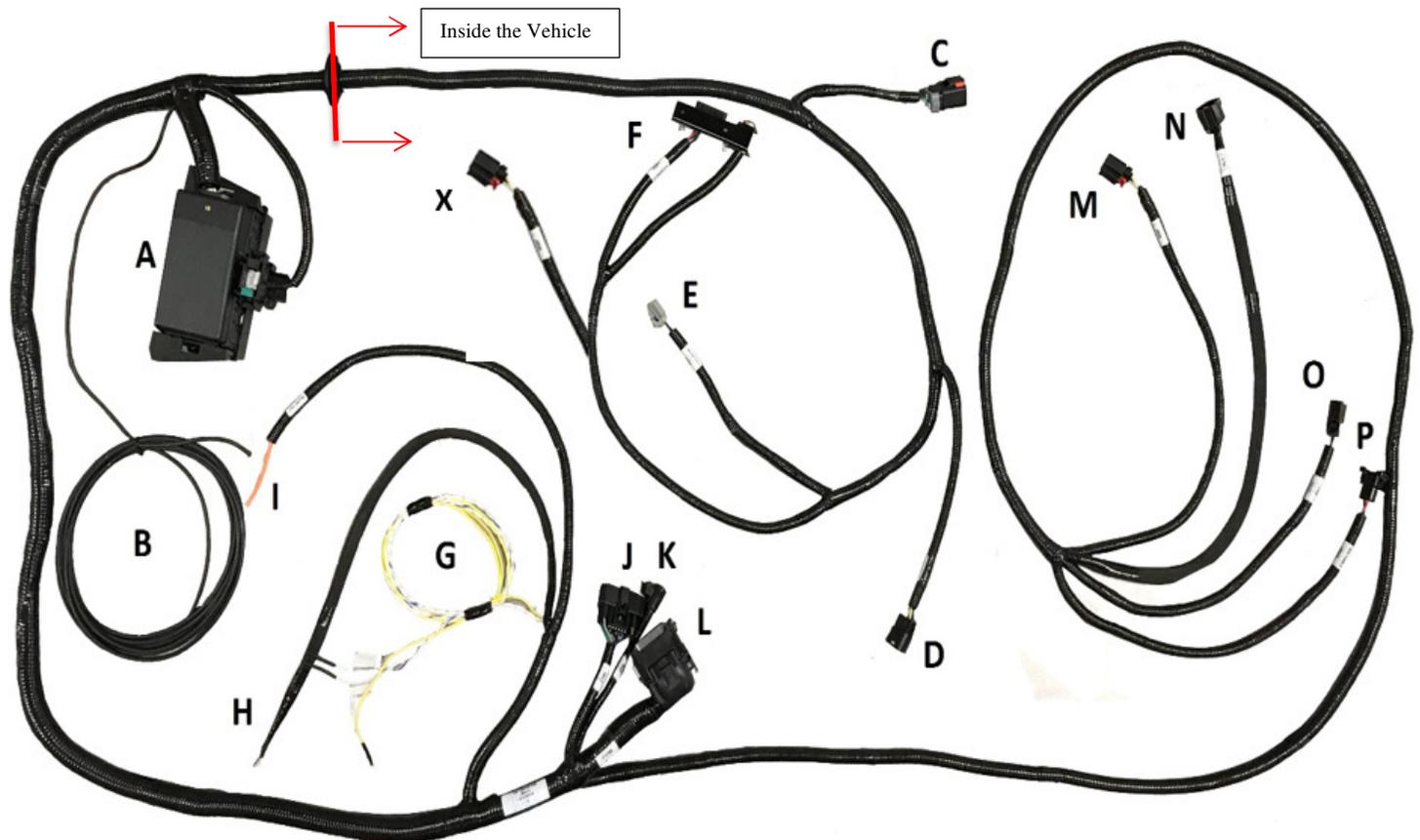
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## 6.0 Control Pack Connection Details

Item	Connector #	Description	Item	Connector #	Description
A	-	FPPDB	O	C132	Ambient Air Temperature Sensor
B	-	Ground	P	C400	Intercooler Pump
C	C160A	Inline to IP Pigtail	Q	C90	PCM Trans connector
D	C2040	APPS	R	C1A	Inline to Controls Pack Harness
-	-	-	S	C1571	O2 sensor Upstream-RH
F	C251	Data Link Connector & MIL	T	C1572	O2 sensor Upstream-LH
G	-	Optional EPAS connection	-	-	-
H	-	Starter Solenoid	-	-	-
I	-	Cooling Fan Feed	W	C168A	Automatic transmission Bulkhead
J	C146	Auxiliary Inline to Engine	X	C8	PATs Module
K	C1B	Inline to Trans Harness	-	-	-
L	C175B	PCM vehicle connector	-	-	-
M	C128	Mass Air Flow Sensor	-	-	-
N	C102A	Alternator	-	-	-

Table 1 - Summary of Controls Pack Connectors





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Figure 1a - Controls Pack Wiring Harness Components



Figure 1b – Transmission Harness



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## 6.1 Engine Harness Routing(Automatic)

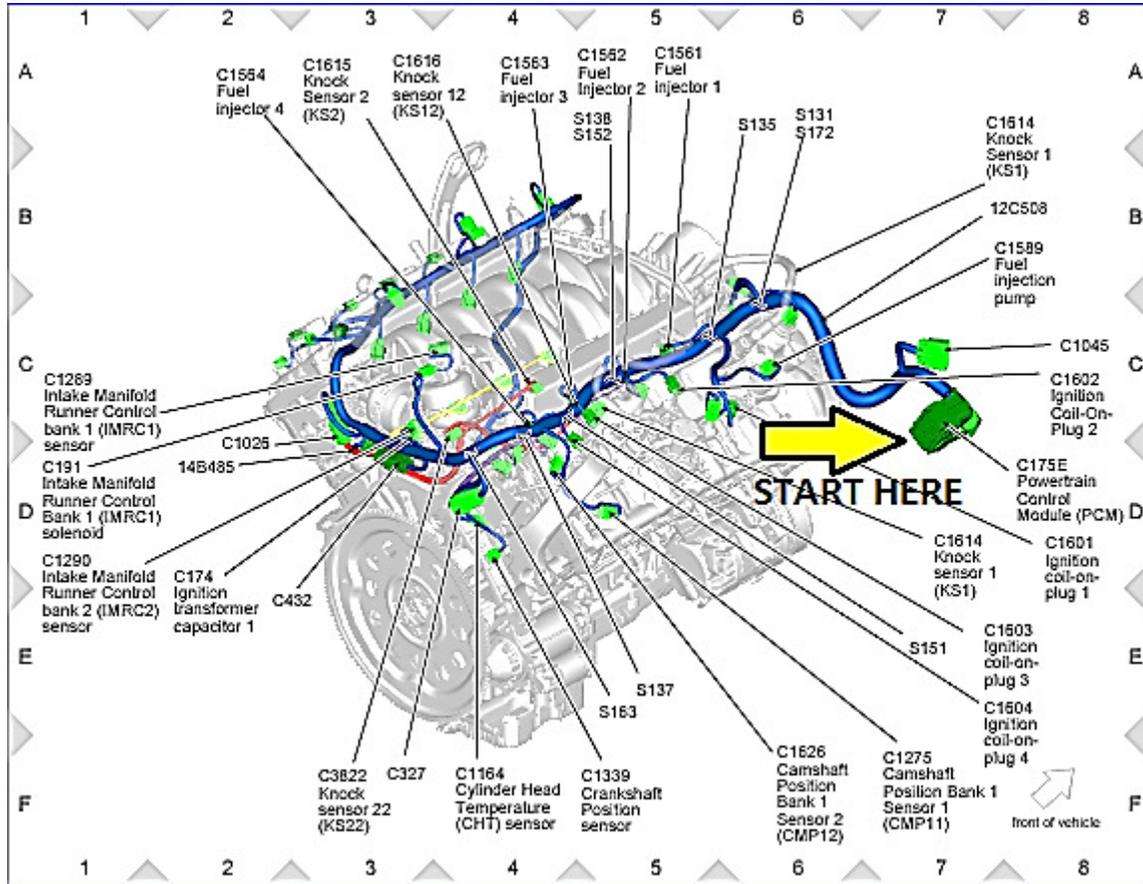


Figure 2 – Rear View of Engine.

**Note:** The wire harness shown in blue above is the ENGINE harness that comes standard with the 5.0L 4V TiVCT NA Crate Engine (Ford Performance P/N: M-6007-M50A); **THIS IS NOT THE CONTROLS PACK WIRING HARNESS.** The automatic engine harness comes with the connection to transmission assembly which can be plugged in.



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## Front View of Engine:

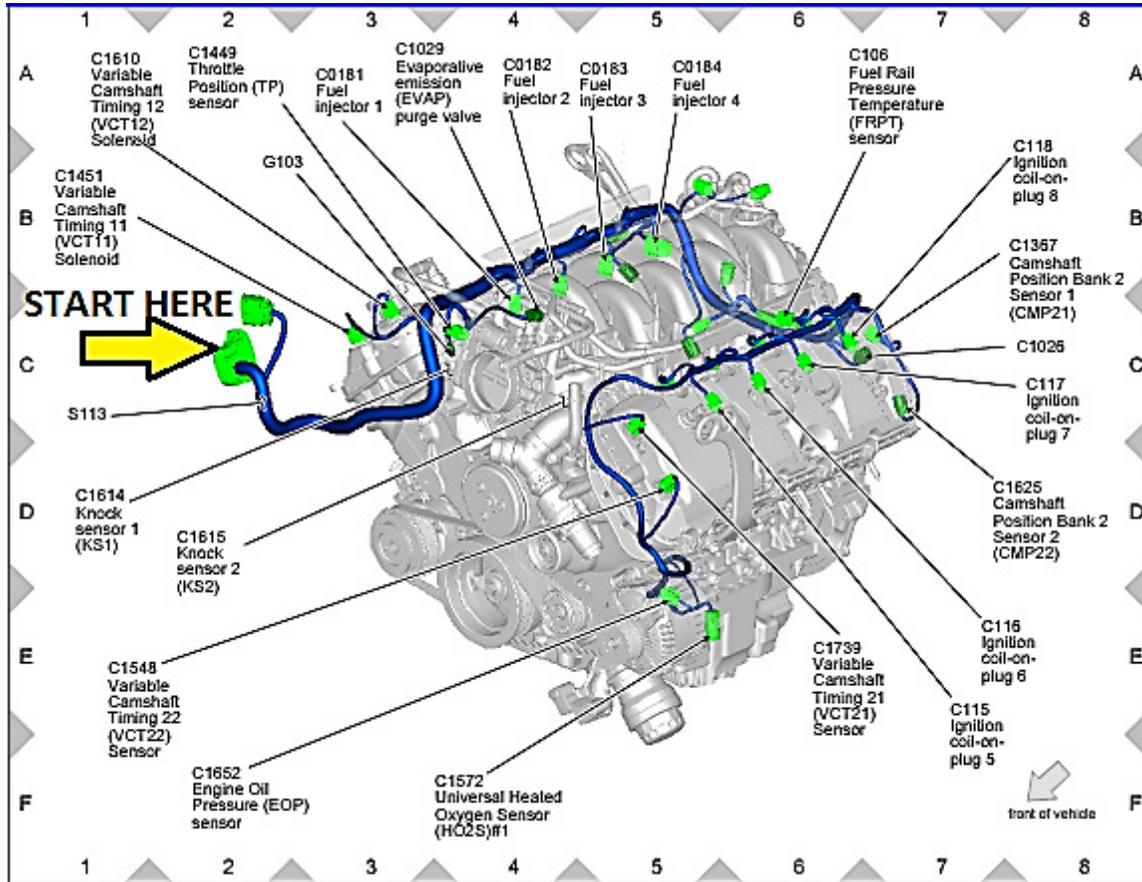


Figure 3 – Front View of Engine.

**Note: The wire harness shown in blue above is the ENGINE harness that comes standard with the 5.0L Gen3 Mustang Crate Engine (Ford Performance P/N: M-6007-M50C); THIS IS NOT THE CONTROLS PACK WIRING HARNESS.**

## 6.2 Tools Required

- Wire cutter / stripping tool
- Crimper
- Digital volt / ohm meter
- Solder gun / solder
- Center punch
- Cordless drill / drill bits / hole saw / screwdriver bits



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### 6.3 Controls Pack Harness Installation Instructions

**NOTE:** To avoid electrical shock and/or damage to sensitive electrical control system components, before beginning any work, remove the vehicle's negative Battery terminal and place a rag or towel between it and the Battery negative Post. **The negative Battery terminal is not to be reinstalled until the last step of installation.**

1. Identify proper mounting location for the PCM, Power Distribution Box (Item A) & Inline Fuse Holder. Locate the PCM connector (Item L) on the Engine Harness as indicated in Figures 2 and 3 by the "START HERE" arrow.
2. Plug the Engine Harness Main connector (C175E), Item L from the Controls Pack Harness and Item Q from Transmission Harness into the PCM; once plugged-in, use a zip-tie to tie the bundle of wires exiting each connector back together. Route the Transmission Harness so that all upstream O2 sensor connectors (Items S and T) are able to reach their corresponding sensors. Connect the O2 sensors and 1-way inline connectors (Items N and K). In the steps that follow, we will be repeating this process of using zip-ties to piggy-back/tie the harness to the existing engine harness approximately every 200 mm or so along the engine harness.
3. Connect the in-line connector (Item J) from the Controls Pack Harness to the mating connector on the Engine Harness.
4. Connect Alternator Connector (Item N), Mass Air Flow (MAF) Sensor Connector (Item M), Ambient Air Temperature Sensor Connector (Item O) to their respective locations, being sure to avoid any pinch-points or exhaust hot-spots.
5. Connect blunt-cut orange 10 AWG cooling fan lead and Starter Lead Eyelet (Item E) to their respective locations.
6. The grommet needs to be properly installed in the firewall of your vehicle so as to protect the Controls Pack Harness routing that passes through to the passenger compartment. All connections previously mentioned are located under hood; all connections mentioned from this point on are located in the passenger compartment.
7. Identify proper mounting location for the Accelerator pedal and Ignition Switch (purchased separately).
8. Identify mounting location for the Bracket with OBDII connector and Malfunctioning Indicator Light.
9. Connect the Ground Eyelet (Item B) to a reliable ground point on the chassis or engine block, away from dirt and water.
10. Route the IP Pigtail (Item C) to approximately the base of the steering wheel to be connected later.
11. Connect the APPS (Item D) to the Accelerator Pedal.
12. Locate the 6-way I/P Pigtail connector with blunt leads (Item C) and continue to Section 6.

\* Removal Procedures for Unused Connectors:

If 100% sure connector is not currently needed and will not be needed in the future, cut routing leading-up to unused connector and individually heat shrink each wire herein. To ensure that the wires are completely isolated from one another and the outside environment, you may also want to wrap the heat-shrunked wire in electrical tape to provide an additional layer of protection from moisture and dirt.



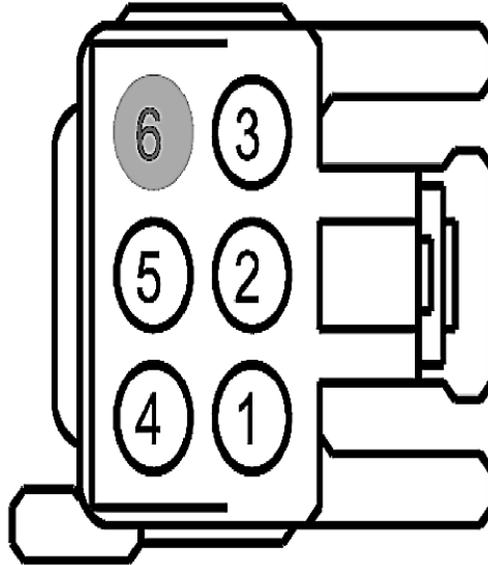
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- Shifter Lever Switch Pigtail.



Pin	Circuit	Gauge
1	CET52 (GN)	26
2	GD216 (BK-VT)	18
3	VLN04 (VT)	26
4	CET53 (BU-OG)	22
5	GD216 (BK-VT)	18
6	*	*

- Pin 1 connect to Pin 4
  - Pin 2 connect to Brake Switch Output (12v when the Brake Pedal is depressed)
  - Pin 3 NOT USED
  - Pin 4 connect to Pin 1
  - Pin 5 Ground to Chassis
- Plug the Shifter in. Wiring the Shifter in this manner allows the Park Release to operate as intended in the 2020 Mustang. When the Brake Pedal is depressed, It will allow you to shift from Park. It will not operate when in any other Gear is selected.



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### 6.4 6-way I/P Pigtail Connection Details



The 6-way pigtail is to be connected according to the chart below. See also the diagrams on the following pages for illustrations of wire connection points, based on the ignition/starter switches that you intend to use. Setup A uses separate toggle switches for ignition and starter inputs, while Setup B uses an ignition cylinder with a key.

Cavity	Lead Label	Wire Color	Description
1	Fuel Pump Relay Out	GN	Provides +12V to the fuel pump
2	-	-	-
3	Starter Motor Request (SMR)	Light Blue	Apply +12V to send a request to the PCM to energize the starter solenoid
4	-	-	-
5	Ignition Relay Trigger	Light Green	Apply +12V to energize the ignition relay/wake-up the system
6	-	-	-

6.4.1 Locate each of the Blunt Leads. This is where you will need to make all of the soldered connections for the harness. Before soldering any wires, however, you must first decided which set-up you will pursue by referencing Set-up A and Set-up B on pages 19 and 20. Once you've decided on your set-up, continue to Step 6.2.

6.4.2 Connect the following REQUIRED blunt leads as follows:

6.4.3 **Blunt Lead 1 – Fuel Pump Relay Out (Dark Green):** Connect to Fuel Pump positive. Separate ground for fuel pump must be provided. The fuel pump will start running any time key is on, then if you don't start the engine the computer will turn it off after a couple of seconds.

6.4.4 **Blunt Lead 3 – Starter Motor Request (Light Blue):**

Set-up A:

Connect to input node of starter momentary switch so that 12 volts is provided when engine starting is requested.\*

Set-up B:

Connect to 'Start' output node of ignition cylinder so that 12 volts is provided when engine starting is requested.\*



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**6.4.5 Blunt Lead 5 – Ignition Relay Trigger (Light Green):**

Set-up A:

Connect this wire to the output side of the ignition toggle switch so that 12 volts is provided when the key is in the 'Start' (cranking) and 'Run' positions. It is imperative that this circuit be reliable, the PCM will interpret an intermittent voltage on this signal as a request to shut down the engine! (Hint, if your engine shuts down after a hard launch check here first).

Set-up B:

Connect to the 'Start/Run' output node of ignition cylinder so that 12 volts is provided when engine starting is requested. It is imperative that this circuit be reliable, the PCM will interpret an intermittent voltage on this signal as a request to shut down the engine! (Hint, if your engine shuts down after a hard launch check here first).

Once all of the blunt lead connections have been soldered onto their appropriate location, insert the 16-way I/P Pigtail connector into Item C.

**\* Important Note on the Starting System**

This kit includes connections and installation instructions for PCM controlled engine starting; however, it is not required that the customer utilize this option. Customers may choose to use their existing non-PCM controlled starting system if desired. If non-PCM controlled starting is used, Step 6.2.2 may be omitted, and any unused blunt leads should be cut to ~2" length and sealed using heat shrink.



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## 7.0 Ford Performance Power Distribution Box Installation

- 7.1. Before you start, you should have your two battery jumper cables at hand (purchased separately, 4 AWG recommended), one from Battery to fuse holder, the other one from fuse holder to FPPDB.
- 7.2. Carefully remove the nut and washers on both terminals of the in-line fuse holder and set aside.
- 7.3. Use one of your battery cables and place the eyelet onto one of the two in-line fuse holder terminals, then one of the washers, and then tighten down with one of the two nuts.
- 7.4. Locate the power terminal of the side of FPPDB, notice there is a battery positive blunt lead eyelet already attached to it. Attach the other eyelet to this power terminal by tightening the nut down on top of the eyelet. The order of installation on the power terminal should be a washer, the battery cable eyelet, then the blunt lead eyelet, another washer, and then the nut. Avoid sharp points and using zip-ties to secure the cable (approximately every 200 mm) along the way. **DO NOT CONNECT ANYTHING TO THE BATTERY YET.**
- 7.5. Place the Buss 250A fuse onto the fuse holder terminals.
- 7.6. On the opposite in-line fuse holder terminal, place one eyelet of your second battery cable, then the other remaining washer, and then tighten down with the remaining nut.
- 7.7. Close the cover of the in-line fuse holder.
- 7.8. Being careful not to inadvertently complete the circuit, connect the opposite end of the battery cable to the positive terminal of the vehicle battery.

Note: This lead **MUST** be hot at all times (HAAT). If this lead is connected through a switch, the Keep Alive Memory (KAM) of the PCM will be cleared whenever the switch is opened. This will result in loss of diagnostic trouble codes, adaptive fuel parameters, and other information stored in KAM by the PCM.

- 7.9. Install and tighten the negative battery terminal (not included in kit) onto the vehicle battery. Attach the ground blunt lead to the negative battery terminal (you will need to provide the eyelet). Verify that you have a good reliable (dry and clean) ground path from the battery negative post to the chassis ground. In general, the resistance from the battery ground to this chassis location should be less than 0.1 ohm.

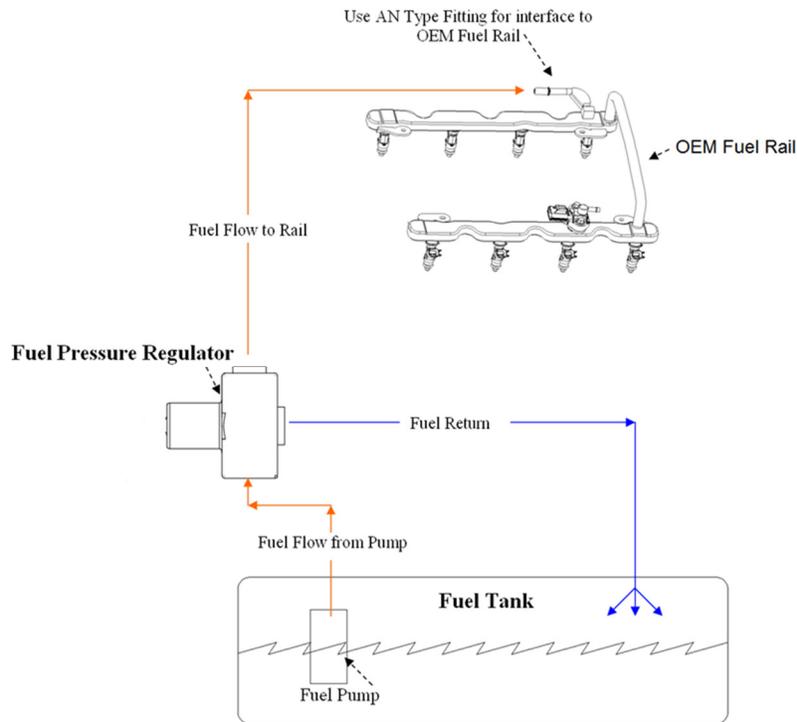


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## 8.0 Fuel System

The PCM is calibrated for a return style fuel system as shown below.

- Included pressure regulator is set at the factory to 75psi. Do not try to adjust it.
- Use only AN type fuel fitting to interface with OEM fuel rail.
- Fuel Pump must be capable of 160 liters per hour flow at 75 psi..



**Fuel pump requirements: 160L/Hr minimum at 75psi**

### Fuel pump location

A common and often overlooked problem is the location of the fuel pump or pumps. Optimally, the fuel pump should be mounted IN THE TANK to reduce the possibility of pump cavitation. Cavitation is essentially localized boiling caused by a reduction in pressure, generally occurring on the inlet side of a pump. This localized boiling results in fuel vapor bubbles which will reduce the volume of fuel the pump is capable of delivering to the engine. Any reduction in pressure or increase in temperature at the inlet side of the pump increases the chances that cavitation will occur. For this reason, it is always best to either have the pump inside the tank immersed in fuel or (in the case of an external pump) gravity fed, which will increase the pressure on the inlet side of the pump. If the fuel pump has to "pull" the fuel, this will result in a reduction in pressure at the fuel pump inlet potentially allowing cavitation and, thus, vapor bubbles to develop. These vapor bubbles are then drawn into the fuel pump and exit the high-pressure side of the fuel pump as compressed vapor. They travel the entire length of the fuel system and are expelled through the fuel injector. This can cause issues ranging from stumbles and hesitations to engine damage due to insufficient fuel delivery and lean A/F ratios. Sometimes this problem can characterize itself by only appearing when the weather gets warmer, which can confound the diagnosis of the issue. In certain cases, it may seem to only develop when driving on certain surfaces, because pavement reflects more heat than an off-road 4x4 trail. Remember, more heat and lower pressure on the inlet side of the pump means a greater chance of cavitation, which is to be avoided whenever possible.



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If you are using an external mounted fuel pump, you should run a very coarse (typically around 100 micron) filter on the inlet side of the fuel pump, and a finer (typically around 10 micron) filter on the outlet side of the pump. A paper filter is NOT recommended on the inlet of the fuel pump because it can cause a restriction in fuel flow which, as mentioned previously, can lead to cavitation.

**Warning: It is highly recommended that an inertia switch is incorporated into the fuel pump wiring to turn off the fuel pump in event of an accident.**

## 9.0 Initial Start-Up

Note: The following information assumes completion of each of the previous steps of this installation manual.

Check all fluid levels, electrical and fluid connections.

9.0 Pressurize the fuel system by turning the key on. Inspect the entire fuel system (from tank to engine) for leaks.

**!!! NOTE: If any leaks are found, do not proceed further until these have been corrected!!!**

9.1. Start Engine.

9.2. Check for leaks and/or noises that may indicate a problem.

9.3. Use the ProCal diagnostic tool to configure your driveline. Use an internet browser to visit <https://www.performanceparts.ford.com/Default.asp> and register and update the PROCAL tool included in your kit (additional instructions for registration are available on this site)

9.3.1. Set Tire circumference and Axle ratio

9.3.1.1. Connect PROCAL to the OBDII port of the vehicle

9.3.1.2. From the "Main Menu" select "Diagnostics & Tools"

9.3.1.3. From the "Vehicle Diagnostics" menu select "Tire/Gear Adjust"

9.3.1.4. Enter the Tire rev/mile as specified by your tire manufacturer

9.3.1.5. Enter the Axle ratio installed in the vehicle

9.3.1.6. Follow the tool prompts to cycle the ignition

9.3.1.7. Tool will report "Done" when the procedure is complete

9.3.2. Learn the crankshaft profile correction

9.3.2.1. Connect the PROCAL to the OBDII port of the vehicle

9.3.2.2. From the "Main Menu" select "Diagnostics & Tools"

9.3.2.3. From the "Vehicle Diagnostics" menu select "Service Functions"

9.3.2.4. From the "Select Functions" menu select "Crank Relearn"

9.3.2.5. Follow the instructions as prompted by the tool to complete the process

9.4. Install the emission label. Placement should be in a visible location on the hood or dashboard.

**CAUTION: Be certain to run the vehicle in a well ventilated area.**



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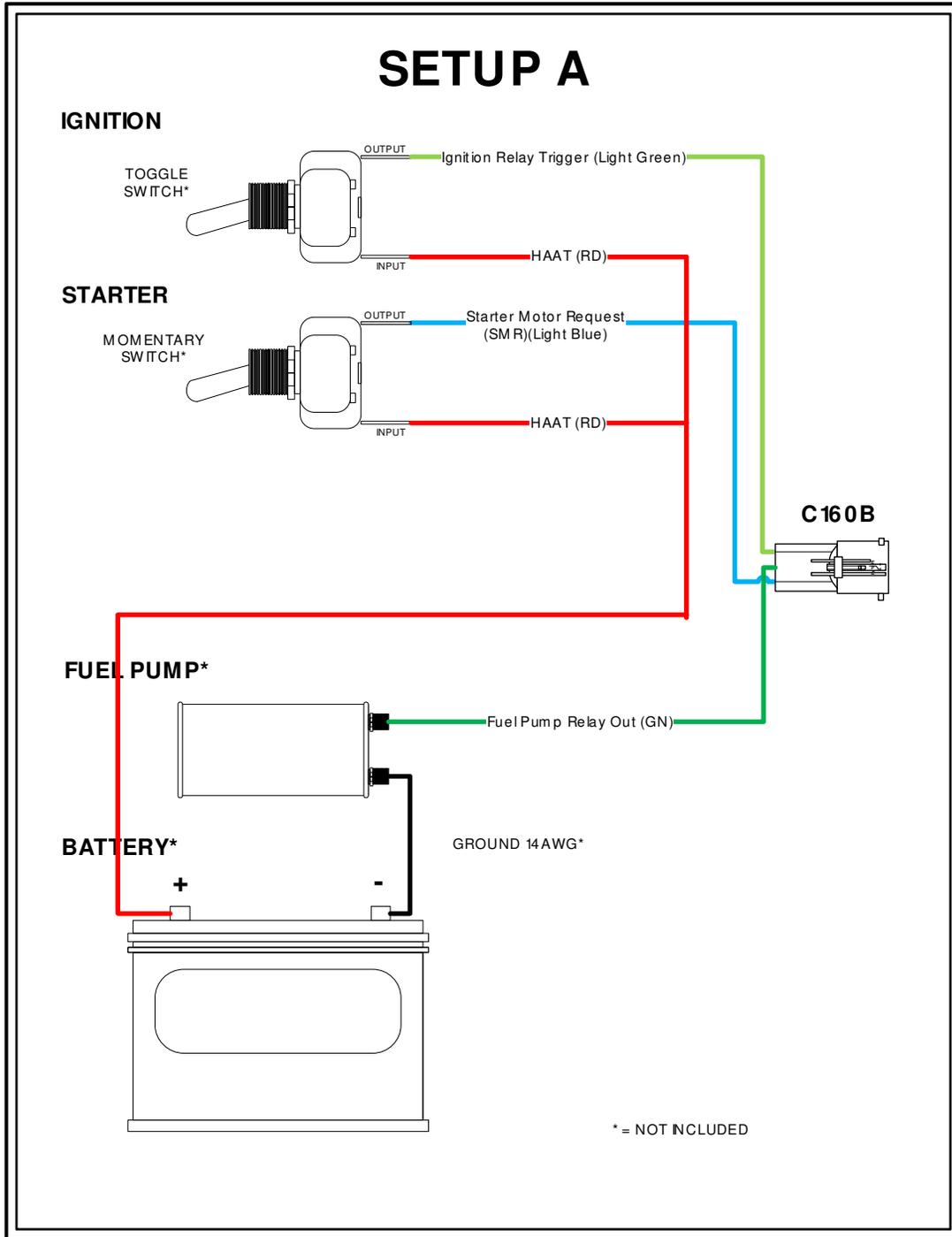
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### 10.0 Wire Usage Schematics

The following two pages detail the two most common wiring configurations—please choose one to complete installation of your controls pack kit. You will need to provide 12V HAAT wire yourself.





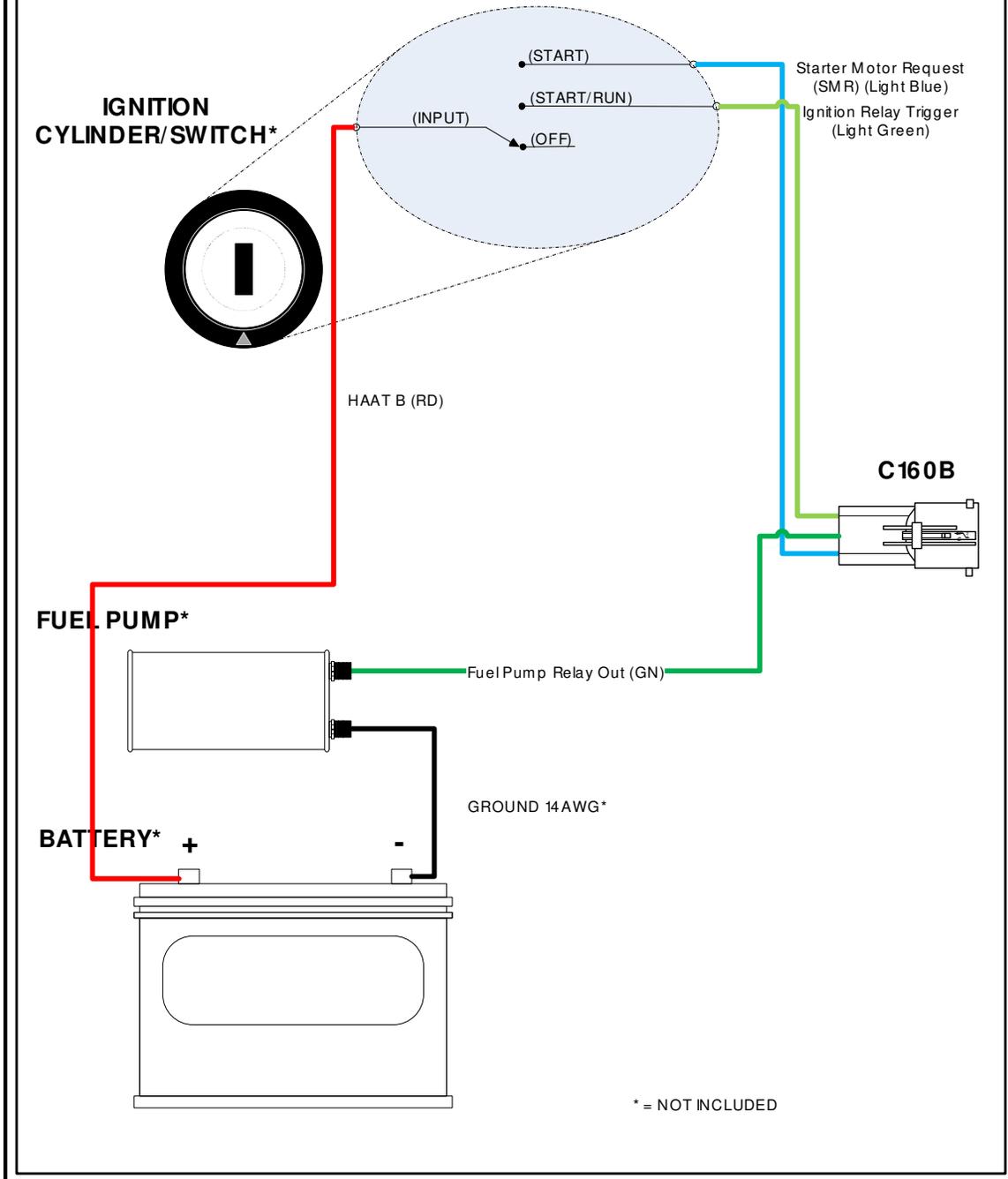
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## SETUP B



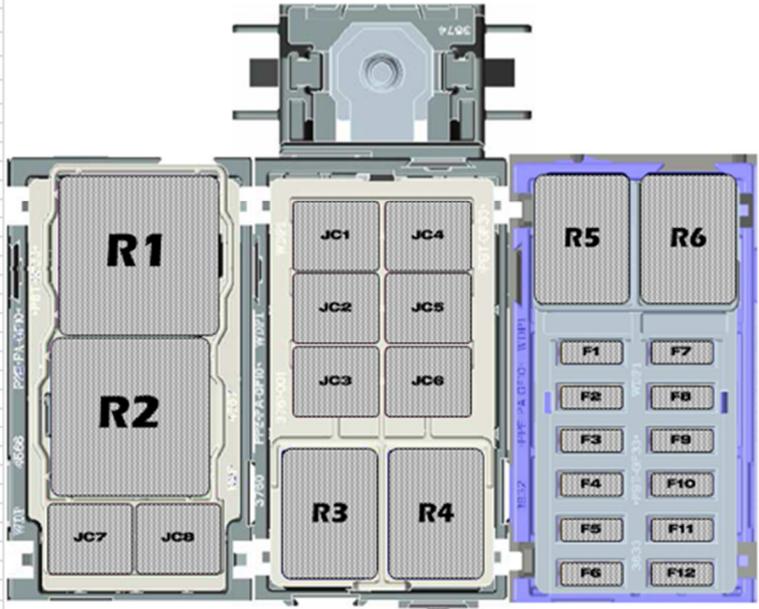


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11.0 Fuses & Relays

- The following diagram outlines the array of fuses and relays included in the controls pack wiring harness, and the function of each.
NOTE: Do NOT replace any of the fuses with a higher value than those specified below.

Table with 4 columns: Component ID, Type, Value, Name. Lists components like JC1 (PCM Relay Feed), F1 (VPwR1), R1 (PCM Relay), etc.



(Top View of PDB - Component ID)

12.0 Troubleshooting tips:

The following troubleshooting tips are intended for you to run a few quick tests to roughly determine what the issues are before calling or find a solution yourself:

- Double check all the grounds. The wirings included in this kit is extremely sensitive to ground issues. Secure all the connections from the chassis grounds to the battery's negative post.
Check all reference voltages, confirm they are not shorted. Use a multimeter to measure the voltage at each sensor. It should read 5V.
If none of the sensors or components have power, check th ignition switch, ignition relay R6, and PCM relay R1 wiring. It should have 12V at both relay outputs with the ignition on.
If the sensor and relay measured voltages are correct, but the Engine does not crank, check for the starter switch and starter relay R3 wirings.
If your engine only cranks, but does not fire, a fuel system malfunction could be the cause.

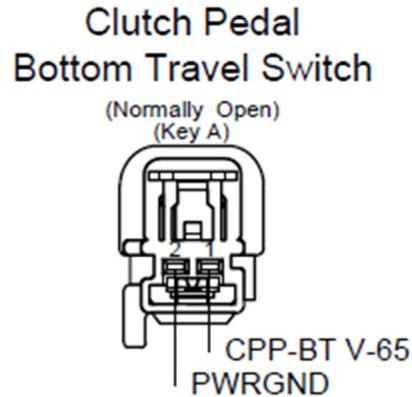
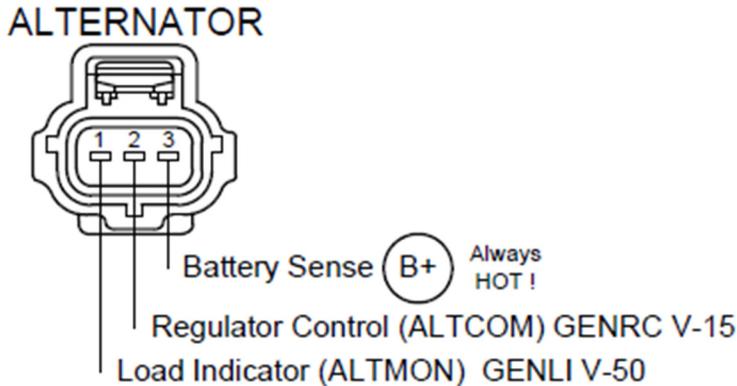
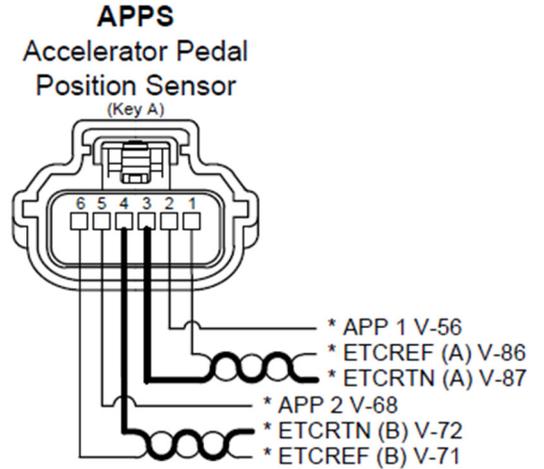
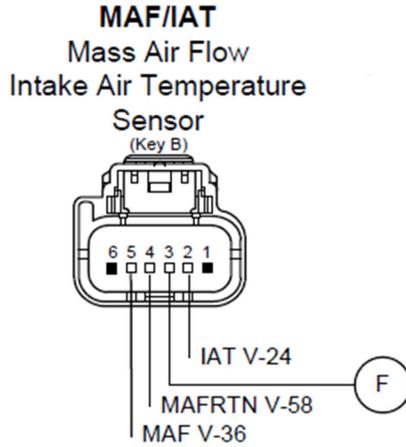
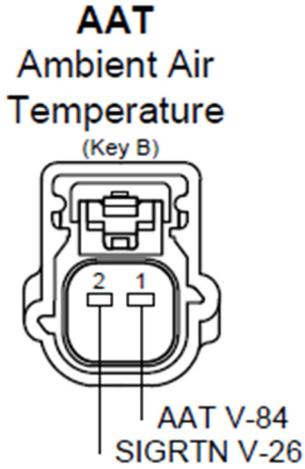


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## 13.0 Connector Faces





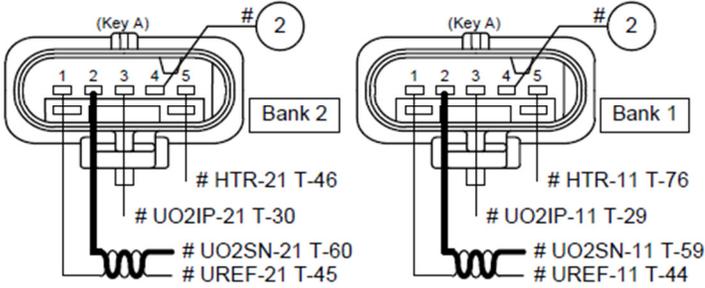
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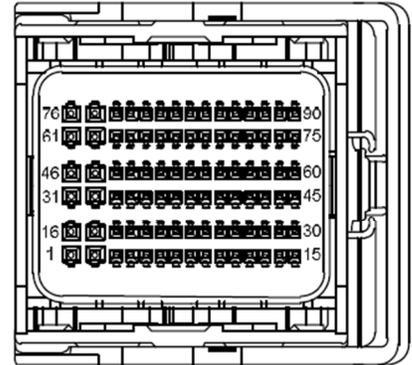
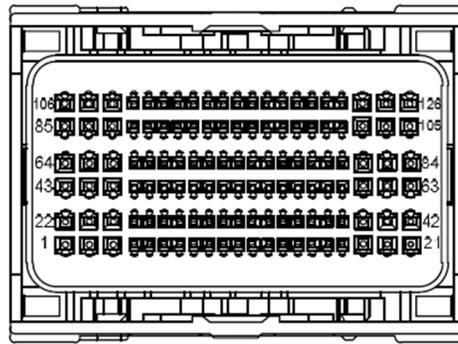
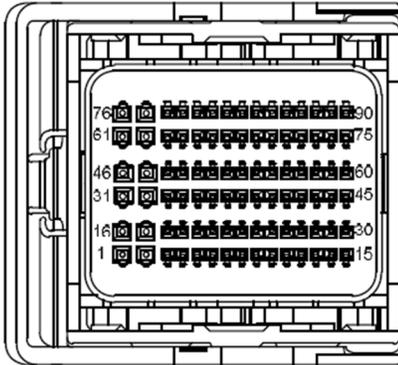
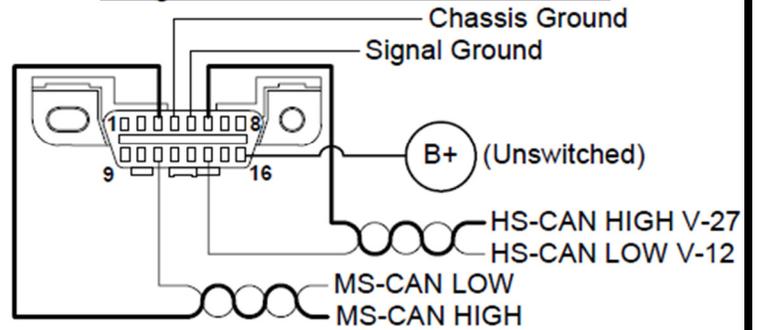
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## UEGO Upstream

Universal Exhaust Gas Oxygen Sensor



## Diagnostic / Data Link Connector



## CMS Downstream

Catalyst Monitor Sensor

