



# LB-47 TELORVEK TPI

## WIRING INSTRUCTIONS FOR Olds / Aurora 4.0 V-8 ENGINE

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 # 612-558-6882) and Rock Valley (phone #800-344-1934) .

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, we're 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 will not work at its peak and will probably be 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.

## STARTING INSTALLATION

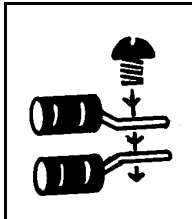
Since there are so many individual circuits to complete, we recommend that you connect them in the order that we prescribe. Disconnect the battery before starting and do not reconnect until instructed.

**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 #21 (INTAKE AIR TEMPERATURE 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 IAT 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.

**BAG #21 INTAKE AIR TEMPERATURE SENSOR (IAT):** Install this sensor in the duct work between the air cleaner and the plenum. Plug the connector into the sensor and run the wires back to the panel. Connect the black wire IAT A->32 to #32 and the tan wire IAT B->31 to #31.

**Bag #22 ENGINE COOLANT TEMPERATURE SENSOR:** The sensor is located in the rear of the engine near the valve cover. Plug the connector into the sensor and run the wires back to the panel. Connect the black wire ECT A->39 to #39 and the yellow wire ECT B->40 to #40.

**Bag #23 FUEL RAIL HARNESS (MAP SENSOR, INJECTORS):** Located underneath the intake manifold cover are the eight injectors and the manifold absolute pressure sensor. There should be no need to remove this cover to gain access to these items due to a fuel rail factory GM harness that exits to the rear of the engine near the throttle body. We have supplied a connector to plug directly into this harness which will complete the connections to the MAP sensor and injectors.

After plugging in the connector run the wires back to the panel. Connect the black wire A->1 to #1, lt green B->5 to #5, red C->4 to #4, lt blue D->2 to #2, dk blue E->6 to #6, pink N->21 to #21, pink P->22 to #22, white T->3 to #3, yellow U->7 to #7, dk green V->8 to #8, black M->32 to #32, lt green R->34 to #34 and gray S->35 to #35.

**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->35 to #35, black wire TPS B->38 to #38 and the dk blue wire TPS C->37 to #37.

**Bag #25 IDLE SPEED CONTROL (ISC) :** The ISC is located on the right side of the throttle body. Plug in the connector and run the wires back to the panel. Connect the wires to the panel as follows: black ISC A->59 to #59, pink ISC B->43 to #43, dk blue ISC C->44 to #44 and the lt blue ISC D->45 to #45.

**Bag #26 IGNITION CONTROL MODULE (ICM):** The ignition control module is located under the coil packs. There is four different connectors that need to be plugged into this module. Plug in all four connectors and run the wires back to the panel.

### **NOTE!**

**READ the printing on the wires carefully before connecting them to the panel. GM has given a connector number to each connector plugged into the ignition control module (C1, C2, C3, C4). We have printed the number of the connector on the wires running from the connector for ease of any trouble shooting down the road. Connecting any of these wires to the wrong terminal on the panel WILL cause an ignition control module failure.**

**CONNECTOR "C1":** Connect the lt blue wire ICM C1 A->14, to #14, black ICM C1 B->13 to #13, purple ICM C1 C->12 to #12, tan ICM C1 D->11 to #11, white ICM C1 E->10 to #10 and the red ICM C1 F->9 to #9.

**CONNECTOR "C2":** Connect the black ICM C2 A->60 to #60 and the orange ICM C2 C->23 to #23. The purple wire TO TACH runs directly to the tach.

**CONNECTOR "C3":** Connect the yellow ICM C3 A->15 to #15, purple ICM C3 B->16 to #16, red ICM C3 E->17 to #17 and the lt blue ICM C3 F->18 to #18.

**CONNECTOR "C4":** Connect the pink ICM C4 B->19) to #19 and the brown ICM C4 A->20 to #20.

**Bag #27 CRANK POSITION SENSOR "A" & "B":** This engine is equipped with two crank shaft position sensors. The crank position sensors are located on the left side of the engine between cylinder #4 & #6. CPS A is located in the upper crank case and the CPS B is located in the lower crank case.

After plugging in the connectors to the sensors run the wires to the panel. Connect the yellow wire CPS A B-> to #15, purple CPS A A->16 to #16, red CPS B A->17 to #17 and the lt blue CPS B B->18 to #18.

**Bag #28 CAM SHAFT POSITION SENSOR:** The cam shaft position sensor is located on the rear of the engine near the exhaust cam shaft on the right side of the engine.

Plug in the connector and run the wires back to the panel. Connect the pink wire CSP A->19 to #19 and the brown CSP B->20 to #20.

**Bag #29 KNOCK SENSOR WIRING:** This sensor will inform the computer of detonation and readjust the timing accordingly. One knock sensor is used located on the right front of the engine under the exhaust manifold. The knock sensor detects detonation in the engine and advances and retards timing so the engine can run at maximum performance. Connect the dk blue wire KNOCK SEN->50 to the knock sensor and run the wire back to the panel. Connect the knock sensor wire to #50.

**Bag #30 OXYGEN SENSORS (2):** GM has added heated O2 sensors to help the ECM go into closed loop faster. This area of the vehicle is hot so keep the wires away from the exhaust. Two sensors are required. **Install the left and right front O2 sensors as close to the block as possible.** If you are using headers the O2 sensors should be installed in the collectors. 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 O2:** The four gang connector with the yellow, dk green, black and orange wires running from it plugs into the left oxygen sensor.

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

Run all the wires back to the panel and using the blue terminals connect the black wires O2 1 D->57 and O2 2 D->57 to #57. Using the red terminals connect the tan O2 2 C->47 to #47, purple O2 2 A->46 to #46, yellow O2 1 A->48 to #48 and the dk green O2 1 C->49 to #49. Using the blue terminals connect the orange wires O2 2 B->25 and O2 1 B->25 to #25.

**Bag #31 FUEL PUMP & OIL SWITCH WIRING:** 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 (GM part #14100455) or the pump WILL NOT operate.

Connect the tan 51->FUEL PUMP wire to #51 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.

The oil pressure switch is located above the oil filter. Plug in the connector and run the wires to the Telorvek panel. Connect the red OIL SW C->52 to #52, tan OIL SW D->51 to #51 and the black OIL SW B->59 to #59.

## Transmission Wiring

This engine was equipped with a 4T80-E transmission which is an automatic, computer controlled, electronic shift transmission. The ECM controls shift points based on vehicle speed, engine temperature, throttle position angle as well as other sensor inputs. The ECM also monitors the transmission as well and will set codes if a fault is found.

**NOTE: If you have decided to use another type of transmission other than the type General Motors used with this engine, CODES WILL SET and store in the ECM. The S.E.S light will also light. For a trouble free installation The Detail Zone STRONGLY RECOMMENDS using the transmission GM intended to be used with this engine.**

**Bag #32 4T80-E AUTOMATIC 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 4T80-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: It green TRANS A->73 to #73, yellow TRANS B->72 to #72, black TRANS C->64 to #64, white TRANS D->63 to #63, pink TRANS E->27 to #27, black TRANS L->33 to #33, white TRANS M->70 to #70, pink TRANS N->67 to #67, red TRANS P->66 to #66, dk green TRANS R->65 to #65, red TRANS S->69 to #69, tan TRANS T->71 to #71, It blue TRANS U->115 to #115 and the dk blue TRANS V->68 to #68.

**Bag #33 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 red wire TCC CUT OUT->29 to #29, It blue wire TCC CUT OUT->115 to #115 and the black wire TCC CUT OUT->60 to #60. The long single purple wire TCC REL->BRK SW runs to the cold side of the brake switch (hot only when the brakes are applied). This color matches our Component Panel wiring kit.

**Bag #34 SPEED SENSOR:** A VSS signal input is needed on all General Motors TPI engines. If the ECM does not see that input a **CODE 24 WILL SET**. The VSS input helps control transmission shifts, some of the EGR and IAC functions. Plug the connector into the sensor located on the left side of the transmission and run the wires to the TELORVEK panel. Connect the purple VSS B->75 to #75 and the yellow VSS A->74 to #74.

**Bag #35 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 recirculation (EGR).

If you are using our complete vehicle 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->62 is run to the TELORVEK panel and connects to #62.

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 #62. Don't forget to install a relay (GM part #14100455).

**Bag #36 COOLING 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.**

Three fan relays are located in the cover of the TELORVEK panel and are pre-wired. You **MUST** use TWO electric cooling fans and wire them as directed in order for the fans to function properly. The ECM will control the fans at low and high speeds depending on the sensor inputs it is receiving from the engine sensors.

The ECM will turn on cooling fan #1 first at a low speed. You should wire the FAN 1 wires to the fan that you want to run first. Connect the white wire 82->FAN 1 GRND to #82 and run it to the ground terminal (wire) running from fan #1 and connect the black wire 81->FAN 1 POS to #81 and run it to the positive terminal (wire) running from fan #1. Connect the Lt blue 83->FAN 2 POS to #83 and run it to the positive terminal (wire) running from fan #2 and the dk blue wire 84->FAN 2 GRND to #84 and run it to the ground terminal (wire) on fan #2.

## **WARNING!!**

**Don't forget to install the three relays in the connectors located in the cover of the TELORVEK panel. The fans WILL NOT operate unless the relays are installed. Use GM part #14100455.**

**Bag #37 POWER STEERING SWITCH:** The power steering switch is a normally closed circuit that opens when power steering pressure exceeds 450-650 PSI. The ECM uses the PSP switch to determine if high PSP loads are present to control idle quality.

Plug in the connector into the switch and run the wires back to the panel. Connect the pink wire PS SW B->26 to #26 and the black wire PS SW A->53 to #53.

NOTE: If you choose not to install a power steering switch run a jumper wire from terminal #26 to #53 on the panel.

**Bag #38 ALTERNATOR CONTROL/FEEDBACK:** We have supplied the control wires and connector but you will also have to connect a large charge wire to the alternator for proper charging. The ECM monitors the voltage level of the " L" post in the alternator connector. The ECM controls the alternator output and should be wired using the wires supplied.

**NOTE: IF YOU ARE ALSO INSTALLING A RON FRANCIS WIRING COMPLETE VEHICLE WIRING SYSTEM, IT ALSO CAME WITH WIRING FOR THE ALTERNATOR. DISCARD THAT WIRING AND FOLLOW THESE ALTERNATOR WIRING INSTRUCTIONS.**

Plug in the connector to the alternator and run the wires back to the panel. Connect the red wire ALT L->61 to #61 and the white wire ALT S->88 to #88.

**Bag #39 PERFORMANCE MODE SWITCH:** The ECM has the capability of allowing the operator to select a more aggressive transmission shift pattern. When the performance mode is selected, the transmission shifts will be firmer and delayed 1-3 mph on upshifts.

A momentary two wire switch must be used. Connect the dk blue wire (116->PERF SW) to #116 on the Telorvek panel and run it to one of the terminals on the switch. Connect the black wire (58->PERF SW) to #58 and run it to the other terminal on the switch.

**Bag #40 ENGINE COOLANT LEVEL SWITCH:** The coolant level switch senses the presence or absence of engine coolant. This switch is mounted in the radiator overflow bottle. The switch is a normally open switch that is closed with the presence of engine coolant.

After plugging into the switch run the wires back to the panel. Connect the black wire ECL SW B->58 to #58 and the lt green wire ECL SW A->117 to #117.

If you choose not to install an engine coolant level switch run a jumper wire between terminals #58 and #117 on the panel.

**Bag #41 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 wires DLC 4->56 and DLC 5->56 to #56, white wire DLC 8->101 to #101, tan wire DLC 1->99 to #99, tan wire DLC 9->102 to #102, dk blue DLC 11->105 to #105, dk green DLC 14->106 to #106 and the red wire DLC 16->30 to #30.

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 24->SES LT to #24 and the brown 55->SES LT to #55. 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 #42 EMISSION BAG EVAPORATIVE EMISSION CONTROL SYSTEM (EVAP SOLENOID) & EXHAUST GAS RECIRCULATION SOLENOID (EGR SOLENOID):**

**CANISTER PURGE SOLENOID:** The EVAP system stores fuel vapor generated by the vehicle and regulates its consumption during normal driving operation. The ECM controls the solenoid and when certain engine parameters are met the solenoid opens allowing engine vacuum to purge the canister. Plug the 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->27 to #27 and the dk green PURGE SOL B->54 to #54.

**EXHAUST GAS RECIRCULATION:** The EGR system is used in automotive engines to decrease the emission levels of Oxides or Nitrogen into the atmosphere. Plug in the connector to the EGR solenoid and run the wires to the panel. Connect the lt green wire EGR SOL A->41 to #41, black EGR SOL B->39 to #39, brown EGR SOL C->42 to #42, gray EGR SOL D->36 to #36 and the pink EGR SOL E->24 to #24.

## FINISHING UP

The ECM accepts three connectors. The TELORVEK panel has three ECM connectors running from it with different color plugs. 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.

## 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.



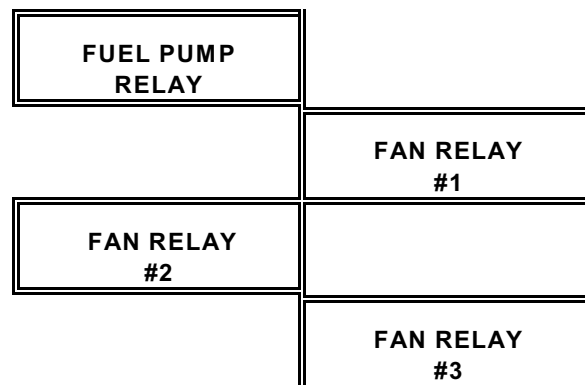
## Telorvek Panel Fuse Designation, Size and Relay Center Layout

### 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
INJECTORS 1,4,6,7	10 AMP	ECM, TCC RELAY, DLC	20 AMP
INJECTORS 2,3,5,8	10 AMP	FUEL PUMP RELAY, OIL SWITCH	20 AMP
IGNITION CONTROL MODULE, EGR SOLENOID, SERVICE ENGINE SOON LIGHT, ECM	20 AMP	FAN RELAY #1	30 AMP
O2 SENSORS, COOLANT LEVEL SWITCH, POWER STEERING SWITCH, TRANSMISSION, PURGE SOLENOID, ALTERNATOR, FAN RELAYS, ECM	30 AMP	FAN RELAY #3	30 AMP



**RELAY CENTER:** In the cover of the TELORVEK panel are four relays the ECM uses to control fuel pump and the cooling fans. 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 using a scan tool. This type of code WILL NOT put the computer into a back-up mode or cause any running problems.

If the S.E.S light stays on after the engine is running, it means the ECM has detected a problem. Unlike in the past when you could jump two terminals together in the DLC connector to get a code read out through the S.E.S light, the systems requires a scanner to read the trouble codes. Any GM dealership or service station can perform this service for you.

# TROUBLE CODE LIST

The following is a list of the 4.0 ECM trouble codes. Purchasing a shop manual will give you much more detail on the codes as well as how to diagnose the problem.

- 12 No 4X reference signal from ignition control module.
- 13 Right oxygen sensor circuit open.
- 14 Shorted coolant temperature Sensor (high temp ind.)
- 15 Open coolant temperature sensor (low temp ind.)
  
- 16 Generator voltage out of range
- 17 Left oxygen sensor circuit open
- 19 Shorted fuel pump circuit
- 20 Open fuel pump circuit
  
- 21 Shorted throttle position sensor (high voltage)
- 22 Open throttle position sensor (low voltage)
- 23 Ignition control circuit problem
- 24 Vehicle Speed Sensor
  
- 25 No 24X crank position signal from IC module
- 26 Shorted throttle position switch (low voltage)
- 27 Open throttle position switch (high voltage)
- 28 Illegal transaxle range switch input
  
- 29 Transaxle shift "B" solenoid problem
- 30 Idle speed control actuator slow or inoperative
- 31 Shorted manifold absolute pressure sensor (high voltage)
- 32 Open manifold absolute pressure sensor (low voltage)
  
- 33 Extended travel brake switch input circuit problem
- 34 Low vacuum signal indicated by Manifold Absolute Pressure sensor
- 35 Reference low circuit (voltage out of range)
- 36 EGR valve printle position out of range
  
- 37 Shorted intake air temperature sensor (high temp ind)
- 38 Open intake air temperature sensor (low temp)
- 39 Torque converter clutch engagement problem
- 40 Power steering pressure switch open
  
- 41 No cam shaft reference signal from ignition control module
- 42 Left O2 sensor lean
- 43 Left O2 sensor rich
- 44 Right O2 sensor lean
  
- 45 Right O2 sensor rich
- 46 Left to right bank fuel trim imbalance
- 48 EGR system malfunction
- 51 Mem-Cal error
  
- 52 ECM memory reset
- 53 Intermittent 4X crank position signal from ignition control module
- 55 Closed throttle angle out of range
- 56 Transaxle input speed sensor circuit problem
  
- 57 Shorted transaxle temperature sensor circuit
- 58 Pass key circuit problem
- 59 Open transaxle temperature sensor circuit (low temp ind.)
- 60 Park/Neutral input with cruise control engaged
  
- 61 Cruise control vent solenoid problem
- 62 Cruise control vacuum solenoid problem
- 63 Set vs vehicle speed difference
- 64 Vehicle acceleration too high
  
- 65 Cruise control servo position sensor failure
- 66 Cruise control engine RPM too high
- 67 Set/coast or resume/accel input shorted
- 68 Cruise control servo position out of range
  
- 69 Traction control active while in cruise
- 70 Intermittent throttle position sensor
- 71 Intermittent manifold absolute pressure sensor
- 73 Intermittent engine coolant temperature sensor
  
- 74 Intermittent intake air temperature sensor
- 75 Vehicle speed sensor signal interrupt
- 76 Transaxle pressure control solenoid circuit malfunction
- 80 TP sensor/Idle learn not complete
  
- 83 No 4X or 24X cam shaft position signal from IC module
- 85 Idle learn throttle position at maximum authority
- 86 Undefined gear ratio
- 88 Torque converter clutch not disengaging
  
- 89 Extended shaft adaptive limit
- 90 TCC brake switch input circuit problem
- 91 Transaxle range switch problem
- 93 Loss of traction control system link failure
  
- 94 Transaxle shift solenoid "A" problem
- 95 Engine stall detected
- 96 Torque converter over stress
- 97 Gear engaged at high throttle angle
  
- 99 High servo position after cruise control disengaged
- 106 Stop lamp switch input circuit problem
- 108 Mem-Cal error
- 109 ECM memory reset
  
- 110 Generator "L" terminal circuit problem
- 112 Total E Prom failure
- 117 Shift "A"/"B" circuit output open or shorted
- 119 Injector open or shorted
  
- 120 A/C low side temp sensor circuit
- 121 A/C high side temp sensor circuit
- 122 Coolant over temp. with A/C request
- 123 A/C very low refrigerant pressure
  
- 124 A/C request circuit shorted high
- 125 A/C high pressure switch shorted
- 126 A/C high pressure condition
- 128 A/C discharge temp./pressure
  
- 131 Knock sensor system test failure
- 132 Knock sensor circuitry failure
- 133 Loss of ABS/TCS data
- 134 Loss of IPC data
  
- 135 Loss of HVAC data
- 136 Loss of DERM data

## Optional Accessories

	GM Part #	RON FRANCIS WIRING Part #
Fuel Pump Relay	14100455	FP-25
Cooling Fan Relay (3)	14100455	FP-25
Park Neutral Relay	14100455	FP-25
TCC Cut Out Relay	14100455	FP-25

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