

The EMP Guardian: A New Way for Protecting Electrical Systems from a Destructive Electromagnetic Pulse

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1. Introduction

An electromagnetic pulse (EMP) is a large burst of electromagnetic radiation that can originate from a large sunspot directed at the earth or from a nuclear explosion in space. Both of these sources of radiation have the effect of generating a large electrical current (called an EMP current) in metal wires. The primary concern is potential destruction of electrical and electronic equipment that is connected to the wires in which the EMP current is generated.

The purpose of this paper is to present a new method of protecting some electrical and electronic equipment from the destruction of an EMP current. This method involves using a proprietary AET, Inc. device called the EMP Guardian. AET holds a United States Patent (No. 7,858,425 B2) on a fully monolithic version of this basic device. This report describes how the AET EMP Guardian can be utilized to protect electrical and electronic equipment from this destructive current.

2. The AET Protection Method

The AET plan to prevent EMP damage is to utilize our proprietary EMP Guardian component in a configuration as shown in Figure 1. The metal wire can be part of the power grid or utility wires. In addition, EMP current can be generated in any power cord or antenna wires in a workplace or a home.

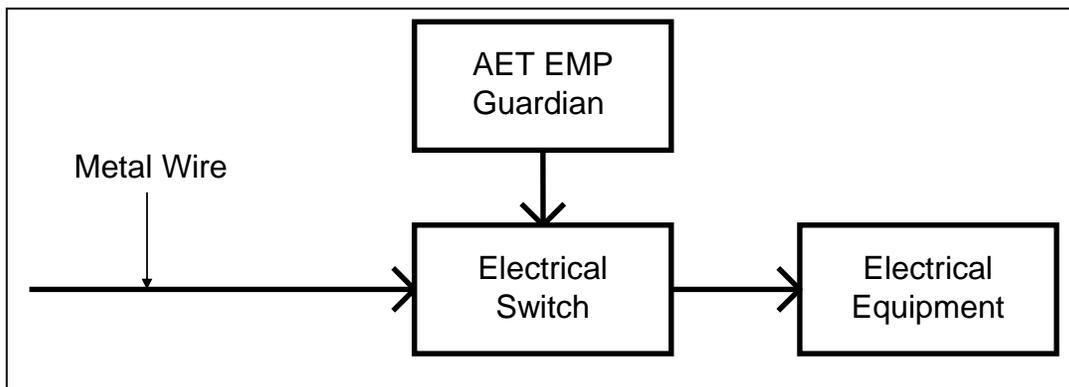


Figure 1. A method of protecting electrical equipment during an EMP event.

To protect the electrical current from an EMP current, the EMP Guardian is connected to an electrical switch (and sometimes to an electro-mechanical switch) that is placed between a piece of electrical equipment and a metal wire. Under normal conditions (no

EMP) the electrical switch is closed and the metal wire is effectively connected directly to the electrical equipment. The electrical equipment operates normally as if the electrical switch and the AET EMP Guardian are not there.

The condition changes significantly when strong electromagnetic radiation passes the metal wire and the AET EMP Guardian. This condition is shown in Figure 2.

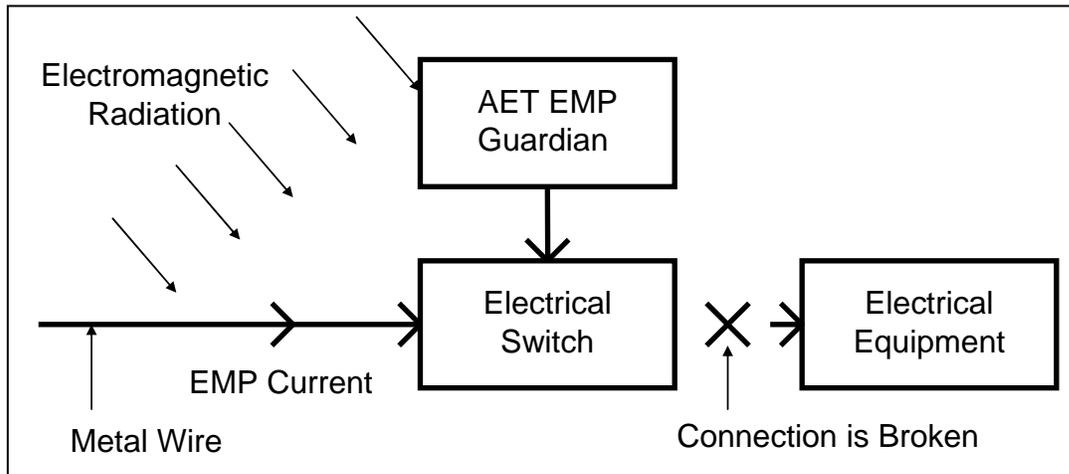


Figure 2. A illustration of the AET EMP Guardian protecting electrical equipment.

In Figure 2 we see the electromagnetic radiation impinging on both the metal wire and the AET EMP Guardian at the same time. The EMP Guardian reacts very quickly, much faster than an EMP current in the wire can form, and sends a signal to the electrical switch to open. This open switch disconnects the electrical equipment from the metal wire and the equipment is saved from the destructive EMP current. The electrical switch contains components within it to allow the EMP current to be safely directed to ground where no harm will take place.

In the case of a long power grid line, the switch will have to be an electro-mechanical switch to handle the large EMP current generated. In any case, this switch must open faster than the destructive EMP current can form. Standard technology exists to build such a switch.

3. How does the EMP Guardian Work?

The key factor to making this system work is to have an EMP Guardian that can react very rapidly and put out a sufficient digital signal to efficiently activate the electrical switch at a low enough cost to be used in many places. The AET EMP Guardian satisfies all of these requirements.

The AET EMP Guardian consists of three subsystems as shown in Figure 3.

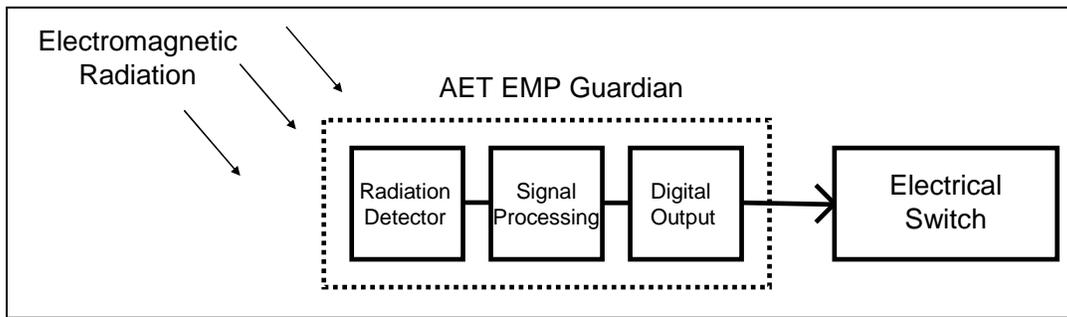


Figure 3. The AET EMP Guardian block diagram

The Radiation Detector in the AET EMP Guardian detects the electromagnetic radiation as it arrives at the site. The detection level of the EMP Guardian can be programmed to send a signal long before the radiation can cause any damage. The signal from the detector is amplified and filtered in the Signal Processing block before it moves to the Digital Output. The job of the Digital Output is to create a sufficient signal to activate the Electrical Switch. This entire process of detecting the electromagnetic radiation through sending the digital signal takes only about 10 nanoseconds (10 billionths of a second).

This very high speed of the AET EMP Guardian is much faster than any significant EMP current would be able to form in a metal wire and thus the technique would be usable for preventing EMP destruction for most systems.

In addition to sending a signal to open the affected metal line, the AET EMP Guardian will work through the EMP event and will be able to send a second signal after a preprogrammed time to reset the switch and again connect the electrical equipment to the metal line. Thus, the AET EMP Guardian will do the entire job of automatically interrupting the power line when EMP danger exists and automatically restoring the power after the danger is past.

4. What is needed?

Although the concept for what AET is proposing for protecting electrical equipment from EMP destruction is easy to understand, significant work remains to be done. AET has already designed and fabricated a prototype EMP Guardian circuit. This part still needs to be fully commercialized by ramping up manufacturing and marketing activities. Electrical and electro-mechanical switch technology exists that will be able to do the job of opening the connection to the electrical equipment, but specific parts must be identified or developed. Information for the use of this technology in specific applications must also be produced.

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