

How To Help Electronic Equipment Survive The Storm



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Outline of the Discussion

What are the problems?

What are some solutions?

Which solution should you use?

Problem #1:

Voltage Too High

Voltage greater than 126-128 volts

Problem with voltage regulators

Taps set incorrectly on transformer

Voltage rise due to capacitors

Neutral shift on Customer side

Plugged in wrong outlet

Problem #2:

Voltage Too Low

Voltage below 112-114 volts

Problem with voltage regulators

Taps set incorrectly on transformer

Voltage drop on high voltage line

Voltage drop on Customer wiring

Problem #3: Voltage Surges (Swells)

15+% Above Normal- Medium Duration

Bad generator voltage regulator

Large 120 volt load drawing inrush current

Recovery voltage after a momentary outage

Problem #4: Voltage Transients (Spikes)

High Magnitude - Short Duration

Static electricity

Lightning strokes

Electric fences

Cow trainers

Utility switching

Fuses clearing

Problem #5:

Voltage Dips

Large Magnitude - Short Duration

Motor starts on the Customer system
Large motor starts from other Customers
Short circuits on the Utility system
Lightning strokes to the Utility system

Problem #6:

Total Loss of Voltage

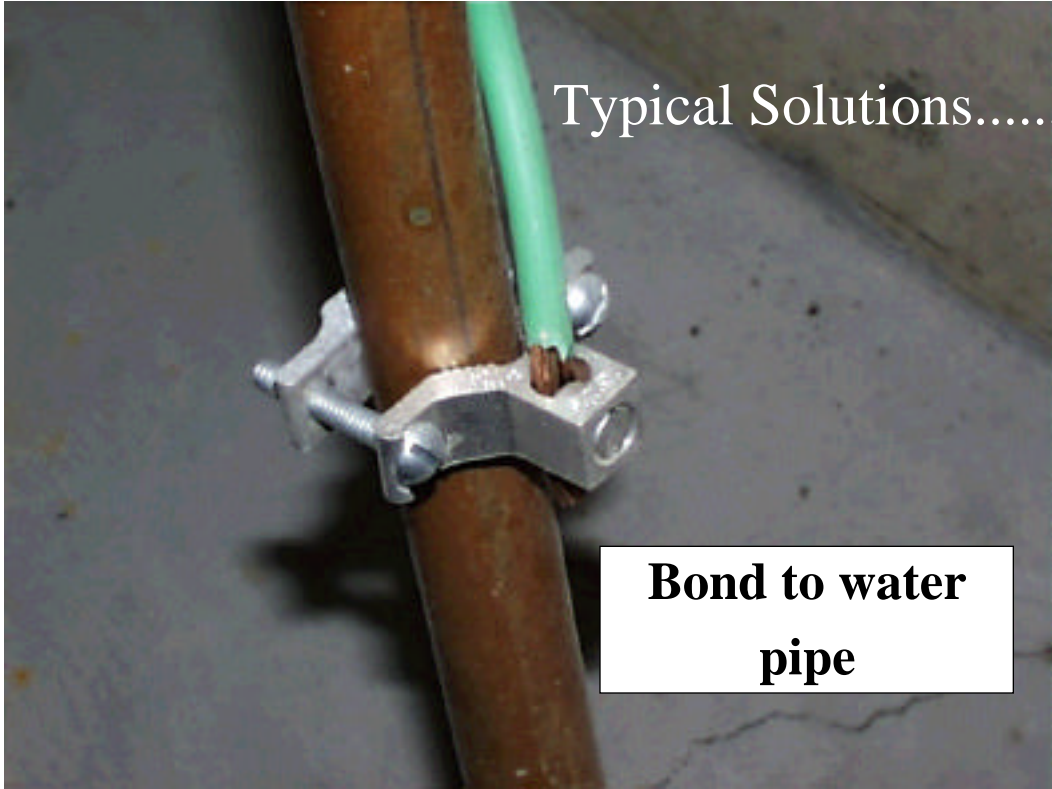
Long Duration - Short Duration

Utility system outage
Customer breaker trips
Plug fell out

*How about some
solutions?*



Typical Solutions.....



**Bond to water
pipe**

Typical Solutions.....



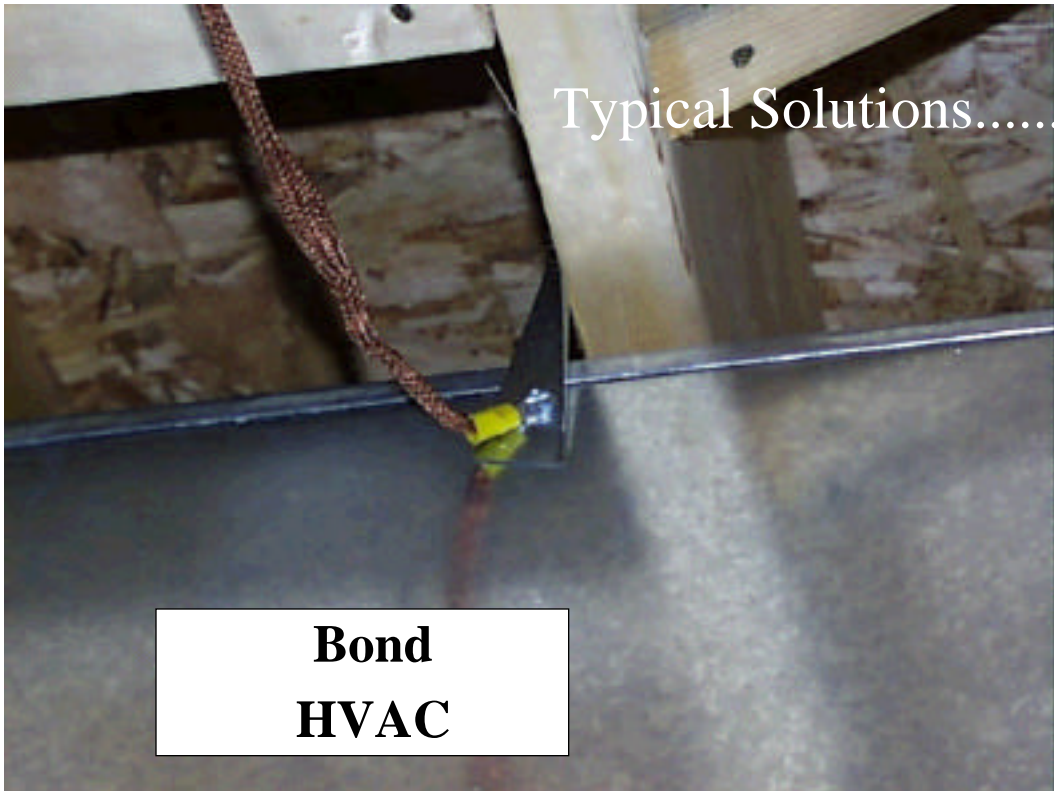
**Telephone
surge arrester**

Typical Solutions.....



**CATV
surge arrester**

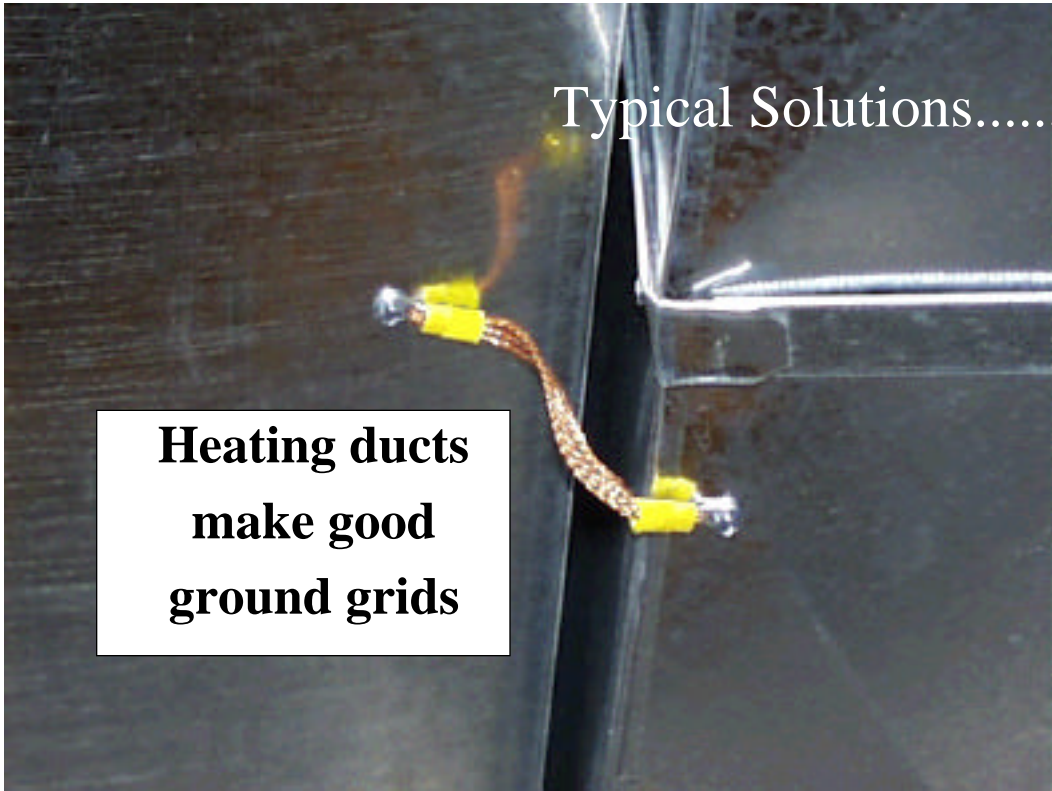
Typical Solutions.....



**Bond
HVAC**

Typical Solutions.....

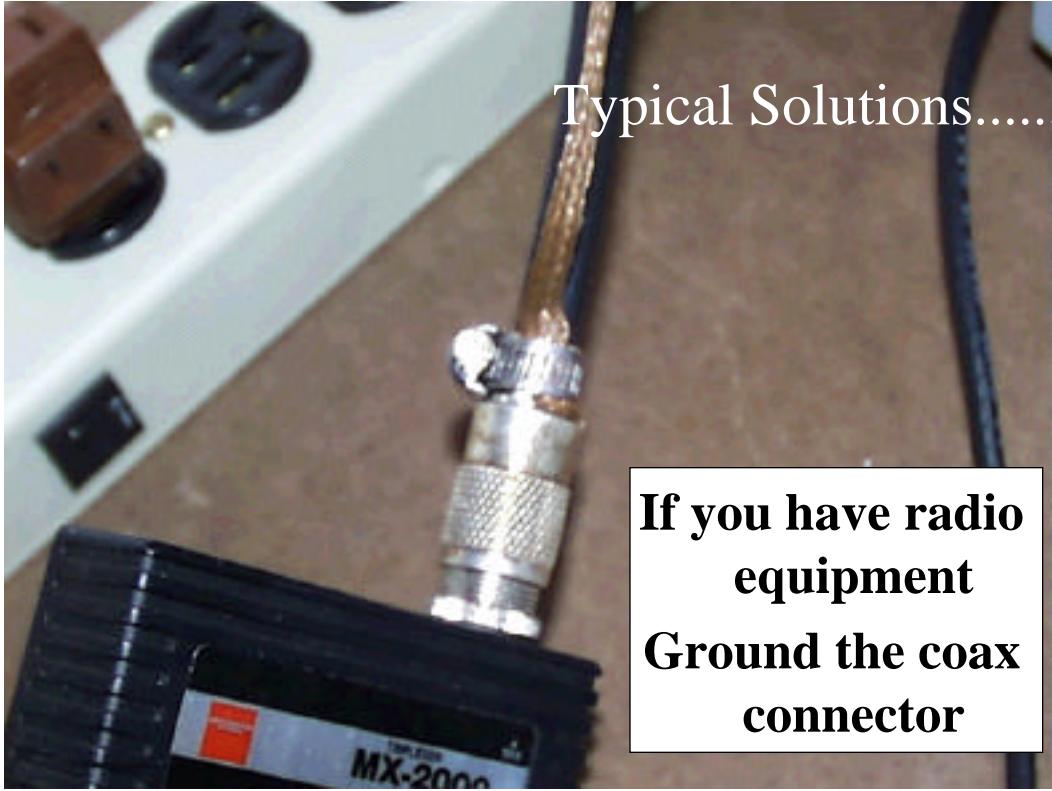
**Heating ducts
make good
ground grids**



Typical Solutions.....

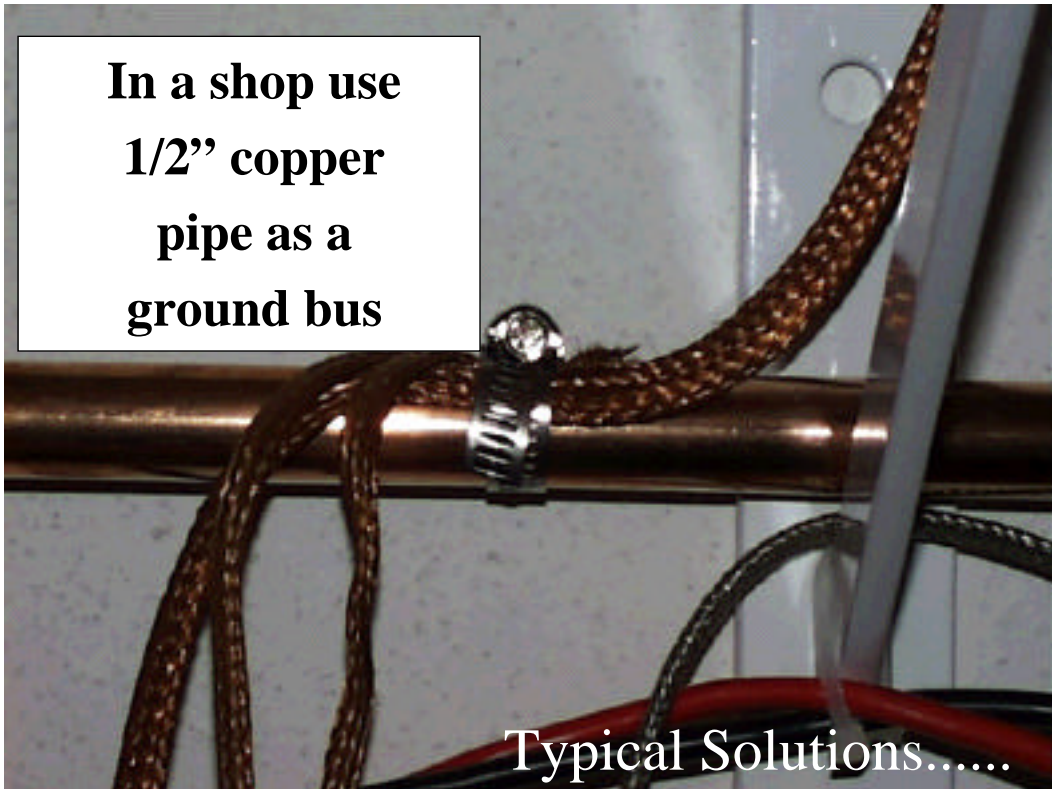
**If it is metallic---bond it to the
common grounding system**

**Imagine a large flat copper sheet
covering the entire area of your home
or farm. You are trying to use
metallic objects to create this
“equipotential plane”**



Typical Solutions.....

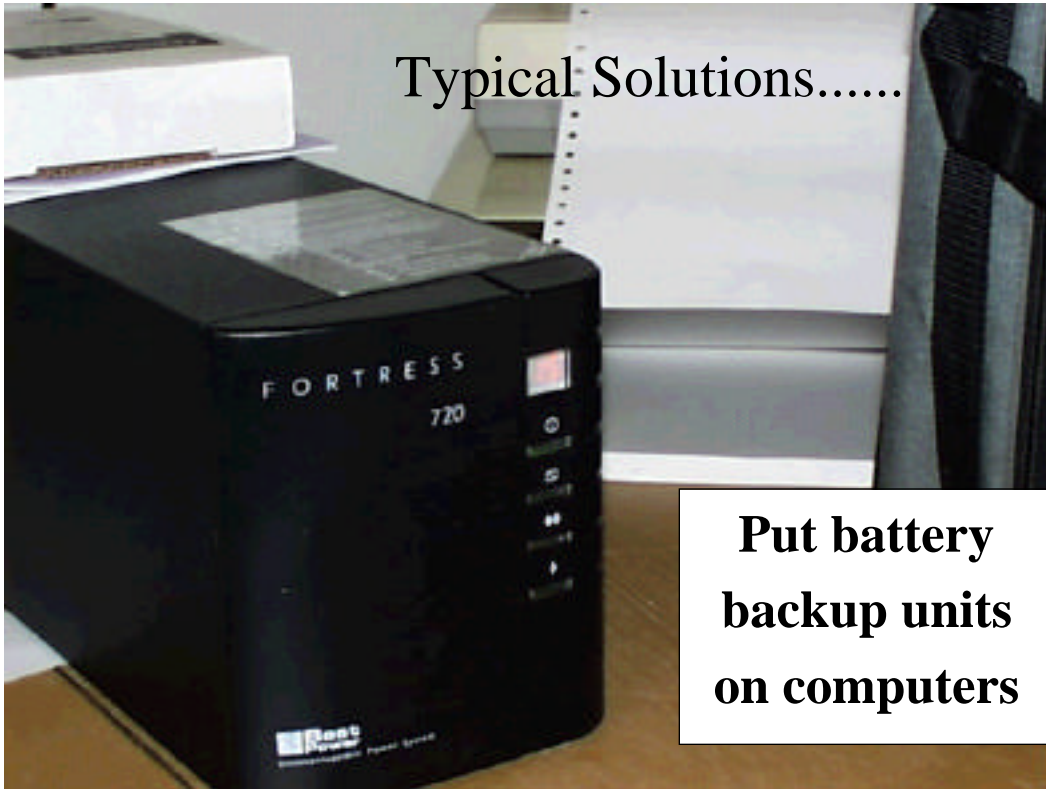
**If you have radio
equipment
Ground the coax
connector**



**In a shop use
1/2" copper
pipe as a
ground bus**

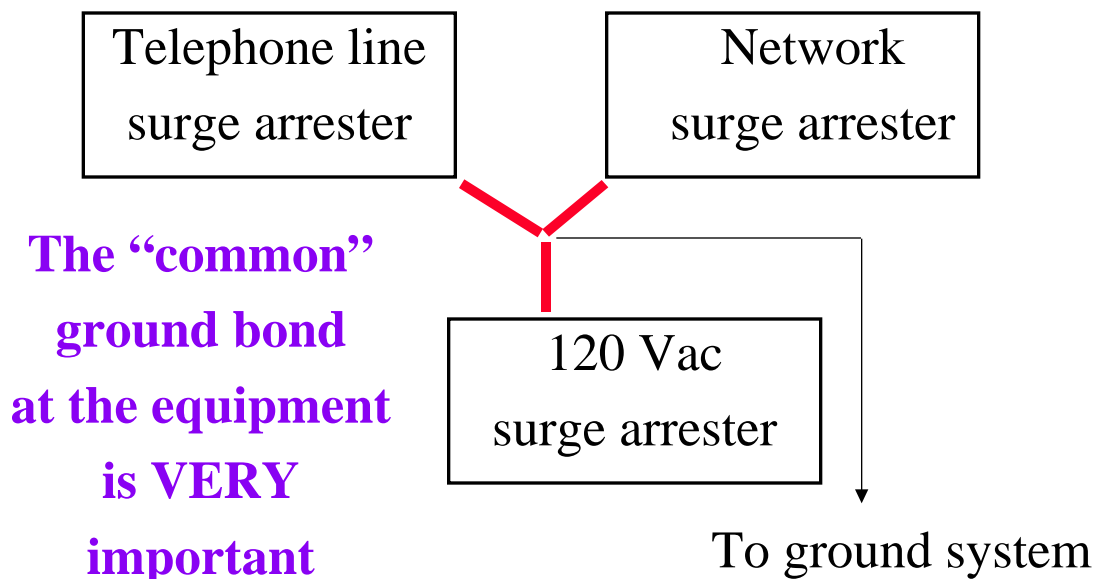
Typical Solutions.....

Typical Solutions.....



**Put battery
backup units
on computers**

Typical Solutions.....**AT THE COMPUTER**



Solutions.....TO DO and **NOT TO DO!**

- * **Do add MOV surge arresters at remote panels.**
- * **Do include remote panel grounds in ground system.**
- * **Do add auxiliary ground bars on remote panels.**
- * **Do NOT connect neutral and ground at remote panels.**
- * **Do NOT try to isolate equipment unless you disconnect and ground all connections to it (during storms).**

Solutions if the voltage is too high...

Quickly! - Call the Utility to check and resolve high voltage concerns

Install voltage protection relays on motor circuits or any circuit that can be damaged by high voltage.

Solutions if the voltage is too low...

Call the Utility to check and resolve low voltage concerns.

If voltage at service is OK, have your electrician check the voltage drop on your 120/240 volt circuits.

Install voltage protection relays on motor circuits or any circuit that can be damaged by low voltage.

Solutions if the voltage surges...

This may go unnoticed unless you see the lights get bright.

Constant voltage transformers could help.

UPS units would protect equipment they serve.

This is an area the industry needs to address.

Solutions for voltage transients...

Install MOV surge arresters at main and remote panels.

UPS units have surge arresters.

Have a good ground and equipment bonding system.

Solutions if the voltage dips...

UPS units would protect equipment they serve.

Constant voltage transformers could help.

Voltage dips cause equipment malfunction, the malfunction normally causes the damage.

Solutions for loss of voltage...

Call the Utility, but first look to see if your neighbors have power.

UPS units can maintain power on critical items for about 15 to 30 minutes.

An on site generator with manual or automatic transfer will pick up critical load before the UPS units have exhausted their battery power.