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**INSTALLATION INSTRUCTIONS AND TROUBLE-SHOOTING PROCEDURES
FOR THE MODEL 928 PERMA-TUNE ELECTRONIC IGNITION BOX**

928.090220

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 new Perma-Tune ignition box

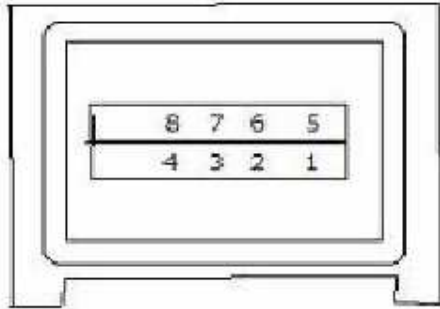
This bulletin is intended to inform mechanics of troubleshooting techniques that can save you time and money. These techniques have been created as a result of data compiled over many years and have been proven effective. The trouble-shooting procedures described in this bulletin are voluntary and are estimated at 0.75 hours to perform including bench test of the Perma-Tune. We at Perma-Tune welcome any additions or corrections that you may contribute to subsequent service bulletins regarding the Perma-Tune Model 928.

The Model 928 Perma-Tune Electronic ignition box is designed to replace the stock ignition module and will plug in the same location as the stock system. In some cases the mounting bolt nuts will have to be moved to the rear set of holes. In other cases the rear mounting bolt holes will have to be drilled. If you need a harness to install this electronic ignition system, replace the stock ignition harness with the Perma-Tune Model MP harness (Reference 911.090218). 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 Perma-Tune Model 928 ignition box is more than a replacement of the original ignition system. It is a performance upgrade boosting the spark energy by a factor of three. This increase in spark energy improves combustion efficiency resulting in more performance and less unburned fuel in the exhaust. Spark plug gap can be increased to 0.065", even on Turbocharged engines and solid core, unshielded spark plug wires can be used without causing radio noise problems.

The connector pin outs in the diagram that follows are provided for your convenience.

View looking at the ignition box:



- 8= Power - Red
- 7= Signal {distributor pin A) - green
- 6= Signal {distributor pin B) - brown
- 5= Ground
- 4= Ground
- 3= Ground
- 2= Tachometer- black / purple
- 1= Coil Hot - white

Unlike other systems, Perma-Tune ignitions make no humming sounds when the ignition switch is on. 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 inside the coil. If you don't hear any splashing, or if there is a lot of air in the coil, replace it. Any good 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 P/N **911.090219** is recommended in order to validate the warranty on the Perma-Tune ignition box.

Do not attach a dwell meter to the coil. Do not connect 12 volts to the coil. To avoid damage to the unit, make sure the engine ground cable is not defective and do not reverse the battery connections.

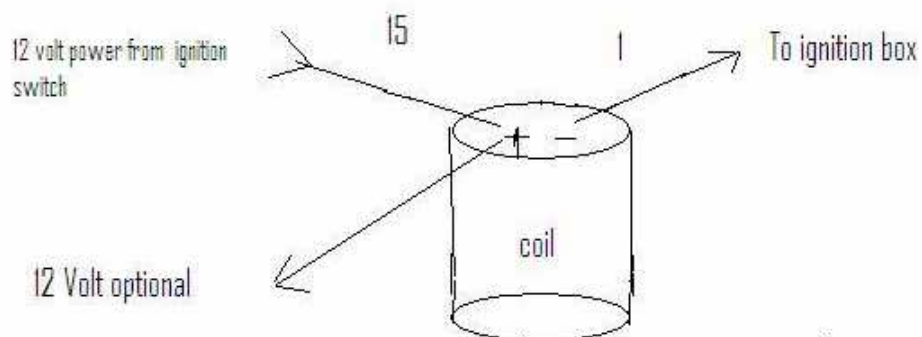
This unit is fail safe, It does not cause intermittent ignition problems. Intermittent ignition operation is usually caused by a faulty spark plug circuit, tachometer, speed relay signal or distributor signal. Check spark plug wires, spark plug connectors, distributor cap and especially the rotor for cracks, corrosion and short circuits. These problems become more evident after the Perma-Tune is installed due to the increased power it produces. Check the tachometer and fuel pump relay or speed relay if so equipped. Check fuel for water contamination. Check fuel pump pressure and carburettor or fuel injection settings. Remove any radio noise suppressors that may be attached to the ignition coil, as they are not needed and may cause intermittent ignition problems.

Check the distributor shaft for excessive wear and the magnetic pulse generator for contamination especially conductive metal filings. These conditions can cause the tachometer readings to bounce at idle. Evidence of burning between the rotor and stator points of the magnetic pulse pickup indicates a defective rotor. If this is the case, replace the rotor and the magnetic pulse pickup components. Check the magnetic pulse generator windings for corrosion or faulty connections, especially the pigtail coaxial wire that connects the distributor to the car.

PARTS INCLUDED W|TH THIS KIT

1. One 928 Ignition Box
2. One Insulator Boot
3. One Tie Wrap
4. One 10/32 x 3/8 Bolt and Nut
5. One 12" eyelet jumper wire

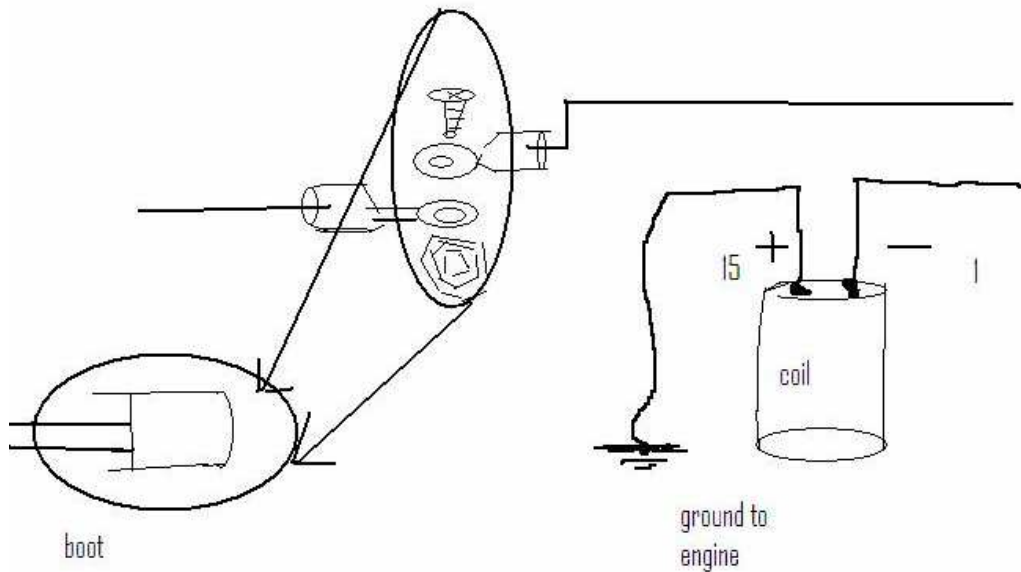
BEFORE PERMA-TUNE INSTALLATION :



BEFORE PERMA-TUNE INSTALLATION

AFTER PERMA-TUNE INSTALLATION :

AFTER PERMA-TUNE INSTALLATION



INSTALLATION:

1. Replace the original ignition box with the Perma-Tune ignition box. The two connector end mounting bolt nuts may have to be moved to the rear mounting holes. If the other mounting holes are not provided, mount the box with the rear mounting holes and then drill holes and install sheet metal screws in the connector end mounting holes.
2. Remove the wire or wires from the # 15 terminal of the ignition coil. If there is more than 1 wire on this terminal, bolt them together as shown.
3. Slip the boot over the wire or wires that were removed from the # 15 terminal of the coil and secure it with a tie wrap as shown.
4. Install the ground wire on the # 15 coil terminal as shown.

TROUBLE-SHOOTING TECHNIQUES:

IGNITION COIL:

The most common cause of engine ignition failure is the ignition coil. When an ignition coil shorts between the primary and the 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 ignition 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 the Model 928 Perma-Tune INSTALLATION GUIDE for more information on the coil. Refer to BENCH TEST procedures for the coil damage diagnostic procedure on the ignition box.

DISTRIBUTOR:

The second most common cause of engine ignition failure on the 928 is the distributor rotor. Rotor failure allows spark plug voltage to flow through the distributor shaft to the energized magnetic pulse generator. Evidence of arcing between the points of the magnetic pulse magnet indicates a defective rotor. In this case replace the rotor, magnetic pulse winding, green wire and ignition box.

Another common ignition problem on the 928 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 the ignition box to malfunction. Refer to the vehicle maintenance manual for triggering signal wave form specifications. 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.

To quickly test the triggering circuit without the use of an oscilloscope: Unplug the harness connector from the ignition box. Refer to the 928 installation instructions' diagram, connect an Ohmmeter between pins 7 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 + /- 100 Ohms. Our experience has shown that a variation of +/ - 25 Ohms indicates degradation of the triggering circuit.

SPARK PLUG CIRCUIT:

High Voltage circuit problems can show up or increase after a Perma-Tune is installed. If a car begins to run rough or develops a miss in the mid RPM range after a Perma-Tune is installed, 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. When examining the spark plug voltage with an oscilloscope, all six cylinders must read the same. The use of dielectric grease on all electrical connections is highly recommended, especially on spark plug boots.

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 spark 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 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. The most common ignition system problem associated with defective ground connections is repeated ignition box failures. Especially common on the 928 are defective ground connections between the engine and chassis of the car. The defective ground connections divert 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. Other ground connection problems can cause weak engine ignition spark, hard starts, poor engine performance and radio reception interference.

There are many ways to troubleshoot ground connections. Here is a fast way to do it on a Porsche 928. Use a digital Ohm meter set to its most sensitive setting, an analogue meter is not sensitive enough to use in 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:

Stab the black lead of the meter directly into the lead of the battery minus terminal and the red lead to the chassis of the car, but 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. Then 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, 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 3, 4 and 5, of the harness connector. Refer to the Model 928 installation instructions diagram for pin location, in some cases pins 4 or 5 are blank. Again the meter should read less than 0.5 Ohms.

CHARGING CIRCUIT

928 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. In the interest of saving diagnostic time, troubleshoot the charging system with the use of an oscilloscope following the factory shop manual instructions.

BENCH CHECK OF THE IGNITION BOX

Refer to the 928 installation instructions' diagram for the box pin outs.

Pins 3, 4 and 5 to mounting hole flange = Zero Ohms is normal. Greater than 0.2 Ohms indicates ground loop damage to the box.

Pin 1 to Pins 3, 4 and 5 = 3,300 Ohms +/- 100 Ohms is normal. Zero Ohm or lower than normal resistance indicates defective ignition coil damage to the ignition box.