SUM-240510
MAX LS Port Injection System

Installation Instructions

WARNING!
This installation guide must be read and fully understood before beginning installation. If the installation guide is not fully understood, do not attempt to start this installation. Failure to follow this installation guide can possibly result in system failure and potentially serious personal injury and/or property damage. Please keep this installation guide. For the safety and protection of you, your vehicle, and others, only a trained and approved mechanic with adequate experience should perform the installation, adjustment, and repair.

If this installation guide is not followed, any component damaged will not be covered by warranty. Should any one component fail, it will not constitute or justify a warranty of the entire system. Replacement and accessory items are available for purchase. If assistance is required or if you need further warranty clarification, please call Summit Racing customer service.

WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Contents for Max LS Based Port Kit

240510-1	LS ECU
240510-3	Primary Wiring Harness
240510-4	EV1 Injector Sub
240510-5	Transmission Control Sub Harness
240510-7	Passenger Bank Oxygen Sensor Sub Harness
240510-9	LS3/LS7 Knock Sensor Sub Harness
240510-10	3 Bar MAP Sensor
240510-11	Cam Extention Harness
240510-16	LS1/LS2 Knock Sensor Sub Harness
240510-19	Hand Held Controller
240510-55	8x 55lb Fuel Injectors
240505-12	2x Wide band Oxygen Sensors
240505-13	2x Stainless Steel Oxygen Sensor Bung Kits
240505-15	USB to USB-C Cable
240505-16	Windshield mount for Hand Held controller
240505-20	Handheld Controller Cable

Features

Summit Racings Max LS ECU System is designed for street and performance engine applications with a 1500-6500 RPM powerband. They are designed to support 750 hp to the flywheel and all systems include a 3 BAR TMAP sensor for power adder applications that support up to 30 PSI of boost (3 BAR).

The system comes with a self learning ECU with touch screen controller for easy setup and configuration. The programmable color touch screen Hand Held Controller includes a data logging feature. The system has a sequential fuel and spark control with individual cylinder trim.

The system also comes with a stainless steel oxygen sensor bung, target AFR and timing control, two fan control outputs, 12 volt square-wave tach output driver for most tachometers and a speedometer output driver for most electric speedometers. The system is compatible with LS1-LS3 24X or 58X crank sensors, 1X or 4X cam sensors, and compatible with both car and truck ignition coils.

Wiring the system is made easy with a custom wiring harness that uses existing factory coil packs and sub harnesses. The Max LS ECU System comes with a knock sensor control and is custom cam friendly. Included are several preset timing curves that are each tailored for different camshafts, final drive gearing, and vehicle weight.

Transmission Control

Optional, the Max LS ECU Systems can be used to control electronic transmissions. This option is used when operating a GM electrotonically controlled automatic transmissions. The Max LS ECU has the ability to control the shift point, shift firmness, when to downshift properly, and all other features involved when controlling the transmission. This feature is suitable for 4L60E, 4L65E, 4L80E or 4L85E GM transmissions. If using transmission control, a sub-harness will connect to the trans connector on the main harness and continue on to the transmission. If not using transmission control leave the connectors on the main harness untouched and set the included sub-harness aside for future upgrades if desired.

Engine Protection Feature

The Max LS ECU System is programmed with limp home features. Our features differ from competitors because the SRE unit will not shut down your system. Instead the ECU will compensate if a sensor fails. This means, that if for any reason a sensor fails, that sensor will receive either a default value or a simulated/calculated value during which time a fault code will be set. This is to ensure that the engine remains running in a safe and controlled manner so that you can get to a repair facility, or to your home to resolve the issue. Due to the compensation features of the ECU, the way to check exactly what is wrong with your system is by way of the fault codes option on the main menu of your hand-held controller. The fault code comes up under the OBD-II style diagnostic standard (P codes) which to the right of the code it will state which sensor is having the problem.Check our troubleshooting guide to solve any fault codes errors. A new feature programmed into our hand-held is a rev offset for warm-up rpm limiting as well as a user adjustable high temperature rev limiter. This feature will protect the engine because it changes your built in rev limiter setting to prevent over rev and possible engine damage during both ends of the spectrum (warm up and high temperatures areas). It will automatically turn the feature off once your engine is back into normal operating temperature range.

Engine Protection Feature

- Be sure the engine has had sufficient time to cool before starting work on the installation.
- Be sure to disconnect the negative terminal of the battery before beginning.
- We recommend using an in tank fuel pump setup for the best performance and reliability.
- If using the Frame Mount Inline Fuel Pump, it should be mounted at, or below, the bottom level of the fuel tank and as close to the tank as possible. No more than 3-feet away from the tank. This type of pump is designed to pump, not draw. Works best when gravity fed.
- Only use hard fuel lines or EFI pressure rated hose along with being sure to use proper EFI rated flared fittings.
- SRE does not recommend aluminum fuel lines EVER!
- Make sure that you remove ALL low pressure flex joints on factory fuel lines and replace them with EFI rated fuel hose and use proper flared connections and clamps. Be careful not to mix 45° and 37° AN fittings. Although they look similar they typically will not seal properly together at higher fuel pressures. 45° fittings usually come from a hardware stores while most auto performance parts stores/speed shops carry the required 37° AN fittings which are what is supplied for the fuel rails in this system.
- Your system needs to run at 58 PSI.
- The use of push lock style hose ends is only recommended when used with same supplier of hose. Interchanging hose ends and hose with other brands could cause leaks.
- The SRE LS ECU System is intended for use with unleaded pump gas. It is recommended to use unleaded fuel to ensure the oxygen sensors last longer and do not fail prematurely.
- Leaded fuel will lead to improper exhaust gas oxygen readings.
- Do not use solid core ignition wires.
- Only the steady state fuel “learns”. Cranking and hard throttle hits will not learn, but they can be tuned in Tuning section in the handheld. Selecting the right “cam” and engine CID (cubic inch) will get the learning closer. The Accel Pump will often need tuning for your particular engine combination.
- Tach output driver provides a 12 volt square wave output signal compatible with most aftermarket tachometers.
- Before starting the install, ensure any RTV silicone sealer that may be used on the header’s gaskets/seal are oxygen sensor compatible. This information can be found on the RTV package. Failure to utilize proper RTV can cause premature wear of the oxygen sensors.

-Your fuel tank must have a vent to prevent pressure building up inside the tank.

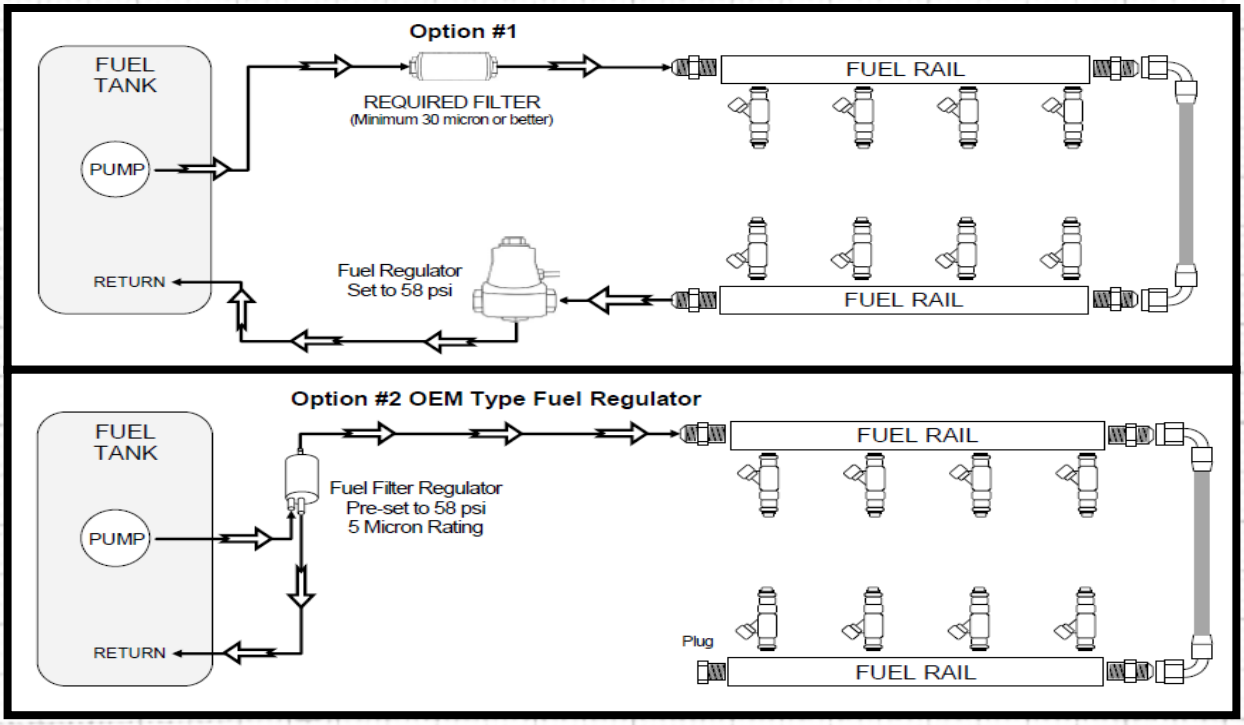
Fuel System Plumbing and Requirements

No fuel system items are provided with the Max LS ECU System.

Follow the below general guidelines when installing your system.

The installation of fuel related components should be done in a well ventilated area free of any possible fire hazards. Gasoline fumes are toxic and highly inflammable Always relieve the pressure from within the system before working/opening any fuel system. Take precautions to ensure that all fuel components are away from heat sources, such as the engine or exhaust pipe. A fire or explosion hazard could cause serious injury or death! Before disconnecting or removing fuel lines, ensure the engine is cold. Do not smoke. Extinguish all open flames. An open flame, spark, or extreme heat near gasoline or fumes can result in a fire or explosion causing damage, serious injury, and/or death. Never get under a vehicle supported by only one jack. Serious injury or death can result from vehicles falling off of jacks. Before working underneath a vehicle, support it solidly with jack stands.

- Your fuel tank must have a vent or use a vented cap to prevent pressure building up in side the tank!
- After installation, the fuel pressure regulator must be set to 58 psi.
- Recommendation is a 100 micron (course filter) between tank and pump and a 10 micron (fine filter) between pump and injectors.
- At minimum a 30 micron or better filter must be installed in the fuel line before any fuel enters the fuel rails.
- Plan the routing of the fuel hose so there is a convenient place to install the filter for easy servicing.
- Make sure you choose a position where the fuel hose can be routed without getting too close to the exhaust manifolds or any moving parts



Wide Band O2 Sensor

This is the key component of any EFI system. The included dual sensors continuously monitors the exhaust gas mixture and sends the information to the ECU where adjustments are constantly made to maintain the air/fuel targets. The benefits of having the wide band O2 sensor is that it provides real time accurate feedback of the amount of fuel the engine needs to reach desired air/fuel ratio directly to the ECU.

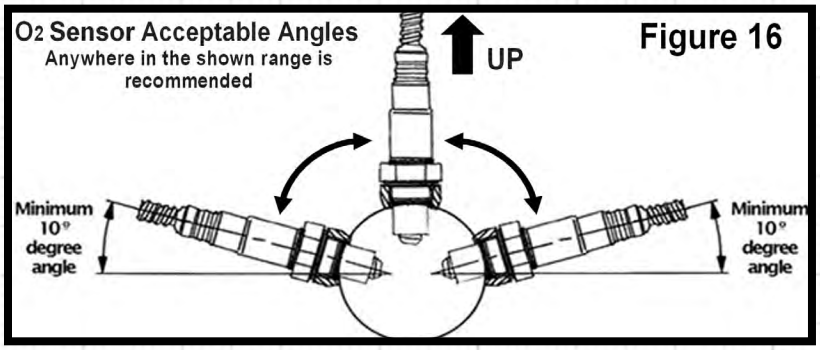
Air Fuel Ratio (AFR)

An approximate value for gasoline's "stoichiometric" value is 14.7. A value of 12.5-13.0 is a "rich" value for near best power. For boost conditions (superchargers and turbochargers) 11.8 is a little richer than best power to keep combustion chambers a little cooler. Settings of 14.7-15.5 are lean and can sometimes be used for better cruise fuel economy. Idle AFR should be set to give a decently stable idle. Many engines prefer between 13.2 and 14.0 AFR value.

Caution must be taken before touching the headers and exhaust. The supplied bung system can either be welded in place or clamped onto the pipe. If installed correctly, the clamp-on method works well and will not leak. If welded, make sure the bung is welded completely all the way around and does not leak. Thread an M18-1.5 bolt into the bung to prevent distortion. Be sure to allow bung to cool completely before removing bolt and installing oxygen sensor.

Notes

- The supplied O2 Sensors should be installed with one in each exhaust bank.
- The sensor should be between 10° to 90° above horizontal (see figure 16) to allow condensation to run off. If this is not adhered to, the sensor is susceptible to water damage and premature failure.
- The O2 Sensor cable connects to one of the cables coming off the main harness.



Install

Step 1
The ideal location for the sensor is in the exhaust collector or within 8-inches of the collector itself. It must always be at least 18-inches from the exhaust valve port, to prevent reversion and false lean conditions.

Step 2
Never position the sensor on the outside of a bend in the exhaust tubing as excessive heat pushed directly into sensor can cause premature failure.

Step 3
Utilizing eye protection, drill a 7/8" diameter hole in the desired location.

Step 4
The supplied bung system can either be welded in place or clamped onto the pipe. If installed correctly, the clamp-on style works well and will not leak. If welded, make sure the bung is welded completely all the way around and does not leak. It is recommended to install a M18-1.5 bolt into the bung to prevent distortion during welding. Do not weld with sensor in place.

Step 5
Once the bung has been allowed to cool completely, prepare to install the sensor.

Step 6
Sensor threads come with anti-seize preinstalled. Do not let the anti-seize come in contact with the head of the sensor.

Step 7
Start to thread the sensor into the bung by hand, and tighten to specifications (often 35 ft lbs), approximately three-quarters turn past finger-tight.

Step 8
Plug sensor pigtail lead into appropriate main harness connector. Drivers side into drivers side main harness connector, passenger side into passenger side connector.

Note: Oxygen sensors will not work on "Zoomie" style headers unless balance tubes are used (connection between all pipes on bank)

WARNING: Do not start the engine without the sensor cable connected to the wire harness and the EFI system is fully operational or damage will occur to the sensor.

AIR LEAKS

It is important that no air leaks exist anywhere in the exhaust system, before or after the sensor, as this will cause false readings. This will lead to poor engine performance, including misfires, and the inability to properly auto-tune the EFI. Continued running of the system with an exhaust leak can create detonation and possible severe engine damage. Incorrect installation of the sensor, exhaust leaks, and any resulting damage is not covered by the SRE manufacturer's warranty. It is very important to ensure your exhaust is leak-free. For optimum EFI operation and function, your exhaust between the engine and the sensor must be totally secure, free of any leaks.

General Wiring Practices

The SRE LS ECU port induction system is highly depends on a clean and constant voltage source. Please ensure when grounding the system it is a clean ground, the ground is just as important as the power side for any electrical system. The SRE LS ECU port induction system contains many processing devices. These devices require clean power and secure grounds. The wiring of these devices must be separated from “noisy” power and ground sources.This includes not clumping wires together

DO

- Do install the main power directly to the battery post terminals and connect the ground rings to the engine block, head, or battery. **DO NOT CONNECT GROUNDS TO THE VEHICLE BODY OR CHASSIS. DO NOT CONNECT THE MAIN POWER TO ANY OTHER SOURCE. ALTHOUGH NOT RECOMMENDED, IF CONNECTING TO MAIN STARTER BATTERY CABLE ENSURE BATTERY CABLE AND CONNECTIONS ARE OF HIGH QUALITY, CORRECTLY SIZED, CORRECTLY TERMINATED. THIS CONNECTION POINT MUST MAINTAIN NO LESS THAN 9.5 VOLTS DURING CRANKING. IF THE BATTERY IS IN THE TRUNK, THESE WIRES NEED TO BE EXTENDED TO REACH THE BATTERY, AS THE VOLTAGE DROP FROM THE BATTERY TO THE FRONT OF THE VEHICLE CAN STILL BE EXCESSIVE WHEN CRANKING**.
- Do ensure that when extending wires, properly upsize the wire (larger wire gauge) per length and load of the circuit.
- Do ensure proper grounding is performed as is imperative for reliable EFI operation and to avoid damage to the ECU & other components. Confirm proper ground connection from the battery to the chassis is installed, and the from battery ground to the engine block/heads.
- Do not let any EFI wires contact any plug wires because noise can be induced into the EFI system. Wires can act as “antennas” so ensure wires are properly loomed away from high noise wires such as spark plug wires.
- Do make sure to properly crimp or solder any wire connections. Apply quality heat shrink over any of these connections.
- Do Make sure battery is fully charged

DO NOT

- DO NOT run high voltage or “noisy/dirty” wires in parallel (bundle/loom together) with any EFI sensor wiring. If wires need to cross, try to do so at an right angle to reduce chances of critical wires picking up/inducing noise into them.
- DO NOT use the electric fan outputs to directly power a fan. They must only be used to trigger a relay ground.
- DO NOT use improper crimping tools.
- DO NOT use anything like “t-taps” etc. Use proper crimper/solder and heat shrink.
- DO NOT splice/share signal wires between different electronic control units (i.e “piggyback”).
- DO NOT connect the Red battery +12V wires (in sheathing) to “noisy” sources. It should ONLY be connected to the battery positive terminal.
- NEVER start an engine with a battery charger attached

Warning! Any modifications of the supplied wiring harness can result in a possible void of warranty

DEFINATELY DO NOT

- DO NOT SHORTEN OR LENGTHEN ECU HARNESS
- DO NOT Twist Wires Together
- DO NOT use Wire Nuts
- DO NOT use Mismatched Connectors
- DO NOT use T-Taps!
- DO NOT Jam Wires into a Fuse
- DO NOT use Broken Butt Connectors
- DO NOT use Bare Wires!
- DO NOT use Electrical Tape on Bare wires
- DO NOT get the cheapest crimpers available
- DO NOT USE ROMEX

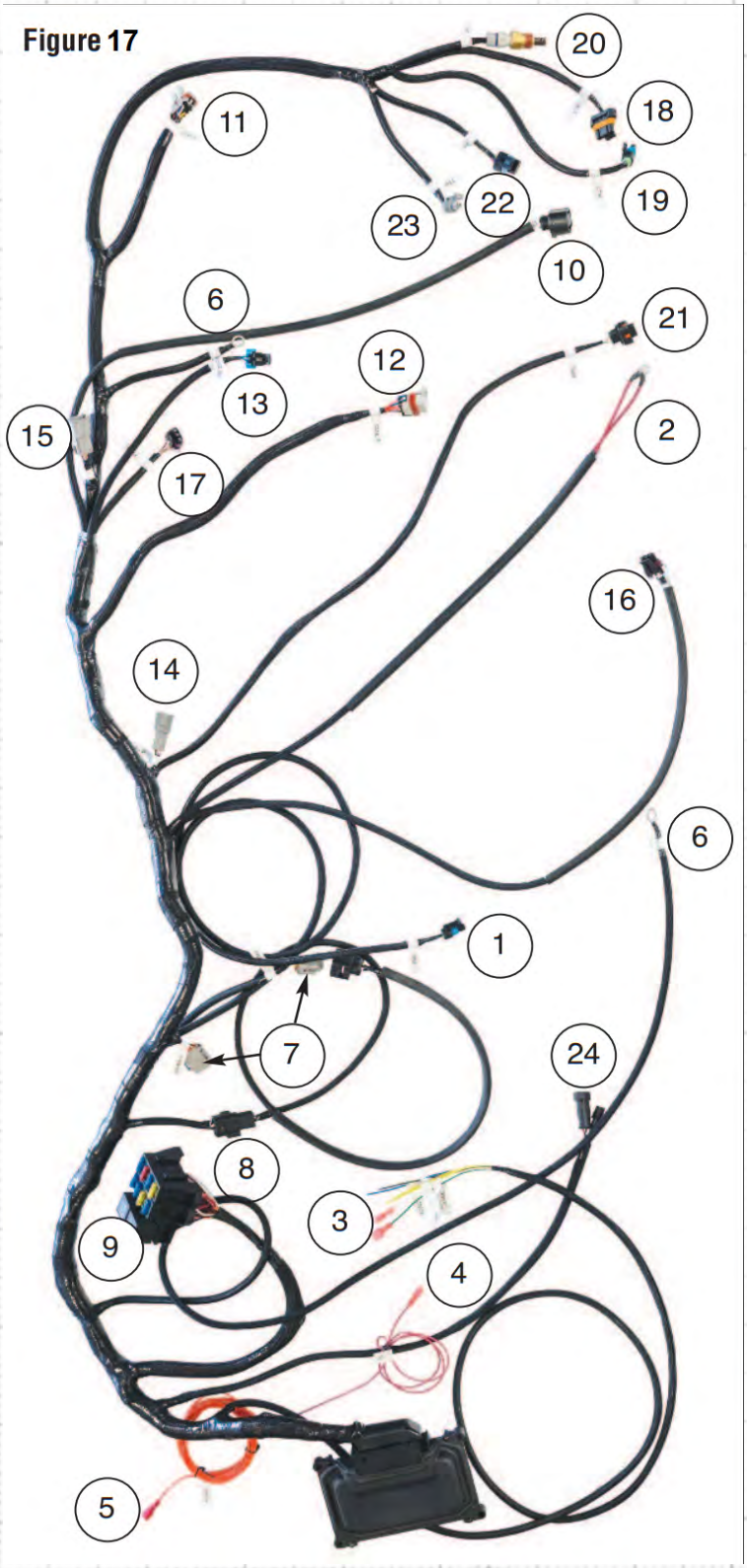
99% OF ISSUES WITH SRE SYSTEMS ARE TYPICALLY FROM POOR QUALITY POWER AND GROUND SIGNALS.

NOTE: Improper wiring modifications will void warranty. If any extensions are necessary install terminals to the desired wire.

Main Wiring Harness Outline

The SRE LS ECU System makes wiring the harness very simple. Every connection in the harness is labeled for where it goes. The only wires that may be cut or extended are the wires labeled in as #3 Accessory Wires Loom (Loose wires individually labeled). See the wire chart below which lists each wire used in the system and what it connects to. It is strongly suggested that any wire extensions are made with the same gauge and color wire as is used in the supplied harness. A quality crimped connection is best for all around connection. If a quality crimp is not able to be achieved, proper soldering with a quality heat shrink covering can be used. Any/All modifications to wiring should only be made on Item 3 “Accessory Wires,” (the vehicle side wiring) such as extensions or cuts. Any modification of the ECU main harness will result in a VOIDED warranty.

Figure 17



#	Connector/ Label Location
1	**VSS** Vehicle Speed Sensor connects to back of transmission.
2	**POS (Red)** Positive 12v goes to starter. Needs to be live even with power off.
3	**Accessory Wires** These wires go to Fan, Tach Out, A/C Kickup, Speedo, & Brake Switch.
4	**Red (key) Wire** On/Off - Connect to 12V circuit that has voltage at key on and cranking.
5	**Orange Wire** Fuel Pump circuit. Wire provides 12V to fuel pump. Connect to pump (+) terminal.
6	**Grounds** These ground the system. They Typically insall to rear of cylinder heads.
7	**Two Trans Connectors** Only used when using transmission control.
8	**O2 Harness Connector** Optional second O2 on passenger side. Yellow 6 Pin.
9	**Fuse Box** Fuse box with relays. See figure 19 for details.
10	**Driver O2 Sensor** O2 sensor for driver side of engine.
11	**Coil Passenger** Passenger side coil harness connector. Coil pack harness not included.
12	**Coil Driver** Driver side coil harness con nector. Coil pack harness notincluded.
13	**Knock** Use sub-harness extension to reach LS2/LS3 knock sensors on side of block.
14	**Injector P** Passenger side injector harness.
15	**Injector D** Driver side injector harness.
16	**CKP** Crank position sensor. Located between start and engine block.
17	**CAM** Use Extension for engines with a front mounted cam sensor.
18	**ALT** Connects directly to alternator.
19	**CTS** Connect to engine coolant tempera ture sensor on driver side front of cylinder head.
20	**IAT** Intake Air Temperature can be in stalled into intake or intake tube be fore throttle body.
21	**MAP** Connects to MAP sensor and is installed on back of intake. MUST USE SUPPLIED MAP SENSOR.
22	**IAC** Idle Air Control. Connects to IAC mounted on the throttle body.
23	**TPS** Throttle position sensor. Connects to TPS mounted on the throttle body.
24	**Handheld Connection** Two female connectors connect to handheld harness to plug in handheld.

Main Wiring Harness Connection Details

Accessory Wires: These wires are labeled and go to Fan1, Fan2, Tach Out, the A/C Request/ Kickup, Speedometer, and the Brake Switch for the torque converter.

- Fan1 (Green) and Fan2 (Blue) These wires are used to control coolant fan operation. They apply ground when activated and must connect to fan relays that are used to control the operation of the fans. **DO NOT CONNECT DIRECTLY TO FAN(S) AS DAMAGE TO ECU WILL OCCUR.**
- Tach Output (White) This wire provides a 12 volt square-wave 50% duty cycle tach output driver for most tachometers. If needed for other tachometer types, this output is adjustable within the Handheld “Tach and Speedo” menu.
- Speedometer (Black) This wire provides a speed signal output for most electric speedometers. From the factory the unit is programmed to output 4000 pulses per mile. This setting is adjustable within the Handheld “Tach and Speedo” menu.
- Torque Converter Brake Switch (Large Yellow) This wire is optional and used for the trans controller to deactivate the torque convertor lockup during braking. The Torque Converter Brake Switch wire is setup for a typical LS style brake switch in which supplies 12 volts when the brakes are off and goes “open” when the brakes are applied.
- If using this input wire is to be used with a different type of brake pedal switch, a relay must be used to “flip” the 12 volts signal so that when the brake are not pressed it senses 12 volts, and no voltage is sensed when the brakes are pressed. See Relay Operation on how to achieve this.
- You can disable the above feature, and need for wire connection, within the software. In this case the system will now lock/unlock the torque convertor based on user entry of load/mph/tps settings.
- AC Request Kickup (Small Yellow) When connected to the AC compressor wire, senses 12 volt and actives strategies within the ECU. This normally includes activation of fans, idle RPM changes via IAC and fuel injector control.

Main Power: (Large Red Wires on eyelet terminal) POS

These eyelets connect to 12 volt battery positive. It is recommended to connect as direct to battery as possible. If going to starter battery lug, ensure battery cable and connections are of high quality, correctly sized and correctly terminated. This connection point must maintain no less than 9.5v in all situations (during cranking, in all driving conditions, and daily vehicle use). If the battery is in the trunk, these wires will need to be extended to reach the battery, as the voltage drop from the battery to the front of the vehicle can still be excessive when cranking. This circuit needs to be live (hot) even when the ignition key switch is off so that the self-learning files are saved. This is fused with a 25 amp fuse in the supplied fuse box. **DO NOT CONNECT TO ALTERNATOR OUTPUT.**

Ground

The wiring harness contains two ground wires (Ignition and ECU low current). They can be attached to existing threaded holes in the back end of either/both cylinder heads. One ground to the driver’s side and one to the passenger’s side. Scrape head clean of paint if needed.

Key (Small Red Loose Wire)

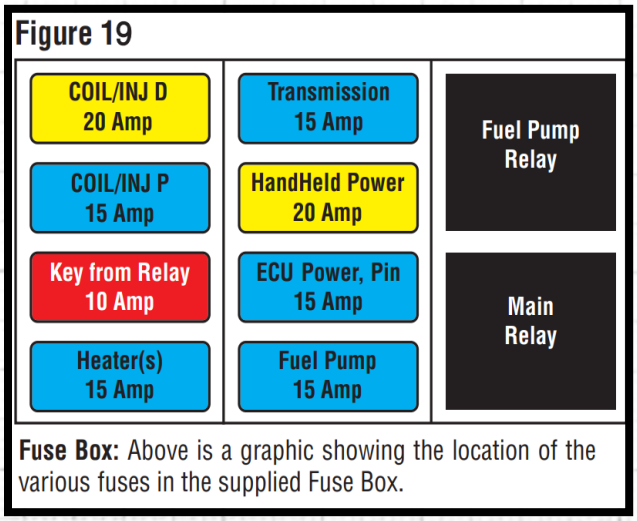
Ignition “Key” switch On/Off power. Wire must be hot in both “Run” (Key On) position AND “Start” (Cranking) position.

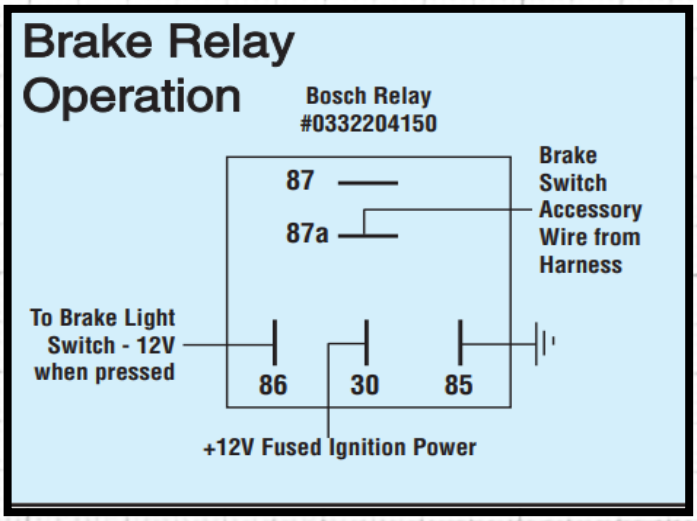
Fuel Pump (Orange Loose Wire)

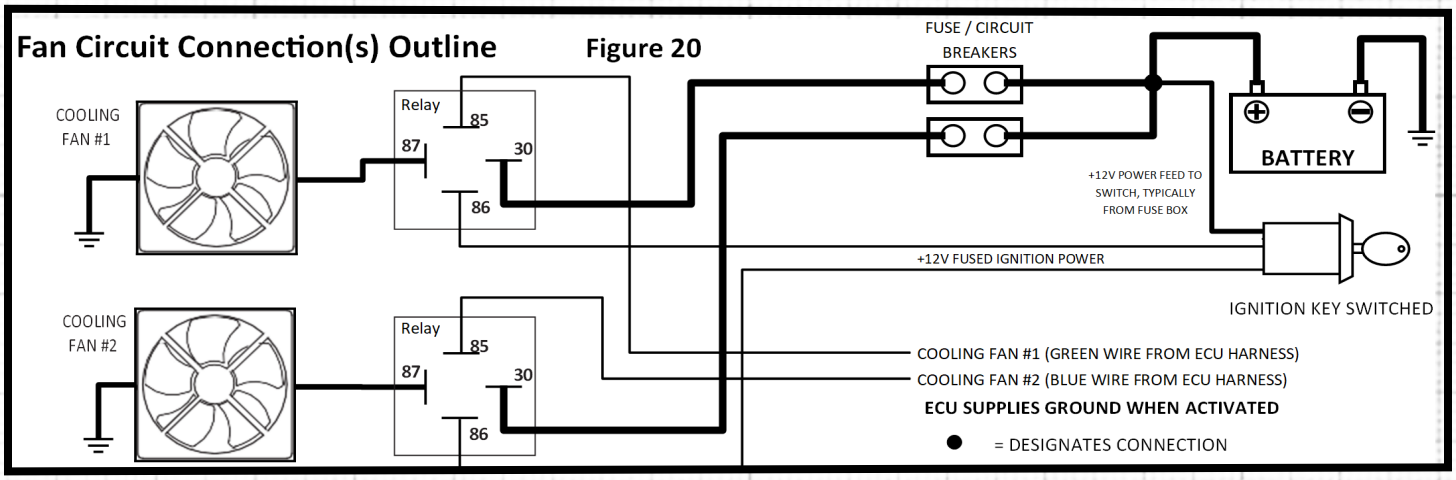
This wire provides 12 volt to the fuel pump and connects to the positive (+) terminal on the pump. No relay is required as one is included in the harness. 15amp current capacity. If the fuel pump being used requires more current, it is recommended to use this use this wire to trigger a larger relay that would be required for a larger current drawing fuel pump.

Two Trans Connectors
These two connectors plug into the supplied sub-harness. The other end of the harness is connected to the connection on your transmission.

VSS
Adapter is offered by Casper Electronics #108096 for first-gen 4L60E (similar case to 700R4) that has a different VSS connector than the 2nd or 3rd gen transmissions.

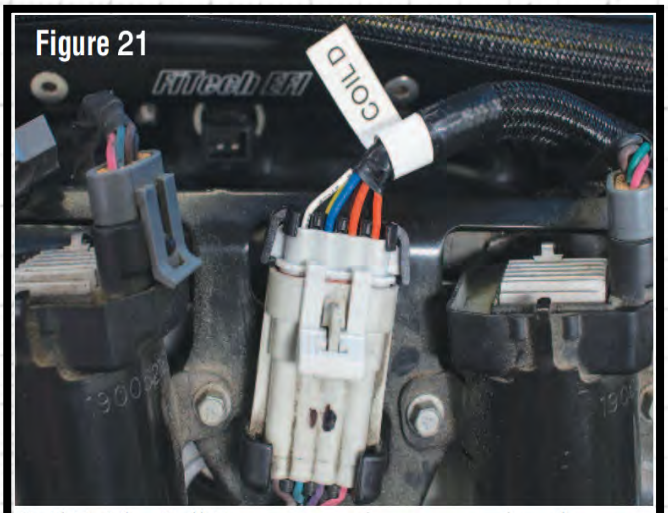






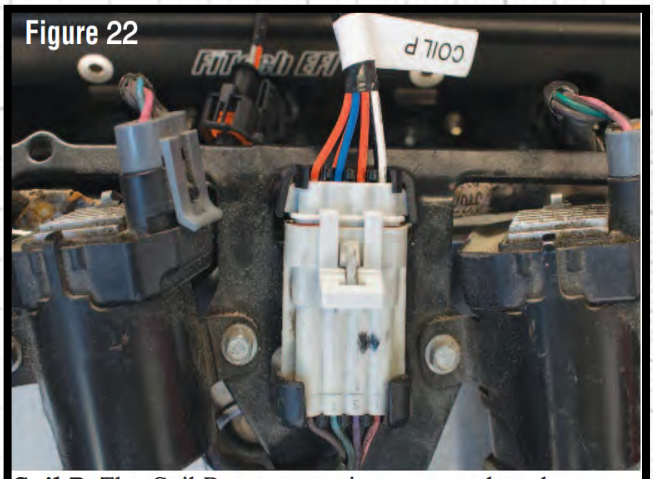
The Fan 1 (Green) and Fan 2 (Blue) wires are relay control wires – they should be connected to Pin 85 of the relay(s) that power(s) the fan(s). Pin 86 should be connected to a KEY Switched ignition source so that the fans turn off with the ignition key. Relay Pin 30 should be fuse or circuit breaker connected to the battery. Pin 87 should go to the cooling fans, and the other wire of the cooling fan should be grounded. Ensure the fan blows towards the engine. Each fan will require a relay.

Figure 21



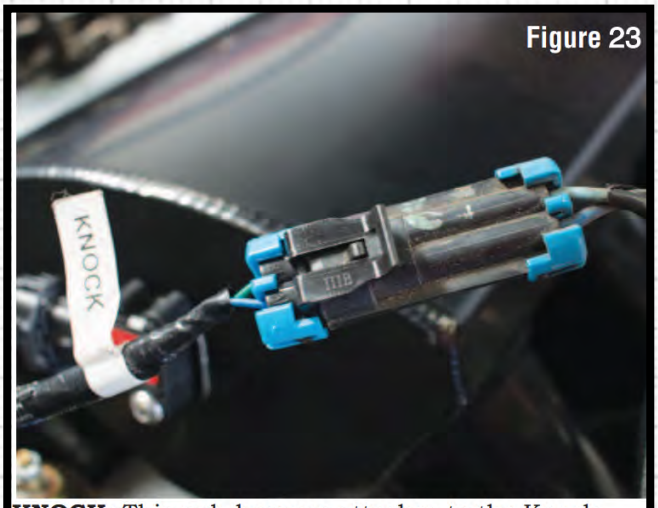
Coil D: The Coil D connector is connected to the existing connector on the driver's side coil pack. Note coils and coil sub harnesses are not included in kit.

Figure 22



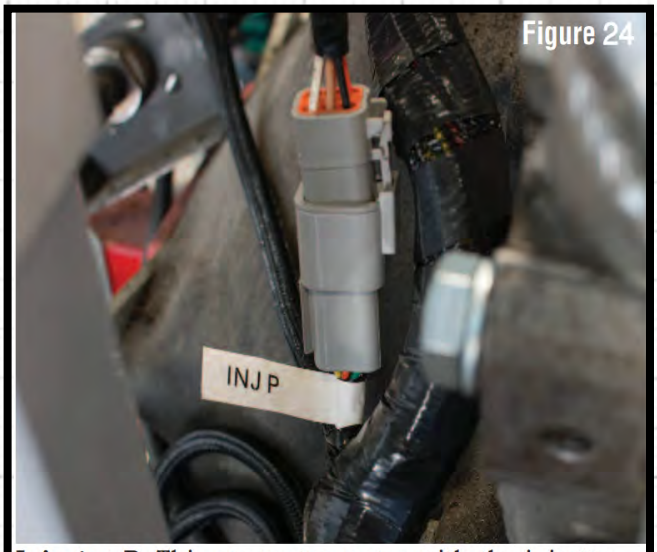
Coil P: The Coil P connector is connected to the existing connector on the passenger's side coil pack. Note coils and coil sub harnesses are not included in kit.

Figure 23



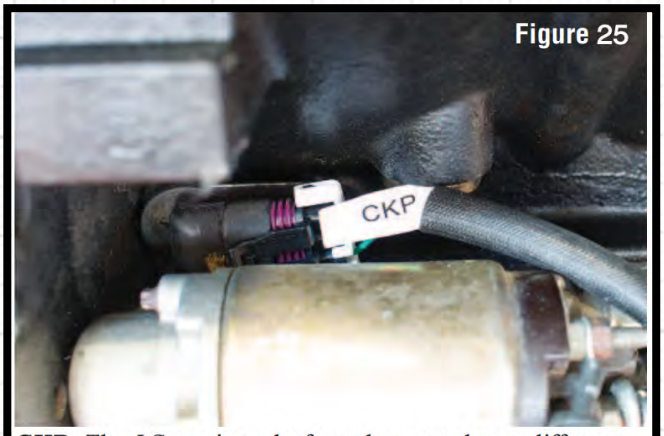
KNOCK: This sub-harness attaches to the Knock Sensor connector located on the side of the block on the LS2/LS3, and on the back of the block on the LS1/LS6.

Figure 24



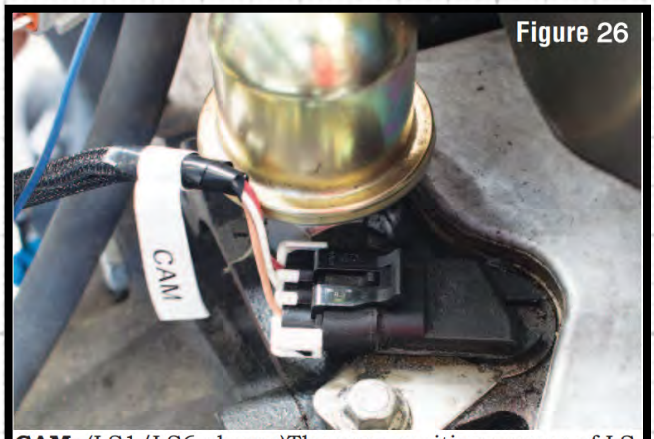
Injector P: This connector mates with the injector harness on the passenger side of the intake manifold.

Figure 25



CKP: The LS engine platform has used two different crank position sensors. There is a 24-tooth or a 58-tooth wheel on the crankshaft. The sensor has always been located behind the starter. The 24-tooth sensor has a black connector whereas the 58-tooth sensor has a gray connector. Note: The ECU can function with either design.

Figure 26



CAM: (LS1/LS6 shown)The cam position sensor of LS engines has changed throughout the years. Not only its location, but its wiring as well. Early models have the cam sensor located at the back of the block near the deck surface. During 2005, as a running change, the location changed to the front of the block between the cam and crankshaft. Must Used GM# 12627501.

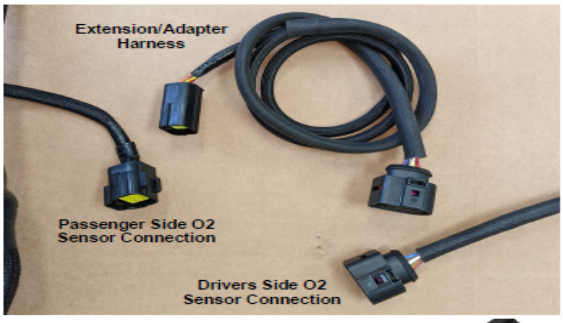
Note: The LS ECU System can function with either design but does require the use of a factory sub-harness (GM#12627501) for front cam locations.

Connect to mating cam sync sensor connector from main harness to the cam sync sensor located at the rear of the engine for LS1 system applications.

For LS3 system applications, the factory sub-harness is required to orient the pinout correctly. This sub harness is GM part number 12627501. The sub-harness is not included in this system.

As an alternative, you can modify and re-pin the extension harness for direct connection. Pins A and C need to be swapped. Contact the SRE technical department for details.

Use supplied extension harness to connect to the cam sync sensor sub-harness as it located in the front timing cover.

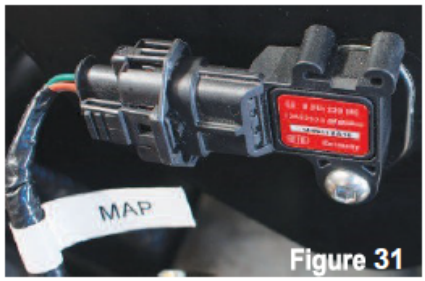


O2 Sensor Harness: There are two connectors on the main harness for the dual oxygen sensors **(2nd sensor not included in this kit, can be purchased separately).** The connections are different types. The connection for the drivers side sensor allows the oxygen sensor to plug directly in. The connection for the passengers side is a 6-pin connector (yellow insert in black housing). This connection requires the use of the extension/adapter harness (shown right) that is included in system. Reference Figure 16 on page 8 for sensor installation instructions.

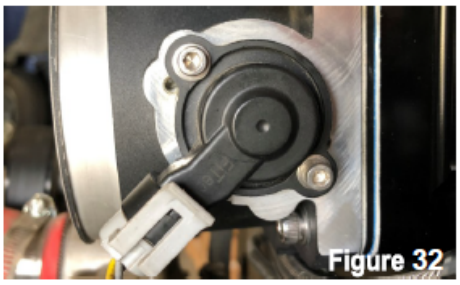
ALT: This wire directly connects to the alternator.

Handheld Controller Cable: Connects the ECU to the Handheld. The 2-wire connection on the harness supplies constant battery 12 Volts and ground to the Handheld. The stereo jack connector has the K-Line CAN communication line. The USB-C connection of the Handheld harness can be inserted into either the bottom of the Handheld or Handheld dongle.

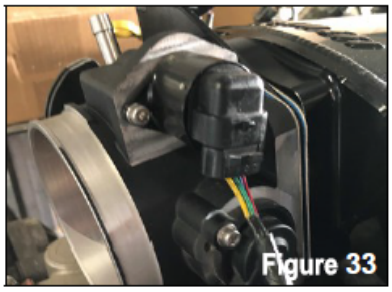
Optional Transmission Connection: (4L60E, 4L65E, 4L80E or 4L85E GM transmissions) (sub-harness shown left, 4L60E shown right) Plug in both connectors on sub-harness into the two designated mating plugs on the main harness. Other end of sub harness connection must be inserted properly into transmission. Although the connection at the transmission can be "pushed" in improperly 180° out , the correct way is for the arrow on the connector to point outwards/away from the transmission on the 4L60E application or upwards on the 4L80E transmission application. Use a mirror if needed to confirm correct install orientation. Remember to select the proper transmission type in the Initial Setup on the Handheld.



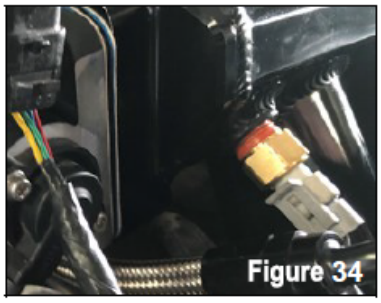
MAP: Connects to the manifold absolute pressure (MAP) sensor mounted on the rear of the manifold.

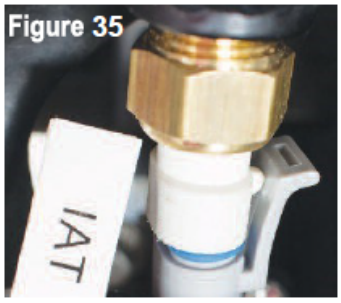


TPS: This connector connects onto the throttle position sensor mounted on the driver's side of the throttle body.

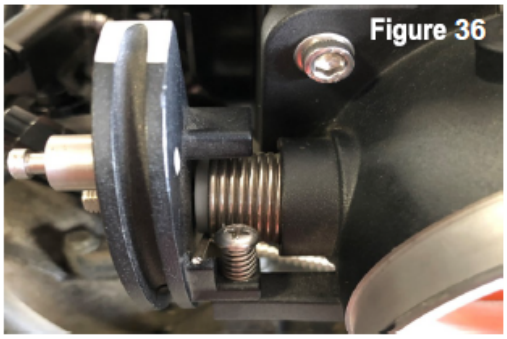


IAC: Connects to the idle air control motor that is mounted on the top of the throttle body.





IAT: Inlet air temperature: Connects to the front driver side of the manifold and threads into the manifold. This sensor is supplied and must be inserted in the manifold.



Idle Speed Adjustment Screw: (Use only to adjust idle during IAC step settings. ECU must be put into correct settings mode before any adjustment is made on this screw or the ECU will continually adjust the IAC to maintain the previous idle speed setting. See Idle Screw Set TPS settings within hand held programming.

Finalizing Hardware Installation

- Attach the air inlet tube, all vacuum hoses, and electrical connectors on the new throttle body.
- Reconnect the negative battery terminal.
- Turn the key to “On” but do not crank, allow fuel system to pressurize and then check for any fuel leaks. Do this several times.
- With engine off and with key in on position, perform the steps below outlined in the “Initial Programming” section.

Key Notes for during/after engine start up

- Check for loose connections or vacuum leaks, fuel leaks, etc.
- Once engine is running and warmed up, set the idle speed. Double-check all fasteners, clamps, and electrical connections to ensure they are all secure.
- After warmup, after cooling down, with engine off, re-torque intake manifold.

Handheld Controller Navigation

There are two ways to navigate the Handheld Controller; you can use the touchscreen with your finger or move via the directional pads up, down, left, right, OK buttons. The on-screen buttons and directional pad buttons are used to navigate through the display pages/settings on the controller by moving the button up and down or side to side, or pressing the OK button in the center of the directional pad to save changes.

1. When making changes to the ECU through the Handheld make sure that the ignition key is on.
2. Once the changes are made turn the key off, wait 15-20 seconds until the values disappear under the “dashboard” feature. Doing this will ensure that your changes have hard saved into ECU.
3. Once the hard save is completed, if desired, the Handheld and/or the battery can be disconnected without interference with the calibrations. These definitions are also available on the Handheld Controller when plugged in.

Initial Programming/Setup

This simple procedure is performed using the Handheld Controller. A laptop computer is not required.

1. Plug the Handheld controller into the harness connector #5 shown on page 10.
2. Without starting the engine, turn ignition key to the ON position. Do not start engine yet.
3. Using the directional pad found on the right side of the controller, scroll down (down arrow) to 09 “Write Cal to ECU” and press the OK button.
4. In this list, there are files listed starting with “Backup”. These files are for use later for backing up user tuned calibrations. Disregard and scroll down past these and locate the listings starting with “default”. Located and select the file that best fits the application, crank tooth count/ transmission option being used and press the OK button to send that base file to the ECU. If utilizing a manual trans, select either trans options that contains the correct crank tooth count for your application. For reference, the base file installed from factory is preconfigured for a 24x crank signal baseline if no calibration is uploaded.
5. Wait for it to finish loading as noted on the screen, then turn key OFF, Screen will remain lit while changes are saved. Wait at least 15 seconds and then turn key back ON.
6. The proper base calibration has been loaded and we are now ready setup the remaining settings.
7. Scroll, locate and enter into “ Initial Setup” menu by pressing the OK Button.
8. Scroll, locate and enter into “Engine Setup”. Using the up/down arrow directional pad buttons to change between settings, input your Engine’s CID (Cubic Inch Displacement), Cam profile type (Mild-Wild 1-4), desired Rev Limit RPM, and desired Idle RPM when warm using the left/right arrow directional pad buttons to change the values of each selection. Make sure to press the OK button after every selection to save the parameter.
9. Back out of the “Engine Setup” and scroll, locate and enter “Auto Transmission” or “Manual Transmission.”
10. Enter your rear tire diameter and rear gear ratio. Make sure to press the OK button after every selection to save the parameter.
11. Skip 03 “Force Upshift RPM”, unless you have a automatic transmission. This will be set later if needed.
12. If you are running a manual transmission, you will leave option number 04 “4LX0e Trans” as “Off”. Note: Off indicates that there is no transmission being controlled by the ECU. If you ARE running an electronically controlled automatic transmission such as a 4L60 or 4L80, ensure option number 04 “4LX0e Trans” is set to “4LX0e” to enable electronic control settings. You will also need to select which automatic transmission such as a 4L60 or 4L80, by going to option 05: “4L6xe 4L8xe” and select your exact transmission. Make sure to press the OK button after every selection to save the parameter.
13. If an automatic trans is selected, go to option 03 “Force Upshift RPM”, and now set to a appropriately desired value. This is the maximum RPM reached before a “Forced” shift is

After initial setting considerations

Cam Selection

Cam selection is based on vacuum load of the engine. Cam-1 is for 15Hg or above, Cam-2 is for 10Hg to 15hg, Cam-3 is 8Hg to 10Hg, and Cam-4 is 8Hg to 6Hg. These are estimates, and you may need to switch between them if the vacuum load is between two different cam settings, to get the engine to run better for your application.

Timing Control

The LS ECU System has a preset timing curve based on the engine calibration selected. If you desire to change timing control it is in advanced setting, under SRE EFI tuning. The spark map can be adjusted based on engine RPM, throttle position, and vacuum reading. Use caution. Too much timing (total advance) can cause engine damage.

Rev Limiter

The LS ECU System provides a fuel controlled rev limiter. When the engine attains the programmed RPM limit, fuel will be cut off to maintain the desired limit. Any external ignition related RPM limiter is independent of the LS ECU System and you should set the EFI related RPM limiter higher than your external rev limiter to prevent a crossover of the two happening at the same time. This also applies to the rev offset for warm-up rpm limiting as well as a user adjustable high temperature rev limiter.

Transmission Control

The preconfigured transmission settings should be enough to get the vehicle up and running without major issues. These settings are tuned to cover 80% of the applications during normal use. The system has enough adjustability to custom tailor the performance to suit the most applications as well as allow plenty of tuneability to cover the remaining 20% applications.

Preparing to start the engine

At this point you should have already confirmed no fuel leaks are occurring but should you have not confirmed, turn the key to “On” but do not crank, allow fuel system to pressurize and check for any fuel leaks around any of the fittings. Do this several times to ensure any leaks do not exist. It is also a good time to confirm you have the proper fuel pressures of 58 psi suppling the injectors.

During the next few steps, you will initially attempt to start the engine and observe for any major issues. While running, be observant and handle immediately any safety concerns that require attention. You may notice some new sounds. The first is ticking from the injectors and it is normal. You may also hear air “whooshing” or “whistling” at idle. Barring any major vacuum leak, this is likely the bypassed air from the Idle Air Control (IAC valve) and this is normal. The IAC valve maintains the desired idle speed as well as modifies the idle speed in cases such as when the AC compressor and/or electric fans turn on by varying a valve to control bypassed air around the throttle blades.

If nothing major distracts or takes attention away from allowing the engine to continuing running, next concern will be continuing running of the engine while reviewing coolant temperature readings via the handheld controller looking for temperatures of above 180°F. The Fan1 temperature for activation is factory set to come on at 192°F with Fan2 temperature set at 196°F. You will want to confirm fan activation or observe for extremely high temperatures (excess of 200°F) as this would be caused by improper connection of the ECU to the fans. Shut the engine off if temperatures exceed 220°F and review and fix any fan and/ or coolant temperature connections.

Preparing to start the engine

Keep in mind proper setting of the idle rpm speed will be set after the engine is warmed up to normal operating temperature, so don't be too concern with a slightly high/increased idle rpm speed at this point. If the initial idle is too high, confirm the throttle cable is adjusted to allow the lever arm to rest on the blade idle screw and the cable is not holding the blade open. If the idle is too low, and/or does not allow the engine to stay running, you can adjust the idle speed screw on the throttle body to increase slightly. A slightly higher idle is preferred initially to allow the engine to warm up, bring to a running temperature. If idle is excessive and/or not in a any desirable range, turn the key to the off position for 30 seconds. This allows the ECU to learn the IAC's new position. Restart engine and re-evaluate idle. The goal here is to get the engine warmed up to operating temperature for final adjustment to be performed.

Starting and Running Idle Speed Adjustment

With the engine now in a warmed up state, the idle screw on the throttle body will need to be adjusted properly. This needs to be set so that the IAC is nearly closed, in the recommended target area of 3-10 IAC Steps for a fully warm engine, out of gear, at idle. For reference, 0 steps indicates valve is fully closed, 255 indicates the valve is fully open.

In normal operation, when the engine is at idle, the IAC will move to adjust and learn the necessary position to maintain the RPM at the Target Idle RPM. When loads are placed on the engine or when the throttle is open, the IAC steps will move around to try and maintain the Target Idle RPM, this is normal.

Typically it is best to adjust this screw from a more open position to start with. This will allow the engine to start at a high idle,
which will make adjusting the IAC easier.

Use the following procedure:

1. Prepare your Handheld controller by locating it to a location that is easily accessible and viewable as you will be working between the Handheld controller and the idle speed screw on the throttle body. You will want viewing access to the Handheld controller while adjusting the idle speed screw.
2. Start the engine and using your Handheld controller scroll, locate and enter into "SRE Initial Setup"
3. Scroll, locate and enter into "Idle Setup"
4. Scroll, and locate "Idle screw set TPS" " and using the right arrow button, switch to "AllZero" and press the OK button after to save the parameter.
5. Navigate back to the initial main page, located and enter into "Dashboard"
6. Scroll down, and locate "IAC Steps". This number will move around slightly and indicate the current Idle Air Controller position in terms of steps. 0 steps indicates valve is fully closed, 255 indicates the valve is fully open. The desired position/number needs to be within the range of 3-10 at normal operating temperature. To adjust this, turn the idle speed screw in or out. If started out at a high idle, the number will typically be zero. If the number reads zero then slowly turn the screw OUT (counter clock-wise) until the IAC Steps starts to read between 3-10. If the number reads higher than 10, slowly turn the screw IN (clock-wise) until the IAC Steps starts to read between 3-10.

7. Once the throttle screw is in the correct position where as the IAC Steps read between 3-10 at the desired idle RPM, shut the engine off by (key position to off).
8. By turning the key off, the Handheld controller defaults the “Idle screw set TPS” setting back to normal.
9. Your idle should be set correctly at this point. Confirm idle remains steady at the desired idle speed/RPM in and out of gear. The ECU will use the IAC to control the engine idle RPM to the meet the desired idle RPM the user set during the initial setup.
10. Should the user desire to change idle speed in the future, you can do so through the handheld and the ECU will adjust the IAC to raise the idle to meet the new desired RPM. IF this new idle RPM is to become a long standing setting, the above procedure should be repeated

IMPORTANT! The ECU takes time to learn after engine components have been changed. It is recommended that the vehicle be driven for one to two hours to allow the computer to adjust before moving to the following adjustments. Making adjustments before the computer has gone through a learn cycle can yield inconclusive and inconsistent results. If idle is low or rough, adjust the bleed screw (Figure 36) clockwise. This will increase idle RPM.

As with any engine, especially with EFI controlled ones, any vacuum leaks will cause problems. In the case of EFI controlled, with minor leaks, this typically causes a increased idle RPM