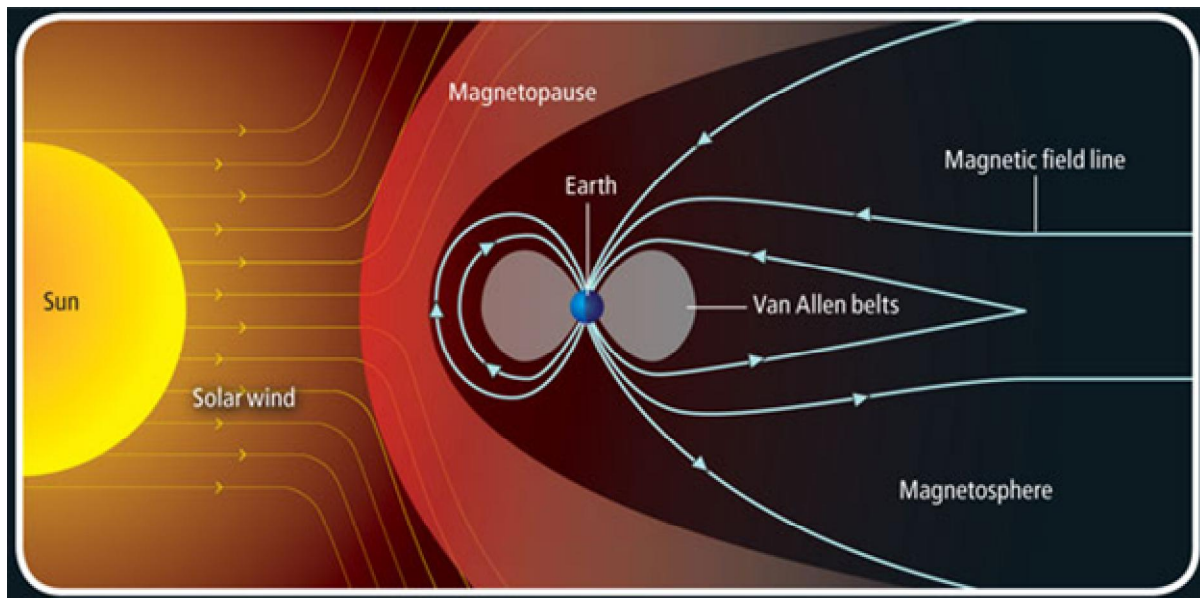


CORONAL MASS EJECTION (C.M.E.)

And Industrial Programmable Components

A basic guide for protecting the program code and data,
for restoration of the Industrial Process after an event.

Byron K. Sanders- C.S.T.
07.26.2013



The guidelines in this document apply also to EMP.

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Date: 07.26.2013

From: Byron K. Sanders (C.S.T. SERVICES)

Greetings.

I'm sending this out to our client list and associates: clients and friends of C.S.T. SERVICES and ELECTRIC MOTOR SHOP: *(some few have been asking me for more details...)*

The subject is CME (Coronal Mass Ejection) and EMP (ElectroMagnetic Pulse). The CME event is a natural cycle. The last big one was 1859. It is referred to as The Carrington Event. When the big event comes around the CME also contains EMP. The standard understanding of EMP pertains to a weapon from an enemy, like China and Russia have threatened us with. A series of small atomic or nuclear devices are detonated over strategic areas at a high altitude in order to bring down the power grid and fry electronic devices, namely computers... including the computer in vehicles. Well the sun does the same thing when the CME is of a high enough magnitude. I get daily reports from NOAA and The Australian Government. So far the events are minor, down to the 65th parallel- up around Maine. So far the power grid fluctuations and satellite interference is minor. The aurora sightings are in upper North America, making their way down. In 1859 the aurora was seen all the way to the equator. Here is a current link about the Carrington Event and the SHIELD Act:

<http://www.foxnews.com/science/2013/06/18/shield-act-to-protect-from-solar-catastrophes-electromagnetic-pulses/>

U.S. Congressman Trent Franks is sounding the alarm to Congress to protect the power grid, at the very least the largest transformers which we have NO reserve stock or spare parts for. The experts are concerned for the lack of preparedness for the worst case scenario. That is another subject altogether.

I'm writing this with rose colored glasses, as it were, in hopes that if we have an event, it is minor. Instead of several years without a power grid, hopefully days, weeks or months. With that in mind, I foresee the need for re-building Industry while the other folks are working on restoring the Infrastructure.

Now to the point: This is in regards to magnetic data storage, hard drives in particular. PLC's have volatile RAM and/or an EEPROM or the older NVRAM. In order to protect against a magnetic event destroying the data files, I have backed up the files of our clients and have them stored in a Faraday Enclosure. All the files on our server for our clients are backed up, including backups for PLC, HMI, OIT, SERVO, VFD, etc.

If you have programmable components that have not been backed up, either do so, or contact us to discuss the procedure. Once backed up, the data needs to be secured in a Faraday Enclosure.

If your facility has any programmable components which aren't backed up, I advise you to do so. For protection against a magnetic event you can copy the files to CD or DVD or a USB Drive which is then placed in an anti-static bag and stored in a Faraday Enclosure. The CD or DVD method uses light for the data storage and is not affected by magnetic pulse, as far as what the experts say. I would still store them away with the rest of your magnetic storage devices in a Faraday Enclosure.

We all hope we don't have the anticipated CME or dreaded EMP event, but it is better to be safe than sorry. You can also clone your hard drive and follow the above instructions for storage in a Faraday Enclosure. That is what we have done. Equipment can be replaced after an event, but it will take months or longer to recover program code and critical data if it is not backed up properly.

I will be putting up a PDF with further instructions on our clients downloads page, at the top under "Preferred Applications and Tips": http://www.cstservices.net/csts_downloads.html

If you don't know what this is about, just Google EMP and CME. The last big CME event was in 1859 when all we had was telegraph. The U.S. Congress has not yet passed the Shield Act, so we might as well help ourselves for C.O.I. (Continuity Of Industry), they are busy helping them selves with C.O.G. (Continuity Of Government) by continuing to build their underground bunkers. The military has hardened electronics which is shielded. The components are ceramic instead of poly-whatever... I have a Panasonic Tough Book which meets Military Specs, the hard drive is shielded. I have an extra hard drive which is a clone of the one in the laptop. The hard drive slides in and out of a side slot of the laptop.

This site has a free download, and also inexpensive options, for software which can clone your drives. If you select a "bit by bit" clone, it will transfer your Operating System, Software and all of your licenses, Data, everything...

<http://www.easeus.com/backup/> I use this software to rescue industrial computers for clients, and then give them a backup hard drive as well.

For more information about CME and EMP, Google it. You might check out this video- an interview of the well known scientist: Michio Kaku : <http://www.youtube.com/watch?v=JFBcaUuXAmY>

While there, on You Tube, you will see several more interviews. Many downplay the warnings, comparing it to Y2K. We at the Electric Motor Shop were very busy helping clients prepare for that event with emergency generators and transfer switches. What most do not realize is how much money was spent by the government and the private sector to protect critical systems against the "millennium bug" which was just a matter of upgrading critical computers to a 4 digit dating system so that the digital and analog controllers would not revert to 1900 A.D. at the turn of the century. There were some events around the country, but they were minor BECAUSE we got ready for it. Preparedness is always a wise choice.

If we have Power Grid damage or fluctuations I am hoping they are minor. I want to see our industry come back online as fast as possible. Programmable Control Logic is a weak link. We can replace your PC and PLC and HMI right now, but the Ladder Logic Code, Sequential Function Chart, GRAFCET, Visual Basic, C-CODE, etc. can take months to re-write.

One more thing, you might examine your company's emergency power system, if you have one. If an EMP brings the grid down in your area, the same pulses that took the grid down will destroy your generator if it comes on immediately instead of after the event is over. There are systems for detection of the magnitude of the CME/EMP... the government has them. I've yet to see very much talk in the private sector about early warning systems, other than receiving an email or text message... what good is that if we get hit and there is no email or texts? A big concern are the nuclear reactors scattered across North America. Each one has an emergency generator to run the pumps to cool the rods. They have, on average, 2 weeks supply of diesel fuel to run the generators. It takes months and/or years to cool the rods when the plant shuts down. 2 weeks of diesel is not enough. But worse than that is the fact that IF the emergency generator comes online, after the grid goes down, and more CME/EMP waves and pulses come through, the generators go down. Now you have a meltdown situation. Solar Panels are also affected, BTW.

Something to consider, something to think about... do what you will with the information...

Kind Regards,

Byron K. Sanders
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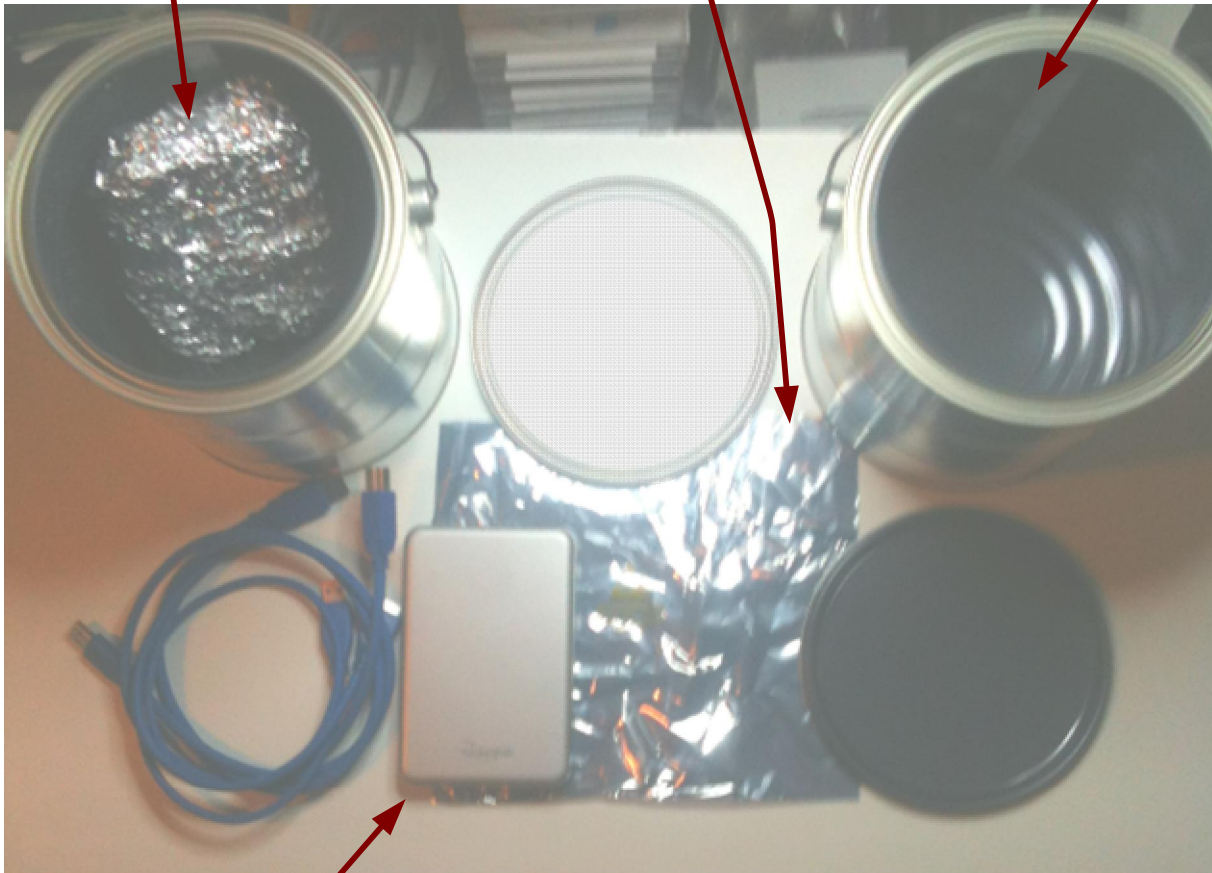
**SIMPLE DIY FARADAY ENCLOSURE:
New empty paint can from Lowe's or Home Depot**

Hard Drive placed
in anti-static bag,
then wrapped in foil

Anti-Static Bag



New
Empty
Paint Can



**USB HARD DRIVE
ENCLOSURE**
(used to Clone and
or Back Up Drive
and Data)

**FREE AND/OR IN-EXPENSIVE SOFTWARE FOR
CLONING AND BACKUP:**

<http://www.easeus.com/backup/>

<http://www.todo-backup.com/products/home/free-backup-software.htm>

NOTES:

One method to test a "Faraday Enclosure" is:
Place CELL phone in the enclosure and try to call it. Some experts are saying, IF the phone does not ring, the cell signal is being blocked, and it MAY block CME or EMP. The only problem is the different wave lengths of different signals. The wave length of CME and EMP is very short. FM for example may be a meter long, Microwave is shorter. The Microwave oven is not a good Faraday enclosure for CME because the CME wavelength is said to be shorter. Google for more information.

ONE EXAMPLE OF AN ARTICLE ON THE SUBJECT OF FARADAY ENCLOSURES FOR PROTECTION AGAINST CME AND EMP:

<http://www.zombiehunters.org/forum/viewtopic.php?f=42&t=89020>

Re: Paging physicists: looking for answers about a Faraday c
Postby Bunsen » Thu Jan 12, 2012 2:24 pm

Answers from a physicist follow:

I'll start with the grounding question, because that's the easiest to answer: Doesn't help a bit. All that matters is that the metal container is conductive and doesn't have gaps (ammo cans are bad at isolating from UHF on up because that rubber gasket only leaves the lid connected to the body at the ends, and that allows radiation in if the wavelength is short enough). If you're concerned about direct lightning hits, then having the can connected to ground could attract lightning to it, especially if it's much above ground level. I'd leave it ungrounded.

The paint can sounds like a great solution for anything small enough to fit inside. Since it's designed to make an airtight seal, you know you have metal-to-metal contact all the way around the edge of the lid. Trash cans aren't very good on that point -- the lid probably only touches the can at a few points, leaving long (also thin, but it's the long part that matters) gaps, so RF can get inside. They, like the ammo cans, will still protect well from low frequencies (such as indirect lightning effects). Insulation on the inside isn't really necessary (the whole point of the Faraday cage is that currents only flow on the outside surface), but I suppose it can't hurt.

Radios are a fine way to test isolation. It's better if you can control the signal strengths involved and have some basis for comparisons, so you can get an idea of how much attenuation the can provides. The point about testing at high frequencies is valid -- in all but a very very few cases, low frequencies will always be better-isolated than high frequencies. The microwave, I think, is one of those few counterexamples -- it's a resonant cavity tuned to one specific frequency (2.45 GHz), and the edges of the door are positioned at natural zero-current areas for that frequency. At any other frequency, the fact that the door isn't electrically connected to the body around most of the edge allows some RF through.

As for what frequencies matter for what sort of threats, it's time for numbers. Starting with the lowest, and therefore easiest for a Faraday cage to handle:

Solar flares and resulting geomagnetic storms: Hundredths of a Hz. Complete non-issue for anyone but the guys running the power grid and pipelines. Small risk of surges on the power lines themselves from transformer failures, but absolutely no RF risk (i.e. if it's not plugged in, it doesn't give a damn).

Lightning: Mostly below 1 MHz. That means wavelengths of hundreds of meters, so anything that more or less surrounds your electronics will protect from the electromagnetic waves (i.e. the indirect effects that extend hundreds of meters from the strike). Direct hits from the strike itself are nearly impossible to protect against, since a lightning strike can easily blow a hole through something like an ammo can. But those follow

conductors, so don't store your Faraday-protected electronics next to that wire running to the old TV antenna on your chimney. For testing in this frequency range, try an AM radio tuned to the strongest station you can find. **Nuclear EMP:** Worst below 100 MHz, but significant up to several hundred MHz. Wavelengths as short as several inches. This is where things become demanding. Gaps of several inches in length may allow RF to penetrate into a Faraday cage. Making sure the lid contacts the body around its whole circumference, or at least every inch or two, is important. To test isolation for this sort of thing, try at least UHF (FRS/GMRS radios operate around 460-470 MHz, which is a good example).

Non-nuclear EMP bomb: Up to several GHz, perhaps tens of GHz. Wavelengths down below an inch. Damn hard to shield against, but short-ranged and, in my opinion, not likely to be seen unless you're on the wrong end of a serious attack from a high-tech power. If you're still concerned about it, then look to absolutely, completely seal your Faraday cage. Consider soldering the lid on to that paint can. Testing at cellphone/wifi frequencies would be a start, but threats could go well beyond that frequency range. There just isn't much consumer hardware that uses frequencies this high.

Bunsen
* * *

Posts: 600
Joined: Mon May 11, 2009 11:21 pm
Location: Buffalo, NY

**LINKS AND SEARCH IDEAS REGARDING
CME and EMP
(just a few...)**

Michio Kaku, Scientist:

<http://www.youtube.com/watch?v=JFBcaUuXAmY>

FOX NEWS about the Carrington Event:

<http://www.foxnews.com/science/2013/06/18/shield-act-to-protect-from-solar-catastrophes-electromagnetic-pulses/>

Google Search Terms:

EMP; CME; Carrington Event; Faraday Cage; Power Grid Surge Protectors; Siemens Grid Transformers; EMP readiness; underground bunkers; shadow government; Cheyenne Mountain underground base; Continuity of Government; COG; base under Denver Airport; secret underground high speed rail

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