

ESTABLISHING SURVIVALIST COMMUNICATIONS SYSTEMS

That EMP-ty Feeling



One of the considerations that will have to be taken into account when dealing with field radio equipment is the possible effects of EMP. (U.S. Army photo)

It's about the right time in our consideration of the potentials of survival communications to mention a little something called electromagnetic pulse, better known as EMP.

As rugged as various pieces of electronics may be built—in break resistant cabinets and with shock mounted installed—they are nevertheless innately vulnerable to a rather insidious enemy. Surprisingly enough, it's the more modern gear that is more prone to falling victim to this problem than the older equipment. This enemy consists of fluctuations in voltage, often called peaks, spikes, glitches, or surges. A rapid or sudden variation in the operating voltage of a transmitter, receiver, electric motor, TV, scanner, stereo, or other device can wreak havoc. A voltage that becomes overly high or drops to a particularly low level can simply burn out the equipment. Modern equipment containing IC's (chips), transistors, and other solid state devices are particularly delicate when it comes to these EMP's.

What can cause EMP's? Arcing power lines, defective or blown electric company transformers, lightning near the equipment, a problem at the electric generating plant (yours or theirs) and—*pffft*—there goes your communications, refrigerator, water pump, and most of the other marvels of technology you've assembled to maintain your comforts and fulfill your needs.

Since 1962 it has been known that, in addition to those EMP sources I've already

mentioned, nuclear detonations also cause violent EMP's. The U.S. military detonated a 1.4 megaton nuclear blast about 250 miles above Johnston Island (in the Pacific). Some 800 miles away, 300 streetlights in Oahu (Hawaii) promptly flickered out, while countless burglar alarms began clanging and buzzing. EMP was the culprit!

EMP is generated when the gamma rays radiated within the first few billionths of a second after a high altitude blast smash into the electrons in the upper atmosphere. The electrons are sent into wild gyrations and accelerate towards the planet's magnetic field, where they become deflected. The result is a very high voltage which establishes a series of electromagnetic pulses that head for the surface of the earth. Earthbound objects are sitting ducks for these EMP's. All pipelines, fences, antennas, electrical lines, telephone and other cables, and metallic structures drink their fill of these pulses and then pass them out to do whatever damage they can to unprotected equipment.

This is not a massive dose of electricity by the time it arrives at the equipment—it doesn't need to be in order to do its damage. It is a very short-lived pulse, lasting only one hundredth of the length of the lightning and containing only one millionth of the energy of the nuclear blast. It isn't even harmful to humans! But it is enough to wipe out communications gear, industrial equipment, military control circuits, broadcast stations,

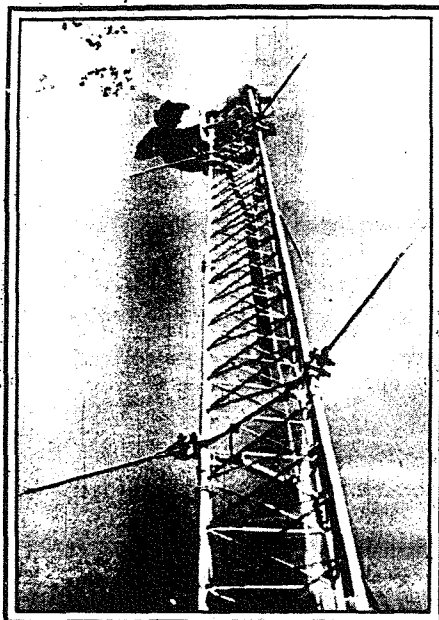
computers, and vehicle ignitions. It has the potential to zonk out the controls of a nuke and send it tailspinning into a meltdown!

Only one atmospheric detonation of a nuclear bomb (intentional or accidental) would be sufficient to traumatize every unprotected electronic circuit in North America. A Soviet EMP device set off between 400 and 1000 miles above Kansas City would adversely affect such devices from Mexico City to the Yukon, and from Miami to Seattle, taking with it satellites, electric power plants, water utilities, sewage treatment plant equipment, medical devices, and telephones, along with firefighting and emergency equipment.

The military has been keenly aware of the threat of EMP to their own equipment and has been taking steps to protect it from being damaged. One of the ways this is being done is by replacing metal wiring with fiber-optic cables between stations in its ground communications systems. The fiber-optic replacements aren't affected by EMP. Extensive testing of materials is also being done to help determine the best ways for existing within the potential threat of EMP. Because the Limited Test Ban Treaty (1963) doesn't allow nuclear weapons to be tested in the atmosphere, EMP simulators have been employed to check out how well military equipment is able to survive EMP's. One such simulator is the Trestle simulator located at Kirtland AFB in New Mexico. It is housed in a 12 story wooden building (held together with 250,000 wooden bolts) and can send out five million volt EMP's.

EMP And You

By now you may have gotten the message that EMP's could wipe out many of your own communications capabilities as well as many non-communications devices upon which you depend. It is, however, possible to provide your equipment with protection against EMP and it is less expensive and complicated than you might have assumed. Once you've done the job, it is operative for an indefinite period and it's maintenance-free. The basic idea is adequate grounding, a way of diverting potentially harmful EMP's to ground before they can do their dirty work. The principle is simple; the EMP isn't hell bent on destroying your equipment, it's just looking for the fastest path to ground. If your equipment happens to be in its path to ground, well, so much for your equipment. If you divert the EMP to ground so it isn't routed through your equipment, then you've given the EMP what it wants and you'll escape its devastation.



A wind generator at the U.S. Army Electronic Proving Ground (EPG), Fort Huachuca, AZ, is tested as part of an unattended power facility to be used at Defense Communications System radio sites. The tests at EPG will determine the feasibility of using commercially available solar cells, thermo electric and wind generators, batteries, fuel cells, and control logic equipment as an integrated power generator system. EPG is one of nine test sites under the U.S. Army Test and Evaluation Command, which checks the developmental quality of proposed Army material. (U.S. Army photo)

The Overall Picture

The old fashioned lightning rod can be a start in giving your home or survival camp some overall protection. This is certainly not the complete solution to the problem, but it is a good start. A lightning rod won't do anything to stop an EMP from sneaking in via the power lines, but it will offer protection against a direct hit by lightning and an airborne EMP.

The lightning rod must be mounted firmly on the highest point of the structure. A heavy duty lightning rod kit can usually be obtained from a well equipped hardware or farm supply store. It should consist of heavy copper wire at least 8-gauge in thickness. The instructions for installing the lightning rod will be included when you purchase the kit, so there's no need to go deeply into them here—except to add that the ground stake or rod should be copper, bronze, or galvanized steel and should be mounted a minimum of 25 feet from any tree or structure, and away from anything combustible. You can also use this ground rod to ground antenna towers, masts, guy wires, and (via a lightning arrester such as a Cushcraft *Blitz Bug*) the antenna cable itself. Don't forget, the TV antenna and its masting also require grounding.

Some homes have grounding rods already installed in connection with the regu-

lar household wiring and/or telephones. Don't figure on using this rod for your lightning rod as it is too short and located too near the structure. You want a rod that's about 7 or 8 feet into the ground and makes contact with wet or damp soil.

Utility Lines

We then turn our attention to shutting off the possible EMP entry route through the power lines. This is intended to eliminate EMP's at the circuit breaker panel or fuse box, although it doesn't protect any individual devices.

Your best bet here is to pick up a device made by GE called *The Lightning Protector*. This isn't a lightning rod (nor a substitute for one), but it does give any surges moving along the power lines a chance to become grounded into the household grounding system before they do any damage on their journey through the house wiring.

Let me say that the instructions for connecting this device specify that the entire house *must* be completely disconnected from the main power lines before it is installed, although the actual installation is not at all difficult. You can install it yourself if you're the slightest bit handy, or you can get a professional electrician to do the job. In any event, the local power utility company will *have* to be called and asked to disconnect the power *before* the job is done, and then hook it back up again after the job is done. This is important since you're dealing with a 240 volt line and any attempt to work on it while the line is *hot* will give you a fatal demonstration of the dangers of electricity.

Specific Equipment

After the other two steps previously described have been completed, you can address your efforts to protecting individual pieces of equipment. This step is optional for those seeking an extra edge of protection.

GE also makes a device called the *Voltage Spike Protector*, which you will find handy. Installation requires no more than plugging the equipment into the small unit and then plugging the unit into the wall outlet. This device contains a varistor that sops up any excess energy passing through it and holds the voltage at the proper level. A big surge of juice *may* burn out the varistor, but it will protect the equipment you are using. You can use the GE Voltage Spike Protector with any communications device or household appliance; you'll probably want to obtain separate devices for each individual piece of portable for fixed location equipment. The GE units are only about \$12 each.

Another approach for protecting larger appliances such as washers, refrigerators, microwave ovens, etc., is intended for installation right in the regular wall outlet housing and sells for around \$5. This approach replaces the standard double receptacle with a single one, which is connected to a glass fuse. In order to install the device, the current must be shut off at the household circuit breaker box in order to avoid the dan-

gers of electric shock. You may want to get a professional electrician to do this job for safety's sake.

These fused outlets can be obtained at electrical supply shops and they should be used only with the quick-burn type fuses instead of the fancier slow-burn types (which they will try to sell you). The slow-burn fuses will not work fast enough to offer any protection whatsoever from an EMP.

It may have occurred to you that I haven't mentioned protecting portable radios and tape recorders. All such units have a receptacle for an external microphone or loudspeaker and that's your key to protection while the set is stored and not in use.

Obtain a (male) plug designed to fit into the set (the set's external speaker receptacle may be easier than the one for the mic); this will probably be a simple miniature sized plug. Note that the part that gets plugged into the equipment consists of a long shaft, an insulator ring, and then a metal tip. The long shaft portion is the ground side of the plug; that's the part in which you are interested. In fact, cut off the tip portion on the other side of the insulator ring. Attach a wire to the ground connection of the plug and then ground the wire. With the modified plug inserted into the equipment, the unit is thus grounded. Unless you are walking around with the unit while it is in use, you can even leave the ground wire connected while you're using the equipment; it should not adversely affect the operation of the equipment.

These steps should offer you as much protection from EMP as might be available to the general public.

A Reader Asks

Reader Mike Winslow of Oregon writes to say that this column has peaked his interest, not only in survival communications but in the entire concept of survival in all of its many facets. He asks if we can suggest any reading materials that relate to topics such as survival, paramilitary operations, and other similar topics.

This is a big order and Mike (who is only one of many readers who have written in with questions along these lines) is *really* asking about information on what amounts to many dozens of books. My advice to those interested in learning more about all of these things is to obtain a catalog from one or more of the several companies offering a wide range of such books and then select those that have the highest appeal. A recently released catalog along these lines from a well-established supplier came in to the office from Lancer Militaria, P.O. Box 100, Sims, AR 71969. Their illustrated catalog runs more than 60 pages and is chock full of fantastic books, insignia, survival clothing, and all sorts of other stuff that will turn on anyone interested in survival. Write and ask for the Lancer Militaria catalog and be sure to tell them that you read about it in *Popular Communications*. By the way, I've done business with Lancer in the past and their service is excellent!