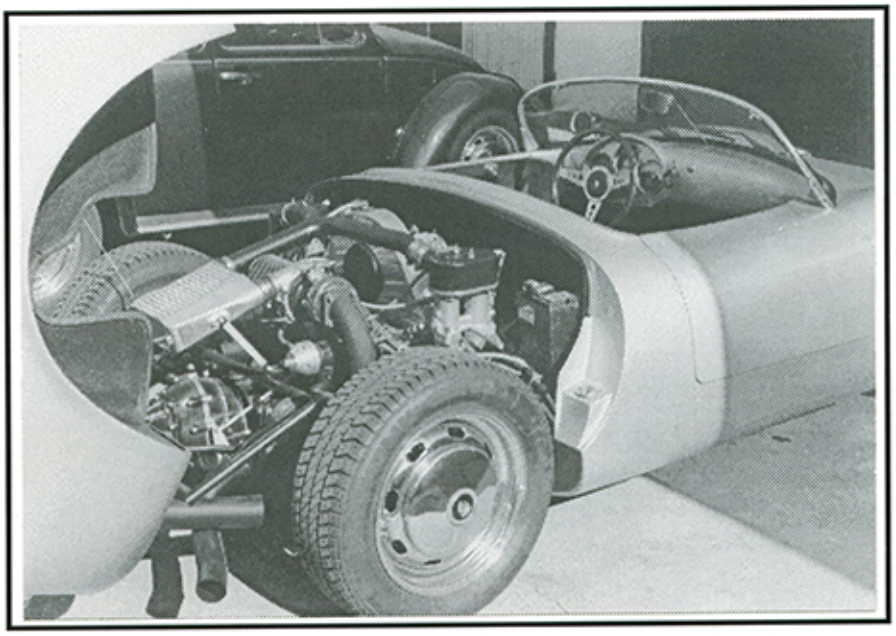
CB PERFORMANCE'S COMPETITION TURBOCHARGING

Installation and Tuning Manual



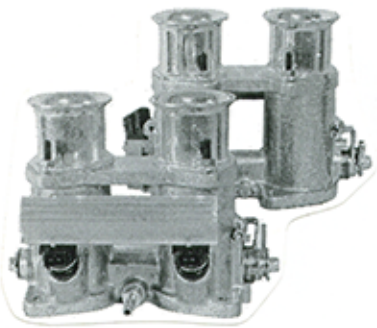
High Performance Electronic Fuel Injection for air cooled VW Engines is now a reality. You can easily install and run it on most VW Engines. But don't confuse the new generation of fuel injection with the original injection offered as factory equipment by Volkswagen. The new stuff is high performance, solid state multi point and it represents a new era in fuel injection for air cooled VW Engines. CB's new system is easy to install, dash adjustable, and makes gobs of horsepower.

This new system is based on the normally aspirated Competition & Ultra Competition Fuel Injection Systems. Unlike other turbo systems, it runs with only three engine sensors. The oxygen sensor found on other fuel injection systems is not used. Its absence allows you to run leaded high octane racing fuel, or any other blend of leaded or unleaded fuel. The absence of the oxygen sensor and other circuits also means that the engine is not overly vacuum sensitive. This roughly translates into the fact that you can run your Turbo Competition System with just about any camshaft!

The key feature of this new turbo system is the four knob dash module. What ever tuning needs to be done, can be done from right inside the car. The dash module is actually a tiny microprocessor that enables you to create fuel curves right from the drivers seat. Beginning from left to right, you start with the idle knob. The idle knob adjusts the idle fuel mixture. Next is the low control knob. This knob sets the low to midrange mixture. To the right of the low control knob, is the knob labeled "switch." The switch knob takes care of separating the idle and low speed features from the high end range. This is done by adjusting voltage. The last knob on the right sets the all out top end horsepower. With these four knobs, any imaginable fuel curve is possible.

At first glance, an engine set up with CB's electronic fuel injection looks similar to an engine with dual carburetors. A second look will show you that there are no mixture screws, accelerator pump arms, or float bowls. That's because CB designed their throttle bodies to match the hardware normally used with Weber IDF or Dellorto DRLA carburetors. The throttle bodies are designed to position one electronic fuel injector in each intake port. The result is state of the art port on port timed fuel injection.

40mm and 48mm throttle bodies are available. Throttle bodies flow an abundance of air. A set of 48mm throttle bodies will outflow a set of 52mm carburetors. The reason becomes very obvious when you look down the barrels of a throttle body. The bores of a throttle body are clean, without any restrictions to air flow. Secondary venturii, accelerator pump jets, and restrictive primary venturii are not needed when you run electronic fuel injection. With CB's fuel injection, air flow has a clean, nonrestrictive shot right through the bodies and into the combustion chambers. That's only one of the reasons that fuel injection makes more power than carburetors. We'll talk about some more reasons why CFI out produces carburetors later on.



Throttle Bodies with machined injector bosses. Competition Turbo Kits are not equipped with velocity stacks.

Injectors mounted in the intake manifold.

Installation of a Competition Turbo Kit follows the same basic outline as with any fuel injected turbo system. The fuel system must be installed to insure circulation of fuel from the tank to the injectors and back to the tank. The fuel pressure reaches higher levels than that of a normally aspirated injection system, so special care must be taken during installation procedures.

CB offers two styles of throttle bodies. One type of throttle body has injector bosses machined for use with injectors. Throttle bodies of this type will not fit into the standard VW sedan engine compartment unless a space saver style manifold/linkage kit is used or major surgery is performed to the sides of the body. This type of throttle body is most often used on race cars or tube framed sand buggies. These throttle bodies can be used with all IDF & DRLA manifolds and throttle linkage. They can reduce the cost of converting over to fuel injection. Just remove your carburetors and bolt on the throttle bodies.

The other style of throttle body produced by CB Performance requires the use of special intake manifolds. The manifolds locate the injectors inboard, between the fan shroud in the manifolds. The use of this type of setup is normally required when the fuel injection system is to be installed in a VW sedan. The use of either type of throttle body will normally provide a quantum leap in performance over carburetion for several reasons. As we mentioned before, the increase in air flow when throttle bodies are used is a positive factor.

The first step to get your Turbo Fuel Injected vehicle up and running is to start with the fuel system. You'll have to scrap your old fuel system and pump because you're going to require a modern fuel delivery system. One similar to that used on all new automobiles where fuel is pumped from the tank, to injectors and pressure regulator under high pressure. Fuel then returns to the tank at reduced pressure. A continuous supply of fuel is circulated throughout the system. The fuel pressure is regulated according to the engine's requirements.

Replace the present fuel outlet at the bottom of your tank with the "T" supplied in your kit. There are two supplied brass barbed fittings. One 1/4"NPT x ½" hose (to the fuel filter - main fuel supply) and one 1/4"NPT x 5/16" hose (used for the return line of fuel system). Be sure to use Teflon tape on fuel fittings. Make certain not to get any excess Teflon or strings of Teflon into the fuel system.

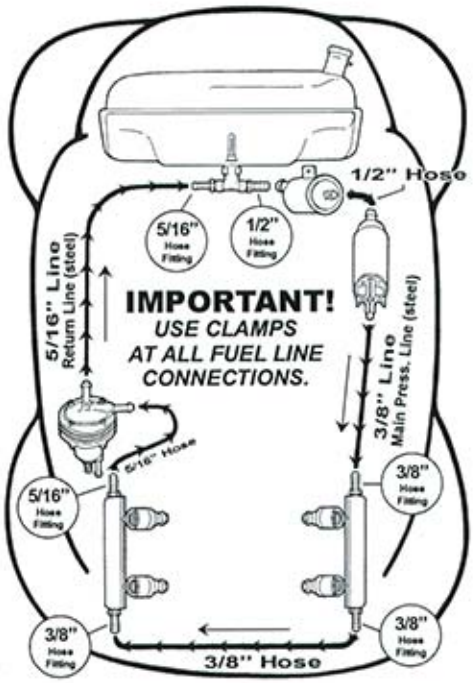
Mount the fuel filter and fuel pump under the fuel tank and below the fuel level. Use the supplied ½" hose to connect the fuel filter to the fuel "T" and the other side of the filter to the pump. Be sure to have the fuel from the tank enter the fuel filter before it passes through the fuel pump. Installation is easy in a race car or dune buggy, because most of these have rear mounted fuel tanks. Make certain to use clamps on all connections.

Installation in a VW sedan is a little more complicated because it requires the installation of two steel fuel lines. One 3/8" line, used for the main pressure line from the pump to one of the throttle bodies and one 5/16" line for the return from the regulator to the tank. On sedan installations the lines can be run so that one goes down the passenger side of the car (main line) and the other line goes down the drivers side of the car (return line), or vice versa depending on how you choose to route the main and return lines. Doing it this way creates a big circle. Fuel comes from the tank, to both throttle bodies, to the regulator and back to the tank

View of barbed fittings installed in "T" at the bottom of fuel tank. On dune buggies, if space is available, install a fuel shut off valve.

CAUTION - CLEAN AND FLUSH YOUR GAS TANK BEFORE INSTALLING YOUR NEW FUEL LINES. THIS IS AN ABSOLUTE MUST! YOUR FUEL SYSTEM MUST BE CLEAN TO OPERATE CORRECTLY!

Refer to pg. 19 for an exploded view of the fuel system.



Drawing #1

again. How ever you decide on mounting the fuel lines for your system, make sure to use the ½" fitting as the main fuel supply to the engine and the 5/16" fitting as the return to the tank. These lines will be running the length of the car, ***rubber fuel line is not an option here!*** Rubber line can be used to connect all hard line connections. Where ever a connection is to be made using rubber line, do not use normal fuel line, ***Use only high pressure fuel line!*** When securing the hard lines to the bottom of your car, use some type of rubberized clamp to help reduce vibration.

Fuel Pressure Regulator with pre-installed barbed fittings.

Two styles of Fuel Pressure Regulators are available. One is tapped for 1/8" NPT and the other has pre-installed 5/16" fittings. The regulator can be secured to one end of the fuel rail, firewall, engine, frame or wherever convenient. Do not mount the regulator on or near the exhaust or any type of heat source. There are too many variables for us to point out one specific location for the installer to mount the fuel pressure regulator.

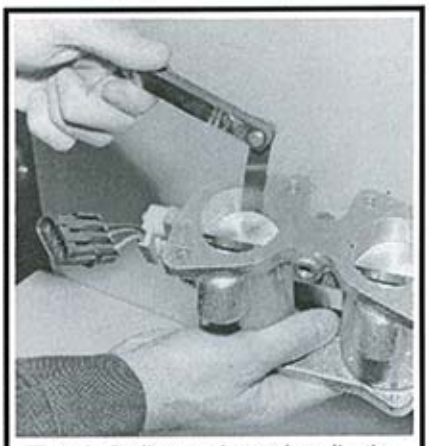
Installing fuel injection is just about like bolting on a set of dual carburetors. The only real departure in the procedure is in installing the injectors into the fuel rails and then positioning the injectors into the ports. As previously mentioned, two styles of throttle bodies are available. The throttle bodies with injector bosses can be used with any IDF or DRLA manifolds. The throttle bodies without machined injector bosses require special intake manifolds with machined ports for injectors in the manifolds. Each type of throttle body has its preferred uses. The throttle bodies with injector ports broaden the application range and can be used on type 1 and type 2 VW, 356, and 914 Porsche engines.

Either type of throttle body can be used with a turbocharger. The important thing is to make certain that the fuel rails are securely fixed in place with retaining brackets to prevent turbo pressure from blowing the injectors out of the bosses. In the next few pages we will explain the assembly of both types of throttle bodies. The general use and assembly is the same except for some hardware differences and the mounting and retaining of the fuel rails.

Before the pre-assembly procedure of the throttle bodies and manifolds begins, it's always a good idea to pre-tune your throttle bodies. Balancing and dialing in a set of dual throttle bodies can be greatly simplified by making certain that each throttle body is adjusted to the same idle speed setting before you bolt'em on. Let's call it pre-tuning. You can pre-tune your throttle bodies by sliding a .003" feeler gauge between the butterfly and throttle bore. Adjust the idle speed screw until you can feel a snug .003" fit between the butterfly and the wall of the throttle bore. Make certain that both throttle bodies are set at the same .003" opening. Check only the butterflies nearest the idle speed adjusting screws.

The idle speed throttle settings obtained in this manner might not be exactly what your engine requires to idle at a desired speed, but they will be reasonably in sync. Increasing or decreasing the idle speed is just a matter of turning the idle speed control screws in or out a ½ turn at a time until a desired speed is reached. In for more idle speed and out for less idle speed. Be sure to adjust the idle speed screws equal and this will keep both throttle bodies closely in sync. The function of throttle bodies is to control air flow. The trick is to start out even and keep them even throughout the opening and closing cycle. The feeler gauge is a good starting point, but the finishing touch to a good balance job is the use of a Uni-Syn gauge, we'll get into that maneuver later on.

Start by bolting the throttle bodies to the intake manifolds. Each throttle body is held in position by four 8mm studs. Throttle Bodies with fuel injectors use all the same length studs. Kits with manifold mounted fuel injectors require one 8 x 60mm stud to be threaded into the inboard hole that lines up with both injector ports. One stud per manifold. These two studs will be used for fuel rail retaining brackets. We will get into fuel rail assembly and securing later on. Thread the short end of the studs into the manifolds and tighten them by double locking two nuts. This technique requires the use of two wrenches, but it assures you that the



Throttle Bodies can be set by adjusting the butterfly to wall clearance with a .003" feeler gauge. Check only the butterfly closest to the idle speed control screw.

This procedure will provide equal flow through each throttle body. You can then further balance the throttle bodies with a Uni-Syn gauge with engine running.

studs won't back out later. When you have secured all of the studs, install the base gasket and position the throttle bodies on the manifolds.

Place one washer on each mounting stud, thread the nuts on and torque them down to twelve pounds. The use of Loctite, thread lock or some other space age miracle "stick'em" on the throttle body mounting studs is not necessary. Just torque them down to twelve pounds.

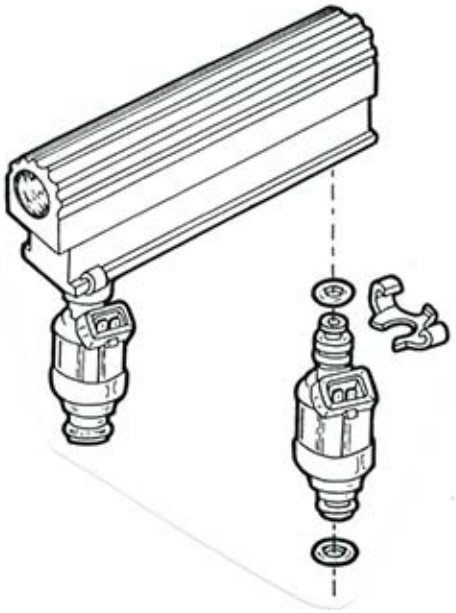
Determine which throttle body will serve as the right side assembly and which one will be the left side assembly. Keep in mind that the throttle linkage control arms face the rear of the engine. That's the end of the engine with the fan belt. When the throttle bodies are installed and sitting at closed idle speed, the throttle shaft control arms tilt in at about 45 degrees towards the center line of the engine. The TPS (Throttle Position Sensor) should be on the right side throttle body and face the flywheel end of the engine.

With the throttle bodies mounted and secured to the intake manifolds, it's time to install the throttle linkage. Thread in the four 6mm studs in the top of each throttle body. They will be used to hold the air cleaner bases in position. Locate the air cleaner bases and a/c base gaskets. Place one gasket and a/c base on each throttle body, making sure to get the bases on the correct side. The vertical supports should face the back of the engine and each other. Back meaning fan belt side. Secure the bases with 6 x 10mm lock nuts supplied with the kit. Tighten the nuts to about 12 foot pounds. It may be necessary to leave one base loose in order to install the cross bar assembly. Depending on the width of your engine, there is sometimes not enough room to get the cross bar past the cross bar swivel ball mounts. If so, you will just have to wait a bit before snugging that base down.

Two swivel ball mounts are required to support the throttle linkage cross bar, one at each end. The cross bar swivel balls thread into the vertical supports on each of the air cleaner bases. They are locked in position with 8mm nuts. When using straight Pro-Comp manifolds or Competition Eliminator Heads, a #3132-3133 style linkage kit is required. The vertical supports on this style of base provide two swivel ball mounting locations. This is to provide the engine builder with a choice in cross bar installation height. Center Mount Fan Shrouds for example, locate the fan at a higher elevation and require the use of the top mounting holes. Thread the cross bar swivel balls and locking nuts into their respective mounting holes. Don't lock the nuts down just yet. We will get back to finishing the linkage up once we have finished the fuel rail assemblies and secured the throttle body/manifold assemblies to the cylinder heads.

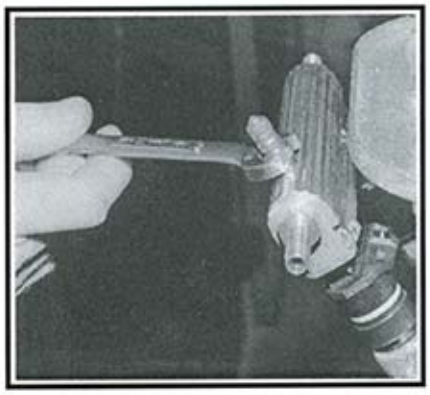
Your Turbo Kit has two fuel rails. Each rail holds two fuel injectors. Fuel enters from one end of the fuel rail and flows out the other end. The system is designed to operate at pressures up to 80 P.S.I. and some times more depending on the application. Rapid flow of fuel through the system is needed to reduce heat build up and to eliminate vapor lock. High fuel pressure is also essential to allow the injector nozzles to atomize the fuel and project the proper spray pattern into the intake valves.

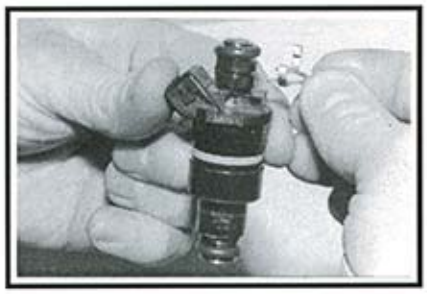
Start the assembly of the fuel rails by threading the barbed fittings into each fuel rail. The brass fittings can be replaced with A/N fittings and stainless line. How ever you plan on doing it, be sure to use Teflon tape on all threaded fuel fittings. Don't let strings of Teflon precede the end of the threaded fittings into the tapped holes. As good as Teflon is, it can raise havoc with fuel pressure regulators and electronic fuel injectors. Make certain to use steel hose clamps at every connection. When using rubber line, make sure it is high pressure fuel line. When installing the brass fittings, there are three ¼"NPT x 3/8" hose fittings and one ¼"NPT x 5/16" hose fitting. The 5/16" fitting can be threaded in either of the two



fuel rails. But when it's time to secure the fuel rails, the rail with the 5/16" fitting should be installed in the throttle body that will be closest to the Fuel Pressure Regulator. Refer back to (page 2 - drawing #1) for illustration on how to run your fuel system.

Locate the Schrader Valve and a 1/8" pipe plug provided in the kit. The Schrader Valve can be installed on either side of the engine, it's best to install it where you will have the most access to it. The Schrader Valve will be used to check the fuel pressure later on. When you have the valve installed, the 1/8" pipe plug has been provided to plug the hole in the other fuel rail. Remember to use Teflon tape on all fittings. Don't over tighten, pipe threads are tapered and seal with very little effort.

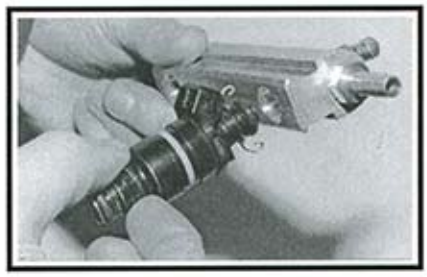


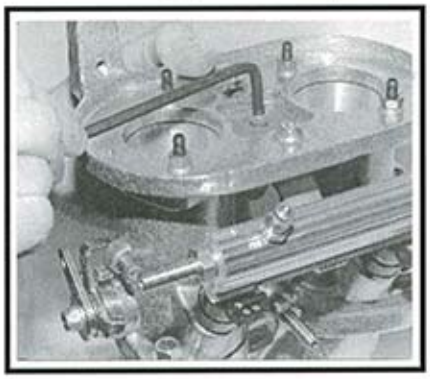


Four clips are required to secure the injectors to the fuel rails. The clips are pushed onto the top groove of each injector. Then push each injector into a port on both fuel rails.To ease the installation of the injectors into the fuel rails, it is a good idea to apply a small amount of oil to the "O" rings. With a little bit of pressure the injectors should slide right in. Excessive force should not be necessary. No hammering! Once the injectors have been pushed in, check to make sure the clips are secure over the edge of the fuel rail. Installing the completed fuel rail assembly into the throttle body or manifold, depending on application, is simply accomplished by lining up the injectors with the ports. Then pushing them down until they feel like they are in all of the way. They should bottom out. If not, check your alignment.

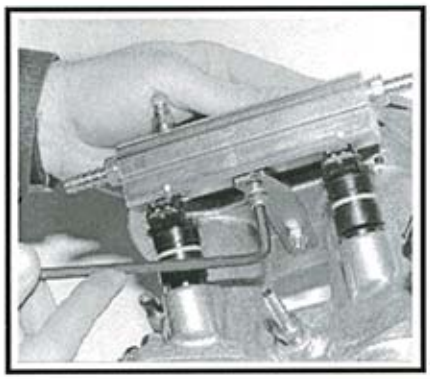
There are two different styles of throttle bodies, and two styles of fuel rail retaining brackets. Your engine will run without retaining brackets, but a healthy backfire or turbo boost could possibly blow the injectors out of their ports.

There are two fuel rail retaining brackets, one for each throttle body. The brackets provide a safety factor and must be installed. The brackets are mounted to the throttle body and the bottom of the fuel rail with 6mm allen head bolts, washers and nyloc nuts. The retaining brackets have two different size holes. The end with the straight cut hole is fastened to the throttle body side. The other end with the oval shaped hole is normally fastened to the fuel rail side for ease of alignment. There are two short (6 x 10mm) and two long (6 x 25mm) bolts. The 6 x 10mm bolts are used on the fuel rail side and the 6 x 25mm bolts on the throttle body side. Secure the bracket to the throttle body first, using a 6 x 25mm bolt, two washers and a nut. After the bolt has been pushed through the throttle body from the top side, slide the bracket on then the washer followed by a nut. Both fuel rails have been drilled and tapped to except 6mm bolts. They require no nuts. Line the retaining bracket up with the fuel rail and thread in the 6 x 10mm bolt. In the future if you need to remove the fuel rail/injector assembly do it at the fuel rail side of the bracket by removing the short 6 x 10mm bolt.

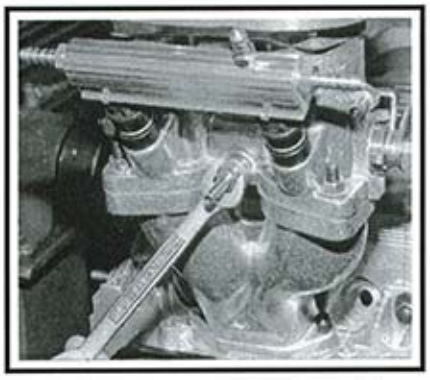




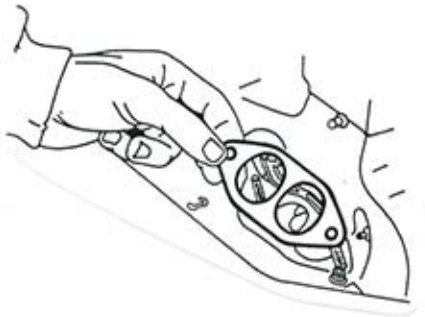
The manifold style is a little more basic. There are still two retaining brackets though, one for each side. Locate the two small rectangular aluminum pieces with one hole drilled through it at one end. You will also need four 8 x 12mm nuts. Thread a nut onto the long 8 x 60mm stud. Thread it down far enough so that there is enough room to slide the retaining bracket on followed by one more 8 x 12mm nut. The preferred amount of clearance between the fuel rail and the retaining bracket should be about 1/32". It's not necessary to run the nuts down so far that when they are tight, the retaining bracket forces against the fuel rail. Too much pressure can cause the "O" rings to leak when under pressure. Repeat this procedure on the other side.



Each throttle body is equipped with a threaded vacuum port. The port is used to supply vacuum (manifold pressure) to the fuel pressure regulator. The vacuum port feeds from an internal passage that senses manifold pressure from both intake ports. The internal passage provides a dampening action between the intake ports which levels out the mani-



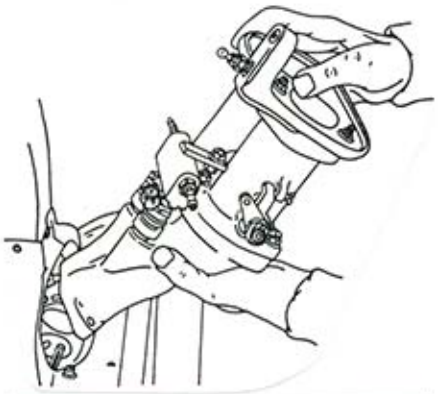
fold pressure signal en route to the fuel pressure regulator. Locate the brass barbed fittings (2),1/8" NPT x ¼" hose. Wrap the threaded ends of the fittings with Teflon tape, thread one into each throttle body vacuum port and snug'em down. Snug is enough, we're dealing with tapered pipe threads, and over tightening could result in a cracked vacuum port.



Use only HIGH PERFORMANCE intake gaskets. Turbo boost will blow big holes in stock intake gaskets.

Bolt the completed throttle-body/manifold assemblies to the cylinder heads. Before positioning the cylinder head to manifold gaskets on the cylinder heads, make sure the sealing surface is clean and free from any old gasket material. Make certain to use the gaskets supplied in your kit. Stock gaskets will not tolerate the pressures of a turbo and will blow out. Line up the intake manifold assemblies with the mounting studs on each head and slide them onto the cylinder heads. Install two 8mm nuts at the base of each manifold and slowly tighten them. The manifolds and throttle bodies will pull inwards as the nuts are tightened. Torque the nuts down to about 14 pounds.

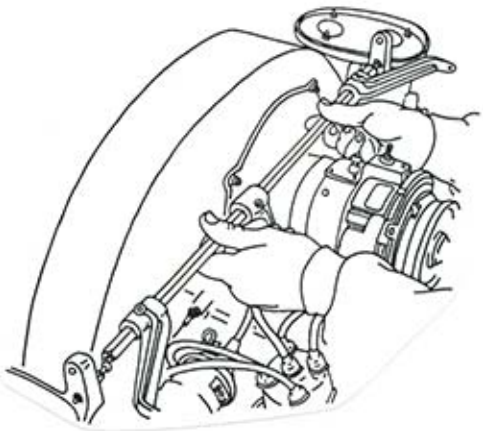
Now back to setting up the linkage. Assembling the linkage is a carbon copy of the procedures followed during the installation of dual carburetors. Start by sliding the aluminum linkage arms and the throttle cable bracket onto the steel hex cross bar. The arms are locked in place with allen set screws. The throttle cable



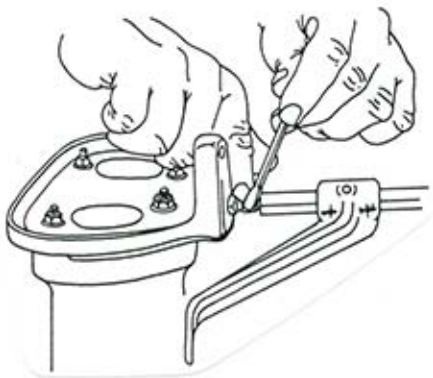
Installing the throttle bodies/manifolds as complete assemblies.

bracket locates one hex degree down from the linkage arms. Don't tighten anything down just yet, we'll do that once everything is lined up properly.

Internal tension springs are placed in each end of the cross bar to aid in centering the cross bar assembly. Place a small amount of heavy grease inside the support holes at each end of the cross bar. Insert the tension springs and place the left end of the hex bar over its respective cross bar swivel ball. Push the cross bar on to the swivel ball and line up the right side end of the cross bar with it's cross bar swivel ball. If it is necessary to loosen one base, do so and line up the cross bar with the swivel mount and then re-secure the base. Hopefully your installation of the cross bar assembly has gone smoothly up to this point. If not, as we mentioned earlier when installing the a/c bases, there are different variables when building an engine. The width of your engine may differ from stock, it may be necessary to shorten or lengthen the length of the cross bar so that enough clearance is provided on the cross bar swivel balls. If the clearance is too far off, it may even be necessary to purchase a new cross bar with the correct length so that the installation is done correctly.



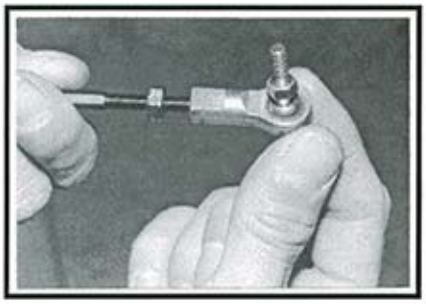
The throttle linkage mounts to the air cleaner bases.



The cross shaft rotates on the swivel ball mounts.

Now screw the swivel balls out until the cross bar is fully supported by the swivel ball mounts. Center the cross bar linkage assembly by rotating the swivel balls. Adjust the length of the swivel ball mounting screws until the cross bar is centered. Over-tightening, resulting in not in enough side play, will cause the linkage bar to bind. Leave about an 1/8" of side play and tighten up the swivel ball lock nuts. Make certain that the cross bar is free to rotate on it's axis. Any resistance or binding of the cross bar can be a real problem later.

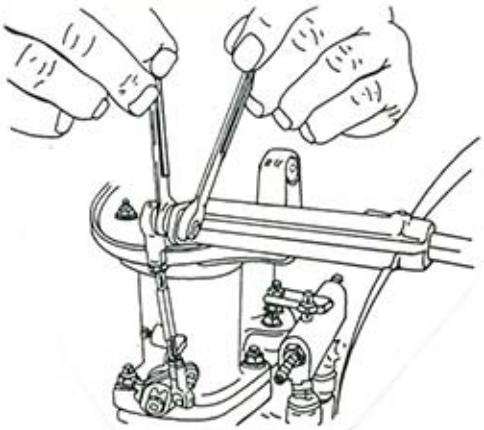
The linkage rods and heim joints are next. There are four heim joints in all. Two right hand and two left hand heim joints. Each side will need one of each. The linkage rods are equipped with matching right and left hand threads. Once installed you'll be able to fine tune your throttle adjustments by rotating the throttle rods. After all adjustments are made, lock them in position by tightening



down the lock nuts. The lock nuts are also supplied in right and left hand threads. Leave the lock nuts loose for now. After the assembly of the linkage rods is done, secure them to the cross bar linkage arms and the throttle body linkage arms. You will need two open end wrenches for this operation, an 8mm and 3/8". Thread the four shake proof nuts down on all four heim joint connections. Not all of the way though, leave them a little loose for now.

Position the aluminum linkage arms on the cross bar so that the throttle linkage rods are vertical when viewed from the rear of the engine. Lock the aluminum linkage arms into position by tightening the allen set screws to prevent the aluminum linkage arms from sliding on the cross bar. Slide the aluminum throttle cable arm into position to line up with the throttle cable and tighten down the set screw. Now check the installed linkage rods, both left and right, making certain that the rods rotate freely. Observe the way the rotation changes the length of the rod assembly. Up to this point the linkage assembly should work freely without any drag or binding. If there is any type of resistance, something is not right. Go back and double check your installation. If everything is in correct working order, tighten up the shake proof lock nuts that secure the heim joints to the upper and lower linkage arms. Tighten these to no more than 2lbs. of torque.

The trick now is to get your linkage aligned to match your preset throttle bodies. Adjust the throttle linkage rods by rotating in right or left hand directions, until both throttle stop arms are resting on the idle



Tighten the heim joint lock nuts to no more 2 lbs. of torque.

speed set screws. By rotating the linkage rods you'll be able to extend or shorten the length of the rods. This will allow you to match the preset throttle bodies. ***Do not*** change the position of the idle speed set screws to match your linkage. You already set both throttle bodies to the same opening. ***Adjust the linkage to match the throttle bodies.***

When you think that you've got the linkage dialed in, push the aluminum throttle arm downwards and watch the linkage arms as they move from closed to open. If one throttle body "leads" the other, you've got some more dialing in to do. The opening and closing throttle action of fuel injection with dual throttle bodies is just like dual carburetors, it has to be precise. So play with your linkage until it works like a Swiss watch. Don't try to reinvent the linkage system. Simply adjust it to match your ***preset*** throttle bodies and tighten up the four lock nuts on the throttle linkage rods.

Look over the complete assembly carefully prior to connecting the throttle cable. The cross bar linkage assembly should work accurately and freely. Both throttle bodies should snap to closed position when the linkage is released without protest.

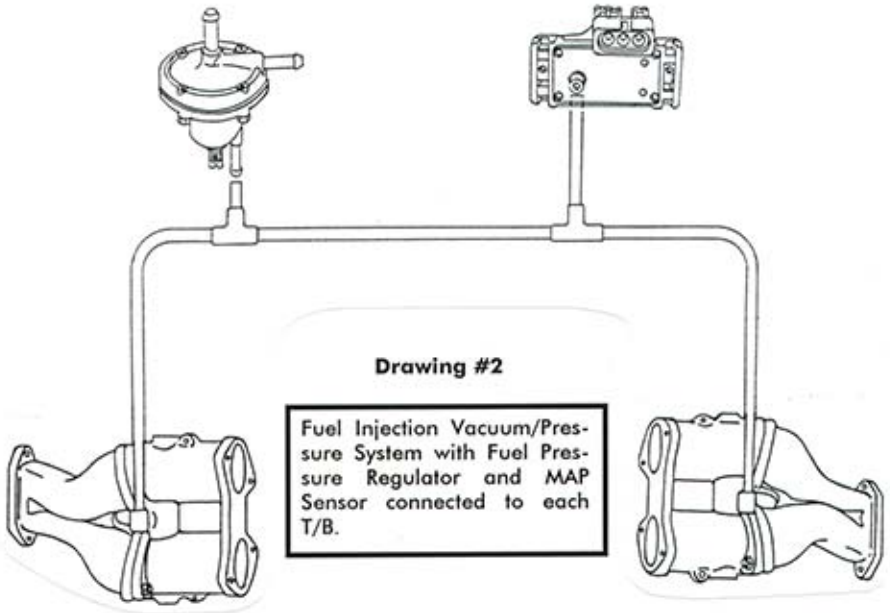
Connect the throttle cable. Have someone operate the throttle pedal from inside the car while you watch the action taking place in the engine compartment. Make certain that the pedal attains the end of its "stroke" at the same time or slightly before the throttle reaches full open. Excessive travel of the throttle pedal can bend the throttle linkage. It may be necessary to install a throttle pedal stop to control or limit pedal movement. If the drag of the throttle cable and pedal seem to be slowing down the closing action of the linkage, it may be necessary to install two helper throttle return springs. The helper springs will provide a safety factor and should be seriously considered for use on any type of vehicle. The slight amount of increase in throttle pressure will never be noticed.

The rest of the fuel system can now be completed. Up to this point all fuel line(hard line), fuel pump/fuel filter, throttle body/manifold assemblies and throttle linkage have been installed. The main line (previously installed) needs to be hooked up to the front of the passenger side fuel rail (flywheel side). Keep in mind, your fuel system may differ from that of what is being described, you may have decided to route your system differently. Use the supplied 3/8" fuel line to make the required connections. Always use clamps to secure connections. Now run a line from the back of the passenger side fuel rail (pulley side) across the engine to the back of the drivers side fuel rail. All connections up to this point should have been done with 3/8" line. The remaining connection needs to be 5/16" line, and it runs from the front of the drivers side fuel rail (flywheel side) to the inlet side of the Fuel Pressure Regulator. Connect the outlet side of the regulator to the return line going to fuel tank. This will complete the fuel system. Refer back to (pg. 2) for illustration.

Previously there were two 1/8" NPT x ¼" hose barbed fittings threaded into the throttle bodies. Those fittings will now be used to supply vacuum/pressure to the MAP sensor and Fuel Pressure Regulator. Mount the Map sensor before running the vacuum line. We suggest mounting the MAP sensor someplace on the fan shroud, front or back. This

will keep it close enough for the wire loom to reach and away from heat at the same time. Refer to (drawing #2) on this page for illustration on hooking up the vacuum line system. In the kit, there are two ¼" brass "T's" and a section of ¼" rubber vacuum line. Use this to run the Vacuum/Pressure System for the regulator and MAP sensor.

The wiring harnesses supplied by CB Performance are complete and ready to snap on. The GM Weather-Pack connectors are designed for easy installation. Each connector is marked as to usage and keyed to fit only one application. High performance turbocharged engines use only three engine sensors:



Drawing #2

Fuel Injection Vacuum/Pressure System with Fuel Pressure Regulator and MAP Sensor connected to each T/B.

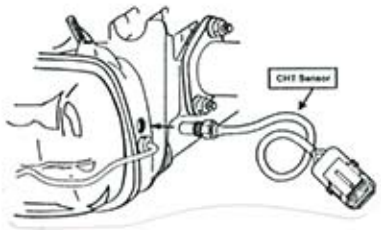
1. TPS - The throttle position switch is mounted on the right side throttle body. The exact throttle position in degrees is reported to the computer while the engine is switched on. The computer uses the combined TPS signal, engine RPM, and MAP signal to control the pulse rate of the injectors. The injectors are turned off during deceleration.

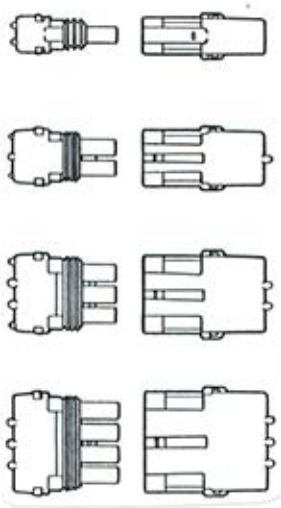
2. CHT - The cylinder head temperature sensor, monitors the temperature of the left side cylinder head. The computer uses information to adjust the air/fuel mixture to compensate for cold start, warm up and fuel delivery during high engine temperature. If your cylinder head is not equipped with OEM injection bosses, it will be necessary to drill and tap (1/8" NPT.) the left side cylinder head as shown to provide a mounting location for the CHT.

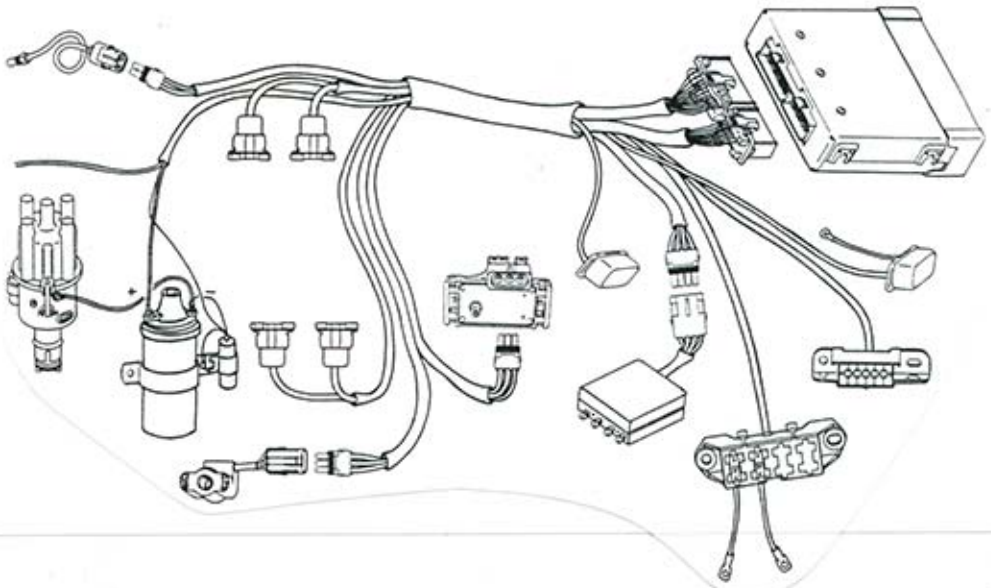
3. MAP - A manifold air pressure sensor measures the pressure within the intake system. Manifold air pressure will vary from 30 inches of vacuum during deceleration to 20 pounds of pressure during periods of turbo boost. Positive MAP signals, signal the computer to increase the pulse rate of the fuel injectors to provide enrichment during boost.

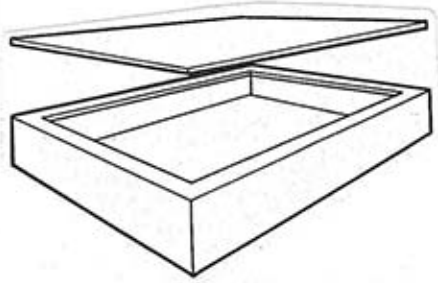
Wiring harnesses are offered in various stock configurations. Special wiring harnesses can be ordered to fit exact requirements. GM Weather-Pack connectors are used throughout.

View is Cylinder Head at #4 Cylinder.





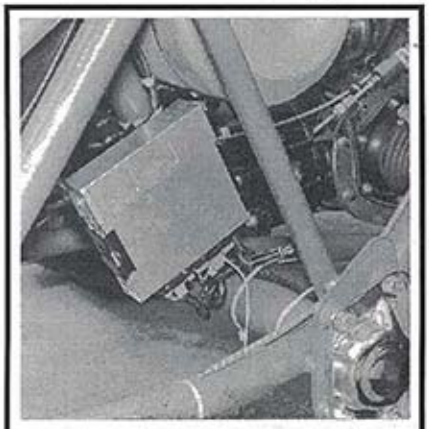




Example of protected enclosure for mounting the computer.

Your computer (ECM) is mounted inside a sturdy aluminum chassis. This enclosure is rugged and designed to withstand severe shock and rapid temperature changes. However the outer shell is **not** moisture proof. If you plan on operating your vehicle in wet or moist conditions, it's advisable to mount your computer in the driest possible location and provide further moisture protection in the form of a heavy duty plastic zip cover or outer enclosure. Various types of plastic snap together boxes and trays are available for this purpose. Aluminum boxes in various sizes are also available that provide a secure moisture resistant installation.

The computer should be mounted away from engine heat and in a protected location. Locate the wire connector end of the computer downward if the computer is to be mounted vertically. This will help keep any foreign debris away from the terminals. Check the length of the harness before you mount your computer. This kit doesn't include wire stretchers, so plan your harness layout before you mount the computer, fuse block, or other electronic components. When your satisfied with the harness layout, mount the computer in as dry and secure a location as possible. And no, the computer won't work under water! If mounted properly it's moisture resistant, but not water proof.



When mounting the computer on a vehicle intended for off-road use, secure it in dry safe location.

Do not use silicon based sealers in an attempt to prevent moisture from entering the computer. Silicon sealers contain acetic acid. Acetic acid emits corrosive gasses during it's curing stage. These gasses can cause severe corrosion of the computer and wiring terminals. It's effect on solder joints is well documented.

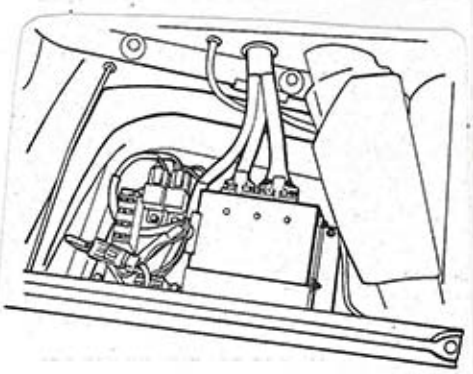
Your computer has two male connector plugs. A large one and a small one. The female connectors on the harness are keyed and will only plug in one way. The connectors are held in place by tension snaps. Depressing the snap lever releases the connector to allow it to be removed.

The ALDL (scan port) connector can be located in any convenient location. The ALDL provides system access to allow the use of a diagnostic scanner. Your CFI system is GM compatible and can be accessed under GM 1990 L 05 5 27R. The scan will indicate engine RPM, temperature, TPS setting, injector pulse rate and voltage system.

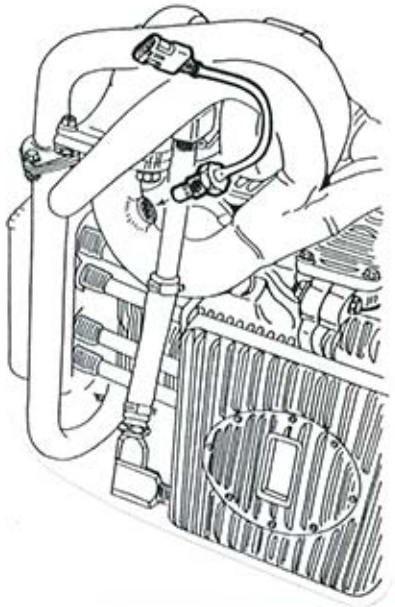
Position and mount the fuse block in a dry, convenient location that provides easy access for servicing the fuses. Each CFI system includes two relays. They are connected to special five terminal plugs that only plug in one way. Mount the relays in a protected area. One relay operates the entire system. The other relay operates the fuel pump. The fuel pump relay is equipped with a fuel pump lead wire. The lead wire is marked (+) positive, and fitted with a round lug ring. It connects to the (+) positive terminal on the fuel pump. The (-) negative terminal on the fuel pump must be routed to ground. Use the supplied piece of wire and lug rings. Make certain to secure it to a good clean ground.

The fuel pump is activated by the computer. A special timing circuit in the computer will turn the fuel pump off when the ignition is left on with the engine not running. The computer will also turn the fuel pump off should the engine stall and the ignition is left on. The fuel pump will restart when the ignition is switched off, and then back on.

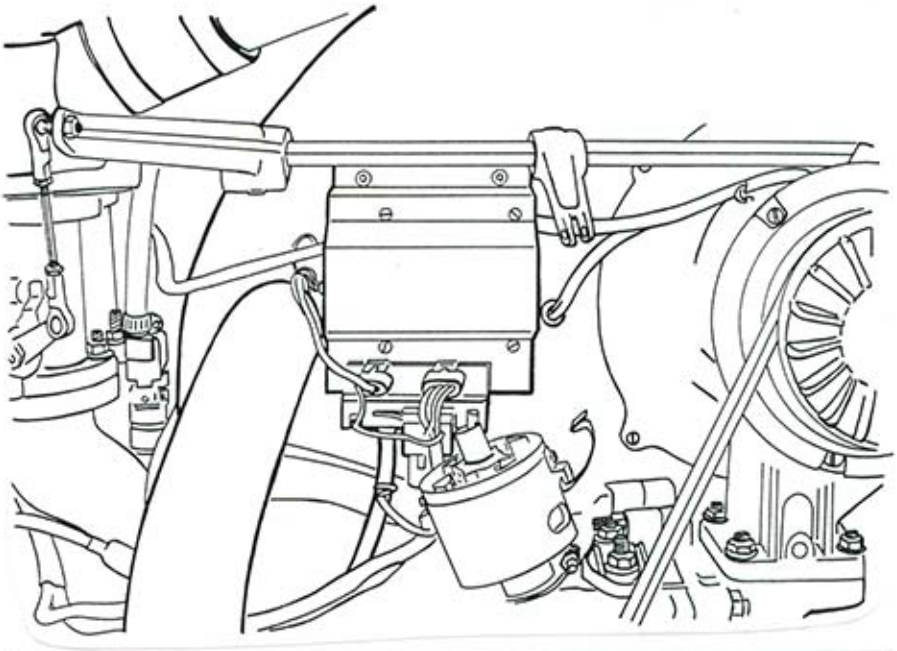
Connect the four injector connectors coming from the harness. Each connector is numbered with a corresponding cylinder number. The plastic connectors simply push onto the injectors. They are held in position by wire snaps. The connectors can be removed by pushing inward on the wire snap. Make certain to position the wires so that they don't interfere with the throttle linkage. Tie the wires with nyties to prevent them from being pulled into the cooling fan (if necessary). Connect the red wire marked (+) positive, to the hot side (12 volt) of the ignition coil. Connect the fused ignition lead to the "switched" hot side of the ignition switch.



The computer can be located under or behind the rear seat in a VW sedan. ***Do not*** mount the computer in the engine compartment. ***Excessive heat will damage the internal components.***



Although it's not necessary for the use of an oxygen sensor with this system, it is necessary to use one if you plan to use an Air/Fuel Ratio Monitor.



Fuel Injection can be used with standard BOSCH ignition systems or computer controlled 40,000 volt HEI systems. Computer controlled HEI systems automatically controls the spark curve.

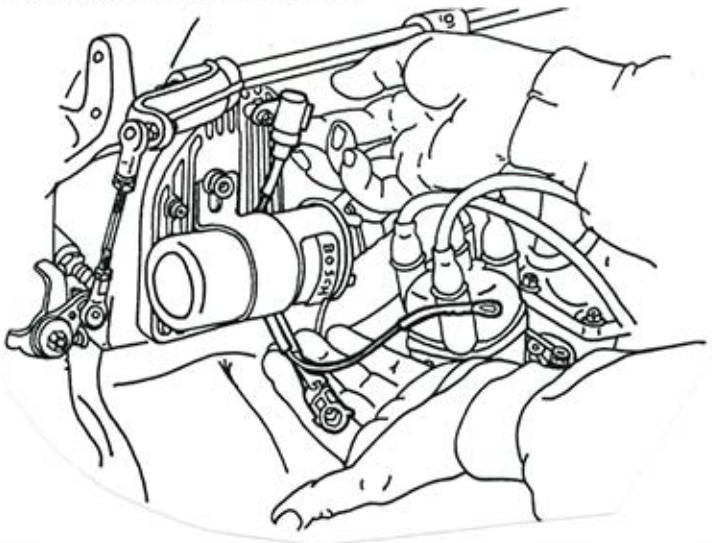
CB's new Competition Turbo System can be used with most any type of ignition with the exception of magnetos. Breaker point, solid state, crank fired and other ignition systems can be used. A 40,000 volt MAGNASPARK HEI ignition system is ideal for use with a turbo system because it supplies a much hotter spark than other types of ignition.

You don't have to get fancy and recurve your distributor, just set it for a total advance not to exceed 24 degrees BTDC. This will provide enough retard to get the engine and enough advance for smooth driving. A maximum spark setting of 24 degrees BTDC will help suppress pre-ignition during boost. The use of "cold" spark plugs is also recommended.

Ignition systems that provide reduced spark settings during boost can also be used. A fully computer controlled ignition system is available from CB. This system requires the main harness to have three additional wires installed during production of the harness. This system will automatically retard your ignition timing from 32 degrees with no boost to 24 degrees with 10 lbs. of boost.

Ignition systems other than our computer controlled ignition requires a Tac Filter. A Tac Filter allows your analog ignition to talk to the digital computer. The Tac Filter creates a signal that the computer can recognize.

The Tac Filter is contained in an aluminum can with a mounting tab. The Tac Filter should be firmly mounted and grounded on or near the coil bracket. Three wires lead from the Tac Filter. One wire affixed with a round eyelet suitable for securing to the distributor clamp stud (ground). The other wires leading from the Tac Filter, one affixed with a single Weather-Pack terminal and the other affixed with a single spade terminal. The Weather-Pack terminal plugs into the loom and the spade terminal goes to the ground terminal on the coil.



A TAC Filter is used to convert the distributor signal to a digital signal. This allows the distributor to feed information to the computer when needed.

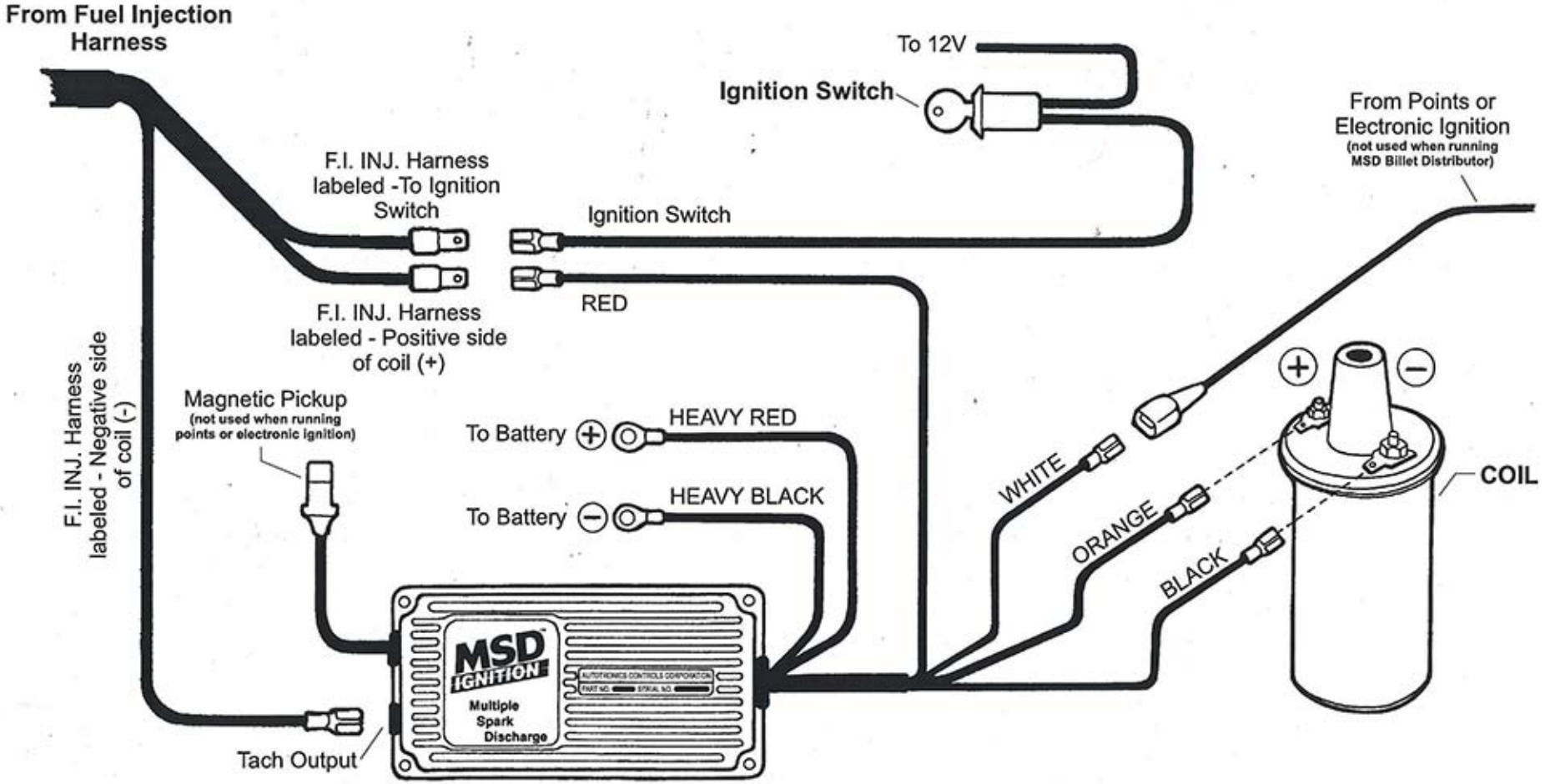
IMPORTANT UPDATED INFORMATION

When using an aftermarket ignition system, such as ***MSD*** or a complete ***COMPUFIRE DIS-IX*** system, refer to the following pages for important installation procedures and wiring diagrams. In instances where engine "***run on***" is occurring (when engine stays running when you turn key off) there is a wiring diagram to guide you through curing this simple problem.

CB PERFORMANCE
1715 N. Farmersville Blvd., Farmersville, CA 93223 PH:(559) 733-8222

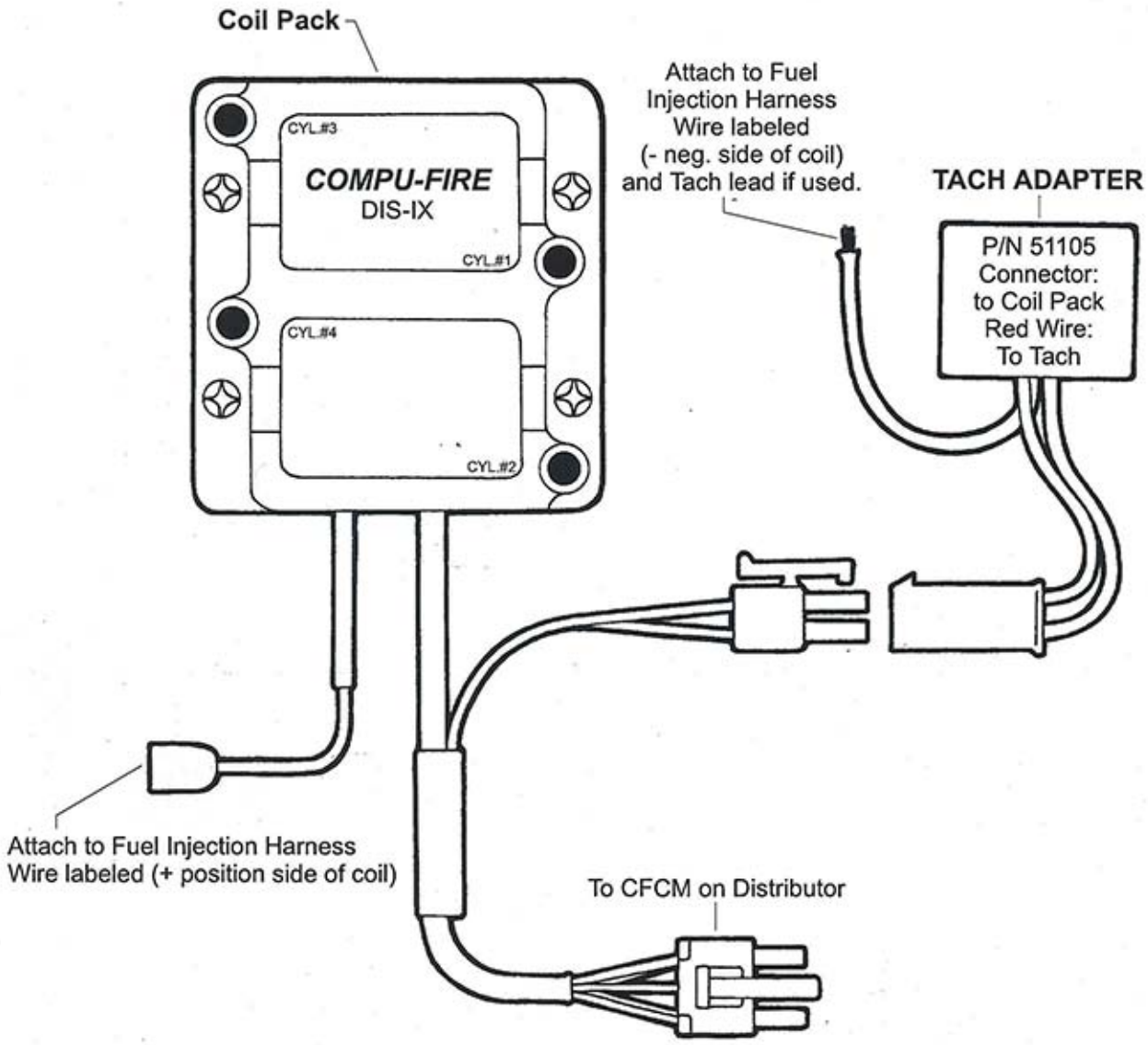
Special Installation Guide
for
MSD 6AL IGNITION

Refer to the original manufacturers mounting instructions. Attach the wiring as shown on this page. Wiring connections for other types of ignition systems will vary.



Special Installation Guide
for
COMPU-FIRE DIS-IX

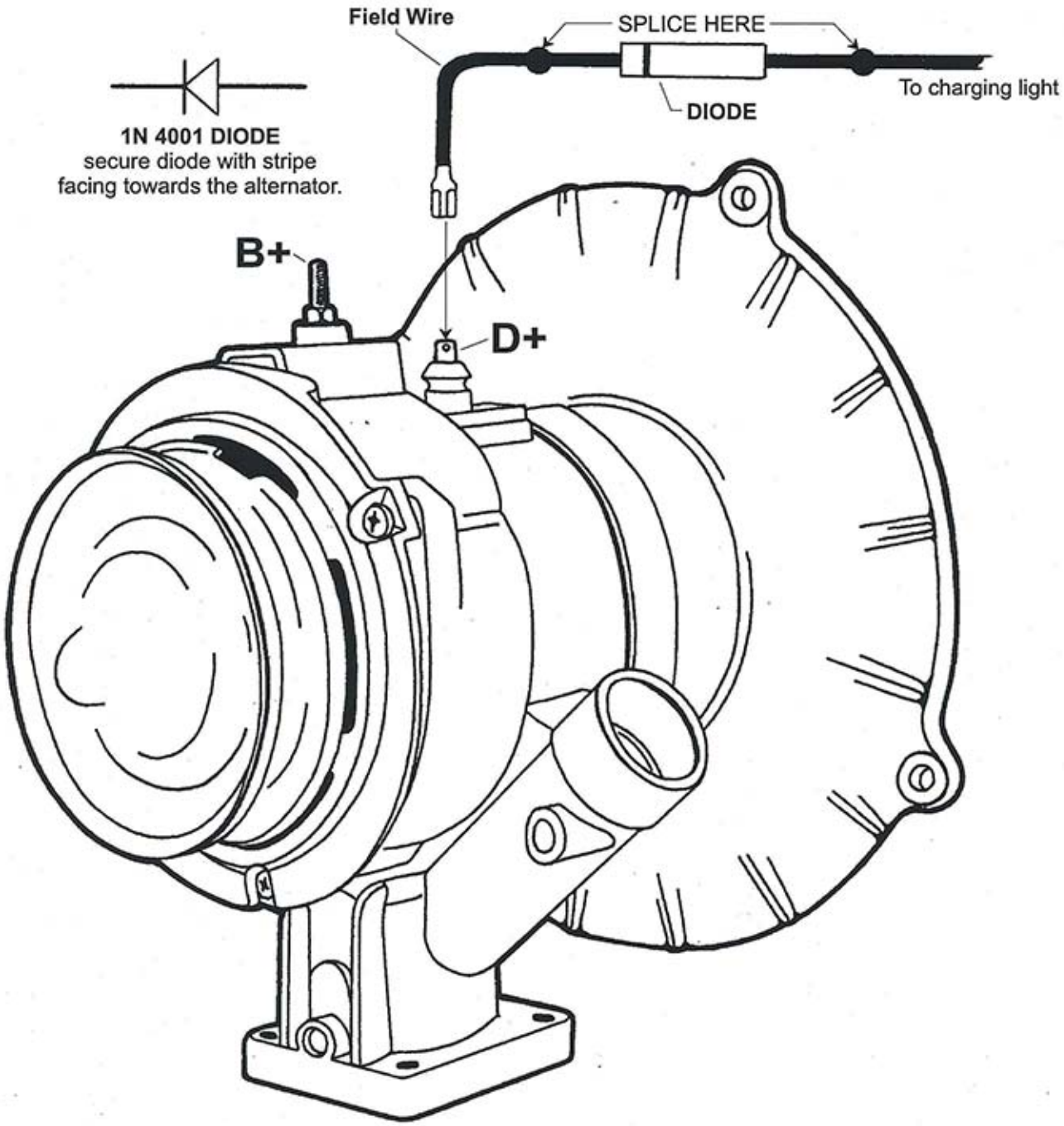
Refer to the original manufacturers mounting instructions. Attach the wiring as shown on this page. Wiring connections for other types of ignition systems will vary.



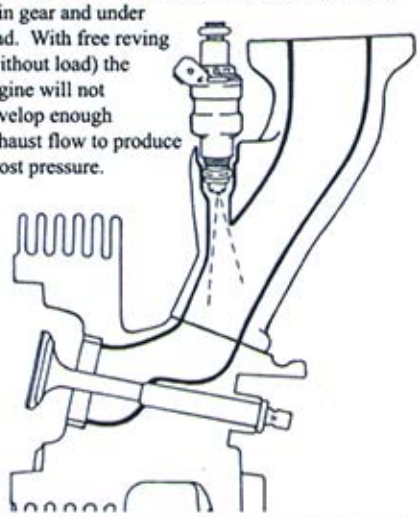
The above ignition system (***COMPU-FIRE DIS-IX***) will function only with special CB Dash Module part #7650

Engine RUN - ON

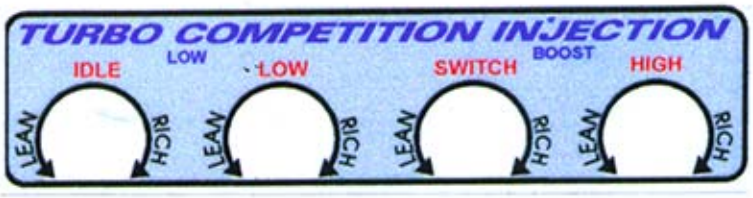
In some applications a situation referred to as "Run-On" will occur. This is where the engine continues to run after the ignition switch is shut off. In a run on situation a diode can be put in line with the alternator field wire. This diode will keep voltage from leaking through to the fuel injection system.



The yellow light marked LOW, will light when the ignition is turned on. It will remain lit until the engine reaches boost stage. At that time, the LOW light will turn off and the Boost light will ignite. Boost pressures are reached only when the engine is in gear and under load. With free reving (without load) the engine will not develop enough exhaust flow to produce boost pressure.



Injectors atomize fuel directly into the intake passages.



Front view of the control module and location of adjusting knobs. The module needs to be mounted in a location where the driver can easily reach it and also won't get disturbed.

The control module connects to the main harness with an extension cord. The cord is fitted with a five wire Weather-Pack connector. The module needs to be mounted in a location where the driver can reach it easily and where it won't get in the way or get disturbed. The module contains a microprocessor that allows you to set idle speed, low setting, switch setting and the high setting.

When you are at the point to start tuning in your engine with the control module, refer back to this section for important tuning procedures! Keep in mind that all of these next four steps are based on idle fuel pressures of 45-50 P.S.I.. These next four steps should be read carefully, they are important to your engines performance.

STEP 1.

To adjust the idle control knob, let your engine warm up to a normal operating temperature. When the engine is warm, simply begin to lean the idle control knob until the engine RPM begins to fall off. This is done by rotating the knob counter clock wise. Once the idle begins to fall off, turn the knob in the other direction. This will start to richen up the idle circuit. When the engine begins to raise in RPM and starts to stabilize, you're there. This adjustment is just like adjusting mixture screws on carburetors. Only you are able to adjust all 4 cylinders at one time.

STEP 2.

To adjust the low control knob, you will have to drive your car at a cruising speed. This may be difficult for those of you who have an off-road application because you will most likely have to use 2nd or 3rd gear to reach a correct adjustment. Once at a cruising speed begin by leaning the low adjustment knob. The same procedure applies here also. Start to lean the knob until the engine begins to go lean (surges at a steady speed). Then begin to richen the mixture back up until the vehicle smoothes out and no longer has any hesitation off idle.

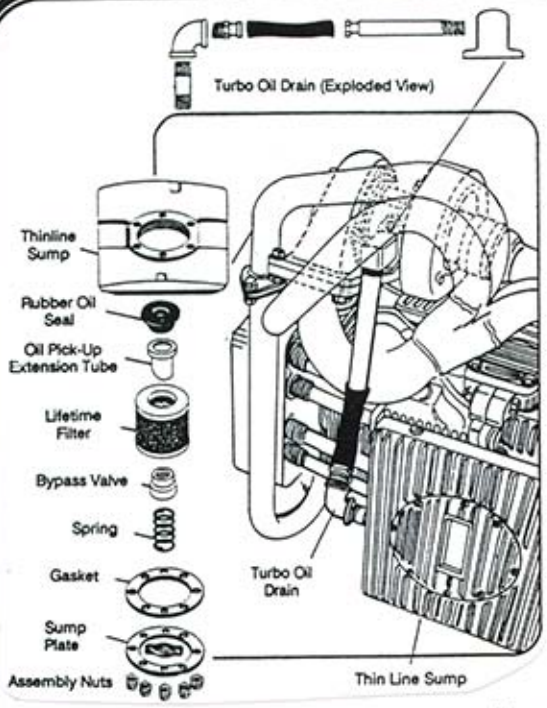
Step 3.

The switch point adjustment is next. The switch control knob isolates the idle and low control settings from the high end control setting. A digital volt meter is the best way and easiest way to go about adjusting the switch knob. Simply plug your volt meter into the side of your control box, set the meter to DC volts and turn the ignition key to the "on" position. Very slowly begin to depress the throttle pedal and watch the volt meter. You should start to see the voltage increase as the throttle pedal goes down. What you want to accomplish is to have the voltage go up to a desired point and then switch over to the high end control. A red high end light will illuminate at this point. Your switch point adjustment controls how high or how low this voltage will be at this certain point. A good starting point is to set the voltage at 2.40 volts. This has proven to be a good starting point and switch over point for most applications. What you don't want to end up with here is to have the low speed and high speed toggling back and forth between each other during a steady cruising speed. The only purpose of this control is to separate the low range adjustment from the high range adjustment.

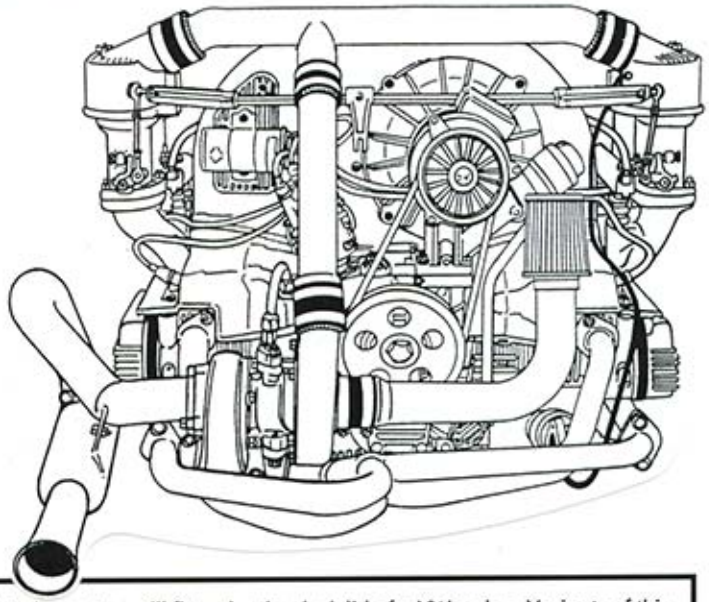
STEP 4.

The last setting is the high setting adjustment. This is where you will have to find some place to test your vehicle. In order to achieve the best setting, it must be adjusted under a wide open throttle situation to get the best power from your engine. This control determines how much fuel is delivered to the engine under load at wide open throttle. You can't set this control with the vehicle sitting in the driveway while you rap it up! It has to be under a load to reach the correct setting. It's just like changing the main jets in a carburetor.

It's best to approach this setting at a known over rich air/fuel mixture. A fat, over rich mixture will cause the engine to "lay down" at higher RPM. The air/fuel mixture can then be leaned by turning the high knob back in the counter clockwise direction until the engine begins to be more responsive. CAUTION! A serious lean condition during boost can burn pistons, valves and torch barrels!!! Approach final tuning (leaning of the air/fuel mixture) with a deliberate, step by step approach. A slightly rich mixture will help cool your engine, and after all we're not running an economy contest.



Oil Sump parts locator and assembly.



A turbo system will fit under the deck lid of a VW sedan. Variants of this system can be used in race cars, dune buggies, and kit cars.

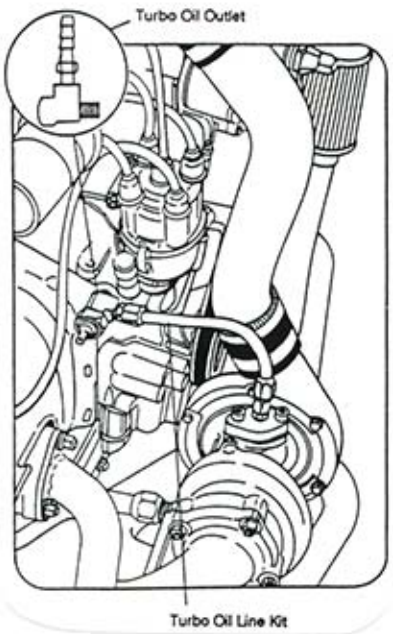
To finish off the installation, install the turbo header, turbo and pressure system. Sedan Hideaway installations require an oil sump to be put onto the engine. The sump will provide a location for oil from the turbo to drain back into the engine.

Remove your old exhaust system and replace it with the new turbo exhaust system. Secure the exhaust to the engine before mounting the turbo to the exhaust. While securing the turbo to the exhaust header and during the rest of the installation make certain not to get anything in the turbo.

On sedans, install the sump now so that the turbo drain can be assembled. Secure the sump so that the inlet for the drain faces the drivers side of the car. Refer to the drawing on this page for illustration on turbo drain assembly.

Turbo lubricating oil is supplied from the 1/8" NPT threaded outlet on the left rear of the engine case. The small diameter turbo oil hose supplied in your kit is fitted with a reducer in one end. The reducer needs to be installed at the pressure or engine end of the oil line. The reducer limits the flow of oil into the turbo. Excessive oil flow can result in an occasional smoky exhaust. Bolt the turbo oil inlet to the turbo using to bolts. High temp silicone can be used to eliminate oil leaks. Use the silicone sparingly around the oil inlet hole. You don't want excess sealant in your turbo bearings.

Secure the billet wastegate to the turbo header. The wastegate is used to regulate boost. The boost line coming from the wastegate will need to be tied in with the pressure system.



You will need to drill a hole in one of the pressure covers (preferably closest to the wastegate) and tap it for a 1/8" NPT fitting. Then secure the supplied line to the pressure cover and then to the wastegate. The wastegate is adjusted by turning the set screw in the end, in or out. Turning the screw in will provide more boost and the opposite for less boost. Be sure to tighten the jam nut when you are done with your adjustment.

The pressure system consists of two air boxes and the compressor cross ducting. Don't secure the air boxes until you get your vehicle running and you have had a chance to adjust the throttle bodies with a Uni-Syn gauge. Secure the intake tube to the turbo intake using one of the intake hoses and two clamps. Oil the turbo air filter before securing it to the intake tube. Use oil only intended for oiling air cleaners. Refer to (pgs. 20-21) for turbo system assembling and parts locator.

Set the fuel pressure to 55-60 P.S.I. with the engine not running. The computer activated fuel pump can complicate this procedure, because the pump will automatically shut off in less than one second. Disconnect the wire leading to the fuel pump relay and hot wire the fuel pump. This will give you time to

12.5 VOLTS ARE REQUIRED TO RUN ELECTRONIC FUEL INJECTION!

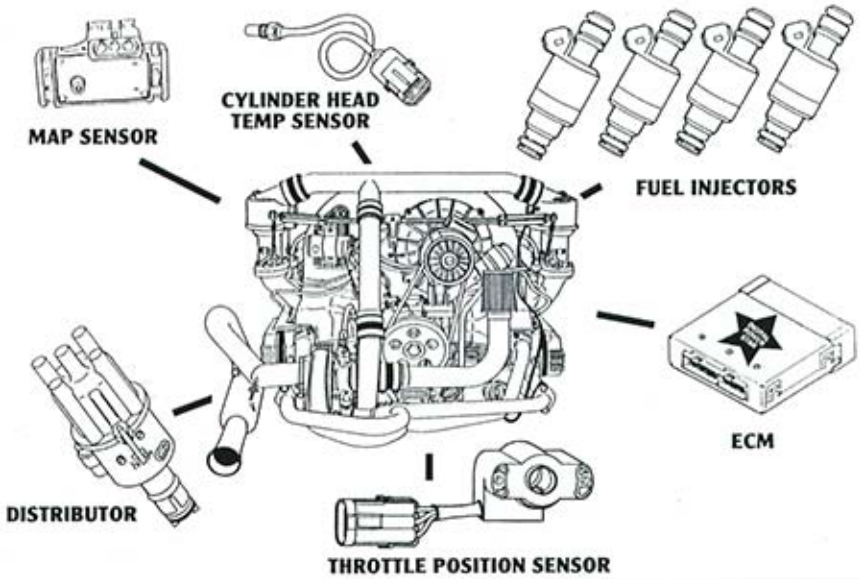
check the fuel system for leaks and to set the fuel pressure.

The fuel pressure is set by removing the cap nut from the top of the fuel pressure regulator and loosening the lock nut on the threaded shaft. Fuel pressure is increased by rotating the adjusting shaft clock wise. Pressure can be checked at the Schrader valve located in the fuel rail. If you don't have a special fuel injection kit, a tire pressure gauge will get the job accomplished. When you have the pressure set, lock the jam nut and replace the cap nut. Remove the jumper wire and reconnect the fuel pump to the fuel pump relay.

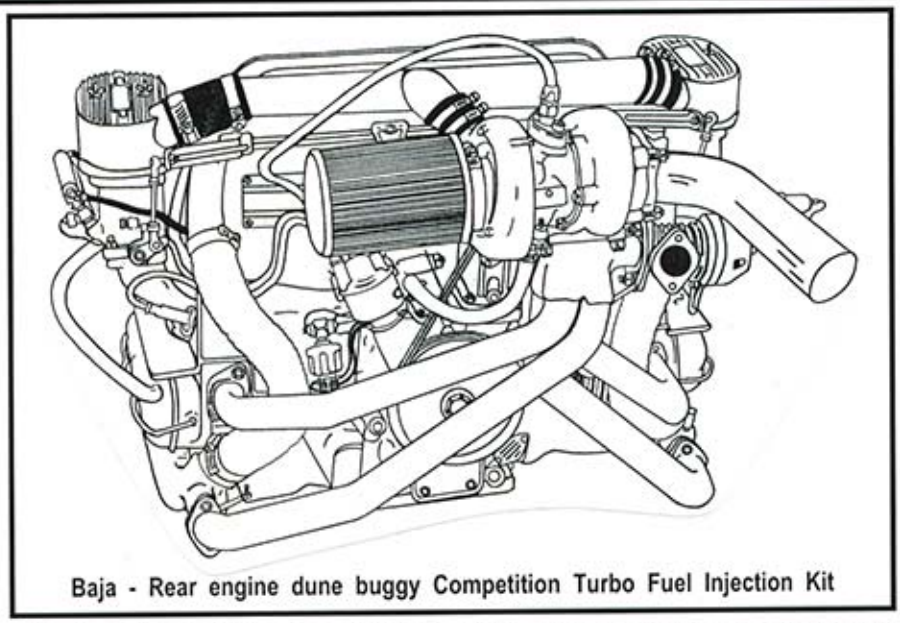
Start your engine, your fuel pressure will drop depending on the amount of vacuum produced by your engine. Camshafts with less duration will produce more vacuum which in turn will drop your fuel pressure accordingly. Vice versa for engines with longer duration camshafts. Stabilize your engine RPM high enough so that it can hold a steady idle. Your next procedure is to use a Uni-Syn gauge and synchronize your throttle bodies. It is very important to get your throttle bodies in sync. Stable fuel pressure is greatly influenced by a set of unbalanced throttle bodies. Once you have achieved a balanced situation, stabilize your engine idle between 800-950 RPM. Go back and recheck your fuel pressure, if it has changed, readjust it to 50 P.S.I at an idle. Balancing the throttle bodies and adjusting the fuel pressure are two of the most important steps to installing CFI. Please don't try to guess with these adjustments.

Now install the air boxes and compressor ducting. Be sure to use the provided clamps at all connections. Double check your installation for any loose ends or leaks, hopefully everything checks out all right. Pick everything up and make sure you don't have any tools lying around on the car. It's time for a test drive. Refer back to (pg. 14) for in depth tuning adjustment instructions using the dash module. GOOD LUCK!

Digital Fuel Injection - What Makes it Work?



BLOW THROUGH IS MODERN STATE OF THE ART!



Baja - Rear engine dune buggy Competition Turbo Fuel Injection Kit

Function by design truly pays off when you team up electronic fuel injection with a compatible turbo-charger. The air flow capacity of four 48mm butterflies opens up the door to some serious horsepower. A Schwitzer S1A turbo with a 0.5 A/R ratio is able to flow enough pressure to push up to 20 P.S.I. of boost through engines up to 1900cc's. Larger engines are able to generate the flow to spin a T04 turbo over 125,000 RPM. Boost pressures over 24 P.S.I. are easily attainable with a T04 running an A/R ratio of 0.7. Keep in mind that **RACING FUEL *will have to be used any time the boost exceeds about 15 P.S.I.*** to prevent pre-ignition and damaged parts.

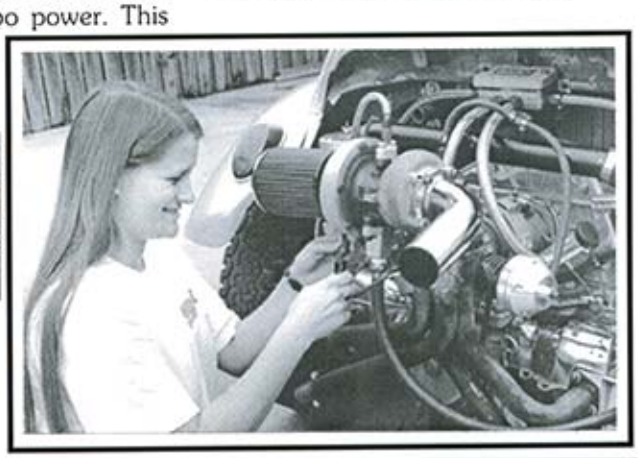
Blow through turbo systems are far more efficient than pull through turbos for several reasons.

The benefits start when the air enters the turbo in a pull through system. A turbo is a pure CFM device and is very sensitive to the pressure of air entering the compressor. Any restriction to entry flow, or drop in air pressure will result in a marked reduction in flow, in pounds per minute to the engine. Automotive engineers are very aware that turbos by design, are much more efficient when used in blow through systems. Who uses fuel injected blow through systems? Every major automotive manufacturer who produces turbo engines.

Most of the OEM turbo systems produced are of the plenum type where a common intake chamber leads to all of the intake valves. A common plenum places restriction on the duration of the camshaft. It's just one of those facts of life. Long duration cams just don't like plenum intake systems. The combination of a long duration cam and plenum intake results in low speed flow reversion, wetted walls and loss of low speed engine vacuum. Which means that these engines are tied to a short duration camshaft. Camshafts with short duration place a limiting factor on performance.

When a blow through turbo system is matched to a set of smooth bore 48mm throttle bodies you've got true port on port turbo power. This type of turbo system can easily run camshafts with durations over 300 degrees and still idle like an electronic watch. Bottom end torque has to be experienced to be believed with port on port blow through injection. Port on port provides even more flow than plenum turbo systems because four 48mm throttle bores function with less resistance to flow than a single throttle body.

What does all of this high tech, high buck computerized discipline do for your VW engine? It makes horsepower and runs trouble free. CB's Turbo EFI engines continually achieve 300 HP on pump gas. These engines are totally driveable and really add the relish to a dune buggy, VW sedan or Porsche kit car.



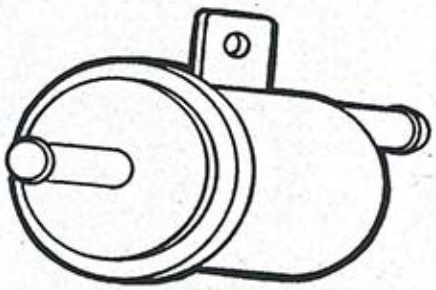
Turbo Competition Injection - dial it in with more power than ever before! It's simple, direct and at your finger tips.

IMPORTANT NOTICE
ABOUT YOUR CAR'S FUEL SYSTEM

Fuel contamination can be the cause of a poorly running engine. Even though your gas tank is relatively new it can still contain enough dirt, metal filings and other debris to plug up a kitchen sink. A close inspection of most any dune buggy gas tank will quickly illustrate the end result of contaminated storage tanks. Most five gallon fuel cans often have junk waiting in the bottom to end up in your fuel tank. Make sure this doesn't get you stranded.

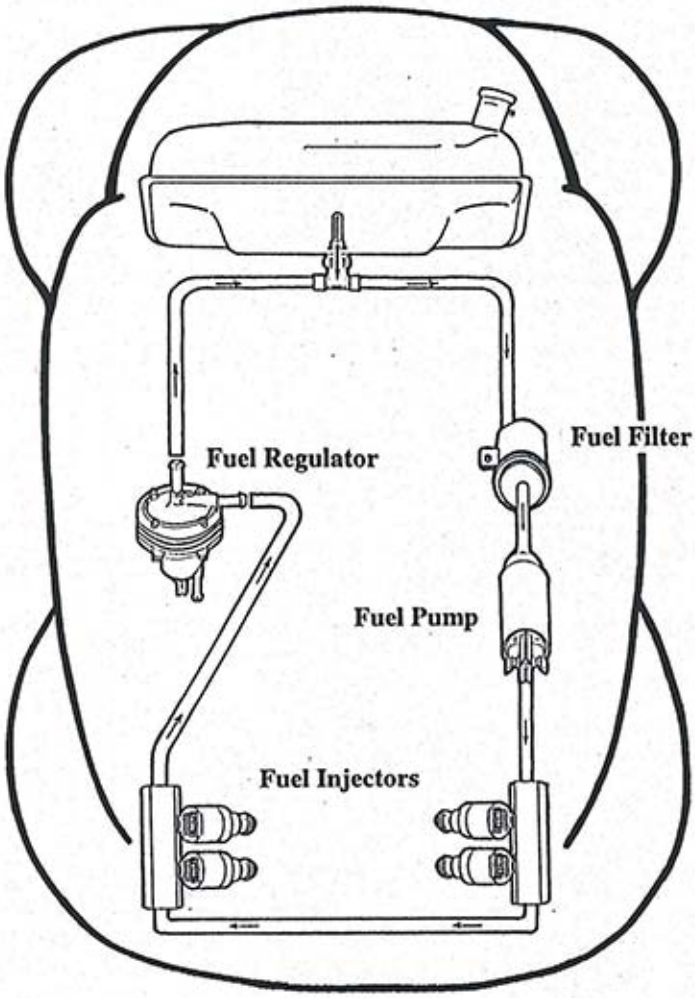
Dirt, sand and other sludge builds up in the filter as the fuel is circulated through the system. The filter will eventually clog to the point that the fuel will only trickle through the filter. When this happens the engine will idle, and depending on the amount of fuel flow, might even run at mid-speed. Full throttle operation with a partially plugged filter will result in serious fuel starvation. Your engine will tell you about this by popping and snapping out of the exhaust pipe as it goes lean due to a lack of fuel.

This condition is often mis-read as burnt points, fouled spark plugs and even tight valves. Check your cars fuel filter on a regular basis. Check the fuel filter as often as you check your oil if you operate your engine in dirty conditions. Also make sure that the fuel filter and fuel pump are installed in the correct order. First the fuel filter and then the fuel pump. The filter can be quickly replaced, and if that doesn't solve the problem work your way through the following Trouble Shooting Guide.

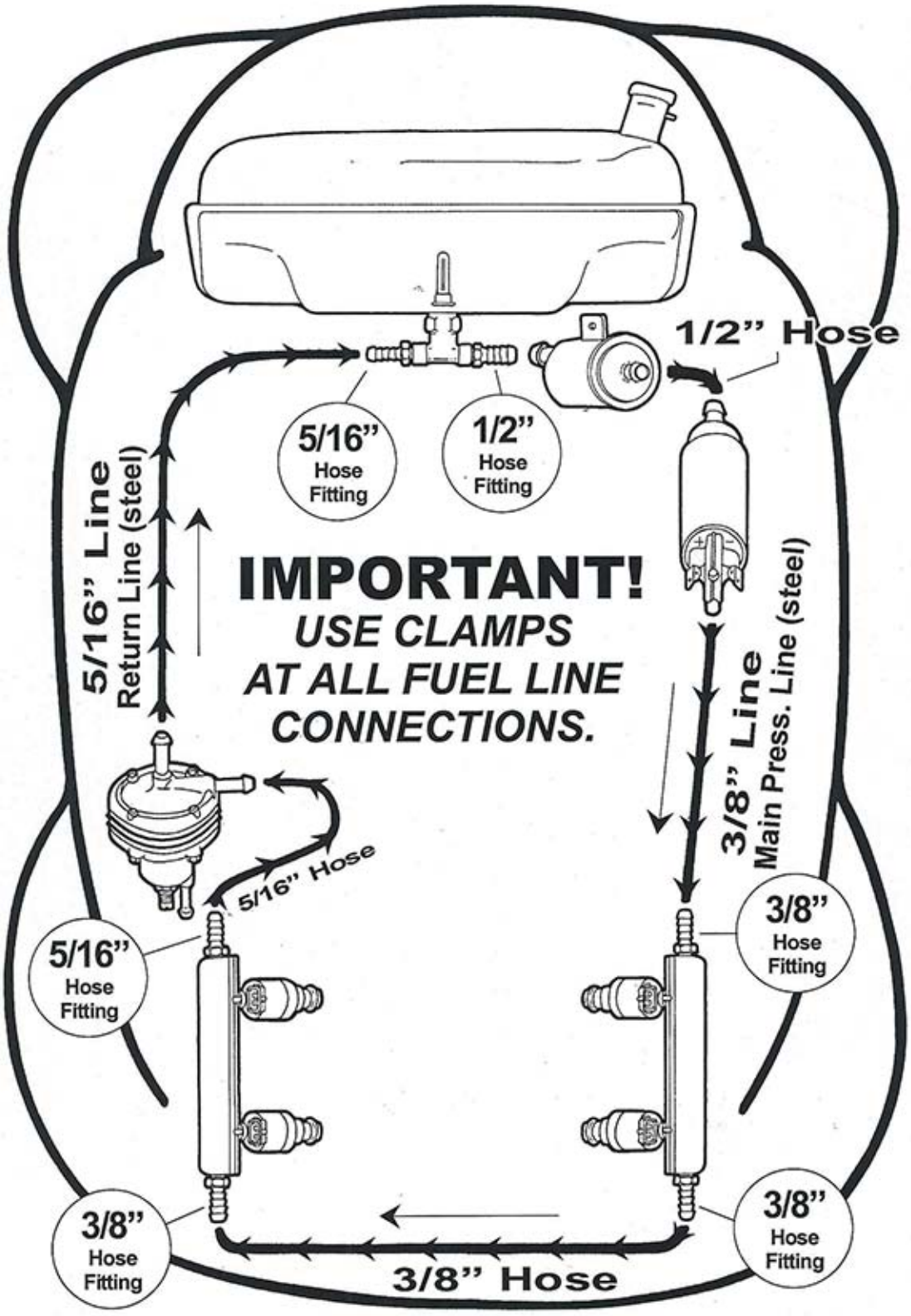


Keep the tank and fuel filter clean.

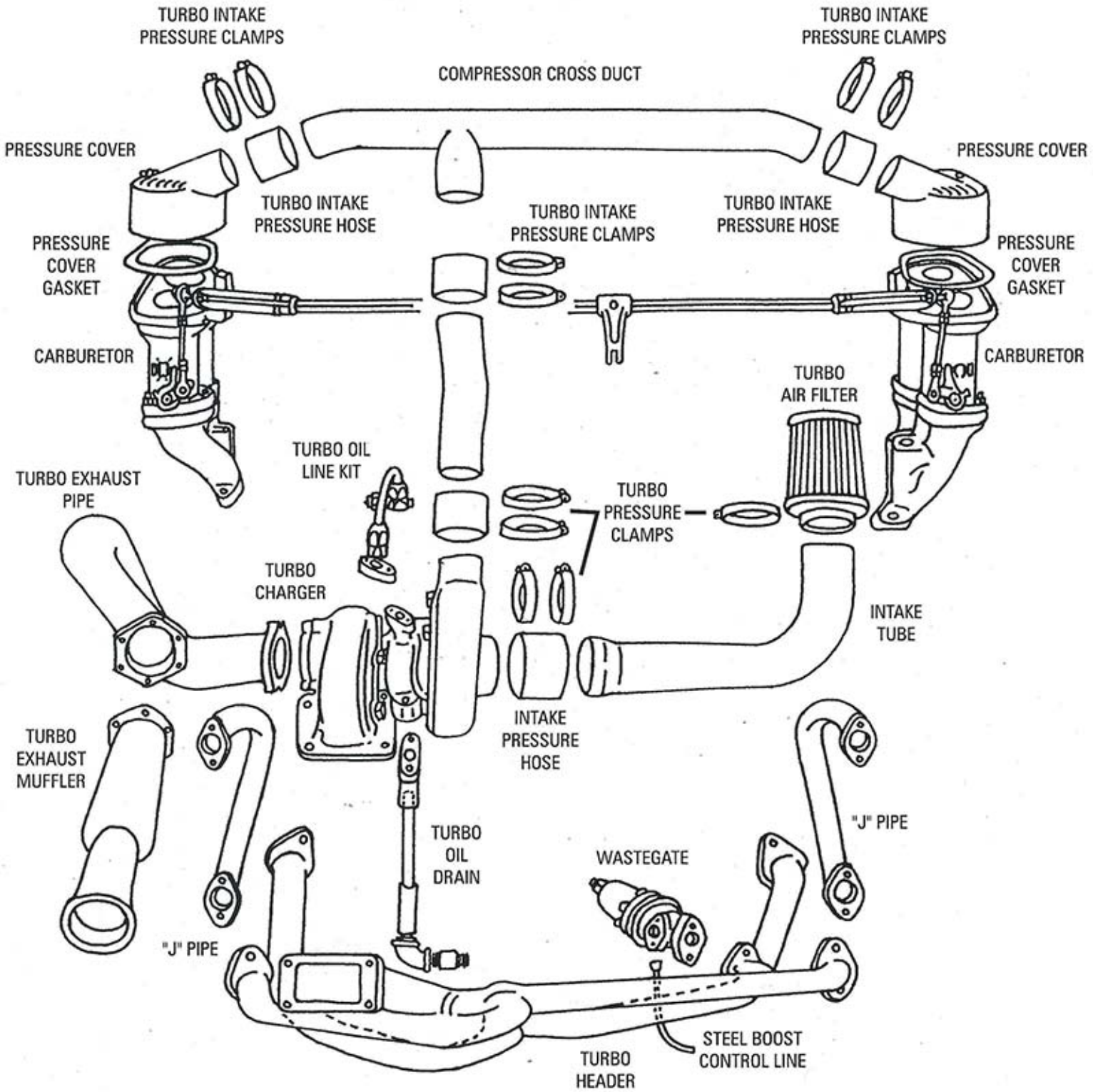
Don't get bugged with a dirty fuel filter.



CAUTION - CLEAN AND FLUSH YOUR GAS TANK BEFORE INSTALLING YOUR NEW FUEL LINES. THIS IS AN ABSOLUTE MUST! YOUR FUEL SYSTEM MUST BE CLEAN TO OPERATE CORRECTLY!



TURBO COMPONENT SYSTEM



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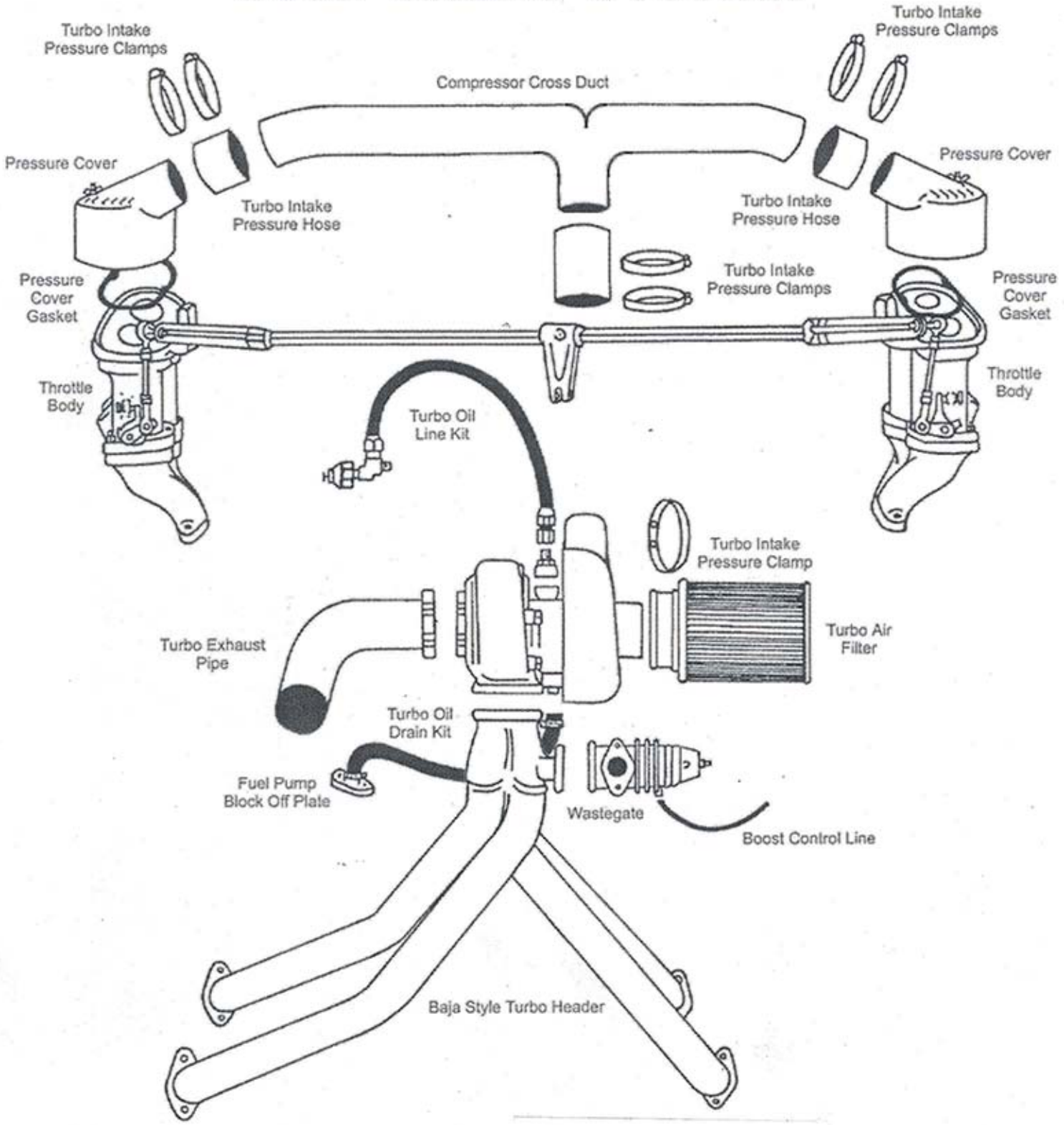
HIGH PERFORMANCE RACING PRODUCTS

1715 N. Farmersville Blvd.
Farmersville, CA 93223
Phon: 559.733.8222
Fax: 559.733.8337

BAJA/BUGGY TURBO SCHEMATIC
COMPONENT SYSTEM



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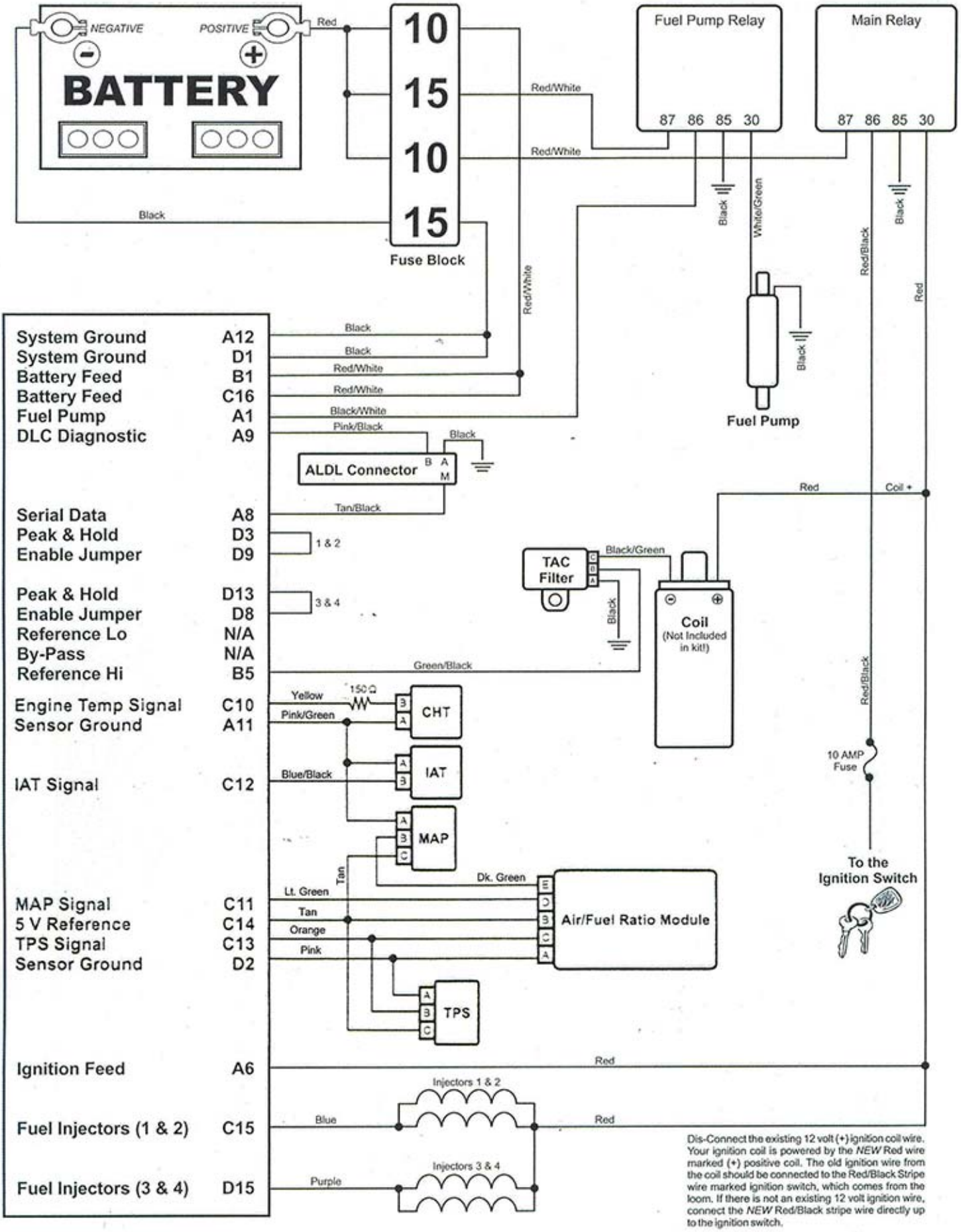
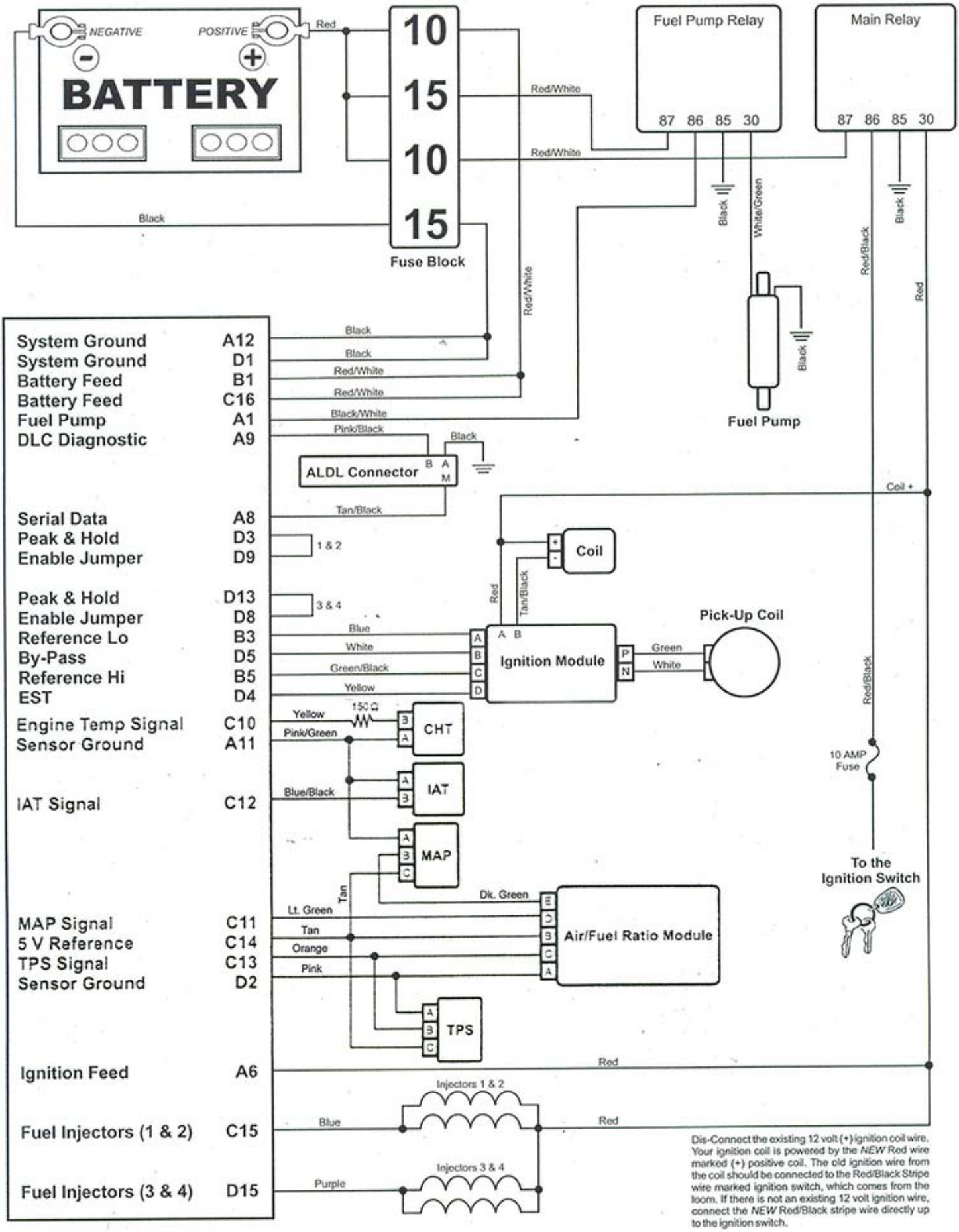
Competition Turbo Injection - (4 injectors)



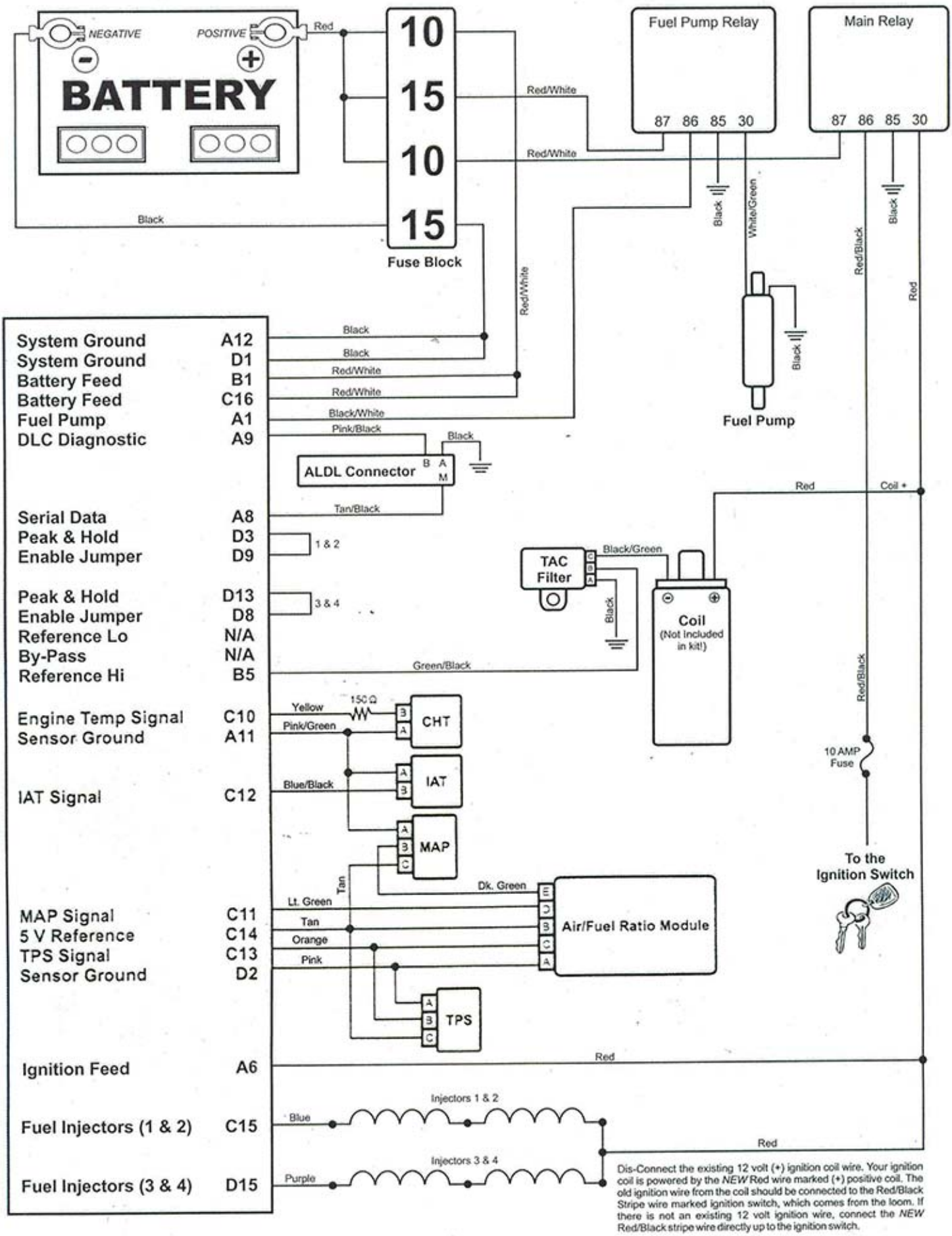
Dis-Connect the existing 12 volt (+) ignition coil wire. Your ignition coil is powered by the *NEW* Red wire marked (+) positive coil. The old ignition wire from the coil should be connected to the Red/Black Stripe wire marked ignition switch, which comes from the loom. If there is not an existing 12 volt ignition wire, connect the *NEW* Red/Black stripe wire directly up to the ignition switch.

Competition Turbo Injection - HEI (4 injectors)



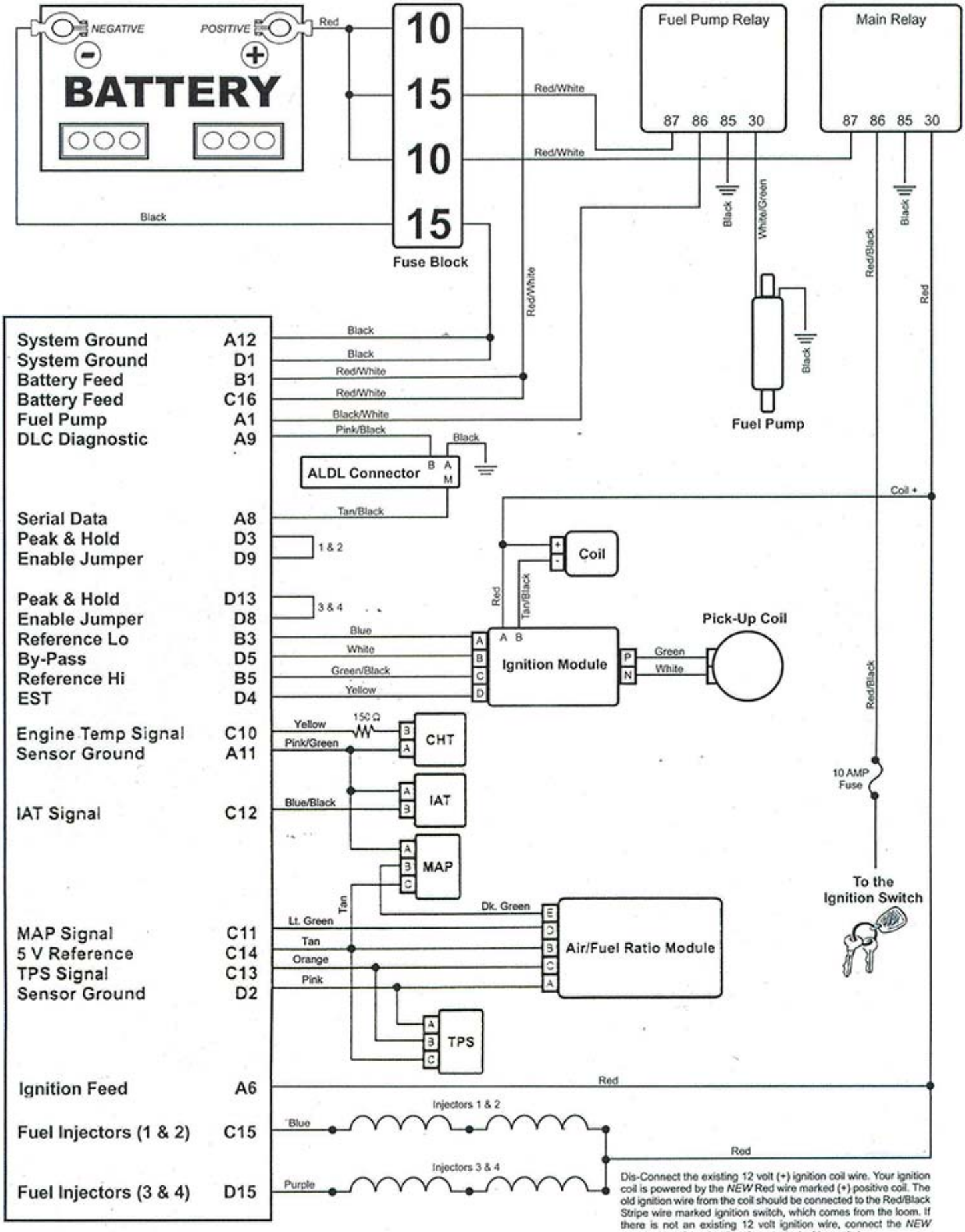
Dis-Connect the existing 12 volt (+) ignition coil wire. Your ignition coil is powered by the *NEW* Red wire marked (+) positive coil. The old ignition wire from the coil should be connected to the Red/Black Stripe wire marked ignition switch, which comes from the loom. If there is not an existing 12 volt ignition wire, connect the *NEW* Red/Black stripe wire directly up to the ignition switch.

Competition Turbo Injection - (4 injectors) 63-64lbs.



Dis-Connect the existing 12 volt (+) ignition coil wire. Your ignition coil is powered by the *NEW* Red wire marked (+) positive coil. The old ignition wire from the coil should be connected to the Red/Black Stripe wire marked ignition switch, which comes from the loom. If there is not an existing 12 volt ignition wire, connect the *NEW* Red/Black stripe wire directly up to the ignition switch.

Competition Turbo Injection - HEI (4 injectors) 63-64lbs.



Dis-Connect the existing 12 volt (+) ignition coil wire. Your ignition coil is powered by the *NEW* Red wire marked (+) positive coil. The old ignition wire from the coil should be connected to the Red/Black Stripe wire marked ignition switch, which comes from the loom. If there is not an existing 12 volt ignition wire, connect the *NEW* Red/Black stripe wire directly up to the ignition switch.

Important Information

Make sure to fit your header to the Engine BEFORE any aftermarket coating. Customer assumes the any responsibility for the header, after coating.