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

911.090223

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 MODEL 911SC
ELECTRONIC IGNITION BOX**

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 0.75 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 911SC Electronic Ignition Box.

General Information :

The Perma-Tune Model 911SC electronic ignition box is designed to replace the stock ignition box on all Turbocharged Porsche 911 cars (Type 930) between 1978 and 1989. It is also suitable for use in the Porsche 911 SC with the 3.0 L normally aspirated engine from 1978 to 1983.

The Perma-Tune Model 911SC electronic ignition box will bolt up and plug in to the same location as the stock ignition system. The Perma-Tune Model 911SC ignition box not only replaces the stock ignition module, it is a performance upgrade boosting the spark energy by a factor of three. This increase in spark energy allows your engine to make more power with the same amount of fuel.

Spark plug gap can be increased to 0.065", (except on turbo charged cars with special spark plugs that cannot be re gapped) and solid core, unshielded copper spark plug wire can be used without causing radio noise problems.

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 refer to the technical and diagnostic guide in the technical support section of the Perma-Tune web site. If you have a Turbocharged vehicle, make certain that the speed relay did not cause the failure of the original ignition box before you install the new box.

If you need a harness to install this ignition system, exchange it for a Model MP Perma-Tune. If you are installing a 911SC engine in a 911 body, use the model 911902EX Engine Exchange kit. If the connector does not match that of the car, you have the wrong unit for that car. In either case contact Perma-Tune for assistance with exchanges.

The dealer you purchased your Perma-Tune from is not authorized to issue warranty replacement or exchange units. Please contact the factory for technical and warranty assistance.

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

The Model 911SC 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 anodised housing that resists corrosion and can be painted.
- External, repairable, fusible link to protect the vehicle and Perma-Tune from ground loop damage.
- 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.

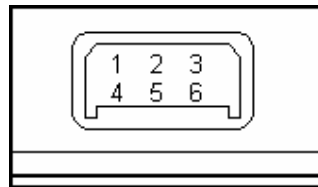
The Perma-Tune ignition coil reference **911.090219** is recommended for use with all Perma-Tune ignition systems.

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, as the Model 911SC 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.
4. Verify ignition timing according to the shop manual and engine bay placards for you Porsche.

HARNESS PIN OUTS :

The connector pin outs below are provided for your convenience.

Note: No rewiring of the vehicle is required.



- 1 = System ground, brown P-T wire.
- 4 = Coil + Hot (coil - to ground), green.
- 2 = Tachometer signal, white P-T wire.
- 5 = Power, red P-T wire.
- 3 = Signal ground (distributor pin B) Green wire shield, black P-T wire.
- 6 = Signal (distributor pin A) Green wire center conductor, yellow P-T wire.

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

Pin 1 to Pin 3 = Zero Ohms is normal. Greater than 0.2 Ohms between pin 1 and 3 indicates ground loop or battery terminal reversal damage to the box.
Warning! To reduce risk of fire, replace the fusible link on the brown wire with a 20 gauge fusible link only.

Pin 1 to Pin 4 = 3,300 Ohms +/- 100 Ohms is normal. Zero Ohm or lower than normal resistance indicates defective ignition coil damage to the box.

Pin 2 to Pin 5 = Zero Ohms is normal. More than 1-Ohm resistance indicates a defective tachometer and/or speed relay (if so equipped) damage to the fusible link inside the box.

Pin 1 to Pin 5 = 200 micro-Farads (μF) to 275 micro-Farads (μF). This reading requires the use of a meter capable of reading capacitance. Polarity sensitive Pin 5 is positive. Any other reading indicates over voltage damage to the spike suppression circuit of the ignition box.

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.

To avoid potential damage to your new ignition box, we recommend that you perform a grounding test on your vehicle's electrical system as well as test of the grounding wires in your engine and chassis before plugging in a new ignition box.

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, perform a distributor signal test.

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 ignition problems is addressed in the diagnostic guide below. Intermittent no start conditions may also be caused by a faulty electronic 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

The most common cause of SC engine ignition failure is the ignition coil. When an ignition coil shorts between the primary and secondary windings, the stock 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. Refer to BENCH TEST for the coil damage diagnostic procedure on the ignition box.

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. Some cars are kept in meticulous repair so, to check if your coil has leaked in the past, remove it from the car and shake it. You should hear evidence of only a small amount of air inside the coil, it should feel similar to a unopened can of soda. If there is a lot of air in the coil, replace it. Any quality 12 Volt ignition coil will work with the Perma-Tune, however some "high performance" coils may cause flash over in the distributor cap. Perma-Tune coil reference **911.090219** or the original equipment coil is recommended.

DISTRIBUTOR TRIGGER SIGNAL

The second most common cause of the Porsche 911 SC / 911 Turbo engine ignition failure is the ignition trigger circuit. Since the ignition box is controlled by the magnetic pulse generator located inside the distributor, any disruption in the triggering signal will cause ignition problems. Full disassembly and inspection of the distributor is highly recommended due to the intermittent nature of triggering problems. Pay special attention to the distributor trigger shielded cable (green wire), magnetic pulse generator magnet and magnetic pulse generator winding connection as these parts are known to fail in combination. An especially common problem is a broken magnet pole.

Evidence of arching between the magnetic pulse generator magnet points indicates a defective rotor. In this case replace the rotor, magnetic pulse winding, green wire and ignition box. The Perma-Tune high performance triggering is so accurate that worn out distributor shaft bearings can be detected by the tachometer. This is indicated by the tachometer needle slightly bouncing at idle and is usually accompanied by excessive end play of the distributor shaft.

Trigger signal problems can cause double triggering which results in a weak ignition spark. Due to the lower triggering resolution of the stock ignition box, some

symptoms of trigger signal problems can be more evident after the Perma-Tune is installed. Refer to the vehicle maintenance manual for triggering signal waveform specifications and distributor repair instructions.

To quickly test the triggering circuit without the use of an oscilloscope: Unplug the harness connector from the ignition box. Refer to the Perma-Tune Model 911SC Installation Instructions diagram. Connect an Ohmmeter between pins 3 and 6 of the harness connector. To prevent the possibility of misdiagnosis, tug on the green triggering signal wire located at the base of the distributor while viewing the meter. The published specification for the magnetic pulse generator is 600 Ohms \pm 100. Our experience has shown that a variation of \pm 25 Ohm indicates a need to repair defective connections or to replace the magnetic pulse generator windings.

SPARK PLUG CIRCUIT

Shielded spark plug wires can cause intermittent ignition due to short circuits between the spark plug wire and spark plug wire shield. Also, high voltage circuit problems can become more evident after a Perma-Tune ignition box is installed due to the high performance nature of the unit. 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 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 carburettor.
- 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, carburettor 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 affect 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, weak engine ignition spark, false

alternator failure light, repeated ignition box failures, repeated alternator failures, repeated tachometer failures, repeated relay failures, dim interior lights.

Especially common on the Porsche 911SC 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.

There are many ways to troubleshoot ground connections, here is a fast way to do it on a 911SC or 911 Turbo: 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 harness connector 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, pin 1, of the cars' harness connector. Refer to the Perma-Tune Model 911SC connector diagram above. 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.

Defective ground connections at the alternator or fuel pump can also cause damage to the ignition box by diverting current through the ignition ground.

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

911SC cars are subject to over voltage conditions caused by faulty alternator rectifiers or a defective voltage regulator located inside the alternator. Over voltage and spikes generated by a defective charging circuit will damage the battery, ignition module, relays and or other electrical systems in the car.

A defective or missing ground connection at the alternator can cause a false alternator failure light on the dash of the car and damage to the alternator, battery, ignition module, relays and or other electrical systems in the car. This ground connection is impossible to physically check without removing the alternator. In the interest of saving diagnostic time, trouble shoot the charging system with the use of an oscilloscope following the factory shop manual instructions.

HARNESS CONNECTORS

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 each half of the connector at the wire to connector crimp connection. Corrosion at this connector 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. The harness connector at the ignition box is also a common problem point on the 911SC. The crimp connectors inside the plastic connector housing that carry the signals, ground and power to the box can push back in the housing. Push the connector into the box and then pull the rubber boot back to inspect the connection between the box and harness. Replace any loose or corroded crimp connectors.

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.