



# **Wire Harness Installation Instructions**

**For Installing:**

**Part #60510 & 60511  
Ford 5.0L 1986-93 Wiring Harness**

**Manual #90518**

# **Painless Performance Products, LLC**

**2501 Ludelle Street**

**Fort Worth, TX 76105-1036**

**800-423-9696 phone – 817-244-4024 fax**

**Web Site: [www.painlessperformance.com](http://www.painlessperformance.com)**

**E-Mail: [painless@painlessperformance.com](mailto:painless@painlessperformance.com)**

If you have any questions concerning the installation of this product, feel free to call **Painless Performance Products'** tech line at 1-800-423-9696. Calls are answered from 8am to 5pm central time, Monday thru Thursday, 8am-4:30pm Friday, except holidays.

Here we have provided you with accurate instructions for the installation of this product. However, if you have comments/suggestions concerning these instructions, please call or email us (our contact information can be found at the top of this page or online at **[www.painlessperformance.com](http://www.painlessperformance.com)**). We sincerely appreciate your business.

**Painless Performance Products, LLC** shall in no event be liable in contract or tort (including negligence) for special, indirect, incidental, or consequential damages, such as but not limited to, loss of property, or any other damages, costs or expenses which might be claimed as the result of the use or failure of the goods sold hereby, except only the cost of repair or replacement.

**Should you damage or lose part of your manual, a full color copy of these instructions can be found online at [www.painlessperformance.com](http://www.painlessperformance.com)**

Installation Manual: **90518**

**3<sup>rd</sup> Edition: June 2020**

**Copyright © 2001 by Painless Performance Products, LLC**

## TABLE OF CONTENTS

1.0	Introduction.....	1
2.0	About These Instructions.....	1
3.0	Tools Needed.....	2
4.0	Pre-Installation and Harness Routing Guidelines.....	2
5.0	General Installation Instructions.....	4
5.1	Grounding The Vehicle.....	4
5.2	Rough Installation.....	4
5.3	Harness Attachment.....	5
5.4	Terminal Installation Instructions.....	5
6.0	Ford 5.0 Wiring Harness Installation.....	6
6.1	Contents of the 60510 & 60511 Wire Harness Kits.....	6
6.2	Dash Section Installation .....	6
6.3	Engine Group Installation.....	11
6.4	Tail Section Installation.....	19
7.0	Ford 5.0 Start Up.....	20
8.0	Trouble-Shooting Instructions.....	20
8.1	The "Check Engine" Light.....	20
8.2	Retrieving Trouble Codes from the Computer.....	21
8.3	Engine Running.....	22
8.4	EEC-IV Diagnostic Trouble Codes and Definitions.....	22

## LIST OF FIGURES

Figure 1	Computer & Harness Connector.....	6
Figure 2	Check Engine Light.....	7
Figure 3	Barometric Pressure Switch (BAP).....	10
Figure 4	Intake Manifold.....	12
Figure 5	Intake (with plenum removed).....	12
Figure 6	Location of IAT & ECT.....	13
Figure 7	Intake Air Temperature & Engine Coolant Temperature (IAT & ECT).....	13
Figure 8	Location of EGR, TPS & ISC.....	14
Figure 9	Idle Air Control Valve (IAC).....	14
Figure 10	Throttle Position Sensor (TPS).....	15
Figure 11	Exhaust Gas Recirculation Valve (EGR).....	16
Figure 12	Thick Film Ignition (TFI).....	17
Figure 13	Ignition Coil .....	17
Figure 14	EGR Vacuum Regulator Solenoid (EVR).....	18
Figure 15	Mass Air Flow Sensor (MAF).....	18
Figure 16	Vehicle Speed Sensor (VSS).....	19
Figure 17	Heated Oxygen Sensor (HEGO).....	19
Figure 18	Self-Test Connectors (STO & STI).....	21
Figure 19	Fuse Location.....	22

## LIST OF TABLES

Table 1	Compatible Parts.....	3
Table 2	Dash Section.....	10
Table 3	Engine Section.....	11
Table 4	Tail Section.....	20

## 1.0 INTRODUCTION

You have purchased what we at Perfect Performance Products, LLC believe to be the most up-to-date and easiest-to-install automotive fuel injection harness on the market. It is designed for easy installation, even if you have no electrical experience.

**This harness is based on the 1993 Ford Mustang setup and is designed to be a complete wiring system for the fuel injection system on Ford 5.0L fuel injection engines with (Mass Air Flow System).** This harness includes all wiring that is needed by the computer to run and control the fuel injection system.

***Note: '94 & '95 engines will require switching the distributor to an '86-93 type and modifying the TPS wiring.***

***Note: '86 & '87 engines can be used if converted to a Mass Air Flow System. The change from Speed Density to Mass Air Flow would require changing the ECM and adding a MAF sensor. See Table 1 on page 3***

***Note: '86-'93 TPS sensors will need to have the connector on the sensor changed to the provided 4 pin connector. Painless is no longer able to obtain the factory style 3 pin connector. Page 15 will walk you through this process.***

Usually, the Computer, Fuse block and Relays can easily be mounted under the dash. Most of the wiring in the harness has been pre-terminated to the proper connector and all wire is rated at 125C and has been Ford color-coded.

These fuel system harnesses have been divided into three major groups:

<b>ENGINE GROUP</b>	Includes wiring for the fuel injectors, distributor, and sensors
<b>DASH GROUP</b>	Includes Computer, fuse block, EEC and fuel pump relays, ignition feed wire, STO and STI (self test) check-engine light, Tachometer signal, Spout connectors, and the barometric pressure connector.
<b>TAIL SECTION</b>	Power wire for fuel pump, constant power wire, ignition ground, oxygen sensors and VSS.

## 2.0 ABOUT THESE INSTRUCTIONS

These instructions provide information for the installation of the 60510 Fuel Injection Wire Harness Kit. The contents of these instructions are divided into major **Sections**, as follows:

- 1.0 Introduction
- 2.0 About These Instructions
- 3.0 Tools Needed
- 4.0 Pre-Installation and Harness Routing Guidelines
- 5.0 General Installation Instructions
- 6.0 60510 & 60511 Fuel Injection Harness Kit
- 7.0 Start Up
- 8.0 Trouble Shooting Instructions and Trouble Codes

**Sections** are further divided into **Paragraphs** and **Steps**. Throughout, the **Figure** numbers refer to illustrations and the **Table** numbers refer to information in table form. These are located in or near the sections or paragraphs to which they correspond. Always pay careful attention to any *Notes* or any text labeled **CAUTION**.

### 3.0 TOOLS NEEDED

In addition to your regular tools, you will need, at least, the following:

Crimping Tool	<i>Note: Use a quality tool to avoid over-crimping.</i>
Wire Stripper	
Continuity Tester	<b>Caution: Do <u>not</u> use a test light to test the computer or sensor wiring or you will damage the computer.</b>
Electric Drill	
1-5/8" Hole saw	(for the rubber grommet in the firewall)

### 4.0 PRE-INSTALLATION AND HARNESS ROUTING GUIDELINES

The installation of your harness kit consists mainly of two parts:

- The physical routing, positioning, and securing of the harness, wire groups, and individual wires and connectors.
- The proper electrical connection of the individual circuits.

These two major tasks are not separate steps, but are integrated together. That is, you will route some wires and make some connections, route some more wires and make some more connections.

We cannot tell you how to physically route the harness in your vehicle. That depends a great deal upon the particular make of vehicle and to what extent you want to secure and conceal the harness. We do offer some general guidelines and routing practices starting in **Paragraph 4.3**, GENERAL installation instructions in **Section 5.0**, and precise instructions concerning the electrical connections you will have to make beginning in **Section 6.0**. To help you begin thinking through the installation of your wire harness, read the following sections:

**4.1** You should get to know the particular engine that you are using:

- Ford Fuel Injection System with a mass airflow (MAF) sensor. The 60510 & 60511 harness will support the Mass Airflow (MAF) and the Thick Film Ignition (TFI) module in addition to the other wiring common to the fuel injection systems.

**4.2** Painless recommends the use of the following parts. See **Table 1 on page 3**. These will meet all requirements and are compatible with the Painless harnesses. The following numbers given are Ford or Motorcraft part numbers. The main computer part numbers are REQUIRED for use with our harnesses. **The computer flash must match the transmission and emissions components being used, not doing so will result in poor performance and/or the check engine light being on.**

***Note: Calibration numbers: If the calibration is known, it is best and recommended that all part have matching calibration. This is for the best performance.***

The computer part numbers shown in the compatible parts list in **Table 1** are required part numbers for that application. The use of any other computer may damage the computer, harness or both. Use of the wrong computer will almost certainly cause problems. The programming in the computer for a manual transmission is slightly different than that of an automatic. Please double check to be sure that you have the correct computer part number (it is shown as a service number on the computer itself). The rest of the part numbers shown are for your information only.

**4.3** Familiarize yourself with the harness by locating each of the harness groups and by looking at the connectors on the wire ends.

- 4.4 Decide where and how the computer and sensors will be mounted. PPP wire harness kits are designed to mount both, under the dash or in the lower kick panel on the right side.
- 4.5 A good exercise is to lay out the wire harness on the floor beside your vehicle and identify all the connectors and wires. The harness must be routed from the inside of the vehicle out to the engine compartment.
- 4.6 You will want to route the harness through and around open areas. Inside edges provide extra protection from hazards and also provide places for tie wraps, clips and other support.
- 4.7 Route the harness away from sharp edges, exhaust pipes, and the hood, trunk, and door hinges.
- 4.8 Plan where harness supports will be located. Use a support approximately every 6 inches unless the harness routes under the floor carpet.
- 4.9 Allow enough slack in the harness at places where movement could possibly occur (body to frame, frame to engine, etc.).
- 4.10 The wires should be bundled into harness groups. Use tape, nylon ties or split loom.

<b>60510 &amp; 60511 FUEL INJECTION KIT</b>		
<b>Description</b>	<b>Ford</b>	<b>Motorcraft</b>
Main Computer	E9ZF-12A650-AA XTP220 (NAPA part #)	
Thick Film Ignition module (TFI)	E6SZ-12A297-A	DY-504
Throttle Position Sensor	E6AF-9B989-CA	CX-1133
Barometric Absolute Pressure Sensor	E7EF-12A644-A2A	DY-530
Intake Air Temperature Sensor	F2DF-12A697-AA	DY-674
Engine Coolant Temperature Sensor	F2AF-12A648-AA	DY-681
Heated Exhaust Gas Oxygen Sensor (HEGO)	E7TF-9F472-AA	DY-605
Vehicle Speed Sensor	E3AZ-9E731-A	
E.G.R. Valve	E7PE-9H473-H2A	CX-1230A
E.G.R. Sensor	F2ZE-9G428-AA	CX-1464
E.G.R Valve Gasket		CG-697
EGR Vacuum Regulator (EVR)	E63Z-9J459-A	
Fuel Pump Relay	Painless # 80130	
EEC Power Relay	Painless # 80130	
<b>Note:</b>		
If you have a used computer take the time to call your local Ford Parts Dealer to verify you have the proper PCM. <b>If you know the calibration of your engine it is best to buy parts with the same code.</b>		

**Table 1** Compatible Parts (Main Computer comes with MAF sensor)

## 5.0 GENERAL INSTALLATION INSTRUCTIONS

### **CAUTION:**

- ***Do not disconnect the battery or the computer connector(s) while the ignition is on.***
- ***Do not short any wire in this harness to ground (with the exception of labeled ground wires) or damage to the computer will result.***
- ***Giving or receiving a jump-start may damage the computer.***
- ***Do not use a test light when testing computer sensors or computer circuits. Damage to the computer will result!***
- ***When routing the wires for the vehicle speed sensor (if used) make certain that they are at least 12 inches away from any ignition wiring (spark plug wires, etc.).***

### **Notes:**

- **All of the adapters, listed in the manual, are included in the wiring kit. You should use or remove them depending on your particular application.**
- **When Connecting the harness, NEVER FORCE ANY CONNECTOR INTO PLACE**
- **When connecting the plugs to the computer USE EXTREME CARE to make sure none of the pins in the computer are or have become bent.**
- **The timing connector for the ignition is near the computer.**
- **The fuel pump you are using MUST be rated at a minimum of 40 pounds PSI (per square inch), and 33 gallons GPH (gallons per hour)**
- **If you have headers you may have to relocate the H.E.G.O. sensor for proper clearance.**

**Note:** Install H.E.G.O's no more than three inches from your header to pipe flanges.

### 5.1 GROUNDING THE VEHICLE

A perfectly and beautifully wired automobile will nevertheless have problems if everything is not properly grounded. Don't go to the effort of installing a quality wire harness only to neglect proper grounding.

- 5.1.1** Connect a ground strap or cable (minimum of a 4-gauge wire) from the negative battery terminal to the automobile chassis (frame).
- 5.1.2** Connect a ground strap from the engine to the chassis (frame). **DO NOT RELY UPON THE ENGINE MOUNTS TO MAKE THIS CONNECTION.**
- 5.1.3** Connect a ground strap from the engine to the body.

### 5.2 ROUGH INSTALLATION

**Caution:** ***Disconnect the power from your vehicle by removing the negative battery cable from the battery.***

**Note:** ***Make no wire connections or permanent mounting of any kind at this time.***

- 5.2.1** Position the computer and sensors in their intended locations.
- 5.2.2** Drill a 1-5/8" hole for the firewall grommet near the computer for the engine group and tail section to pass through.
- 5.2.3** Route the engine group and tail section through the hole. Push the grommet (already installed on the harness) into the hole until it is seated.
- 5.2.4** Route the dash group over to the driver's side of the car.

### 5.3 HARNESS ATTACHMENT

**Note:** *Harness routing and shaping will be a time-consuming task. Taking your time will enhance the beauty of your installation. Please be patient and take your time.*

**5.3.1** Mold harness groups to the contour of the dash, engine, frame, etc. Remember to route the harness away from sharp edges, exhaust pipes, hinges, and moving parts.

**5.3.2** Attach harness groups to your automobile with clips or ties starting at the computer and working your way outward.

**Note:** *Do not tighten tie wraps or mounting devices at this time. Make all harness attachments LOOSELY.*

**5.3.3** When used every 1-1/2" or so on the visible areas of the harness, plastic wire ties make a very attractive assembly. Otherwise, a tie installed in other areas every 6" or so will hold the wires in place securely. REMEMBER TO TAKE YOUR TIME.

### 5.4 TERMINAL INSTALLATION INSTRUCTIONS

**Note:** *In the following steps you will be making the circuit connections. Before you start, you should carefully read Sections 6.0 through 8.0, as applicable, and continually refer to the wire connection charts, DOUBLE CHECKING your length calculations before cutting any wire or making any connections. These directions are for the wires, which do not have a connector already, installed on them.*

**5.4.1** Have all needed tools and connectors handy.

**5.4.2** Select the correct terminal for the wire and application.

**5.4.3** Determine the correct wire length and cut the wire. Remember to allow enough slack in the harness and wires at places where movement could possibly occur. DOUBLE CHECK YOUR CALCULATIONS.

**5.4.4** Strip insulation away from wire. Strip only enough length necessary for the type of terminal you are using.

**Note:** *In the following step, make sure that the terminal is crimped with the proper die in the crimping tool. An improper crimp will not make a good connection. DO NOT OVER CRIMP.*

**5.4.5** Crimp the terminal onto the wire.

**5.4.6** Connecting the wires and connectors throughout the harness is a repeating process. Make sure that each wire is first properly routed and then attach. DO NOT ATTACH THEN ROUTE AFTERWARD.

**5.4.7** When all wires are attached, tighten the mounts and ties to secure harness permanently.

**5.4.8** Attach the connectors to the computer BEING CAREFUL NOT TO BEND ANY PINS.

**5.4.9** **Only after all connections have been made** throughout the harness, connect the battery to the vehicle.

**CAUTION:** *Be sure the ignition is off when you reconnect the battery or you will damage the computer.*

## 6.0 FORD 5.0 WIRING HARNESS INSTALLATION INSTRUCTIONS

### 6.1 CONTENTS OF THE 60510 & 60511 WIRE HARNESS KIT

Take inventory to see that you have everything you are supposed to have in this kit. If anything is missing, go to the dealer where you obtained the kit or contact Painless Performance at (817) 244-6898. The kit should contain the following items:

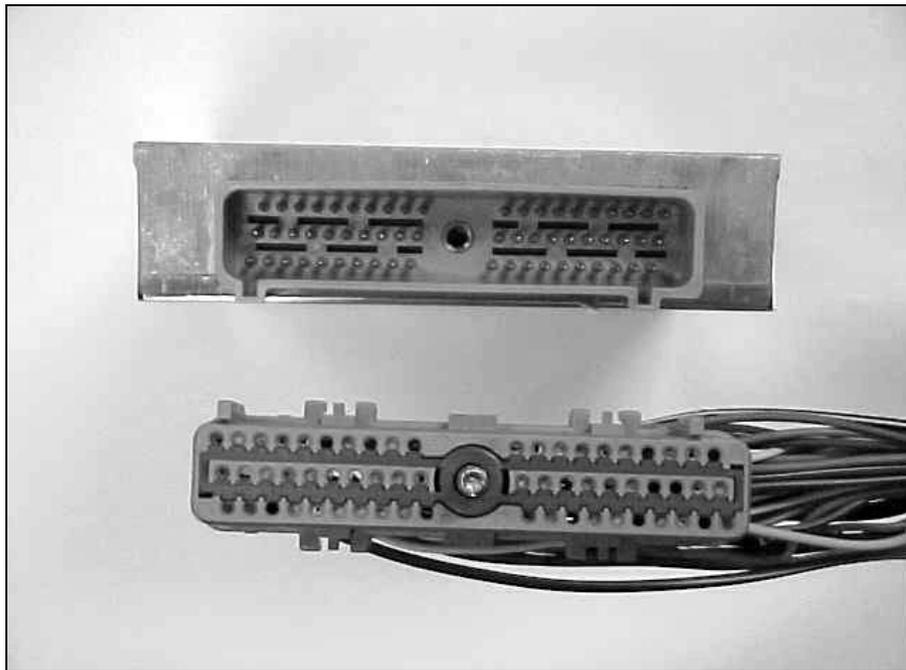
- The main wire harness with the connectors already on the ends of most of the wires.
- Thick Film Ignition Adapter.
- Fuel Injection Installation Instructions P/N 90510 (this booklet).

### 6.2 E.E.C & DASH SECTION INSTALLATION

**Note:** *If you have not already done so, read Sections 4.0 and 5.0 of these instructions and think through the installation of the harness before securing or cutting any wires.*

The wires in this group consist of the Engine computer connector, harness ground, STO and STI (self test) connectors, the check engine light and bracket, tach output, 12v activation wires, NSS, and barometric pressure sensor wires.

- Find a suitable location under the dash to mount the computer. This location should also allow room for mounting the pre-wired fuse block and relays.
- Using the provided fuse block spacers and four 1.5" screws. Mount the fuse block. The spacers are needed to keep wires exiting the back of the fuse block from rubbing the mounting surface which over time, could cause a short. The fuel pump relay and EEC power relay can be mounted using the two ¾" long screws.
- A custom bracket may need to be fabricated to mount the computer.
- Install the 60 position E.E.C connector into your E.E.C. your computer. Starting the bolt by hand. Once started use a 10mm socket to tighten it the rest of the way. **DO NOT OVER TIGHTEN OR FORCE INTO PLACE.**

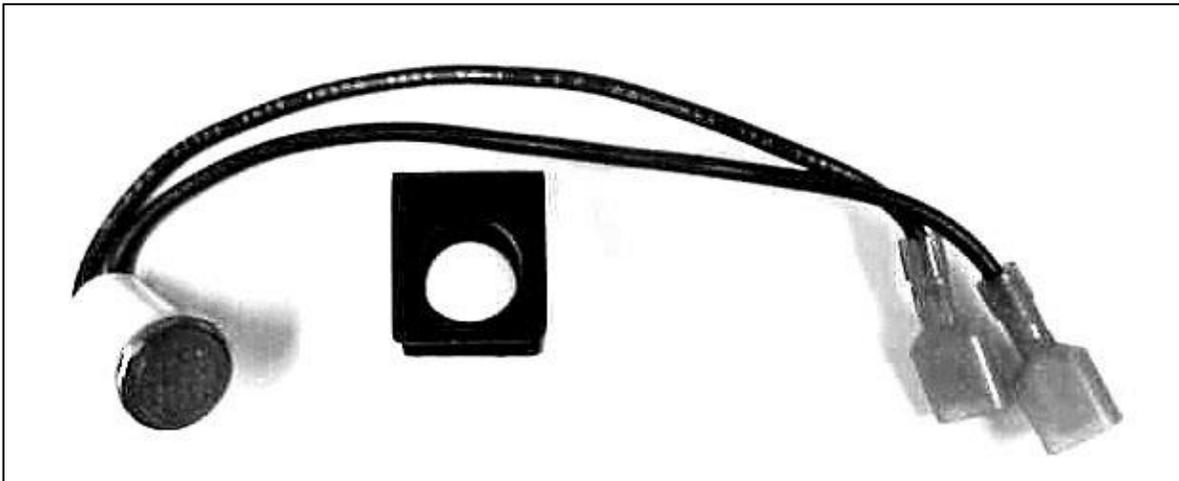


**Figure 1** Computer & Harness Connector

- **EEC GROUND:** Connect the Black and Black/White wires that share a pre-installed 5/16" ring terminal to a chassis ground source. This is the ground connection for the EEC and the EEC relay, ensure it is connected to a clean ground source.
- **IGN:** Locate the RED/LT.GRN wires labeled "IGN". Connect both wires to a **fused 12V source. POWER IS REQUIRED WHEN THE KEY IS IN THE RUN AND START POSITION.** This is the power wire for the computer and relays.

If connected to the proper power source, your check engine light will come on when you turn the key to ON/RUN, and it will stay on while you are cranking the engine for start. **DO NOT RECONNECT THE BATTERY TO CHECK UNTIL THE ENIRE HARNESS HAS BEEN INSTALLED.** On installs being done on vehicles with a Painless chassis harness, we suggest using the #920 coil wire found on your chassis harness.

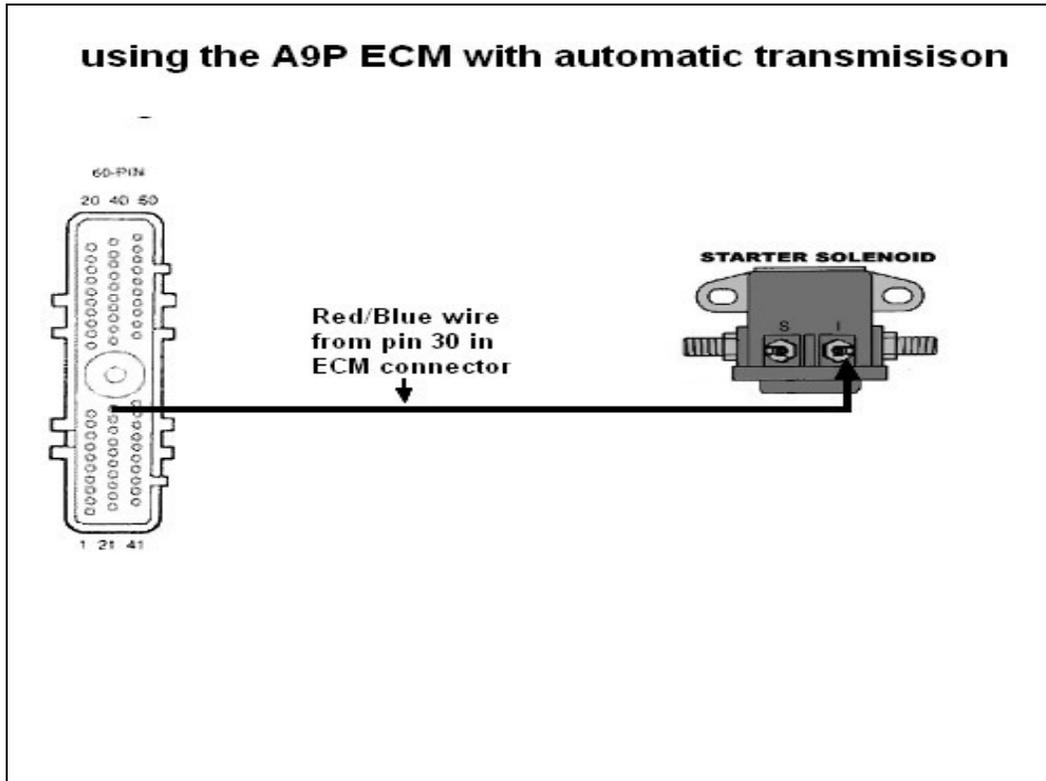
- **CHECK ENG:** Find a suitable location to mount the check engine light bracket so that it will allow you to see the check engine light while driving. After mounting the light bracket install the light into bracket. Connect the wires of the harness to the light, it does not matter which wire of the light connect to the power and ground wires of the harness.



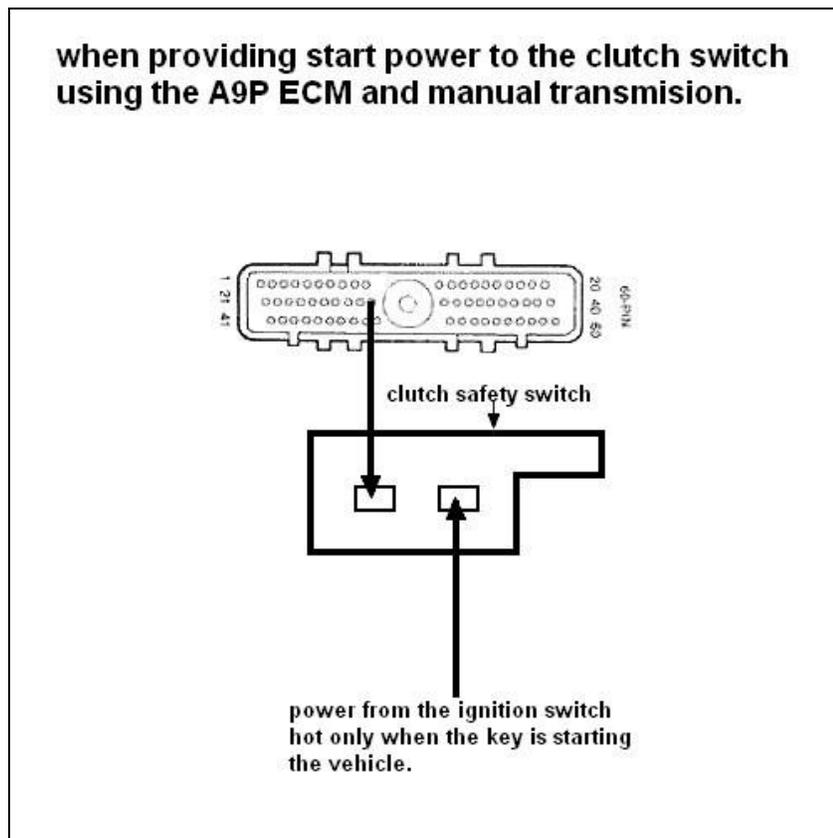
**Figure 2** Check Engine Light

- **SPOUT CONNECTORS:** There is an inline connection just behind the EEC connector that is used for setting timing. During normal operation of the engine, these connectors should be connected to one another. If any ignition timing modifications are to be made, this connection should be unplugged to set initial timing, then re-connected. Additional information on this can be found under the **START UP** portion of this manual, page 20.
- **E.E.C. TEST:** These connectors will allow trouble codes to be read in the event the check engine light comes on. Using these connectors to preform KOEO, Key On Engine Off, and KOER, Key On Engine Running, is explained later in this manual on page 21.
- **TACH:** The tan wire labeled Tach, is a tach signal wire from the computer. It will provide a tach signal to a tachometer. This is an optional connection.
- **NSS:** To properly connect the **NSS** wire, you must be careful to connect it properly and make sure you are using the correct ECM and the correct diagram for the transmission used or **you will damage your ECM**

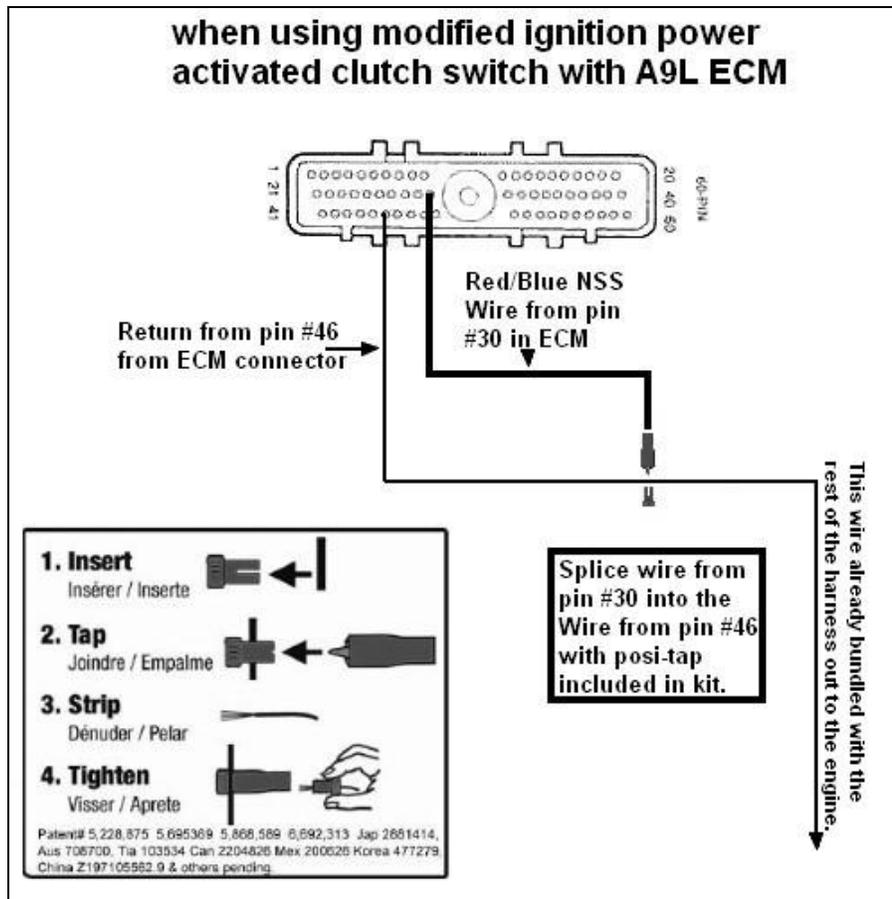
This is the diagram when using the **A9P** ECM and an automatic transmission. The NSS wire will need to be routed to the engine section. It needs to connect to a power source that only has power when the ignition switch is in the START position. The easiest place to source this would be the I terminal of the starter solenoid.



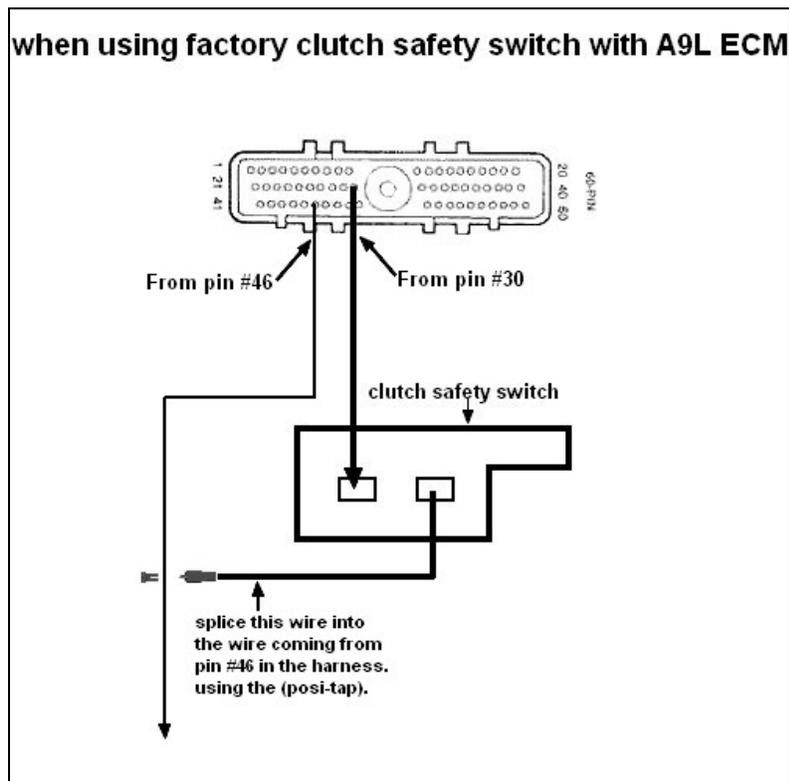
This is the diagram used when using the **A9P** ECM and a Manual transmission.



This is the connection if you are using the **A9L** ECM and an automatic transmission.



This is the connection if you are using the **A9L** ECM and a manual transmission.





- **BPS:** The Barometric Pressure Sensor is commonly referred to as the BAP sensor (Barometric Air Pressure). This sensor provides readings to the PCM to adjust air/fuel ratios. **Do not** connect this sensor to manifold vacuum.

In factory applications this sensor was located on the firewall in the engine compartment. The Painless harness has moved this connection to inside the vehicle to aid in a cleaner appearing installation. If you'd like to mount this sensor in the engine compartment extra length has been provided to allow re-routing.

**Figure 3** Barometric Pressure Sensor (BAP)

Color	#Positions In Connector	Labeled	Connect To
Grn/Ylw(1), Lt.Blu/Orn, Ylw, Red	5	Fuel Pump Relay	Fuel Pump Relay
Blk/Wht, Red/Lt.Grn, Red or Ylw	4	EEC Power Relay	EEC Power Relay
Brn/Wht, Gry/Red, Lt.Grn/Blk	3	BAP (2)	Barometric Pressure Sensor
Red/Lt.Grn	2 wires	Ignition	Ignition
Tan/Ylw	1 wire	TACH	Tachometer (optional)
Blk/Wht, Blk	2 wires w/ring	EEC Ground	A good grounding source
Red/blu	1 wire	NSS wire	*see pages 8 & 9

**NOTES:**

1. **On Striped wires (example: Blk/Wht), the second color (stripe) may not be bold.**  
**Observe two-color wires closely.**
2. **BAP can also be mounted under the hood.**

**Table 2** Dash Section

### 6.3 ENGINE GROUP INSTALLATION

The engine group is designed to be separated into left side (driver), right side (passenger), and a Mass Air Flow section. Each side is tie-wrapped separately, **but not labeled**. The portion of the harness with injectors 1-4 will connect to the right side (passenger). **Note: The plenum cannot be installed until harness has been installed.**

**Note: This manual will skip over the following connections on the harness: TFI Ground, Starter Relay, Fuel Pump, VSS, and both HEGO (oxygen sensor) connections. These connections will be made after all of the connections to the top of the engine have been made. Instructions for these connections begin on page 19**

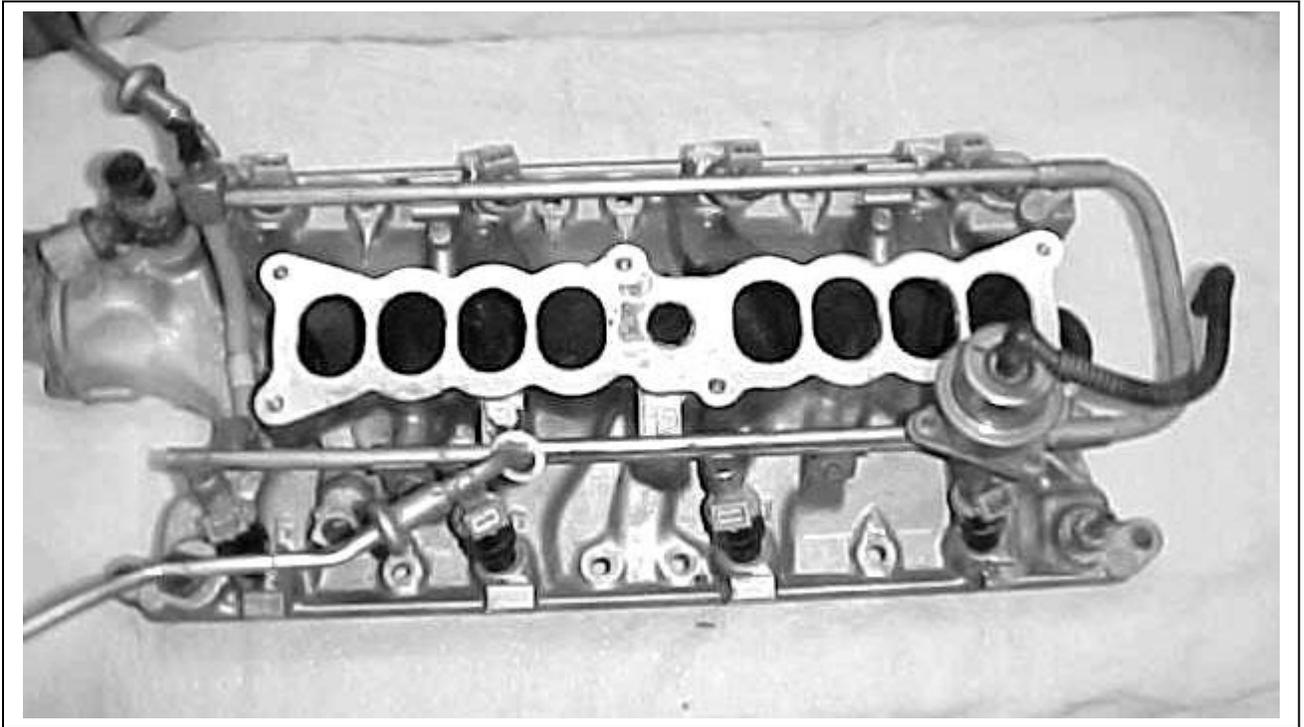
Starting at the rear of the engine, using the table below and the following images, begin attaching the connectors to their proper places and THEN secure the harness to the engine when ready.

Wire Colors	# Positions In Connector	Labeled	Connect to
Red/Lt.Grn, Tan/Ylw	3	COIL	Coil
Gry/Red, Brn/Wht Brn/Lt.Gr	2	EGR	Exhaust Gas Recirculation Valve
Red, Wht/Blu	2	IAC	Idle Air Control Valve
Gry/Red, Gry/Wht Brn/Wht	3	TPS	Throttle Position Sensor
Lt.Gr/Red, Gry/Red	2	ECT	Engine Coolant Temp Sensor
Red/Wht, , Wht, Lt.Gr/Orn, Tan/Red, Brn/Ylw, Brn/Lt.Gr, Tan/Blk Red/Ylw	8 connectors 2 pos. each	INJ	Fuel Injectors
Brn/Pnk, Red	2	EVR	EGR Vacuum Regulator
Gry, Gry/Red	2	IAT	Intake Air Temp Sensor
Red, Blk/Wht, Lt.Blu/Red, Tan/Blu	4	MAF	Mass Air Flow
Orn/Red, Pnk, Tan/Ylw Gry/Org, Red/Lt.Gr	6	TFI	Thick Film Ignition

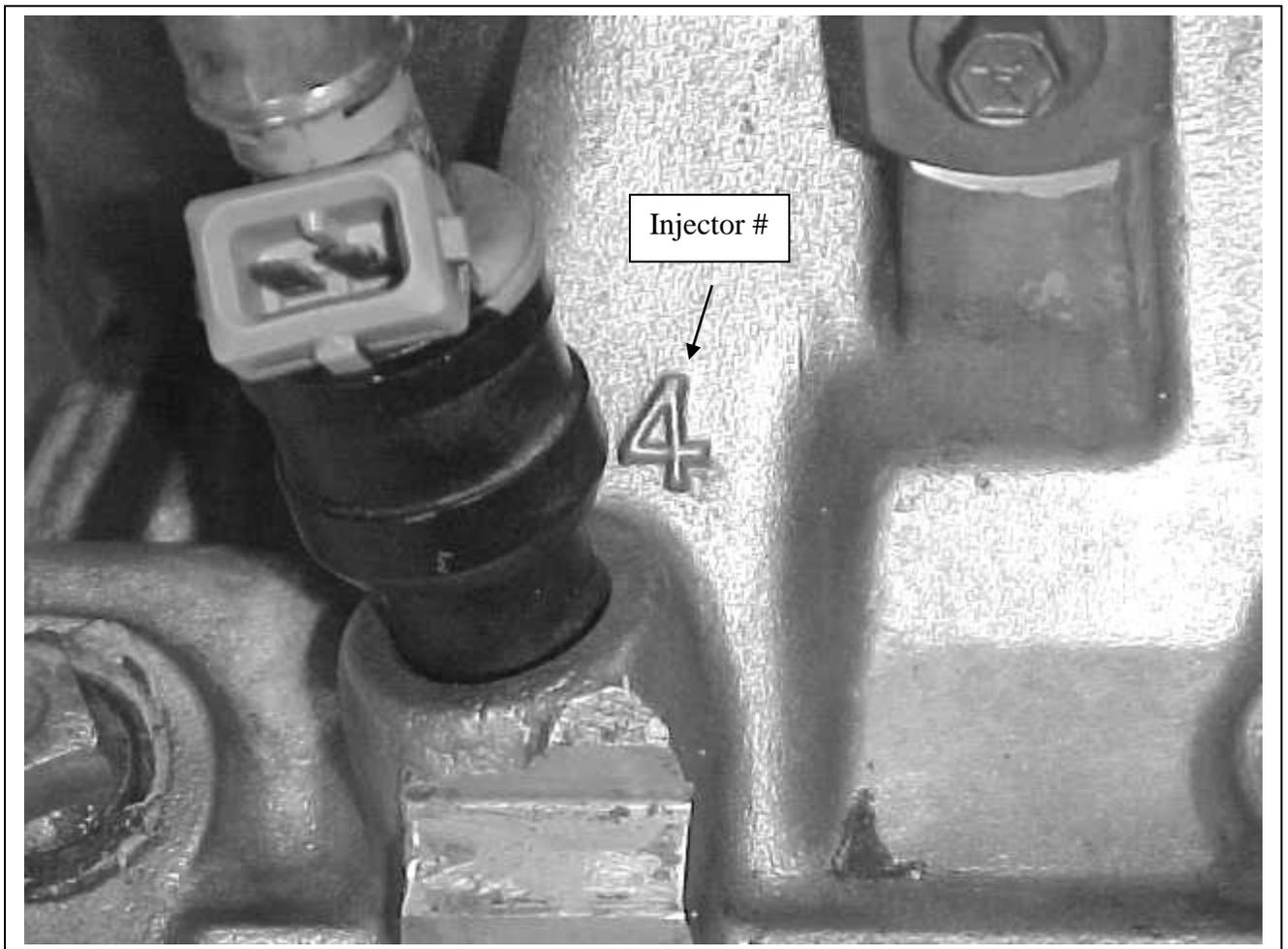
**NOTES:**

- Each injector connector has a Red/Wht (Inj 1-4) or Red/Ylw (Inj 5-8) wire. These wires are the power wires to the injector**

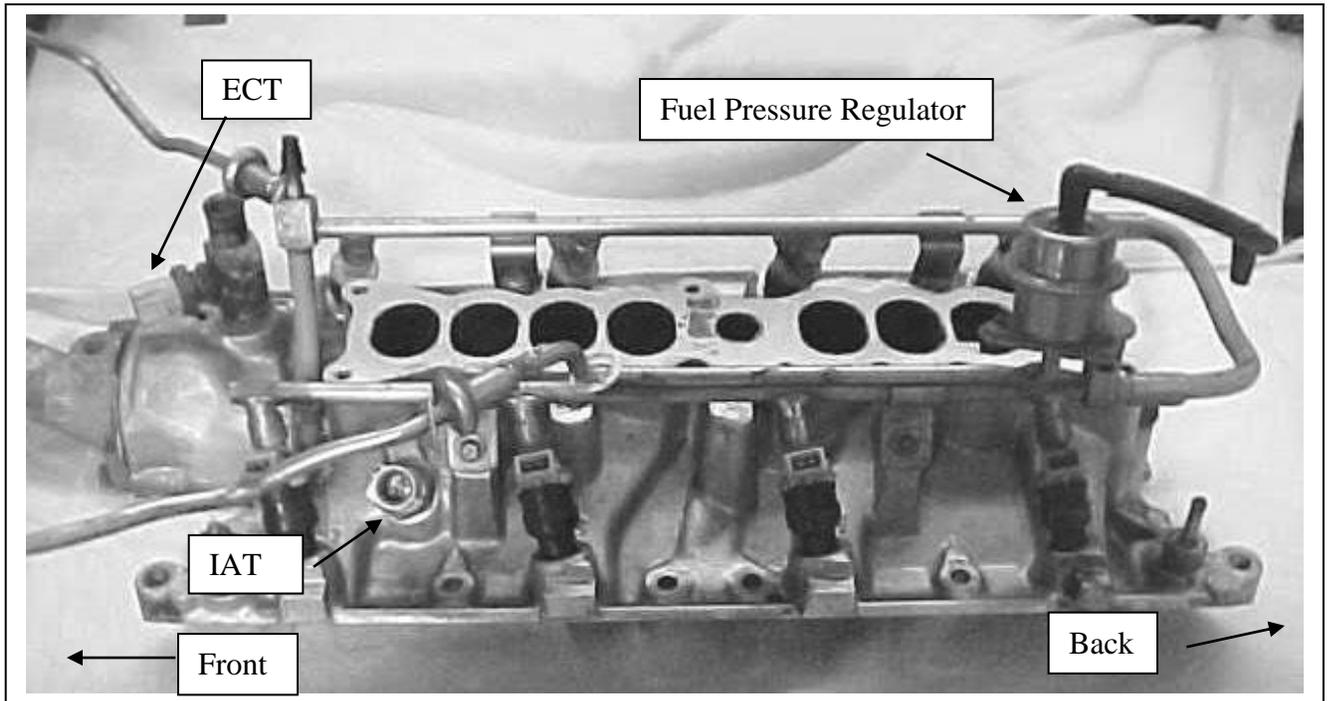
**Table 3** Engine Section



**Figure 4** Intake (with plenum removed for harness installation)



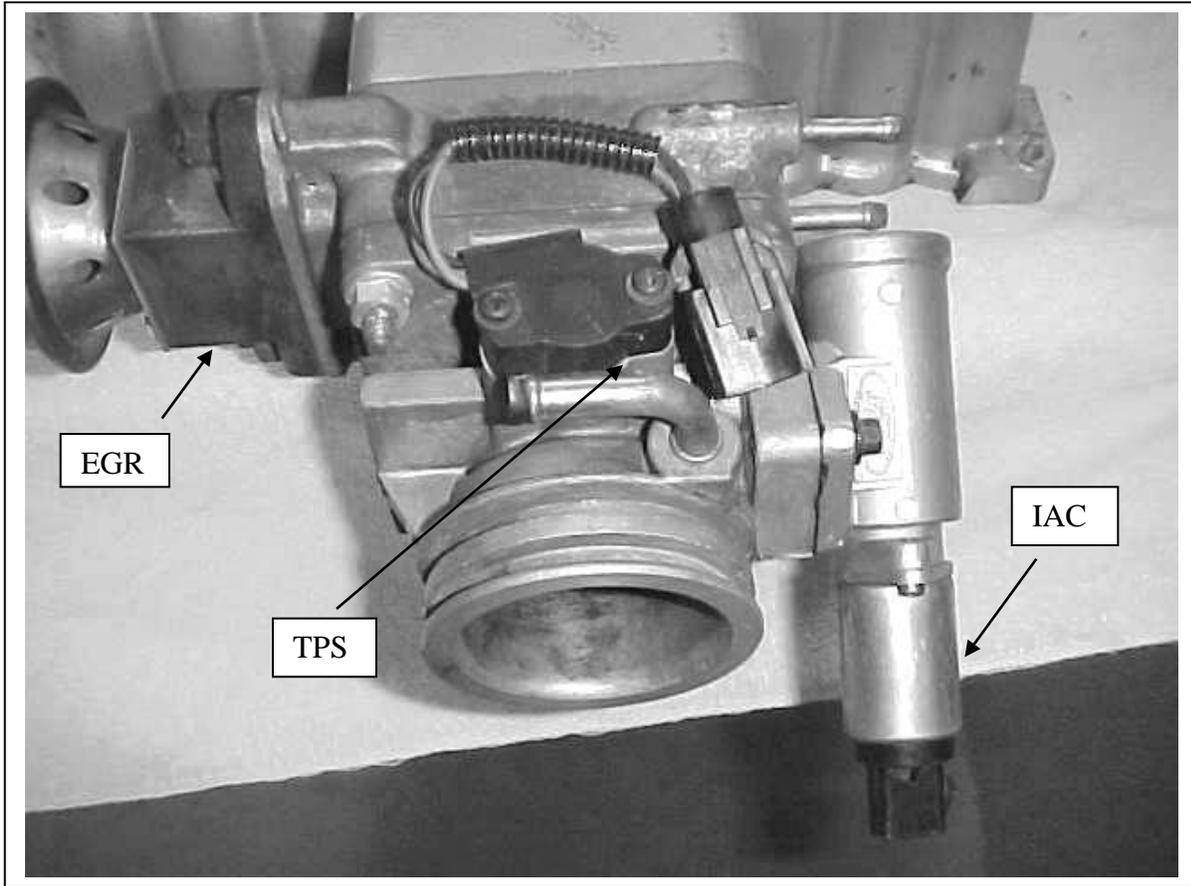
**Figure 5** Injectors (numbered on stock intake)



**Figure 6** Location of IAT & ECT

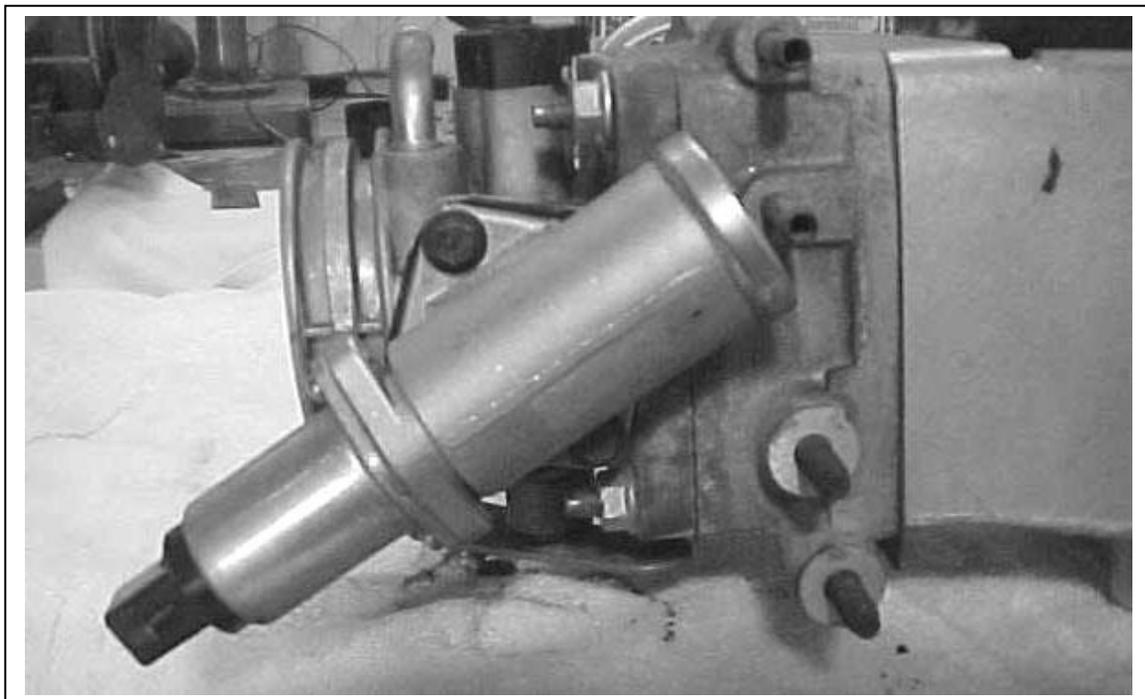


**Figure 7** (IAT) Intake Air Temperature - right & (ECT) Engine Coolant Temperature – left



**Figure 8** Locations of EGR, TPS & IAC (these are mounted on the plenum)

**Make sure your IAC housing/valve is installed with the connector down towards the intake manifold, as shown. It is possible to install it connector end up towards the hood, which will cause high idle issues.**



**Figure 9** (IAC) Idle Air Control Valve



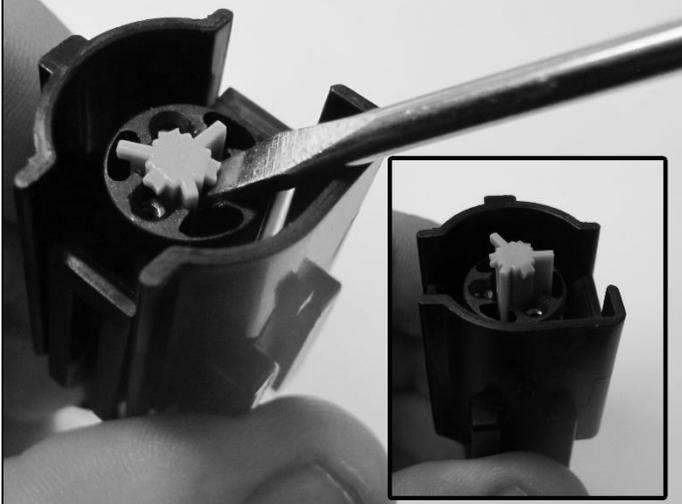
**Figure 10** (TPS) Throttle Position Sensor

**Those with a '94-'95 TPS, a connector pigtail has been provided in the kit. Cut the connector pre-installed on the harness and splice the provided pigtail onto the harness. Simply match the colors.**

Effective May 2020, **1968-1993** TPS sensors will require the connector on the sensor to be changed. This is due to Painless no longer being able to obtain the factory style 3 pin connector. We have provided a 4 pin connector as it is readily available and uses the same socket style terminal the three pin uses. This allows our customer to do a simple modification instead of having to crimp new terminals. A red terminal lock is also provided to ensure the terminals are in place in the new four pin connector once the wires are in place.

- The connector can be removed from the TPS with the sensor still attached to the throttle body. If you decide to remove the TPS sensor for this modification, make sure you are familiar with the installation process and adjustment of the TPS, not outlined in this manual.
- Using a small screw driver pry up and remove the terminal lock from the center of the connector installed on the TPS. As shown in the photo on the next page, Step #1.
- Three small plastic tangs hold the terminals in place, one on each terminal. Using a small screwdriver, pick, or piece of stiff wire, pry the tang away from the terminal while pulling the wire from behind. As shown in the photo on the next page, Step #2.
- With the 3 wires removed from the TPS sensor 3 wire connector, use the pin out on the next page (Step #3) for inserting the Black, Green, and Orange wires of the TPS sensor into the new four pin connector. If you have a mispin, the wires are removed from the four pin connector in the same manner you removed the wires from the original three pin connector.
- With the new connector now on the TPS, the Painless harness can now be plugged into the TPS.

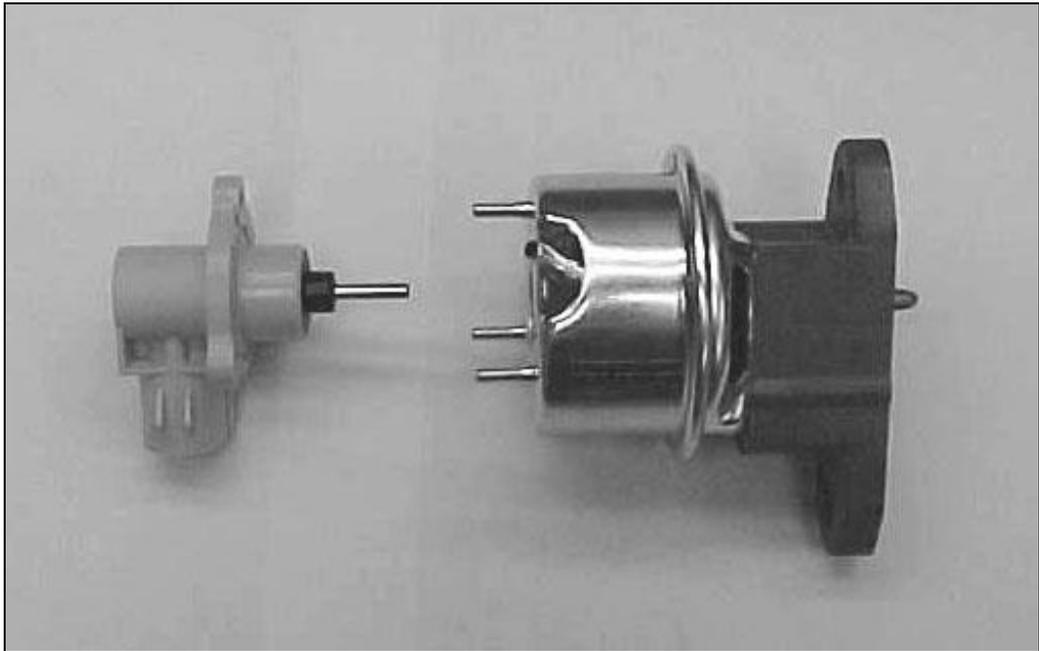
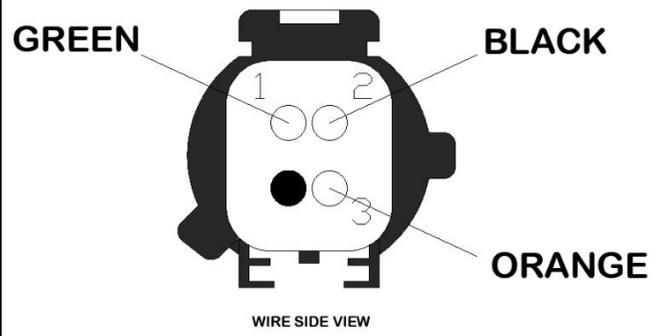
**STEP #1- REMOVE TERMINAL LOCK**



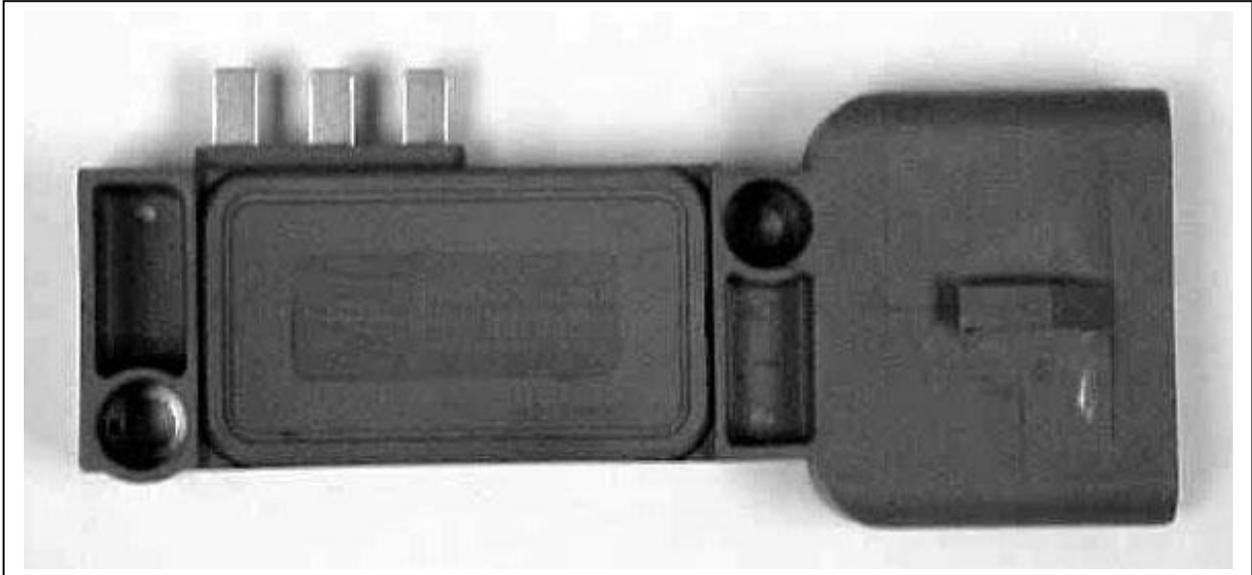
**STEP #2- TERMINAL REMOVAL**



**STEP #3- NEW CONNECTOR PINOUT**



**Figure 11** (EGR) Exhaust Gas Recirculation Valve

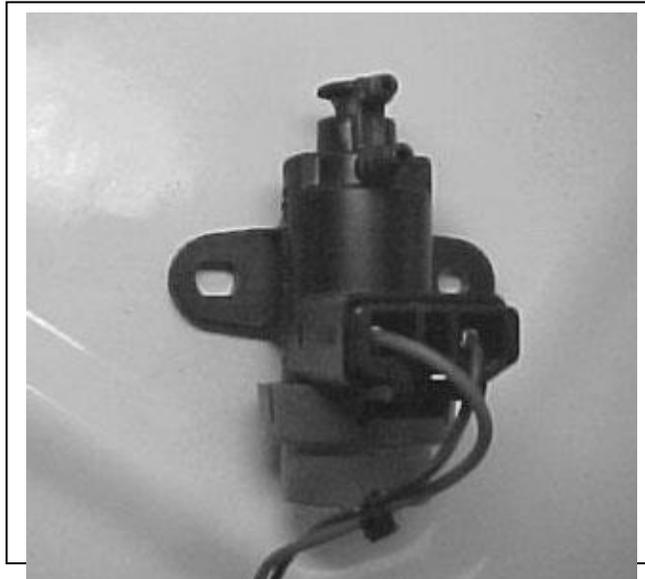


**Figure 12** (TFI) Thick Film Ignition Module Those '94-'95 engines **must** use a 1986-1993 distributor.

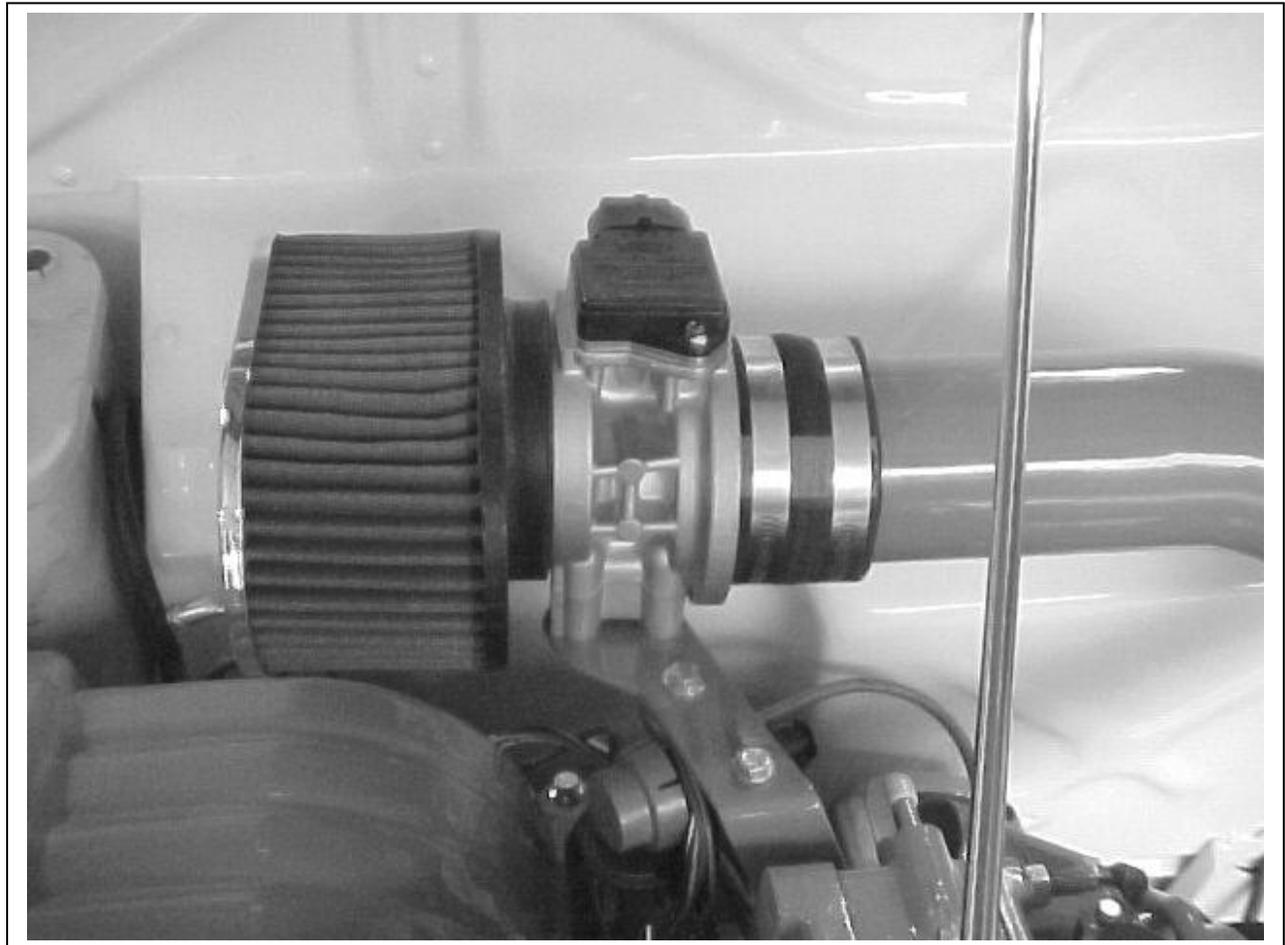
**NOTE:** Due to the connector of the TFI being so large, the Painless harness has this connection as a pigtail. The smaller connector installed on the harness allows for the connection to be passed through the firewall during routing. The supplied pigtail must then be connected to the Painless harness to allow connection to the TFI.



**Figure 13** Ignition coil



**Figure 14** EGR Vacuum Regulator Solenoid (EVR)



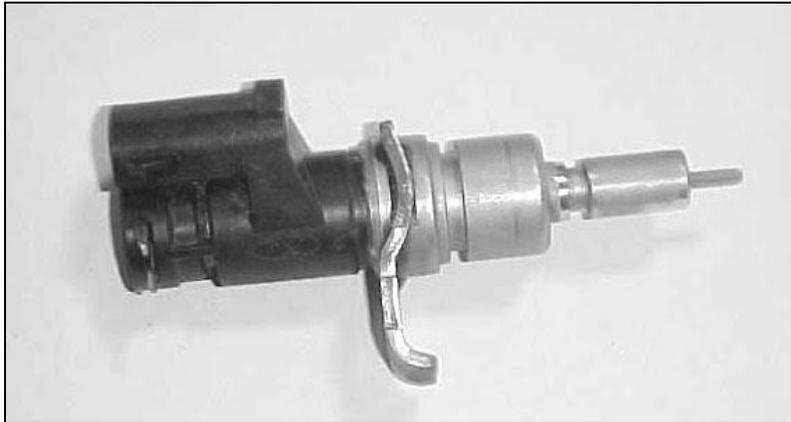
**Figure 15** (MAF) Mass Air Flow Sensor w/air filter

## 6.4 TAIL SECTION INSTALLATION

- **TFI GROUND**: This is an orange wire in the harness with a pre-installed 5/16" ring terminal. Connect this wire to a clean ground source as this wire is the ground source for the ignition. An intake manifold bolt makes for a good place. The engine will not run if not attached properly.
- **STARTER RELAY**: This is a yellow, open ended wire. Connect this wire the the B+ side of the starter relay or to the positive side of the battery. This wire provides constant Battery 12v power to your computer and relays.
- **Fuel Pump**: This Green/Yellow wire is the power wire for the fuel pump. Connect this wire to the + side of your fuel pump.
- **VSS**: The computer utilizes the VSS for controlling air/fuel ratio and ignition timing.

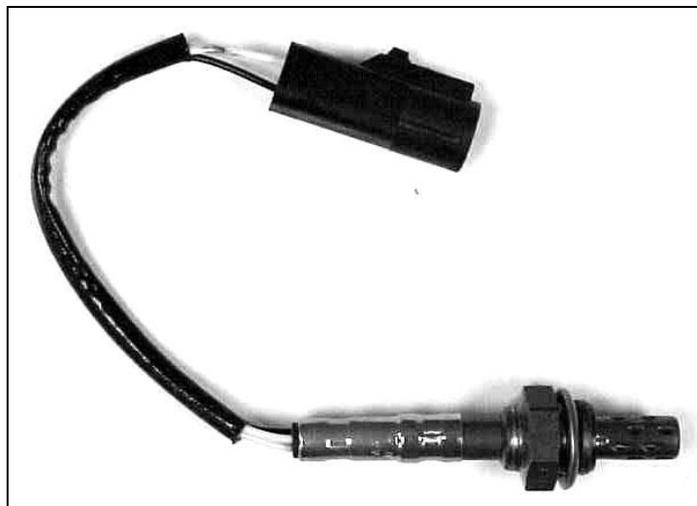
If you ARE using the VSS, route the 2-position connector to the transmission and attach it to the sensor

If you ARE NOT using the VSS, tape up the connector and store it in the harness.



**Figure 16** VSS Vehicle Speed Sensor

- **HEGO**: Connect both oxygen sensor connectors to the oxygen sensors. Pay close attention as they are directional. The connector with the red/black wire going to the left and the connector with the Gray/Light Blue wire going to the right. If you have long tube headers installed, O2 extensions (not offered by Painless) may be required.



**Figure 17** (HEGO) Heated Oxygen Sensor (Note: left and right are the same)

Wire Colors	# of Positions	Labeled	Connect to
Grn/Ylw	1	Fuel Pump	Fuel Pump
Orn	1	TFI Ground	Chassis Ground
Ylw	---	---	Starter Relay (Large Battery Terminal)
Gry/Blk, Pnk/Orn	2	VSS	Vehicle Speed Sensor
Red/Blk, Gry/Ylw, Blk/Wht	4	Left	Heated Exhaust Gas HEGO (1) Oxygen Sensor
Gry/Blu, Gry/Ylw, Blk/Wht	4	Right	Heated Exhaust Gas HEGO (1) Oxygen Sensor

**Table 4** Tail Section

## 7.0 FORD 5.0 START UP

- 7.1** The fuel system must be pressurized. This is done by turn the key on and off several times.

**Note:** *Inspect your fuel lines for leaks. From the tank to the engine.*

- 7.3** Start your engine and listen for noises that would indicate a problem. While listening inspect your engine for fluid leaks.

- 7.4** You are now ready to set your initial engine timing.

**7.4.1** You must unplug the **SPOUT** connector located near the computer.

**7.4.2** Loosen your distributor and set your initial timing to the factory setting of 10° BTDC.

**7.4.3** Tighten the distributor back down and check timing. Shut off engine.

**7.4.4** Plug the **SPOUT** connector back together and restart the engine. The timing should advance at this time.

- 7.5** Check your H.E.G.O bungs for leaks while your vehicle is still running.

## 8.0 TROUBLE SHOOTING INSTRUCTIONS

If you are having trouble with your engine running badly or not running at all, first perform basic trouble shooting (checking for faulty connections, spark, timing, fuel pressure, etc.) then see is

The computer has stored a trouble code in its memory.

### 8.1 THE "CHECK ENGINE" LIGHT

Normally, the "check engine" light should come on when the ignition is initially turned on, then go out a few moments after the engine starts running. If it reappears, or stays on while the engine is running, the computer has detected a problem and a trouble code has been set.

- 8.1.1** The computer identifies particular trouble codes by flashing the "check engine" light in a certain way. The codes are read by counting the flashes:

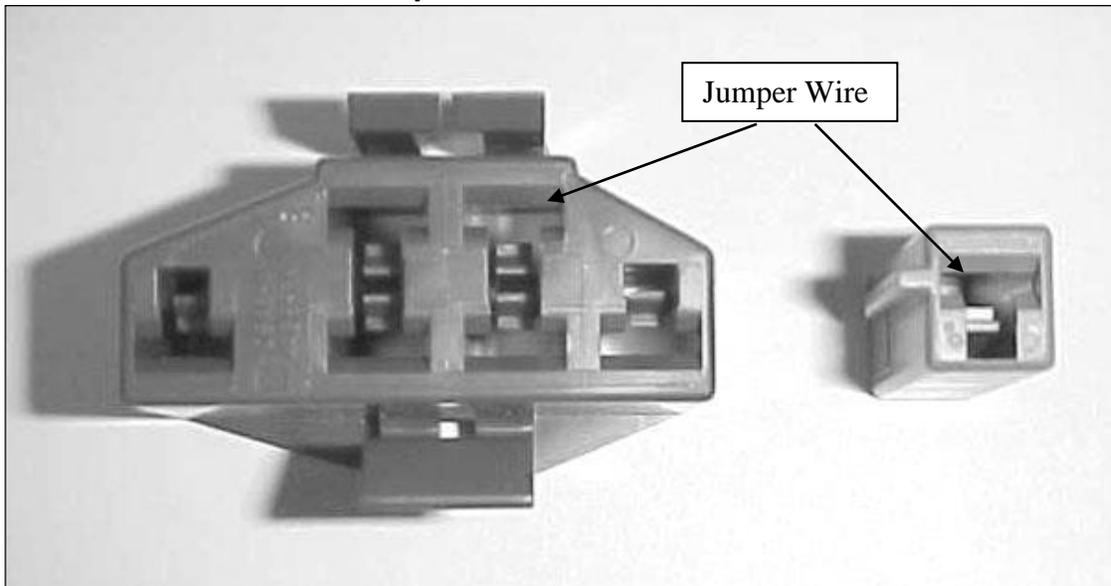
- A. The first digit (the "tens" digit) of the code is flashed quickly, followed by a brief pause, then the second digit (or "ones" digit) is flashed, followed by a longer pause. For example, three (3) quick flashes followed by a brief pause followed by two (2) flashes indicates code 32.
- B. The code will repeat itself three (3) times. The next code, if any, will be displayed in the same manner.

**Note:** *When you access the codes from the computer a code 11 (one flash followed by one flash) will first be displayed. THIS DOES NOT INDICATE A PROBLEM. Code 11 will be flashed 3 times, followed by the particular trouble codes, if any. If the computer merely flashes code 11 there are no trouble codes stored. Code 11 means the system passed.*

## 8.2 RETRIEVING TROUBLE CODES FROM THE COMPUTER KEY ON ENGINE OFF (KOEO)

- 8.2.1 Before you can perform this test you need to start your engine and allow it to run till you reach operating temperature. This is done so the H.E.G.O. sensors are warm.
- 8.2.2 In order to retrieve the trouble codes stored in the computer, locate the Self-Test connectors (STO and STI) (installed and connected in **Paragraph 6.2.1**). Take the STI connector and jumper it over to the STO connector. (See **Figure 8.1**)

Once you have done this turn the key to the on position. **Do not start vehicle. Do not press on the accelerator.**



**Figure 18** STO & STI Self-Test Connectors

- 8.2.3 After you have read any codes (remember the normal code 11), write them down for reference. Remove the jumper from the connectors. Turn key off. This procedure will take a few minutes. **Do not rush.**
- 8.2.4 Take the codes one at a time and match them to the codes in **Section 8.4**. This will tell you in which circuit the computer has detected a problem with.

**Note: A code indicates a problem in a specific circuit, NOT THAT A PARTICULAR PART IS BAD.**

**8.2.5** Before taking more extensive corrective actions for any trouble code, make sure that all connections on the indicated circuit, INCLUDING THE COMPUTER, are clean and tight. Inspect the wiring in the circuit for any broken, shorted, or exposed wires. Finally, insure all ground wires are clean and secure.

**8.2.6** If you are getting a code from your computer and need to clear the code, other than code 11, after you have replaced a part, readjusted a part, etc. You can do this by making sure the ignition is off and then disconnecting the negative battery cable for a minimum of two minutes. After the two minutes are up then you simply reconnect the negative battery cable and recheck the system for codes.

### **8.3 ENGINE RUNNING (ER)**

You will need to start and run your engine for several minutes, or until you have reached a normal operating temperature. As in KOEO test this is done to warm up the H.E.G.O sensors.

1. Turn off your engine and wait 10 to 15 seconds.
2. Jumper the STO and STI as described in the KOEO test.
3. Start your engine and read your codes. Match them to the codes in **Section 8.4**.
4. Once your finished Turn off your engine and remove the jumper.

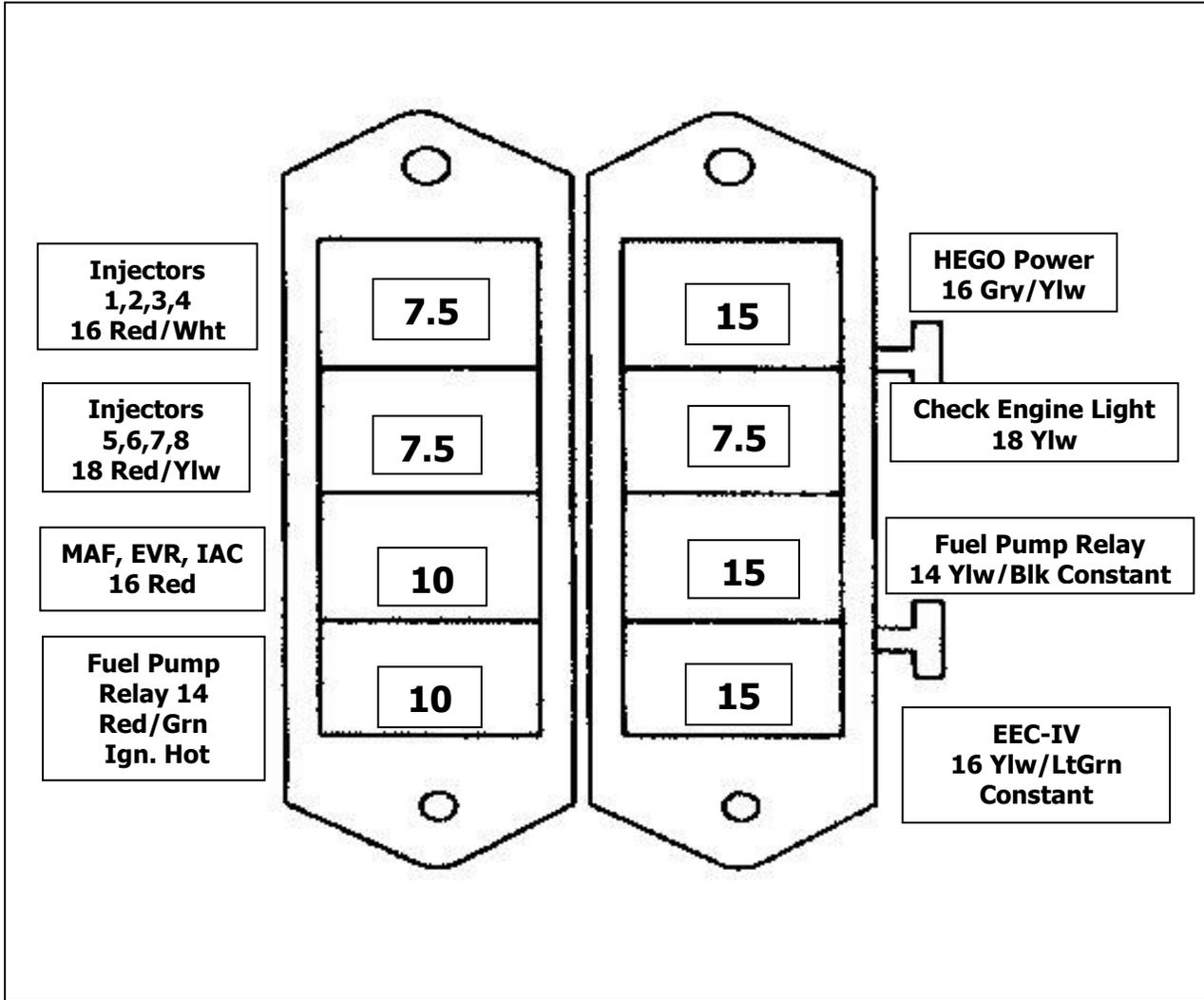
### **8.4 EEC-IV Diagnostic Trouble Codes and Definitions**

11 orc	System pass
12 r	Cannot control RPM during KOER Self-Test high rpm check (KEY ON ENGINE RUNNING)
13 r	Cannot control RPM during KOER Self-Test low rpm check
14 c	PIP circuit failure (PROFILE IGNITION PICKUP)
15 o	PCM Read Only Memory (ROM) test failed
15 c	PCM Keep Alive Memory (KAM) test failed
16 r	Rpm too low to perform HO2S test
18 r	SPOUT circuit open
18 c	IDM circuit failure/SPOUT circuit grounded
19 o	Failure in PCM internal voltage
21 or	ECT out of Self-Test range
22 orc	MAP/BARO out of Self-Test range
23 or	TPS out of Self-Test range
24 or	IAT out of Self-test range
26 or	MAF out of Self-Test range
29 c	Insufficient input from Vehicle Speed Sensor (VSS)
31 orc	EVP circuit below minimum voltage
32 orc	EVP voltage below closed limit
33 rc	EGR valve opening not detected
34 orc	EVP voltage above closed limit
35 orc	EVP circuit above maximum voltage
41 r	HO2S circuit indicates system lean (Right HO2S)
41 c	No HO2S switch detected (Right HO2S)
42 r	HO2S circuit indicates system rich (Right HO2S)
51 oc	ECT indicated -40°C (-40°F)/ circuit open
53 oc	TPS circuit above maximum voltage
54 oc	IAT indicated -40°C (-40°F)/circuit open
56 oc	MAF circuit above maximum voltage
61 oc	ECT indicated 123°C (254°F)/ circuit grounded
63 oc	TPS circuit below minimum voltage
64 oc	IAT indicated 123°C (254° F)/ circuit grounded
66 c	MAF circuit below minimum voltage

- 84 o EGR Vacuum Regulator (EVR) circuit failure
- 87 oc Fuel pump primary circuit failure
- 91 r HO2S circuit indicates system lean (Left HO2S)
- 91 c No HO2S switching detected (Left Ho2s)
- 92 r HO2S circuit indicates system rich (Left HO2S)
- 98 r Head fault is present-FMEM mode (Failure Mode Effects Management)
- No DTC'S Unable to initiate Self-Test or unable to output DTC's

**DTC's not listed will not be applicable to this system**

**Key: o= Key On Engine Off, r = Engine Running, c = Continuous Memory**



**Figure 19** Fuse Location

## **NOTES**

**Painless Performance Products, LLC**  
**Limited Warranty and Return Policy**

Chassis harnesses, fuel injection harnesses, and Trail Rocker units are covered under a lifetime warranty.

All other products manufactured and/or sold by Painless Performance are warranted to the original purchaser to be free from defects in material and workmanship under normal use. Painless Performance will repair or replace defective products without charge during the first 12 months from the purchase date. No products will be considered for warranty without a copy of the purchase receipt showing the sellers name, address, and date of purchase. You must return the product to the dealer you purchased it from to initiate warranty procedures.