



FORD PERFORMANCE

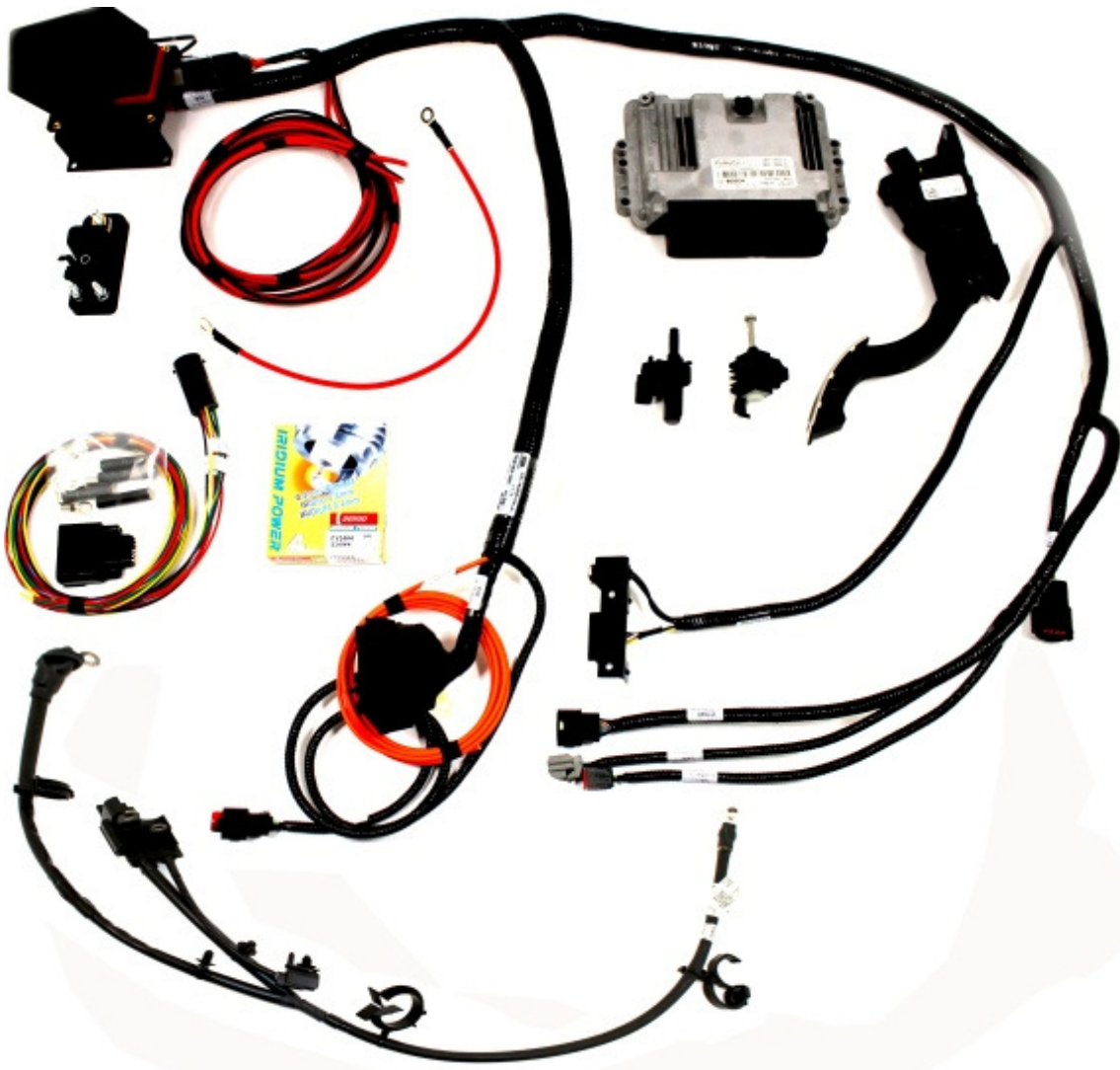
M-6017-20T 2.0L GTDI Controls Pack Instruction Sheet

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Please visit www.fordracingparts.com for the most current instruction and warranty information.

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

Controls Pack Installation Manual 2012 and newer 2.0L GTDI



Factory Ford shop manuals are available from Helm Publications, 1-800-782-4356



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1.0 Introduction

This kit was developed by Ford Performance in order to allow performance enthusiasts the ability to install the 2.0L 4V TiVCT GTDI Crate Engine (Ford Performance P/N: M-6007-20T) into the application of their choice. The system supports use of a manual transmission only.

Note: Cruise control is not available with this system

2.0 Overview

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

3.0 What's Included

3.1 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, spark timing and boost pressure according to varying driver demand (ie – accelerator pedal input).
- The wiring that plugs into the PCM is integral to the wiring harness that was included with the 2.0L crate engine, the length of these wiring leads dictate that mounting location be in close proximity to the engine itself.

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- The PCM in this Controls Pack has a custom software and calibration dataset which were specifically modified/developed by Ford Performance engineers to provide peak performance and reliability with the 2.0L 4V TIVCT GTDI Crate Engine (Ford Performance P/N: M-6007-20T)



3.2 Accelerator Pedal Position Sensor (APPS) – BV6Z-9F836-E

- 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.



3.3 Clutch Pedal Position Switches: Bottom Travel (CBT) - 6G9Z-11A152-A (Gray Plunger) Top Travel (CTT) - 4M5Z-11A152-A (Black Plunger)

- The switches translate the clutch pedal position to the PCM. The bottom travel switch also acts as a starter safety interlock. The starter motor will not energize until the clutch has been fully depressed.
- CBT switch is Normally Open (IE – Clutch Pedal NOT fully depressed); Closed with Clutch Pedal fully depressed
- CTT switch is Normally Open (IE – With Foot off Clutch Pedal); Closed Otherwise

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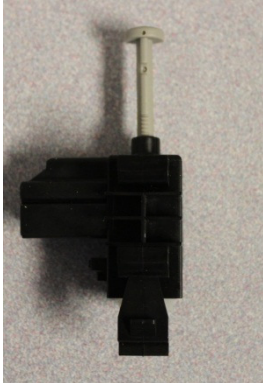


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- Clutch pedal assembly P/N: BV61-7B633-AA is available through an Authorized Ford Parts dealer. Includes a clutch pedal and mounting bracket with provisions to hold both the Top and Bottom of Travel switches in the appropriate locations



WARNING: DO NOT BYPASS THE STARTER INTERLOCK. DOING SO CREATES A HAZARD TO THOSE IN AND AROUND THE VEHICLE AS THE STARTER CAN ENGAGE WITH THE TRANSMISSION IN GEAR AND THE CLUTCH PEDAL LET OUT.

3.3 Universal Exhaust Gas Oxygen Sensor (UEGO) – BA5Z-9F472-A

- UEGO sensor provides 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.
- UEGO is supplied with a light coat 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).
- Locate the UEGO sensor within 2-3" of the turbo outlet
- Tighten to 48 Nm (35 lb-ft).
- **NOTE:** Do not splice, lengthen or otherwise modify the UEGO wiring. Doing so will adversely affect the sensor performance & reliability of the signal.



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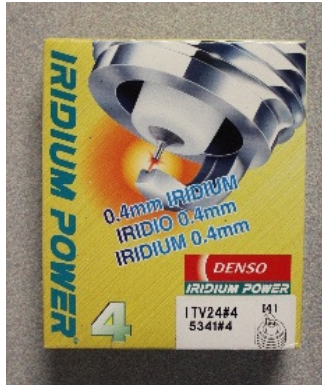
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3.4 Set of (4) Spark Plugs – ITV24

- Special Cold Range Spark Plug required for use with Ford Performance PCM (included with M-6017-20T Controls Pack) to prevent Pre-Ignition (PI).
- Plugs are to be gapped 0.026”-0.028”
- **NOTE:** Do not attempt to run the engine using the plugs that came with your crate engine. Doing so can result in irreparable damage to the engine!



3.5 Cable Assembly, B+ - Starter & Alternator – CV6Z-14300-AB

- Provides B+ from Alternator Output Post to the Battery “+” Post and Starter Solenoid
- Pigtail from Starter Solenoid plugs into the wiring harness supplied with 2.0L 4V TiVCT GTDI Crate Engine (Ford Performance P/N: M-6007-20T)



3.6 Controls Pack Wiring Assembly

- Connects to vehicle battery and 41way inline connector on engine harness
- Contains Power Distribution Box (PDB) and High Power 70A Relay
- Electrical connections to Accelerator Pedal (APPS) and Clutch Switches (CBT/CTT)
- Wire leads for Ignition Switch & Starter

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4.2 Tools Required

- Wire Cutter/Stripping Tool
- Crimper
- Digital Volt/Ohm Meter
- Solder Gun / Solder
- Center Punch
- Cordless Drill / Drill bits / Hole saw / Screwdriver bits

5.0 Modifications of Your Crate Engine Harness

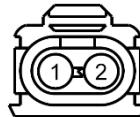
5.1 Removing unused connectors

- There are a series of connectors located on the harness that came with your M-6007-20T Crate Engine Assembly that will need to be removed. This section will identify these connectors. In each case, it is recommended that you cut the wires leading to the connector and tape each wire, or place shrink tube over it, INDIVIDUALLY. This is very important in order to ensure that you do not inadvertently short a hot and ground lead together, causing damage your PCM and/or other sensitive electronics.

5.2 Connector ID

- Please see the diagrams that follow this list to aide in locating the connectors in question. The number in parenthesis is the connector ID.

- Evaporative Emission (EVAP) Purge Valve (C123):

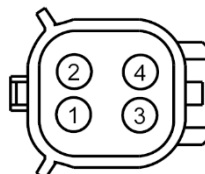


- A/C Compressor Solenoid (C100)



(NOTE: Remove if you do NOT intend to use the Factory A/C Compressor)

- Catalyst Monitor Sensor (C142):



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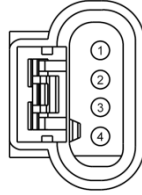


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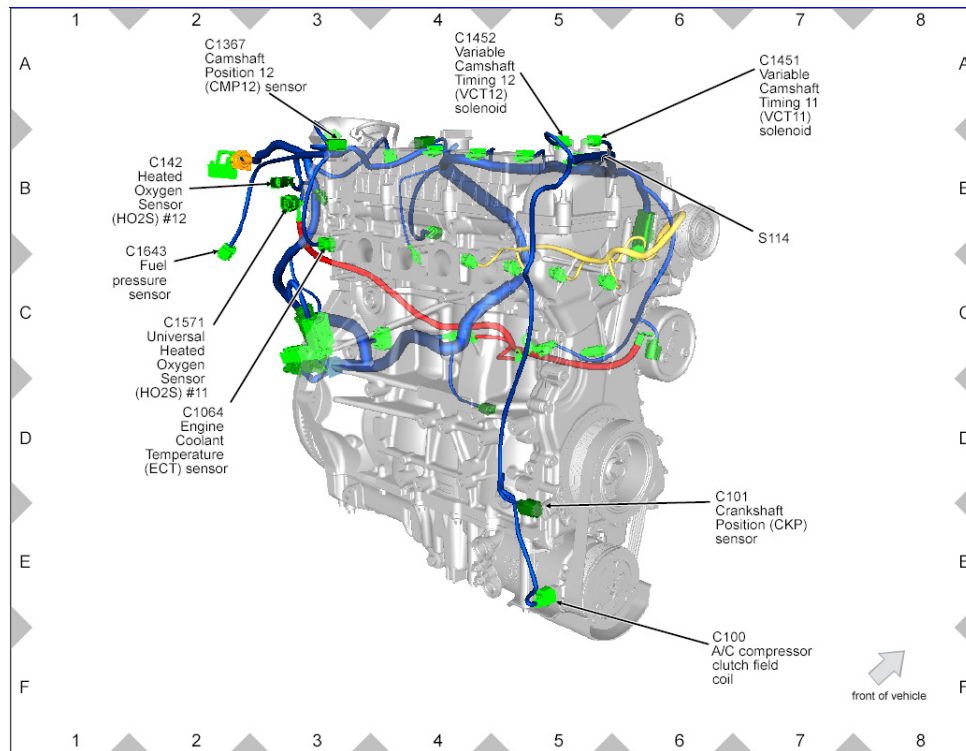
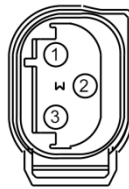
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- Sound Symposer/Noise Generator (C1720):



- Fuel Low Pressure Sensor (C1643):



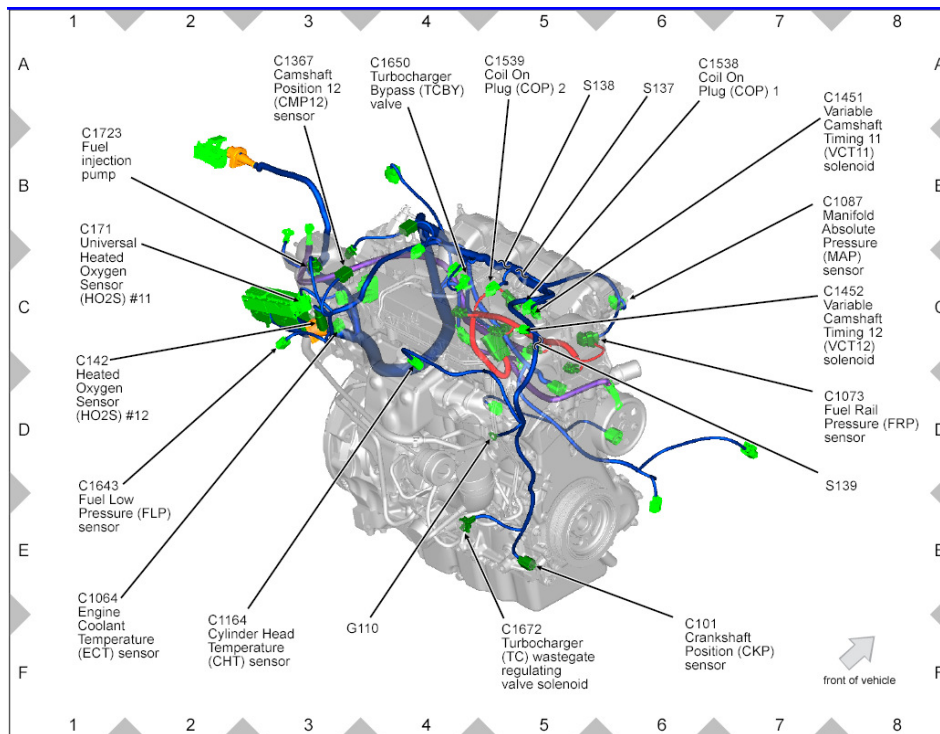
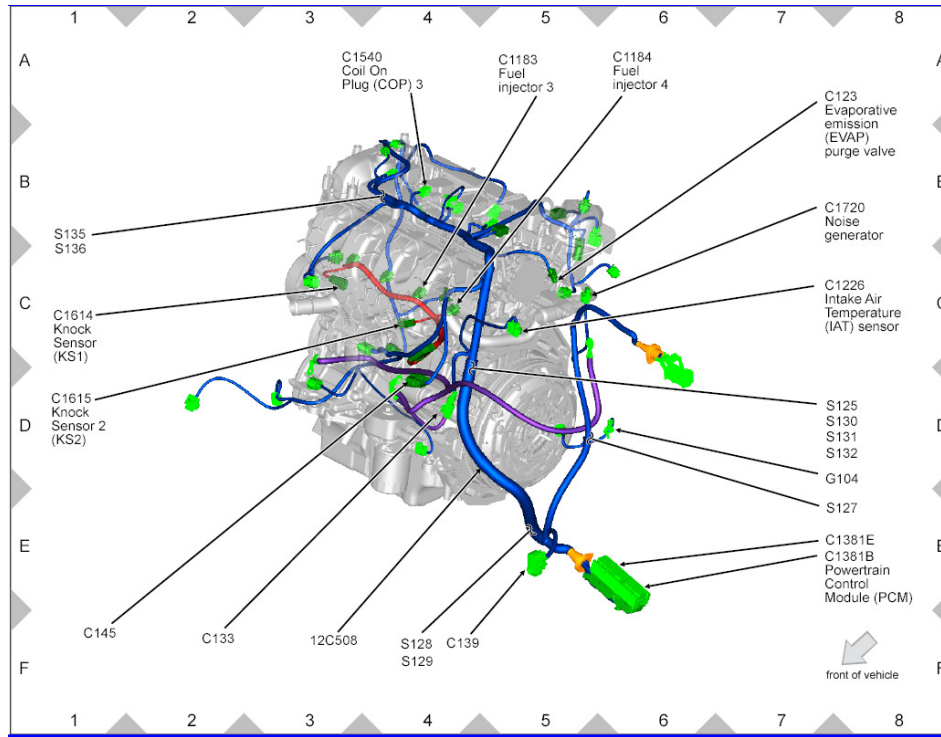
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5.3 Cap off the Unused Inline Connector

- Locate the 16way Sealed Cap (Item M, Controls Pack Wiring Harness) and attach it to the connector ID C145 in the diagram above. The connector is not used, so installing the cap will protect it from water intrusion.

6.0 Step by Step Controls Pack 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 mounting location for the PCM, Power Distribution Box (B) & Inline Fuse Holder (A). Lay each component on its own piece of cardboard and use a pencil to create a template of the footprint. Use the templates to drill holes in the proper location/orientation within the vehicle engine compartment. Attach components to vehicle.
2. Identify mounting location for the Accelerator pedal, Clutch pedal (*purchased separately*) and Ignition Switch (*purchased separately*). Lay each component on its own piece of cardboard and use a pencil to create a template of the footprint. Use the templates to drill holes in the proper location/orientation within the vehicle passenger compartment. Attach components to vehicle..
3. Identify the most appropriate location, based on your application, for the controls pack wiring harness to pass through the engine compartment/passenger compartment bulkhead. Use a center punch to mark the location of the center of the hole, this will keep the drill bit from 'walking' while you are cutting through the bulkhead. Next use a hole saw to create a hole large enough for the harness to pass through. It is strongly recommended to file/smooth the sharp metal edges created by the hole saw and install a rubber grommet in the hole so as to prevent the metal edges from perforating the harness and causing damage to it. Feed the harness through the opening and route to the appropriate locations.
4. Plug in the Accelerator pedal (F) and both Clutch switches (G, H) to their respective electrical connectors.
5. Identify mounting location for the Bracket with OBDII connector and Check Engine Lamp (E). Be sure to complete step 4 before you do this as you will be limited by the harness lead length. Use a piece of paper or cardboard and a pencil to create a template of the bracket footprint. Use the template to drill holes in the proper location/orientation within the vehicle passenger compartment. Attach the bracket to the vehicle.
6. Locate the C8 Jumper with Blunt Leads (J). Connect the wires according to Section 6.2.
7. Untape the Main B+/Ground Lead coil of wires (L).
 - Locate the (2) RED LEADS (ensure that you have enough length to reach the Inline Fuse Holder (A) that was mounted in Step 1 above). Cut off any excess length of wire, remove approximately 10mm of insulation from the end of the remaining wire, slide a piece of shrink tube (N) over each end, and crimp a ring terminal (N) onto each wire. For added reliability of connection, solder the terminal to the wire. Slide the shrink tube down over the crimped portion of the ring terminal, and using a lighter or heat gun, shrink and seal the connection. Connect one wire to each of the output studs of the Inline Fuse Holder (A). See Section 6.3 for Fuses & Relay functions explanation.

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- Locate the BLACK LEAD (ensure that you have enough length to reach the Negative Battery Terminal, which is still to remain disconnected from the Battery). Cut off any excess length of wire, remove approximately 10mm of insulation from the end of the remaining wire, slide a piece of shrink tube (N) over the end, and crimp a ring terminal (N) onto the wire. For added reliability of connection, solder the terminal to the wire. Slide the shrink tube down over the crimped portion of the ring terminal, and using a lighter or heat gun, shrink and seal the connection. Connect the wire to the Negative Battery Terminal.
8. Use the 6AWG Jumper (K) to connect the input of the Inline Fuse Holder to Positive Battery Terminal.
 9. Install and tighten the Negative Battery Terminal onto the Vehicle Battery.

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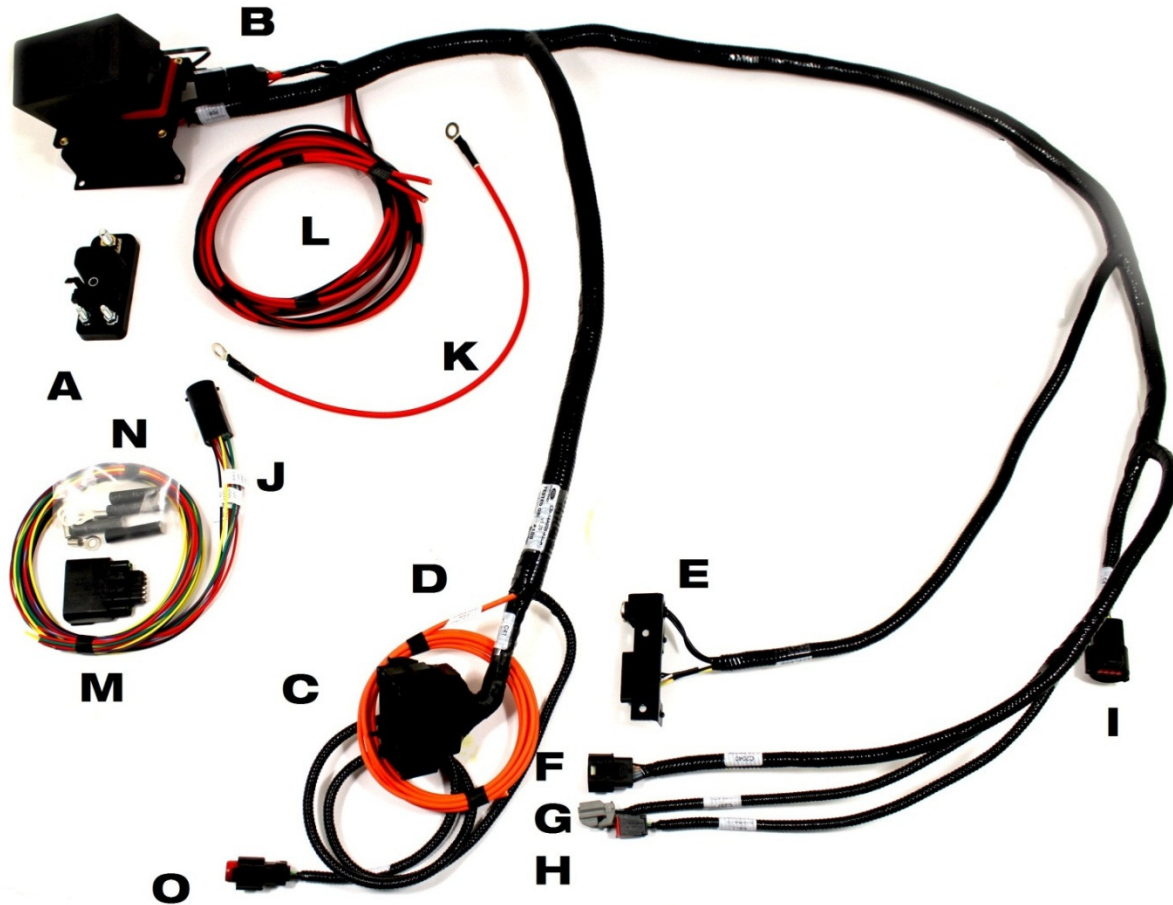
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6.0 Wiring Harness Details

6.1 Component Identification



Item	Description	Item	Description	Item	Description
A	Inline Fuse Holder	F	Accelerator Pedal Assembly Connector	K	6AWG Jumper (Battery B+ to Inline Fuse Holder)
B	Power Distribution Box (PDB) / High Current Relay	G	Clutch Bottom of Travel Switch Connector	L	Main B+/Ground Leads (Battery Connections)
C	4Way Inline Connector to Engine Harness*	H	Clutch Top of Travel Switch Connector	M	16way Sealed Cap (connects to Engine Harness*)
D	Power Lead for Engine Cooling Fan	I	8way Inline Connector to Blunt Lead Pigtail	N	Shrink Wrap and Ring Terminal Kit (used to terminate Main B+/Ground Leads (item L))
E	Bracket containing Diagnostic Interface Port and Check Engine Lamp	J	C8 Blunt Lead Pigtail	O	A/C Pressure Transducer Connector

*Engine Harness is included with Ford Racing Crate Engine M-6007-20T

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6.2 C8 Pigtail Connections

The C8 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	(Setup A) Connect This Lead To:	(Setup B) Connect This Lead To:
1	-	-	-	-	-
2	AUX1 12V HAAT	YE	Provides constant +12V	Ignition Toggle Switch Input A/C Toggle Switch Input Starter Momentary Switch Input	Ignition Cylinder Input A/C Toggle Switch Input -
3	Starter Switch Input	BD/BL	Apply +12V to send a request to the PCM to energize the starter solenoid^(A)	Starter Momentary Switch Output	Ignition Cylinder START Output
4	PWR GND	BK	Provides Ground^(C)	-	-
5	Fuel Pump (+)	DG/YE	Provides +12V to the Fuel Pump	Fuel Pump "+" Terminal	Fuel Pump "+" Terminal
6	A/C Switch Input	VT	Apply +12V to send a request to the PCM to energize the A/C Clutch Solenoid^(B)	A/C Toggle Switch Output	A/C Toggle Switch Output
7	Ignition Switch Input	RD/LG	Apply +12V to energize the Ignition Relay/Wake Up the system	Ignition Toggle Switch Output	Ignition Cylinder START/RUN Output
8	AUX2 12V KEY ON	RD	Provides +12V when ignition is ON^(C)	-	-

^(A) Clutch Bottom of Travel Switch must also be closed in order for PCM to activate starter motor

^(B) A/C Compressor operation also depends upon A/C Pressure Transducer input

^(C) Provided for convenience, do not exceed 10A

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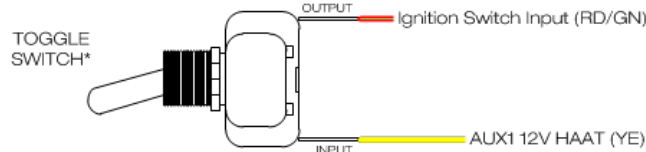
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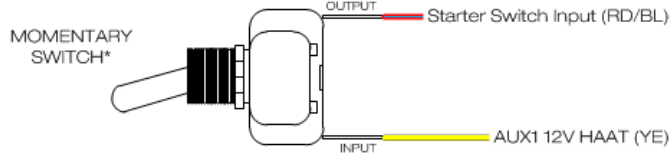
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SETUP A

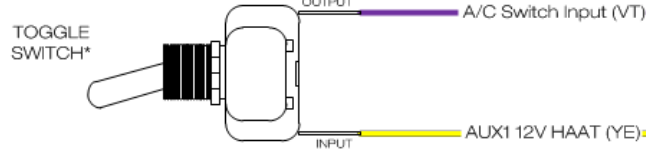
IGNITION



STARTER



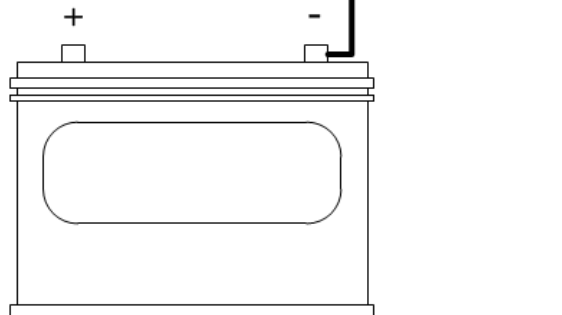
A/C



FUEL PUMP*



BATTERY*



C8 PIGTAIL

* = NOT INCLUDED

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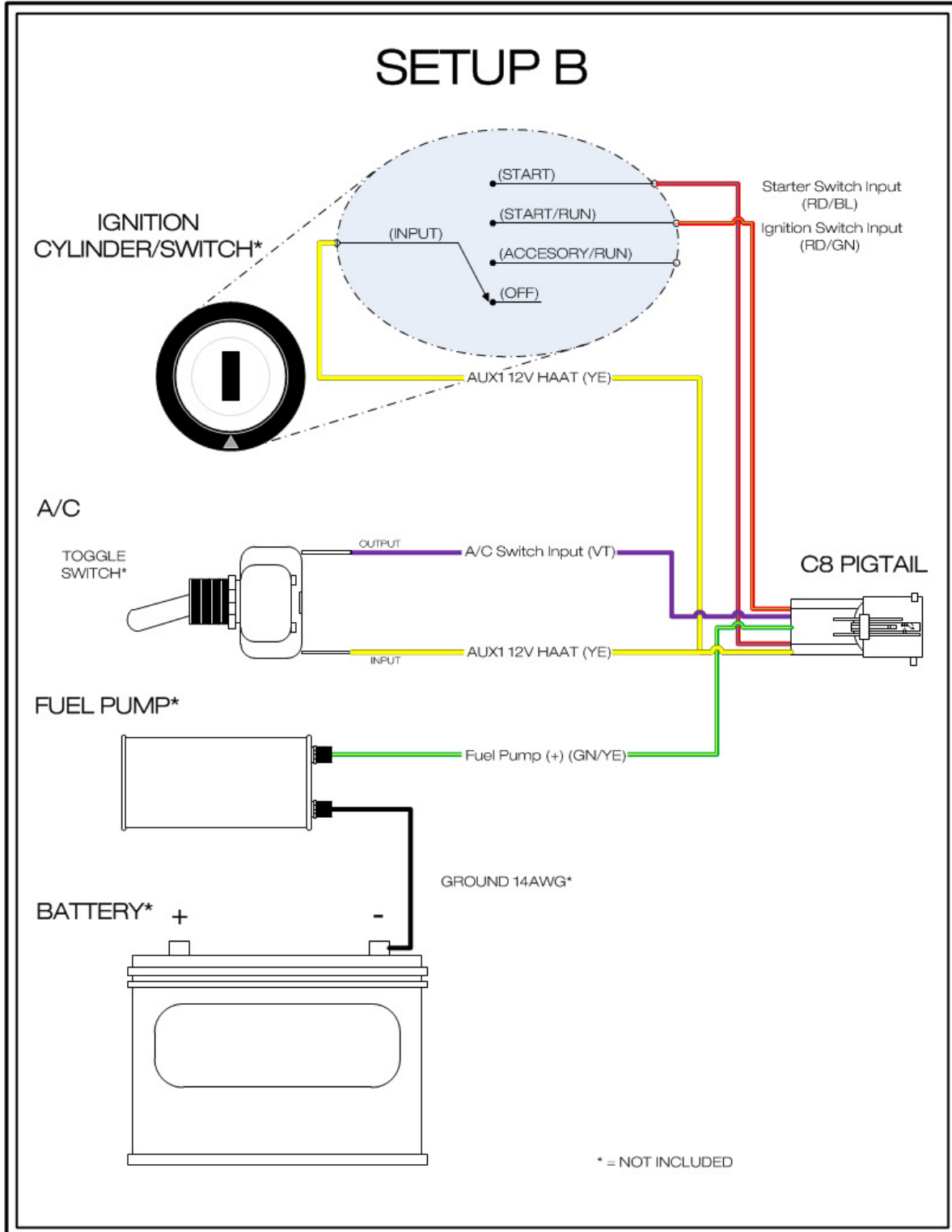


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SETUP B



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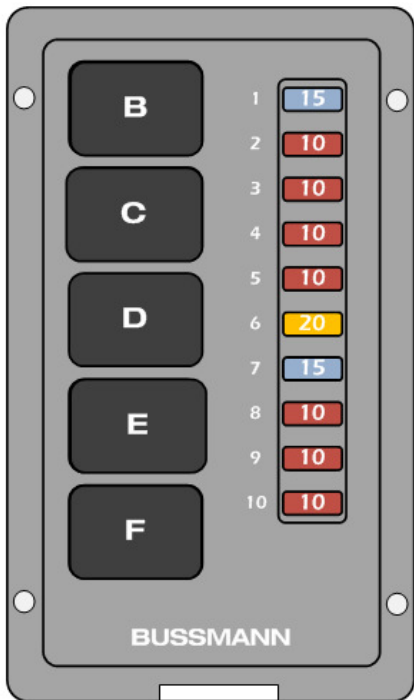
6.3 Fuses & Relays

- 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.



STANDALONE (ISO) RELAY

ID	RATING	FUNCTION	OUTPUT	CONNECT TO
A	70A	ENGINE COOLING FAN B+	BL2 (ORANGE WIRE)	-



POWER DISTRIBUTION BOX

ID	RATING	PURPOSE	OUTPUT TO (CONNECTOR-PIN):
B	-	PCM POWER RELAY	FUSE 2 FUSE 3 FUSE 4 FUSE 5
C	-	FUEL PUMP RELAY	FUSE 6
D	-	STARTER RELAY	C41-41
E	-	IGNITION RELAY	FUSE 1
F	-	A/C CLUTCH RELAY	FUSE 7
1	15A	IGNITION RELAY OUT	- C41-04 - C41-20 - FUEL PUMP RELAY-85
2	10A	PCM RELAY OUT	C41-29
3	10A		C41-24 C41-30 C41-31
4	10A		C41-25
5	10A		C41-26
6	20A		FUEL PUMP RELAY OUT
7	15A	A/C CLUTCH RELAY OUT	C41-37
8	10A	12V BATTERY - UNSWITCHED	C41-21 C251-16
9	10A	12V BATTERY - UNSWITCHED (AUX1)	C8-02
10	10A	12V BATTERY - UNSWITCHED (AUX2)	C8-08

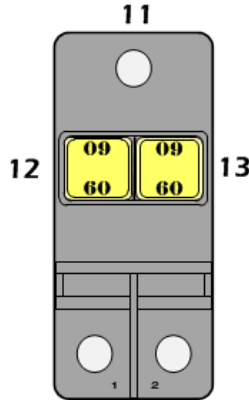
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INLINE FUSE HOLDER

ID	RATING	FUNCTION	OUTPUT/STUD	CONNECT TO
11	-	B+ SUPPLY FOR FUSES (12) & (13)	-	6AWG JUMPER (TO BATTERY B+ TERMINAL)
12	60A	POWER DISTRIBUTION BOX B+ SUPPLY	1	RT1
13	60A	COOLING FAN RELAY/STARTER RELAY B+ SUPPLY	2	RT2, RT3

Fuel System:

The M-6007-20T engine with Ford Performance Controls Pack requires premium fuel.

A return style system with a non-vacuum reference regulator required.

Fuel pressure must be set at 55psi

Plumbing the regulator as close as possible to the mechanical high pressure pump will ensure that the fuel entering the mechanical fuel pump is at the lowest temperature possible.

Fuel Pump Requirements: 110L/Hr at 55psi

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.

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.

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Push-On EFI Fitting -6 AN Male To 5/16" SAE Quick-Disconnect Female for OEM hard lines are available from aftermarket sources. This type of fitting can be used to attach the fuel line to the high pressure mechanical fuel pump.



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