

SETUP & INSTALLATION



Step 1 - Pre Installation Procedures

A) Before beginning this installation, read the instructions completely and be certain you understand all aspects of the installation before proceeding. There will also be some necessary tests to perform on the vehicle to ensure a successful install.

Check voltage output of the alternator to make sure it falls within acceptable tolerances. This will be between 12.7-14 volts. Check the battery to make sure it is fully charged and is in good condition.

The standard Bosch "Blue Coil" is **NOT** compatible with this system.

Standard VW solid core plug wires must **NOT** be used. A high quality suppression core wire is required. **RESISTER SPARK PLUGS ARE REQUIRED!** Ask the tech representative at CB Performance for recommendations.

B) Disconnect the battery. **DO NOT** proceed further without doing so. It is advisable after disconnecting the battery to drain the fuel tank and remove it. Disconnect the fuel line at the engine and blow the line clear with compressed air (wear eye protection) to be absolutely certain the fuel line is clear of any foreign material or debris. It is recommended to install two 3/8" fuel lines from the fuel tank to the engine. The larger 3/8" line is needed to prevent fuel starvation to the engine on larger/higher horsepower engines. Make sure the supplied fuel filter is installed. The 1/2" filter is the pre-filter and is installed between the tank outlet and the fuel pump. This is a very high-pressure system. Make sure all hose connections are tight and leak proof.

Remove the existing carburetors and fuel pump. It may be necessary to mock up the throttle bodies and linkage to make sure it fits your particular configuration. Once satisfied with the fit, remove them and use tape to cover the intake ports to prevent any debris from entering the engine.

Step 2 - Wiring

Stretch out the wiring harness to determine the best routing of the wiring for your particular application based on where you want to mount the EMS. If the EMS is going to be installed in a Beetle/Karmann Ghia, the EMS is supposed to be installed under the back seat (opposite the battery). In off-road applications or open cockpit vehicles where the environment is a factor, find the best possible mounting point (an enclosure is a must). Ensure that the harness will reach the engine correctly from it's mounting point. The harness is clearly tagged for where all the wires need to go. The ends which connect to the injectors, throttle position sensor, cylinder head temp sensor, O2 sensor, ignition wiring and the ganged ground wires (engine case attachment required) will need to be routed into the engine bay. A minimum 1 1/4" hole will need to be drilled wherever the wiring is to pass thru sheet metal, so plan well. This is the easiest to do when the throttle bodies/carbs are off, for best access. **DO NOT** cut or modify the wire harness. The harness is designed for your application and modifying it will void any type of warranty or support from CB Performance.

NOTE: The fuel pump must be mounted in the horizontal position. Mounting the fuel pump vertically will damage it. **DO NOT** mount the pump at the rear of the vehicle. The fuel pump is designed to be gravity fed from the tank. Trying to pull the fuel through the small diameter stock fuel line will

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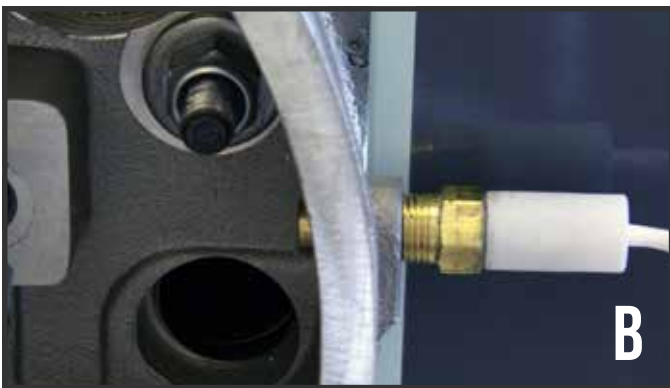
compromise the efficiency of the pump and cause it to run hot or cause it to fail. A pump can tolerate restrictions on the discharge much better than on the suction side.

Mount the EMS under the back seat, opposite the battery side of the tunnel. Keeping the EMS connector where the EMS is mounted, pull the engine bay segment of the wiring through the hole(s) you drilled being careful not to cut the insulation sheathing as you pass it through. Be sure there is enough slack in the wiring to attach all the connectors without stretching the wires too tightly.

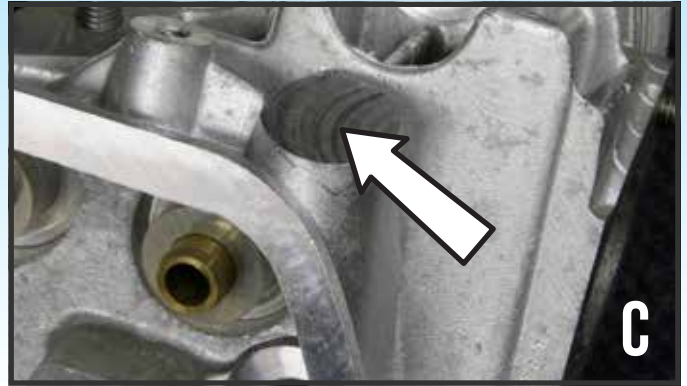
Step 3 - Hardware Installation



Under no circumstances should Teflon tape be used on any threads in this kit. Use only Blue Loctite for threaded sealant. Teflon tape will find it's way into the fuel injectors and or the fuel pump and damage them [A].



The cylinder head temp sensor is to be installed in the 3-4 cylinder area. If using bolt-on valve covers, we recommend that it be installed in the valve cover bail boss [B].

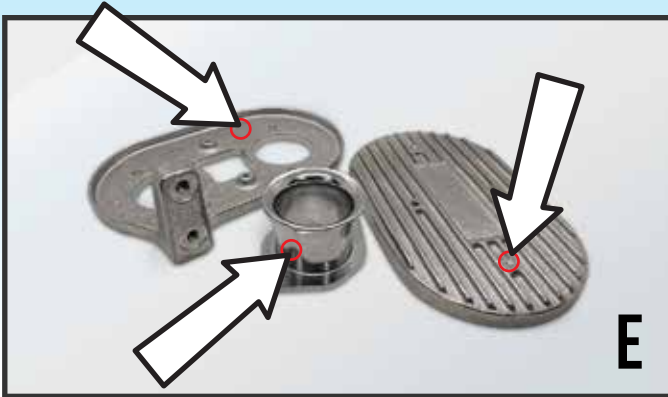


If you have an available boss cast into the cylinder head (New-Style CB 044's or Panchito 044's), you can use the boss [C].

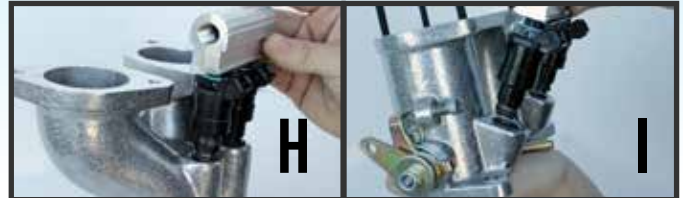


If using clip-on style valve covers, we recommend that it be installed below the boss [D]. Make sure before you drill a hole into your cylinder head, that there is no interference from push rods or head studs and the sensor. Use an 11/32" drill and an 1/8" NPT pipe tap. You will break through into the rocker box of the head, so be prepared to catch the shavings to prevent entry into the engine. Clean the shavings from the tapped hole and install the sensor using blue loctite for thread sealant.

Intake Air Temperature Sensor (IAT) - Installation of the IAT sensor will be on the 3-4 side of the engine, above the throttle plate. Locations for sensor placement can be in the air cleaner lid, air cleaner base, velocity stack or in the side of the throttle body [E]. A 1/8" NPT hole will need to be drilled and tapped in the desired location.



Next, take the rail assembly and push it down into either the throttle body or manifold [H, I]. In either throttle body or manifold assembly, some fuel rail hold downs need to be used. Refer to pictures to correctly assemble the hold down assemblies [J, K, L].



There are several types of throttle body/manifold setups. Regardless of the setup you are running you must first push the fuel injectors into the injector securing clip [F].



Then grease up the "O" rings on the injectors (**DO NOT USE OIL**). Take the injectors and push them up into the fuel rails until they seat all the way and you hear the clip latch onto the rail. Take note that none of the o-rings have been pinched [G].



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Depending on your vehicle configuration, it may be easier to install the manifolds first without the throttle body rather than the whole assembly. Remove the tape covering the intake ports and install the throttle bodies with the supplied gaskets.

On all applications, make sure you have a good chassis ground, free of rust or powder coating. Install the Fuel Pressure Regulator (FPR) between the last remaining port of the two fuel rails and the fuel 'T' under the tank. The FPR must NOT be mounted inside the engine compartment. Extended periods of high temperatures will cause fluctuations in your fuel pressure. Make sure the vacuum line is securely attached to the vacuum port of the FPR.

After engine is started, the FPR needs to be set to 43 lbs. @ idle. Re-check the pressure after the engine warms up. If the pressure has changed, you will need to re-adjust it to 43 lbs. @ idle.

For those with IAC motors, skip the next part. Connect a 1/4" vacuum hose to the barbed fitting in each throttle body. You will need to install a vacuum T in this line. The T will go to the fuel pressure regulator. In this line, you will add another T to run vacuum to the MAP sensor, located at the ECU. Take a small nylon zip tie, and use it as a clamp to secure the line to the fuel pressure regulator. It will be necessary to weld an O2 sensor bung into the exhaust if one is not already present.



If a 4-into-1 header is being used, install the bung into the muffler head pipe a few inches away from the collector flange, preferably at somewhere between the 10 O'Clock and 2 O'Clock position [M].



Turbo Applications: Weld the O2 sensor bung after the turbo. Please refer to the pictures to see the recommended placement of the O2 sensor [N].

Insure O2 sensor clears turbo drain pipe.

Step 4 - Linkage

The first step to assemble your linkage is to slide the linkage arms onto the hex bar. The two linkage arms mount on each end of the hex bar while the straight throttle cable arm mounts in the middle. The throttle cable arm locates 60 degrees, or "one hex degree" down from the linkage arms. There are two centering springs supplied in your kit. Grease these springs very well and push them into each end of the hex bar. Take the two threaded swivel balls and jam nuts and thread them into the linkage bases that are mounted on your throttle bodies. Slip one end of the hex bar into the swivel ball. While centering the other end, slide it into the second swivel ball. It might be necessary to loosen the throttle body or intake manifold to make enough room to slide the hex bar into place. The swivel balls will need to be adjusted outward until there is a 1/4" of side to side movement of the hex bar. Try to keep the outward adjustment of the swivel balls the same from side to side. Once this is accomplished, lock the jam nuts down. Make sure you have at least a 1/4" of hex bar free play after tightening the jam nuts.

The linkage rods and heim joints are next. There are four heim joints in all. Two right hand and two left hand heim joints with corresponding lock nuts. Each side will need one

of each. The linkage rods are equipped with matching right and left hand threads. Thread the locknuts and heim joints onto the linkage rods. Leave these 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 ended wrenches for this operation, an 8mm and 3/8".

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 setscrew. Now check the installed linkage rods, both left and right, making sure 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 2 pounds of torque.

Step 5 - Fine Tuning the Linkage Assembly

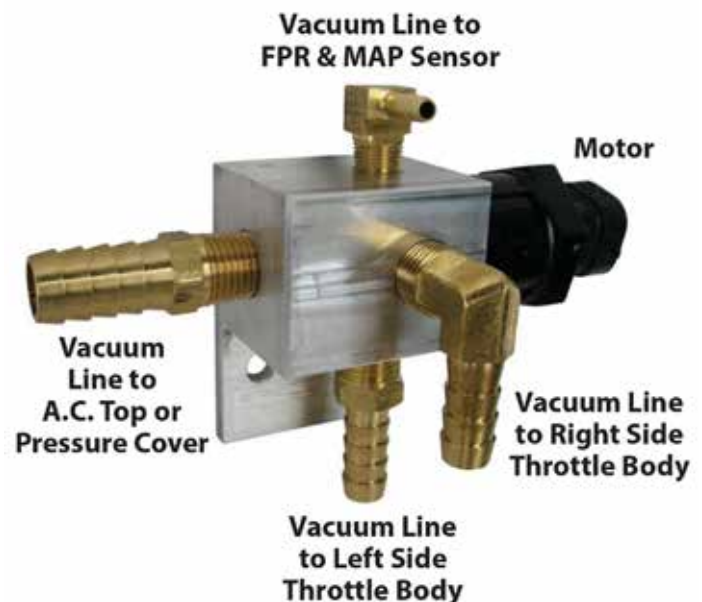
Adjust the throttle linkage by rotating in the right or left hand directions, until both throttle stop arms are resting on the idle speed set screws. By rotating the linkage rods, you'll be able to extend or shorten the length of the rods. This will allow you to match the preset throttle bodies. Do not change the position of the idle speed set screws to match your linkage. Adjust the linkage to match the throttle bodies. Once dialed in, push the aluminum throttle arm downwards and watch the linkage arms, as they should move from their stops or "closed" position at the same identical time. If they don't, then you have some more adjusting to do.

Step 6 - Idle Air Control

Mount the IAC remote mount on the back of fan shroud, in the center. Route the 3/8" hose from each throttle body to the two 1/4" NPT ports closest to the motor. DO NOT use 1/4" NPT port directly across from the motor - this is the output.

The 1/8" NPT port on the top of the mount is the vacuum source for your fuel pressure regulator and MAP sensor. The 1/4" NPT port directly across from the motor is routed to the air cleaner lid or a small Uni Vent filter (not supplied) can be used. It is recommended that this uses filtered air.

In a Turbo Application, the output hose must go to the pressure cover. Not doing this will allow a boost leak.



Step 7 - Wiring Connection

The gang of ground (earth) wires needs to be attached directly to the engine case. One of the case, distributor, or fuel pump block off bolts will suffice for grounding. It's vital that these wires are attached to the engine case to minimize electrical "noise". Snap the injector connectors to

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the injectors. The connectors are clearly marked. The injectors may be rotated to facilitate easy wiring connection.

The fuel pressure sensor is screwed into one end of one of the fuel rails. Apply blue Loctite to the threads and tighten it firmly. It uses a clearly marked connector. Attach the TPS, IAT and CHT sensor connectors via their respective weatherpak connectors.

Screw the O2 sensor into the bung with a little anti-seize compound on the threads and attach the connector. Be sure to route the wiring away from the hot exhaust.

The ignition switch wire is located near the ECU. You can run a new wire (recommended) or splice into an existing wire. Then finally connect both the coil connections from the EMS to the coil, one marked negative, and one positive or the single lead marked "to Coil Pack." Make sure that there are no "hot" wires from the ignition switch attached to the coil. After connections have been made, tie the wiring harness up and away from hot surfaces and away from the cooling fan inlet. Use rubber grommets on the holes that the wiring passes through. Do not tie anything up to ignition wires, as this will add EMI noise to your fuel injection, causing problems.



It is important that the wire harness is ran behind the fan shroud to help eliminate electrical noise interference. Make sure harness is zip-tied to the case so that it is not pulled into the fan while running [0].

Step 8 - Ignition

Crank Trigger - Bring the engine up to TDC and remove the crank pulley bolt. Install trigger wheel, making sure to line up the keyway. You may need to use the bolt supplied to help draw the wheel into the pulley. Remove the two upper case nuts behind the crank pulley. Install the provided bracket with shouldered nuts provided. Torque to 18 ft. lbs. Install extension bracket, leave bolts loose enough to allow the extension to slide. Install Crank sensor into extension bracket. Line up sensor over 8th tooth, counter-clockwise from the missing tooth on the trigger wheel. Use provided shims if necessary to shim sensor .020" from trigger wheel. Tighten everything down, making sure the sensor is centered over the 8th tooth.

Mount coil pack on firewall or fan shroud. The poles on the coil are marked with which cylinder goes where. The terminals marked Cylinder #1 and #3 can go to either Cylinder #1 or Cylinder #3 - orientation does not matter. Repeat steps for Cylinders #2 and #4.

For distributor hole plug installation, refer to install instructions included with the plug.

Cam-Sync - For sequential ignition systems, it is required to install a cam-sync. Rotate engine so that the crank sensor is directly over the 8th tooth, clockwise from the missing tooth. Remove old distributor and place aside. Remove cap from cam-sync and install into distributor hole. Make sure the cam-sync is fully seated and route large ring terminal to clamp stud. Rotate the cam-sync until the reluctor lines up with the pick-up. Clamp everything down making sure reluctor is still lined up.

Step 9 - Fuel Line Connections

A) It is desirable to mount the pump as close to the tank as possible. It uses a rather large 15mm hose attachment on the suction side, along with a similar sized filter. A new tank bung is provided with a 1/2" hose barb as well. The

filter goes inline between the tank and pump, and is marked with an arrow for direction of flow. Make sure it points the correct way. Two "P" clamps are used to attach the pump to any flat surface. Mount the pump below tank level and in the horizontal position. Make sure there are no kinks in the hose. Connect the discharge end to the fuel line in the chassis.



B) On all engines, two fuel lines need to be installed in your vehicle. One is for pressure and one is for return. Use a 3/8" ID Fuel line for each. Make sure the 1/2" Fuel filter is installed before the fuel pump.

C) The fuel pressure regulator [P] needs to be installed after the last fuel rail. Before installing onto vehicle, remove the 1/8" NPT plug on the front of the fuel pressure regulator and install the provided fuel pressure sensor. Use blue Loctite to seal the threads. The fuel pressure regulator must never be

installed in the engine compartment or near high heat areas.

Fuel Pressure fluctuations will occur if the fuel pressure regulator is mounted near heat. Attach the 1/4" vacuum line that is 'T'd between each throttle body to the vacuum port on the fuel pressure regulator. Make sure the connection is tight. Use a clamp if necessary (refer to the fuel pressure schematic page).

D) After engine is started, set fuel pressure to 43 psi @ idle. After engine warms up, recheck pressure and adjust if needed. Refer to instruction manual included with the fuel pressure regulator for plumbing instructions.

A precautionary note: On all applications, it is advisable to install the fuel tank, connect the suction line, pour in a little fuel, and check for leaks. Turn the key on and let the pump cycle. The pump is designed to shut off in one second. Turn the key off and wait 5 seconds and turn the key on again. Repeat this process 3-4 times until you have confirmed there are no fuel leaks.

With all the hardware mounted, the connections to the EMS may now be made. The gang of red battery leads attach directly to the positive side of the battery. ***NOTE: If a battery cut-off switch is installed, the 12 volt battery positive leads must be connected to the hot side. The ECU needs to shut down properly or damage/corrupt data could occur.***



WARNING!

**NEVER, UNDER ANY
CIRCUMSTANCES SHOULD
YOU RUN LEADED RACING FUEL!**

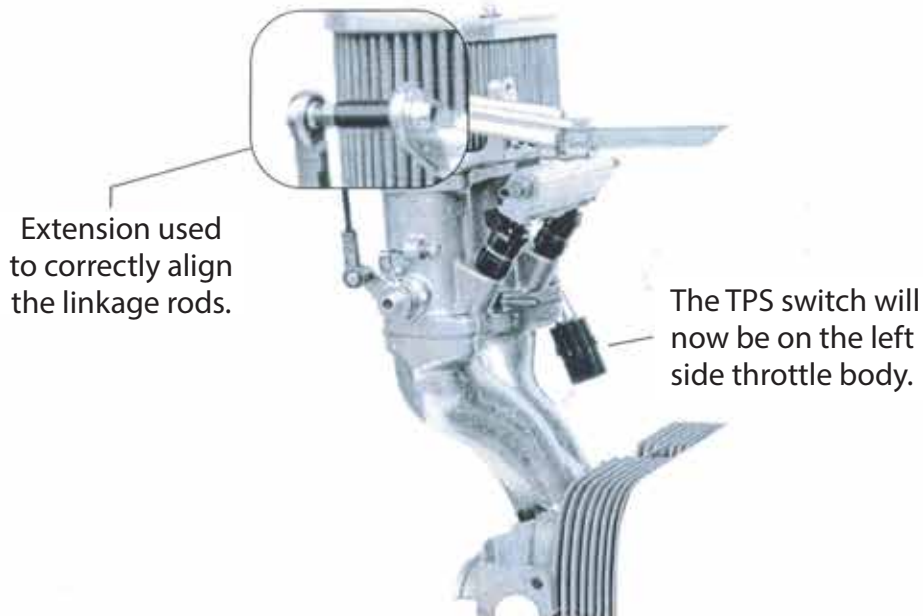
**ONLY UNLEADED RACING FUEL
IS ACCEPTABLE TO RUN IN YOUR
CB GEN4 EFI SYSTEMS**

**SERIOUS DAMAGE TO
OXYGEN SENSOR AND/OR
ENGINE WILL OCCUR
WITH LEADED FUEL.**

SPACE SAVER MANIFOLDS

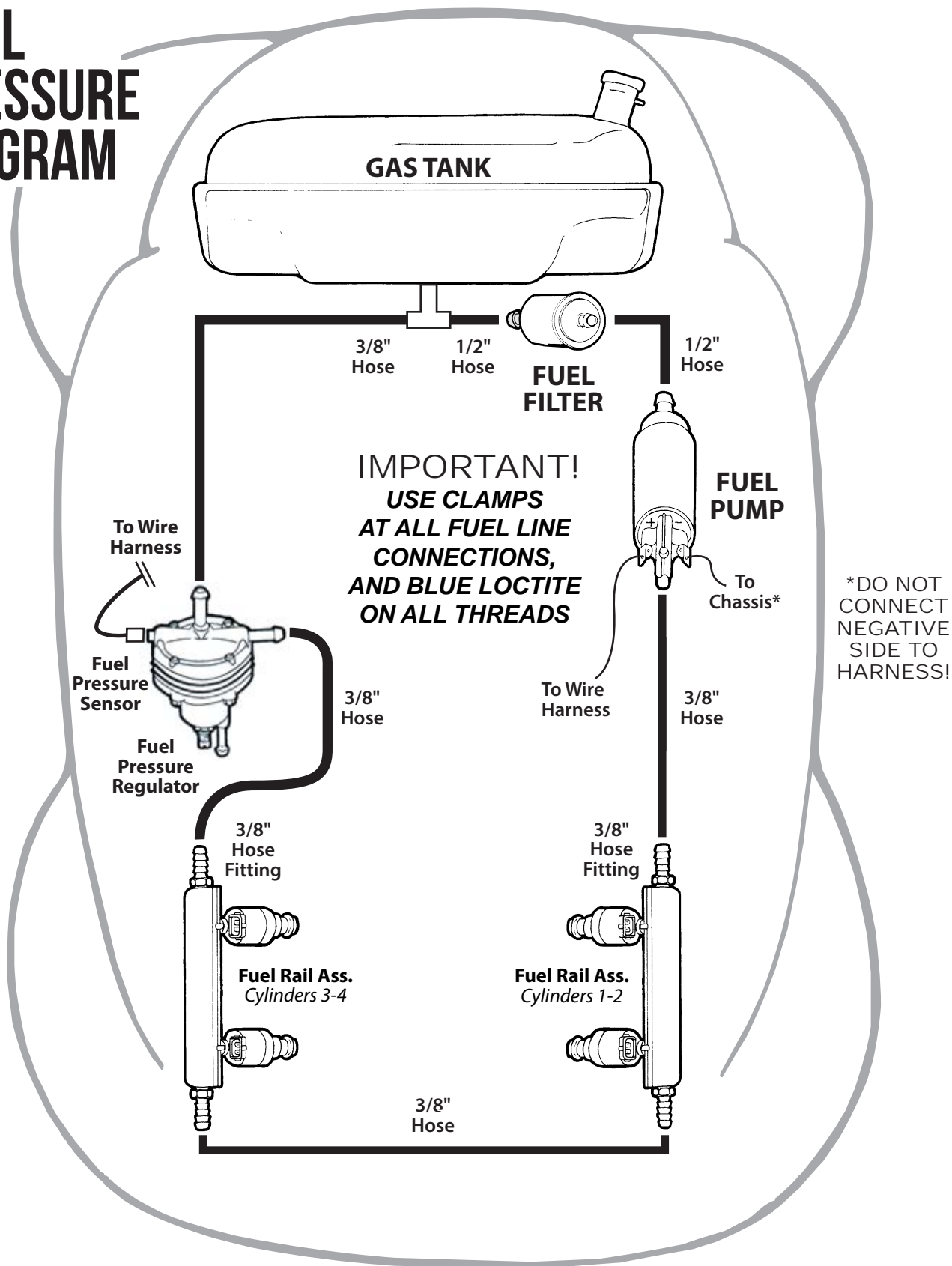


The Space Saver Manifolds installed in a similar manner to what was shown in the manual. The major difference is the use of the Space Saver style linkage and manifolds. This enables throttle bodies machined for injectors to be used within a sedan engine compartment. The TPS will now be on the left side throttle body (drivers side) and the injectors will be inboard. There are two extensions used on the aluminum linkage arms to correctly align the linkage rods. Refer to the above photo for a completed view of a Space Saver Manifold installation.

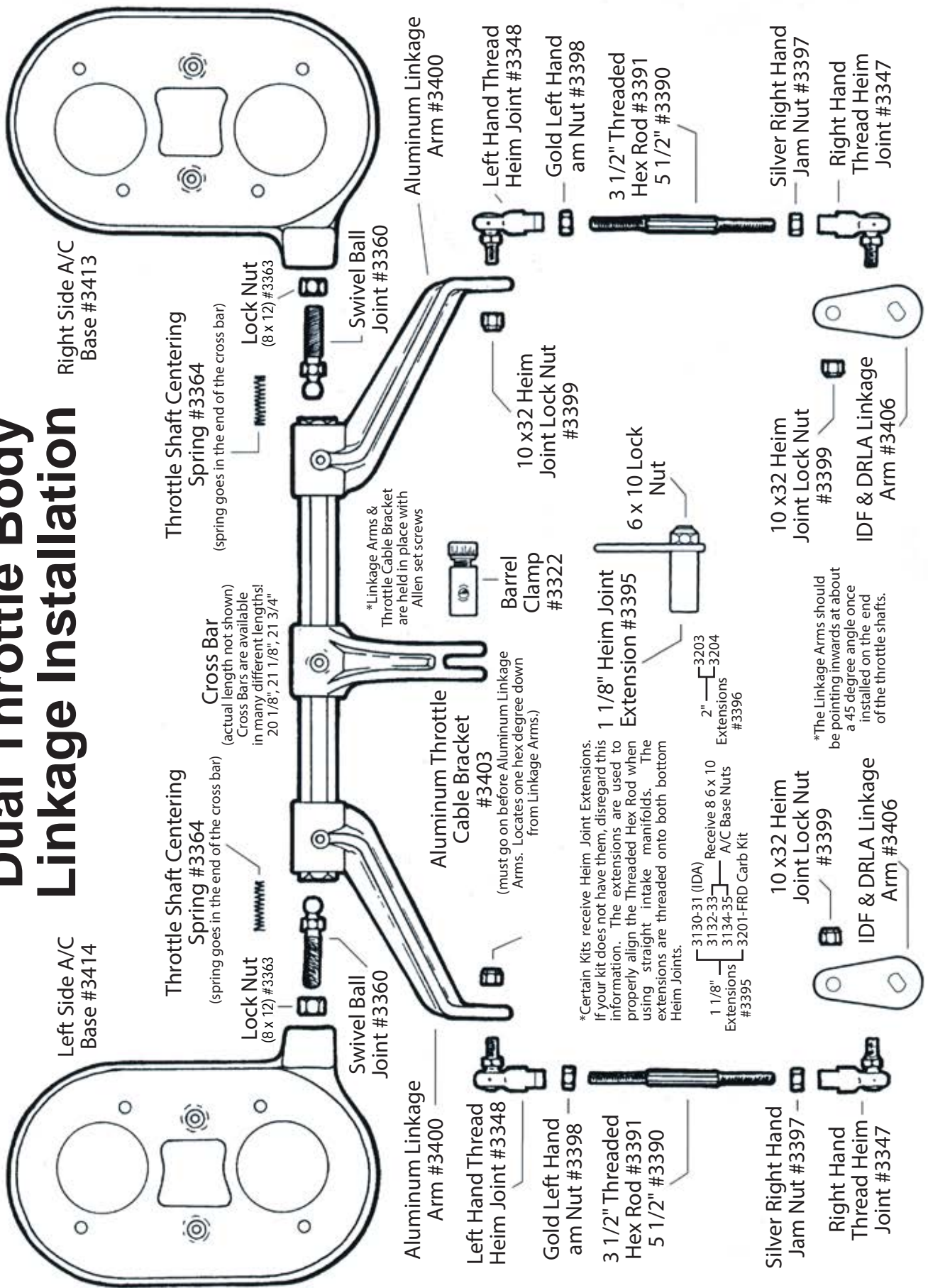


CAUTION - CLEAN AND FLUSH YOUR GAS TANK BEFORE INSTALLING YOUR NEW FUEL LINES. THIS IS AN ABSOLUTE MUST! YOUR FUEL SYSTEM MUST BE CLEAN TO OPERATE CORRECTLY!

FUEL PRESSURE DIAGRAM



Dual Throttle Body Linkage Installation



Left Side A/C Base #3414

Right Side A/C Base #3413

Throttle Shaft Centering Spring #3364
(spring goes in the end of the cross bar)

Throttle Shaft Centering Spring #3364
(spring goes in the end of the cross bar)

Cross Bar
(actual length not shown)
Cross Bars are available in many different lengths!
20 1/8", 21 1/8", 21 3/4"

Lock Nut (8 x 12) #3363

Lock Nut (8 x 12) #3363

Swivel Ball Joint #3360

Swivel Ball Joint #3360

Aluminum Linkage Arm #3400

Aluminum Linkage Arm #3400

Aluminum Throttle Cable Bracket #3403
(must go on before Aluminum Linkage Arms. Locates one hex degree down from Linkage Arms.)

*Linkage Arms & Throttle Cable Bracket are held in place with Allen set screws

Left Hand Thread Heim Joint #3348

Left Hand Thread Heim Joint #3348

Gold Left Hand Jam Nut #3398

Gold Left Hand Jam Nut #3398

3 1/2" Threaded Hex Rod #3391
5 1/2" #3390

3 1/2" Threaded Hex Rod #3391
5 1/2" #3390

Silver Right Hand Jam Nut #3397

Silver Right Hand Jam Nut #3397

Right Hand Thread Heim Joint #3347

Right Hand Thread Heim Joint #3347

10 x32 Heim Joint Lock Nut #3399

10 x32 Heim Joint Lock Nut #3399

IDF & DRLA Linkage Arm #3406

IDF & DRLA Linkage Arm #3406

*Certain Kits receive Heim Joint Extensions. If your kit does not have them, disregard this information. The extensions are used to properly align the Threaded Hex Rod when using straight intake manifolds. The extensions are threaded onto both bottom Heim Joints.



1 1/8" Heim Joint Extension #3395

6 x 10 Lock Nut

Barrel Clamp #3322

*The Linkage Arms should be pointing inwards at about a 45 degree angle once installed on the end of the throttle shafts.

IMPORTANT INFORMATION

*Make sure to fit your header
to the Engine **BEFORE** any
aftermarket coating.*

*Customer assumes any
responsibility for the
header, after coating.*

Hide-away Turbo Assembly Instructions



Here you can see some before and after pics of some Engine Sheet Metal that has been modified to run on a Turbo System.



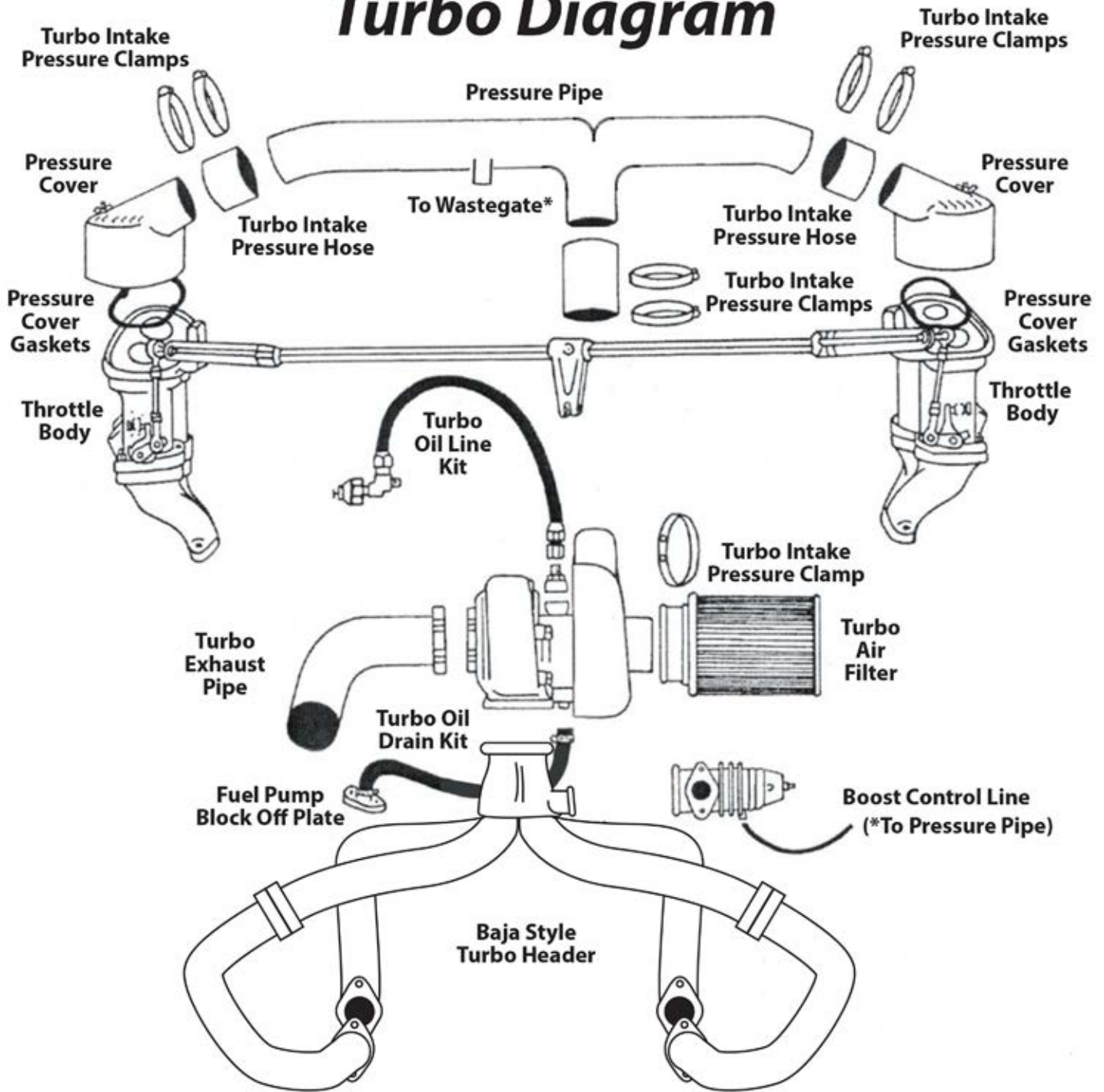
The following pictures show the proper assembly of Turbo Drain Pipe, and the next two pages feature the assembly of the entire Turbo System.



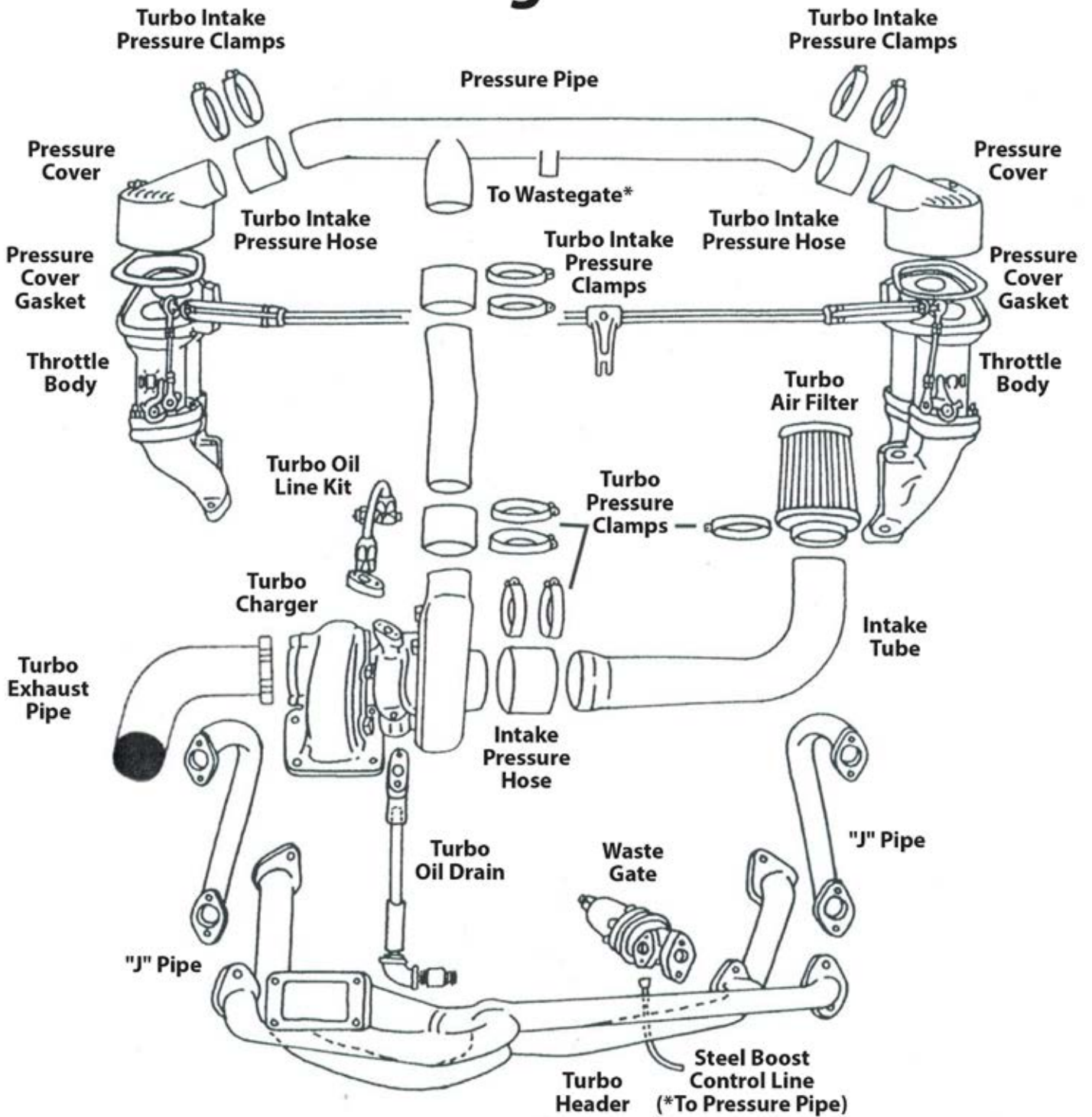
*(Turbo Rotated
to show Fittings)*



Rear Engine/Baja Turbo Diagram




Hideaway Turbo Diagram

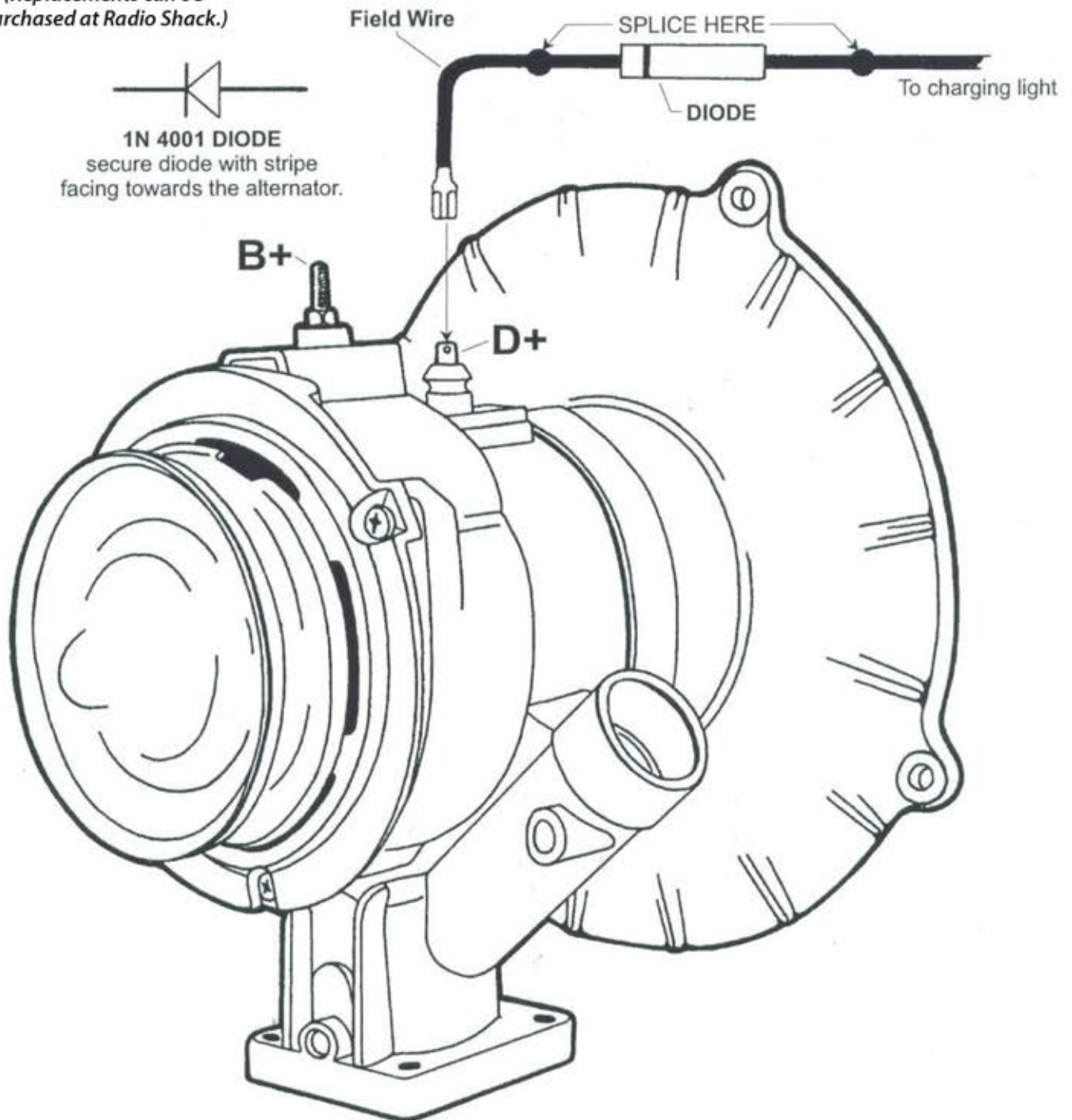


Engine Run-On

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.

(Replacements can be purchased at Radio Shack.)

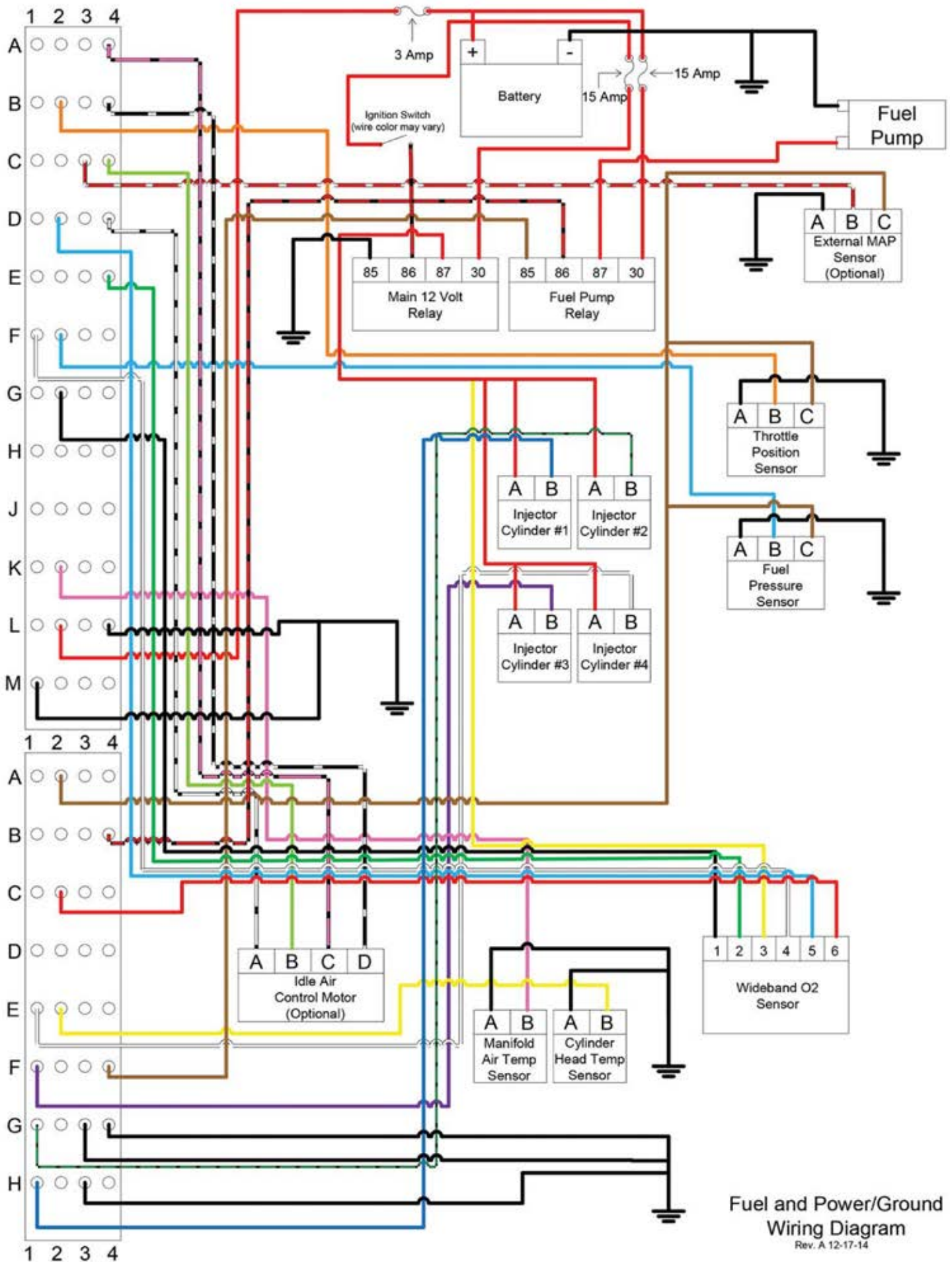

1N 4001 DIODE
secure diode with stripe facing towards the alternator.



C3100 ECU WIRING PIN-OUT (REV F 3-28-15)

PIN	DESCRIPTION	USE	TYPE	NOTES	WIRE GUIDE
J1_BF2	VR1 (+)	VR1 (+)	INPUT	USE TWISTED WIRE	20
J1_BE3	VR1 (-)	VR1 (-)	INPUT	USE TWISTED WIRE	20
J1_AJ2	VR2 (+)	VR2 (+)	INPUT	USE TWISTED WIRE	20
J1_AH2	VR2 (-)	VR2 (-)	INPUT	USE TWISTED WIRE	20
J1_BB2	HALL CRANK	HALL CRANK (+)	INPUT	USE TWISTED WIRE	20
J1_BB3	HALL CAM	HALL CAM (-)	INPUT	USE TWISTED WIRE	20
J1_BD2	COIL (-) TACH PICKUP	COIL (-) TACH PICKUP	INPUT		20
J1_BC4	OUT_1 (-)	AUX 1	OUTPUT		20
J1_BD4	OUT_2 (-)	BOOST SOL. (-)	OUTPUT		20
J1_AH1	OUT_3 (-)	WATER METH (-)	OUTPUT		20
J1_AG1	OUT_4 (-)	WATER METH PUMP RLY (-)	OUTPUT		20
J1_AJ1	OUT_5 (-)	AUX 2	OUTPUT		20
J1_BE4	OUT_6 (-)	NITROUS 1	OUTPUT	MUST CONNECT TO SSR	20
J1_AK1	OUT_7 (-)	NITROUS 2	OUTPUT	MUST CONNECT TO SSR	20
J1_BA4	TACH OUT	TACH OUT	OUTPUT		20
J1_BF4	RELAY (-)	RELAY (-)	OUTPUT	CONNECT TO [85-POWER RELAY]	20
J1_BC3	DIGITAL_1	2-STEP	INPUT		20
J1_AB3	DIGITAL_2	AC	INPUT		20
J1_AC2	DIGITAL_3	DATALOG TRIGGER	INPUT		20
J1_AF4	COIL_1 (-)	COIL_1 (-)	OUTPUT		20
J1_AH4	COIL_2 (-)	COIL_2 (-)	OUTPUT		20
J1_AK4	COIL_3 (-)	COIL_3 (-)	OUTPUT		20
J1_AM4	COIL_4 (-)	COIL_4 (-)	OUTPUT		20
J1_BH1	INJ_1 (-)	INJ_1 (-)	OUTPUT		20
J1_BG1	INJ_2 (-)	INJ_2 (-)	OUTPUT		20
J1_BF1	INJ_3 (-)	INJ_3 (-)	OUTPUT		20
J1_BE1	INJ_4 (-)	INJ_4 (-)	OUTPUT		20
J1_BD1	INJ_5 (-)	INJ_5 (-)	OUTPUT		20
J1_BC1	INJ_6 (-)	INJ_6 (-)	OUTPUT		20
J1_BB1	INJ_7 (-)	INJ_7 (-)	OUTPUT		20
J1_BA1	INJ_8 (-)	INJ_8 (-)	OUTPUT		20
J1_AB2	TPS	TPS	INPUT		20
J1_AC3	EXT MAP	EXT MAP	INPUT		20
J1_AF2	FUEL PRESSURE	FUEL PRESSURE	INPUT		20
J1_BE2	CTS	CTS	INPUT		20
J1_AK2	ATS	ATS	INPUT		20

PIN	DESCRIPTION	USE	TYPE	NOTES	WIRE GUIDE
J1_AA4	IAC	IAC_C	OUTPUT		20
J1_AB4	IAC	IAC_D	OUTPUT		20
J1_AD4	IAC	IAC_A	OUTPUT		20
J1_AC4	IAC	IAC_B	OUTPUT		20
J1_AL2	B+	B+	INPUT		18
J1_BB4	KEY	KEY	INPUT		20
J1_BG3	GND	GND			18
J1_BG4	GND	GND			18
J1_AM1	P_GND	P_GND			18
J1_AL4	P_GND	P_GND		IGNITION P_GND	18
J1_BH3	P_GND	P_GND			18
J1_BA2	5V_AUX	5V_AUX	OUTPUT		20
J1_AG2	WIDEBAND_1	WIDEBAND_1	OUTPUT	VS	20
J1_AE4	WIDEBAND_2	WIDEBAND_2	INPUT	R_CAL	20
	WIDEBAND_3	WIDEBAND_3	INPUT	H (+) CONNECT TO [87-POWER RELAY]	20
J1_AF1	WIDEBAND_4	WIDEBAND_4	OUTPUT	H (-)	20
J1_AD2	WIDEBAND_5	WIDEBAND_5	OUTPUT	VGND	20
J1_BC2	WIDEBAND_6	WIDEBAND_6	INPUT	IP	20
J1_BD3	BOOT		INPUT		



Fuel and Power/Ground
Wiring Diagram
Rev. A 12-17-14