

5.0 RSC COYOTE Installation Instructions



Important Notes:

- ☑ Before installing please read the installation manual and verify that all items are present. . If you are missing hardware or have any questions, please contact ROUSH Performance at 1-(800) 59-ROUSH.

- ☑ The supplemental instructions supplied with this manual are updates required for proper communication between Roush Software and the Ford Racing Control pack. These topics differ from the Ford Racing Wiring & Controls Pack instructions.

- ☑ The installation instructions provided with this kit are basic steps for installing the Low Temp Cooling system for the ROUSH Coyote engine. Depending on your vehicle application and component routing, additional wire and/or coolant hose may be required. Modification to the mounting brackets and mounting points of components may also be necessary to achieve the proper packaging of the LTR system.

- ☑ The ROUSH LTR kit supplied with your engine is designed to interface with the **Ford Electronic Throttle Crate Engine Controls Pack M-6017-A504V** included with the Coyote Powertrain

- ☑ Only use Roush software in the PCM. Operating a Roush engine with FRTsoftware will cause serious engine damage and void the Roush warranty.

PACKAGING LIST FOR LOW TEMP COOLING SYSTEM

Part Ref	Description	FRPP Part Number	Qty
	Intercooler System	---	
36	Degas Bottle	13108D080	1
37	Intercooler Electric Water Pump with Bracket	392022009	1
38	Bracket - Intercooler Pump Mounting	13108C419	1
39	Intercooler Low Temp Radiator (LTR)	13108K229	1
40	3/4" Hose – Degas Bottle Inlet	13118D031	1
41	3/4" Hose – Intercooler Pump Inlet	13108D029	1
42	3/4" Hose – Intercooler Pump to LTR	13108K236	1
43	3/4" Hose – Intercooler LTR Outlet	13118D030	1
44	3/8" Hose – Engine Bottle Degas Hose	13118276	1
45	3/4" Hose Sleeve – 424mm Heater Hoses	1311-18K579SLV	2
46	Side Shield – Radiator Assembly – LH	1310010207LH	1
47	Side Shield – Radiator Assembly – RH	1310010207RH	1
	Hardware Kit E – Intercooler System	13116066FRTHKE	1
48	Bracket – LTR Upper LH	13108K242	1
49	Bracket – LTR Upper RH	13108K243	1
50	Bracket – LTR Lower LH	13108K244	1
51	Bracket – LTR Lower RH	13108K245	1
52	Rubber Grommet – LTR Isolator	R07060107	4
53	Sleeve – LTR Isolator	R07060108	4
54	Degas Bottle Cap	9C3Z-8101-B	1
55	Clamps – 3/4" Hoses (Constant Tension)	CT19x12-BO	8
56	Bolt – Long Bumper Bolts (M8 x 35)	R18020007	2
57	Bolt – LTR to Brackets (4) & I/C Pump to Bracket (2) (M8 x 25)	W500224	6
58	Nut – I/C Pump Mounting Bracket to Bumper Bolts (M8)	W520413	4
59	Bolt – Degas Bottle Mounting & LTR Bracket to Chassis (M6 x 22)	R18020057	4
60	J-Clip – Degas Bottle & Pump Bracket Mounting (M6 Short)	N623332	1
61	NVH Isolator – I/C Pump to Bumper Beam	13108Z419	1
62	NVH Isolator – I/C Pump to LTR	13108Y419	1
63	Nut – I/C Wiring Relay to Chassis (M6)	W520412	1

If you are missing any items, please call us toll free at 1-800-59-ROUSH.

GLOSSARY OF TERMS

ACT	Air Charge Temperature Sensor (From the factory, this function is integrated into the MAF sensor. With this kit, a separate ACT sensor is installed into the intake manifold)
ETC	Electronic Throttle Control
MAFS	Mass Air Flow Sensor
PCM	Powertrain Control Module (a.k.a. ECM, ECU, PCU, EEC)
PCV	Positive Crankcase Ventilation
TPS	Throttle Position Sensor
VMV	Vapor Management Valve (aka Canister Purge Valve)
Breakout Point	A place in an electrical harness where the wiring for an individual component leaves (breaks out of) the main harness to attach to an individual component.

LIMIT OF LIABILITY STATEMENT

The information contained in this publication was accurate and in effect at the time the publication was approved for printing and is subject to change without notice or liability. Ford Racing Performance Parts reserves the right to revise the information presented herein or to discontinue the production of parts described at any time.

SAFETY PRECAUTIONS

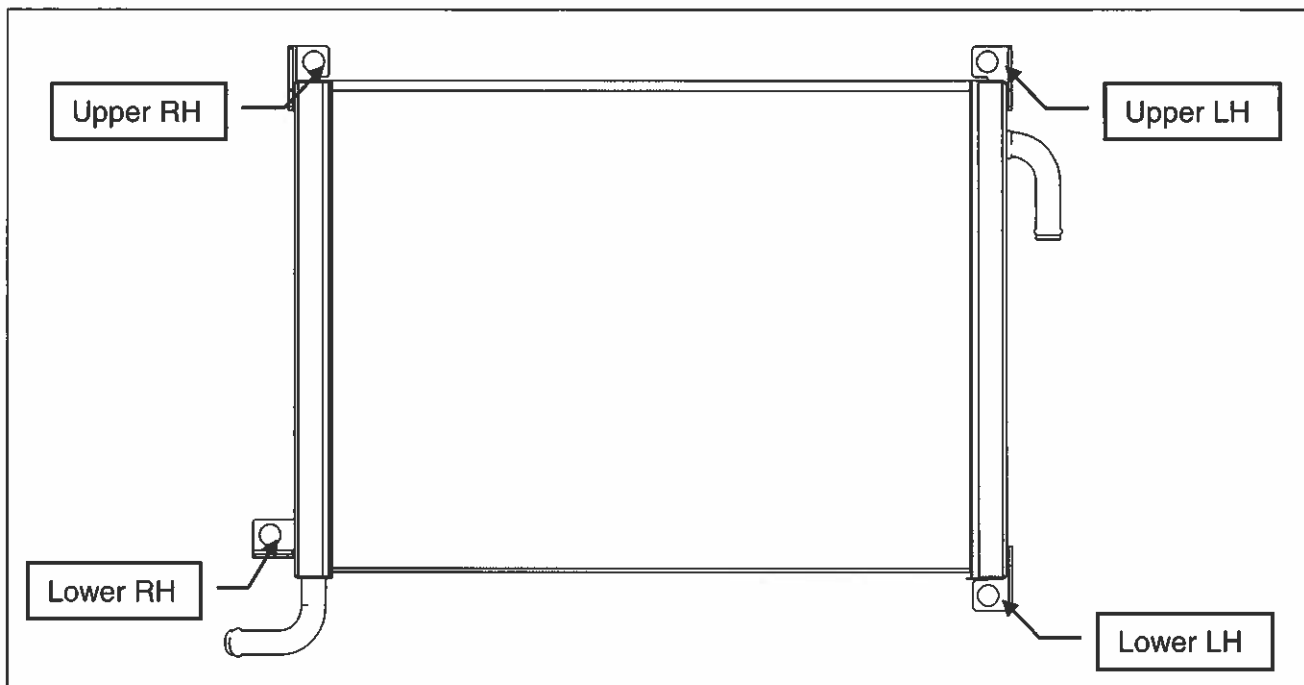
STOP! CAREFULLY READ THE IMPORTANT SAFETY PRECAUTIONS AND WARNINGS BEFORE PROCEEDING WITH THE INSTALLATION!

Appropriate disassembly, assembly methods and procedures are essential to ensure the personal safety of the individual performing the kit installation. Improper installation due to the failure to correctly follow these instructions could cause personal injury or death. Read each step of the installation manual carefully before starting the installation.

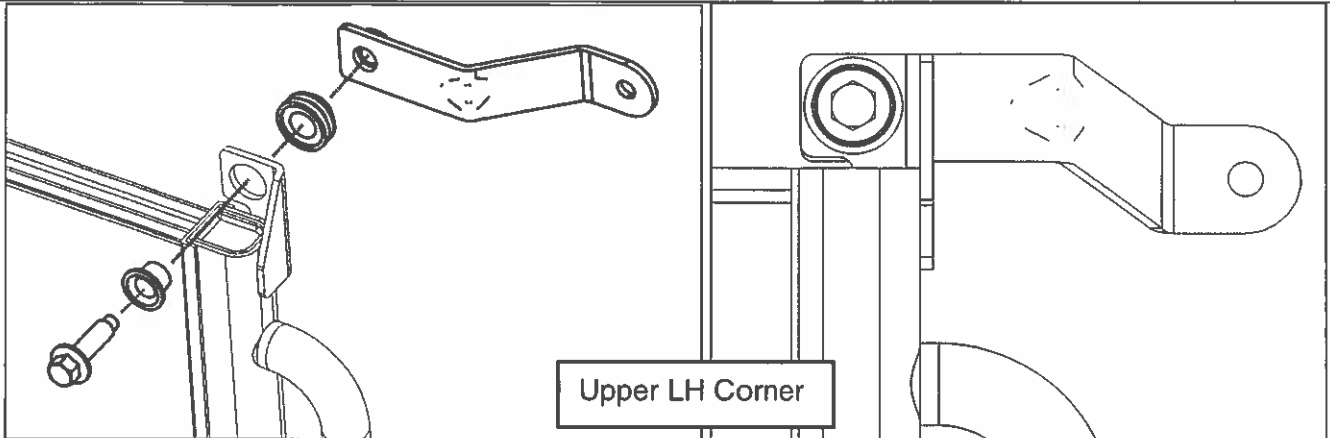
- ! Always wear safety glasses for eye protection.
- ! Place the ignition switch in the OFF position.
- ! Always apply the parking brake when working on the vehicle.
- ! Block the front and rear tire surfaces to prevent unexpected vehicle movement.
- ! Operate the engine only in well-ventilated areas to avoid exposure to carbon monoxide.
- ! Do not smoke or use flammable items near or around the fuel system.
- ! Use chemicals and cleaners only in well-ventilated areas.
- ! Batteries can produce explosive hydrogen gas which can cause personal injury. Do not allow flames, sparks or flammable sources to come near the battery.
- ! Keep hands and any other objects away from the radiator fan blades.
- ! Keep yourself and your clothing away from moving parts when the engine is running.
- ! Do not wear loose clothing or jewelry that can be caught in rotating or moving parts.

Intercooler Low Temperature Radiator (LTR)

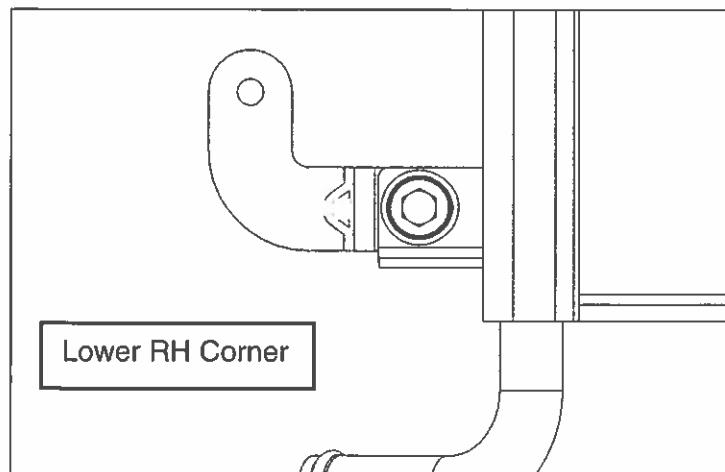
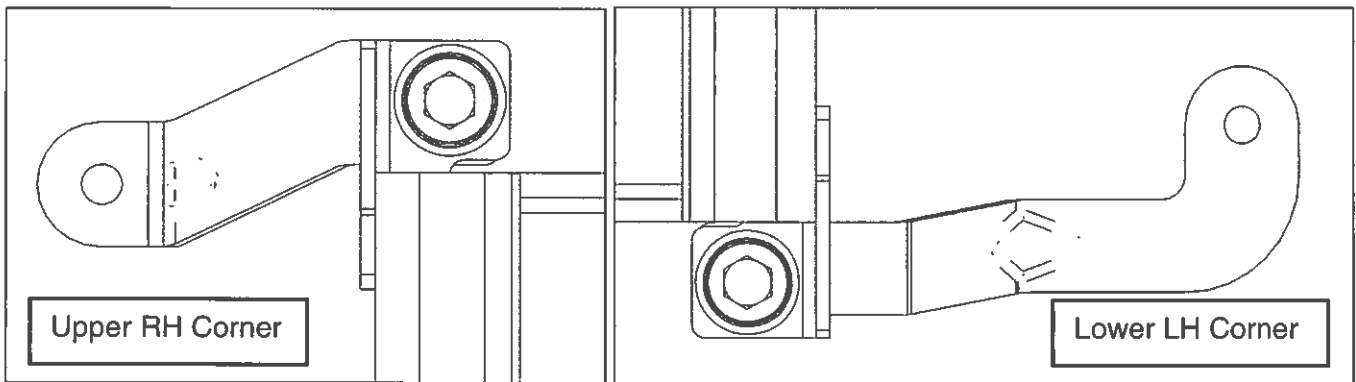
1. Insert (1) Rubber Grommet (R07060107) found in Hardware Kit E (13116066FRTHKE) into each mounting tab on the Low Temp Radiator (LTR) (13108K229).



2. Push (1) Sleeve (R07060108) found in Hardware Kit E (13116066FRTHKE) into each of the rubber grommets previously installed.
3. Mount the Upper LH LTR Bracket (13108K242) to the upper LH corner of the LTR using (1) M8 x 1.25 x 25mm bolt (W500224). These can be found in Hardware Kit E (13116066FRTHKE). Align the edges of the bracket such that they are flush with the mounting tab on the LTR. Torque bolt to 25 Nm.



4. Repeat step 3 for each of the remaining LTR Brackets. 13108K243 will go to the upper RH corner, 13108K244 to the lower LH corner and 13108K245 to the lower RH corner of the LTR. These can be found in Hardware Kit E (13116066FRTHKE).

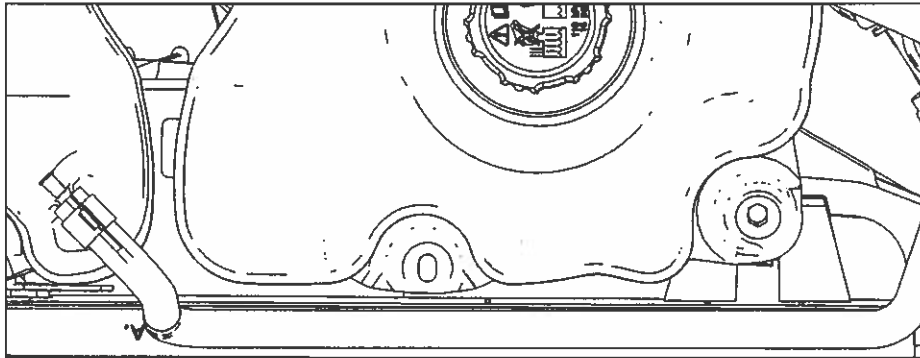


Intercooler Reservoir Mounting

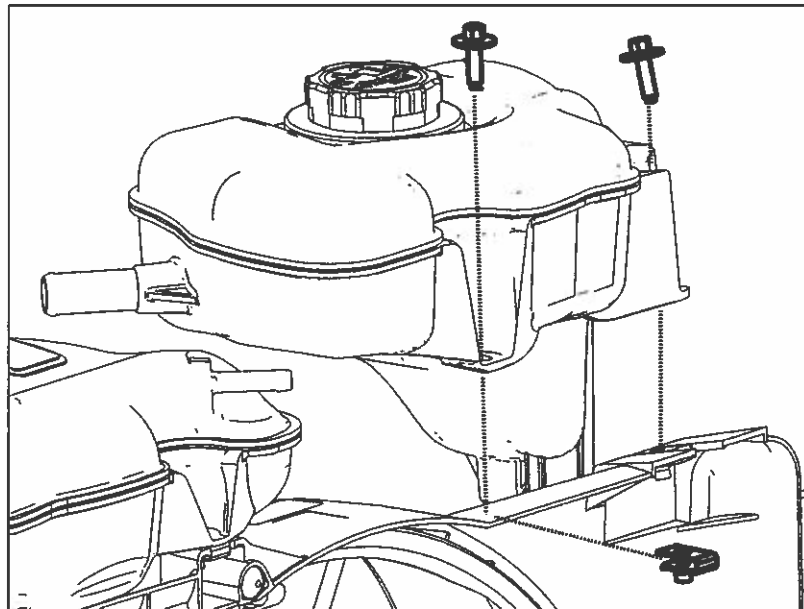
NOTE:

The degas bottle mounting location will be determined by your particular vehicle application. The Degas Bottle must be mounted so that the fill port is the highest point of the cooling circuit. This will allow proper purging of trapped air in the system. It is **very important** to verify that the air is purged and that coolant is flowing properly through the system.

1. Install the Intercooler Degas Bottle (13108D080) with Degas Bottle Cap (9C3Z-8101-B) onto the fan shroud using (1) M6 x 1.0 x 22 mm bolt (R18020057) from Hardware Kit E. Use the bottle as a template to mark the second mounting hole with a paint pen. Remove the bottle and drill a 5/16" hole through the mounting location that best fits your application.



2. Install (1) M6 J-Clip (N623332) from Hardware Kit E onto the fan shroud. Reinstall the fan shroud and bolts and torque to 10 Nm. Reinstall the intercooler degas bottle using (2) M6 x 1.0 x 22 mm bolts (R18020057) and torque to 10 Nm.

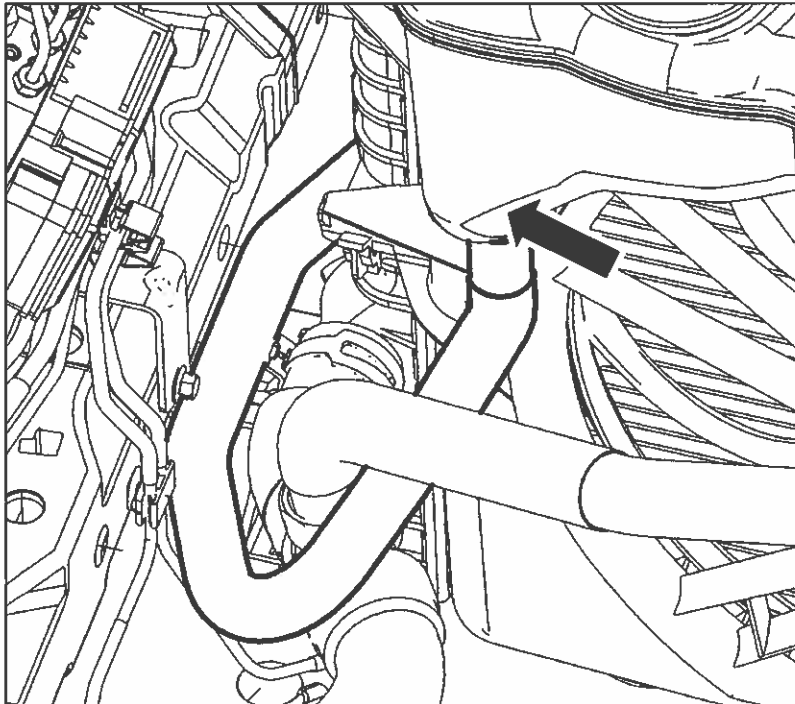


Intercooler Radiator Assembly Mounting

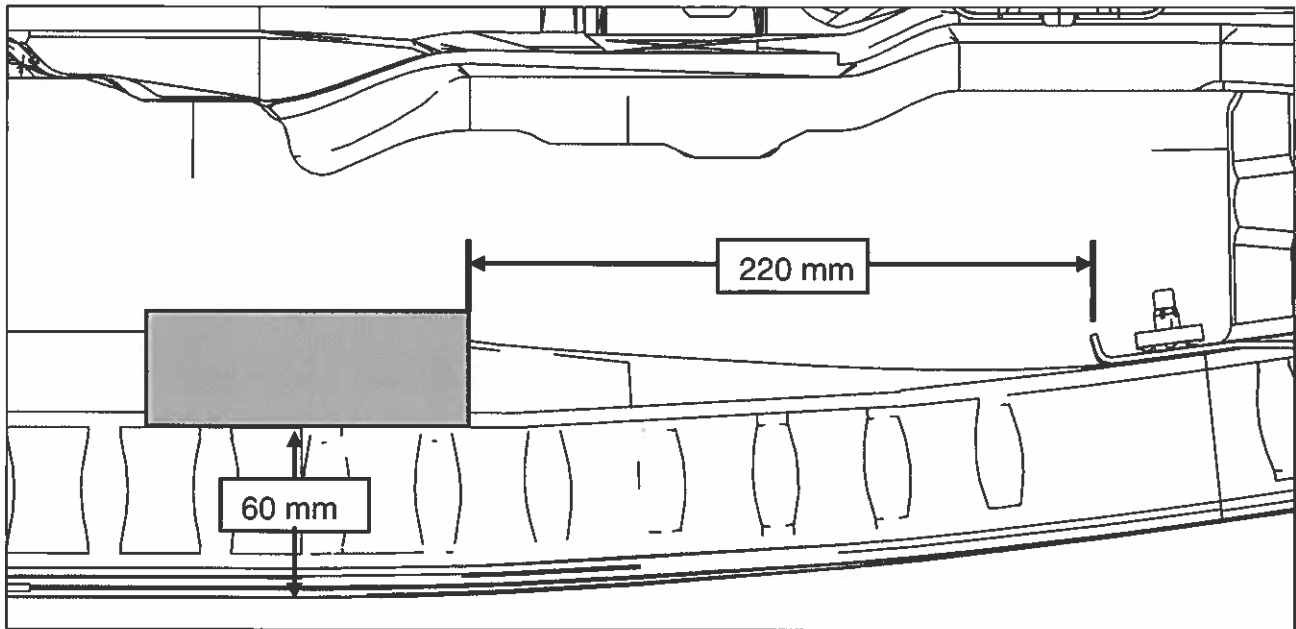
1. Install the new LTR assembly into the vehicle using (2) M6 x 1.0 x 22 mm bolts (R18020057) found in Hardware Kit E (13116066FRTHKE). Torque the two bolts and two nuts to 10 Nm.
NOTE: The LTR should always be mounted in front of the powertrain cooling system.

Electric Water Pump, Mounting Bracket and Hoses

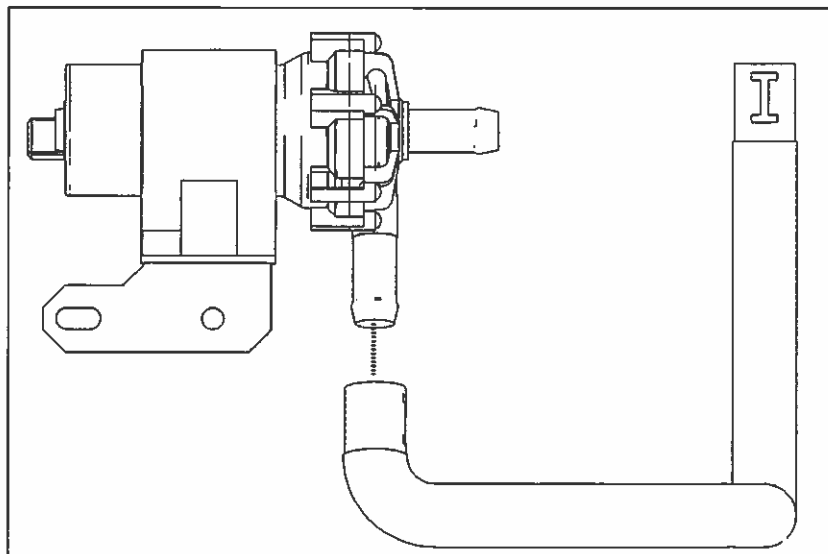
1. Install the Intercooler Pump Inlet Hose (13108D029) from the degas bottle outlet port to the front of the LTR by routing the hose around the lower radiator hose "T" joint and along the frame rail. Secure the hose to the bottom of the degas bottle using (1) 3/4" constant tension clamp (CT19x12-BO). Orient the clamps so the "I" on the hose is in the center of the clamp tangs.



2. Install the Intercooler Pump (13108Z419) found in Hardware Kit E, in an area of the engine compartment such that the pump and hoses have adequate clearance from moving components and road debris. The image below is a basic example and measurements for clarity purposes only. This step will depend on your particular vehicle application.



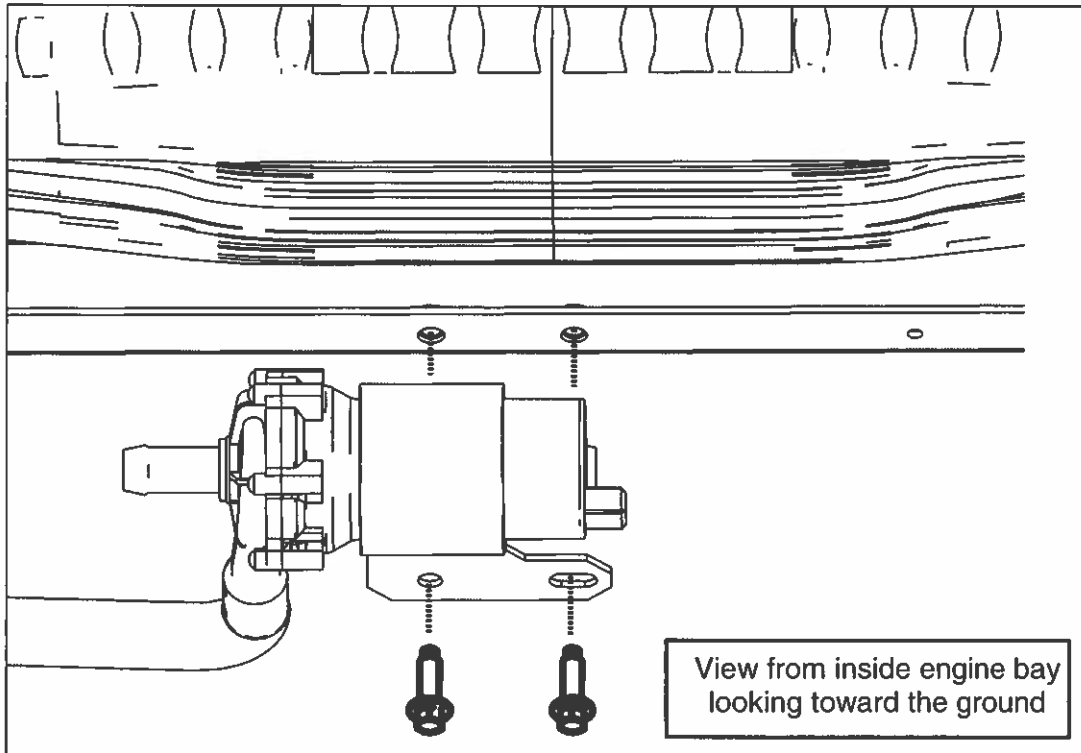
3. Connect the Intercooler Pump to LTR hose (13108K236) to the Intercooler Pump and Bracket assembly (392022009). Orient the hose so the "I" is aligned with the arrow on the pump outlet port. Secure the hose to the pump using (1) $\frac{3}{4}$ " constant tension clamp (CT19x12-BO). Orient the clamp so the "I" on the hose is in the center of the clamp tangs.



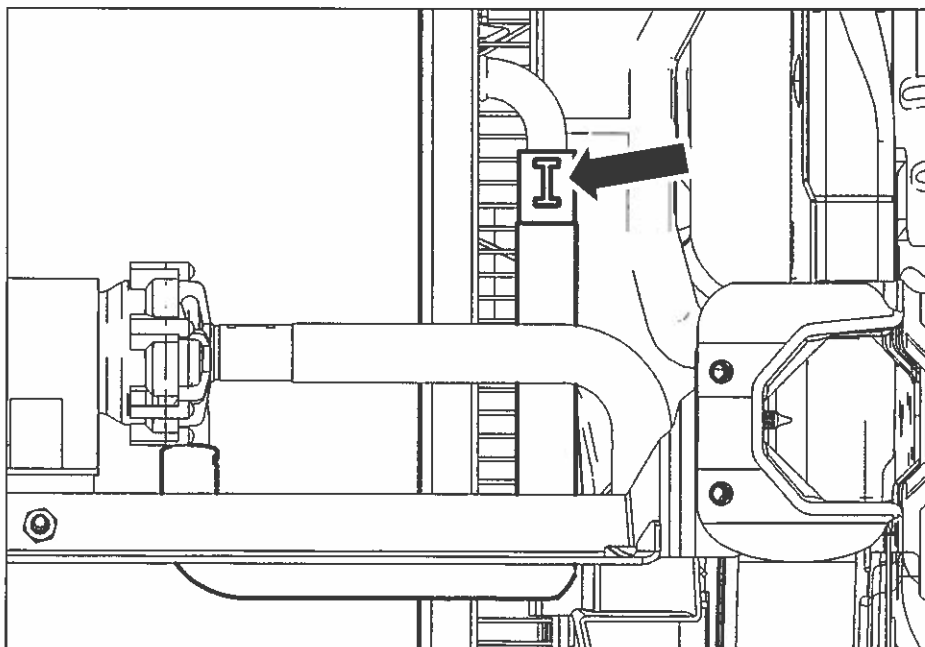
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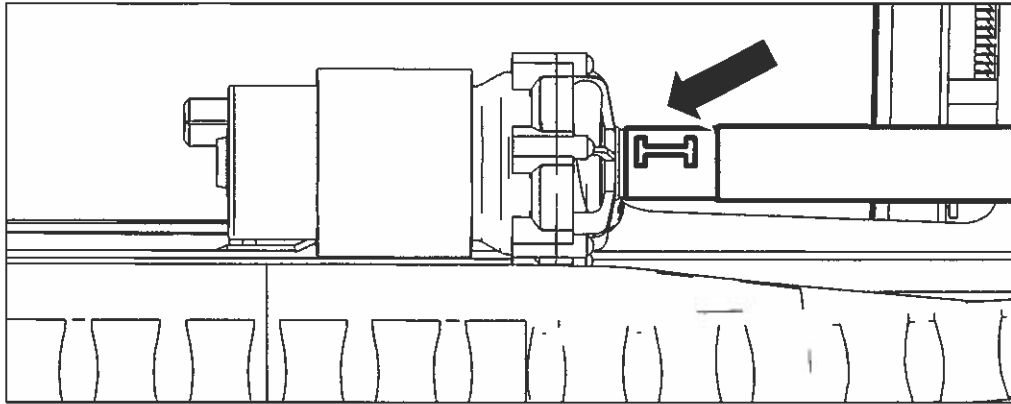
- Secure the Intercooler Pump and hose to the Intercooler Pump Mounting Bracket using (2) M8 x 1.25 x 25 mm bolts (W500224) from Hardware Kit E so the outlet is facing away from the two holes that are in the bracket. Torque bolts to 25 Nm.



- Connect the Intercooler Pump to LTR hose to LTR inlet port using (1) 3/4" constant tension clamp. Orient the clamp so the "I" on the hose is in the center of the clamp tangs.



6. Connect the Intercooler Pump Inlet Hose to the inlet port on the intercooler pump. Secure the hose to the pump using (1) $\frac{3}{4}$ " constant tension clamp. Orient the clamp so the "I" on the hose is in the center of the clamp tangs.



7. Route the remainder of the Intercooler Pump Wiring Harness and secure. Connect the wiring harness to the pump and secure the harness to the bracket using the holes in the intercooler pump mounting bracket.

Note: Route all intercooler hoses very carefully. It is critical for intercooler performance that these hoses are not kinked once installed into the vehicle.

Final Assembly

1. Fill the engine cooling system (using a proper coolant mixture) to the marked level on the radiator degas bottle.
2. Using the same coolant mixture, fill the intercooler system. The coolant should be approximately one inch below the top of the cap.
3. Inspect all under hood wiring harnesses for potential interference issues. Use zip ties to safely position the harness away from any areas of concern.

Important: Both coolant systems can trap a large amount of air. It is very important to verify that the air is purged and that coolant is flowing properly through both systems. Roush recommends vacuum filling both systems to properly evacuate the trapped air.

Inner Cooler Pump Wiring

- Connect the Intercooler Pump Motor (< 3 amps) to the fuel pump relay's high-current output. Whenever the fuel pump is on, the IC Pump will operate. Unlike FRT software, Roush software does not communicate with the IC Pump relay located in the FRT Power Distribution Box.

SPEEDOMETER

- PCM Pin C5 is VSOUT (vehicle speed output signal). This is an industry standard speed signal for an electronic speedometer. The signal from this pin can be checked with an electrical multi-meter with an Hz setting.

The transfer function is:

$$\text{VSOUT Hz} = 2.22 * \text{MPH.}$$

Example: 50 mph = 111 Hz.

TACHOMETER

- PCM Pin C10 is CTO (clean tachometer output signal). The signal from this pin can be checked with an electrical multi-meter with an Hz setting.

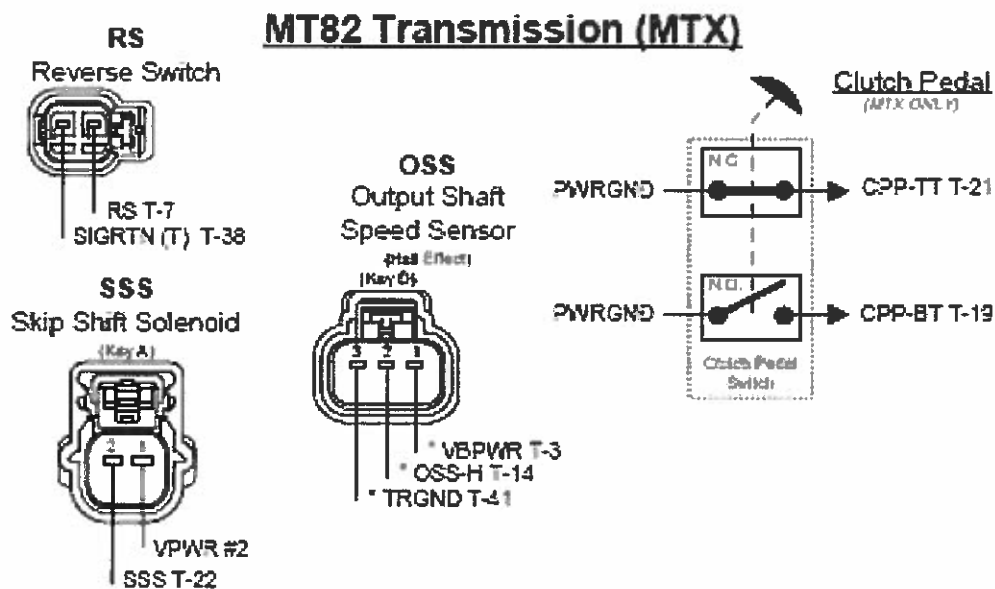
The transfer function is:

$$\text{CTO Hz} = \text{RPM} / 15.$$

Example: 1,500 rpm = 100 Hz.

OUTPUT SHAFT SPEED SENSOR (Hall Effect Sensor, 0-5v square wave)

- PCM Pin T14 is OSS (output shaft speed sensor)
- T41 is trngd.



NOTE: All connector views are looking into the connector's face with the wires flowing away from the viewer.

AC CLUTCH COORDINATION

- PCM Pin C12 is ACCR (AC Clutch Request). In order to coordinate idle speed control and cooling fan operation with the AC compressor the PCM must receive an AC request via the high-speed network. Roush offers a custom Gateway Module for this purpose. The Roush Gateway Module also provides outputs for the Check Engine, Wrench, and Alternator warning lights.

SPARK PLUG SERVICE INFO

- Gap: 0.80 – 0.90 mm ! **CRITICAL !**
Type: Motorcraft CYFS-12YP (or equivalent)
Firing Order: 1 – 5 – 4 – 8 – 6 – 3 – 7 – 2

Fuel system Installation

GENERAL INFORMATION:

- The fuel system provided is intended for the **Roushcharged 5.0L Coyote Crate Engine**
- The fuel system is not designed to fit a specific vehicle application. Additional fittings and fuel line may be required for your specific vehicle.
- All liability regarding the vehicle's fuel system design, installation, and operational integrity is the vehicle owner's responsibility.
- Please read and follow all manufacture installation instructions provided with each component.
- Use a thread sealant compound on all pipe thread fittings. Do not use Teflon tape. This could cause damage to the fuel system components.

INSTALLATION NOTES:

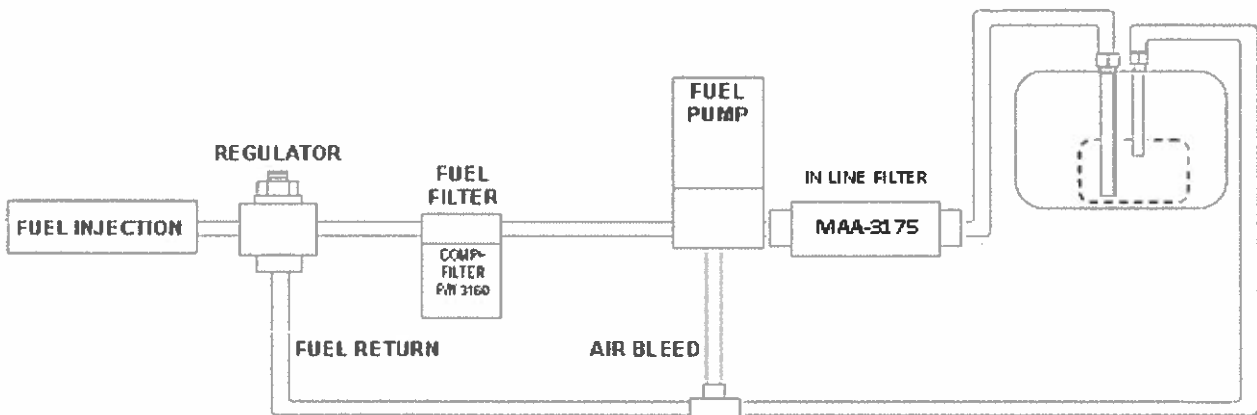
- **Figure 1** is a general routing schematic of a basic fuel system only. Your specific application may vary. If unsure of the proper installation please consult a professional technician.
- Your vehicle must utilize a return style fuel system.
- Your vehicle's fuel tank should utilize a fuel reserve cup in the bottom of the tank which will allow fuel to flood both in and out. This cup retains fuel near the fuel supply tube in the event of low fuel.
- Use of a fuel pressure gauge is recommended. This should be located in a safe and accessible location near the fuel rail.
- The fuel pressure regulator may be mounted anywhere after the fuel pump; however, it is recommend that the regulator and fuel filter be placed near the pump at the rear of the vehicle, and measure the pressure near the fuel rail.
- The in-line filter provided in this kit is designed to thread directly into the inlet port of the fuel pump.

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- Do not connect an intake manifold pressure reference line to the fuel pressure regulator; the vacuum port on the regulator must remain open to atmosphere.
- An electric Fuel Pressure Gauge (Autometer Fuel Pressure Gauge ATM-4363 or equivalent) is highly recommended. Most intermittent engine performance issues are the result of a momentary loss of fuel pressure from fuel slosh or inadequate fuel system design. A fast response electronic fuel pressure gauge is the best method to capture pressure spikes.
- It is required to adjust the fuel pressure regulator to 55 psi with the engine idling normally. This setting is not performed at the component manufacturer.

FIGURE 1



Fuel System Safety

All liability regarding the vehicle's fuel system design, installation, and operational integrity is the vehicle owner's responsibility. Roush recommends extraordinary care be used in the design and construction of a custom fuel system. Some major fuel system design considerations are:

- Component and material specification
- Fuel Type (gasoline or ethanol/gasoline blended, premium grade octane)
- Durability
- Component mounting location
- Fuel line routing
- Heat protection
- Workmanship
- Collision protection
- Refueling, storage, and atmospheric venting during all modes of vehicle operation, and at all ambient temperatures and atmospheric pressures.
- Unleaded Fuel Only filler neck restriction.

Use only components and connections approved for high-pressure, ethanol/gasoline blended automotive applications. Depending on the vehicle's fuel line routing, insulators and/or heat shields may be required as well. An inertia switch is recommended to interrupt the fuel system's electrical circuit for collision protection.



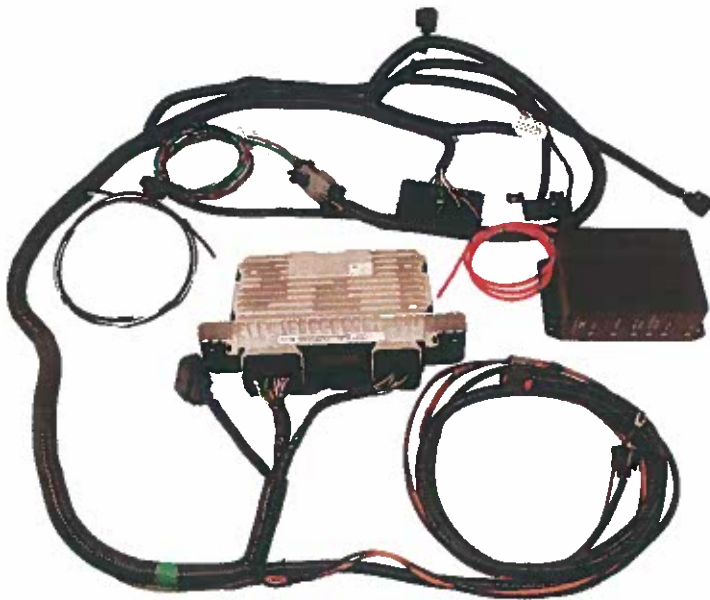
M-6017-A504V
Electronic Throttle Crate Engine Controls Pack
INSTRUCTION SHEET

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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 RACING
TECHLINE AT 1-800-367-3788 !!!**

Controls Pack Installation Manual
2011 and newer 5.0L 4V



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



M-6017-A504V Electronic Throttle Crate Engine Controls Pack INSTRUCTION SHEET

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1.0 INTRODUCTION

This kit was developed by Ford Racing to allow performance enthusiasts to easily install today's modern muscle into street rods from yesterday. We have developed this system to take the complexity and mystery out of installing a Mustang Electronic Throttle Control (ETC) engine into your vehicle.

NOTE: This system does not support cruise control.

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



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2.0 OVERVIEW

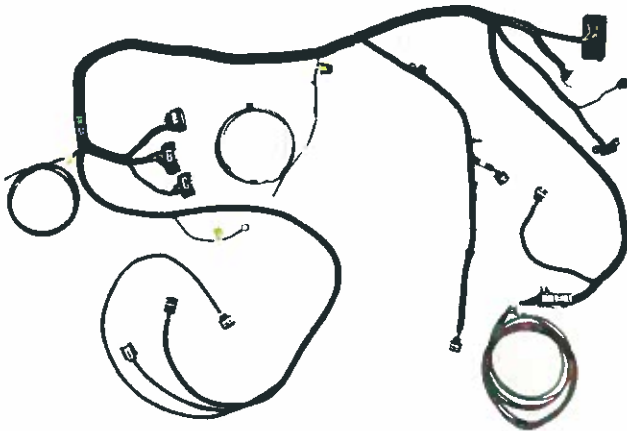
This booklet provides a step by step guide for the preparation and installation of the controls pack. Please read the instructions thoroughly before starting the installation. If you have any questions, contact Ford Racing Technical Support at (800) 367-3788.

3.0 COMPONENTS INCLUDED

3.1 Cowl Wiring Harness

CM-14A006-A5LB

This harness is labeled and includes all connections required to power up and run your engine equipped with a 2011 or newer factory engine harness.



3.2 Ford Racing Power Distribution Box

CM-14A068-B

The FRPDB connects directly to the **CM-14A006-A5LB** wiring harness. The FRPDB contains all relays and fuses needed for engine, air conditioner and cooling fan control. The FRPDB may be mounted either in the passenger compartment (preferred) or in well ventilated under-hood locations away from direct sources of heat such as exhaust headers.



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3.3 Accelerator Pedal

BR3Z-9F836-D

This pedal is required for correct electrical interface with the PCM. The engine will not operate correctly without this exact pedal.



3.4 Powertrain Control Module (PCM)

CM-12A650-A5LA (5.0L 4V)

Commonly referred to as the engine computer, or 'brain', this PCM is calibrated for operation with a stock BR33-9600-BC air cleaner assembly (included with this kit) and 'Return Style' fuel system as shown on page 14. The PCM is designed for under-hood mounting but may also be located in the wet cowl/wiper motor area or passenger compartment of the vehicle if desired. Wiring modifications may be required to support location of the PCM in either of these two areas. The pictures below show an example of the PCM installed in the wet cowl area.



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PCM Calibration Application Notes:

- The calibration provided in this PCM will NOT work with the 'Returnless' fuel system as used on factory Mustang vehicles. Use of a return style fuel system is required. Refer to section 9 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.
- **Premium Fuel Only (91 Octane or higher).**



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!

3.5 Universal Exhaust Gas Oxygen Sensor (UEGO) 8F9A-9Y460-EA

Two UEGO sensors provide wide range feedback to the PCM for closed loop air fuel ratio control.

* Apply a light coat of anti-seize lubricant to the threads of the UEGOs before installing. This lubricant will damage the sensor element so make sure no lubricant comes in contact with the sensor element. Tighten to 48 Nm (35 lb-ft).



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The engine harness and controls package M-6017-A504V is designed to operate with the UEGO sensors in the 2011-2012 Mustang GT stock locations. Moving the UEGO sensors to alternate locations can result in the need to recalibrate the PCM.

Here are some tips if sensors have to be relocated.

The best option is to locate the sensor so it is sampling from all 4 cylinders and at a distance that does not require modification of the UEGO harness.

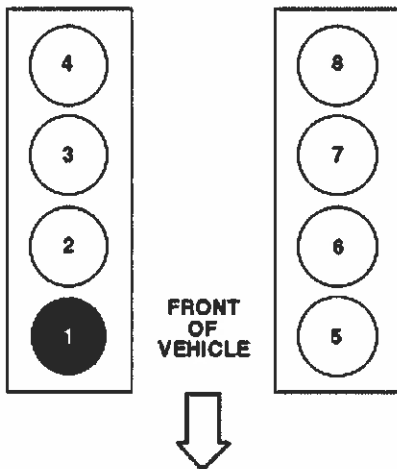
NOTE: Modification of the UEGO harness can affect function of UEGO sensor.

If your header design will not allow you to sample all 4 cylinders without UEGO harness modifications, a better alternative is locating the UEGO sensor to sample from a single cylinder.

The cylinders that have (on average) the closest A/F ratio to the bank average are cylinder #4 (on bank 1) and cylinder #7 (on bank 2). If that's not possible due to packaging constraints, the next best choices are cylinder #3 (on bank 1) and cylinder #8 (on bank 2). Calibration required!

Firing Order:

1 - 5 - 4 - 8 - 6 - 3 - 7 - 2



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3.6 Air Cleaner Assembly with Integral Mass Air Flow Sensor **BR33-9600-BC**



IMPORTANT NOTE: The calibration of the PCM you have received requires use of this air box/MAF sensor system exactly as received. Any changes to the air inlet system will result in changes to how the air entering the engine is measured and will require modification to the PCM's calibration.

Ford Racing recognizes that it may not be practical to package this Air Box/MAF sensor system in some vehicle applications. The recommendations listed below are intended to serve as guidelines for designing an air inlet system that will provide good control system performance once the control system calibration has been modified to work with the new Air Inlet System:

- 1) **Flow Profile:** the MAF sensor should be located on a straight section of zip tube where the flow profile is generally uniform. If the sensor cannot be located on a straight section put the sensor on the outside radius of the zip tube so the sensor is located in the higher flow velocity area.
- 2) **Flow Area:** Keep the cross sectional area of the MAF sensor tube as close as possible to the cross sectional area of the original induction system.
- 3) **Flow quality:** minimize flow direction changes and maintain smooth tubing to minimize air flow disturbances and turbulence.
- 4) **Flow pulsation:** install sensor at least 6 to 8 inches upstream of the throttle body.
- 5) **Transient performance:** installing the sensor too far upstream of the throttle body (>24 inches) will result in transient lean/rich spikes due to the additional amount of time required for the measured air flow to travel from the MAF sensor to the intake manifold.
- 6) **MAF sensor contamination:** A) install sensor in upper half of cross sectional area to minimize possibility of condensation coming in contact with the MAF sensor element. In other words, if a clock is superimposed on a cross section of the zip tube, the sensor should be installed somewhere equal to or above the 9:00 and 3:00 positions. Most OEM applications have the sensor located at the 9:00 or 3:00 location. B) Sensor must be installed downstream of air filter and upstream of blow-by inlet. Ideally, sensor should be located 3 diameters upstream of the blow-by inlet.

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4.0 TOOLS REQUIRED

In addition to a common assortment of sockets, wrenches and screwdrivers, you will also need the following:

- Wire Strippers
- Digital Volt/Ohm Meter
- Solder Gun / Solder
- Electrical Tape / Shrink Tubing
- Hand Drill
- Hole Saw
- Utility Knife

5.0 PRE-INSTALLATION

5.1 Disconnect the battery prior to performing any wiring modifications.

5.2 Identify mounting location for the PCM and FRPDB. The harness design in this kit assumes PCM location in the right front (passenger side) of the engine compartment and FRPDB installation in the glove box/passenger compartment area. Some customers have successfully located both the PCM and FRPDB in the passenger compartment glove box area – some minor wiring modifications may be required to accommodate this configuration. Either location is acceptable as long as all connectors are able to mate without excessive strain on the harness wiring.

5.3 Identify where the Ford Racing Controls Pack harness can pass through on the Right (Passenger) side of the bulkhead. You will need to determine the proper location to cut a hole for the harness to pass through. Check for any wires, hoses, etc. that may become damaged by the hole saw.

5.4 Use a center punch to mark the location of the center of the hole. By using the center punch, this will keep the drill bit from 'walking' while you are cutting through the bulkhead.

5.5 Drill hole to size required to allow OBD II and accelerator pedal connectors to pass through from engine to passenger compartment. Clean any sharp edges with a file or die grinder.

5.6 The grommet will need to be cut in order to be installed onto the harness. Using a utility knife, carefully make one cut starting from the inside of the grommet and cutting outwards. It is always safest to pull the knife away from you while cutting.

5.7 Route the harness through the hole, starting from the engine compartment side; pass the accelerator pedal connector (Page 9, Connector #4), OBD II connector (Page 9, Connector #5), and blunt leads into the passenger compartment.

5.8 Route the accelerator pedal connector, OBD II connector, and blunt leads under the dashboard and towards the driver (left) side of the vehicle.

5.9 Route the remaining Fuel Pump Lead (Green wire) along the passenger side floor boards to the fuel pump at the rear of the vehicle. See fuel pump plumbing and location recommendations on page 14 and 15.

5.10 Install the PCM and FRPDB.

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M-6017-A504V
Electronic Throttle Crate Engine Controls Pack
INSTRUCTION SHEET

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6.0 HARNESS WIRE COLORS AND CONNECTOR LOCATIONS

BK = Black	GY = Gray	PK = Pink	WH = White
BR = Brown	LB = Light Blue	VT = Violet	YE = Yellow
DB = Dark Blue	LG = Light Green	RD = Red	
DG = Dark Green	OG = Orange	TN = Tan	

Number	Connector	Connects to	Wire colors/Pin locations
1	Blunt lead wire connections	See page 13	See Page 19
2	UEGO L	Bank 2 Universal Exhaust Gas Oxygen	See Page 18
3	UEGO R	Bank 1 Universal Exhaust Gas Oxygen	See Page 18
4	Accelerator Pedal	Accelerator Pedal Assembly (APPS)	See Page 18
5	OBD II Diagnostic connection	Diagnostic equipment	See Page 18
6	EPAS (AIM for race car)	Electronic Power Assisted Steering (if equipped)	See Page 18
7	PDB (15 pin) / Fan power eyelet (orange wire)	Power Distribution Box / Fan power lug (For connection instructions refer to photo page 16)	See Page 20
8	PDB BEC	Power Distribution Box (bolt in)	See Page 20
9	*Intercooler pump	*Supercharger Intercooler Pump (if equipped)	See Page 19
10	MAF	Mass Airflow Sensor	See Page 18
11	ALT	Alternator	See Page 18
12	Chassis ground eyelet	Vehicle frame / Sub-frame	Black
13	Cooling fan	Cooling fan motor	Orange=pos. Black=neg.
14	PCM (50 way)	Powertrain Control Module	See Page 20
15	PCM (70 way)	Powertrain Control Module	See Page 18
16	In-Line Connector (ILC)	Engine harness	See Page 18
17	Starter solenoid, Battery NEG	Starter Solenoid / Batt. NEG post	Starter=white Batt.neg.=Black

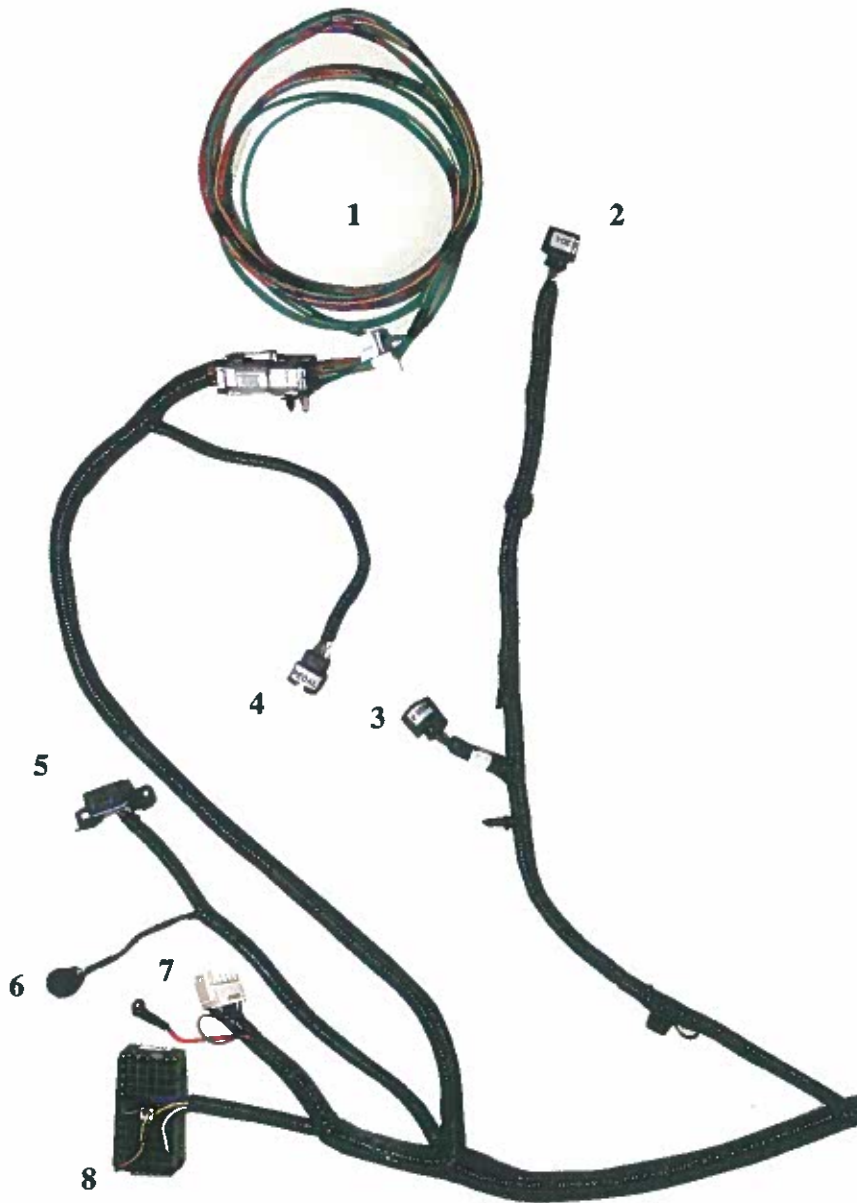
NOTE: Cooling fan is switched on at 195F, turns off at 190F. This is based on inferred engine coolant temperature. Engine coolant temperature is inferred from the cylinder head temperature. Inferred coolant temperature may not be the same as actual coolant temperature.

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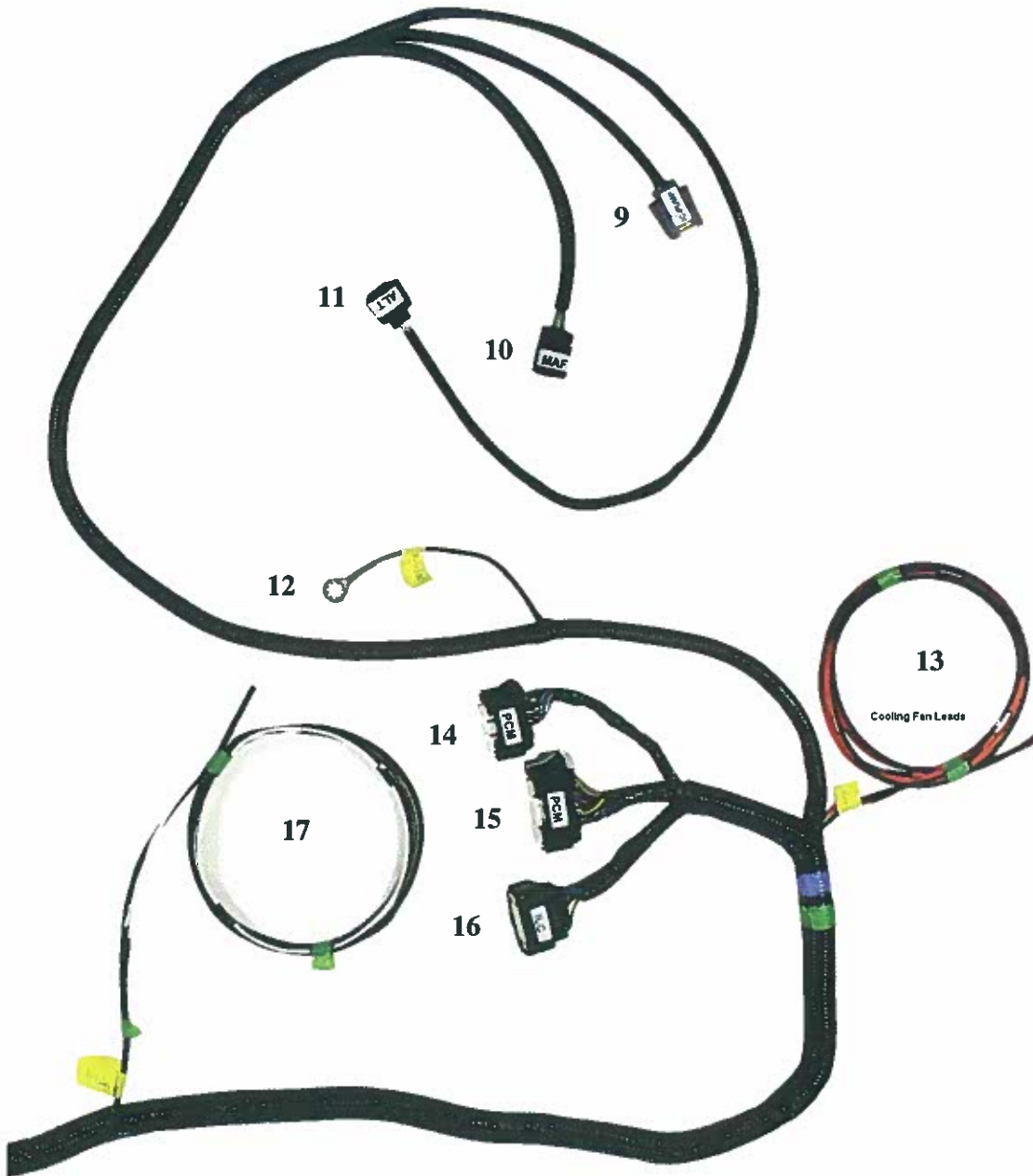


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7.0 HARNESS INSTALLATION

- 7.1 Attach main harness connector (Connector #8) to the FRPDB. Use a Phillips screwdriver to gently snug the mounting screw for this connector. Access to this screw is through a hole in the back side of PDB.
- 7.2 Attach the PCM Connector (Connector #15) to the cowl pocket (outside 70 pin connector) of the PCM
- 7.3 Attach the Auxiliary Inline Connector (Connector #16) to the mating inline connector of a 2011 MY or newer engine harness.
- 7.4 Attach the 15 pin FRPDB Connector (Connector #7) to the FRPDB. Attach the cooling fan power lead (orange wire with eyelet) to the cooling fan power lug using supplied nut (refer to picture in section 10). Leave the lid off of the FRPDB until verification of installation is complete to allow for trouble-shooting if necessary.
- 7.5 Using a sheet metal screw, attach the eyelet (Connector #12) to the inner fender or bulkhead. Verify that you have a good reliable ground path from the battery negative post to the location being used for this eyelet on the chassis. In general, the resistance from the battery ground to this chassis location should be less than 0.1 ohm.
- 7.6 Find a mounting location for the Accelerator Pedal. Ensure that the mounting location is sufficiently strong so the mounting surface will not fatigue over time from the constant usage of the accelerator pedal. If necessary, fabricate an additional support plate for mounting the accelerator pedal. Once the pedal is mounted, attach the Accelerator Pedal Connector (Connector #4)
- 7.7 Attach the OBD II Diagnostic Connector (Connector #5) at a location of your choosing that will provide easy access for connection of diagnostic tools. This is usually under the dashboard on the driver (left) side of the vehicle. Verify that the connector, once mounted, does not interfere with any part of your body while in the seated position.

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 8.2 C may be omitted, and unused blunt leads should be cut to ~2" length and sealed using heat shrink.

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8.0 WIRING CONNECTIONS

- 8.1 Locate each of the Blunt Leads. This is where you will need to make all of the soldered connections for the harness.
- 8.2 Connect the blunt leads as follows:
- A. **Blunt Lead 1 – Ignition Switch Position (Red/Light Green Wire):** Connect this wire to a **SINGLE SOURCE** on the ignition switch that provides 12 Volts when the key is in either the 'Start' (cranking) or 'Run' position. 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).
 - B. **Blunt Lead 2 – Fuel Pump (Dark Green):** Connect to Fuel Pump positive. Separate ground for fuel pump must be provided. The fuel pump will be running any time key is on.
 - C. **Blunt Lead 3 – Starter Motor Request (Red/Light Blue):** Connect to start node of ignition switch so that 12 volts is provided when engine starting is requested.*
 - D. **Blunt Lead 4 – Clutch Position (Neutral Switch) (Dark Blue/Orange):** This circuit **must be grounded** either directly to ground or through an optional customer provided clutch pedal switch.* (PCM will not engage the starter without proper ground/switch)
 - E. **Blunt Lead 5 - CTO (Tan/Yellow):** This wire is the tachometer lead. This is not a mandatory connection.*

*If non-PCM controlled starting is used, step 8.2 C may be omitted, and unused blunt leads should be cut to ~2" length and sealed using heat shrink.

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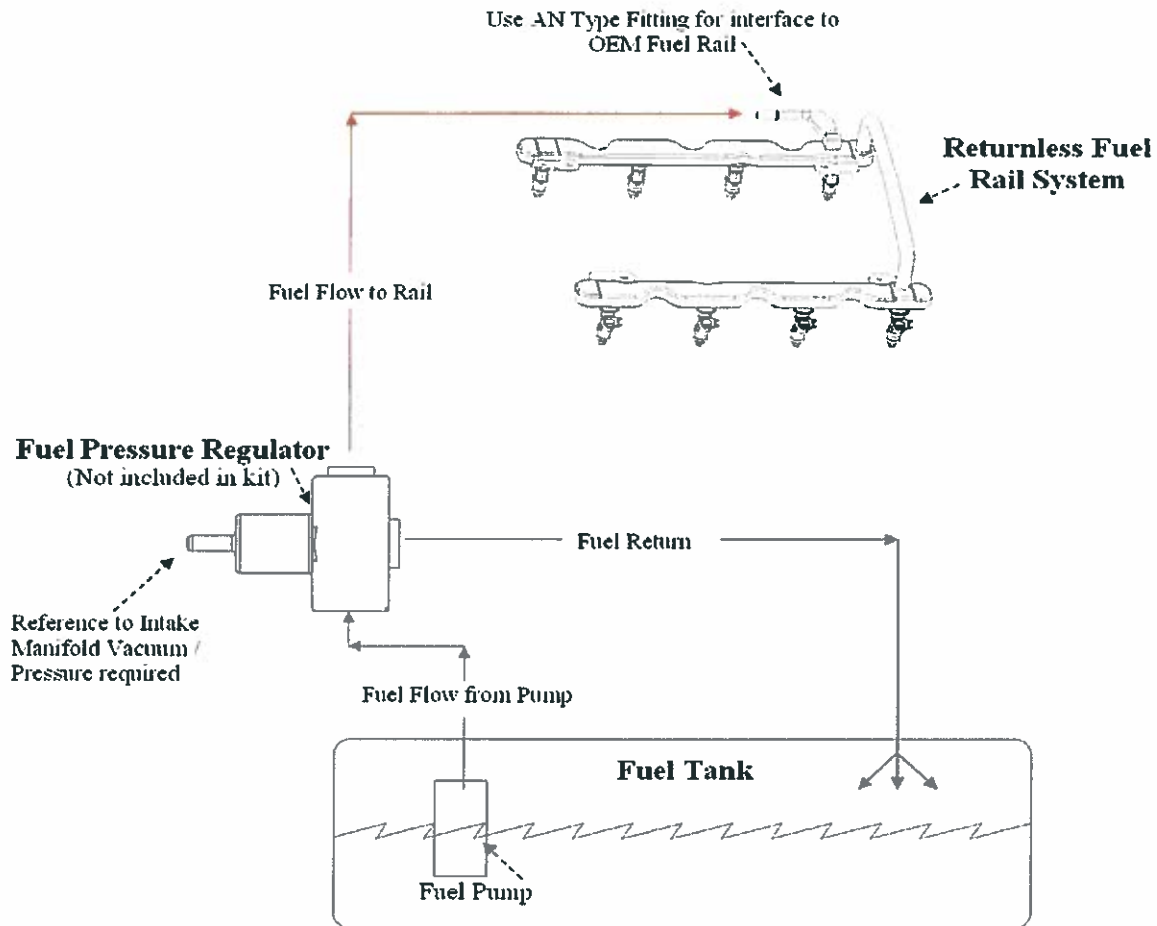
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9.0 Fuel System

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

Notes:

- Set regulator to maintain 55 psi delta fuel pressure across injector (55 psi at fuel rail with engine off):
- Use only AN type fuel fitting to interface with OEM fuel rail.
- Fuel pressure regulator must have reference to manifold vacuum.





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Fuel pump requirements: 155L/Hr minimum 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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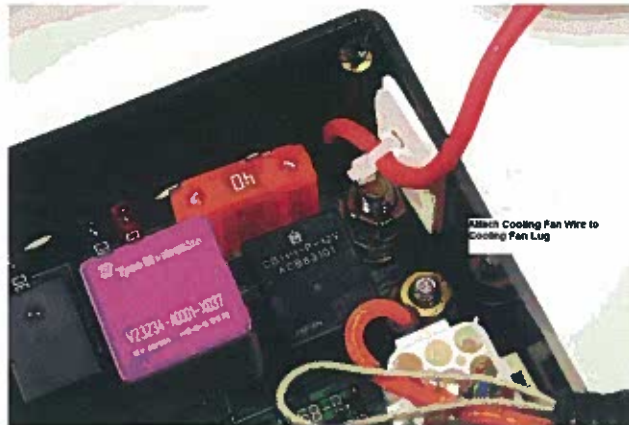


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10.0 FRPDB Installation

- 10.1 Connect the main power lead from the FRPDB to the battery positive terminal. 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.
- 10.2 Connect the cooling fan power lead (orange wire with eyelet) to the cooling fan power lug of the FRPDB using supplied nut. Leave the lid off of the FRPDB until verification of installation is complete to allow for troubleshooting.



NOTE: Do not use power tools to tighten eyelet retaining nut, damage to the circuit board may occur if overtightened!

- 10.3 Connect the main harness connector #8 and 15 pin connector #7 to the FRPDB



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11.0 INITIAL START UP

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

- 11.1** Check all fluid levels, electrical and fluid connections.
- 11.2** Pressurize the fuel system by turning the key on. Inspect the entire fuel system (from tank to engine) for leaks.
If any leaks are found, do not proceed further until these have been corrected.
- 11.3** Start Engine. Check for leaks and/or noises that may indicate a problem.

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

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12.0 CONNECTOR FACES AND WIRE USAGE SCHEMATIC

PCM - 70 Way
(Female Terminals)

PCM70way CONNECTOR	PIN	WIRE	GA.	CIRCUIT #	FUNCTION	TO
PCM0-02	1	LB/RD	20		MAF RTN	UW-4
PCM0-05	2	PK	20		V/SOUT	Blunt Lead
PCM0-07	3	LG/YE	20		ISAC	PDB-08
PCM0-10	4	TR/YE	20	3500	IC TO	C47-07
PCM0-12	5	GR/WH	20	327E	ACCRT	PDB-09
PCM0-13	6	VT	20	181C	ISOC	C47-11
PCM0-14	7	PKOY	20		GENLI	ALC-1
PCM0-16	8	WH/PK	20		SMB / 12V STBY	PDB-11
PCM0-18	9	TR/RD	20		Ign Relay Control	BEC-C9
PCM0-19	10	VE/GR	20	225	Fuel Pump Com. (FPCL)	C47-13
PCM0-21	11	DB	20	206	Injector PWM	S-508
PCM0-23	12	TR/YE	20		APP	APP-03
PCM0-25	13	LG/WH	20		APP 2	APP-05
PCM0-32	14	GR/WH	20	318	Fuel Pump Mon. (PPM)	C47-16
PCM0-35	15	BR/YE	18		IAT#2	AUX-10
PCM0-38	16	BR/PK	20		PCM Relay Control	PDB-12
PCM0-39	17	TR/LB	20		MAF (Freq)	C47-20
PCM0-42	18	RD/LG	20	291D	ISP-3	C47-23
PCM0-44	19	GR/RD	20		APPRN (1)	APP-03
PCM0-45	20	GR/WH	20		APPRN (2)	APP-05
PCM0-47	21	LT	20		IAT	UW-2
PCM0-48	22	DB/YE	20	3100	ISCS RTN	C47-26
PCM0-50	23	BK	18		Chase Ground	S-510
PCM0-51	24	DB/YE	20		ISCS RTN PCM signal	PDB-14
PCM0-53	25	YE/LB	20		GENRLC	ALC-2
PCM0-57	26	DB/WH	20		ACCSS	PDB-15B
PCM0-58	27	PK/LG	20	132G	HS CAN (-)	S-600
PCM0-59	28	WH/GR	20	151G	HS CAN (+)	S-700
PCM0-60	29	LT	20		APPRN (2)	APP-05
PCM0-61	30	LT	20		APPRN (1)	APP-03
PCM0-62	31	YE	20		ISOPWR / ISVHAT	S-72
PCM0-64	32	WH	20	311D	ISCS	C47-10
PCM0-67	33	GR/GR	20		V/PWR	PDB-9
PCM0-68	34	GR/GR	20		V/PWR	PDB-8
PCM0-69	35	BR/WH	20		PWR Ground	S-510
PCM0-70	36	BR/WH	20		PWR Ground	S-510

*V/SOUT Blunt lead "Hank-taped" at C47 take-out

MAF
(Female Terminals)

MAF CONNECTOR				
PIN	COLOR	GA.	FUNCTION	TO
MAF-2	GY	20	IAT	PCM0-47
MAF-3	LG	20	VPWR	S-900
MAF-4	LB/RD	20	MAF RTN	PCM0-02
MAF-5	TR/LB	20	MAF (Freq)	PCM0-40

In-Line to EPAS (or AIM for Race Car)
(Female Terminals)

AIM CONNECTOR				
PIN	COLOR	GA.	FUNCTION	TO
AIM-1	WH/LG	20	HS CAN (+)	S-700
AIM-2	BK	20	GND	S-570
AIM-3	LG/RD	20	KAPWR	S-70
AIM-4	PK/LG	20	HS CAN (-)	S-800

ALT
(Female Terminals)

ALT CONNECTOR				
PIN	COLOR	GA.	FUNCTION	TO
ALT-1	PK/GY	20	GENLI	PCM0-14
ALT-2	YE/LB	20	GENRLC	PCM0-53
ALT-3	YE	20	VBAT Monitor	BEC-C9

AUX/ILC to 14C508 Engine Harness
(Female Terminals)

AUX/ILC CONNECTOR					
PIN	COLOR	GA.	CIRCUIT #	FUNCTION	TO
AUX-1	VT	14		VPWRH3 - Coils	S-350
AUX-2	VT	18		VPWRH3 (Non-ML Loads)	S-350
AUX-9	DB	14		VPWRH - Fuel Injectors	S-608
AUX-12	BR/WH	18		PWR Ground	S-570
AUX-13	BN/VT	18		IAT #2	PCM0-38
AUX-16	LG	18		VPWRH2, Engine Sensors	S-900

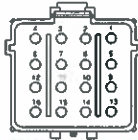
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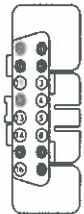
C47
(Female Terminals)
Inline to Blunt Leads Pigtail or
Vehicle Body Harness



PIN	COLOR	GA.	CIRCUIT #	FUNCTION	TO
C47-01	LGBK	20	4033	Fuel Pump Relay (Hi)	PDB-13
C47-02	RD/LB	20	202	SMR 12V START	PDB-11
C47-03	RD/LG	20	201D	ISPR	PCM70-42
C47-05	PK/LG	20	152C	HS CAN (-)	S-800
C47-08	WH/LG	20	151C	HS CAN (+)	S-700
C47-07	TN/YE	20	3800	CTO	PCM70-10
C47-08	LB/YE	20	1000	CPP-BY (1-19)	PCM50-19
C47-09	DG/BN	20	3100	SCCS RTN	PCM70-48
C47-10	WH	20	3110	SCCS	PCM70-64
C47-11	VT	20	181C	BOO	PCM70-13
C47-12	LG/VI	20	101U	CPP-TT (1-21)	PCM50-21
C47-13	DG	14	938A	Fuel Pump Feed 1 of 2	PDB-12
C47-14	DG	14	938B	Fuel Pump Feed 2 of 2	PDB-15
C47-15	YE/OG	20	225	Fuel Pump Com. (FPC)	PCM70-19
C47-16	BN/WH	20	518	Fuel Pump Mon. (FPM)	PCM70-32

**** Blunt Leads are 'Hank-Taped' into this Take-out

Data Link Connector (DLC)
(Female Terminals)



PIN	COLOR	GA.	FUNCTION	TO
DLC-04	BK	20	PWR Ground	S-570
DLC-05	BR/WH	20	PWR Ground	S-570
DLC-06	WH/LG	20	HS CAN (+)	S-700
DLC-14	PK/LG	20	HS CAN (-)	S-800
DLC-16	LG/RD	20	KAPWR	S-70

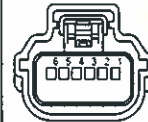
TWISTED PAIR

Supercharger Inter-cooler Pump (SCICP)
(for optional supercharger) C1217

PIN	COLOR	GA.	FUNCTION	TO
SCICP-1	WH/RD	14	SCICP 12V Feed	PDB-5
SCICP-2	BK	20	GND	S-570

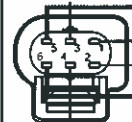


APPS
(Female Terminals)



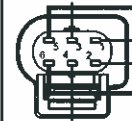
PIN	COLOR	GA.	FUNCTION	TO
APPS-01	BN/WH	20	APPVREF (1)	PCM70-45
APPS-02	TN/YE	20	APP 1	PCM70-28
APPS-03	GY/RD	20	APPRTN (1)	PCM70-44
APPS-04	GY	20	APPRTN (2)	PCM70-60
APPS-05	LB/WH	20	APP 2	PCM70-29
APPS-06	BN	20	APPVREF (2)	PCM70-61

UEGO #1 Right Side



PIN	COLOR	GA.	FUNCTION	To
UEGO1-1	TN/YE	20	UO2SIA Bank 1	PCM50-29
UEGO1-2	GY/DB	20	UREF Bank 1	PCM50-15
UEGO1-3	LG/TN	20	HTR Bank 1	PCM50-24
UEGO1-4	VT/GY	20	VREF2	S900
UEGO1-5	LG	20	UO2SIP Bank 1	PCM50-17
UEGO1-6	TN/VT	20	UO2SN Bank 1	PCM50-4

UEGO #2 Left Side



PIN	COLOR	GA.	FUNCTION	To
UEGO2-1	WH	20	UO2SIA Bank 2	PCM50-28
UEGO2-2	BN	20	UREF Bank 2	PCM50-40
UEGO2-3	GY/VT	20	HTR Bank 2	PCM50-35
UEGO2-4	VT/GY	20	VREF2	S900
UEGO2-5	TN/LB	20	UO2SIP Bank 2	PCM50-16
UEGO2-6	WH/LG	20	UO2SN Bank 2	PCM50-39

****Blunt Leads

BL1 PK (20) to PCM-05, VSOUT
BL2 VT (20) to PDB-07, ACCR

Each Blunt Lead wire extends 160mm past C47 and shall be 'Hank-Taped' to harness take-out.

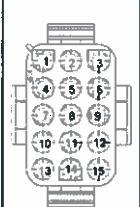
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PDB 15pin (Female Terminals)



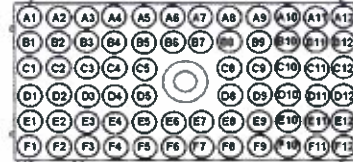
PIN	COLOR	GA.	CIRCUIT #	FUNCTION	TO
PDB-01					
PDB-02					
PDB-03	BK/WH	18		PWR GND	S-570
PDB-04	LG/RD	20		KAPWR	S-70
PDB-05	WH/RD	14		SCCP 12V Feed	SCCP-1
PDB-06	LG/YE	20		SMC	PCM70-07
PDB-07	DB/WH	20		ACCS	PCM70-57
	VT	20		ACCS	Blunt Lead ¹⁾
PDB-08	GY/WH	20	321A	ACCR	PCM70-12
PDB-09	GVOG	20		VPWR	PCM70-67
	GVOG	20		VPWR	PCM70-68
PDB-10	BN/PK	20		PCM Relay Control	PCM70-38
PDB-11	WH/PK	20		SMR	PCM70-16
	RD/LB	20	202	SMR	C47-2
PDB-12	DG	14	938A	Fuel Pump Feed 1 of 2	C47-13
PDB-13	LG/BK	20	4933	Fuel Pump Relay (H)	C47-01
PDB-14	DB/YE	20		SCCP PCM signal	PCM70-50
PDB-15	DG	14	938B	Fuel Pump Feed 2 of 2	C47-14

¹⁾ACCS Blunt lead "Hank-taped" at C47 take-out

DOUBLE CRIMP
DOUBLE CRIMP
DOUBLE CRIMP

PDB BEC

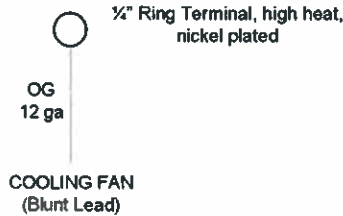
(Female Terminals)



PIN	COLOR	GA.	CIRCUIT #	FUNCTION	TO
BEC-A1	LG	18		VPWR2 Engine Sensors	S-900
BEC-A12	IN/RD	20		Fan Relay Control	PCM70-18
BEC-C9	YE	20		VBA ¹⁾ Monitor	ALT-3
BEC-D5	VT	14		VPWR3 Coils	S-350
BEC-E6	DB	14		VPWR4 Fuel Injectors	AUX-2
	DB	20		Injector PWM (S, L)	PCM70-21
BEC-F8	BR/WH	18		PWR Ground	S-570
BEC-F10	IN/LG	12		Starter Solenoid 12V Feed	BL-55

DOUBLE CRIMP

Fan Ring Terminal Install on 1/4" Stud in PDB



PCM50way

50 Way "Key C"



PIN	COLOR	GA.	FUNCTION	TO
PCM50-4	TN/VT	20	UO2SN Bank 1	UEGO #1-6
PCM50-15	GY/DB	20	UREF Bank 1	UEGO #1-2
PCM50-16	IN/DB	20	UO2SIP Bank 2	UEGO #2-5
PCM50-17	LG	20	UO2SIP Bank 1	UEGO #1-3
PCM50-19	LB/YE	20	Bottom Throttle	C47-8
PCM50-21	LG/VT	20	Top Throttle	C47-12
PCM50-24	LB/VT	20	HTR Bank 1	UEGO #1-3
PCM50-28	WH	20	UO2SIA Bank 2	UEGO #2-1
PCM50-29	TN/YE	20	UO2SIA Bank 1	UEGO #1-1
PCM50-35	GY/VT	20	HTR Bank 2	UEGO #2-3
PCM50-39	WH/LG	20	UO2SN Bank 2	UEGO #2-6
PCM50-40	BN	20	UREF Bank 2	UEGO #2-2

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