



## PWR-EFI-1 Conversion Overview for 911/930 Turbos

- **System Description**

The PWR-EFI system is a complete electronic fuel injection replacement for your entire CIS-based induction system, retaining only your intake manifold, intercooler and air feed pipes, which utilizes the latest technology in 3D ignition timing, wide multi-parameter AFR control and peripherals such as electronic boost control, soft/hard shift alert signaling and data logging.

- **EFI Components Illustrated/described**

	<p>Wiring Harness; Constructed entirely of aircraft grade wiring, provided complete with bonded labels for all connections, rubber sleeve reinforced at all junctions. ECU end has supplemental connections for Controller Area Network (CAN) line (for digital dash, AFR meters, etc.), boost control control (2 settings, basic wastegate and .2bar increase) and hard/soft shift light systems. Engine end has connections for both standard single wire and wide band oxygen sensors.</p>
	<p>The heart of PWR-EFI, the ECU can mount in stock location under the driver's seat and is programmed to your engine configuration. Besides line-outs referred to above, has supplemental pin-out connections for positive-powered triggering of supplemental electrical devices (exhaust by-pass actuators, etc.)</p>
	<p>EFI system relay/mounting bracket; our system utilizes the (+) accessory post on your starter (formerly used for warm up regulator) for main power, relay being activated by your ignition switch-on.</p>
	<p>Idle motor, provides stable idle hot/cold, engine loaded (air conditioning compressor cycling) or unloaded idle. Sophistication of PWR-EFI programming eliminates need for idle screw use on throttle body.</p>
	<p>CNC machined from billet aluminum with stainless steel fuel rails and AN fittings accepts all modern injector types from factory to race (mototrons). Bridging each bank of injector blocks ensures better manifold/engine sealing, stability and port alignment. Can be made in any size from stock (32.5mm) to 38mm and are now sold separately from the PWR-EFI system for customers desiring to design/build their own EFI system.</p>
	<p>CNC machined phenolic blocks fit between heads and injector blocks to reduce heat soaking from engine to intake manifold/fuel system.</p>
	<p>Fuel pressure regulator, sized and set to injector type used in your conversion.</p>

	<p>Throttle body modification: We modify your throttle body to accept a throttle position switch (TPS) blank off unused ports on both it and the manifold . We provide long-shaft throttle bodies on exchange basis for pre-86 cars.</p>
	<p>Manifold Absolute Pressure (MAP) Sensor: mounted on a tab adjacent to your throttle body and plumbed to the throttle body vacuum port previously used for ignition advance/retard.</p>
	<p>Braided fuel lines and injectors: Injectors are sized to the particular PWR-EFI application - stock engine, previously modified engines and PWR package engine. No splicing of your existing fuel feed/return lines, we provide everything from fuel filter-out to return line.</p>
	<p>Head temp and intake temp sensors; clip on to head via access cut in engine tin by scavenge pump or screw mounted in head if we are building your engine.&amp;nbsp; The intake temp mounts on intake just above throttle body.</p>
	<p>Boost control (993tt based) ; via driver operated switch, enables supplemental boost setting (up to 1 bar) .2 bar over initial wastegate setting (.7- .8 bar depending on static compression ratio) .</p>
	<p>Your air cleaner is replaced with a cone-type air cleaner mounted to the rubber elbow on your intake formerly attached to the sensor plate assembly.</p>
	<p>By-Pass (CBV): Billet 993-996TT-type CBV replaces alloy housing CBV on pre-C2 vehicles and plastic Air Cutoff Valve (ACV) on 91-94 year vehicles.</p>
	<p>Our system includes three dimensional control of your ignition retard/advance via the ECU. We modify your distributor by removing the mechanical advance/retard unit and then locking the shaft at TDC. Your xx coil is replaced with an inductive type coil.</p>

● **CIS Components Illustrated and described**

	<p>Air cleaner Assembly</p>
	<p>Complete sensor plate assembly, fuel distributor and warmup regulator. The single biggest source of "throttle lag", the sensor plate, xx ft away from the throttle body must detect vacuum/pressure changes before changing injection flow rates. The MAP sensor, just 5 inches away from the TPS now detects these changes without need for any device inhibiting the intake air stream.</p>

	Injector blocks, injectors and fuel lines.
	On later model cars with oxygen sensors, any supplemental electronic support devices, like the Jetronic ECU pictured here are removed.&nbsp; Advances in technology enable our ECU - a component smaller than this one – to control the entire injection system rather just trim the AFR as this component once did.
	Capacitive Discharge (CD) unit works in conjunction with distributor and coil to produce spark in your ignition system PWR-EFI incorporates all ignition control into the ECU leaving just the coil and the distributor.
	As CIS is a electro-hydraulic system with the injectors operated by pressure rather than electrical solenoids, the fuel pressure accumulator provides residual pressure in the system to enable engine startup – especially hot starting - , dampens fuel pressure variations and helps to suppress fuel boiling in the lines through heat soak.
	Air slide, an electro-mechanical devise used to stabilize engine idle during warmup cycle, is replaced by much more sophisticated idle motor. To provide even more control, we no longer use the idle screw on your throttle body.
	We disassemble your engine harness and remove superfluous wiring and connectors for the warmup regulator, cold start valve, air slide, cold start valve heat sensor and fuel pump cutoff sensor and add wiring for tachometer-out to ECU.
	The air pump and all plumbing/belts and drive are removed. We re-attach your turbo scavenge pump directly to the back of the cam housing eliminating the three drive components on the right.
	Many vehicles arrive at our shop with aftermarket fuel enrichment/control systems which are no longer needed and are removed.
	Your CDI-type coil is replaced with an inductive coil.&nbsp; Though some EFI conversions require a supplemental cold start valve, PWR-EFI uses the latest ECU technology eliminating the need for one.
	Compressor By-Pass Valve (CBV): If your vehicle is still fitted with this component utilizing a short intercooler, then we disable the valve assembly and add a billet aluminum 993-996TT style CBV.

- **Overview of installation/function**

- **What you remove (CIS).** Air cleaner assembly, complete sensor plate assembly, all injector/cold start valve lines/injectors and fuel lines on the engine itself, air regulator, fuel pressure accumulator, air pump assembly and all lines (if still fitted), compressor by-pass valve assembly, CD ignition box – an expensive component (\$1,200) beginning to fail now at an alarming rate – and on later model cars fitted with oxygen sensors, any

electronic support devices such as the Jetronic ECU. Naturally, any aftermarket enrichment devices previously used to shore up the injection on your modified engine are now no longer needed and removed. On vehicles converted at PWR or engines shipped for the conversion we go through the engine wiring harness and remove all superfluous wiring and connectors.

- **What is installed with a PWR-EFI-1** A pair of Cnc'd aluminum injector blocks, with insulators sized to your request (from stock 32.5mm up to 38mm), matching fuel rails, all lines, injectors and fuel pressure regulator, an idle motor with plumbing, air cleaner assembly, all required sensors/switches, complete stand-alone wiring harness, ECU, a new ignition coil, and boost by-pass valve. Your distributor and throttle body are replaced with the appropriately modified items on an exchange basis and if you have specified larger intake ports, your intake manifold modified as well
- **Key features of system:** Though engines built at PWR have one head machined for the temp sensor, we have a bracket that will enable your mechanic to fit the head temperature sensor and heat transfer plate without removing the engine from the car. We'd mentioned exchanging your distributor and removing your cd ignition box. The ECU now provides three dimension mapping of your ignition curve so thus your distributor is now consigned to the role of being simply a crankshaft position sensor, all its internal advance mechanisms removed and its rotor locked solid. No need for that CD box, that function's now in the ECU and tailored specifically to your application. As an extra cost option, if you'd like crankfire ignition, we will modify your flywheel to suit ignition trigger pickups.

The ECU was developed to take into account the same parameters that a normal Bosch DME ECU requires but, being a generation newer than that fitted to even the 993T, it has incredible capability. In standard issue it totally controls the ignition advance, fuel delivery, provides you with an optional boost setting via switch 2/10ths of a bar over the base setting dictated by your wastegate, has output cables for both soft/hard shift point alerts if you care to install warning lights in your dash and can be setup to run partially closed loop utilizing an oxygen sensor for that extra measure of efficiency, or completely open on a fixed enrichment map. But, this ECU offers something completely different from the standard issue DME ECU in your street vehicle, it will run an electronic dashboard like you've seen in the latest race cars.

- **Advantages of PWR-EFI over CIS**

- **Vastly improved throttle response.** MAP sensor now inches away from throttle blade instead of 6 feet on CIS, no air impedance from sensor plate and 3D ignition timing up to 15 degrees over stock at initial throttle tip in.
- **More accurate fuel delivery/ignition timing** permits higher static compression ratings (up to 8.2/1) and boost (1 bar) safely on basically stock engines.
- Far more **scalable to future improvements** (look at our 623hp 3.5 litre engine) than CIS which limits engine mods to about 450hp.
- Whether replacing you aging CIS system with the latest technology or specifically looking for improved power/driveability/efficiency, this is the **most cost effective EFI conversion on the market.**
- An increasing problem with model specific CIS system component replacement, **all components are modern OEM, often cross-model, and readily available.**
- **Vastly improved access to your engine compartment for servicing** (look at our shop motor installation in the 77' 930).
- Unlike CIS, **tuneable to your exact engine configuration and with greater accuracy,** try CO readings of .2 compared to the standard 3.5% required with

performance oriented CIS systems still only providing nominal fuel flow and protection at high rpm/boost levels.

- **Far greater reliability with less component failure.** For example, though CIS injectors pop off at relatively low pressure (1-2 bar), they require system pressures as high as 7.2 bar (100+psi) to operate and residual pressure remaining in the system to ensure your engine will even start. Our conversion replaces all of these components (fuel pump check valve, residual pressure valves, fuel accumulators, etc.) with one, a readily accessible fuel pressure regulator. All PWR-EFI components are built to modern EPA emission's life cycle requirements.
- **Consolidates all engine control functions into one electronic control unit.** Adds boost control, hard/soft shift points, infinite ignition/fuel mapping while eliminating your former engine cold start circuit, expensive ignition control system (CD box), ignition cutoff delay, lambda control unit, etc..

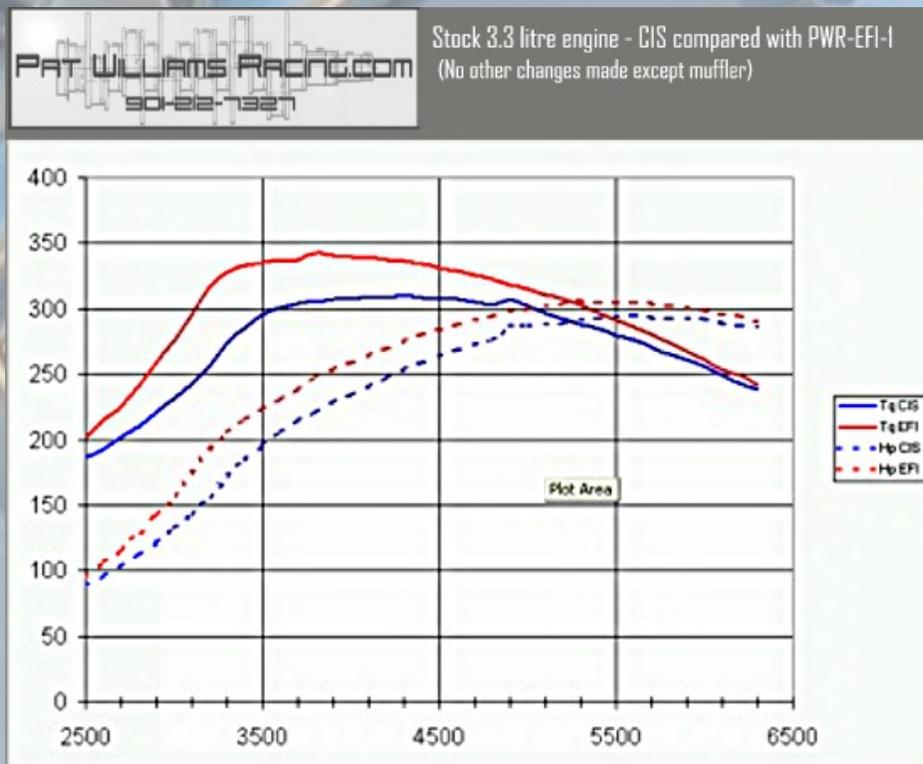
- **FAQ's**

- Three different PWR-EFI versions described:  
*In addition to the PWR-EFI-I features described above, PWR-EFI-II is fully sequential, has 3 ignition drivers to run coils/Bosch distributorless for twin plug, can run interface for full digital dash (Aimes) enabling full data logging. PWR-EFI-III adds 6 ignition drivers (enabling individual cylinder spark trim), traction/launch control and ability to run NTK sensor for more accurate exhaust analysis.*
- How can I obtain a PWR-EFI conversion for my 911/930Turbo?  
*To ensure the safety margins in the ECU mapping that are the hallmark of this system are in place, we do not currently sell conversions for home mechanic installation. These systems are sold either installed by us or by full service Porsche facilities. We have sold complete PWR-EFI packages to some of these shops around the country enabling them to do the final mapping refinement. Please mention your shop's name when inquiring. If you desire PWR to convert your engine/car, we provide a purpose built crate for the former and will arrange transportation for the latter. 95% of the installations to date have been on engines/vehicles from out of state – shipping is not a problem for us.*
- Do you only sell the conversion in one configuration (can I buy just the injector manifolds separately, a system along with the software and necessary connections to program the ECU, etc.)?  
*Yes, you (shop or individual) can buy the injector manifolds as a complete kit ready to install with all gaskets priced at \$1,450.00. We have sold many to nationally known Porsche shops and individuals either desiring to build their own system or to replace unsatisfactory components sourced elsewhere. We are also selling an increasing number of complete PWR-EFI packages to shops enabling them to fine tune installed systems, compensate for engine upgrades on PWR-EFI converted cars and build custom applications. With this purchase we will provide technical support, ie, ECU mapping.*
- How do I arrange transportation of my engine or car?  
*Once your conversion has been scheduled, PWR will send you a purpose built crate for your engine and arrange all transportation. We arrange vehicle transport to/from PWR daily. Within a 500 mile radius, we encourage you to utilize our contract transport service. Beyond 500 miles, we have several transport companies familiar with our requirements.*
- How much will this conversion cost?  
*The PWR-EFI-I system costs \$9,000 and 28 shop hours at \$83.00/hour to install. If you ship us your car we do not charge to remove/re-install your engine or make the various vehicle wiring harness connections.*
- I'd like to convert my currently stock 911/930 turbo, what improvement(s) can I expect?  
*First, we encourage customers converting cars that are otherwise stock to replace their original muffler with a more free-flowing replacement because flow restrictions. More*

power, yes, but most importantly, and the characteristic mentioned most often by our customers is the spectacular improvement in engine response - eliminating the worst characteristic of this engine configuration, "throttle lag" - and drivability. The graph below indicates that with just the PWR-EFI conversion and a free-flowing muffler, a stock engine generated more power and torque at every rpm at least 500 rpm sooner.

➤ What if I modify my car further?

Small modifications can be compensated automatically by the ECU, but, just as with current EFI technology, major engine modifications require changes to ECU mapping. We have converted such a variety of vehicles now that we most likely have a map for your intended configuration in our library. All you need do is remove your ECU and send in a FedEx Overnight box to us, we will reprogram it and return it to you within that business week.



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