



RFI/EMI TECHNICAL DOCUMENTATION

This documentation will detail installation basics and tech tips on how to reliably improve your vehicles electrical systems with your ignition upgrade. These tips can reduce EMI, EMF and RFI interference issues that may arise with high output ignition components. The number one contributor to interference issues is the removal an internal component used in standard spark plugs which attenuates the power output. Some vehicles may respond negatively with the increased ignition energy requiring some attention to detail for the best possible spark output.

WeaponX Part Number WPXIE-v1 (Interference Eliminator)

WeaponX has a developed a 2 wire solution that successfully removes unwanted interference in any automotive application so it is the easiest solution to any issues that may occur. See below for further steps in reducing interference issues.

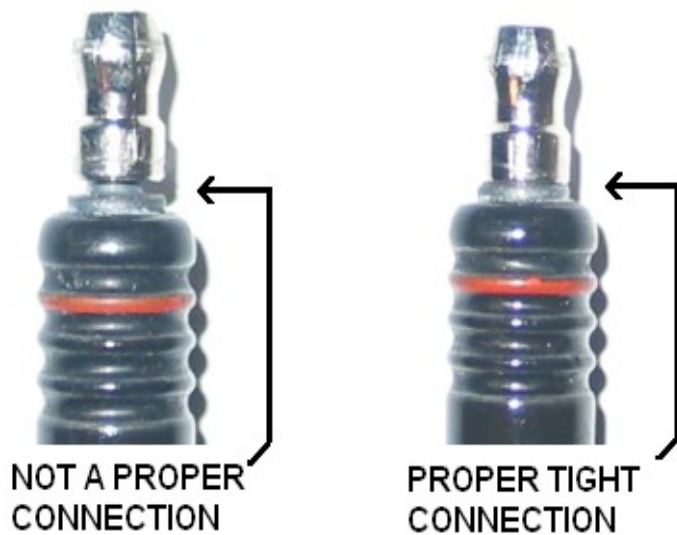
Step 1

It is very important to shield any piggybacked devices and wiring that is connected to the PCM. With extra spark output comes increased EMI interference. Piggyback devices increase the chances that the computer will be affected by ignition interference. Typical devices include shift lights and flip chips that connect to vital control signal wiring to the PCM. When the computer wiring is extended without shielding the chance of interference and computer malfunction drastically increases. Some symptoms include shift lights and tachometers that don't function properly, stalling vehicles and random computer codes. If these symptoms occur make sure all grounds are connected (specifically the ground near the PCM), upgraded, and all piggybacked and OE wiring is shielded as it is from the factory. If required contact WeaponX for appropriate wire type for your application or spark plug selection to relieve symptoms. Also, see APPENDIX (A) for further methods on reducing interference. Devices such as Boost A Spark and Plasmabooster are not required and should also be avoided to reduce noise if an issue arises..

Step 2

Although it is not required, with the added power output of the ignition system it is **HIGHLY** recommended to use a 4 gauge or larger ground strap tied from your battery negative terminal to the engine block as well as your vehicle frame. This will aid in reducing RFI/EMI and increase power output

of the ignition coils by improving electrical conduction to the ignition system.



Step 3

Remove the ignition coils, and spark plugs if necessary. Make sure the upper spark plug screw on cap is **FIRMLY** tightened down. The screw on cap should not be loose and should be touching the base of the terminal. It should also be tight enough that you cannot loosen it by hand. Loose terminals can cause power reduction in the ignition circuit as well as create extra RFI, EMI and EMF interference. Re-install and torque new spark plugs as per manufacturer specifications.

APPENDIX (A) Further Information on further reducing PCM EFI and RFI issues.

TWISTED PAIRS



If you wish to further reduce crosstalk caused by RFI and EMI in the vehicle electronics it is possible to reduce EMI / RFI in the ignition circuit by twisting the ignition wires in an even fashion through the length of the wire and then wrapping the wires in electrical tape so that they remain together. You can also wrap the wires in a foil and ground the foil to the vehicle frame to further enhance protection in the circuits.

Twisting the wires provides protection against *crosstalk*, noise generated by adjacent pairs. When electrical current flows through a wire, it creates a small, circular magnetic field around the wire. When two wires in an electrical circuit are placed close together, their magnetic fields are the exact opposite of each other. Thus, the two magnetic fields cancel each other out. They also cancel out any outside magnetic fields. Twisting the wires can enhance this *cancellation effect*. Using cancellation together with twisting the wires can help clarity in the ignition and surrounding wiring.

FERRIT BEAD



Alternative methods to reduce interference includes purchasing a ferrite bead and wrapping the ignition and ancillary device signal wires around the ferrite bead. This is a common and effective way to remove interference from the source. Typical ferrite beads can be found on many small electrical device power wires such as vehicle after market stereos, camera's, computer monitors etc.

These devices reduce the transient signals thereby reducing interference in the system and increasing integrity of the signals.

RADIO CAPACITORS

There are 2 critical components to reducing engine interference that come stock on all engines. These are called radio capacitors or condensers. Typically they are connected to the ignition power wires and many times are grounded to the engine block or engine heads.

If these devices are removed or fail major interference issues **will** arise. Often times engine builders remove these critical components without understanding the important function they perform. Ford engines have 2 of these that are typically mounted to the heads in small black epoxy encapsulated boxes.

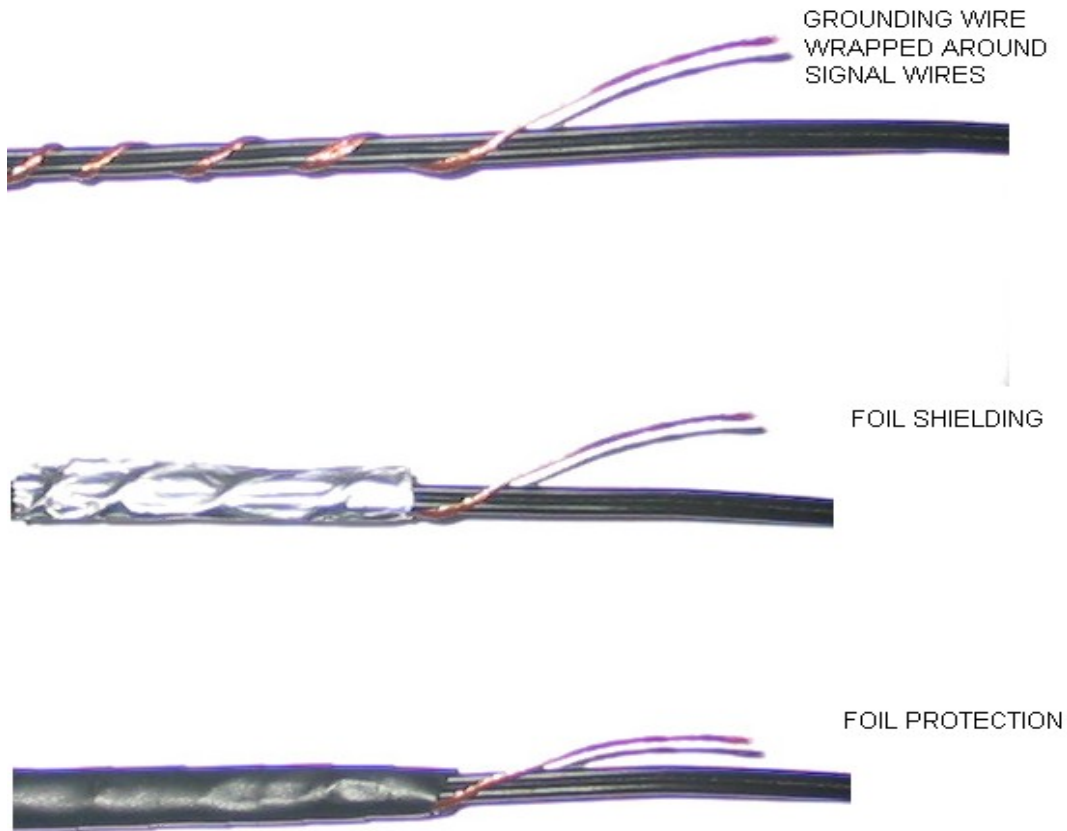
INTRODUCTION TO SHIELDED WIRE AND THE FORD PCM HARNESS

Typically from factory, Ford PCM harnesses are shielded and grounded to reduce crosstalk and system interference. When after market devices are introduced, spliced or cut into the system the integrity of the shield is greatly reduced. This reduction in integrity typically causes engine stalling and ancillary devices that do not work properly (ie shift lights triggering at the wrong rpm) among other things.

When increasing the output of the ignition system it is very important not to damage or reduce the integrity of the shields due to increased energy output and potentially increased interference as a by product of the energy increase.

When installing ancillary devices such as tachometers, shift lights etc it is a good idea to shield the signal wires that are tapped into the PCM harness. As a general rule any wire being tapped into the PCM harness should be shielded and reduced as much as possible in length.

SHIELDED WIRE ASSEMBLY



A good and cost effective way to shield wire is as such. (Shown in the figure above)

a) use a bare wire, wrap it around your accessory wire and then ground it

b) wrap a piece of tinfoil around the wire to "shield" it, make sure the conducting surface contacts the bare wire

c) wrap electrical tape around the assembly to protect the shield and you have a shielded wire assembly just like the OEM harness

***IMPORTANT** – PCM and ignition wiring harness should also be checked and shielded if necessary in your application

FLASH TUNES VS CHIPS / FLIP CHIPS

When tapping into the computers main memory it is important to shield the area where the PCM is being tapped into. The stock PCM is shielded in a metal casing in order to reducing air born interferences. When a chip is left hanging external to the computer what can happen is these air born interferences have an open receptor for interference and potential PCM issues. (think of a cell phone with or without an antenna) This phenomenon greatly increases when using flip chip switches because of the extended wire from the computers memory. This wire, being shielded or not, can cause antenna reception of excessive interference. This in effect can cause PCM mis-calculation since it is directly connected to the PCM memory.

What is recommended is to shield and reduce the wire length as much as possible or to preferably use a flash tune to remove the hardware connected to the PCM port. This will reduce interferences that can be received directly at the PCM..

VOLTAGE IN THE SYSTEM

Other areas of potential concerns are alternators. In specific, poorly designed aftermarket alternators which can degrade power to the ignition circuit. If these alternators cannot supply a consistent amount of voltage to the ignition circuit it will cause signal degradation to the ignition coils. Because of the ignition coils high output nature they require a consistent 13+ volt input for maximum performance and EMI reduction characteristics.

ACCUMULATED SYSTEM EMI FROM OTHER SOURCES

While it is known that vehicle ignition systems are a source of high EMI / EMC and RFI signals in an automobile it is also known that the fuel system is also another source of high frequency interferences due to the high current draw of the system. This symptom intensifies itself when add on fuel pump “boosters” or accessories are piggybacked to the stock electronics.

Accumulated interference from multiple sources such as ignition add ons and fuel system add ons can cause excessive EMI/EMC and RFI levels in the engine management system and surrounding electronics causing erratic operating behavior. It should be noted that Ford has recently changed all their fuel pump power wiring to operate in “twisted pairs” (as stated above) to reduce electrical interferences in the system. Ford has also issued a TSB for 05 previous vehicles concerning this issue. Customers concerned with this issue can download the Ford TSB to read up on, and address this issue here.

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<http://www.weaponxperformance.com/technicalPDF/02-16-04.pdf>