

# TELORVEK TPI WIRING INSTRUCTIONS FOR PI-94 (93-95 S/T TRUCK) 4.3 Central Port 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 an high pressure in-tank electric fuel pump. It must be capable of producing 60 PSI. Custom installations are available from Tanks, Inc. (phone # 320-558-6882) 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.

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 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.

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.

## STARTING INSTALLATION

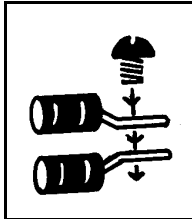
Since there are so many individual circuits to complete, we recommend that you connect them in the order that we prescribe. Disconnect the battery before starting and do not reconnect until instructed.

**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 #40 (engine coolant temp 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 ECT sensor is always mounted on the 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 #40 ENGINE COOLANT TEMPERATURE SENSOR (ECT):** The sensor is located on the top front of the engine. Plug the connector into the sensor and run the wires back to the panel. Connect the black wire ECT A->2 to #2 and the yellow wire ECT B->1 to #1.

**BAG #41 INTAKE AIR TEMPERATURE SENSOR (IAT):** The IAT sensor is located on the left front of the engine near the stock alternator location. After plugging into the sensor run the wires to the panel and connect the tan wire IAT A->9 to #9 and the purple wire IAT B->7 to #7.

**BAG #42 THROTTLE POSITION SENSOR (TPS):** The TPS sensor is located on the left front of the upper intake manifold on the 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->4 to #4, black wire TPS B->2 to #2 and the dark blue wire TPS C->3 to #3.

**Bag #43 IDLE AIR CONTROL (IAC):** The IAC is located on the upper intake manifold on the front of the engine near the stock location for the A/C compressor. Plug the four gang connector into the IAC and run the wires back to the panel. Connect the wires to the panel as follows, black IAC D->18 to #18, light green IAC C->19 to #19, white IAC B->20 to #20 and the light blue IAC A->21 to #21.

**Bag #44 MAP SENSOR:** The MAP (Manifold Air Pressure) sensor is bolted directly onto the upper intake manifold assembly with the nipple facing down through the manifold. **IMPORTANT: A seal is needed between the MAP sensor and the manifold to avoid any vacuum leaks. Check this area after the engine is running for any vacuum leaks.** Plug the connector into the sensor and run the wires back to the panel. Connect the purple wire MAP A->7 to #7, light green wire MAP B->5 to #5 and the gray wire MAP C->6 to #6.

**Bag #45 ELECTRONIC SPARK TIMING (Distributor) IGNITION COIL:** The connector on the wires will plug directly into the distributor. Run the wires back to the panel and connect the black wire EST A->32 to #32, the tan wire EST B->33 to #33, the purple wire EST C->34 to #34 and the white wire EST D->35 to #35.

NOTE: Located four inches from the distributor connector in-line on the tan (EST B->33) wire is a timing disconnect connector. When setting engine timing this connector must be un-plugged, timing set and then plugged back together. A hard code #42 may set when setting the timing. To clear the code, Un-hook the battery for two minutes or clear the it with a scan tool.

**IGNITION COIL:** Plug the gray connector into the coil. Using the yellow terminal run the orange wire COIL->14) to #14 on the Telorvek panel. The purple wire TACH runs to the tach.

**NOTE: A wire harness is needed to interface between the distributor and coil. The coil must use the factory harness that connects the coil to the distributor. It may be ordered direct from GM under part # 12090012.**

**Bag #46 CENTRAL MULTIPOINT FUEL INJECTOR ASSEMBLY (CMFIA):** The CMFIA is located under the upper intake manifold. GM has installed an interface harness that connects to the injector itself and runs out from the left front upper intake manifold eliminating the need to remove the manifold to complete the injector connection.

Plug in the connector to the interface harness connector and run the wires back to the panel. Connect the pink (CPI INJ A->44) to #44 and the dark blue (CPI INJ B->45) to #45.

**Bag #47 FUEL PUMP \ OIL SWITCH:** 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 53->FUEL PUMP wire to #53 on the panel and run it to the fuel pump. The tan wire then connects to the positive terminal on the pump. The black wire (FUEL PUMP GRD) connects to the negative terminal on the fuel pump and run to a good ground.

**OIL SWITCH:** This switch is located in the rear of the engine near the distributor. Plug in the connector into the oil pressure switch. Run the wires back to the panel and connect the red (OIL SW C->12) to #12 and the tan (OIL SW D->53 to #53.

**Bag #48. KNOCK SENSOR WIRING (2):** These sensors will inform the computer of detonation and readjust the timing accordingly. There are two knock sensors mounted on the engine. One is in the left cylinder head and the other is mounted in the top rear of the engine. Connect the dk blue (LR KNOCK SEN->31) to the sensor in the left cylinder head and the other dk blue (RR KNOCK SEN->31) to the rear mounted sensor and run both wires back to the panel and connect them to #31.

**Bag #49. ENGINE GROUNDS:** Proper grounding on a computer controlled engine is very important. A bad ground can cause many different kinds of driveability problems. Make sure when connecting ground wires, that the surface is paint and rust free before the connection is made.

Connect the (FRT ENG GRD->27) and (REAR ENG GRD->27) to a good front and rear engine ground and run the wires back to the panel. Connect both wires to #27.

**Bag #50 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 A->25) to #25, white wire (DLC B->51) to #51 and the orange wire (DLC M->52) to #52.

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 (44->SES LIGHT) to #44 and the brown (43->SES LIGHT) to #43. 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 #51 EGR VALVE:** The EGR solenoid is located on the front of the engine, near the throttle body. Plug in the connector and run the wires back to the panel. Connect the light green (EGR A->10) to #10, purple (EGR B->8) to #8, brown (EGR C->11) to #11, gray (EGR D->6) to #6 and the pink (EGR E->15) to #15.

**Bag #52. OXYGEN SENSOR (O2) (HEATED):** The O2 sensor and ECM control the air/fuel ratio. Only one sensor is required and should be installed as close to the block as possible. This area of the vehicle is hot so keep the wires away from the exhaust. O2 Sensors have a 25,000 mile life. Replace used O2 Sensors with new. If you must install an adapter, use The Detail Zone part # OS-30.

The Purple wire (O2 C->24) connects to #24, black (O2 B->25) to #25 and the pink (O2 A->16) to #16.

**Bag #53. INTAKE MANIFOLD TUNING VALVE ASSEMBLY (IMTVA) & RELAY:** The IMTVA is electrically controlled by the ECM based on RPM and TPS inputs. This valve splits or singles the plenum. During the low and high RPM range, the ECM de-energizes the valve and enables a split plenum condition that provides for peak torque along with increased horsepower. During the mid RPM range, the ECM energizes the valve for a single plenum condition that provides for mid RPM range peak torque. The IMTVA is controlled by a relay which is pre-wired and mounted in the Telorvek panel. **NOTE:** A relay must be installed in the housing (Airtex part #1R1061, Standard Motor Products part #RY116 or GM part #14100455.) or the IMTVA will not operate.

Plug in the connector into the IMTVA located on top of the plenum and run the wires back to the panel. Connect the pink wire (IMTV B->50) to #50 and the black wire (IMTV A->26) to #26.

## 4L60-E Transmission Wiring

The 4L60-E transmission is a fully automatic rear wheel drive electronically controlled transmission. Shift points are controlled by the ECM via two shift solenoids. Shift schedules and torque converter lock-up are also controlled by the ECM and are influenced by transmission temperature.

**Bag #54 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: light green (TRANS A->28) to #28, yellow (TRANS B->29) to #29, red (TRANS C->30) to #30, dark blue (TRANS D->54) to #54, pink (TRANS E->47) to #47, black (TRANS L->55) to #55, purple (TRANS M->8) to #8, dark green (TRANS N->56) to #56, orange (TRANS P->57) to #57, light blue (TRANS R->58) to #58, white (TRANS S->59) to #59 and the purple (TRANS T->60) to #60.

### More Transmission Information

The ECM tells the 4L60-E transmission when to shift from gear to gear. The ECM is also looking for certain signals produced by the transmission. If these signals are not received by the ECM, codes WILL SET. We tested the transmission on our dyno, simulating the transmission was not there. We found no difference in engine performance but some soft codes did set.

**Bag #55 SPEED SENSOR & BUFFER:** A VSS signal input is needed on all General Motors fuel injection 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 and run the wires to the TELORVEK panel. Connect the purple (VSS B->39) to #39 and the light green (VSS A->38) to #38.

**BUFFER (DRAC MODULE):** On a stock vehicle installation, the buffer compensates for various axle ratios, tire sizes and converts the VSS signal into a square wave for use by the ECM. The buffer sends two different signals to the ECM. It relays transmission output speed which is used to control shift points. The other signal is used to control engine operating functions.

In the past GM listed many different part numbers for these electronic devices depending on rear ratio and tire size. Now they can only be purchased from an AC Delco authorized electronic repair facility. Any GM dealership can handle the purchase of a buffer.

The following information must be given to the GM dealership when ordering a Buffer:

- 1) Rear Ratio \_\_\_\_\_
- 2) Tire Size \_\_\_\_\_
- 3) Outside Diameter of rear Tires \_\_\_\_\_

Mount the buffer close to the Telorvek panel. Plug the connector into the buffer and connect the light green wire to #38, black wire to #26, orange wire to #48, light blue wire to #42, purple wire to #39, white wire to #40 and the brown wire to #41.

**ELECTRIC SPEEDOMETER CONNECTION:** Terminal #42 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 #56 CANISTER PURGE SOLENOID.** The canister purge solenoid is mounted on the manifold on the left side. Plug the connector into the solenoid and run the wires back to the panel. Connect the pink wire (CPS B->15) to #15 and the dark green wire (CPS A->17) to #17 on the Telorvek panel.

**Bag #57 BRAKE SIGNAL (TCC CUT OUT RELAY):** The TCC relay is mounted in the cover of the Telorvek panel and is pre-wired. 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. The purple wire (49->BRK SW) connects to #49 and run to the cold side of the brake switch (hot only when the brakes are applied). This color matches our Component Panel wiring kit. **NOTE:** A relay must be installed in the connector (Airtex part #1R1061, Standard Motor Products part #RY116 or GM part #14100455. or the brake signal circuit WILL NOT operate.

#### OTHER CONNECTIONS

**AIR CONDITIONING REQUEST:** If you vehicle has A/C then connect a wire to #22 on the TELORVEK panel and splice it to the wire running to the A/C compressor clutch. This circuit will have 12 volts when the A/C switch is on.

## FINISHING UP

The ECM accepts two connectors. The TELORVEK panel has two ECM connectors running from it with different color plugs. Plug the connectors into the computer.

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

Fuse Row #1		Fuse Row #2	
Fuse Designation	Fuse Size Block #1	Fuse Designation	Fuse Size Block #2
(IGNITION FEED) ECM, Ignition Coil	20 AMP	(IGNITION) O2 Sensor	10 AMP
(IGNITION FEED) EGR Solenoid, Canister Purge Solenoid, ECM	15 AMP	(IGNITION) IMTV Relay, Buffer	15 AMP
(IGNITION FEED) Injector, S.E.S LT	15 AMP	(BATTERY) Oil Switch, Fuel Pump Relay, ECM	20 AMP
(IGNITION) Transmission	15 AMP	(BATTERY) TCC Cut Out Relay	20 AMP

### Relay Center

**Fuel Pump Relay**

**TCC Relay**

**IMTV Relay**

**RELAY CENTER:** In the cover of the TELORVEK panel are relays the ECM uses to control fuel pump, TCC control and IMTV. 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 three relays. 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) 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 jumping the A & B slots in the DLC connector. This type of code WILL NOT put the computer into a back-up mode or cause any running problems.

With the engine off and the ignition key on, connecting a jumper wire from terminal A to terminal B of the DLC (white and black wires) will allow the computer to "flash" trouble codes on the S.E.S light. Each code will flash 3 times. Each number is flashed separate. Example: Thirteen is flashed as a single flash followed by three flashes. This will repeat three times before moving on to any addition codes.

### 93-94 4.3 VORTECH TROUBLE CODES

13 Oxygen Sensor Circuit (open)	44 Oxygen Sensor (Lean)
14 Coolant Temperature Sensor (High Temp. Indicated)	45 Oxygen Sensor (Rich)
15 Coolant Temperature Sensor (Low Temp. Indicated)	51 Faulty Prom (MEM Cal Problem)
16 VSS Buffer Fault	52 System Voltage High Long
	53 System Voltage High
21 Throttle Position Sensor (Signal Voltage High)	54 Fuel Pump Relay Voltage Low
22 Throttle Position Sensor (Signal Voltage Low)	55 Faulty ECM
23 Intake Air Temp (Low Temp. Indicated)	58 Transmission Fluid Temperature circuit (High Temp Indicated)
24 Vehicle Speed Sensor	59 Transmission Fluid Temperature circuit (Low Temp Indicated)
25 Intake Air Temp (High Temp. Indicated)	
28 Transmission Range Pressure Switch Fault	66 3-2 Control Solenoid Circuit Fault
32 Exhaust Gas Recirculation Circuit (EGR)	67 TCC Clutch Circuit
33 Map Absolute Pressure (High Voltage Low Vacuum)	69 TCC Stuck On
34 Map Absolute Pressure (Low Voltage High Vacuum)	72 Vehicle Speed Sensor Loss
35 IAC Error	
37 Brake Switch Stuck On	73 Transmission Pressure Control Solenoid circuit (Current Error)
38 Brake Switch Stuck Off	75 Transmission System Voltage Low
42 Ignition Control circuit (Shorted or Grounded Circuit)	79 Transmission Fluid Over Temp
43 Knock Sensor circuit	81 Transmission 2-3 Shift Solenoid Circuit
	82 Transmission 1-2 Shift Solenoid Circuit

## Optional Accessories

	<b>GM Part #</b>	<b>Ron Francis Wiring#</b>
Electronic Control Module	16197427 or 16196395	
Prom (MEM CAL)	16195891	
Fuel Pump Relay	14100455	FP-25
TCC Cut Out Relay	14100455	FP-25
Intake Manifold Tuning valve Relay	14100455	FP-25

### *Copyright Infringement*



**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!!**