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**INSTALLATION INSTRUCTIONS AND TROUBLE-SHOOTING PROCEDURES  
FOR THE MODEL 901 PERMA-TUNE ELECTRONIC IGNITION BOX**

**911.090220**

**WARNING: HIGH VOLTAGE!**

**DISCONNECT THE BATTERY BEFORE INSTALLING OR SERVICING ANY  
COMPONENTS ON THE VEHICLE.**

Failure to follow these instructions and the vehicle owner's handbook and shop manual could result in serious personal injury, death and or damage to property. This part is designed to be installed by a mechanic that is familiar with European automobiles and safety standards.

**PLEASE READ THIS BEFORE INSTALLING YOUR PERMA-TUNE**

The following instructions are intended to inform mechanics of installation and diagnostic techniques that can save time and money. These techniques have been created as a result of data compiled over many years and have been proven effective. The diagnostic procedures described here are voluntary and should take less than 0.5 hours to perform. Perma-Tune Electronics Inc. welcomes any additions or corrections that you may contribute to subsequent publications of these instructions regarding the Porsche Model 901 Electronic Ignition Box.

**DESCRIPTION :**

The [Perma-Tune Model 901 electronic ignition box](#) is designed for any pre electronic Porsche engine, four or six cylinder, with breaker point ignition. It increases spark energy by a factor of ten over conventional breaker points ignition. This is why spark plugs will never foul again, even when set to large spark plug gaps and will actually recover from fuel contamination. [The Perma-Tune Model 901](#) uses the points only as a sensor so they will generally last the life of the engine. Dwell is not a factor, simply set the points to stock gap specifications and then adjust the

engine timing using a timing light. The unique circuitry of the [Perma-Tune 901](#) allows the use of solid core spark plug wire without causing radio noise.

The [Perma-Tune Model 901](#) is a universal type ignition module and is complete with a wiring harness, mounting bracket and hardware. It is compatible with all stock Porsche and aftermarket tachometers and is compatible for use with the Model RV020 Rev Limiter and the Model 911030 Breakerless Pickup. The [Perma-Tune Model 901 ignition box](#) is also compatible with any electronic triggering signal that mimics breaker points ignition.

On twin plug engines, one set of breaker points can be used to trigger two [Perma-Tune Model 901](#) modules for perfectly synchronized ignition. A six volt version of the [Perma-Tune Model 901](#) and C911E is available, it is part number 911E6V or C911E6V (supplied without a wiring harness).

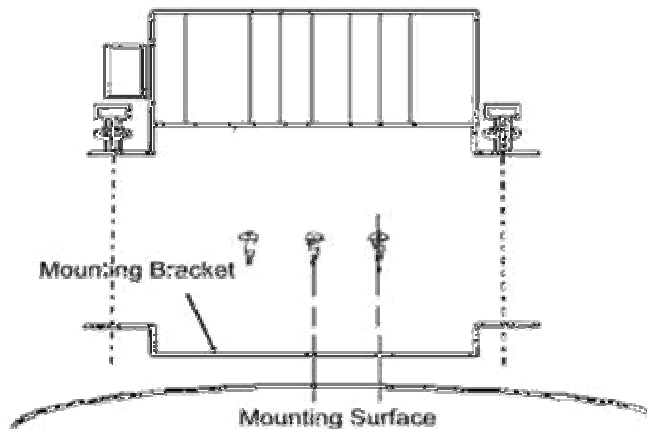
#### GENERAL INFORMATION :

By design, Perma-Tune ignitions make very little heat of their own. Wiring problems external of the unit will cause your Perma-Tune to get hotter to the touch than the other components under the hood. If this is the case we recommend you read these instructions.

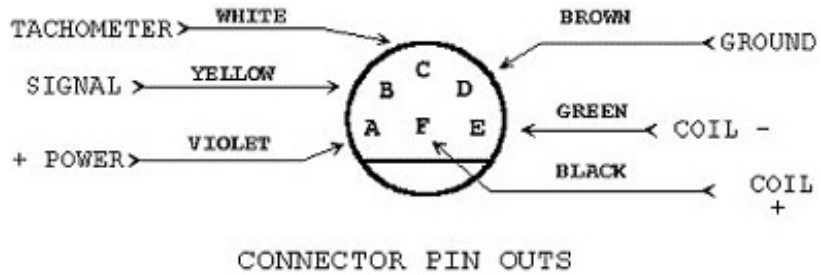
#### INSTALLATION INSTRUCTIONS :

##### MOUNTING :

Bolt the [Perma-Tune Model 901 electronic ignition box](#) to a flat surface so as not to bend its mounting flanges. The flanges can be cut or drilled. Avoid mounting the unit near the exhaust system. If a flat mounting surface is not available, mount the adapter bracket provided in the desired location and bolt box to the bracket. When mounting the box on a non conductive surface the mounting flanges need not be grounded.



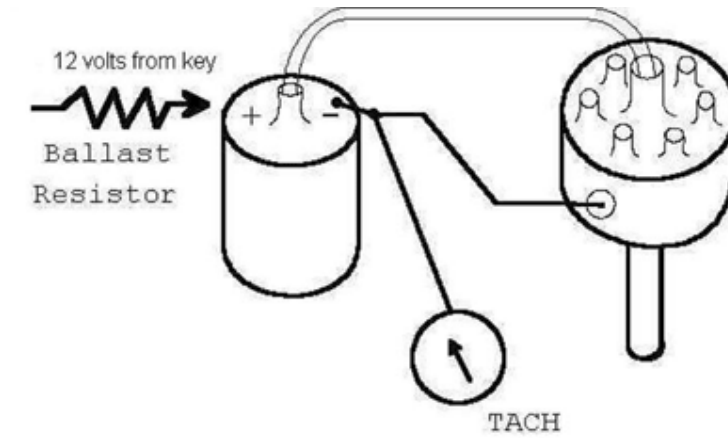
CONNECTIONS :



Solder and shrink tube connections are recommended. Crimp connectors of the marine variety are acceptable. Any wires not used must be insulated. Cut wires as short as possible, do not coil excess wire.

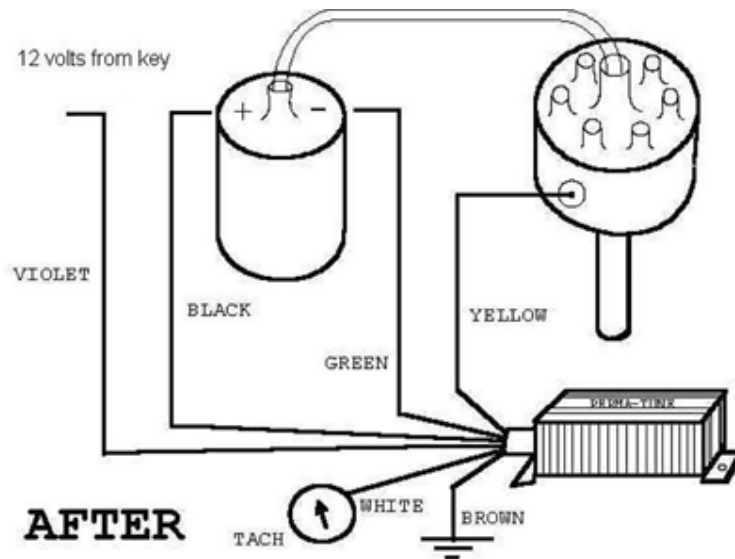
WIRING :

IGNITION SYSTEM DIAGRAM BEFORE THE PERMA-TUNE 901 INSTALLATION :



**BEFORE**

IGNITION SYSTEM DIAGRAM AFTER THE PERMA-TUNE 901 INSTALLATION :



**A. Violet Wire.** Ignition switch power. **DO NOT CONNECT DIRECTLY TO BATTERY.** Eliminate the ballast resistor if so equipped. Power requirements are 5 Amps continuous and 50 Amps surge at 12 Volts. Use 30 Amp fuse protection, use 12 Gauge wire to extend the Violet wire if required. If you are installing the Model 911030 Breakerless Pickup, connect the red wire of the pickup to the Violet wire and the 12 Volt wire.

**B. Yellow Wire.** Trigger signal to breaker points. Also will operate most tachometers on Porsche 911 '72-'77 and 914 1.8L. Rev limiting tachometers can be connected here. Disconnect the condenser if so equipped. If you are installing the Model 911030 Breakerless Pickup, connect the black wire of the pickup to the yellow wire.

**C. White Wire.** Optional tachometer signal for Porsche 914 2.0 L, 356 and most other automotive tachometers. Tape off if not used.

**D. Brown Wire.** Ground to chassis and battery minus. The Perma-Tune Brown Wire, engine and battery minus terminal must be grounded to the vehicle chassis.

**E. Green Wire.** Coil Hot signal. This is also an optional tachometer signal for tachometers that are not compatible with the signal from the Yellow or White wire. Perma-Tunes' unique circuitry allows the coil primary polarity to be switched for radio noise suppression or to control spark plug polarity. In most situations negative polarity is selected by connecting the green wire to the coil negative terminal and the black wire to the positive terminal.

**F. Black Wire.** Coil positive connection. DO NOT CONNECT 12 VOLTS HERE.

## BENCH CHECK OF THE 901 ELECTRONIC IGNITION BOX :

When unplugged, the Model 901 electronic ignition box should read between :

**Pins A and C = zero ohms +/- .3 ohms.** Zero Ohms is normal. More than .3-Ohm resistance indicates a defective tachometer damage to the fusible link inside the box.

**Pins A and B = 100 ohms +/- 1 ohms.** Open circuit or higher than normal resistance indicates ground loop or over voltage damage to the box.

**Pins E and F = 3,300 ohms +/- 100 ohms.** Lower than normal resistance indicates defective ignition coil damage to the box.

**Pins A and D = 200 micro-farads ( $\mu$ F) to 250 micro-farads ( $\mu$ F).** This reading requires the use of a meter capable of reading capacitance. Polarity sensitive Pin A is positive. Any other reading indicates over voltage damage to the spike suppression circuit of the ignition box.

## SERVICE NOTES :

**To avoid damage to the unit and voiding your warranty:** Do not connect a rev limiting tachometer to the green or white wire, damage to the Model 901 Perma-Tune electronic ignition box will result. Use only a Perma-Tune Rev Limiter P/N RV020. Do not use a test light or jumper wire on the ignition box, tachometer, distributor or ignition coil. Do not connect a dwell meter to the engine or damage to the meter and/or to the 901 ignition box may result. Do not connect 12 Volts to the coil. Do not exceed .075" spark plug gap. To avoid damage to the unit, make sure the engine ground cable is free of defects and is well connected to the battery negative terminal and vehicle frame. Burned breaker points is an indication of grounding and or charging circuit problems. Also damage may result to the unit if unused tachometer wires are shorted to ground. Unlike other systems, Perma-Tune ignitions make no humming sounds when the ignition switch is on. Under normal running conditions, pin C should show a 50 Volt saw tooth wave and pin F should show a clean 400 Volt spike when viewed with a high-speed oscilloscope.

We recommend solid strand silicone spark plug wire. On twin plug engines the high voltage wires from the coil must be kept separated. Twin plug harness wires that are allowed to cross will reduce the effectiveness of the 901 ignition box and may cause feedback problems.

## TROUBLESHOOTING GUIDE

Hard start problems may be caused by load resistors or condensers that are left in the circuit after the Perma-Tune is installed. While these components do not effect the operation of the Perma-Tune, they may cause the Perma-Tune to cease functioning or may cause permanent damage to the ignition box if they become defective. For the sake of vehicle authenticity load resistors and condensers may be left on the vehicle, simply disconnect the condenser from the circuit and bypass the resistors.

If the engine does not start but kicks just as the ignition key is released from the start position, check the ignition switch start circuit. To check this circuit, place a Voltmeter on the violet wire of the Perma-Tune and observe the meter while cranking the engine.

If the engine does not start but kicks just as the ignition key is returned to the off position, check the breaker points circuit. To check this circuit, place a Voltmeter on the yellow wire of the Perma-Tune and observe the point's voltage when the points are opened and closed. The meter should read the same voltage as that of the battery when the points are open and exactly zero Volts when the points are closed.

Hard start problems can be mechanical or electrical in nature. Defective starter components can cause excessive drain on the battery leaving insufficient residual energy to allow the Perma-Tune to function. As a general rule, if there are 5 Volts available to the Perma-Tune during cranking of the engine, it will produce a spark, no matter how slow the engine is being cranked.

The source of most intermittent problems are addressed in the diagnostic guide. Intermittent no start conditions may also be caused by a faulty electronic tachometer on cars not equipped with a mechanical tachometer. Disconnect the tachometer from the ignition system if so equipped, if the problem goes away, replace the tachometer. Also disconnect any noise suppressors, condensers or load resistors. If the Perma-Tune unit gets any hotter than the rest of the components in the engine compartment, there are problems in the wiring of the car or faulty connections between the Perma-Tune and the car. Refer to your shop manual and the diagnostic guide to find and repair the problem to avoid damaging your electrical system components.

## DIAGNOSTIC GUIDE

Presented in approximate order of statistical occurrence.

### IGNITION COIL

By far the most common cause of engine ignition failure is the ignition coil. When an ignition coil shorts between the primary and secondary windings, the ignition box will be destroyed by the high voltage feedback from the defective coil. If the defective box is replaced without replacing the coil, the new box will also be destroyed in a short time. If the stock box is replaced with a Perma-Tune box, the car may still run but run poorly or develop intermittent problems a short time after installation. The Perma-Tune replacement box can usually withstand feedback from a defective coil until the coil shorts completely and the car stops running at all. In most cases the coil can be replaced and all is well, however, in some cases the box can be damaged.

Before proceeding with the coil test procedure in the shop manual, perform a visual inspection of the ignition coil. Replace the ignition coil if there is evidence of oil leaking from inside the high voltage tower or at the seal at the top of the coil. To check if your coil has leaked, remove it from the car and shake it. You should hear only a small amount of air splashing inside the coil, if you don't hear any splashing, or if there is a lot of air in the coil, replace it. Another way to check for coil leakage is to compare its weight with a new coil. Any quality ignition coil will work with the Perma-Tune, however some "high performance" coils may cause flash over in the distributor cap. Perma-Tune coil P/N **911.090219** or any quality 12 Volt coil

without an internal ballast resistor is recommended. Refer to BENCH TEST section for the coil damage diagnostic procedure on the ignition box.

## SPARK PLUG CIRCUIT

High Voltage circuit problems can show up or increase after a Perma-Tune is installed. Rough idle or a miss in the mid RPM range can mean there is a defective coil, cap, rotor, spark plug wire, or spark plug wire connector. Since the Perma-Tune is a high performance ignition, these problems can be masked by installing a comparatively low power stock ignition box in the car. The use of dielectric grease on all electrical connections is highly recommended, especially on spark plug boots. When examining the spark plug voltage with an oscilloscope, all six cylinders must read the same. When checking the spark plug wires with an Ohm meter, all six cylinder wires should read the same resistance.

### Cylinders that read lower than the others may indicate:

- Shorted or fouled spark plug.
- Narrow spark plug gap.
- Shorted spark plug cable.
- Excessively rich mixture due to leaking injector or carburetor.
- Low compression due to bad valves, rings or other mechanical wear.

### Cylinders that read higher than the others may indicate:

- Open plug cable.
- Excessively wide spark gap.
- Worn spark plug.
- Lean misfire due to an induction leak, carburetor problems or restricted fuel injector.
- Overly advanced ignition timing.
- Worn distributor shaft bearings.

## GROUND CIRCUIT

Ground loop problems are very common on Porsche cars, especially on cars that do not get driven much. Symptoms of a ground loop problem are many, can effect the entire electrical system and are often intermittent in nature. Some indications of ground loop problems are: hard starts, poor engine performance, radio reception interference, burnt breaker points, weak engine ignition spark, false alternator failure light, repeated ignition box failures, repeated alternator failures, repeated tachometer failures, repeated relay failures, dim interior lights etc. All Porsche cars that use engines with breaker points are subject to ignition system damage caused by defective ground connections, especially common on the 911 are defective ground connections between the engine and chassis of the car. The defective ground connection diverts current from the starter through the ignition system. The higher the ground connection resistance, the more current will flow through the ignition system during cranking and the faster the ignition will be damaged. In extreme cases the breaker points will become burnt. Another common ground failure point is where the battery ground cable connects to the frame of the car. This connection is subject to dissimilar metals corrosion between the steel frame of the car and the brass plug that is braised into the body as the ground connection. This point is usually overlooked because it is obscured by the trunk carpeting and wiring.

There are many ways to troubleshoot ground connections; here is a fast way to do it on a 911 or 356. Use a digital Ohm meter set to its most sensitive setting, an

analogue meter is not sensitive enough to use this technique. To reduce the chance of misdiagnosis, tug on the wire being tested while watching the meter and perform the test in the order as follows:

1. Stab the black lead of the meter directly into the lead of the battery minus terminal and connect the red lead to the chassis of the car, do not connect the red lead to the battery ground connection. The resistance should read less than 0.5 Ohms, any more than that indicates a bad connection.
2. Move to the back of the car and connect the black lead of the meter to the chassis of the car and the red lead to the engine case, again the meter should read less than 0.5 Ohms.
3. Disconnect the ground wire from the ignition box. Connect the black lead of the meter to the engine case and the red lead to the ignition box ground wire, again the meter should read less than 0.5 Ohms.
4. Connect the black lead of the meter to the engine case and the red lead to the aluminum relay panel that the Perma-Tune is connected to. Again the meter should read less than 0.5 Ohms.

**WARNING !** To avoid the possibility of fire, do not install additional ground wires on the vehicle and replace defective ground wires using only wires of the same gauge.

#### CHARGING CIRCUIT

Cars equipped with generators can have problems with the generator and regulator that can cause battery and or ignition system damage. Worn or defective generator brushes can cause low voltage output and damage to the generator armature. Defective voltage regulators can cause over voltage conditions that will cause damage to the battery, ignition box, tachometer and or other electrical equipment on the car. Cars that have been retrofitted with alternators are subject to over voltage conditions caused by faulty rectifiers or voltage regulators. Both alternator and generator equipped cars can experience damage to the charging circuit if the alternator or generator ground wire is missing or is defective.

#### RECTANGULAR CONNECTOR

The rectangular 14 pin engine harness connector causes many problems that are misdiagnosed as ignition box problems. This connector is located on the aft end of the relay box which is located aft of the ignition box. Corrosion attacks the connector at the pin and socket mating points and inside the connector half's at the wire to connector crimp connection. This situation is almost certain to occur if the protective relay box cover is missing or if the engine compartment was cleaned with a high pressure water hose.