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**INSTALLATION INSTRUCTIONS AND TROUBLE-SHOOTING PROCEDURES
FOR THE MODEL 911 PERMA-TUNE ELECTRONIC IGNITION BOX**

911.090221

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 911 Electronic Ignition Box.

General Information :

The Model 911 Perma-Tune electronic ignition box is designed to replace the stock ignition box and will bolt up and plug in to the same location as the stock system. If the connector on the box does not fit the car harness connector, you have the wrong box. If you are installing a 911SC engine in a 911 body, use the model 911EX902 Engine Exchange kit. If you need a harness to install this ignition system, exchange it for the Perma-Tune electronic ignition box reference **356.090220**. Use the Plasma Drive Perma-Tune for late model Porsche engine management systems, hall effect distributors or after-market engine management

computers. Use the Model MP Perma-Tune on magnetic pulse type distributors like the Porsche 917 or any other magnetic sensor.

The Model 911 increases spark energy three times that of the stock ignition system. This is why spark plugs will never foul again, can be set to 0.065" spark plug gap and will actually recover from fuel contamination. The Perma-Tune system 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.

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 the technical and diagnostic instructions available on the internet at: <http://www.permatune.com> .

The white wire of the Perma-Tune Model 911 ignition box is intended for use with an aftermarket tachometer and can be used as an engine diagnostics port. When using the Perma-Tune soft RPM limiter, connect the white wire to the "Trig" connection of the RPM limiter. Note: Never allow the white wire to come in contact with ground, damage to the Perma-Tune Model 911 box will result.

NEW FEATURES OF THE MODEL 911 PERMA-TUNE IGNITION BOX :

The Model 911 supersedes the older model Perma-Tune electronic Ignition box of the same reference and has many improvements over the older model:

- Larger housing to accommodate more robust, reliable components.
- Black anodized housing that resists corrosion and can be painted.
- External, repairable, fusible link to protect the vehicle and Perma-Tune from ground loop damage.
- Tachometer output that is compatible with most aftermarket tachometers and can be used for diagnostic purposes. This output also allows the use of the Perma-Tune adjustable soft RPM limiter, Model RV020.
- Flying lead connector for easy installation and maintenance.

INSTALLATION INSTRUCTIONS :

1. Remove the old ignition module from the car according to the shop manual for this car. Perform a bench check of the module according to the manufacturer's specifications. Perform any maintenance procedure needed, if the bench check procedure indicates so, to prevent damaging the new ignition module upon its installation.

NOTE: On some cars, the relay panel where the ignition box is located must be unbolted from the car so that the nuts can be held while the bolts for the ignition box are unscrewed. One of the screws for the relay panel mounting also holds the braided ground strap that provides the ground for the relay panel. This ground strap can be easy to forget to hook back up because

when it is removed from the relay panel it will fall forward between the fuel filter and fuel accumulator where it cannot be seen.

It is extremely important that this ground strap be reconnected when the relay panel is bolted back to the car. Failure to reconnect this ground strap may result in damage to the car and or your new ignition box.

2. Perform an ignition coil resistance test. Replace the coil if the coil does not test to specifications or if there is evidence of oil or tar leaking from the coil.

Note: To avoid potential damage to your new ignition box, we recommend that you replace the ignition coil when the ignition box is replaced.

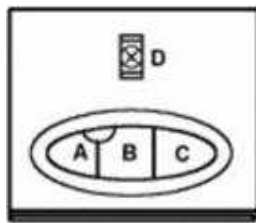
The Perma-Tune ignition coil reference **911.090219** is recommended for use with all Perma-Tune ignition systems.

3. Bolt the ignition box to the relay panel. Before plugging in the connector, perform the distributor signal test and the ignition module ground wire test. The ground wire test is very important, the Model 911 electronic ignition box has an outer black casing which is anodized and it will not make a ground connection when it is bolted in. If the tests indicate a fault exists, repair any fault that may exist in the vehicle or wiring, and then plug in the module.

Note: The Model 911 Perma-Tune electronic ignition box is equipped with a single ground connector that is intended to supply the ground connection to the box. If your car is equipped with a power noise suppressor, leave the ground for the suppressor disconnected, the suppressor is not needed and may cause intermittent ignition problems.

4. Verify ignition timing according to the shop manual and engine bay placards for you Porsche.

HARNESS PIN OUTS Note: No rewiring of the vehicle is required.



A = + or 15, coil hot primary terminal (- or 1, coil ground primary terminal is connected to the engine ground) Green wire of the Perma-Tune harness.

B = Power from ignition switch. Red wire of the Perma-Tune harness.

C = Distributor breaker points. Yellow wire of the Perma-Tune harness.

D = Ground. Brown wire of the Perma-Tune harness.

White wire of the Perma-Tune harness = Tachometer output (This is an optional feature, do not rewire the stock tachometer.)

BENCH CHECK OF THE IGNITION BOX (Applicable to the Perma-Tune Model 911 ignition box only.)

PIN A TO D = 3,300 Ohms +/- 100 is normal. Zero Ohm or lower than normal resistance indicates defective ignition coil damage to the box.

PIN B TO C = 100 Ohms, +/- 1 is normal. Open circuit or higher than normal resistance indicates ground loop or over voltage damage to the box.

PIN D TO PIN B = 220 micro-farads (μF) to 260 micro-farads (μF). This reading requires the use of a meter capable of measuring capacitance. The reading is polarity sensitive. Pin B is positive. Any other reading indicates over voltage damage to the spike suppression circuit of the ignition box.

WHITE WIRE TO PIN B = Zero Ohms is normal. Open circuit indicates that the white wire was shorted to ground.

SERVICE NOTES

To avoid damage to your Perma-Tune and voiding your warranty:

Do not attach a dwell meter to the coil. Do not connect 12 volts to the coil. Do not use a test light or jumper wire on the ignition box, tachometer or ignition coil. Make sure the relay panel ground cable, engine ground cable and battery negative cable connections are not defective. Remove any radio noise suppressers or condensers that may be attached to the ignition system, they are not needed and may cause intermittent ignition problems. Check spark plug wires, spark plug connectors (resistor type), and distributor cap for corrosion and carbon tracking. Check the rotor for shorts, defective resistor and/or defective rev limiter components. Check fuel for water contamination; check fuel pump pressure and fuel injection settings.

Unlike the stock ignition systems, Perma-Tune ignitions make no audible sounds when the ignition switch is on and make very little heat of their own under normal operating conditions.

If needed, replace the fusible link on the brown wire with a 20 Gauge fusible link only.

TROUBLESHOOTING GUIDE

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 power wire of the Perma-Tune ignition box 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 ignition box 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 electronic ignition box to function. As a general rule, if there are 5 Volts available to the Perma-Tune ignition box 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 mechanical injected cars, disconnect the idle relay, if the problem goes away replace the idle relay. On mechanical injected cars, unplug the tachometer isolator, if the problem goes away, trouble shoot the tachometer circuit according to the shop manual. On CIS injected cars, 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 ignition box 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 your Perma-Tune ignition box, however some "high performance" coils may cause flash over in the distributor cap. Perma-Tune coil Reference **911.090219** or any quality 12 Volt coil without an internal ballast resistor is recommended. Refer to BENCH TEST 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 wring.

There are many ways to troubleshoot ground connections; here is a fast way to do it on a Porsche 911. 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. Reconnect the ground wire to the ignition box.

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 :

Older Porsches 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.

Porsche 911 cars equipped 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 battery and charging circuit if the alternator or generator ground wire is missing or is defective.

HARNESS WIRES :

Most Porsche 911 cars were built with coaxial ignition box harness wires and noise suppressers to reduce radio noise emitted by the stock ignition system. Over time the coaxial wires become brittle, crack and short out causing intermittent engine ignition and / or damage to ignition system components. Harness wires that have cracked outer jackets or that are no longer flexible should be replaced. Noise suppression devices like capacitors and resistor blocks can fail and cause intermittent engine ignition. Unlike other ignitions, Perma-Tune boxes do not emit radio noise. Coaxial wire can be replaced with 14 gauge automotive hook up wire and noise suppressers can be eliminated to increase engine ignition reliability. Be aware that the connectors can push back in the housing. Pull the rubber boot back to inspect the connection between the box and harness.

RECTANGULAR CONNECTOR :

The rectangular 14 pin engine harness connector in your Porsche can cause 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.