



TELORVEK TPI WIRING INSTRUCTIONS FOR LT-60B Caprice/Buick (96/97) LT-1 Fuel Injection System

Thank you for purchasing the absolute finest of wiring kits for the General Motors fuel injection. We have taken considerable time to work out the circuitry so that you, the customer will understand at least some of what this is all about. We ask that you follow our instructions closely. We recommend a high pressure in-tank fuel pump. Custom installations are available from Tanks, Inc. (phone # 320-558-6882) and Rock Valley (phone #800-344-1934).

IMPORTANT

This kit requires using all O2 sensors, emission control and catalytic converters UNLESS you have had your ECM reprogrammed. Otherwise, your check engine light will be illuminated all the time.

Computers in automobiles as well as the computers we use in our home or office are getting more and more sophisticated. The auto makers have the capability now to incorporate much more computing power into a small package. In complying with federal law automakers have toughened the emission outputs of their engines, which in the future will be even tougher.

In the older TPI engines the computer controlled, but did not look for or set a trouble code if the emissions control devices malfunctioned or were removed. The newer engine computers (like the one you are installing) not only look (sense) for but will set a trouble code and put the ECM into a back-up mode if the emission control devices malfunction or are not installed.

Just like you, I was used to building my street rods over the years with out all the plumbing that was necessary for the emissions to function properly. Just for the record, by the 1990 clean air act it is illegal to remove the emission control devices from the engine they were intended to be used on. We have found by talking to customers throughout the country that most states are not enforcing this law, but I promise you in the future they will! It sure will be nice to know that you are prepared.

IMPORTANT: Should you eliminate a sensor, your injection system may not work at its peak and could end up in some variation of back up mode. There are many factors that will help you get a trouble free start up that you must consider.

DIAGNOSTIC PROCEDURES

It would be impossible to cover all the procedures that GM requires to diagnose all possible problems a fuel injection system could have in a set of installation instructions. If this is the first time you worked with a fuel injection system, we highly recommend purchasing a shop manual from the year, make and model the engine and computer came from. The book will not only help with diagnosing problems but will also teach you about the engine you just installed.

WARNING!

After the kit installation is complete and it is necessary to diagnose a starting or drive ability problem, follow the procedures recommended in the shop manual. All voltage tests must be performed using a HIGH impedance, digital voltmeter. DO NOT use a test light on this system! DAMAGE WILL BE DONE to the engine computer if a test light is used on this system.

ENGINE CONTROL COMPUTER (ECM) "NEW" (GM PART #16214399) In 1994 the prom (mem-cal) is now part of the ECM and can not be removed. GM now programs the ECM for the vehicle it is being used in. In the past you were able to purchase the ECM and then purchase a prom (mem-cal) to install in the computer which tells the ECM the type of vehicle, engine size, transmission etc. After purchasing the ECM it MUST BE programmed for the engine it is being used on. It will be necessary to provide the dealership with a "VIN" number from a similar in order for them to program the computer.

ELECTRONIC SPARK CONTROL MODULE (Knock Sensor Module) The ECM requires this module (GM PART LT-1 #16214671, 4.3 L99 #16214691) to be installed in the computer to function properly. **NOTE: A new ECM WILL NOT function WITHOUT first being programmed and having a knock sensor module installed.**

ENGINE CONTROL COMPUTER (ECM) "USED" If you purchased the engine and computer used it must be used in a application as it was in the vehicle it was removed from.

You will need all stock parts and sensors. The back page of the instructions is a list of optional accessories we offer and some of the General Motors part numbers you may need.

Ron Francis Wiring fuel injection wire harnesses are “ALL” designed to follow the electronic circuitry of the vehicle your engine was removed from! Following this simple procedure allows our fuel injection harness customers to have their vehicles diagnosed by “ANY” GM dealer or reputable repair facility familiar with diagnosing fuel injection electronic systems.

Ron Francis Wiring does not re-engineer electronic circuitry that a vehicle manufacturer has spent millions of dollars on testing and designing. Our goal is to allow an “easy”, “neat”, “pain free” installation through quality installation instructions and a state of the art wiring kit.

If your vehicle experiences starting or runability problems, 99% of the time it is some sort of mechanical, NOT A WIRING PROBLEM. Fuel injection engines still run similar to carbureted engines, the difference being that the engine computer receives “inputs” from various sensors throughout the engine. The computer then uses this information to calibrate fuel delivery and engine timing.

Diagnosing a NO SPARK situation is the same on a computer controlled fuel injection engine as it is on a carbureted engine. Spark control, even though it may be done slightly different depending on engine year and make, is still essentially the same. A rotor is turned allowing spark to be provided to the plugs, the same as in a carbureted engine.

Thank you for purchasing our products!

STARTING INSTALLATION

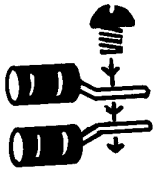
Since there are so many individual circuits to complete, we recommend that you connect them in the order that we prescribe. Disconnect the battery before starting and do not reconnect until instructed.

TELORVEK PANEL LOCATION: (BEFORE DRILLING ANY HOLES) The location of the TELORVEK panel and engine control computer (ECM) can be any where you choose **INSIDE** the vehicle. They should be mounted in an accessible location, under the dash, under the seat or in the trunk are good. A lot of wires will be connected to the panel so the more accessible the panel the easier the wire connections will go. After the Telorvek panel installation is complete, only the fuses need to be readily available.

If mounting the panel under the dash or seat, leave enough extra wire so it can be pulled down from under the dash or from under the seat after all the connections are made. The reason for this, the panel can be used as a **BREAKOUT BOX** for diagnosing (trouble shooting) problems in the future. Some diagnostic procedures require taking volt readings on wires to find a problem. It is a lot easier to sit in a seat then bending over a fender.

IMPORTANT: Check to be sure you have all the bags required for the installation. Each bag contains at least one sensor connection and approximately 20 feet of wire to reach the TELORVEK panel. We suggest opening bag #20 (mass air flow sensor) first. Plug the connector into the sensor and run the wires back to the TELORVEK panel. If they reach, then all the other sensor connections will also, because the MAF sensor is always mounted in front of the engine.

We have packaged three sizes of terminal forks. The red terminals are for the 18 gauge wires and the blue are for 16-14 gauge wires and yellow are for 10-12 gauge wires. Use the red forks when installing terminals on the wires unless other wise directed.



Always put the first terminal under a screw with the fat wire side down as in the drawing. Install any second terminals just the opposite as this will allow the screw to hold squarely and tight. The insulation from one terminal should not interfere with the one next to it.

Use a crimping tool that is designed for insulated terminals. If the tool punctures the insulation (plastic) or damages it in any way, you are using the wrong tool. The proper tool will only "flatten" the plastic and if the handles are squeezed completely, the proper crimp has been made. Get in the habit of test pulling at each terminal as you crimp it to the wire.

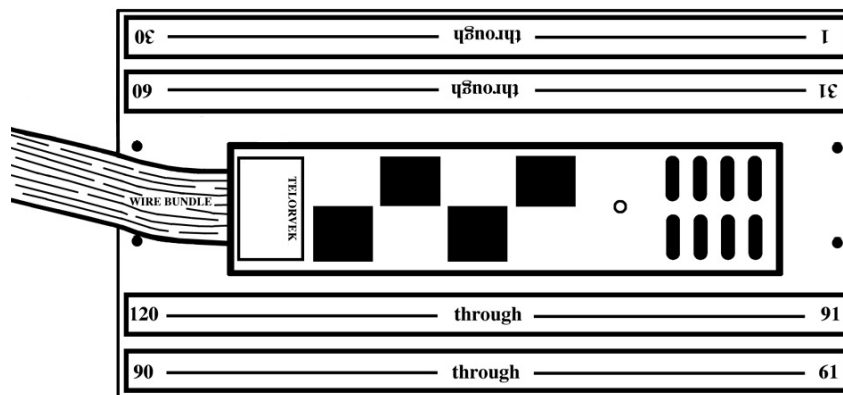
Any sensor that is difficult to hook-up should not be eliminated. All sensors are important if you desire your conversion to run as good as a factory engine. Eliminating any part of this kit WILL cause some portion of the EFI to work improperly.

Ron Francis Wiring has made every effort to assure a quality product and can assure you that this system works well in your application. Once you have confirmed proper installation, any trouble you experience will be a defective part or seat of the pants repair. Your unit can be tested at any General Motors Dealership with no difficulty.

Numbered terminal block cover strip reference.

The drawing below is for your reference on the correct positioning of the Telorvek fuel injection panel terminal block cover strips.

When connecting wires to the panel be sure the numbered terminals match the drawing below.



Bag #20 MASS AIR FLOW SENSOR (MAF): On a factory installation, this sensor is mounted in the intake air duct between the air cleaner and plenum. Plug the three gang black connector into the sensor and run the wires back to the panel. Connect the yellow MAF A->6 to #6, black MAF B->26 to #26 and the orange wire MAF C->4 to #4.

BAG #21 INTAKE AIR TEMPERATURE SENSOR (IAT): Install this sensor in the duct work between the Air Cleaner and the Plenum. Plug the gray connector in to the sensor and run the wires back to the panel. Connect the black wire IAT A->7 to #7 and the tan wire IAT B->8 to #8.

Bag #22 MAP SENSOR: After installing the MAP (Manifold Air Pressure) sensor on top of the plenum in the holes provided by GM make sure that the nipple from the sensor is sealed where it goes through the plenum. Plug the green connector into the sensor and run the wires back to the panel. Connect the black wire MAP A->7 to #7, the green wire MAP B->9 to #9 and the gray wire MAP C->10 to #10.

Bag #23 ENGINE COOLANT TEMPERATURE SENSOR: The sensor is located off to one side of the water pump. Plug the connector into the sensor and run the wires back to the panel. Connect the black wire ECT A->12 to #12 and the yellow wire ECT B->11 to #11.

Bag #24 THROTTLE POSITION SENSOR (TPS): The TPS sensor is located on the right side of the throttle body. Plug the connector into the sensor and run the wires back to the panel. Connect the gray wire TPS A->14 to #14, black wire TPS B->12 to #12 and the dk blue wire TPS C->13 to #13.

Bag #25 ELECTRONIC SPARK TIMING (Distributor): The LT-1 engine is normally supplied with an assembly/diagnostic test connection harness (about 2 feet long) running from the distributor to the middle of the right valve cover. Our harness is equipped with this connector. If you have the factory GM harness in place, discard our short assembly/diagnostic harness and plug directly into the GM harness.

IMPORTANT: Over the history of the LT-1 engine two different distributor connectors were used, one short (supplied in the kit) and one long (2 1/8 inch long not available to aftermarket). If you are not reusing the factory assembly/diagnostic harness, check the hole depth of the distributor connection and compare it to the harness supplied in the kit. DO NOT JUST PLUG IT IN! Both the short and long connectors are the same diameter. If you plug the short connector into the distributor that requires the long connector, the connection seems secure however the contacts in the distributor have not made contact with the terminals in the connector. This prevents the engine from starting. The long connector distributor harness is available through GM under part number 12130319.

After making the distributor connection run the wires to the panel. Connect the black wire DIST A->15 to #15, the purple wire DIST B->16 to #16, the red wire DIST C->17 to #17 and the pink wire DIST D->18 to #18.

Bag #26A IGNITION COIL & IGNITION COIL MODULE: The ignition coil is located on the front of the engine. Plug in the three gang connector with the orange and green wires into the coil and run the orange wire back to the panel. Connect the orange IGN COIL A->5 to #5 using a yellow terminal. Also supplied is a wire for a tach. Connect the purple wire 95->TACH to terminal #95 and run it to the tach.

The ignition coil module is located on the front of the engine right next to the coil. Plug in the four gang connector and run the wires back to the panel. Connect the white wire COIL DR B->19 to #19, orange COIL DR A->5 to #5 and the black wire COIL DR C->25 to #25.

Bag #26C CRANK SHAFT POSITION SENSOR: Plug in the connector into the sensor located by the lower crank pulley and run the wires back to the panel. Connect the yellow wire CRK SHAFT C->30 to #30, orange CRK SHAFT A->1 to #1 and pink CRK SHAFT B->18 to #18.

Bag #27 IDLE AIR CONTROL (IAC): The IAC is located on the right side of the throttle body. Plug the four gang connector into the IAC and run the wires back to the panel.

NOTE

This connector has two light blue and two light green wires. READ the printing on the wires carefully making sure the wires are being connected to the correct terminals.

Connect the wires to the panel as follows: It green IAC A->20 to #20, It green IAC B->21 to #21, It blue IAC C->22 to #22 and It blue IAC D->23 to #23.

Bag #28 INJECTORS: In 1994 GM has started to fire the injectors sequentially (one at a time) unlike in the past when the injectors were fired one bank (four) at a time. According to GM this did not improve horse power but was done for better emissions at low RPM'S. The injector wiring is in two sections, one for the left side injectors and one for the right side injectors. Note the color of wires running from the injector connectors. The left injector harness has pink, black, purple, white, red wires and the right injector harness has pink, lt green, lt blue, yellow and dk blue wires. Follow the paragraphs below on their connections:

LEFT INJECTOR CONNECTIONS: Starting from the front of the engine and working towards the fire wall, plug the injectors in as follows: injector #1 has pink & black, injector #3 has pink & purple, injector #5 has pink & white and injector #7 has pink & red wires.

RIGHT INJECTOR CONNECTIONS: Starting from the front of the engine and working towards the fire wall, plug the injectors in as follows: injector #2 has pink & lt green, injector #4 has pink & lt blue, injector #6 has pink & yellow and injector #8 has pink & dk blue.

After all the injectors are plugged in run all the wires back to the TELORVEK panel. **Note the injector harness has two pink wires. READ the printing on the wires carefully before connecting them.** Using the blue terminals, connect the pink wire INJ 1->41 to #41 and the other pink wire INJ 2->46 to #46. Using the red terminals, connect the rest of the injector harness wires as follows: black INJ 1->42 to #42, purple INJ 3->43 to #43, white INJ 5->44 to #44, red INJ 7->45 to #45, lt green INJ 2->47 to #47, lt blue INJ 4->48 to #48, yellow INJ 6->49 to #49 and dk blue INJ 8->50 to #50.

Bag #29A OXYGEN SENSOR (4): GM now uses heated O2 sensors. These sensors help the ECM go into closed loop faster. This area of the vehicle is hot so keep the wires away from the exhaust. Four sensors are required per engine. **Install the left and right front O2 sensors in each exhaust manifold or in the header collector as close to the block as possible. The left and right rear O2 sensors mount behind the catalytic converters in each exhaust pipe.** These sensors monitor the status of the converters and WILL set a trouble code if a faulty converter is detected or a converter is not used at all. NOTE: The O2 sensors do not send a signal to the ECM until they reach 600 degrees. Mounting them in header collectors may take longer for them to heat up causing the ECM to stay in OPEN LOOP longer than normal. If you must install an adapter, use The Detail Zone part # OS-30.

LEFT FRONT O2: The four gang connector with the orange, black, tan and lt blue wires running from it plugs into the left front oxygen sensor.

RIGHT FRONT O2: The other four gang connector with the orange, black, tan and purple wires running from it plugs into the right front oxygen sensor.

LEFT REAR O2: The four gang connector with the orange, black, dk green and lt green wires running from it plugs into the left rear oxygen sensor.

RIGHT REAR O2: The other four gang connector with the orange, black, brown and yellow wires running from it plugs into the right rear oxygen sensor. Run all the wires back to the panel and connect the black wires LF O2 C->24, and the RT O2 C->24 to #24. Connect the other two black wires RT REAR O2 C->29 and the LF REAR O2 C->29 to #29. Connect the tan LF O2 A->51 to #51, the other tan RT O2 A->53 to #53, lt blue LF O2 B->52 to #52, purple RT O2 B->54 to #54, yellow RT REAR O2 A->91 to #91, brown RT REAR O2 B->92 to #92, dk green LF REAR O2 A->93 to #93 and the lt green LF REAR O2 B->94 to #94. Using the blue terminals connect the two orange wires LF O2 D->3 and RT O2 D->3 to #3 and the other two orange wires RT REAR O2 D->31 and LF REAR O2 D->31 to #31.

Bag #30B KNOCK SENSOR WIRING (2): There are two knock sensors located on each side of the engine block screwed into the block drain holes. These sensors will inform the computer of detonation and readjust the timing accordingly. The knock sensor must be used because it advances and retards the timing. Plug the connector with the lt blue plugs into the left knock sensor and the connector with the dk blue wire plugs into the right knock sensor. Run the wires to the panel and connect the lt blue to #58 and the dk blue to #55.

Transmission Wiring

The 4L60-E automatic transmission is a computer controlled, electronic shift transmission. In order to follow the GM color codes some of the wire colors have been duplicated. Look at the printing on the wire carefully before connecting the wires to the panel.

4L60-E Automatic Transmission Wiring (Wiring Bags #31 & #32C)

Bag #31 BRAKE SIGNAL (TCC CUT OUT RELAY): In order for the transmission and torque converter clutch to operate properly a signal must be sent to the ECM to tell it when the brakes are applied. Mount the relay within thirty inches of the TELORVEK panel. Run the orange wire TCC CUT OUT->36 to #36, lt blue wire TCC CUT OUT->37 to #37 and the black wire TCC CUT OUT->28 to #28. The long single purple TCC REL->BRK SW runs to the cold side of the brake switch (hot only when the brakes are applied).

Bag #32C AUTOMATIC 4L60-E TRANSMISSION: Un-coil the large harness and plug the connector into the transmission. Run the wires to the TELORVEK panel.

👉 NOTE 👈

Due to the amount of wires necessary to operate the 4L60-E transmission and to follow GM color codes, some wire colors had to be duplicated. READ the printing on the wires carefully before connecting them to the TELORVEK panel.

Connect the wires to the TELORVEK panel as follows: lt green TRANS A->65 to #65, yellow TRANS B->66 to #66, red TRANS C->67 to #67, lt blue TRANS D->68 to #68, orange TRANS E->34 to #34, yellow TRANS L->69 to #69, black TRANS M->70 to #70, pink TRANS N->71 to #71, red TRANS P->72 to #72, dk blue TRANS R->73 to #73, white TRANS S->74 to #74, lt green TRANS U->84 to #84 and the tan TRANS T->75 to #75.

Bag #33 SPEED SENSOR: A VSS signal input is needed on all General Motors TPI engines. If the ECM does not see that input a **CODE WILL SET**. The VSS input helps control transmission shifts, some of the EGR and IAC functions. Plug the connector into the sensor and run the wires to the TELORVEK panel. Connect the purple VSS A->76 to #76 and VSS B->77 to #77.

ELECTRIC SPEEDOMETER CONNECTION: Terminal #78 on the Telorvek panel is for the dash mounted electric speedometer. This terminal will generate 4000 pulses per mile. Wire and calibrate the speedometer following the instructions that came with your speedometer.

Bag #34 FUEL PUMP: The fuel pump relay is located in the cover of the TELORVEK panel and is pre-wired. A relay must be installed in the connector (Airtex part #1R1061, Standard Motor Products part #RY116 or GM part #14100455) or the pump WILL NOT operate. Connect the tan 56->FUEL PUMP wire to #56 on the panel and run it to the fuel pump. The tan wire then connects to the positive terminal on the pump and the black FUEL PUMP GRND wire connects to the negative side of the pump and then to a good ground. A pump that is capable of producing a minimum of 45 PSI must be used.

Bag #35 PRIMARY & SECONDARY FAN RELAYS: Allowing the engine computer to control these fans works far better than any other control such as wired direct or with a toggle switch. Let the computer control the engine temperature as it should for best performance.

NOTE: DO NOT LOWER THE THERMOSTAT TEMPERATURE, DOING SO WILL CAUSE THE ENGINE TO RUN RICH.

The primary and secondary fan relays are located in the cover of the TELORVEK panel and are pre-wired. Connect the lt blue 79->PRIME RAD FAN to #79 and the purple 80->2ND RAD FAN to #80 and run both wires to the fans. Connect the lt blue wire to the primary fan and the purple to the secondary fan. Both fans must be grounded.

WARNING!!

Don't forget to install the primary and secondary relays in the connectors located in the cover of the TELORVEK panel. The fans WILL NOT operate unless the relays are installed. Use Airtex part #1R1061, Standard Motor Products part #RY116 or GM part #14100455 in both connectors.

Bag #36 PARK/NEUTRAL RELAY: This system was developed to allow a regular park / neutral switch tell the computer when the vehicle is in park, neutral or drive. Since the signals are different from normal neutral switches, we have made this small circuit that will plug into a stock GM neutral switch or splice to just about any two wire neutral switch. The signal input controls the idle air control (IAC), vehicle speed sensor diagnostics (VSS) and exhaust gas recirculating: (EGR).

If you are using Ron Francis Wire Works Wiring kit, this is a simple, color coded plug-in to GM Neutral Safety Switches. The regular car wiring that normally runs to the neutral safety now plugs into the P/N relay kit with the blue and purple wires in the black connector. The plug with the blue and black wires running from the relay is connected to the original neutral safety switch. Run the black wire with the ring terminal to a good ground. The orange wire PN RELAY->81 is run to the TELORVEK panel and connects to #81.

NOTE: Using any other standard neutral switch requires removing the plug and splicing. Either color wire can be used on either terminal. The black plug with the Lt Blue and Black wires is connected into your neutral safety switch. If the connector on the wires doesn't fit your application, remove it and connect the wires to the neutral safety switch directly.

- ✓ The blue wire in the plug must be connected to the 12 volt supply from the ignition switch. This wire becomes hot (12 Volts) when you turn the key to crank.
- ✓ The purple wire is connected to the wire that runs to the starter solenoid.
- ✓ Run the orange wire to the TELORVEK panel and connect it to #81.
- ✓ Don't forget to install a relay (Airtex part #1R1061, Standard Motor Products part #RY116 or GM part #14100455).

Bag #37C SERVICE ENGINE SOON LIGHT (S.E.S) and DATA LINK

CONNECTOR. (DLC): The DLC is the diagnostic link for computerized testing at your local GM dealer or a hand held scanner. Please consider a very accessible location for this important part. Mount the connector in the desired location and run the wires back to the panel. Connect the black wire DLC 4->27 to #27, the white wire DLC 11->115 to #115, the purple DLC 2->110 to #110, the red DLC 16->38 to #38 and the tan wire DLC 9->99 to #99.

The S.E.S light can be any two wire un-grounded 12 volt lamp located on the dash board or where ever desired. Connect the pink 35->SES LT to #35 and the brown 40->SES LT to #40. Run the wires to the SES LT and make the connection. Connecting a S.E.S light on the dash is not necessary, the yellow L.E.D light on top of the TELORVEK panel performs the same function.

Bag #38A EMISSION BAG: The EGR solenoid is mounted on the left side of the manifold and the Canister Purge solenoid and Evaporative Emissions Vacuum Switch is on the right side of the manifold. If you desire a clean look on the manifold, relocate these items and mount them under the dash. They must be plugged in or trouble codes will set.

EXHAUST GAS RECIRCULATION: The black connector with pink and gray wires is for the EGR solenoid. Plug in the connector to the EGR solenoid and run the wires to the panel. Connect the pink wire EGR SOL A->2 to #2 and the gray wire EGR B->101 to #101

CANISTER PURGE SOLENOID: Plug the red connector with the pink and dk green wires into the canister purge solenoid and run the wires to the panel. Connect the pink wire PURGE SOL A->2 to #2 and the dk green PURGE SOL B->102 TO #102.

EVAPORATIVE EMISSIONS VACUUM SWITCH: Plug in the connector and run the wires back to the panel. Connect the pink wire EVAP SW B->114 to #114 and the black EVAP SW A->28 to #28.

AIR PUMP/SECONDARY AIR INJECTION BLEED VALVE SWITCH: The air pump is controlled by the ECM through a relay located in the cover of the TELORVEK panel. A relay (GM part #14100455 must be installed in the connector or a trouble code will set. The three gang connector plugs into the air pump. The two gang connector plugs into the bleed valve switch. Ground the black wire running from the air pump connector and the bleed valve switch. Using the blue terminal connect the red wire AIR PUMP A->57 to #57 on the TELORVEK panel.

OTHER HARNESS CONNECTIONS

A/C REQUEST: Terminal #82

A/C STATUS CONNECTION: Terminal #83

A/C EVAPORATOR TEMPERATURE: Terminal #87

A/C Relay clutch Control: Terminal #107

A/C Pressure Signal: Terminal #108

FINISHING UP

The ECM accepts four connectors. The TELORVEK panel has four ECM connectors running from it with different color plugs. Stamped in the case of the ECM next to the four harness connections is the color plug that plugs in to that slot. Plug the connectors into the computer making sure the connector locks snap into the computer case.

Three connections remain, battery hot, ignition and battery ground. These three wires are running out of the TELORVEK panel along with the wires to the computer. Un-coil them and wire as follows:

BATTERY CONNECTION: The red wire out of the plug connects to a battery (hot all the time) source. Run this wire to the positive battery post if the TELORVEK panel and battery are mounted in the rear of the vehicle or to the starter solenoid if the panel is mounted towards the front of the vehicle. If your vehicle is equipped with a master disconnect, connect this wire to the hot side of the switch.

IGNITION CONNECTION: The orange wire is connected to a keyed ignition source (hot with the key in run and crank).

NOTE: After you wired in the ignition connection, check it with a test light, make sure this wire remains hot with the key in the run position and crank position.

BATTERY GROUND: The Black ground wire from the plug runs direct to the battery. Do not consider grounding the battery to the frame and then the engine to the frame. Run the battery ground directly to the engine.

You have now completed the kit installation. You may have noted empty terminals on the Telorvek panel that do not have any wire connections to them. The Detail Zone runs all computer connections out of the computer plug(s) even if they are not used in aftermarket applications.

STARTING THE ENGINE

You have now made all of the connections necessary to TRY to start your car. If you try now, you will be disappointed since you did not hook up the battery. You can do so now. If you turn the key on but do not crank engine, you will hear the fuel pump for about 2 to 4 seconds before it stops. This will indicate the pump is ready. During normal operating it is best if you do not wait until the pump stops as this is not an indication that the pressure is up. There is no need to "pump" the throttle to start a fuel injected car.

CRITICAL! After the motor is running check the MAP sensor to make sure there is not any vacuum leaks!

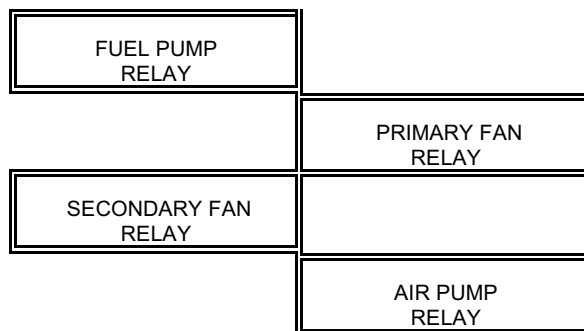
Telorvek Panel Fuse Designation, Size and Relay Center Layout

Fuse Designation & Size

The harness has a total of eight fuses. Shown below is a diagram of what each fuse protects.

Top, Front View Of Fuse Blocks

Ignition Feed Fuse Row #1		Battery Feed Fuse Row #2	
Fuse Designation	Fuse Size Block #1	Fuse Designation	Fuse Size Block #2
MAF, O2 LF & RT EGR, C/P VSS	15 AMP	FUEL PUMP RELAY, ECM	15 AMP
S.E.S LT, PRIMARY & SECONDARY FAN RELAY, TCC CUT OUT RELAY, 4L60-E TRANSMISSION	15 AMP	PRIMARY FAN RELAY	30 AMP
INJECTORS 1,3,5,7	10 AMP	SECONDARY FAN RELAY	30 AMP
INJECTORS 2,4,6,8	10 AMP	AIR PUMP	20 AMP



RELAY CENTER: In the cover of the TELORVEK panel are four relays the ECM uses to control fuel pump, primary & secondary cooling fans and the air pump. The ECM can not handle heavy load items and it requires a relay to handle the load and the ECM then controls the relay. The harness has a total of six relays, four in the cover of the TELORVEK panel and two that are mounted remotely. All relays in the harness require Airtex part #1R1061, Standard Motor Products part #RY116 or GM part #14100455.

WARNING: All relays must be installed in the connectors. Eliminating any of them will cause damage to the engine.

TROUBLE CODE DEFINITION

The ECM looks for certain parameters from each sensor it controls. If it sees one out of specification it will set and store a trouble code. Not all codes will light the service engine soon light. There is two types of trouble codes:

HARD CODE: A hard code will light the S.E.S light and in most cases (not all) put the ECM into a back-up (open loop) mode. When this happens the timing remains fixed (will not advance or retard), both cooling fans will turn on and the engine will run only taking the input from the TPS sensor. This usually causes a rich condition as well.

SOFT CODE: A soft code will not light the S.E.S light. This type of code will set, store and can only be read by connecting a scanner to the DLC connector. This type of code WILL NOT put the computer into a back-up mode or cause any running problems.

NOTE: In order to read any trouble codes it will be necessary to connect a scan tool to the DLC connector. This service can be performed at any GM dealer or repair facility in your area. You can not put 1996 and newer engines in diagnostic mode by jumping wires together in the DLC connector like could be done in the past, a scan tool must be used.

LT-1 TROUBLE CODES

PO100 MAF Insufficient Signal Activity	PO562 System Voltage Low
PO101 MAF System Performance	PO563 System Voltage High
PO102 MAF Circuit Low Frequency	PO601 PCM Memory
PO103 MAF Circuit High Frequency	PO602 PCM Not Programmed
PO106 MAP System Performance	PO712 Transmission Fluid Temperature High
PO107 MAP Circuit Low Performance	PO713 Transmission Fluid Temperature Low
PO108 MAP Circuit High Performance	PO719 TCC Brake Switch Circuit Low
PO112 IAT Circuit Low Voltage	PO724 TCC Brake Switch Circuit High
PO113 IAT Circuit High Voltage	PO742 TCC Stuck On
PO117 ECT Circuit Low Voltage	PO748 Pressure Control Solenoid
PO118 ECT Circuit High Voltage	PO751 1-2 Shift Performance Solenoid
PO121 TPS Insufficient Signal Activity	PO753 1-2 Shift Solenoid Electrical
PO122 TPS Circuit Low Voltage	PO756 2-3 Shift Solenoid Performance
PO123 TPS Circuit High Voltage	PO758 2-3 Shift Solenoid Electrical
PO125 ECT Excessive Time to Closed Loop	P1107 MAP Circuit Intermittent Low Voltage
PO131 O2 LF FRT Low Voltage	P1111 IAT Circuit Intermittent High Voltage
PO132 O2 LF FRT High Voltage	P1112 IAT Circuit Intermittent Low Voltage
PO133 O2 LF FRT Slow Response	P1114 ECT Circuit Intermittent Low Voltage
PO134 O2 LF FRT Insufficient Signal Activity	P1115 ECT Circuit Intermittent High Voltage
PO135 O2 LF FRT Heater Circuit	P1121 TPS Circuit Intermittent High Voltage
PO137 O2 LF REAR Low Voltage	P1122 TPS Circuit Intermittent Low Voltage
PO138 O2 LF REAR High Voltage	P1133 Left Front O2 Insufficient Switching
PO140 O2 LF REAR Insufficient Signal Activity	P1134 Left Front Transition Time Ratio
PO141 O2 LF REAR Heater Circuit	P1153 Right Front O2 Insufficient Switching
PO151 O2 RT FRT Low Voltage	P1154 Right Front O2 Transition Time Ratio
PO152 O2 RT FRT High Voltage	P1171 Fuel System Lean During Acceleration
PO153 O2 LF FRT Slow Response	P1222 Injector Control Circuit Intermittent
PO154 O2 LF FRT Insufficient Signal Activity	P1351 Ignition Control Circuit High Voltage
PO155 O2 LF FRT Heater Circuit	P1361 Ignition Control Circuit Low Voltage
PO157 O2 RT REAR Low Voltage	P1371 Distributor Ignition Low Resolution Circuit
PO158 O2 LF REAR High Voltage	P1380 Rough Road Data Unusable
PO160 O2 LF REAR Insufficient Signal Activity	P1381 Misfire Detected
PO161 O2 LF REAR Heater Circuit	P1415 Secondary Air Injection Left Side
PO171 Left Fuel Trim System Lean	P1416 Secondary Air Injection Right Side
PO172 Left Fuel Trim System Rich	P1441 EVAP Flow During Non-Purge
PO174 Right Fuel Trim System Lean	P1508 ISC System Low
PO175 Right Fuel Trim System Rich	P1509 ISC System High
PO200 Injector Control Circuit	P1532 A/C Evaporator Temp Circuit Low
PO300 Engine Misfire Detected	P1533 A/C Evaporator Temp Circuit High
PO323 Distributor Low Circuit Intermittent	P1539 A/C Clutch Status Circuit High
PO325 Knock Sensor Module	P1543 A/C System Performance
PO332 Knock Sensor Circuit Low/High Voltage	P1545 A/C Clutch Relay Control Circuit
PO335 Crankshaft Position Circuit	P1546 A/C Clutch Status Control Circuit
PO336 Crankshaft Position Circuit Performance	P1572 Traction Control System
PO372 Distributor High Circuit	P1626 Theft Deterrent System
PO400 EGR System	P1641 Fan Relay One Control Circuit
PO403 EGR Solenoid Control Circuit	P1642 Fan Relay Two Control Circuit
PO410 Secondary Air Injection System	P1643 Engine Speed Output Circuit
PO412 Secondary Air Injection System Control Circuit	P1652 VSS Output Circuit
PO420 Left Catalytic Converter System	P1657 Skip Shift System Control Circuit
PO430 Right Catalytic Converter System	P1661 S.E.S Light Control Circuit
PO441 EVAP No Flow During Purge	P1667 Reverse Inhibit Solenoid Control Circuit
PO443 EVAP Purge Control Circuit	P1810 Pressure Sw Assembly Circuit Malfunction
PO500 VSS Circuit (Manual Transmission Only)	P1812 Transmission Fluid Temp High
PO502 VSS Circuit Low Input	P1860 TCC PWM Solenoid Circuit Electrical
PO506 ISC Low Valve Responding	P1864 TCC Solenoid Circuit Electrical
PO507 ISC High Valve Responding	P1870 Transmission Component Slipping
PO530 A/C Refrigerant Pressure	P1886 2-3 Control Solenoid Circuit Electrical
PO531 A/C Refrigerant Pressure Circuit Performance	
PO560 System Voltage Malfunction	

LT-1 Cooling Systems

General Motors has installed quite an elaborate recovery system to handle their new reverse cooling system. This system is in place to handle AIR POCKETS that may stop coolant flow through the entire motor. EXTRA care should be taken to bleed (burp) all the air out of the motor. There is a bleed valve on the thermostat housing for this purpose. Bleed this valve after the engine thermostat has opened. Repeat after some usage.

Care should be taken to be sure the air bleed line from the back of the engine is correctly plumbed. If not done exactly like the Camaro, You may need an extra connection in the top of the radiator. Install a water temperature gauge and keep a close eye on it during testing and the first 500 miles.

Optional Accessories

	GM Part #	Ron Francis Wiring Part #
Electronic Control Module	16214399	
Electronic Control Module (LT-1) (Knock Sensor Module)	16214671	
Electronic Control Module (L99) (Knock Sensor Module)	16214691	
Oxygen Sensor (heated) 2 req.	25312184	
Fuel Pump Relay	14100455	RL-5
Cooling Fan Relay (2)	14100455	RL-5
Park Neutral Relay	14100455	RL-5
Air Blower Relay	14100455	RL-5
TCC Cut Out Relay	14100455	RL-5

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Ron Francis Wiring has taken the extra effort to produce a quality, easy to understand instructions. We will aggressively prosecute any other harness supplier who attempts to copy this material!!