

Wire Harness Installation Instructions For Installing:

Part # 65140 – '91-'98 Jeep 4.0L Engines
Part # 65141 – '91-'98 Jeep 4.0L Engines w/HI TORQUE Camshaft



Manual # 90554 Perfect Performance Products, LLC Painless Performance Products Division 2501 Ludelle Street Fort Worth, Texas 76105-1036 (800) 423-9696

We have attempted to provide you with as accurate instructions as possible, and are always concerned about corrections or improvements that can be made. If you have found any errors or omissions, or if you simply have comments or suggestions concerning these instructions, please write us at the address on the cover and let us know. Or, better yet, send us a fax at (817) 244-4024

For Technical Questions
E-mail address: tech@painlessperformance.com
Tech Line: (800) 423-9696

Perfect 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 damage, or any other damages, cost 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.

P/N 90554 Painless Performance Products Manual February 2008 First Edition

Copyright © 2008 by Perfect Performance Products, LLC

TABLE OF CONTENTS

1.0	Introduction4				
2.0	About these Instructions5				
3.0	Tools Needed5				
4.0	Contents of the 65140 Wire Harness Kit6				
5.0	Pre-Installation and Harness Routing Guidelines. 5.1 Understanding the engine.				
6.0	Genera 6.1 6.2 6.3	l Installation Instructions. Grounding the vehicle. Rough installation. Harness attachment.	10		
7.0	1991-1 7.1 7.2 7.3 7.4 7.5	998 Jeep 4.0L PERFECT System Wire Harness Installation Specific circuit connections	11 12 14 15		
8.0	Trouble 8.1 8.2 8.3	e Shooting Instructions	36 36		
7.1	Diagno	ostic Link Connector (DLC)	12		
7.2		s Relays			
7.3	Knock Sensor				
7.4		n Sensor			
7.5	Ignition Module and Coil				
7.6	Throttle Position Sensor (TPS) and Idle Air Control (IAC)				
7.7		Distributor Connection			
7.8	Coolant Temperature Sensor				
7.9	Manifold Absolute Pressure Sensor (MAP)				
7.10	Intake Air Temperature Sensor (IAT)				
7.11	PERFECT Fuse Block				
7.12	PERFECT Engine Control Module (ECM)				
	• • • • • • • • • • • • • • • • • • • •	Pages 22-35 Distributor Modifications	•••••		
		LIST OF TABLES			
Table	4.1	Sensor Requirements	8		
Table		Engine and Computer Connections			
Table		Diagnostic Trouble Codes			
		-			

PLEASE READ ALL INSTRUCTIONS PRIOR TO INSTALLATION

1.0 Introduction

Congratulations on purchasing the most up-to-date and easiest-to-install engine management system on the market. It has been designed for easy installation, even with little or no electrical experience.

This kit is a complete fuel injection system for the Jeep Multi Point Injection 4.0L L6 engines. This kit includes all the wiring needed by the MEFI computer to control the fuel injection system. It is designed to use the parts listed in **Table 4.1**. Use of any other parts may cause the system to function improperly.

This system will work on Jeep 4.0L engines from 1991-1998 with the appropriate sensors. See **Table 4.1** below for sensor, distributor, coil and fuel injector requirements.

This system is weatherproof; which means all of the connectors on this harness, that can be, are the weather pack type of design. So, if mounting the ECM and Relays in the engine compartment is desired, it can be done with limited corrosion/moisture problems. The computer and dash group can also be easily mounted under the dash for a cleaner installation.

Most of the wiring in the harness has been pre-terminated to proper connector and all wire has been color-coded. All wring is 600 volt, 275° F, TXL.

This harness is divided into three major groups:

Engine Group Includes wiring for the fuel injectors, distributor and sensors.

Dash Group Includes ignition feed wires, assembly line diagnostic link (ALDL)

connector, check engine light, computer connectors, tachometer

wiring, relays and fuse block.

Tail Group Includes power wire for the fuel pump.

2.0 About these instructions

These instructions provide the information needed to install the 65140 PERFECT '91-'98 **Jeep 4.0L Engine Jeep 4.0L** fuel injection harness kit. These instructions are divided into major **Sections**, as follows:

- 1.0 Introduction
- 2.0 About These Instructions
- 3.0 Tools Needed
- 4.0 Contents of the 65140 Wiring Harness Kit
- 5.0 Pre-Installation and Harness Routing Guidelines
- 6.0 General Installation Instructions
- 7.0 Wire Harness Installation
- 8.0 Trouble Shooting Instructions

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. Please pay special attention to any **Notes** or any labeled **CAUTION**.

3.0 TOOLS NEEDED

In addition to everyday mechanics tools; the following will also be needed:

Crimping Tool - Always use a quality tool, such as a Thomas & Betts to ensure superior crimps.

Wire Stripper – Be sure to only strip ¼" of the insulation off for all crimps made during the installation of the harness.

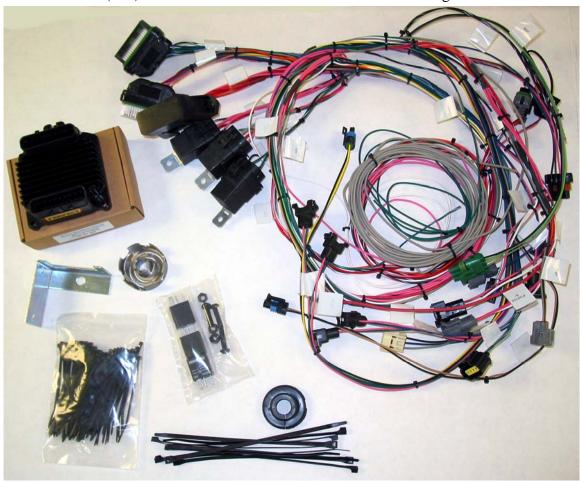
Continuity Tester – ONLY use this device when the battery is disconnected. CAUTION: Do not use a test light to test the computer or sensor wiring or damage to the computer may result.

Electric Drill & 13/8" Hole Saw – Use this to drill the hole into the firewall for the main pass through location of the fuel injection harness.

Digital Voltmeter – Use this to verify the battery is fully charged (11.9-12.7 volts) and once the engine is running, the alternator is charging the battery (13-14.5 volts).

4.0 CONTENTS OF THE 65140 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 your dealer where you purchased the kit or contact Painless Performance at (800) 423-9696. This kit should contain the following items:



- The main wiring harness with required connectors installed.
- PERFECT ECM 65140
- Installation Manual (this booklet)
- Coil/Ignition Module Bracket
- Distributor Shutter Wheel

5.0 PRE-INSTALLATION AND HARNESS ROUTING GUIDELINES

The installation of your harness kit will consist of two (2) steps

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

We cannot tell you how to route the harness in your vehicle. That depends a great deal upon the particular make of the vehicle and what extent you want to secure and conceal the harness. We do offer some general guidelines and routing practices starting in **Paragraph 5.1.3**, general installation instructions in **Section 6.0** and precise instructions concerning the electrical connections you will have to make beginning in **Section 7.0**.

To begin the installation of the wire harness, read the following sections:

5.1 Understanding the Jeep 4.0L engine

- 5.1.1 The 1991-1998 Jeep 4.0L L6 engines came with several different sensor/component packages. Distributors, injectors, Idle Air Control, and the Throttle Position Sensor all changed throughout the years. This made it very difficult to build one fuel injection harness to control them all. So, through the purchase of specific components based on what year engine needs to be controlled, this kit can control the 1991-1998 Jeep 4.0L L6 engines.
- 5.1.2 The PERFECT system for the Jeep 4.0L requires the use of the following parts in Table 4.1. These parts meet or exceed all requirements of the PERFECT Performance Products harness and controller.

1991 – 1998 Jeep 4.0L Sensor Requirements				
GM MAP Sensor	Delco # 16137039	NAPA # 21961 CRB		
GM Ignition Coil	Delco # <u>D-573</u>	NAPA # IC29		
GM Coolant Temp	Delco # <u>25036979</u>	NAPA # TS4015		
GM Intake AirTemp	Delco # <u>25036979</u>	NAPA # TS4015		
GM Oxygen Sensor	Delco # <u>AFS-105</u>	Bosch # 15703		
GM Knock Sensor	Delco # <u>10456126</u>	NAPA # DKS206		
GM Ignition Module	Delco # <u>D-1986-A</u>	NAPA # TP12		
*Distributor	Mopar # 56027028	NAPA # 48-4694 NRD Must Use with MP847		
*Distributor Pickup (1997-1998 4.0L)	Mopar # 56041030	NAPA # MP847 ECH		
Throttle Position Sensor (1997-1998 4.0L's)	Mopar # 4874371	NAPA # 220161 CRB		
Fuel Injectors (1996-1998) (48-50psi fuel pressure at the rail)	Mopar # 53030778	NAPA # 218313 CRB		
Fuel Injectors (1994-1995) (39psi fuel pressure at the rail)	Mopar # 53030343	NAPA # 218669 CRB		
Fuel Injectors (1991-1993) (39psi fuel pressure at the rail)	Mopar # 33007127	NAPA # 218689 CRB		
*Note: All of the listed injectors will work with this Fuel Injection Kit. Be sure to				
regulate the fuel pressure to the specified pressures. Any slight change of the fuel				
Idle Air Control Motor (IAC)	Mopar # 4874373 AB	NAPA # 2-29571 CRB		

Table 4.1 – Sensor Requirements

Note: This harness does not have wiring for emission devices.

5.1.3 Familiarize yourself with the harness by locating each of the harness labels and by looking at the connectors on the wire ends.

^{*} Most 1997-1998 Jeep Wranglers and Cherokees came with the correct distributors. 1997 Grand Cherokees did not come with the correct distributors. Due to the lack if information available, depending on the year of Jeep engine and what model of Jeep it was removed from will determine if the correct distributor is present. Best choice is to compare it to the pictures on page 24 of this manual.

- 5.1.4 Decide on the mounting location for the computer and relays. This PERFECT Fuel Injection harness kit is designed to mount the computer and relays either under the hood or under the dash of the vehicle.
- NOTE: This harness is weatherproof to provide efficient and trouble free operation in the off-road environment. Painless does not recommend washing our harness with a pressure washer. In the event where the engine and harnessing needs a good wash, use a light detergent first to loosen the dirt and then carefully wash the engine and harness with a garden hose. Be sure to cover any exposed wire connections with plastic bags beforehand.
- 5.1.5 A good exercise is to lay out the harness on a workbench beside your vehicle and identify all the connectors and wires.
- 5.1.6 When routing the harness, be sure to avoid exhaust manifolds, accessory belts, hood hinges and any other objects on the engine or under the hood that may damage the harness. Whenever possible, be sure to use the provided zip ties to help secure the harness.
 - NOTE: Jeep 4.0L engines naturally make the exhaust manifold/headers glow red during long periods at higher rpm operation. With this in mind, it is recommended to wrap the knock sensor, knock sensor connector and wire to avoid it being burnt. Header wrap can significantly reduce under hood temperatures and prevent this problem.
- 5.1.7 Plan where harness supports will be located. Many times the OEM harness supports can be used. The harness brackets located near the fuel injector rail are a prime example of a good harness support to use.
- 5.1.8 Allow enough slack in the harness at places where movement could possibly occur such as engine to body and engine to frame.

6.0 GENERAL INSTALLATION INSTRUCTIONS

CAUTION:

- Never disconnect the battery or the computer connectors with the ignition on.
- Separate the two ground wires by connecting them to two different locations.
 This will aid in noise suppression throughout the harness and especially on the clean sensor ground.
- Giving or Receiving a "Jump Start" may cause damage to the computer
- Using a test light to test any of the sensor circuits, will result in computer damage.
- A test light may be used to check for 12 volts at the coil and the injectors.

Notes:

• There is normally a small amount of current drain on the battery with this fuel injection system.

- Each connector in this harness is different and will only fit in its appropriate sensor. Never Force any Connectors.
- When connecting the plugs to the computer <u>use extra care</u> to ensure none of the pins on the computer are bent.
- The fuel pump you are using <u>MUST</u> be rated at a minimum of <u>60 PSI</u> (lbs. per square inch). It will be necessary to purchase an external fuel pressure regulator in most instances. The two specific fuel pressures needed for these systems are 49psi or 39psi. This is determined by the specific fuel injectors used. See Table 4.1 for the fuel injector part number.

6.1 GROUNDING THE VEHICLE AND ENGINE

A **PERFECT**ly wired vehicle will only have problems if the chassis harness components and the fuel injection system aren't properly grounded. Don't go to the effort of installing a quality fuel injection system only to neglect proper grounding.

- 6.1.1 Connect a ground strap or cable (minimum of a 4 GA. wire) from the negative battery terminal to the frame. Be sure to clean the place of connection on the frame with a wire wheel to remove any grease or dirt. For the best connection, use a star type lock washer to fasten the ground cable to the frame.
- 6.1.2 Connect a ground strap (minimum of a 4 GA. wire) from the engine to the same point on the frame in step 6.1.1. This is best accomplished with a braided ground strap which is available from an auto parts store. **DO NOT RELY ON THE MOTOR MOUNTS TO MAKE THE CONNECTION FROM THE ENGINE TO THE FRAME, THEY'RE MADE OF RUBBER AND RUBBER DOESN'T CONDUCT.**
- 6.1.3 Connect a ground strap from the engine to the body. This will ensure your vehicle has the proper grounds for most all circuits both for the engine and separate from the engine.

6.2 ROUGH INSTALLATION

CAUTION: DISCONNECT THE POWER FROM YOUR VEHICLE BY REMOVING THE NEGATIVE BATTERY CABLE FROM THE BATTERY.

- 6.2.1 Position the computer, fuse block and relay bases in their desired mounting location. This location should be either under the dash or on the firewall in the engine compartment.
- 6.2.2 If mounting the computer under the dash, drill a 1 3/8" hole in the firewall for the pass thru grommet.
- 6.2.3 Route the engine connectors and the gray fuel pump wire though the hole. Push the grommet (already installed on the harness) into the hole until it is seated. Be sure the split on the grommet is at the top of the hole in the firewall.
- 6.2.4 Route the fuse block and relay bases to their desired mounting location.

6.2.5 Mounting screws for the computer have been included. Be sure not to over tighten these screws to avoid warping the computer housing. An effort also needs to be made to mount the computer onto a relatively flat surface. Otherwise, damage can result to the steel cover on the rear of the computer, which will damage the internals of the computer.

6.3 HARNESS ATTACHMENT

Note: Harness routing doesn't necessarily need to be a time-consuming task, but some caution must be taken to ensure isolation of the harness from hot and sharp parts on the engine. A good way to protect the harness is to use the factory harness mounting points as often as possible. Most 4.0L engines had a plastic housing along side the valve cover to hold the injector, TPS, IAC and IAT sensor wiring. Some 4.0L engines also had a thermal blanket on top of the intake manifold as a thermal barrier for both the harness and the injectors. If your engine doesn't have this thermal barrier, purchasing one from a Mopar dealer is advisable.

- 6.3.1 Permanently mount the computer, fuse block and relays. Be sure to use the appropriate ¹/₄" bolt holes in the computer housing to fasten it to a bracket under the dash or flat against the firewall.
- 6.3.2 Attach harness groups to your vehicle with clips or ties starting at the computer and working outward.
- 6.3.3 Rubberized clamps from your local auto parts supplier make for a very professional method of fastening the engine section of the harness onto the engine.
- 6.3.4 Call your local Painless Wiring dealer for a price on the PowerBraid Fuel Injection Kit P/N 70921. This kit comes with all the high performance braid needed to make your new harness look fantastic under the hood of your vehicle.

7.0 1991-1998 JEEP 4.0L SYSTEM WIRE HARNESS INSTALLATION

7.1 SPECIFIC CIRCUIT CONNECTION

Note: If you have not already done so, read sections 5.0 and 6.0 of these instructions and think through the installation of the harness before securing or cutting any wires.

7.2 DASH SECTION INSTALLATION

The wires in this group consist of the Diagnostic Link Connector (DLC) (SEE **FIGURE 7.1**), the check engine light (pre-mounted into a bracket) and three (3) other wires.



FIGURE 7.1 Diagnostic Link Connector (DLC)

- A. Find a easily accessible and visible location to mount the Check Engine Light and the DLC connector. Note: The Check Engine Light wires are pre-terminated and their colors are Pink and Brown/White. Do not apply 12V switched power to the pink wire in this section; it supplies power to the Check Engine Light.
- B. Mount the DLC connector and the check engine light in the place selected.
- C. Locate the PINK ignition hot activation wire, labeled "IGN" and attach it to a 12V **fused** power source **WHEN THE KEY IS IN THE RUN AND START POSITIONS ONLY.** This is the ignition power signal wire for the harness and computer. It allows the computer to power up and enables the main harness relay to power up the sensors, injectors, and ignition system. With the pink wire correctly wired, the check engine light will come on when the ignition switch is in the "ON" position and when the engine is not running.

The three relays supplied in the kit:

- **Fuel Pump Relay** Supplies the 12V power to your fuel pump. It will run for 3 seconds after the ignition is turned to the on position to prime the fuel rail to prepare the engine to start.
- A/C Signal Relay Supplies the computer a ground signal to slightly increase engine RPM to compensate for the load on the engine from the A/C compressor.
- **Ignition Relay** Supplies 12V power to the O2 sensor heater, Ignition System, Check Engine Light and Computer when the key is in the Run or Start position.

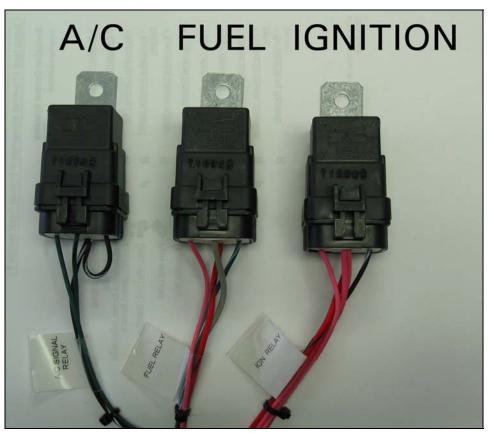


FIGURE 7.2 Relays and Function

Note: All three relays are identical.

7.3 ENGINE GROUP INSTALLATION

The engine group is designed to be separated into left side (driver) and right side (passenger) sections. Each side is tie-wrapped separately, **but not labeled**. The right side of the harness has connectors for the distributor, ignition module, and ignition coil. The left side of the harness has connectors for the idle air control motor, throttle position sensor, injectors, oxygen sensor, knock sensor and MAP sensor. When you begin routing, separate the engine group into left and right sections and place them accordingly.

- 7.3.1 Before you connect any wires, separate the fuel pump wire from the engine group and place it out of the way.
- 7.3.2 Locate the Ground #1 and Ground #2 breakouts on the harness. Attach each of them to their own separate bolts. By separating them, as opposed to connecting both of them to the same bolt, aids in noisy signal dissipation.
- 7.3.3 Using **Figure 7.1** thru **7.11** and the **Table 7.1**, plug in each harness connector to its appropriate sensor or device.
- 7.3.4 Check to make sure your distributor has the correct distributor connector. See **Table 4.1** for the correct cam sensor information. This PERFECT System uses the original cam sensor signal **specifically** from the 1997 Wrangler and Cherokee and the 1998 Wrangler, Cherokee and Grand Cherokee 4.0L distributors.
- 7.3.5 Check to make sure the 65140 wire harness has the correct Throttle Position Sensor connector. This PERFECT System uses the TPS from the 1997 and 1998 Wrangler and Cherokees. Most if not all of the Grand Cherokees have the incorrect TPS. See **Table 4.1** for the specific part number.
- 7.3.6 Check to make sure the 65140 wire harness has the correct Idle Air Control Motor Connector. This PERFECT System uses the IAC Motor from the 1997 Grand Cherokees and the 1998 Wrangler, Cherokee and Grand Cherokee. See **Table 4.1** for the specific part numbers.
- 7.3.7 The Pink wire labeled IGNITION needs to be connected to the original coil wire from the original engine or connected to a fused ignition switched 12V power source.
- 7.3.8 The Green wire tagged A/C SIGNAL needs to be connected to the A/C compressor clutch power wire; if the vehicle is equipped with A/C. This will enable an increase in the engines RPMs when the A/C is turned on to compensate for the additional load of the A/C compressor and the additional electrical load on the alternator.

7.4 TERMINAL INSTALLATION INSTRUCTIONS

- 7.4.1 Have all tools and connectors handy.
- 7.4.2 Select the correct terminal for the wire. The wires to be connected with crimp on terminals are 18ga. (Red 22-18ga/Blue 16-14ga/Yellow 12-10ga)
- 7.4.3 Determine the correct wire length and cut the wire. Remember to allow enough slack in the harness and wires at places where movement will occur. **Double-check your calculations**.
- 7.4.4 Strip insulation away from the wire. Strip only enough length necessary for the type of terminal lug you are using. (1/4" will be appropriate for most crimp on terminals.)

Note: In the following steps, be sure each terminal is crimped with the proper die in the crimping tool. An improper crimp will not make good enough of a connection. DO NOT OVER CRIMP.

- 7.4.5 Crimp the terminal onto the wire.
- 7.4.6 Connecting the wires and connectors throughout the harness is a repeating process. Make sure that each wire is properly routed and then terminated.
- 7.4.7 When all the wires are terminated, tighten the mounts and ties to secure the harness permanently.
- 7.4.8 Attach the connectors to the computer. **Be careful not to bend any pins**.
- 7.4.9 After all the connections have been made throughout the harness, connect the battery to the vehicle.

CAUTION: BE SURE THE IGNITION IS OFF WHEN YOU CONNECT THE BATTERY OR DAMAGE TO THE COMPUTER MAY RESULT.

7.5 TAIL SECTION INSTALLATION

- 7.5.1 Locate the Gray Fuel Pump wire which was separated earlier from the engine group. Cautiously route it towards the rear of the vehicle. Be sure to avoid all sharp edges, moving or hot parts that may damage the wire.
- 7.5.2 Take this gray wire and connect it to the fuel pump positive terminal. This is the 12V ignition hot power wire for the fuel pump. It is supplied through the Fuel Pump relay, which is controlled by the computer.
- 7.5.3 See the Tables 7.1 and 7.12 for harness connections.

Label on Harness	Connects to:	# of Wires	Wire Colors
DIST	Distributor	3	Org/Red, Blk, Gry
ICM	Ignition Control Module	4	Pnk, Wht(18),
			Blk/Wht, Wht(16)
COIL(Black)	Ignition Coil	2	Pnk/Blk, Wht
COIL(Gray)	Ignition Coil	2	Pnk, Wht
OXY	Oxygen Sensor	4	Blk/Wht, Pnk, Pur,
			Blk
INJ #1 – INJ #6	Injectors	2	Blu, Pnk OR Grn,
			Pnk
GROUND #1	Engine Block	2	Blk/Wht, Blk/Wht
GROUND #2	Engine Block	1	Blk/Wht
STARTER B+	Large Battery Post on	1	Red
	Starter		
FUEL PUMP	Positive Post on Fuel Pump	1	Gry
A/C SIGNAL	A/C Compressor Clutch B+	1	Dark Green
MAP	MAP Sensor	3	Gry, Lt Grn, Blk
KNOCK	Knock Sensor	1	Dark Blue
IAT	Intake Air Temp Sensor	2	Tan, Blk
IAC	Idle Air Control Motor	4	Dk Grn/Wht,
			Blu/Wht, Blu/Blk,
			LtGrn/Blk
TPS	Throttle Position Sensor	3	Gry, DkBlu, Blk
ECT	Coolant Temp Sensor	2	Ylw, Blk

Table 7.1 Engine Side of Harness Connections

Label on Harness	Connects to:	# of	Wire Colors
		Wires	
IGN	Switched B+ Power	1	Pink
TACH	Tachometer Signal Input	1	White
FAN RELAY	Ground Activation of	1	Grn/Wht
	Fan Relay for Automatic		
	Operation		
J1	Computer	-	-
J2	Computer	_	-
DLC	Diagnostic Connector	4	Red, Org/Blk,
	-		Wht/Blk, Blk/Wht
DLC	Check Engine Light	2	Brn/Wht, Pnk
IGN RELAY	Ignition Relay	5	(3)Pnk, Red/Blk,
			Blk/Wht
FUEL RELAY	Fuel Pump Relay	4	Red/Blk, Pnk, Gry,
			Grn/Wht
A/C SIGNAL RELAY	Computer & A/C Clutch	4	Blk/Wht, Grn, Grn/Blk

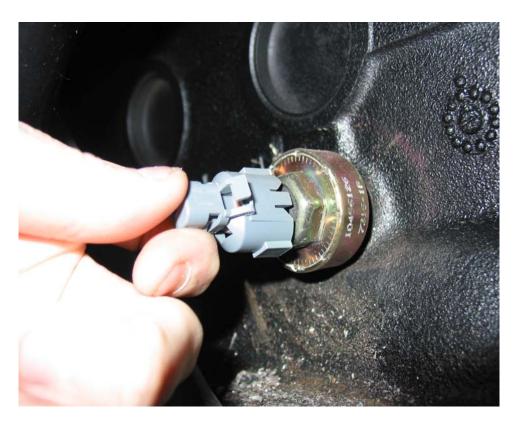


Table 7.2 Computer Side of Harness Connections

Figure 7.3 Knock Sensor (Below Intake Manifold)



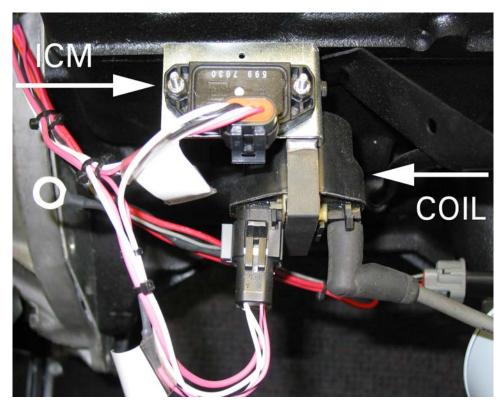


Figure 7.4 Oxygen Sensor

Figure 7.5 Ignition Module and Coil with PERFECT Bracket

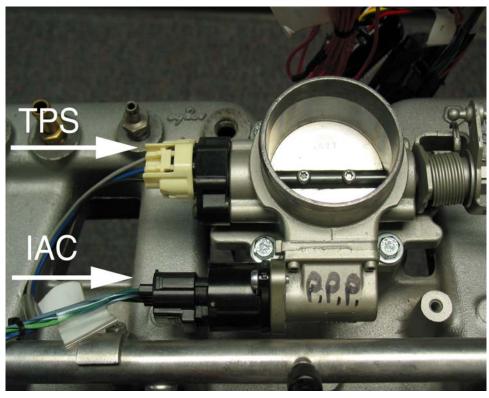




Figure 7.6 Throttle Position Sensor (TPS) and Idle Air Control (IAC)

Figure 7.7 Distributor Connection

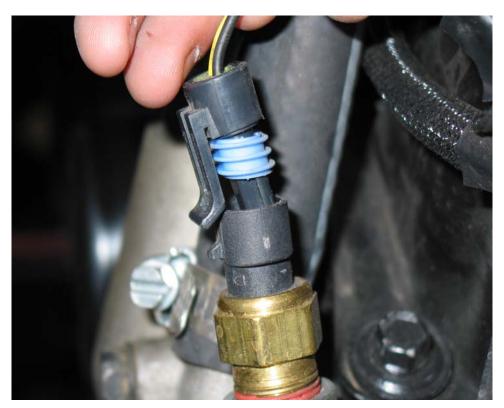


Figure 7.8 Coolant Temperature Sensor (CTS)

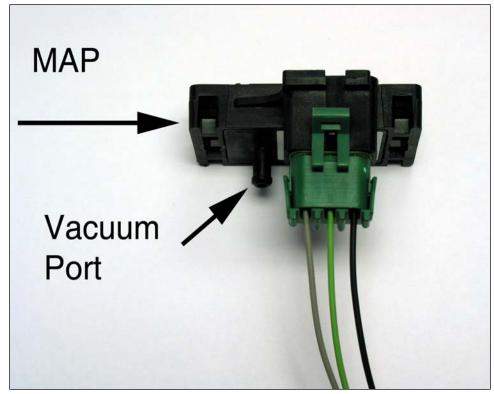


Figure 7.9 Manifold Absolute Pressure Sensor (MAP)



Figure 7.10 Intake Air Temperature Sensor (IAT)

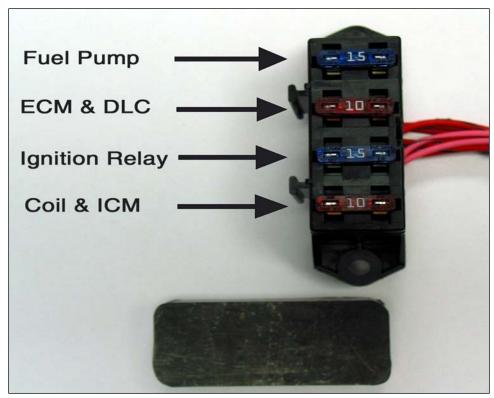


Figure 7.11 PERFECT FUSE BLOCK

Note: ECM (Engine Control Module), DLC (Diagnostic Link Connector), ICM (Ignition Control Module)



Figure 7.12 PERFECT ECM

Distributor Modifications

The Jeep 4.0L engines, from the factory, use both a crankshaft sensor and a camshaft sensor. The crankshaft sensor is located on the bell housing and the camshaft sensor inside the distributor. This PERFECT Engine Management System **only** uses the camshaft sensor. Inside this kit a new shutter wheel has been included and will need to be installed into the correct stock distributor. See Table 4.1 for the specific years of distributors supported with this system. The following photos illustrate the installation of the shutter wheel and the removal of the stock mounting tab.

Steps 1 – 9 illustrate how to disassemble the Distributor.



STEP #1 Carefully knock the roll pin out of the drive gear. Be sure not to squeeze the fragile aluminum housing in a vise.



Step #2 Do not lose any of these pieces as they will all be reused.



Step #3 Carefully, remove the original shutter wheel, shaft and thrust washer all the while twisting the parts back and forth. (The thrust washer is below the original white plastic shutter wheel.)



Step #4 Now; remove the roll pin holding the original shutter wheel on the shaft. Be sure to keep the original roll pin and don't forget the thrust washer on the bottom of the shutter wheel.



Step #5 Be sure to keep the roll pin and don't forget the thrust washer on the bottom of the shutter wheel.



Step #6 Remove the original shutter wheel from the shaft.



Step #7 In order for the timing to be adjustable on this system the original lock down tab on the distributor must be cut off. The photo above shows the tab being cut off with a pneumatic cut off wheel.



Step #8 The tab may also be cut off using a band saw.



Step #9 Depending on the quality of job done on cutting off the lock down tab, the distributor may only need a bit of a touching up. An engine lathe works quite nicely for this step, but a flat file can do the job as well. Just be sure to make the flange as round as possible.

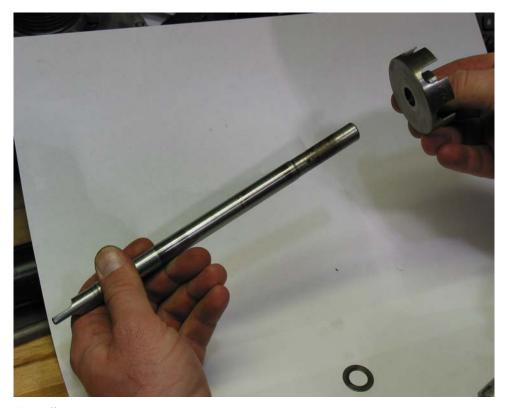
Steps 10 – 9 illustrate how to reassemble the Distributor.



Step #10 Take Note of all the parts needed for a compete reassembly.

- 1. Distributor Housing(Aluminum)
- 2. Thrust Washer
- 3. Thrust Washer with three fingers
- 4. Distributor Drive Gear
- 5. Distributor Drive Gear Roll Pin(The larger of the two pins)
- 6. PERFECT Shutter wheel
- 7. Original Shutter Wheel Roll Pin
- 8. Distributor Shaft
- 9. Distributor Gasket

^{*}Be sure to thouroughly clean all of these parts and lightly coat the shaft and drive gear with engine oil before installing Distributor Assembly into the engine.



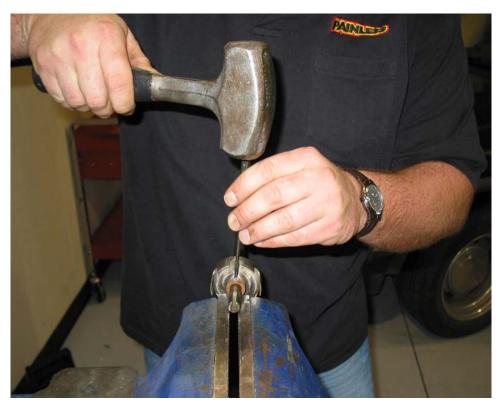
Step #11 Install new PERFECT shutter wheel onto the rotor side of the distributor shaft.



Step #12 Verify the holes line up for the roll pin. It may be necessary to chase the hole with a 1/8" drill bit. Remember to keep the drill as square to the hole as possible and don't wobble the drill back and forth while drilling.



Step #13 Install the smaller original shutter wheel roll pin into the PERFECT shutter wheel.

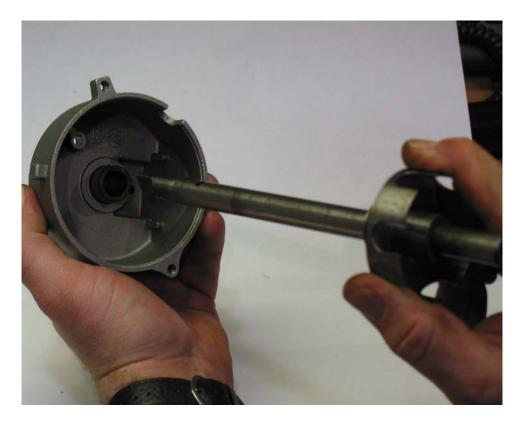


Steps #14 Carefully, drive the roll pin into the shutter wheel and shaft by using a hammer and metal punch until it's flush. DO NOT PUT ANY PRESSURE ON THE SHUTTER WHEEL SHUTTERS AS IT MAY BEND OR BREAK THEM OFF.





Step #15 Install the original thrust washer onto the now assembled shutter wheel and distributor shaft. DO NOT SKIP THIS STEP; IT IS REQUIRED FOR THE PROPER DISTRIBUTOR SHAFT END-PLAY.





Step #16 Apply a small amount of engine oil on the distributor shaft assembly and insert it into the distributor housing. Be sure to wipe off any excess oil afterwards.

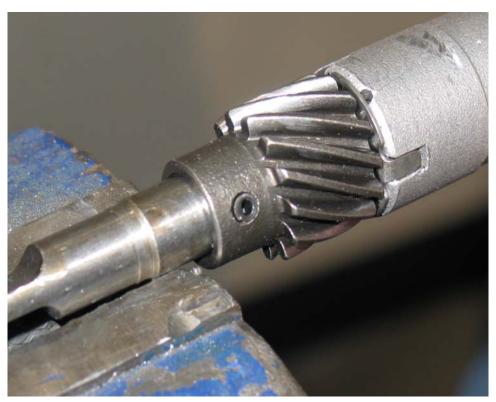


Step #17 Install the Thrust Washer with three fingers onto the engine end of the distributor.

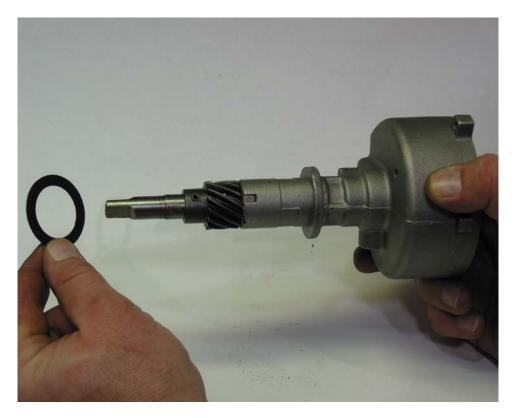


Step #18 Install the Distributor Drive Gear onto the engine side of the distributor shaft and housing.





Step #19 Install the larger Distributor Drive Gear Roll Pin using a hammer and metal punch until its flush.



Step #19 Install either the old or a new distributor housing gasket.



Final Step #20 Install the cam sensor onto the distributor housing.

The Distributor is now ready to be installed into the engine. Either an earlier model distributor hold down will need to be purchased or a Small Block Chevrolet hold down can be used. Be sure in whichever choice is made the distributor is firmly held in place in the engine.

Once all of the above has been completed, including harness installation, computer mounting and distributor modification and install. It will be necessary to set the base timing on the system by following these next instructions.

- 1. Place a jumper between the A and B terminals on the Diagnostic Link Connector with the engine running. This tells the computer to request the timing to be at 10 degrees.
- 2. Hold the throttle open far enough to rev the engine up to 1000rpms.
- 3. Measure the base timing with timing light and set it to 10 degrees.
- 4. Lock down the distributor and remove the jumper wire from the DLC connector.

At this point the engines timing has been synchronized with the computer. Providing this system has been installed on a relatively healthy engine with clean injectors, the correct fuel pressure and a fresh tune up; the throttle response will be crisp and the engine will run smoothly.

8.0 TROUBLE SHOOTING INSTRUCTIONS

Note: Only scanners with marine cartridges and marine cable plugs will communicate with the PERFECT computer.

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, fuel pressure, etc.) then see if the computer has stored any trouble codes in its memory.

8.1 THE CHECK ENGINE LIGHT

Normally, the "check engine" light should come on when ignition is initially turned on, and then go out few moments after the engine starts running. If the computer has detected a problem and a fault code has been set the light will come back on.

- 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 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 indicate a code 32.
 - B: The code will repeat itself. The next code, if any, will be displayed in the same manner.

Note: When you access the codes from the computer a code 12 (one flash followed by two flashes) will first be displayed. THIS DOES NOT INDICATE A PROBLEM. Code 12 will be flashed 2 times, followed by the particular trouble codes, if any. If the computer merely flashes code 12 there are no trouble codes stored. Code 12 means the engine is not running.

8.2 RETRIEVING TROUBLE CODES FROM THE COMPUTER

- 8.2.1 In order to retrieve the trouble codes stored in the computer, locate the ALDL plug installed in **Section 7.2**. Turn the ignition on, BUT DO NOT START THE ENGINE. Connect a jumper wire from the ALDL terminal "A" to terminal "B" see **Figure 7.1** and observe the check engine light.
- 8.2.2 If you have read any codes (remember the normal code 12), write them down for reference Remove the jumper wire from the ALDL connector.
- 8.2.3 Take the codes one at a time and match them to the codes in **Table 8.1**. This will tell you in which circuit the computer has detected a problem.

Note: A code indicates there is a problem with a specific circuit, NOT NECESSARILY THAT A PARTICULAR PART IS BAD.

- 8.2.4 Before taking more extensive corrective actions for any trouble codes, make sure that all connections on the indicated circuit, INCLUDING the computer, are clean and tight. Inspect the wiring in the circuits for any broken, shorted, or exposed wires. Finally, insure all ground wires are clean and secure.
- 8.2.5 If you are getting a code from your computer and need to clear the code, other than 12, after you have replaced a part, readjusted a part, etc. You can do this by making the following steps.
 - A: Install a jumper wire from terminal A to terminal B
 - B. Ignition ON engine OFF
 - C. Move throttle from 0% (idle) to 100% (WOT) and back to 0%.
 - D. Remove the jumper wire.
 - E. Turn ignition OFF for at least 20 seconds.
 - F. Ignition ON engine OFF
 - G. Recheck for codes.

Code #	Circuit affected
13	Oxygen Sensor
14	Coolant Temp. High Voltage (COLD)
15	Coolant Temp. Low Voltage (HOT)
21	Throttle Position Sensor (high voltage)
22	Throttle Position Sensor (low voltage)
23	Intake Air Temp. Low Voltage (HOT)
25	Intake Air Temp. High Voltage (COLD)
33	MAP Sensor Circuit (high voltage)
34	MAP Sensor Circuit (low voltage)
41	Ignition Control Circuit (open IC circuit)
42	Ignition Control Circuit (grounded IC)
44	Knock Sensor Inactive
54	Heated Oxygen Low Voltage (lean)
55	Heated Oxygen High Voltage (rich)

Table 8.1 Diagnostic Trouble Code Chart

8.4 WHEN TO CALL PERFECT PERFORMANCE PRODUCTS TECH LINE

- 8.4.1 These harness kits have been built with the highest regard to strict quality control and tested before shipment. Before calling use please double check all connections and perform basic trouble shooting (fuel pressure, spark, injector pulse, etc.).
- 8.4.2 If you have any questions concerning the installation of this harness or are having trouble in general; please call the Painless Performance tech line at (800) 423-9696. All calls are answered from 8 AM to 5 PM CST, Monday-Friday, except holidays. Please leave a message if you are unable to reach us and we will return your call as soon as possible.

Note: HELPFUL INFORMATION ON THE PERFECT ECM CALIBRATIONS.

The PERFECT ECM has been specifically calibrated for your particular engine. This computer will NOT work with any other type of engine. The computer has been programmed with a REV. limit set @5,000 RPM. If your computer was to detect an engine malfunction it will set the "check engine" light and store a code. The computer will also place itself into a "safe mode" if the engine temperature reaches 250°. Once the engine cools down the computer will reset itself out of "safe mode" and return to normal running operation. Safe mode will still allow you to drive your vehicle, but will not allow the engine to rev over 1,300 RPM.

E-mail:tech@painlessperformance.com WEB: www.painlessperformance.com

Painless Performance Limited Warranty and Return Policy

Chassis harnesses, fuel injection harnesses, and Striker ColdShot 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.