Gen. I Ford 300

Install

3420 South Lapeer Rd.

Unit B

Metamora, MI. 48455

248-393-1621

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Congratulations on the purchase of your *Affordable Fuel Injection*™ TBI system. We are confident that this purchase will give you the performance and driveability you deserve from your GSE equipment. The following instructions are intended to provide you with thorough instructions for installing your TBI system. Please read through the instructions completely before beginning your installation. Many of your questions may be covered within this manual.

Verify that all of the components are included in your shipment.

1. Wiring Harness
2. ECM with AFI calibrated chip (the chip is already installed in the ECM).
3. Throttle Body (with IAC and TPS)
4. ECT sensor (Engine Coolant Temp)
5. MAP Sensor (Manifold Absolute Pressure)
6. O2 Sensor with exhaust ring for installation
7. Fuel Pump Relay
8. Power Relay
9. Check Engine Light
10. Adapter plate
11. Adapter plate mounting studs, washers and nuts
12. Tach Filter
13. Fuse protection link
14. Throttle cable stud
15. Fuel filter
16. Fuel Inlet tubes
17. Inline Fuel Pump
18. Fuel pump block off plate
19. Air cleaner adapter (to adapt to 2 ¾" air filter inlet when requested)
20. Weather tight ECM enclosure (For TUG Baggage Tractor and De-Icers only)

INSTALLATION INSTRUCTIONS

NOTE: **THIS IS A CUSTOM FUEL INJECTION SYSTEM BUILT FOR YOUR GSE EQUIPMENT. AS WITH ALL CUSTOM PROJECTS SOME FABRICATION MAY BE REQUIRED. YOU MAY ALSO REQUIRE SOME SMALL PARTS THAT ARE NOT INCLUDED IN THE KIT.**

ECM

The ECM is the central unit of the fuel injection system. This unit provides the signals that trigger the injectors. The ECM is to be mounted under the dash of the vehicle or in an enclosed weather tight case. The ECM should be mounted so that it does not move around in the vehicle. It can be mounted with brackets, bolts, Velcro etc.

For Tiger, Clark, Harlan and similar tractors that have a dash the ECM units are mounted under the dash. For tractors that are not covered, insure that the ECM is located so that it is not exposed to the elements. For open cab models that may be exposed to rain and snow on a regular basis it may be desirable to install a piece of aluminum or sheet metal over the ECM to provide more protection.

TUG baggage tractors and De-Icers will use a weatherproof enclosure to provide protection from the elements. For TUG models, mounting the enclosure in front of the seat and on the metal portion of the fuel tank cover is the most desirable. For de-icers there will be a commercial type electrical enclosure that houses the ECM and is mounted inside the rear area close to the control panel.

WIRING HARNESS

The wiring harness included with this kit has been specially built for your unique application. This harness only includes the connectors and leads that are required to run your particular engine based upon the order specifications. Therefore, if there are leftover parts this indicates that an error has been made during assembly and installation of the system. Each connector will be marked with a label to the correct sensor that it is to be connected too. In the following section we will describe each sensor and the connector that attaches to it. The wiring harness is fabricated to allow the proper sensor to be hooked up to the respective

connector. The "keying" of the connector will not allow for an improper connection.

There is one fusible link required which is to be securely connected to the red battery wire after this wire is cut to length. Fuses which also protect the system are located integral to the relays.

The PINK power wire needs to be attached to an Ignition 1 (IGN1, battery power only with key on or in the crank position) power source. Ensure that this is an ignition 1 source. An ignition 1 source is 12volts available any time that the key is not in the off position. Also this PINK wire must have 12V while the vehicle is in the cranking mode (starting). This means the wire will have power when the key is on, or start, or back to on. Usually this wire can be taken from the proper terminal on the ignition switch, the power side of the coil (+), or from the fuse box. The system will not work if power is not provided to the (PINK) ignition wire while cranking.

The red wire is to be connected to a direct battery lead which has 12v always feeding it; a direct connection to the battery or starter relay is optimal. It is important that these wires are connected to the indicated source or your fuel injection system will not operate properly.

A main fuse link is provided which is the main fuse protection for the entire system. This link is to be installed at the battery source and secured and sealed to the red battery wire. Two additional fuses are used for protection and located in the relays.

> **It is very important that the ECM and components be supplied with proper voltage at all times. Improper operation of the charging system can result in system malfunctions and drivability issues**.

The harness is to pass through the firewall or floorpan to allow the proper connections to the sensors and components on the engine. In some cases there may already be a hole that can be used to pass the harness through. If this is the case then use and seal up the hole appropriately. If you need to drill a hole this hole needs to be approx. 1 – 1 1/2" (1 ¼" being the ideal size), or whichever size you need to fill with a grommet when sealing up. Ensure that no wires are routed in a way that allows them to rub or potentially wear on any metal surfaces.

Included are two relays, a power relay and fuel pump relay. These relays are of the same design and can be used for either application. The power relay is used to ensure proper voltage is supplied to your system so as not to tax the current wiring of the vehicle with undue voltage requirements. The power relay connects to Ign. 1 feed to power up the relay (pink wire you

connected above), and the input to the relay is battery powered. This battery lead is labeled and can be attached directly to the battery, the starter solenoid, or any other appropriate full time 12-volt supply. We have included a length of wire long enough to choose your own connection option. Insure that the main fuse circuit protection is installed between the battery power source and the red battery wire. A low temperature solder connector is also provided to provide a secure and sealed connection. The fuel pump relay is controlled by the ECM and no connections are required except for the power wire to the fuel pump itself.

An ALDL connector is another extension of the harness mounted inside of the vehicle or enclosure. This connector is a two-row rectangular connector with mounting tabs on it. This is usually mounted under the dash and available for diagnostics and scan tool hook up. This can be hooked up to a GM scan tool to monitor the sensors and retrieve trouble codes. You can use a late 80's or early 90's GM TBI definition for proper operation. For some scan tools enter VIN 10th "L" 3rd "C" 8th "K". Your ECM is identified with the scan tool codes required for your application.

A wire is also provided which is connected to a check engine light. This light can be mounted in the dash, use an empty "idiot light" socket in the instrument panel, or mounted in a small bracket under the dash. It should be mounted in an area noticeable in case of any malfunctions. De-icer applications typically choose to mount the ALDL connector and the check engine light inside the control box. This allows for diagnostics and troubleshooting for the technicians only. The wire from the ECM is the ground for the light. When a fault exists, or the system is in diagnostic mode, or the engine is not running with the key on, the light is illuminated. The other side of the light requires a 12v ignition feed that you need to supply from the fuse box, or other source.

FUEL PUMP

An external inline fuel pump has been included with your TBI system. This pump delivers a constant fuel pressure to the throttle body where it is then regulated down to 10 - 15 psi and returned to the fuel tank. This pump should be mounted to the frame or body of your vehicle in an area that will be protected from the elements as best as possible. The fuel pump should be mounted below the fuel tank fuel level for the pump to work properly. If necessary weatherproof the pump by mounting a cover over it.. A fuel filter is to be installed in the fuel line **PRIOR** to the fuel pump. Premature failure of the pump can be the result of improper fuel filter installation. Some aftermarket high density fuel filters can cause a large drop in fuel pressure under load and are not recommended for use with your system. If you are using high density filters insure that you have proper fuel pressure during all modes of operation. If you are using the original engine mounted

fuel pump that has its own fuel filter attached to the pump, this filter is sufficient for proper system operation.

The engines mechanical fuel pump can be kept on the engine and used as a scavenger pump for the electric fuel pump. With this type of installation the electric fuel pump can be mounted in whatever location you choose, as a constant fuel flow is available for the electric pump. Ensure that the fuel filter is still installed between the mechanical and the electric pump if you choose this type of fuel pump installation unless you have the pump mounted filter.

If your equipment is fitted with an electric pusher or scavenger pump these pumps may not provide enough fuel flow for the system to operate properly. To insure that proper pressure is being maintained, monitor fuel pressure over time if you are using one of these pumps. In previous cases these pumps have been removed and the original mechanical pump and the electric pump have been used as described above.

A 12 or 16 Ga. pink wire labeled "Fuel Pump", with sufficient length has been included with the wiring harness for the pump power feed. This wire comes from the fuel pump relay which is mounted on the inside of the vehicle or weatherproof enclosure. The mounting and the ground are ***very important*** for proper operation of the fuel pump. is the mounting and the ground. A ground wire is to be attached to a stable clean body ground or run back to a battery ground. An improper ground will result in insufficient fuel flow and/or premature pump failure. Mount the fuel pump in the bracket supplied or similar, to keep the pump noise from radiating into the vehicle. You can use the mounting screws supplied with the pump, or supply your own to ensure proper mounting. You may want to "prime" the fuel feed line with gasoline to aid in the priming of the pump for proper operation.

FUEL LINES

A TBI fuel injection system requires two fuel lines for proper operation; a feed line and a return line. Some vehicles are built with two lines for this purpose, even if originally equipped with a carburetor. If you are starting from scratch you will need to install both of these lines from the fuel tank to the Throttle body. Usually a 3/8" or 5/16" line is used for the feed, and a 5/16 or 1/4" line for the return. Do not use smaller than ¼" for any of the fuel lines. The ideal installation incorporates both the fuel feed and return lines attached to the fuel tank. Some fuel tanks are supplied with a tank vent for evaporative emission purposes. These fittings usually have a restriction incorporated internally and are not sufficient for a fuel return. If the restriction can be removed and the fitting is of sufficient size, this can be used for a return. Do not eliminate this fitting for evaporative emissions purposes if these items are still in use. Insure that any factory fittings that are on the fuel tank are free flowing and do not restrict the flow of fuel back to the fuel tank.

If you do not have a place to return the fuel to the tank within the fuel-sending unit, the most desirable and recommended procedure is to install a return to the tank. This may require removing the tank or the sending unit to install a return. Use only fuel line and fittings approved for fuel injection.

On TUG brand units most fuel tanks have two fittings on the bottom of the tank that can be used. The one fitting that is currently used can be used for the feed line. The other plugged line can be used as a return line. This second fitting has a tube internally in the fuel tank that allows for a return of the fuel higher in the tank; insure that you do not use this for the feed line. Some stations have chosen to install a shut off valve in the feed line prior to the fuel filter for easier fuel filter service purposes.

ADAPTER PLATE

An adapter plate has been included that is mounted between the Velocity Governor (if equipped) or the intake manifold and the TBI unit. Installation of these plates is pretty straightforward but there are some things to be aware of when installing the plate and the TBI unit. A ¾" hole has been drilled through the adapter plate on one side for access to the adjustment screw on the velocity governor. Vacuum leaks are the largest problem facing fuel injection systems and the addition of the adapter plate has the potential of providing more sources for leaks.

Before installing the adapter plate on the engine loosely bolt the TBI unit to the adapter plate with the gasket between the TBI unit and plate. When installing the governor and adapter plate to the intake manifold be careful not to drop anything in the opening when cleaning gasket surfaces.

Lay the adapter on the governor (if equipped) to become familiar with the fit of the plate. Insure that the governor and the adapter plate with the gaskets installed allow for a non interference fit. If there is any interference modify the adapter accordingly to allow for proper clearance. Apply a small amount of gasket sealer to both sides of the gasket one at a time. Spread it very thin with your finger to make the gasket appear wet. With the gasket on the adapter slip the adapter bolts supplied through the adapter and gasket to hold them together. Then apply a couple drops of blue locktite to the threads of all bolts. Line up to the intake manifold and start bolts by hand then tighten. On some engines there is the possibility that the mounting bolts between the intake and exhaust manifolds may interfere with the adapter plate. Insure that the fit between the intake and the adapter is sufficient and allows for a leak free installation.

The TBI gasket in many cases should be sufficient to seal but many people have found the gasket sealer treatment as described above to eliminate any problems here as well. Ensure that all necessary mechanisms are in place with the TBI and that it has the proper clearances to the intake and other accessories before sealing it down. A small amount of blue

locktite should be applied to the bolts attaching the TBI to the adapter plate. This interface is also a source of vacuum leaks and the use of blue locktite to prevent any loosening of the bolts will offset leaks in that location.

THROTTLE BODY

Install the throttle body on the adapter plate as described above. The throttle lever is a cam type and can be connected in one of several ways depending on what type of governor is used.

Velocity Governor The throttle body/adapter plate assembly is mounted on top of the governor. The throttle cam in many cases lines up well with the throttle cable on the engine. Modifications can be made to the cable by removing the sheath at the end of the cable assembly, removing the end on the cable and installing a barrel stud over the cable to allow the cable to actuate as in production. A hole can also be drilled in the cam and a ball stud can be installed to use the cable as is. Some "bending" or actual cutting and welding of the engine throttle cable bracket many times is required to allow for proper operation and alignment with the cam.

Mechanical governor A ball stud many times can be installed as above to allow the lever of the mechanical governor to properly operate the throttle. In some cases removing one of the springs on the throttle body allows for smooth operation of the mechanical governor. In some instances if the governor cannot easily overcome the spring load a lever can be added to allow for more mechanical advantage.

Ensure that smooth unrestricted movement can be obtained from the accelerator pedal from idle to WOT (Wide Open Throttle). Connect the wires to the injector, TPS (Throttle Position Sensor), and IAC (Idle Air Control) valve. Connect a vacuum line from a ported source to the upper vacuum port on the velocity governor if using that type of system. The lower port on the governor is then routed to the distributor. The ported vacuum connection can be connected directly to the distributor when using a mechanical governor. The MAP sensor requires a full vacuum source. The manifold vacuum for the MAP needs to be attached below the velocity plate directly to the manifold for true manifold pressure when using the velocity governor. Also the vacuum can be taken from any source when using a mechanical governor, ensure that it is a full manifold vacuum source. Plug all vacuum ports not being used; it is critical that there are no vacuum leaks.

Connect fuel lines to the rear of the throttle body. There are two different size fittings for the fuel feed and fuel return. The largest is the feed and the smaller one being the fuel return to the fuel tank. These fittings are not flare or inverted flare fittings. We have included the proper fuel line adaptors in the kit that hook up directly to the throttle body.

ENGINE SENSORS

MAP SENSOR

The MAP sensor is a very important part of the fuel injection system. This sensor sends a voltage to the ECM in relation to the amount of vacuum (pressure) the engine is creating. This signal is used in conjunction with the engine speed to infer the amount of air that is being used by the engine. This is what is called a speed/density system. Because fuel control is very dependent upon this signal it is very important to install correctly. This sensor is to be installed as close to the manifold vacuum source as possible. The port on the sensor is to face down with the vacuum line attached. This vacuum line should have no sags or dips and the length should be as short as possible. Some people install this sensor in the center of the firewall towards the cowl or even under the air cleaner at times. Attention needs to be given to the connection of the vacuum line ensuring no leaks. For the velocity governor application insure that the vacuum line is connected to the manifold below the governor.

COOLANT SENSOR

The coolant sensor is just like it sounds; it sends an electrical signal to the ECM in proportion to the engine coolant temperature. This sensor is to be installed before the thermostat preferably or in the block itself. There is a plug in the rear of the block that can be used for the ECT sensor or anywhere on the engine side of the thermostat. Connect the two-wire connector when installed. Ensure that there are no coolant leaks from the threads of the sensor. It is also important that a continuous flow of coolant is present at the tip of the sensor or a false reading and engine damage can occur.

OXYGEN SENSOR

The oxygen sensor is installed in the exhaust pipe and samples the exhaust to determine if the engine is running rich or lean of 14.7:1 air/fuel ratio. The O2 sensor should be installed as close to the engine as possible. Many replacement manifolds have a boss already tapped that will accept an O2 sensor. It is preferable to use this location or drill and tap that location on the manifold. A threaded boss has been included with your kit that can be welded into the exhaust pipe to hold the O2 sensor. Placement of this boss should always be in a position that is somewhere between horizontal to vertical. In no instance should the sensor wire be pointed in a position that would be considered facing down.

CRANK INPUT

A wire labeled "CRANK SIGNAL" is to be installed on the crank terminal of the starter solenoid or off the ignition switch. A 12 volt signal is provided to the ECM from this wire only when the engine is cranking. The ECM, to determine when the engine is cranking, uses this signal to allow the fuel pulse width to be expanded for cold start up fuel enrichment.

ENGINE GROUND

An eye terminal with 1-3 black wires and labeled "engine ground" needs to be properly attached to the engine block. It is very critical that a proper ground is used for this input to the ECM and that it is mounted to the engine itself. ***It is most critical that this is a connection going to a bare grounding surface and not a painted surface. It is good practice to run an extra ground wire from the negative (-) on the battery to the ground wire coming from the ECM (from the wire harness Engine ground). Make sure that the ground from the engine to the body of the vehicle is intact. An improper ground will not allow the system to operate properly.***

TACH FILTER

This system uses an electrical circuit (tach filter) to condition the signal output from the distributor module to the negative terminal of the coil. A wire marked "tach input" will be part of your wiring harness and connects to the "-" terminal of the ignition coil or the lead out of your ignition module. The tach filter is located toward the ECM and is connected to the harness through a 4 pin weather pak connector.

FINAL CHECKS AND START UP

After you have finished the above installations you are ready to check the system for operation. Turn the ignition key to the "ON" position, but do not start the engine. The fuel pump should turn on for about 2 seconds and then turn off. If this does not happen see #7 below in troubleshooting. If your installation includes using the original mechanical fuel pump it will be necessary to crank the engine before fuel is available to the electric fuel pump. Disconnect the connector from the injector and crank the engine for about 5 seconds; reinstall the injector connector after this operation Leave the ignition in the "ON" position until the fuel pump has turned off. Turn the ignition off for at least 10 seconds and repeat the ignition cycle. Perform this operation 2 or 3 times to allow fuel to fill the system preparing to start. Inspect all fuel lines and connections to ensure there are no fuel leaks. It would also be appropriate at this time to install a fuel pressure gauge to insure that the proper fuel pressure of 10 – 15 psi is being delivered.

Assuming no fuel leaks, you are ready to start the engine. Do not press on the accelerator pedal to start the engine. The IAC valve will provide the proper amount of air for the vehicle to start and run. Start the engine and let it idle; it may take a bit to run smoothly. At this point the control system has not "learned" the engine and the IAC valve has not learned it proper position. These are all functions of the fuel injection system that happen after the engine has been running.

If you have access to a scan tool use a hook up for a 1990 350 cu. in. 4.3L Chevrolet truck. For some scan tools enter VIN 10th "L" 3rd "C" 8th "Z".

If your system is equipped with a tach filter and not using the ECM controlled distributor set ignition timing to the factory specifications for your engine. Insure that the timing is in fact being set with the proper TDC indicator. We have found on some engines that two different indicators are present and that the timing was set to the incorrect indicator. This causes operational issues with the engine if the timing is not set correctly.

Restart the engine and let it idle for a while. Insure that there are no fuel or vacuum leaks while running and that the idle appears to be controlled by the ECM. The engine speed will be higher while cold and first started and will come down to a base idle on its own. If the engine will not idle properly check for vacuum leaks, proper timing setting, or a check engine light illuminated. When all of these checks have been made go to troubleshooting guide #10 to and set the base engine speed to 625 RPM in drive or neutral for de-icing applications. When you are confident that all is running properly, you may shut it down and complete the remainder of the installation.

Secure any wires that you may choose, ensuring they are routed away from exhaust manifolds, cables, etc. You can seal the wiring harness to the

firewall or floorpan at this time when you are confident of the amount of wire required running into the engine compartment.

Install an air cleaner and you should be ready for operation. For de-icer and other applications an air horn adapter may be included with your kit. This adapter bolts down to the TBI unit and allows for a rubber coupling to attach it to the air cleaner assembly or a production type air cleaner opening to be adapted. On other applications a "bar" is necessary to allow a hold down point for the air cleaner assembly. These should be included with your kit.

Once you have installed your Affordable Fuel Injection system you will enjoy the modern technology of fuel injection for years to come. You will benefit from a low maintenance system that provides good drivability and adjusts for towing, altitude and other normal drive situations. The greatest advantage to EFI is dependability and drivability. EFI for the most part is relatively maintenance free once installed and working properly. The sensors are robust and provide for many hours of maintenance free operation. EFI also provides seamless drivability. The system supports all of your engine functions whether it is –20 deg. Or 100 deg, at sea level or 5,000 ft.

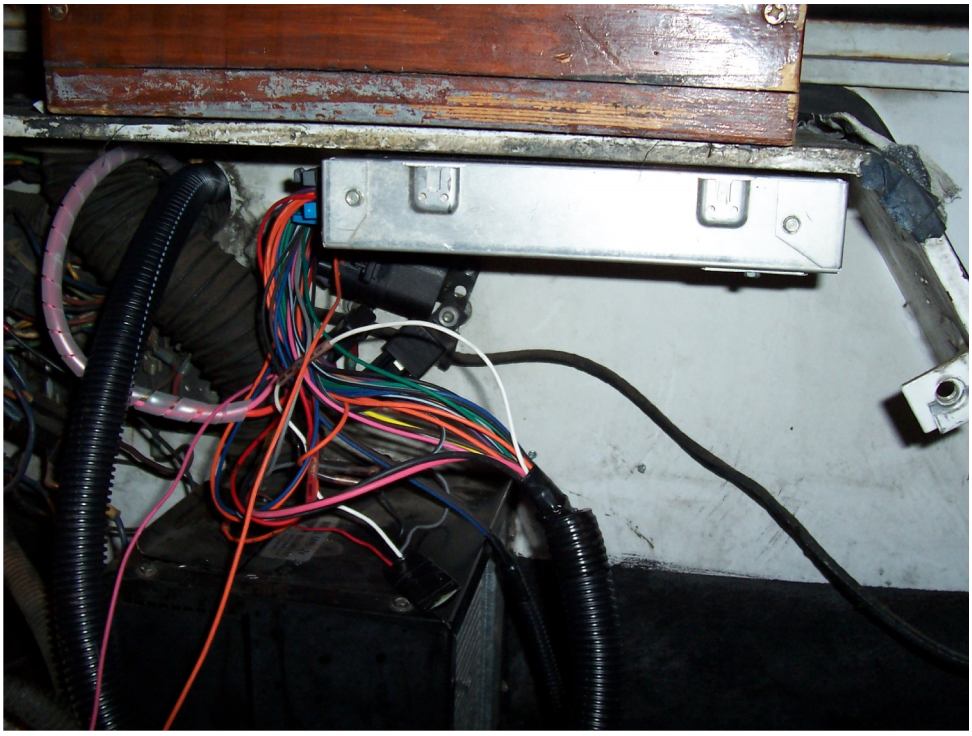
Thank you from Affordable Fuel Injection.

GSE EQUIPMENT FORD I-6 ENGINE

1100-49tch	Ford 300 Inline 6 with 1 bbl. adapter & tach filter for Tiger Baggage Tractor
1100-49tug	Ford 300 Inline 6 with 1 bbl. adapter & tach filter for Tug Baggage Tractor. Inc. Weatherproof enclosure and 8 Ft. wire harness.
1100-49ice	Ford 300 Inline 6 with 1 bbl. adapter & tach filter for De-icing machine. Includes weatherproof enclosure and 8 ft. wire harness.
1100-49ice2k	Ford 300 Inline 6 with 1 bbl. adapter & tach filter for Trump 2000 and 2002 De-icing machines. Includes weatherproof enclosure and 9 ft. wire harness.

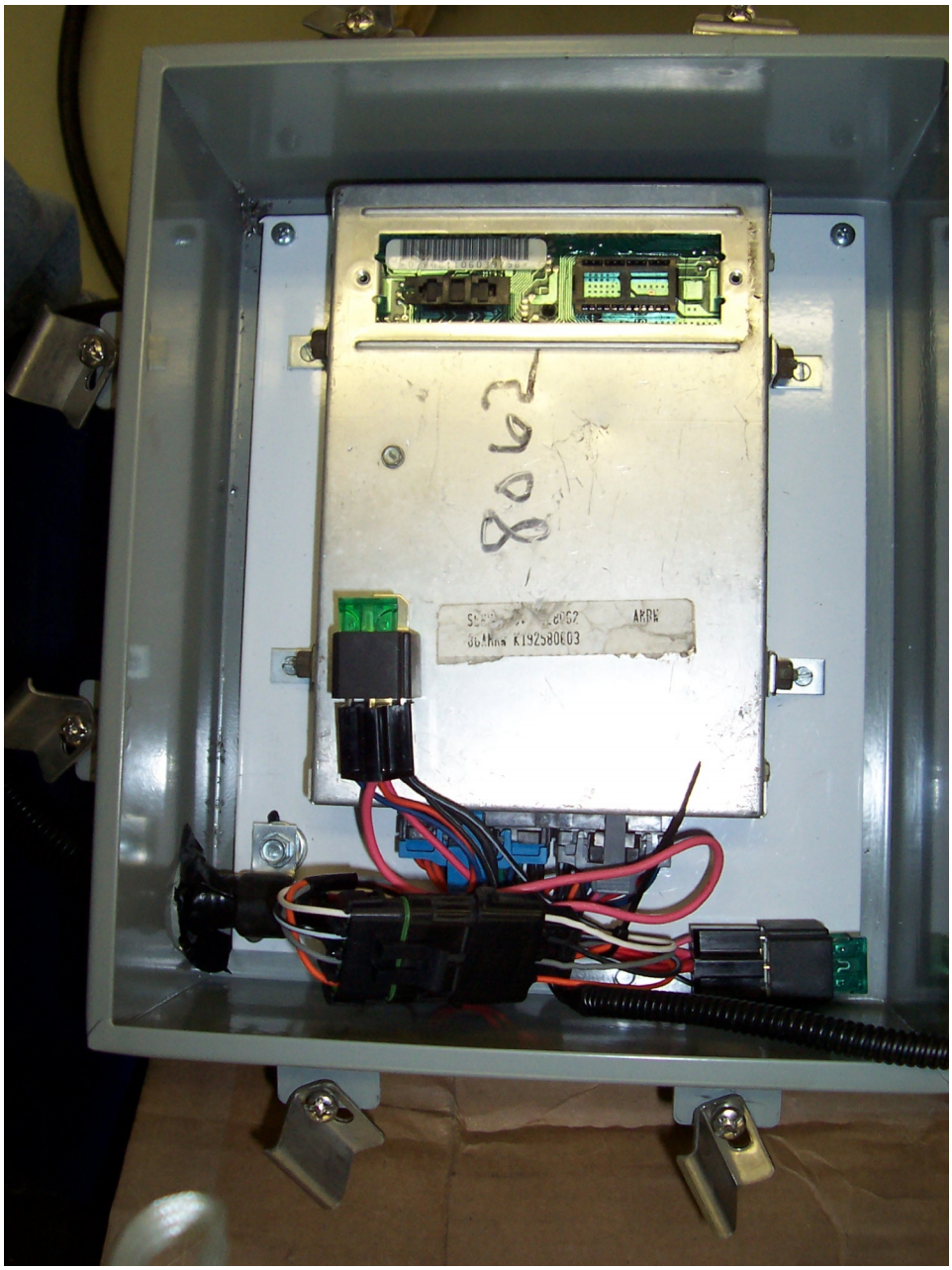
COMPONENT PARTS

	AFI #		GM #		Standard #
Harness Baggage Tractor	8315		-		-
Harness TUG Baggage Tractor	8318		-		-
Harness De-Icing Machine	8318a		-		-
ECM	E8062		1228062		EM8062
Calibration Chip	GSE6FFC		-		-
Tach Filter	7813		-		-
ECT	7302		15326386		TX3
MAP	7300		12569240		AS5
O2	7301		AF-12		SG12
TPS	7306		17106682		TH47
IAC	7309		17111826		AC15
Throttle body	7603		17088083		NRC7121 (NAPA)
Injector	7650		17089098		TJ14
Fuel Pressure Regulator	7704		17112481		PR152
Flange Gasket	1192F		10066605		FJG119
Manifold base gasket			-		
Fuel Pump	GYIP52		-		Bosch 0580254996 Carter P5001
Relay	7311		-		-
CE Light	7312		-		-
Adapter Plate	7107		-		-
Fuse Link	7314		-		-
Throttle cable barrell	100014		-		Bowman 100-014
Throttle Ball stud					
Fuel Filter	G7333		-		Fram G7333
Fuel Tube Feed	801401		-		PTC 801-401
Fuel Tube Return	801400		-		PTC 801-400
Air Cleaner 2" adapter	11085		-		-
ECM Enclosure	4KP03		-		Grainger 4KP03

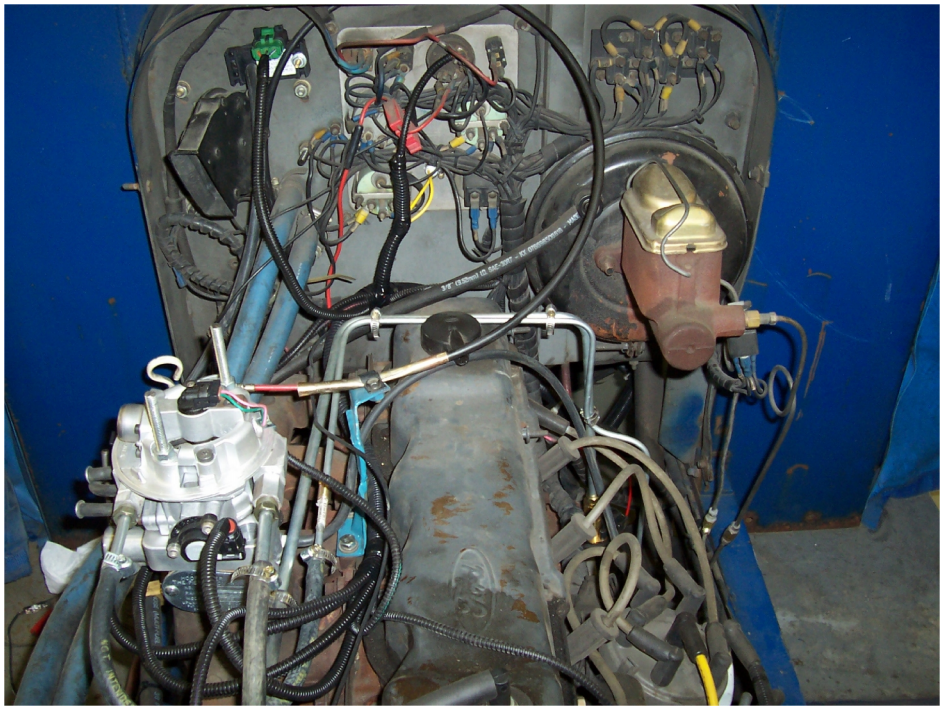


Typical ECM installation with baggage tractors equipped with a dash. This unit is a Tiger with enclosed cab. Similar installations can be performed with other type units and fastened with Velcro, bolts or other.

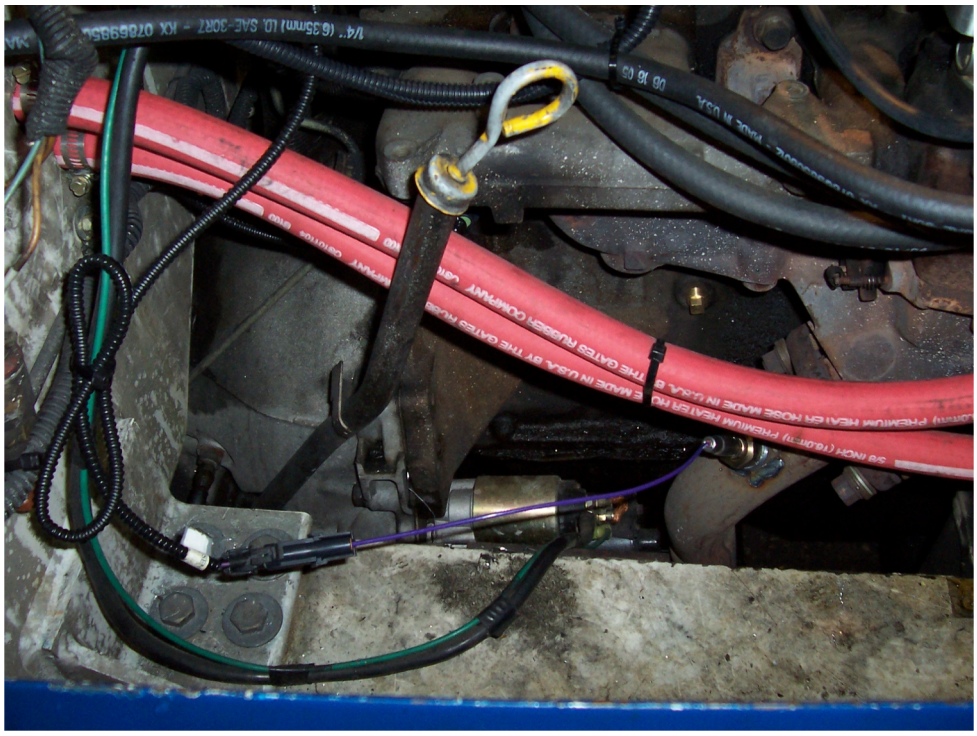
De-Icer's mount the ECM in weatherproof enclosure inside of rear compartment.



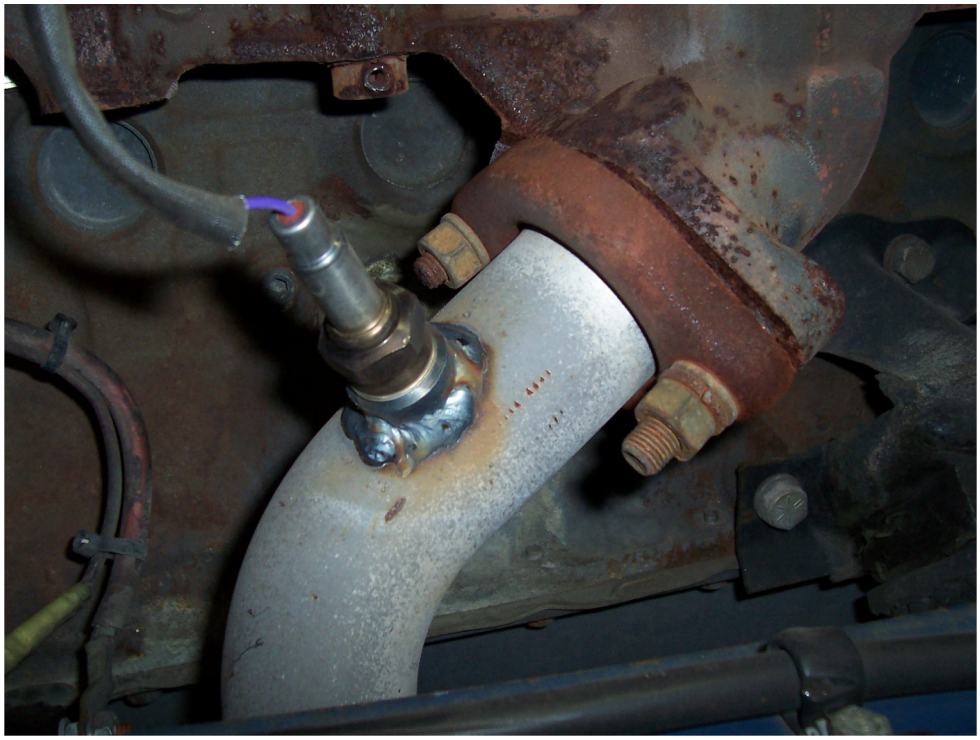
Typical ECM mounting in Weatherproof enclosure.

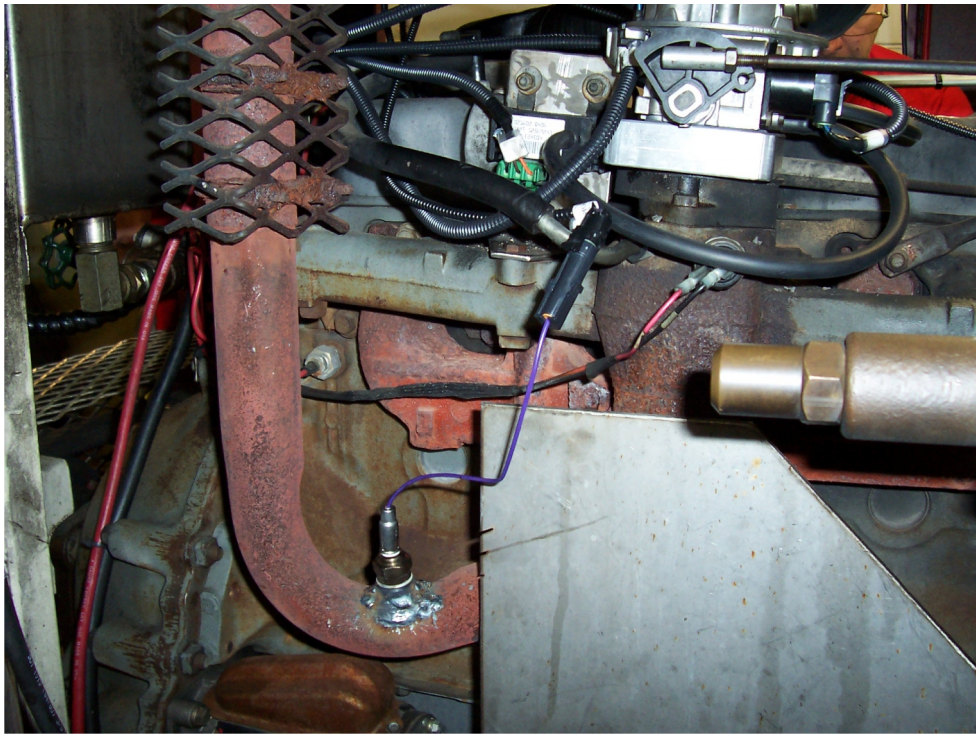


Typical fuel line routing. All units require a return fuel line back to the fuel tank. This application shows return line directly to the fuel tank to an existing port in the sending unit and secured to the frame.

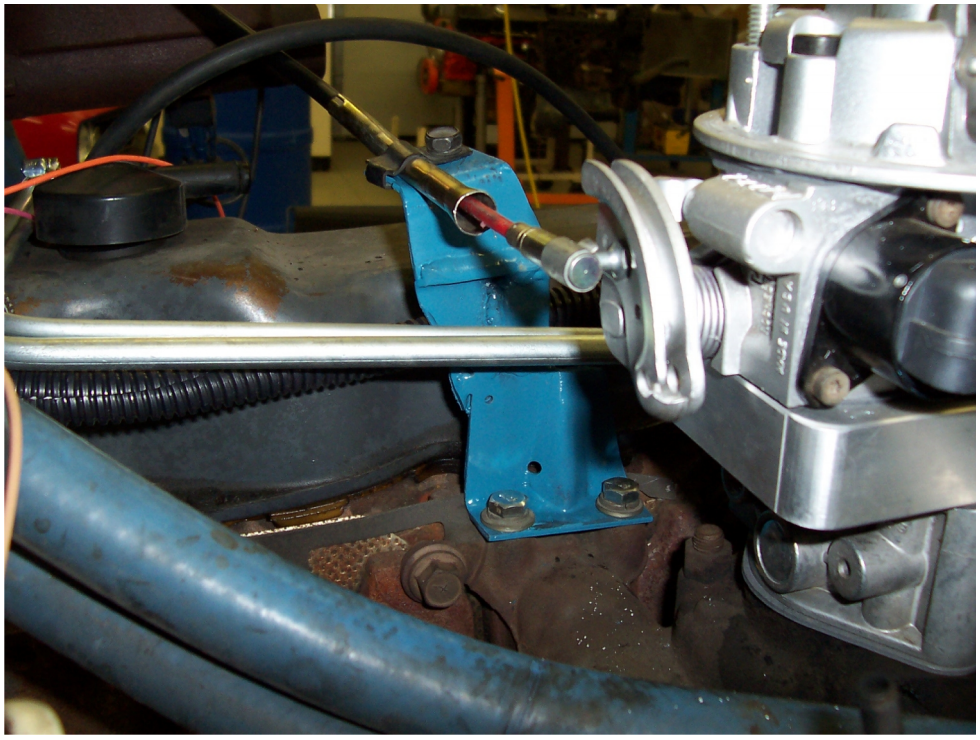


Typical O2 installation when tapped hole is not available in the exhaust manifold. An 18mm hole can be drilled and tapped into the standard O2 location in the exhaust manifold.

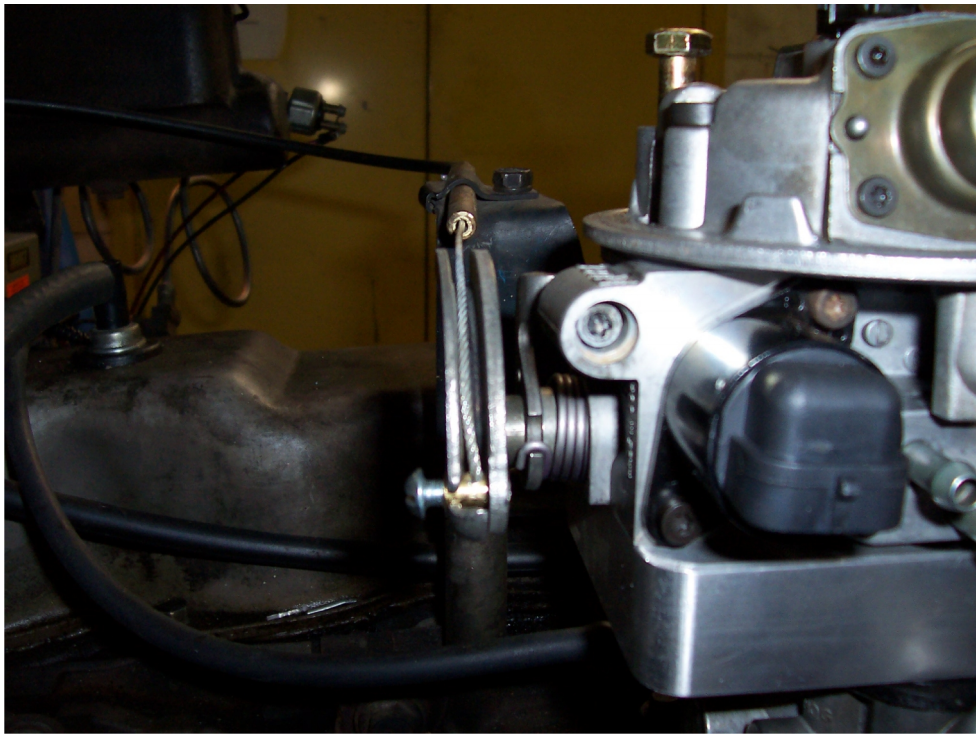




De-Icer O2 sensor installation

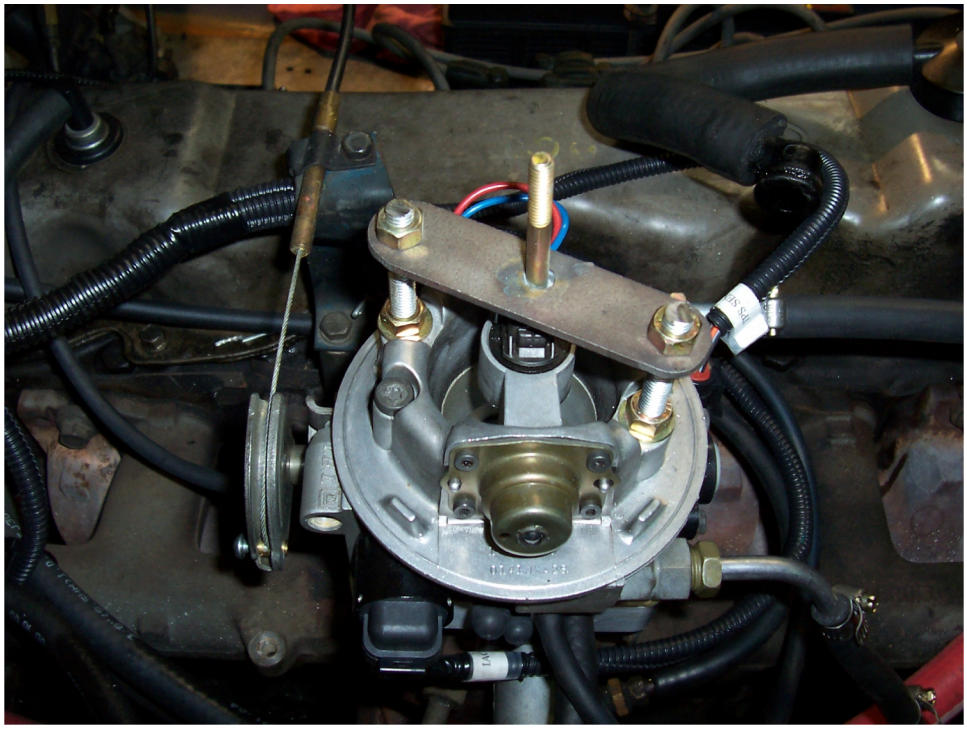


Ball stud application for attaching throttle cable. The throttle cable bracket may need to be modified and/or bent for proper cable alignment to the throttle cam.



"Barrel" cable type installation for throttle cable. This requires modifications to the cable.

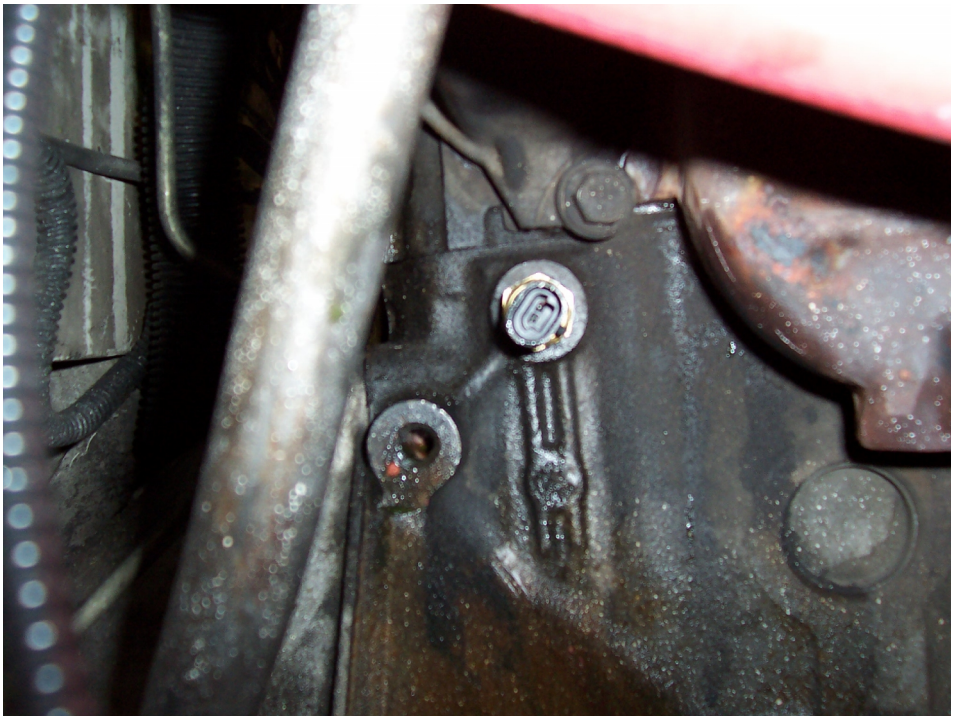
Air Cleaner adapter held down with studs for TBI unit.



Above: A bar with a welded bolt is required for some air cleaner hold down applications.

Solenoid connection, crank wire on crank side of starter solenoid and Battery power to the other side.

ECT installation, at the front of the engine under the thermostat or the rear of the engine in the block. The location must provide a constant flow of coolant past the sensor.



Troubleshooting your TBI Fuel Injection System

Most of the problems encountered while installing your fuel injection system or after a time of operation are very simple. If your check engine light is on you more than likely have a hard fault meaning something is grounded out, unplugged, operating out of range or has gone bad. See below for how to determine what the fault may be and code definitions.

With the addition of Fuel Injection to your engine it is important to remember that the basics are still there, necessary and have not changed. Batteries must be fully charged, charging systems fully operational, the ignition system is fully operational and the integrity of the engine is intact. All of these items are common to an engine and need to be in full operational condition regardless of the fuel system that has been added to your engine.

The ALDL connector allows for full diagnostics of your unit. A scan tool can be used and set up for a GM TBI application to read the data, or to check for stored codes. Consult a service manual or see below for any check engine light code definitions. You can use a late 80's or early 90's GM TBI definition. If you have access to a scan tool use a hook up for a 1990 350 cu. in. 5.7L Chevrolet truck. For some scan tools enter VIN 10th "L" 3rd "C" 8th "K".

If you have installed a Fuel Injection system in your vehicle and are having some initial issues here is a quick checklist to work from to get you started.

Pink Ignition wire MUST be connected to 12 volt switched ignition that receives power during crank and key on.

1. Check to make sure your check engine light is not on, or that it is on with the key on but the engine is not running.
2. Make sure that the red battery wire is connected to a battery source (It is highly recommended that this wire is connected directly to the battery) and the pink wire is connected to an ignition 1 source. If your ignition wire is not connected to an ignition 1 source your ECM will not be powered while cranking the engine.
3. Check that the ground wire is securely fastened to the block and that the interface between the block and the terminal is clean.
4. Ensure that there are **NO** vacuum leaks.
5. Ensure that your MAP sensor is connected to a full manifold vacuum source and not a ported source.
6. Set the ignition timing correctly making sure that you disconnect the set timing connector to set it. In some cases you cannot set the timing with the connector disconnected and keep the engine running. If this happens set timing to 15 degrees, allow the engine to fully warm up, then disconnect the set timing connector to set the base timing to the correct specification.

7. Ensure that you have full manifold vacuum routed to your fuel pressure regulator (if equipped on MPFI systems) and there are no vacuum leaks with this connection.
8. Check your fuel pressure to ensure that you are providing the proper pressure to the system.

Fuel Pressure is critical for proper operation. Fuel tank must be free from debris and fuel pressure needs to be constant and consistent.

Some aftermarket high density fuel filters can cause a large drop in fuel pressure under load and are not recommended for use with your system. If you are using one of these types of filters insure that you have proper fuel pressure during all modes of operation.

99% of all issues are usually taken care of with one or more of these 8 steps of diagnosis.

First and foremost the engine and fuel injection system must be free of vacuum leaks. Vacuum leaks are the leading cause of installation issues with your fuel injection system. Check all sources of potential vacuum leaks including components not related to the fuel injection system.

There are instances where the vacuum leak is coming from the adapter plate used to attach the throttle body to the manifold. If this is the case make sure that the seal is positive between the manifold and the adapter plate; also between the adapter plate and the throttle body. In some instances it is necessary to seal these with silicone to provide a positive seal.

Another common issue is a lack of good grounding. Many issues have been resolved simply by making sure that the ground path is secure and clean.

Fuel System Checks

Fuel Pressure is critical to the operation of a fuel injection system. Always check to insure that you have the proper fuel pressure. Fuel pressure should be a constant 10 – 15 PSI on a TBI fuel injection system and is typically around 12 – 13 psi. Higher pressure than 15 psi indicates that there is an issue with the installation. Many times this is due to kinked fuel lines, improper routing of the return line and/or fuel line restrictions. (See Part 3 of Troubleshooting guide #3) Many fuel tanks have fittings on them which are used for a fuel tank vent. These fittings are not suitable to use as a return line because they have a restriction in them and restrict the flow of fuel back to the tank. If you have installed your return line to a "vent" line you will need to route the return line in a different fashion.

Fuel pressure on a TBI unit should stay constant under all throttle conditions. There should be less than 1 psi of pressure difference from idle to WOT operation of the TBI unit. A pressure drop of more than 1 psi under these conditions indicates an issue with the fuel delivery system.

With retrofit fuel injection systems many times we are drawing fuel from gas tanks that are many years old; hence many years have passed where contamination can settle into the fuel tank. The electric fuel pump installed for a fuel injection system

will drawing a greater volume of fuel from your tank than your old system did. If there are any contaminants in the tank this many times will plug up or greatly restrict the flow of fuel to the system causing many issues.

Step by Step Troubleshooting guide.
Your fuel injection system has been pre calibrated to your particular vehicle. As long as the information about your engine was correctly stated, the system as received will provide many years of trouble free use. However from time to time problems are encountered with your fuel injection system. Here are a few commonly asked questions about fuel injection problems. Match the issue # with the chart below for an explanation of the issue and use the troubleshooting fault tree.

Use of this section may require a digital voltmeter, test light, fuel pressure gauge, timing light, tachometer and/or a diagnostic scan tool. If you are familiar with vehicles and how they are serviced you should be able to work through this section with no issues. In many instances you may want to have a professional automotive technician familiar with fuel injection repair to help you.

1. **My engine cranks but will not start.**
2. **My engine is running to lean, or is backfiring on acceleration.**
3. **My engine is running rich.**
4. **I do not seem to have as much power as I should.**
5. **I am getting a sag when I accelerate.**
6. **My engine takes longer to start than I think it should.**
7. **The fuel pump is not coming on when I first turn the key on.**
8. **The RPM on my engine does not come down when I come to an idle.**
9. **I am not getting as good of fuel economy as I think I should.**
10. **The engine is revving up and down when I come down to an idle. There is a large "sucking" sound coming from the throttle body when it is warmed up. My engine stalls or almost stalls when I come down to an idle.**
11. **My fuel pump is real noisy.**
12. **My check engine light does not come on when I turn the key on.**
13. **My check engine light is flashing fast all the time.**
14. **My check engine light is on when the engine is running.**

1. Engine cranks but will not start.

There is an assumption that the battery is at a full state of charge, the fuel tank has fuel in it and that all sensors are correctly connected and there are no trouble codes in the ECM.

1. **Does the injector spray fuel when cranking the engine?**

Yes – Go to step 2.
No - Remove one of the injector connectors from an injector. With a voltmeter or test light measure the voltage or validate power to the pink wire of the connector with the key on.
Yes – Pink wire has voltage, go to step 1a.
No – There is no power getting to the system. Check for proper connection to the battery, fuses are good, relays have been connected and seated properly. Correct the power

issue; if there is still no fuel spray when cranking the engine after this has been corrected go to step 1a.

1a. With the voltmeter or test light still connected crank the engine and verify voltage to the pink wire on the injector connector.

Results: "0" volts or the light goes out when cranking the engine.

The primary (pink) ignition wire is incorrectly connected to the vehicle. This is to be an ignition 1 (ING1) source which is power in both the key run and crank position. Correct the connection of this wire and verify voltage to the pink wire on the injector connector. Test again for fuel spray during crank. If the engine still cranks, is spraying fuel, but will not start go to step 2.

"Low volts, < 8" This is an indication of either a battery in a state of very low charge, a bad battery or too much resistance in the system.

-record the battery voltage while cranking at the battery.

-record the voltage at the pink wire of the injector connector while cranking the engine.

-compare these two voltages, they should be within .2 (2/10) volts of each other. If these voltages are greater than .2 there is a bad connection or too much resistance in the wire feeding the ECM.

-Correct the issue with low voltage. If cranking voltage is above 9 volts while cranking and there is still no fuel spraying the issue is in the fuel delivery system.

"9 volts or higher" this is normal cranking voltage. If there is no fuel spraying while cranking the issue is in the fuel delivery system or ignition system Trouble shoot the fuel system for improper operation (See Fuel System checks at the beginning of this guide). Troubleshoot ignition system, go to 1b.

1b. Your TBI fuel injection system fueling is "triggered" from the ignition system. It is assumed that the coil is operational, a 12 volt ignition 1 (IGN1) source is connected to the positive terminal of the coil for external coil applications or to the positive slot for coil in cap applications.

Remove plug wire and check for spark while cranking.

No Spark – Repair ignition system.

Has spark – Insure wire continuity between the ECM and the distributor or tach Filter. If fuel is still not spraying go to fuel system troubleshooting before replacing any components. If all wires are in tact and routed correctly and all fuel system checks are correct, replace distributor module or tach filter.

2. Perform the fuel system checks found at the beginning of this troubleshooting Guide. If the fuel pressure and fuel system are operating as required Insure that the check engine light is on with the key on but the engine not running and there are no stored codes (except for code 42 if you have just set the ignition timing or code 12). If you have installed a new distributor, removed the distributor for any reason your ignition timing may be off too much to operate the engine properly. Disconnect the connector(s) from the injectors and set the ignition timing to its proper setting while cranking the engine. Assumption here also is that the timing mark on the balancer is lined up with TDC of #1 cylinder and that the distributor is seated properly and not 180 degrees off. If all of this checks OK go to step 3.

3. Measure the voltage on the throttle position sensor. If using a scan tool you can read TPS, if not measure the voltage. To measure the throttle position voltage check between

the brown wire and the black/white striped wire on the TPS with the TPS still connected and the key on. DO NOT PUNCTURE THE WIRES to measure this voltage and only use a digital voltmeter. Voltage can be measured by back probing the TPS connector between these wires either with a thin paper clip or appropriate tool used for this type of measurement.

If you have gone through all of the above procedures and the engine still will not start you will need to call tech support. In many cases the specifications of the engine are different than what was originally discussed or assumed. When you call tech support you will need to have the following information available.

Fuel pressure at the inlet of the TBI unit_____
Return line fuel pressure_____
Voltage measured at the battery while cranking_____
Voltage measured at the pink wire on the injector while cranking_____
Voltage measured at the TPS sensor key on engine off_____
Codes stored in the ECM
Any information that you feel is important for diagnosing the issue at hand.

2. My engine is running to lean, or is backfiring on acceleration.

Assumption here is that all plug wires are installed properly, the secondary ignition system (plug wires, coil, cap and rotor) is in good operating order and the engine is in good order.

Perform fuel system checks found at the beginning of this guide.

Check initial ignition timing again.

If the timing is OK check to insure that the timing is advancing as it should with throttle lever actuation.

If the fuel system checks performed are OK and the initial ignition timing is OK we may not have been given the proper information to build your system and you will need to call tech support.

If you have gone through all of the above procedures and the engine is still running lean or is backfiring on acceleration you will need to call tech support. In many cases the specifications of the engine are different than what was originally discussed or assumed. When you call tech support you will need to have the following information available.

Fuel pressure at idle_____
Fuel pressure while briefly accelerating the engine to WOT_____
Return line fuel pressure_____
Voltage measured at the battery while running_____
Engine operational temperature_____
Initial ignition timing_____

Timing at 2000 RPM_____
Any information that you feel is important for diagnosing the issue at hand.

3. Engine runs too rich.

Check for vacuum leaks and insure that all vacuum leaks are corrected and sealed. If the engine is also running at a higher than expected idle this is a good indication of a vacuum leak as well.

1. Is the vacuum line to the MAP sensor securely fastened to both the MAP sensor port and the port on the throttle body?

Yes, If engine is still running rich go to step 2.
No – Repair leak, kink or routing, is engine still running rich? If yes go to step 2.

2. Is the MAP sensor connected to a full manifold vacuum port? For 2 bbl. units this will be the port on the back of the throttle body between the two fuel lines or the far left port on the front side of the throttle body as you are looking at the front of the throttle body. (see picture) On a 1 bbl. unit this is one of the far left ports

Yes – If engine is still running rich go to step 3.
No – Correct the vacuum source issue, if the engine is still running rich go to step 3.

3. Is the fuel pressure measured at 12 psi "+" or "-" 1 psi while running?

Yes – If the engine is still running rich go to step 4.
No – Is the return line connected to an unrestricted return port on the fuel tank?

Many fuel tanks have a port on the fuel tank that is for a fuel vent. These ports are not adequate for a fuel return. There is an orifice in these ports that will restrict the flow of fuel. Check that you have not used a vent port for the fuel return line.

No – Go to step 3a.
Yes – Fuel is being returned to a vent line. Re-route fuel return line to a non orificed port or fabricate a free flowing return line port to the fuel tank or fuel return. If still running rich go to step 3a.

3a. Measure return line fuel pressure. This pressure should be less than 3 psi, if not there is a restriction in the return fuel line. If return fuel line pressure is less than 3 psi and the engine is still running rich go to step 4.
If return line pressure is not less than 3 psi there is a restriction in the fuel line Find and repair the restriction until the fuel pressure on the return line is less than 3psi. In some cases this requires a larger diameter fuel return line. Go to step 3b to help determine root cause of increased return line pressure.

3b. Remove the fuel return line and attach a length of rubber hose of sufficient length to run into an approved gasoline container. Run engine and recheck fuel pressure on both the feed side and the return side. If both sides are within the above ranges there is a restriction in the fuel delivery system that needs to be repaired.

4. Does the engine have a fully operational thermostat?

Yes – insure that the engine will reach 180 deg. in a reasonable time, go to step 5.
No – Install new thermostat, proper size thermostat will be 190 – 195 degrees. If still running rich go to step 5.

5. **Is the coolant sensor installed in a portion of the engine or the cylinder block which provides a constant flow of coolant over the tip of the sensor?**

Yes –Go to step 6.
No – Reinstall the coolant sensor in a different location to insure constant flow of coolant over the sensor. If still running rich go to step 6.

6. **Is the charging system operating properly and is the voltage measured at the battery and the injector 13 volts or higher with the engine running?**

Yes – Go to step 7.
No – Repair charging system. Note the discussion about older style AC Delco single wire alternators. If still running rich after reparing go to step 7.

7. **If you have gone through all of the above procedures and the engine is still running rich you will need to call tech support. In many cases the specifications of the engine are different than what was originally discussed or assumed. When you call tech support you will need to have the following information available.**

Fuel pressure at idle_____
Return line fuel pressure_____
Voltage measured at the battery while running_____
Voltage measured at the pink wire on the injector while cranking.
Engine RPM at start up idle on a cold start_____
Engine RPM at idle with stabilized temperature_____
Engine operational temperature_____
Initial ignition timing_____
Any information that you feel is important for diagnosing the issue at hand.

4. I do not seem to have as much power as I should.

Verify that you have set your timing properly by disconnecting the set timing connector, setting the timing to the specified value, reconnecting the connector and shutting the engine off and starting it back up before proceeding. For tach filter applications insure that the timing is set to factory specifications and that both the mechanical and vacuum advance units are operating properly. In some instances you can advance your timing an additional 4 – 5 degrees and evaluate. If you do not have any spark knock this setting may be OK for your application. Evaluate for spark knock and return the ignition timing back to its base at any time you may encounter spark knock.

Ensure that your plug wires are properly connected with the correct firing order.

Your fuel pressure may be insufficient; see fuel system checks at the beginning of this guide.

Verify that there are no vacuum leaks and that the MAP sensor is properly connected.

5. I am getting a sag when I accelerate.

Timing is a critical issue with sags. Verify that your timing is correctly set by disconnecting the set timing connector and properly setting the timing; see #4 also.

Fuel pressure is not adequate for proper operation, make sure that there is no contamination in the tank or your fuel filter is plugged. (See Fuel System check above). A plugged fuel filter may be an indication of a contaminated tank.

Bad ground to the block, insure that the surface that you are making the connection to on the block is clean and making a positive connection.

Your O2 sensor may be contaminated, bad or not properly installed in the exhaust.

You may have left out some of the important specifications for the proper calibration chip to be made.

If you have gone through all of the above procedures and the engine is still sagging on acceleration you will need to call tech support. In many cases the specifications of the engine are different than what was originally discussed or assumed. When you call tech support you will need to have the following information available.

Fuel pressure at idle_____
Fuel pressure when throttle is blipped to WOT _____
Return line fuel pressure_____
Voltage measured at the battery while running_____
Voltage measured at the pink wire on the injector while cranking.
Engine RPM at start up idle on a cold start_____
Engine RPM at idle with stabilized temperature_____
Engine operational temperature_____
Initial ignition timing_____
Any information that you feel is important for diagnosing the issue at hand.

6. My engine takes longer to start than I think it should.

Check for vacuum leaks, this is the most common cause.

Make sure that your timing is set correctly; see Troubleshooting point #4.
Fuel pressure is not adequate for proper operation. See Fuel System Checks at the beginning of this guide.

Fuel pump relay is not coming on or is faulty.

On a TBI system verify that the crank wire is connected to the crank side of the ignition switch or the crank side of the starter solenoid.

Check that the MAP sensor is properly connected to a full manifold vacuum source. Ensure that the vacuum source to your MAP sensor is free from restrictions and has a secure connection.

Throttle plates are not adjusted properly not allowing an adequate amount of air for starting the engine. Go to Troubleshooting guide #10 and verify the adjustment.

Throttle position sensor is out of adjustment or faulty. Throttle position voltage with throttle fully closed with the key on should be .5 volts +,- .2 volts.

If you have gone through all of the above procedures and the engine is still sagging on acceleration you will need to call tech support. In many cases the specifications of the engine are different than what was originally discussed or assumed. When you call tech support you will need to have the following information available.

Fuel pressure at idle_____
Voltage measured at the battery while running_____
Voltage measured at the pink wire on the injector while cranking_____
Voltage measured between the black wire and brown wire on the TPS with the key on engine not running_____
Engine RPM at start up idle on a cold start_____
Engine RPM at idle with stabilized temperature_____
Engine RPM at idle with IAC fully seated or blocked off._____
IAC counts at stabilized idle in drive if using a scan tool_____
Engine operational temperature_____
Initial ignition timing_____
Any information that you feel is important for diagnosing the issue at hand.

7. The fuel pump is not coming on when I first turn the key on.

Is the check engine light on with the key on engine off? (Assumes check engine light is connected properly, see installation instructions to verify check engine light installation)

Yes - Go to step 1.
No – Check for proper installation of check engine light.

a. Check fuses to insure that they are not blown. If fuses are OK go to b.
b. Check voltage at check engine light, if 12 volt are not present the check engine light is not connected properly. If 12 volts are present either the ECM is not powered properly or is defective.

1. Insure that the IGN1 wire is not connected to a battery feed.
   a. Check pink wire to the power relay and/or the pink wire powering up the injector(s) to insure there is no voltage with the key off. If voltage is present with the key off the pink wire is not properly connected or the power relay is bad.
      a. Check fuel pump relay for proper operation.
         - Turn ignition off for at least 15 seconds.
         - Connect voltmeter or test light to the blue wire at the fuel pump relay.

- Turn ignition on, voltage should be present at this wire for the first 2 or 3 seconds after turning on the ignition switch.
- If voltage is not present either the ECM is not powered or grounded properly or the ECM is faulty.
- If voltage is present check for voltage at the fuel pump with the same type of operation.
- If voltage is not present at the fuel pump check the wiring, if wires appear to be OK replace the fuel pump relay.
- If voltage is present verify the ground for the fuel pump is sufficient and securely fastened. If fuel pump ground is OK the fuel pump is defective.

If you have gone through all of the above procedures and the fuel pump is still not coming on when you turn the key on you will need to call tech support. When you call tech support you will need to have the following information available.

Voltage measured at the check engine light with key on engine off_____
Voltage measured at the pink wire on the injector while cranking_____
Voltage measured at the pink wire on the injector with the key off_____
Voltage measured at the blue wire at the fuel pump relay at first 3 seconds of the key on_____
Voltage measured at the pink wire to the fuel pump at the first 3 seconds of the key on_____
Voltage measured with voltmeter between the black wire and pink wire on the fuel pump for the first 3 seconds of the key on_____
Any information that you feel is important for diagnosing the issue at hand.

8. The RPM on my engine does not come down when I come to an idle.

- More than likely you have a large vacuum leak, verify that your system is free from vacuum leaks.
- Check that all non used vacuum ports are plugged.
- Verify that the bolts holding down your throttle body are not protruding through the bottom of the adapter plate causing the plate to lift off its base.
- Your ignition wire is connected to a battery source and not an ignition 1 source.
- The engine has not come to full operating temperature as of yet.
- Your thermostat is inoperable or opens at too low of a temperature. You should be using at least a 180° stat.
- Throttle cable or throttle on the throttle body is not coming to a complete close. Throttle plate is binding in the throttle bores.
- The throttle plates are adjusted too far out, see procedure #10 for proper adjustment sequence.
- IAC is not working, either faulty or there is a wiring issue.

If you have gone through all of the above procedures and the engine is still idling too high you will need to call tech support. When you call tech support you will need to have the following information available.

Voltage measured between the black wire and brown wire on the TPS with the key on engine not running_____
Engine RPM at start up idle on a cold start_____
Engine RPM at idle with stabilized temperature_____
Engine RPM at idle with IAC fully seated or blocked off._____
IAC counts at stabilized idle in drive if using a scan tool_____
Engine operational temperature_____
Initial ignition timing_____
Any information that you feel is important for diagnosing the issue at hand.

9. I am not getting as good of fuel economy as I think I should.

If all is set up properly with the installation of your fuel injection system you are probably getting as good of fuel economy as you are going to get.

1. Insure that your timing is set properly
2. Your thermostat is in good working order
3. Your fuel pressure is at the specified pressure (see fuel system check at the beginning of this guide.
4. You may have other factors such as tires, brake drag or other external issue from the fuel injection system that is not working properly.
5. Re-evaluate your driving habits and insure that you are driving in a fashion that will provide you optimum fuel economy. If you are trying to race everyone from the light chances are you will not get the fuel economy that you expect.

If you have gone through all of the above procedures and you still feel that you should be getting better fuel economy you will need to call tech support. In many cases the specifications of the engine are different than what was originally discussed or assumed. When you call tech support you will need to have the following information available.

What is the Fuel Economy that you are getting_____
What is the Fuel Economy that you are expecting_____
Voltage measured at the battery while running_____
Voltage measured between the black wire and brown wire on the TPS with the key on engine not running_____
Engine RPM at idle with stabilized temperature_____
Engine operational temperature_____
Initial ignition timing_____
Trouble Codes from the ECM (see #14)_____
Any information that you feel is important for diagnosing the issue at hand.

10. The engine is revving up and down when I come down to an idle. There is a large "sucking" sound coming from the throttle body

when it is warmed up. My engine stalls or almost stalls when I come down to an idle.

This is usually an indication of a vacuum leak; again make sure that you have no vacuum leaks.

This could also be an indication of the wrong base ignition timing. Verify that you have set your ignition timing correctly (see #4).

Your engine may also require more air going through the throttle plates at idle than it is currently set for. Here is a procedure to check this setting.

a. Make sure your engine temperature is at full operating temperature.

b. Jumper Pins A & B of the ALDL connector (I use a paper clip) with the key on but the engine off. This is the same thing you do when checking for engine codes and your check engine light will flash off and on.

c. Wait about 45 seconds or until any trouble codes present have flashed through; code 12 is normal (see #14) After this then unplug your IAC valve which is on the throttle body but do not turn off the key.

d. Remove the jumper from the ALDL, turn the key off, wait 15 seconds and start the engine. It may start hard and you may have to depress the throttle pedal a little bit to start the engine.

e. If you have a fast idle this did not work or you have a vacuum leak that is not repaired, or the throttle plates are already too far open. You may have to tape over the fresh air hole that the IAC receives its air from.

f. If you do not have a fast idle then it is OK and you can proceed to adjust the throttle plates. Let the engine idle for a little bit and then check you idle speed. The speed should be about 575 – 600 at idle in drive or about 50 rpm less than you requested for your chip. If it is lower than this you can raise the idle up or if it is above this determine if you should bring the speed down. More than likely it will always be lower.

g. There is a little cap on the side of the throttle body by your throttle lever that has an adjustment screw under it (if not already removed).

h. Remove this cap and use the screw under there to adjust your base idle speed without the IAC operational. Base idle is to be set in drive for an automatic transmission.

i. If you have done all of this and you still have an issue we may not have received all of the proper information to build your chip and you will need to call tech support.

If you have gone through all of the above procedures and the engine is still idling too high you will need to call tech support. When you call tech support you will need to have the following information available.

Voltage measured between the black wire and brown wire on the TPS with the key on engine not running_____
Engine RPM at start up idle on a cold start_____
Engine RPM at idle with stabilized temperature_____
Engine RPM at idle with IAC fully seated or blocked off._____
IAC counts at stabilized idle in drive if using a scan tool_____
Engine operational temperature_____
Initial ignition timing_____

Any information that you feel is important for diagnosing the issue at hand.

11. My fuel pump is real noisy.

If your fuel pump is real noisy you may not have isolated it from the body or the frame real well. Isolation brackets were provided with your fuel pump. If these are properly installed it should isolate any radiated noise from the pump. If this is insufficient you may need to isolate it more with some rubber grommets.

We have also diagnosed noisy fuel pumps with fuel return lines being too small. By stepping up the size of the return line you may eliminate fuel pump noise after the other items have been addressed. Fuel pump noise also can radiate through the fuel lines to the frame or body of the vehicle. Insure that the fuel lines are isolated as well if need be to eliminate the noise.

A noisy fuel pump can also be an indication that it is starving for fuel. Insure that all filters are in good order and that the fuel tank sock is clean. Prolonged fuel starvation will damage the fuel pump and not allow proper flow; it may also radiate a lot of noise.

12. My check engine light does not come on when I turn the key on.

Your check engine light should illuminate when you turn the key to the on position for a bulb check.
Check for proper installation of check engine light.

a. Check fuses to insure that they are not blown. If fuses are OK go to b.
b. Check voltage at check engine light, if 12 volt are not present the check engine light is not connected properly. If 12 volts are present either the ECM is not powered properly or is defective.
c. If the fuse is OK insure that you are receiving 12 volts to the ECM where indicated (see wiring diagram provided) If you are not receiving 12 volts to the ECM something in the vehicle's power circuit is not connected properly.
d. If 12 volts is available at the proper cavities of the ECM please check that you have a proper ground circuit to the engine block.

If you have gone through all of the above procedures and the fuel pump is still not coming on when you turn the key on you will need to call tech support. When you call tech support you will need to have the following information available.

Voltage measured at the check engine light with key on engine off_____
Voltage measured at the pink wire on the injector while cranking_____
Voltage measured at the pink wire on the injector with the key off_____
Any information that you feel is important for diagnosing the issue at hand.

13. My check engine light is flashing fast all the time.

A constant rapid flashing check engine light indicates that you have a fault in the ECM and it is operating in back up or limp home mode. Make sure that the calibration chip is in the ECM and there are no bent pins on the chip. If the chip is properly installed and there are no bent pins the ECM or the chip is faulty and needs to be replaced or repaired.

14. My check engine light is on when the engine is running.

A check engine light indicates a hard fault with your fuel injection system.

Insure that all of your sensors are connected, you have a good ground and that no wires are pinched.

Also insure no vacuum leaks and that your MAP sensor is connected to a full manifold vacuum source.

If all of these steps indicate a proper installation and no issues you will need to read the codes from the memory area of the ECM and follow the diagnostic procedures for that particular code.

If you have a scan tool this is very easy. If you do not have a scan tool you can use your check engine light to output the fault codes. Below you will find this procedure along with a definition of all the different fault codes that can be output.

THE CONNECTOR

```
--------tab------------
| F  E  D   C   B   A |
| M  L  K   J   I   H |
-----------------------
```

To Display Trouble Codes

Run a wire (I use a paper clip that is in a "U") from Pin A to Pin B with the ignition on but the engine not running. The "Check Engine " light will flash in the following sequence: flash, pause, flash-flash, long pause flash, pause, flash-flash, long pause flash, pause, flash-flash, long pause. This is a code "12" which will always be there. After this series of flashes and pauses any stored trouble codes will now flash. If you do not see the "12" flash three times, your diagnostic circuit is defective.

Vehicles will display stored trouble codes, then "12" again, followed by energizing "most system controlled relays." The fuel pump relay will not energize. The idle air control valve will fully extend to enable checking minimum idle speed.

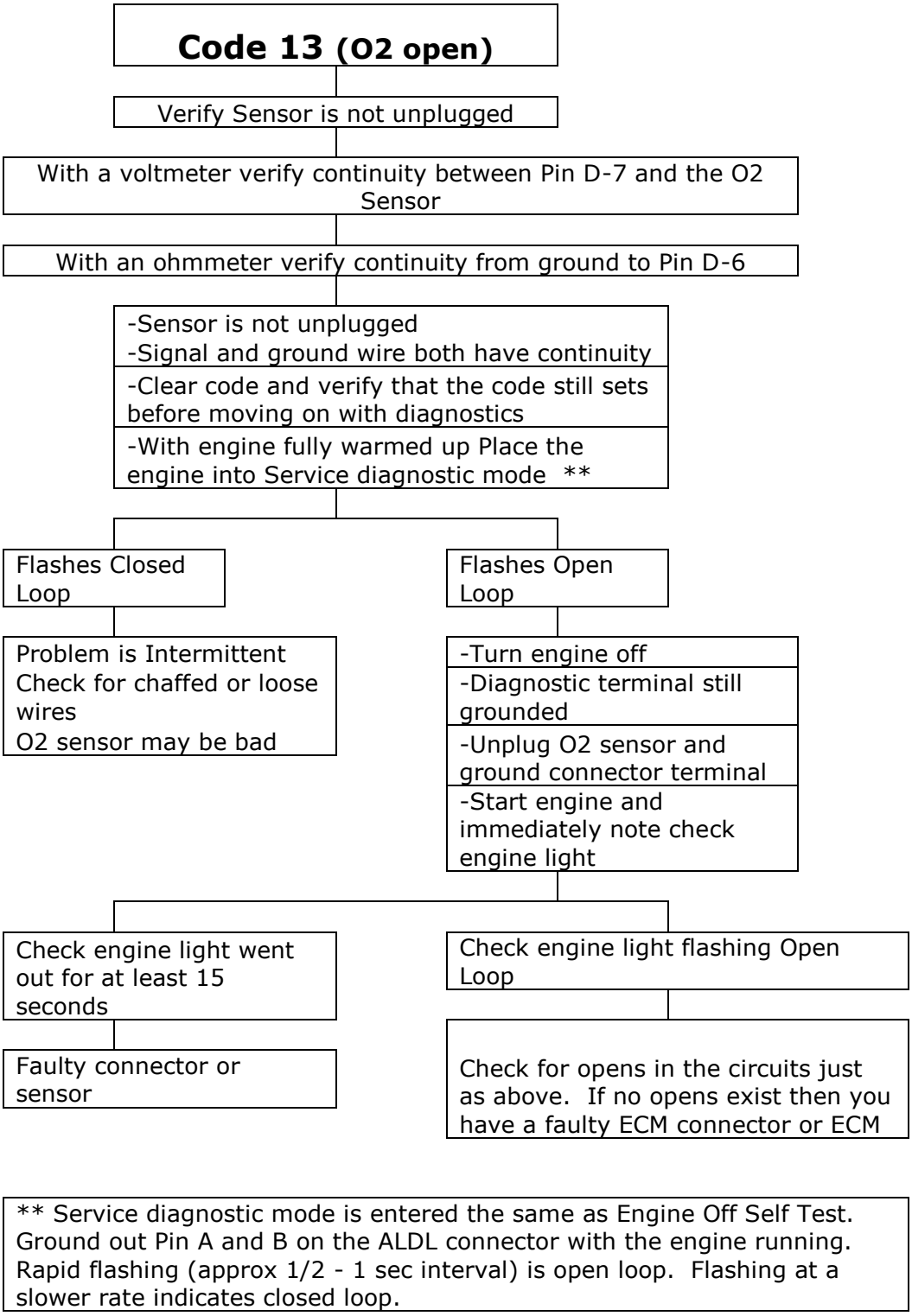
CLEARING THE TROUBLE CODES

Turn the keyswitch to the off position. To clear any trouble codes, disconnect the battery for 30 seconds or unplug the connectors to the ECM. If this is done at the battery, and your car stereo is equipped and programmed with a four digit pin code, you may have to re-enter that as well to use your stereo again. A better place to remove power is at the fuse.

TROUBLE CODES

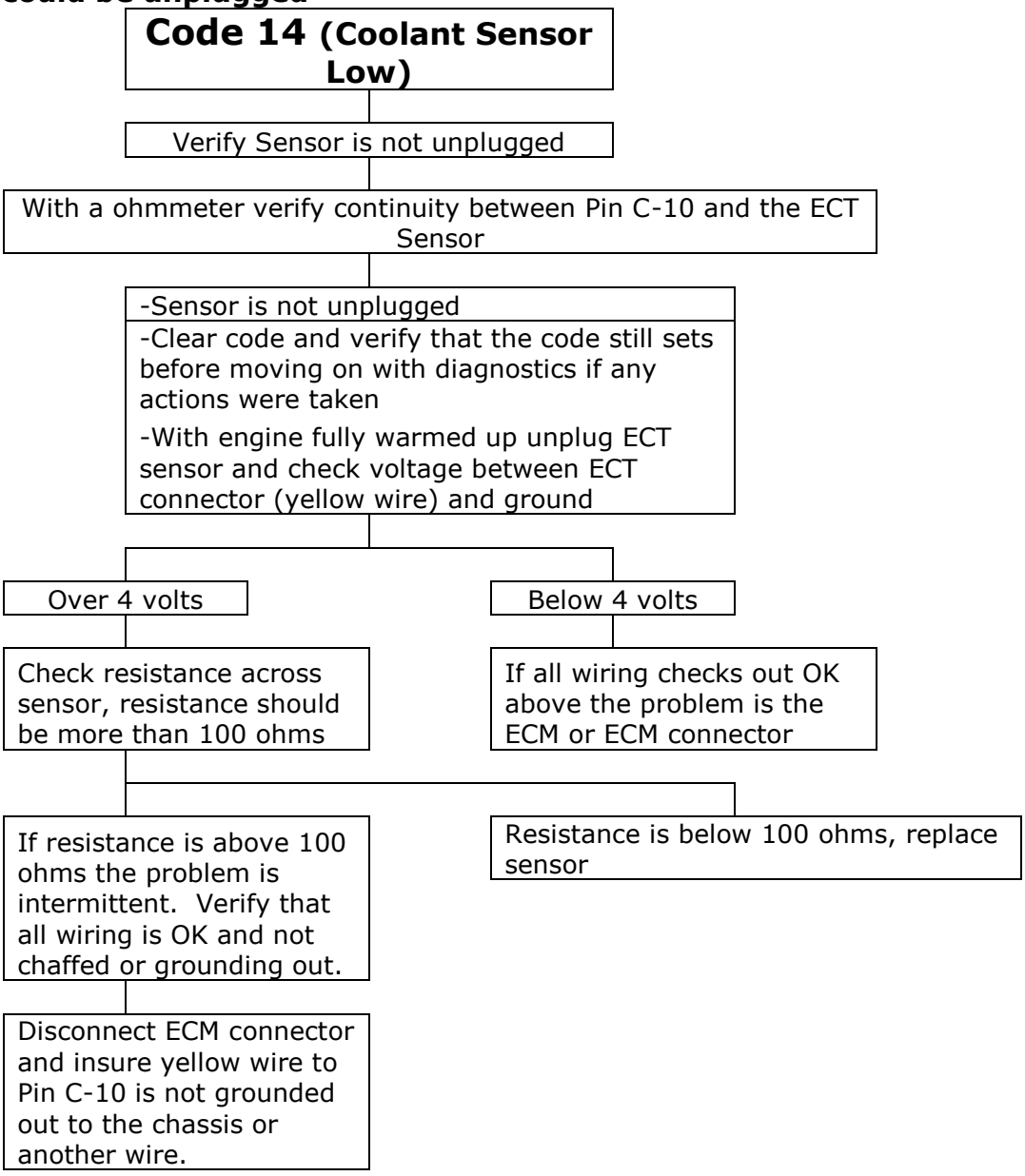
12. No reference pulses to Electronic Control Module (ECM). The code is always flashed when checking codes and only indicates that the engine is not running.

13. Oxygen sensor signal stays lean during warm engine cruise, your O2 sensor could be unplugged.

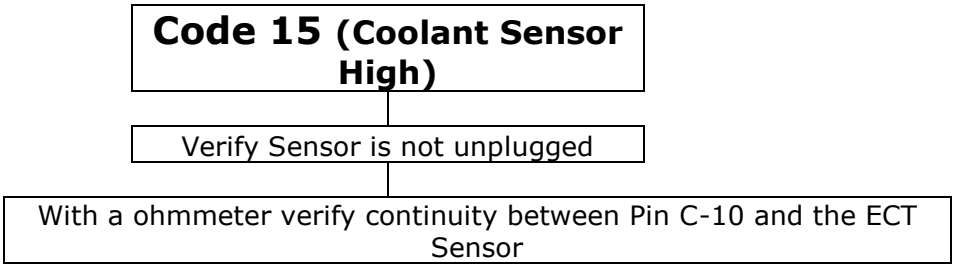


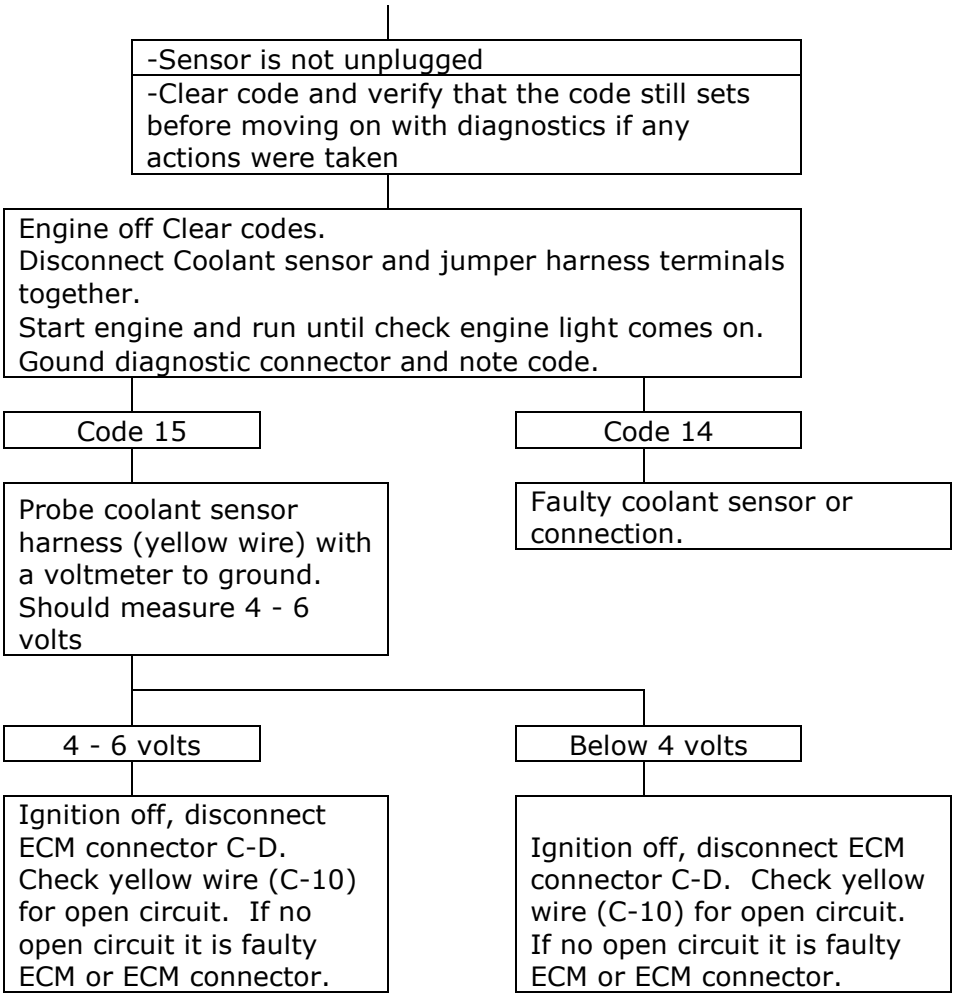
** Service diagnostic mode is entered the same as Engine Off Self Test. Ground out Pin A and B on the ALDL connector with the engine running. Rapid flashing (approx 1/2 - 1 sec interval) is open loop. Flashing at a slower rate indicates closed loop.

14. High temperature indicated at engine coolant temp. sensor. Sensor could be unplugged

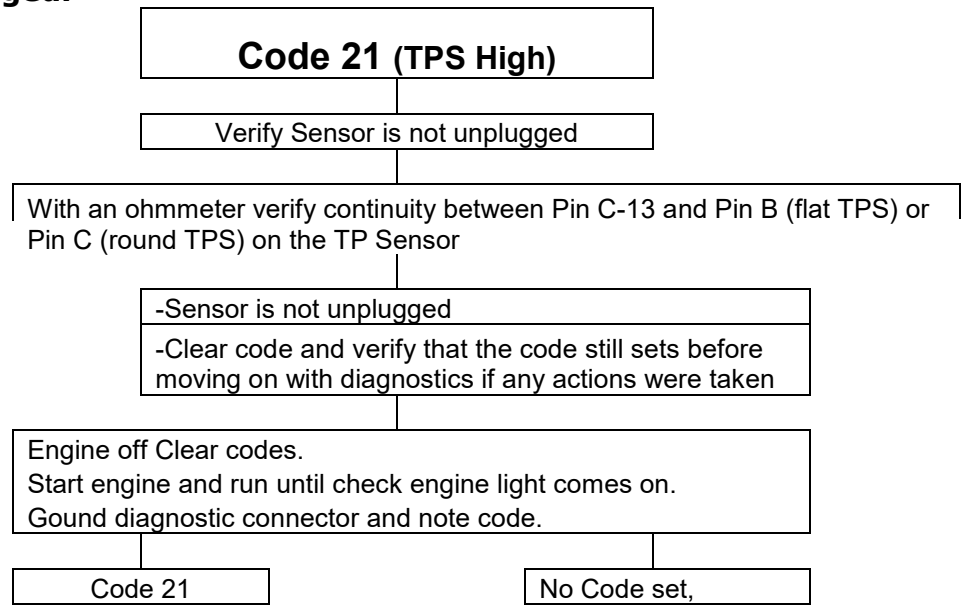


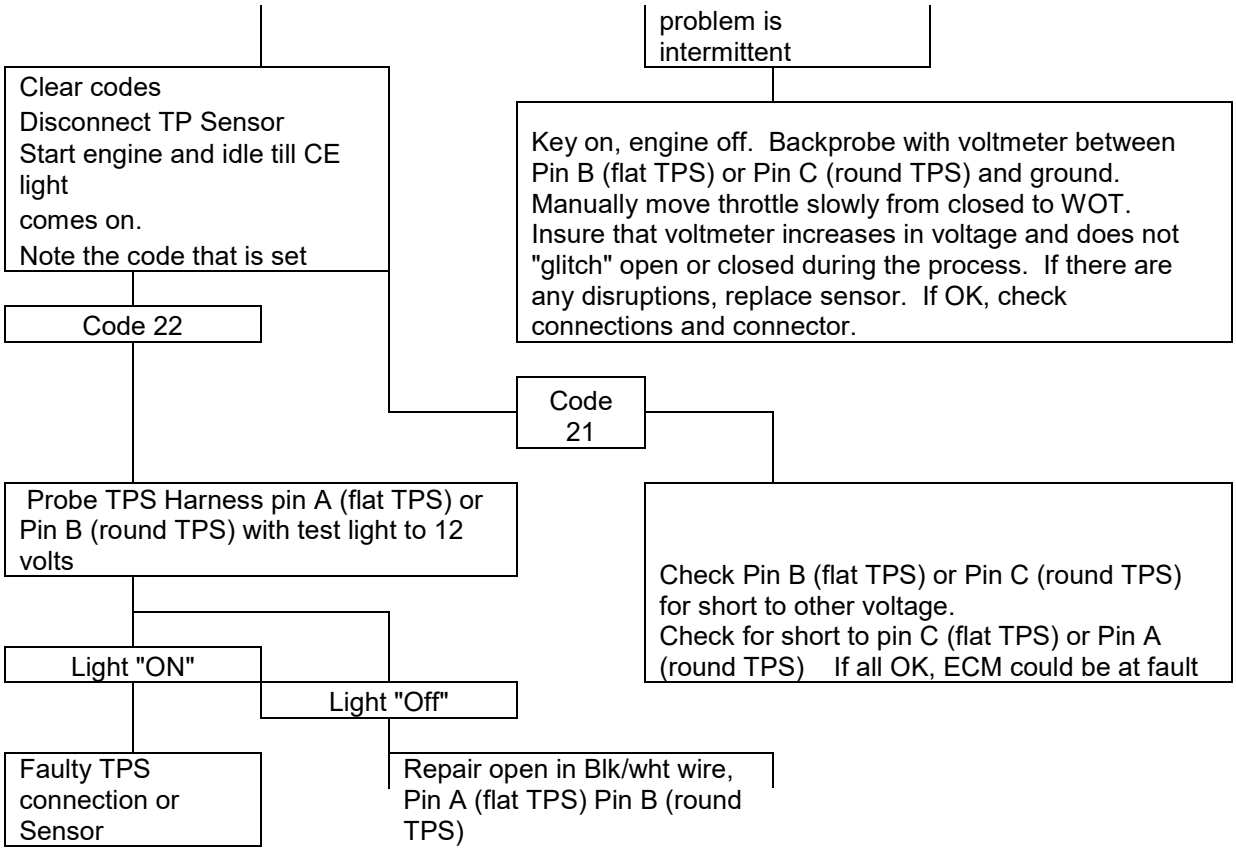
15. Low temperature indicated at engine coolant temp. sensor



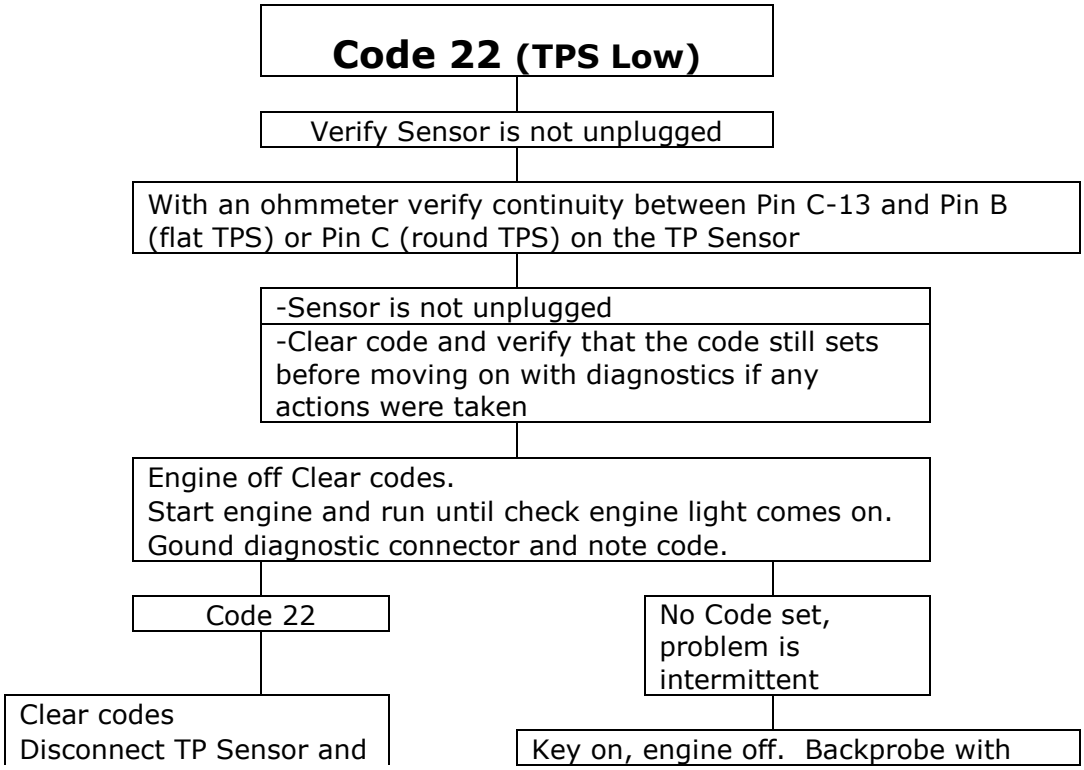


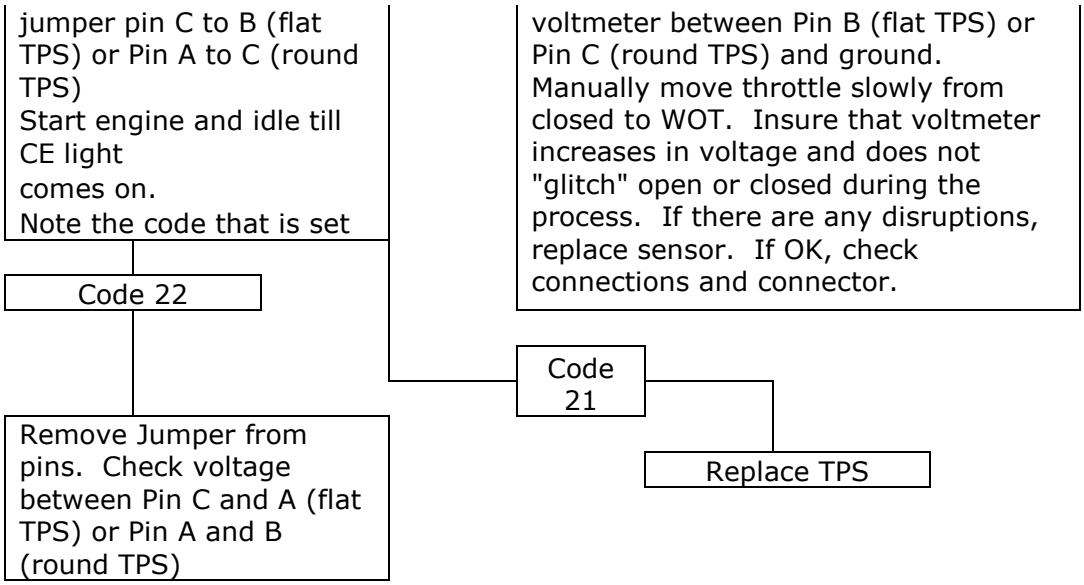
21. High voltage at throttle positon sensor. Sensor could be unplugged.



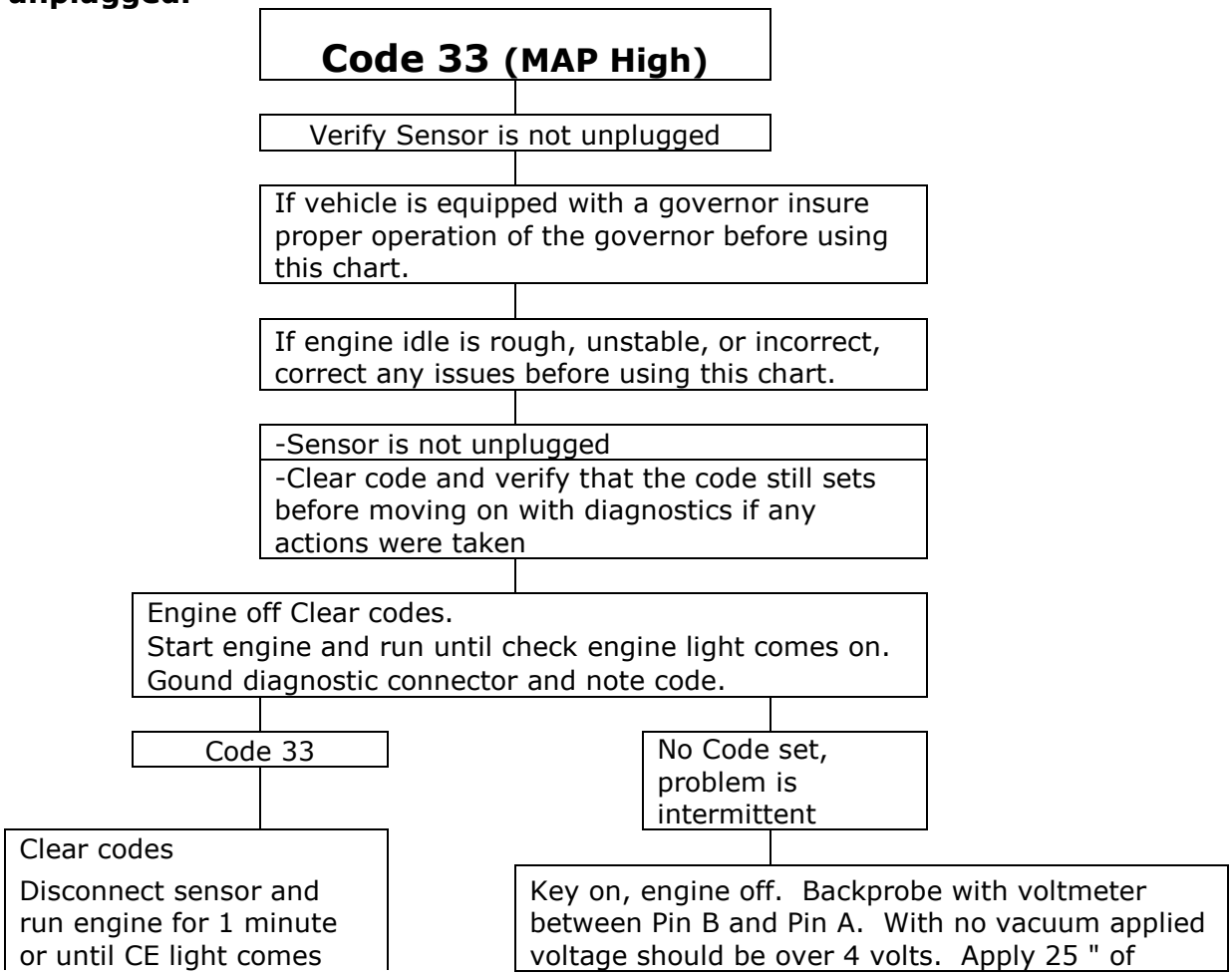


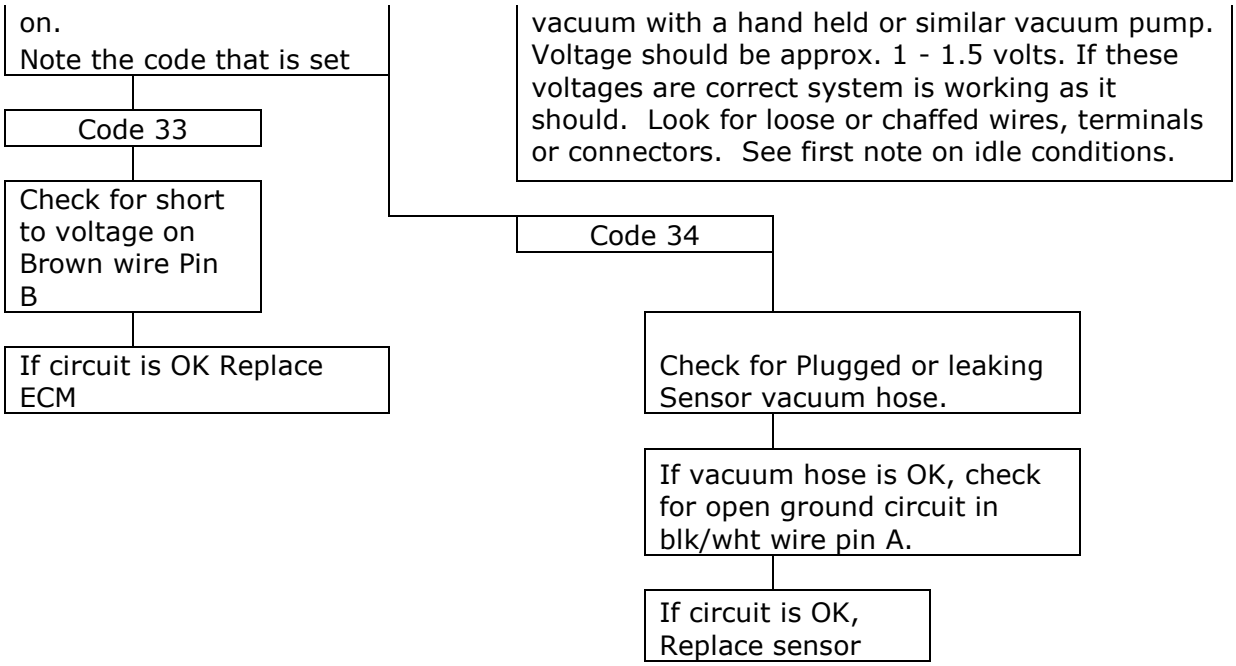
22. Low voltage at throttle position sensor



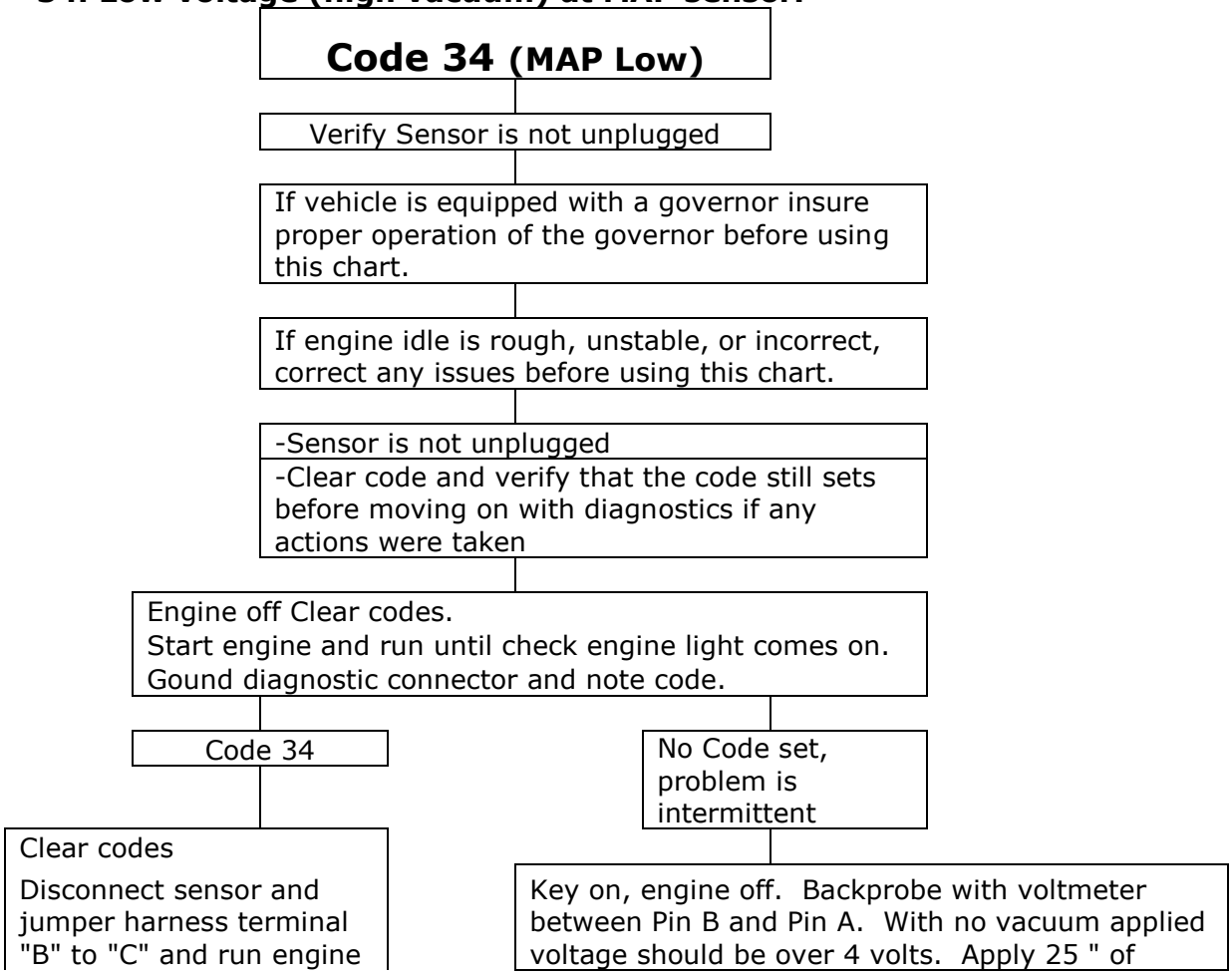


33. High voltage (low vacuum) at MAP sensor, sensor could be unplugged.





34. Low voltage (high vacuum) at MAP sensor.



for 1 minute or until CE light comes on.
Note the code that is set

Code 34

Remove jumper "B" to C".
Check voltage between harness terminal "A" and "C" with voltmeter

4 - 6 Volts

Check for open or short to ground on connector Pin B, brown wire.

Circuit OK, Faulty ECM connector or ECM

vacuum with a hand held or similar vacuum pump. Voltage should be approx. 1 - 1.5 volts. If these voltages are correct system is working as it should. Look for loose or chaffed wires, terminals or connectors. See first note on idle conditions. Check TPS adjustment.

Code 33

Replace Sensor

Below 4 - 6 volts

Check for open or short to ground on connector Pin C, orange wire.

Circuit OK, Faulty ECM connector or ECM

44. Oxygen sensor lean

Code 44 (O2 Lean)

Verify O2 Sensor is not unplugged

If vehicle is equipped with a governor insure proper operation of the governor before using this chart.

Codes 33 and 34 can cause a code 44. If either of these codes are present repair them first before proceeding.

-Sensor is not unplugged
-Ground diagnostic terminal (field service mode)**
-Run warmed up engine for approximately 1 minute between 1200 and 1800 RPM, note "Check Engine" Light.

Flashing Closed Loop

Trouble Is intermittent

Light staying off more than on or flashing "Open Loop" at either RPM

-Ignition off diagnostic terminal grounded
-Disconnect O2 sensor
-Start engine and note "Check Engine Light"

"Check Engine" light off for at least 15 seconds

Check Purple wire from ECM Pin D-7 for open or short to ground

If circuit and wire OK, Faulty ECM or ECM connector

"Check Engine" Light Flashing Open Loop

Check the following:
- Sensors
- Bad or lean injectors
- Contaminated fuel
- EGR valve (if equipped)
- Low fuel pressure
- Vacuum leaks or exhaust system leaks

If all check OK replace O2 sensor

** Service diagnostic mode is entered the same as Engine Off Self Test. Ground out Pin A and B on the ALDL connector with the engine running. Rapid flashing (approx 1/2 - 1 sec interval) is open loop. Flashing at a slower rate indicates closed loop.

45. Oxygen sensor rich

Code 45 (O2 Rich)

Verify O2 Sensor is not unplugged

If vehicle is equipped with a governor insure proper operation of the governor before using this chart.

Codes 33 and 34 can cause a code 45. If either of these codes are present repair them first before proceeding.

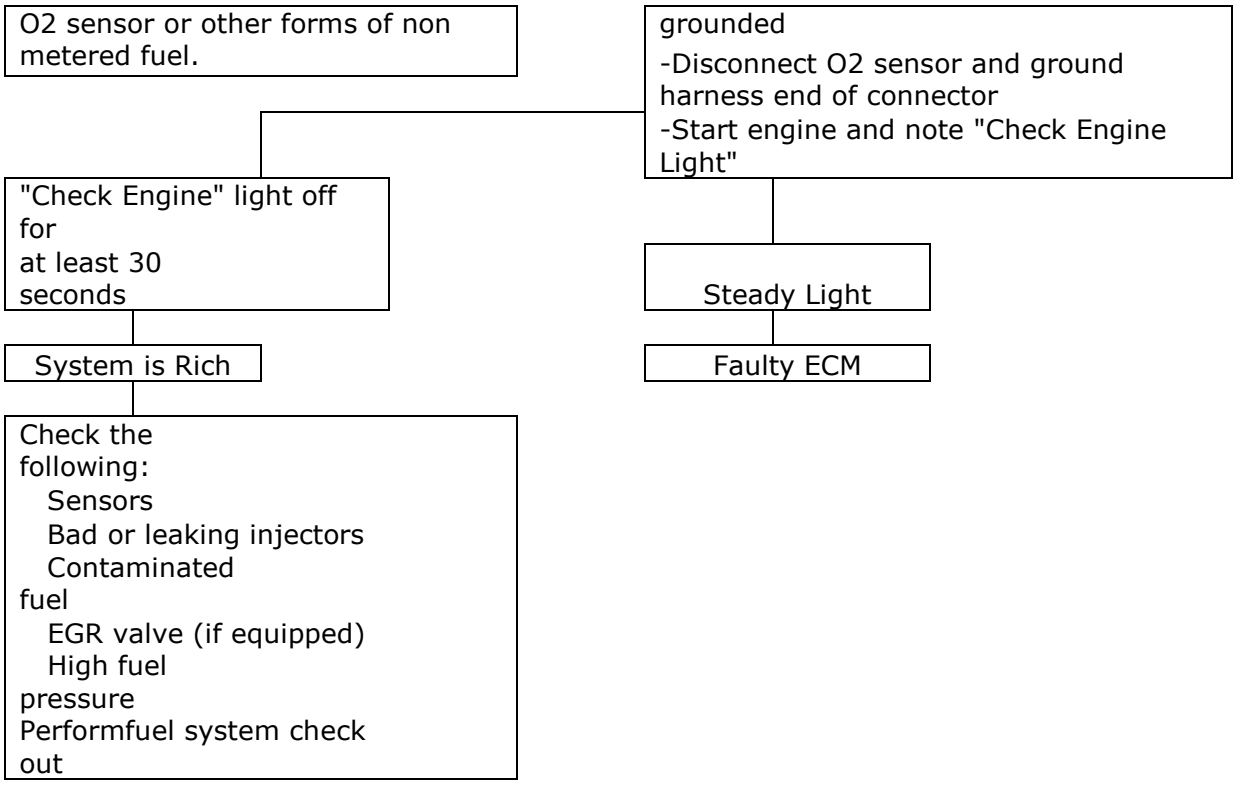
-Sensor is not unplugged
-Ground diagnostic terminal (field service mode)**
-Run warmed up engine for approximately 1 minute between 1200 and 1800 RPM, note "Check Engine" Light.

Flashing Closed Loop

Trouble is intermittent, perform fuel system check, contaminated

Light staying on more than off or flashing "Open Loop"

-Ignition off diagnostic terminal



** Service diagnostic mode is entered the same as Engine Off Self Test. Ground out Pin A and B on the ALDL connector with the engine running. Rapid flashing (approx 1/2 - 1 sec interval) is open loop. Flashing at a slower rate indicates closed loop.

51. PROM error
52. Calpak Missing
54. Low voltage at fuel pump OR Low voltage at Fuel pump relay
55. Problem at Electronic Control Module (ECM) - ECM failure OR Serial bus error

Code 51 (Eprom Problem)

Check that all pins are fully inserted in the socket. If OK, replace PROM, clear memory and recheck. If code 51 reappears replace ECM

Code 52 (Fuel CALPAK missing)

Install missing or faulty CALPAK

Code 54

Fuel Pump Relay or relay wiring

Code 55

Replace ECM

FUEL INJECTION T.B.I.
WIRE PINOUT

A-1 BLUE FUEL PUMP RELAY "85"
A-5 ORANGE CHECK ENGINE LITE
A-6 PINK IGN 1 RUN TO PIN A ON INJECTORS
A-8 BLUE ALDL CON. PIN "E"
A-9 BROWN ALDL CON. PIN "B"
A-11 BLACK/WHITE MAP RETURN GREEN CON. A
A-12 BLACK TO BLOCK GROUND TO CONNECT WD-1, D-6

B-1 BAT RED FUSED CONNECTS WITH C-16
B-2 ORANGE FUEL PUMP RELAY PIN"87"
B-3 BLACK/WHITE PIN D IGN GROUND
B-5 GRAY TACH FILTER

C-3 GREEN IAC PIN A
C-4 BLUE IAC PIN B
C-5 GREEN IAC PIN D
C-6 BLUE IAC PIN C
C-9 TAN CRANK INPUT TO STARTER STUD or IGNITION SWITCH
C-10 YELLOW ECT
C-11 BROWN MAP INPUT PIN B ON GREEN CON.
C-13 BROWN TPS PIN C
C-14 ORANGE (5V REF) GOES TO MAP PIN C & TPS PIN A
C-16 RED 12 VOLT CONNECTS IN WITH B-1

D-1 BLACK BLOCK GROUND CONNECT W/ D-6, A-12
D-2 BLACK/WHITE ECT & TPS RETURN ON TPS PIN B
D-6 BLACK/WHITE O/2 GROUND GOES TO BLOCK GROUND CONNECT W/D-1,A-12
D-7 PURPLE 0/2
D-14 or D-16 GREEN or PURPLE , INJECTOR PIN B

PINK WIRE TO IGN. 1 PIN A FROM INJECTORS FROM A 6

PIN A ON ALDL TO BLOCK GROUND

RELAY
85 FROM IGN. SWITCH
86 GROUND
30 12V.
87 IGN. OUT / FUEL PUMP