

2009 – 2013 GEN IV LSA 6.2 Drive by Wire (58X)  
Electronic Fuel Injection Wiring Harness w/ Manual or Non-  
Electronic Automatic Transmission

**HAR-1099**

# PERFORMANCE SYSTEMS INTEGRATION

Thank you for choosing Performance Systems Integration (PSI). We offer a full line of LSX/LT1 and GM Overdrive Transmission parts for your conversion needs. 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 about them.

## **PERFORMANCE SYSTEMS INTEGRATION LIMITED WARRANTY AND RETURN POLICY**

All products manufactured and/or sold by ***Performance Systems Integration (PSI)*** are warranted to the original purchaser to be free from defects in material and workmanship under normal use. **PSI** 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. The buyer is responsible for returning the product to **PSI** to initiate the warranty procedures. If defects occurred under what **PSI** deems to be normal use, product will be returned free of charge.

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# PERFORMANCE SYSTEMS INTEGRATION

## 1.0 INTRODUCTION

Thank you for purchasing what PSI has designed as the most up-to-date and easiest-to install automotive fuel injection harness on the market. This harness is designed to be a complete wiring harness for the fuel injection system on General Motors 2009 to 2013 LSA fuel injected engines using a 58X crank sensor and factory installed Drive By Wire Throttle Body.

**NOTE:** PSI customizes the 58X harnesses to customer specifications prior to shipment. This includes variations in Accelerator Pedal, Alternator, Variable Valve Timing (VVT) Camshaft, Intake Manifold and Mass Airflow Sensor (MAF). If the incorrect items are used, the engine will not work correctly. Please ensure you are using the correct components prior to installation.

This harness is constructed with GM Delphi Connectors and Terminals with GXL (600 volt polyethylene cross-linked) wire which is professionally assembled and 100% quality inspected prior to shipping. This harness includes all wiring that is needed by the ECM to run and control the fuel injection system and transmission.

List of Terms			
Item	Description	Term	Purpose
1	Engine Control Module	ECM	This is the computer which controls engine function.
2	Throttle Position Sensor	TPS	ECM Input for engine throttle position.
3	Drive by Wire	DBW	Throttle Body operation by ECM
4	Exhaust Gas Recirculation	EGR	ECM Output to control engine emissions.
5	Engine Coolant Temperature	ECT	ECM Input to determine engine temperature.
6	Inlet Air Temperature	IAT	ECM Input to determine air temperature.
7	Manifold Absolute Pressure	MAP	ECM Input to determine engine load.
8	Mass Air Flow	MAF	ECM Input to determine airflow into engine.
9	Oxygen Sensor	O2	ECM Input to determine air/fuel ratio of engine.
10	Vehicle Anti-Theft	VATs	ECM Input to prevent engine from starting.
11	Charcoal Canister Purge	CCP	ECM Output to control engine emissions.
12	Vehicle Speed Sensor	VSS	ECM/TCM Input to determine vehicle speed.
13	Malfunction Indicator Light	MIL	ECM Output to alert of EFI Malfunction.
14	Data Link Connector	DLC	ECM Input for retrieving trouble codes.
15	Accelerator Pedal Position	APP	ECM Input to determine pedal position

**Table 1 - List of Terms**

## 2.0 PRECAUTIONS

Below are a few precautions that should be taken prior to and after installing this wiring harness:

1. Never disconnect the battery or the ECM Connectors while the ignition is turned 'On'.
2. Never short any wires in this harness to ground (with the exception of the 'Ground' wires) or damage to the ECM will result.
3. Never use a 'Test Light' to determine the condition of any circuits. A digital Volt/Ohm Meter with a minimum of 10-Mohm resistance is required to test any circuits. Do not back probe wires as this can lead to permanent wire damage.

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**WARNING:** Factory LSA vehicles used a Fuel Pump Control Module (FPCM) to control fuel pressure under boost. The FPCM is **NOT** used with the PSI Harness. We highly recommend installing a Boost Sensitive Fuel Pressure Regulator to properly regulate fuel pressures. The tune **MUST** be adjusted once the engine is in the vehicle or **engine damage MAY occur**.

## **3.0 PRE-INSTALLATION REQUIREMENTS**

The following information details some of the hardware and software requirements when installing this harness:

**\*(SEE TABLE 2 FOR COMPATIBLE REPLACEMENT SENSOR PART NUMBERS)\***

1. All LSA Engines will require the VAT's System to be removed from the ECM. If the VAT's is not removed from the ECM the engine will NOT start. Contact PSI for removal of this function.
2. Factory Stock LSA Engines utilized four (4) O2 Sensors; two (2) Sensors on each side of the engine, one before and one after the catalytic converter. The rear O2 Sensors (after the catalytic converters) are **not** used with the PSI Harness. Provisions are provided for two pre-catalytic converter oxygen sensors in the harness.
3. **LSA engines utilized Evaporative and CCP features for emissions control. This harness does not include these provisions. Evaporative and CCP are not necessary for engine operation. ECM reprogramming may be necessary to avoid storing a Diagnostic Trouble Code (DTC) for absence of emissions equipment.**
4. If any sensors are missing or damaged, PSI recommends replacements listed in Table 2. Note that the ECM listed in Table 2 must be used.
5. It is recommended that you use a VSS when using a T56 or non-electronic automatic transmission (TH350, TH400, Powerglide, 700R4, etc). Failure to use a VSS can result in unexpected stalling during hard braking or an INOPERABLE THROTTLE BODY.
6. The Oil Pressure Sensor is **NOT** required for normal operation of the engine. If you wish to use an oil pressure gauge, you will need an oil pressure sensor from a 2009 Silverado LY6. See the table below for the OEM part numbers compatible with our harness.
7. If using an aftermarket gauge, you **MUST** use the sender that comes with the gauge.
8. You **MUST** have a brake switch for proper Drive by Wire throttle control and TCC operation. These are necessary to allow proper function of the TCC. The brake switch should be closed (electrically connected) when the brakes **ARE** being applied and open (not electrically connected) when the brakes **ARE NOT** being applied.

**CAUTION:** FAILURE TO WIRE THE BRAKE SWITCH CORRECTLY COULD RESULT IN AN INOPERABLE THROTTLE CONDITION.

# PERFORMANCE SYSTEMS INTEGRATION

<b>TABLE 2. COMPATIBLE PARTS</b>	
<b>Item Description</b>	<b>Part Number</b>
Engine Computer (ECM)	GM Service# (2009) 12636659, (2010- 2013) 12633264
Knock Sensor	GM# 12570125 / Delco# 213-1576
Ignition Coil	GM# 12611424 / Delco# D-510C
Oxygen (O2) Sensor	GM# 12581966 / Delco# 213-1694
Mass Air Flow (MAF) Sensor <b>*CAUTION: SENSOR WIRING AND PCM TUNE MUST MATCH SENSOR USED</b>	GM# 15865791 / Delco# 213-4222 (LS3/LS7 Cartridge Style) GM# 10393948 / Delco# 213-4343 (Vortec 09+)
Cam Position Sensor	GM# 12568983 / Delco# 213-3826
Crankshaft Position Sensor	GM# 12585546 / Delco# 213-3520
Intake Air Temp Sensor	GM# 12614717 / Delco# 213-4405
Manifold Absolute Pressure (MAP) Sensor, Supercharger Pressure Sensor	GM# 12591290 / Delco# 213-3842 (Inlet/Barometric) GM# 12592525 (Outlet)
Accelerator Pedal Position (APP) Sensor	GM# 25835421 (Corvette)
Oil Pressure Sensor (Not Required for normal engine operation)	GM# 12621234 / Delco# 2134411 (2009- Up)
LSA Ignition Coil / Fuel Injector Sub-Harness	(Driver side) PSI# SUB-1001 (AVAILABLE FROM PSI) (Passenger side) PSI# SUB-1002 (AVAILABLE FROM PSI)

**Table 2 - Compatible Parts**

## **4.0 TOOLS**

Non-Standard Tools Required for Installation:

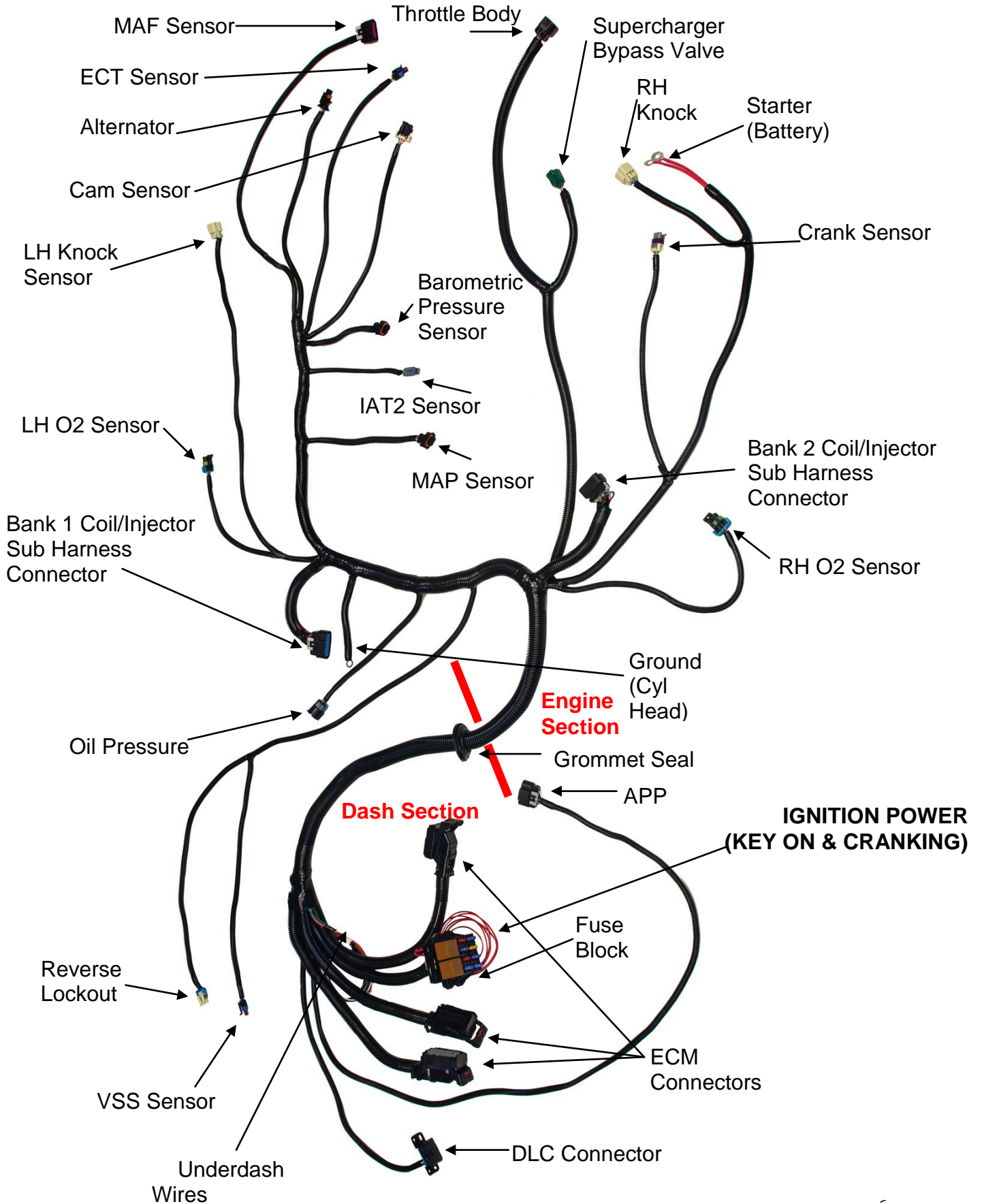
1. Terminal Crimping Tool
2. Wire Strippers
3. Electric Drill
4. 2" Hole saw (for the rubber grommet in the firewall)

## **5.0 ROUGH INSTALLATION/ROUTING**

This harness was designed with the intent of ECM mounting in the passenger compartment (e.g. glove box, or under dash). This fuel injection harness has two sections, the Engine Compartment Section, and the Dash Section, reference Figure 1 below. Note that the Engine Compartment Section is on one side of the Grommet Seal and the Dash Section is on the other side.

- **ENGINE COMPARTMENT SECTION:** Includes wiring for the fuel injectors, coils and sensors.
- **DASH SECTION:** Includes ignition feed wires, DLC Connector, Underdash Wires, Accelerator Pedal Position Sensor, ECM Connectors, and Fuse/Relay Center.

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**NOTE:** Routing your harness depends a great deal upon the particular make of the automobile and to what extent you want to secure and conceal the harness.

- 5.1 Decide where and how the ECM and Fuse/Relay Center will be mounted. PSI wiring harnesses are designed to mount either under the dash or in the kick panel on the right side. They must be no further apart than the wiring will allow.
- 5.2 A good exercise is to lay out the wire harness on the floor beside your vehicle and identify all the connectors and wires.
- 5.3 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.
- 5.4 Route the harness away from sharp edges, exhaust pipes, and the hood, trunk and door hinges.
- 5.5 Allow enough slack in the harness at places where movement could possibly occur (body to frame, frame to engine, etc.).
- 5.6 Familiarize yourself with the harness by locating each of the harness sections and by looking at the connectors on the wire ends, reference Figure 1.

As with all automotive wiring, the grounding circuit is critical for proper operation. Ensure that there is secure grounding of the following, battery to engine, battery to chassis, engine to chassis, and harness to engine.

**NOTE:** This harness is equipped with Ground Wiring on the rear portion of the driver side cylinder head.

- 5.7 Connect a ground strap or cable (minimum of a 4 Ga. wire) from the negative battery terminal to the chassis (frame).
- 5.8 Connect a ground strap (minimum of a 4 Ga. wire) from the engine to the chassis (frame). **DO NOT RELY UPON THE MOTOR MOUNTS TO MAKE THIS CONNECTION.**
- 5.9 Connect a ground strap from the engine to the body.

## 6.0 HARNESS INSTALLATION

**CAUTION:** BEFORE BEGINNING INSTALLATION, DISCONNECT THE POWER FROM YOUR VEHICLE BY REMOVING THE NEGATIVE BATTERY CABLE FROM THE BATTERY.

Connecting the Wiring Harness is a simple process and is detailed in the following steps.

- 6.1 Mark the position where the wiring harness will come through the firewall with a metal punch. (Typically near the passenger side cylinder head) Using a 2" hole saw, drill a hole in the firewall. Make sure to debur the hole with a file.
- 6.2 From **inside** the vehicle, feed the Engine Section of the wiring harness through the 2" hole. Push the grommet (already installed on the harness) into the hole until it is seated.

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**NOTE:** Make no wire connections or permanent mounting of any kind at this time. Remember to route harness away from sharp edges, exhaust pipes, hinges and moving parts.

- 6.3 Route the engine compartment section to the top of the engine. The engine section is designed to be separated into left side (driver) and right side (passenger) sections, in much the same way as factory wiring. Each side is wire loomed separately, **BUT IS NOT LABELED**. The driver side of the engine section is longer, and has the connectors for the CAM, MAF, and ECT Sensor, reference Figure 1.
- 6.4 Route the driver side section behind the intake manifold and then between the driver side rocker cover and fuel rail.
- 6.5 Route the passenger side section between the passenger side rocker cover and fuel rail.
- 6.6 Route the VSS connector over the transmission case to the rear of the transmission.

**CAUTION:** WHEN ROUTING THE WIRES FOR THE VEHICLE SPEED SENSOR MAKE CERTAIN THAT THEY ARE AT LEAST 12 INCHES AWAY FROM ANY IGNITION WIRING (SPARK PLUG WIRES, ETC.).

- 6.7 Route the Battery Positive (**2 LARGE RING TERMINALS COVERED IN RED HEAT SHRINK**), Knock sensor connector and Crank sensor connectors behind the passenger head and under the exhaust manifold (header) to their respective locations.
- 6.8 Route the Fuse Block/Relay Center and ECM connectors to their preferred mounting locations. Position the ECM in its intended location (e.g. under the dash).

**CAUTION:** IT IS IMPORTANT TO AVOID ECM CONTACT WITH MOISTURE OR DAMAGE MAY OCCUR.

- 6.8 Route the underdash wires, Figure 1, to the driver side of the dash.

## 7.0 ENGINE COMPARTMENT SECTION CONNECTIONS

- 7.1 Locate the black wires in the driver side group that end in two, large ring terminals and ground them to the engine, Figure 1. (Commonly to the rear of the driver side cylinder head ).
- 7.2 Using Figure 1 and specific connections indicated in Table 3 connect the wiring as directed.
- 7.3 Route the Reverse Lockout connector to the rear of the transmission.
- 7.4 If using a T56 or similar transmission, take the connector for the Vehicle Speed Sensor (VSS) and connect it to the Vehicle Speed Sensor on the driver side of the transmission.



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Connector	Connected To	Wire Colors	Check if Complete
1	Driver Side Injector and Coil Sub-Harness	Pink, Orange (x2), Dk Green, Tan, Blue, Black, Pink, Purple, Tan, Yellow, Dk Green, Brown (x2)	
2	Driver Side Injector and Coil Sub-Harness	Pink, Brown, Dk Blue, Lt Blue, Yellow, Black, Brown, Dk Green, Blue, Orange, Green	
3	LH O2 Sensor	Tan, Purple, Pink, Gray	
4	MAF/IAT Sensor	Yellow, Black, Pink, Purple, Tan	
5	Alternator	Brown, Gray	
6	ECT Sensor	Tan, Yellow	
7	Cam Sensor	Orange, Pink, Brown	
8	LH Knock Sensor	Dk Blue, Gray	
9	Throttle Body	Brown, Yellow, Tan, Dk Green, Lt Blue, Purple	
10	MAP Sensor	Orange, Lt Green, Gray	
11	RH Knock Sensor	Lt Blue, Gray	
12	RH O2 Sensor	Tan, Purple, Pink, Lt Green	
13	Crank Sensor	Dk Blue, Yellow, Lt Green	
14	<b>Starter (Battery Positive) 2 RING TERMINALS</b>	Large Ring Terminals (Black)	
15	VSS Sensor	Yellow, Purple	
16	Grounds (Rear of Cylinder Head)	Black	
17	Oil Pressure (Optional)	Tan, Grey, Black	
18	Reverse Lockout	Lt Green, Pink	
19	Intake Air Temp Sensor	Lt Blue, Yellow	
20	Barometric Pressure Sensor	White, Orange, Gray	
21	Bypass Valve	Pink, Gray	

**Table 3 – Engine Compartment Connection Checklist (Reference Figure 1)**

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## 8.0 DASH SECTION CONNECTIONS

The wires in this section consist of the DLC (OBDII Port), Ignition Feed, MIL indicator (Check Engine Light), Speedometer, Tachometer, Accelerator Pedal Position Sensor, ECM Connectors, Primary Cooling Fan, Park/Neutral Signal, and Brake Signal wires.

**CAUTION: DO NOT MAKE ANY CONNECTIONS WHILE THE ECM IS PLUGGED INTO THE HARNESS.**

8.1 Using Figure 2 and specific connections indicated in Table 4, connect the wiring as directed. All connections in Table 4 are required unless otherwise noted.

**NOTE:** A fuel pump relay is provided with the signal side of the relay being pre-wired from PSI. However, in order to provide a clean installation, the feed and output sides of the relay are not wired. PSI has provided you with two blade terminals to complete this circuit. Ensure that properly sized and fused wiring is used, depending on the capacity of your fuel pump. Measure the length of wire needed to reach the fuel pump, strip the wire and crimp the supplied blade terminal onto the wire. Insert the terminal into the relay holder per Figure 2. Perform the same operation for wiring the power supply side of the relay ensuring that the wire is run from an appropriate power source.

**CAUTION: BE SURE TO PROPERLY GROUND AND FUSE YOUR FUEL PUMP OR ENGINE DAMAGE MAY OCCUR.**

8.2 Connect the 3 ECM connectors to the ECM, **BEING CAREFUL NOT TO BEND ANY PINS.** Connectors are color coded to prevent incorrect installation.

8.3 All wires not being used should be individually taped and secured to prevent electrical shorting.

8.4 Permanently mount your ECM, Accelerator Pedal, and Fuse/Relay Center.

8.5 After all connections have been made throughout the harness, reconnect the battery.

**CAUTION: BE SURE THE IGNITION IS OFF WHEN YOU RECONNECT THE BATTERY OR DAMAGE TO THE ECM/TCM WILL OCCUR.**

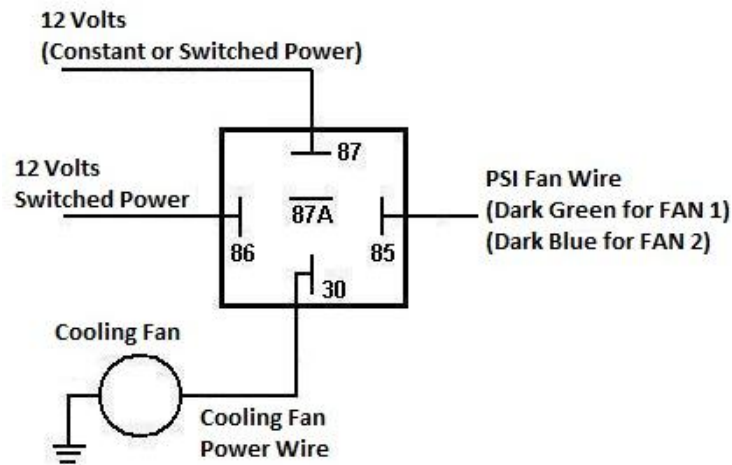
**NOTE:** In stock configuration Fan #1 will come ON at 226F and go OFF at 221F. (ECM reprogramming is available through PSI to alter fan temperatures).

# PERFORMANCE SYSTEMS INTEGRATION

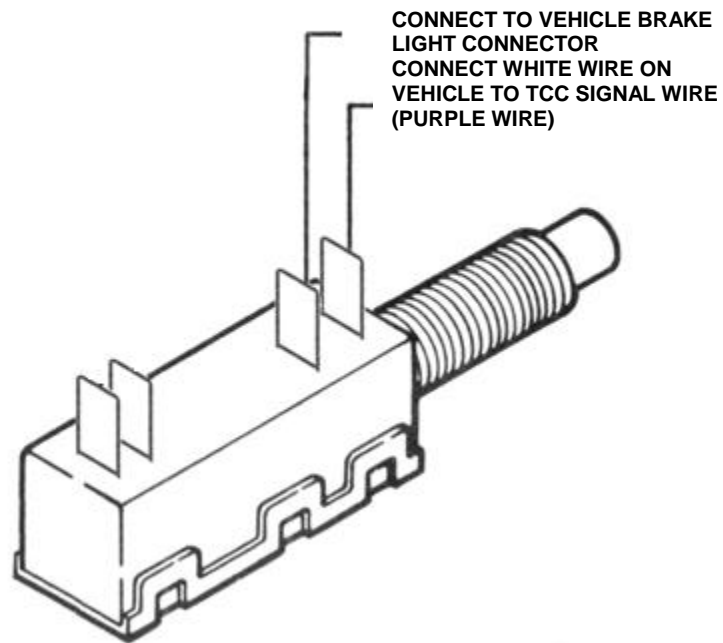
<b>UNDERDASH WIRES (BUNDLED TOGETHER)</b>			
<b>WIRE COLOR</b>	<b>CONNECTED FROM</b>	<b>CONNECTED TO</b>	<b>CHECK IF COMPLETE</b>
Brown	MIL Lamp Ground	Through Automotive Light to 12V	
Black	Speedometer (Optional)	Speedometer Module	
White	Tachometer (Optional)	Electronic Tachometer	
Dk Green	Fan 1 Ground (Optional)	Ground Side of Customer Supplied Fan 1 Relay	
Orange	Clutch Position (Optional) *NOT NEUTRAL SAFETY*	To Ground (While Clutch is Depressed)	
Purple	Brake Signal / TCC Ground	To 12V (Brakes Applied)	
Pink	Coolant Pump Relay Ground	Coolant Pump Relay	
<b>UNDERDASH WIRES</b>			
N/A	Fuel Pump (Line)	To 12V Battery Power	
N/A	Fuel Pump (Load)	To Fuel Pump	
Red	Ignition Feed (Relay Center)	12V Fused Switched Power <b>(KEY ON and CRANKING)</b>	
Multiple	ECM Connectors (x3)	ECM	
Multiple	Accelerator Pedal Position Sensor	Accelerator Pedal	

**Table 4 - Dash Connections Checklist**

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**Cooling Fan Relay Diagram**



**Brake Switch Diagram**

CONGRATULATIONS! Your PSI LSA/LS9 58X Fuel Injection Harness installation is complete.

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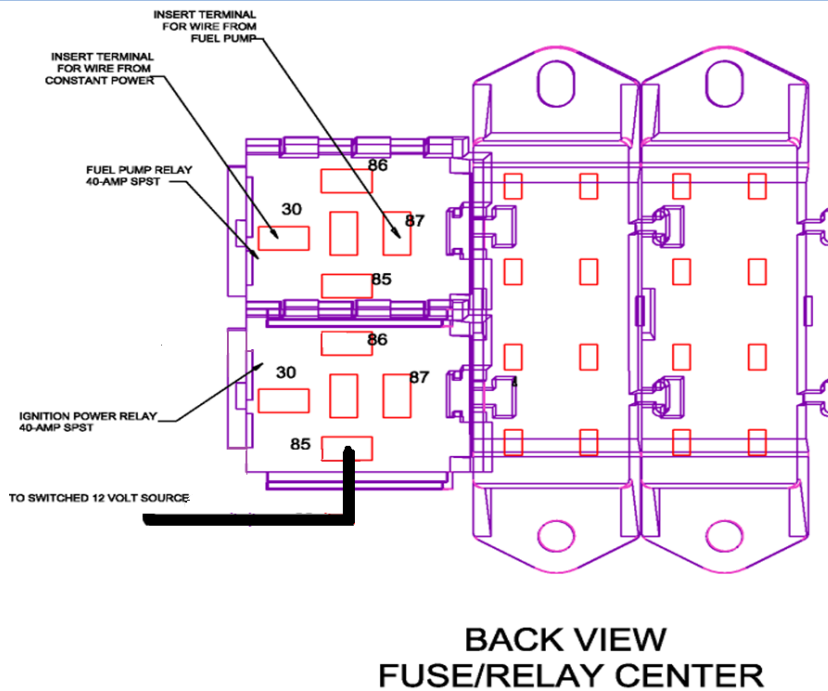
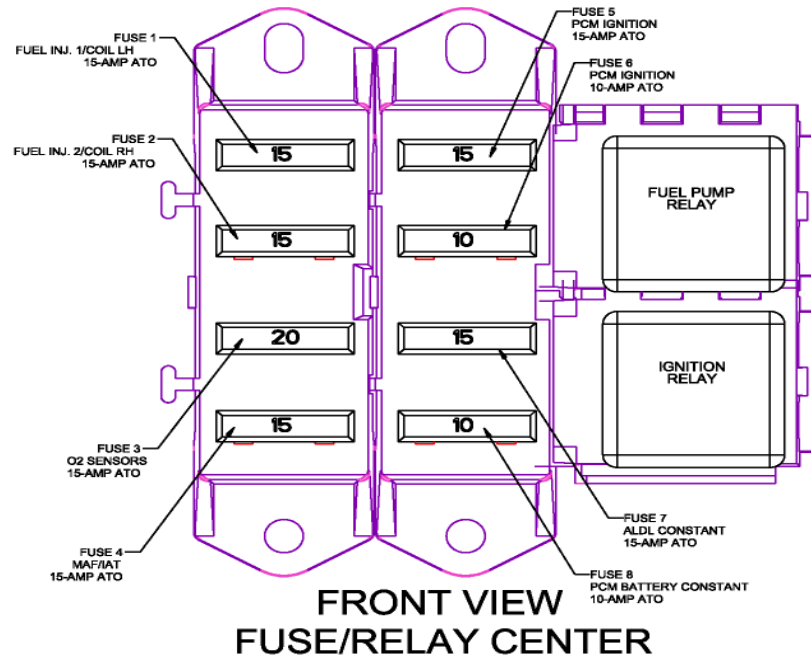
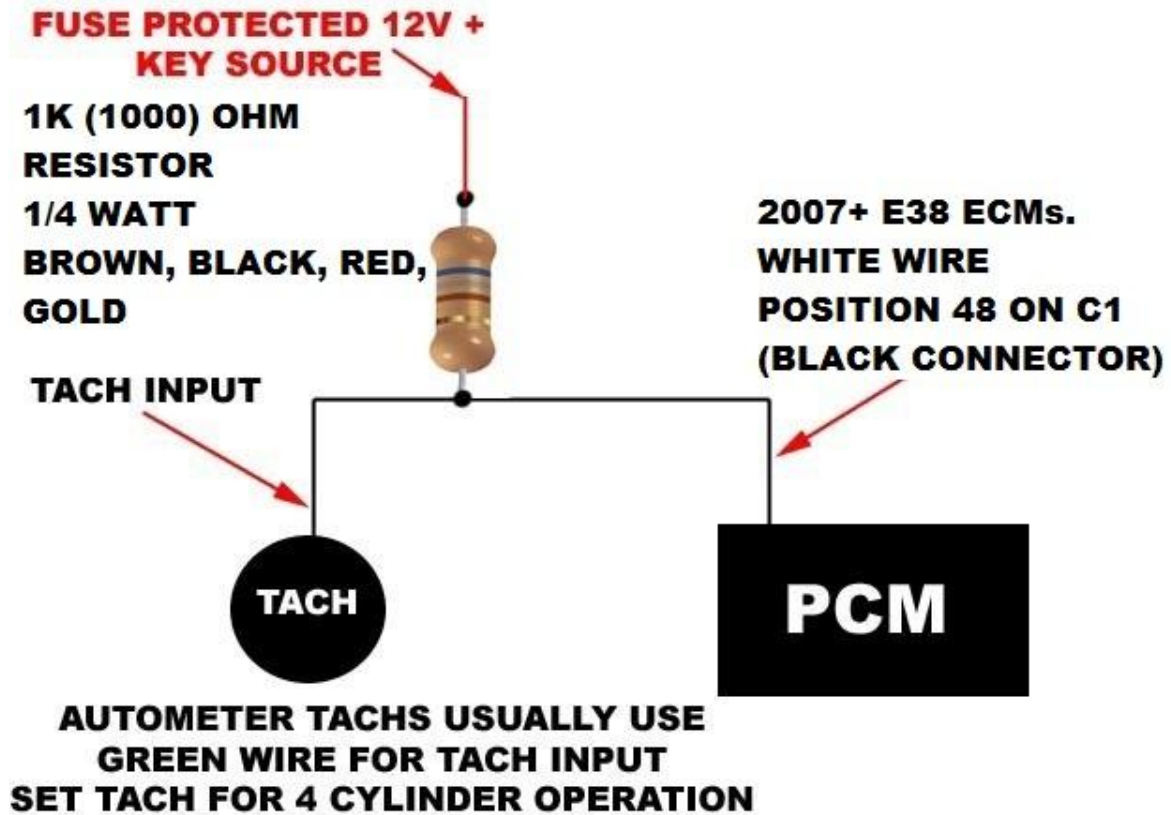


Figure 1 - Fuse/Relay Center (Front and Back View)

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If your Tachometer gauge is giving sporadic or incorrect readings, you will need to put a 1k Ohm resistor into the Tach circuit as shown below.



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## 9.0 TROUBLE SHOOTING INSTRUCTIONS

If you are having trouble with your engine running poorly or not running at all, first perform basic trouble shooting (ensure that you are using the correct parts, see Table 2), check for faulty connections, 12V at starter, blown fuses, disabling of VATS in PCM, spark, timing, fuel pressure, etc., then see if the PCM has stored a trouble code in its memory.

Check the following items prior to contacting PSI.

### NO-START

1. Red Ignition Wire (From back of Fuse/Relay Center) has 12-volts with the Key in the **ON** position and **CRANKING** position. This cannot be stressed enough, most NO-START conditions can be traced to this wiring issue.
2. Check that 2 Large Ring Terminals by Crank Sensor are connected to **CONSTANT POWER**. These wires are covered in black heat shrink and loom.
3. Check Fuel Pressure for correct value (Approximately 58-psi).
4. Check that Fuel Injectors are firing. In many cases, engines which have been sitting for a few months have old fuel which has turned to varnish and clogged the injectors. A simple way to check if the injectors are clogged is to place a NOID LIGHT (Available at most autoparts stores) in the injector plug while cranking the engine. If the plug lights up, then the injectors are being commanded to fire. If the spark plugs are firing, and fuel pressure is correct, then the injectors are clogged and must be cleaned.

### THROTTLE PEDAL DIES

1. Purple brake switch wire is not connected properly.
2. Incorrect tune in ECM for throttle body, MAF and MAP sensors being used.
3. Incorrect APP Pedal used.
4. Trouble Codes exist.

### COOLING FANS STAY RUNNING

1. Check Engine Light is connected properly.
2. Trouble Codes exist.

## 9.1 “CHECK ENGINE” LIGHT

Normally, the “Check Engine” or “MIL” indicator lamp should come on when the ignition is 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 ECM has detected a problem and a trouble code has been set.

## 9.2 RETRIEVING TROUBLE CODES FROM THE ECM

**9.2.1** In order to retrieve the trouble codes stored in the ECM, a scanner must be connected to the DLC connector. Follow the instructions provided with the scanner to read the codes set in the ECM. (Normally with the ignition in the “ON” position, but with the engine NOT running).

**9.2.2** After you have read any codes, document them for reference. Remove the connector from the DLC connector. This will tell you in which circuit the ECM has detected a problem.

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

- 9.2.3** Before taking more extensive corrective actions for any trouble codes, make sure that all connections on the indicated circuit, **INCLUDING THE ECM**, 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.
- 9.2.4** If a trouble code is detected and the problem has been fixed, clear the codes by first making sure the ignition is off, then disconnecting the **NEGATIVE** battery cable for at least 3 minutes.

## **10.0 TECHNICAL SUPPORT**

**PSI** harnesses are built with the highest regard to quality control, and all products are 100% quality inspected. Before contacting us, please double check all connections and perform normal basic trouble shooting (fuel pressure, timing, ignition system, etc.).

**\*(SEE TABLE 2 FOR COMPATIBLE REPLACEMENT SENSOR PART NUMBERS)\***