**EMP - PRACTICAL PROTECTION**

An atomic bomb exploded high over the center of the North American continent would damage delicate, unprotected electronic devices from the Atlantic to the Pacific, from the middle of Canada to the middle of Mexico. Iran is planning just such an attack. The word May 27, 2005 is that Iran is now equipped for an atomic weapon, news that reportedly stunned President Bush.  The "possibility" has now turned into a "probability," not if, but when we get hit with a terrorist EMP bomb.  It is for that reason that major US ports have, or soon will have, radiation detection equipment for scanning all inbound ships. Sept. 7, 2009:

1. Nuke Over U. S. Could Unleash Electromagnetic (EMP) Tsunami
2. Military Source Warns of North Korea's EMP Bomb
3. Surviving EMP to depend on preparation
4. An EMP Attack, Thinking The Unthinkable

"Project STARFISH PRIME is probably the most famous test shot in EMP lore because it burned out street lights in Hawaii at a slant range of 800 miles, but it was a high altitude detonation (about 240 miles up).  STARFISH was 1.4 Mt; a larger bomb at higher altitude would reach out farther.

Conversely, a surface burst also creates an EMP, but the pulse is very quickly attenuated.  Depending on the size of the burst, the pulse could be gone in 10-30 miles, depending on the size of the yield.  It’s not as much the pulse that’s being attenuated, but the ionizing radiation (which creates the pulse) that’s stopped fairly quickly in the lower atmosphere." [Ikstrums, Sept. 2, 2005]

A surprise EMP attack could well destroy all exposed electrical equipment, including generators, and leave the country in the dark for decades. The electrical infrastructure would fail, of course, but so would the banking system, virtually all transportation, the pumping of fuel, etc.  In short, our country would be reduced to 1870's technology almost instantly.  But individuals can prepare now, while there is still time.

"EMP effects go beyond damaging equipment. They also disrupt the ionosphere severely, which affects RF propagation of several radio bands for anywhere from one hour to over a day. Projects TEAK and ORANGE (high altitude, 3.8 Mt each) disrupted a Navy VLF comm link that was 3,000 miles away at the closest point to the blasts.  
  
"But there’s also good news here. VHF and UHF transmissions are typically line-of-sight and not impacted by ionospheric disturbances, assuming the equipment survived the initial blast and pulse. Among other things, the 2 m and 70 cm amateur bands would be functional after a blast." [Ikstrums, Sept. 2, 2005]

"The electromagnetic field pulses produced by weapons designed and deployed with the intent to produce EMP have a high likelihood of damaging electrical power systems, electronics and information systems upon which any reasonably advanced society, most specifically including our own, depend vitally," Wood said. "Their effects on systems and infrastructures dependent on electricity and electronics could be sufficiently ruinous as to qualify as catastrophic to the American nation."

EMP Warning, June 20, 2005:

An Iranian political-military journal, in an article entitled “Electronics To Determine Fate Of Future Wars,” suggests that the key to defeating the United States is EMP attack: “Advanced information technology equipment exists which has a very high degree of efficiency in warfare. Among these we can refer to communication and information gathering satellites, pilotless planes, and the digital system.... Once you confuse the enemy communication network you can also disrupt the work of the enemy command and decision-making center. Even worse, today when you disable a country’s military high command through disruption of communications you will, in effect, disrupt all the affairs of that country.... If the world’s industrial countries fail to devise effective ways to defend themselves against dangerous electronic assaults, then they will disintegrate within a few years.... American soldiers would not be able to find food to eat nor would they be able to fire a single shot.” (Tehran, Nashriyeh-e Siasi Nezami, December 1998 -January 1999) (Click here for the entire article.)

For more information on EMP, please see the following articles on the free Internet:

1. Building Faraday Cages
2. Iran plans to knock out U.S. with 1 nuclear bomb
3. America in the dark
4. Ex-CIA chief warns of EMP nuke threat
5. Nations Planning an EMP Attack

As most people depend upon city water that must be pumped through electric pumps, a gravity flow water system would be a decided advantage in long term survival. My booklet, "Rainwater Collection and Storage," gives precise information on how to collect and store water for your own family without attracting attention to yourself.

Even if you have taken the protective measures given below, the most likely timing of an EMP attack would be before noon on the West Coast, about 3:00 PM on the East Coast, to catch as many vehicles on the highway as possible - and while people are at work, far from their homes.  The roads would be clogged with vehicles that no longer worked, families separated, and thus maximum disruption of the economy *and* fear instilled in the populace.  Remember, an EMP attack would be a terrorist's dream, and causing maximum panic in the civilian population would factor highly into the timing of such an event.  Therefore, wise people will have an evacuation plan already formulated!

So how do we protect our equipment?  There is no definitive answer, as the results of testing for EMP has not been released to the general public. An EMP is both an electric field and a perpendicular magnetic field.  The electric field is what does the damage and is measured in volts per meter (V/m).  We can infer and extrapolate, but there are no guarantees, as an EMP pulse can only last 1/100th of a second but project 50,000 to 100,000 volts per meter (V/m).  [Ikstrums, Sept. 2, 2005.]

There are two sorts of damage that can occur as a result of an EMP pulse.  The first type of damage is that caused directly to exposed transistors, diodes, and circuit boards in radios, transmitters, ignition circuits in vehicles, solar panel controllers,  etc.  An EMP pulse travels in a straight line, so protection is needed from an EMP from the sides and the top *except* if the object to be protected is sitting on a conductive surface.

The second is through the accumulation of an overload of electricity on a long line, such as a power line.



Faraday cages can be built to totally enclose sensitive equipment not in use.  This subject is covered in more detail at this link for Faraday cages.  In general, the equipment is placed in a metal or foil covered box, insulated on the inside, and preferably grounded. Exposed radios and similar equipment are extremely difficult to protect, particularly if they are plugged into a 110 volt household electric circuit.  In that case, spare equipment stored in Faraday cages would be most advantageous. If the Faraday cages are sitting on a conductive surface, they should be grounded.  Grounding is safer in any case, though.

The second problem, long line accumulation of an EMP surge, requires isolation of equipment and proper grounding, so the EMP pulse has an easier path to earth than through the equipment.  Ground rods should be driven down to wet earth, if at all possible, to provide a sufficient ground.  That may mean an 8 foot ground rod, or even longer, depending upon your location.

All the photos below are "thumbnails." Click on the photo to enlarge it, then use the "back" button on your browser to come back to this page.

The ground clamps in the photo above cost less than $3.00 each, and are available at almost any hardware store.

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|  | At left are simple ground wires for electrical equipment that must be plugged in, such as freezers. One end slides under the cover plate in an electrical outlet, and the other end has a screw which can be connected to a ground wire and thence to a ground rod.  (See below) |

The package of two ground screws above cost me $2.49 at a True Value Hardware store.  True Value Hardware part #GCS12SM2.

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|  | At left is a 100 foot coil of steel guy wire.  It can be cut to whatever length is needed with strong bolt cutters.  Being flexible, it is easy to bend around corners. Steel is not as good as copper, but will work. |
|  | Here a ground screw is attached to a length of guy wire. A freezer or water pump can now be protected from an EMP surge. |

There are no guarantees that a simple ground screw will completely protect an electric motor plugged into the socket to which the ground screw is attached.  Grounding electric motors is hard!  But it is a very inexpensive way to help make sure that any electrical surges find an easier path to ground than through an electric motor, and thus a well pump or freezer have a chance of surviving an EMP pulse.

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|  |  | At left is a common steel garden shed.  At the back left corner I have grounded it using 1/4" ground wire: The insulated ground wire does not touch the base/floor of the shed so things inside are safe. |

The shed has a wooden floor, which is nonconductive. An EMP pulse hitting the metal shed would be bled off to the ground wire, so items inside should be safe. If items inside a metal shed need to be grounded, the ground wire should be insulated and go to a separate ground rod to prevent feedback! Let me explain "feedback." If two ground wires are attached to the same ground rod, and only one wire, say the one from a metal shed, feeds an EMP pulse to the ground, that same electricity can flow back up (feedback) the ground wire to a grounded generator inside the shed, for example, as the ground wires are effectively joined by the ground rod. If two ground rods cannot be used, it is far better to ground the shed and not ground a generator or ATV on a nonconductive floor in the shed.

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|  | A vehicle can be grounded with a chain attached to a trailer hitch or the frame.  This is not an ideal ground, but should work with the voltages produced by EMP providing the chain is laying on a wet, conductive surface.  This is about the only method of vehicle grounding that is truly portable.  If the vehicle is stored in a garage with a dry concrete floor, it would be better to use an alligator clip clamped to the frame or trailer hitch (see below), with the ground wire shown above.  The other end of the ground wire should be attached to a ground rod or water pipe. |

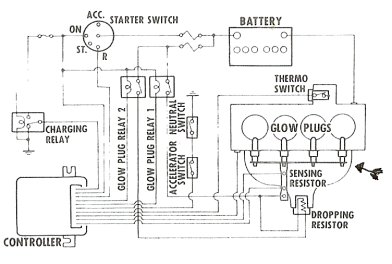
The illustration above is for grounding a vehicle that is not moving. How does one ground a moving vehicle? A dragging chain!

The chain above has enough length to wrap around the front of the trailer hitch, just behind the rear axle and about 3 feet in front of the rear bumper, with about 4" of chain left to drag on the ground. It would be very hard for someone to see the dragging chain except on vehicles with lift kits. The chain simply drags along on the pavement, makes very little noise, and wears out relatively slowly. The frame and body of the vehicle are normally insulated from the ground by the rubber tires, but the dragging chain makes a good ground.  I use a long enough chain so that I could make 3 loops around the front of the trailer hitch and still have 4" of chain dragging. When the chain wears down, I can remove the attachment clamp, unwrap one loop in the chain, and again have enough chain dragging to make a good ground. So, attach a ground chain and go on vacation without worrying about being stuck.

Will a dragging chain actually ground a vehicle?  Yes.  Until perhaps 40 years ago, many states required gasoline tankers to be grounded via a dragging chain so a buildup of static electricity would not cause a gasoline explosion.  Then some bureaucrat realized the dragging chain might cause some idiot to think there was a reason for the chain, and therefore an explosion was possible.  So, instead of using chains to eliminate the problem, gasoline tankers were required to have a tiny diamond shaped sign on the back reading "1203."  The public was not told that "1203" meant highly volatile gasoline was in the tank as that too might scare them, but the sign was all the "cover" the bureaucrats needed to say they had warned the public. Very clever.  Insane, but clever.

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|  | This small alligator clip can be attached to bare metal on a vehicle frame or trailer hitch, while the other end of the ground cable is clamped to a ground rod.  The alligator clip from NAPA (part #BEL 726142) cost only $1.99, which is cheap enough protection for a vehicle. The same clip can be used to ground Faraday cages. This is an ideal setup for grounding a vehicle in a garage. |

Older diesel engine vehicles are more reliable under EMP conditions because they lack the computerized fuel management and ignition systems of modern gasoline engine vehicles.  However, that does not mean that an ungrounded diesel vehicle would still start!  It would run, but getting current to the glow plugs might well mean the use of a small, easily made jumper cable.  Note on the diagram below the controller, sensing resistor, dropping resistor, thermo switch, relays, etc, all between the battery and the glow plugs.  All those susceptible components can be bypassed by using a jumper cable from the positive terminal on the battery to the glow plug buss.



A jumper cable between the positive terminal on the battery and the glow plug buss (see arrow) will heat the glow plugs when the engine is cold.  The hood is opened, the jumper cable attached, run back inside the vehicle and start the engine, then run back and yank off the jumper cable. Bingo, your diesel engine will start and run!

You will want to be pretty quick when using the jumper cable.  Each glow plug draws about 12 amps, so a 4 cylinder engine is drawing almost 50 amps through that 10 gauge jumper wire.  Once the engine is running, you will want to pull off the jumper cable as fast as you can. As long as the engine is warm, it will start without the use of the jumper cable and glow plugs. The radio and some other electrical devices would not work, but the vehicle would run!

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|  | A jumper cable made using 10 gauge wire and small alligator clips on each end.  I made this one in 1977 for a Diesel Rabbit. |

A running vehicle will be rare after an EMP attack, and you won't want yours stolen.  Some people know how to "hot wire" the ignition system and may know about the jumper cable system described above.  But you can fool them if you want to.  Take a look at the fuel injector pump on a diesel engine. You will find a single, small electrical wire attached to the injector pump. Diesel engines will run until the fuel is shut off, so a small electro magnet pulls a shut off plug out of its socket when the ignition key is turned on.  When the ignition key is turned off, electric current is off and the electro magnet releases the plug to shut off the flow of fuel to the engine.  It is easy to cut the wire to the injector pump, splice in a small micro switch, run the wires through an existing hole in the firewall, and install the micro switch under the dashboard.  Only you will know the switch is there.  Flip off that micro switch and the engine will not get fuel, it *will not start*, even if the ignition switch is "hotwired."

This same technique can be used on older gasoline engine vehicles with carburetors, points and a distributor that would still be running after an EMP attack.  There is a small black wire running from the bottom edge of the distributor to the coil.  Snip that wire, splice in a micro switch installed under the dashboard, and turn the switch off when the vehicle is parked.  Even if someone "hot wires" the ignition switch, the vehicle *will not start* because no electricity is getting to the spark plugs! The battery would be ground down and too weak to start the vehicle, but it would still be there and still be yours!  All you would need to do is charge (or replace) the battery, flip on the micro switch, and the vehicle will start...roughly, as it would have been flooded with fuel...but it would start and run again. The radio and some other electrical devices would not work, but the vehicle would run!

To really confuse would-be thieves, it is possible to install another micro switch to turn off the air conditioner compressor, and it looks exactly like the micro switch to kill the engine. Only you would know the combination of "up" or "down" on the switches to turn them on or off.  The pulley on the front of air conditioner motors is always being turned by a fan belt, but the compressor itself is not engaged until it is turned "on" by the switch on the dashboard...that switch energizes an electro magnet which engages a clutch and the air conditioner compressor motor will turn and work.  But there is a safety device, a low pressure cut off switch, built into the back of the air conditioner receiver/drier: look for the sight glass on the vertical cylinder and you will see a wire behind it.

Snip that wire, splice in a micro switch, and ***you*** can control whether or not the air conditioner clutch will engage, while the normal dashboard switch still controls the air conditioner vents and fan.  In this era of high gasoline prices, that little switch can save a lot of fuel in normal driving conditions.  Air conditioners can use up to 20% of available engine power.  When driving up a long hill, for example, the micro switch can be flipped "off," the air conditioner compressor motor will stop working, but cold air will still blow through the normal vents, saving you precious fuel and preventing the engine from overheating while driving up steep hills. In an emergency where you could literally be "heading for the hills" with a heavily-loaded vehicle and probably pulling a trailer, this little switch could very well keep the engine from overheating and dying - the last thing you would need to happen in an emergency.

If you do any of this rewiring, plan ahead and use long enough leads to the under-dash micro switches, or the engine compartment will begin to resemble a spaghetti factory.  Run the wires over to the side of the engine compartment and try to make them look like normal engine wiring.  Those extra wires may drive your auto mechanic nuts, but they will keep your vehicle running and safe!

None of the EMP protective systems described above are expensive...they just take time and effort.  And, of course, this must be done now, before an EMP attack!

Several things you should have are the GP-L4 Survival Radio in a small Faraday Cage, and an LED hand pump flashlight.  You may be on the road, and these items are small and portable.

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|  | With the Survival Radio shown at left, you could hear news on AM, FM, or SW. Some distant radio stations would survive an EMP attack, and this little radio has excellent reception. This is the ***only*** AM, FM, SW radio that will fit in a Faraday cage (see one here) and still fit in the glove compartment in your vehicle!  The GP-4L Survival Radio is $23.95 at my Survival Shop. |