



# Surge Protector and Power Strip Safety

By the

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## Overloading



- The most common cause of fires from extension cords, power strips, power taps, or surge protectors is due to improper use and overloading, especially when cords have multiple outlets such as power strips and/or surge protectors.
- Extension cords and power strips can get hot enough to ignite cloth, paper, carpet etc. and start fires.

## Add it UP!

- If your device uses eight amps at 125 volts, then its wattage rating will be 1000 watts. ( $8A \times 125V = 1000W$ )
- Additionally, if you are going to use an extension cord or a power strip with two or more connected devices, you must add together the total wattage ratings for all the connected devices whether idle or in full operation. Idle equipment has the potential of turning on to full load.
- Do not use an extension cord or power strip that has a lower rating than the equipment intended to be plugged into it.

## Typical Office Power Strip

- The total amps should not exceed the rated capacity of the power strip.

• Computer	2.0 amps	250 watts
• LCD Monitor	1.5 amps	190 watts
• Speakers	0.12 amps	15 watts
• Desk Lamp	0.32 amps	40 watts
• Scanner	1.2 amps	150 watts
• <u>Printer (Printing)</u>	<u>9.4 amps</u>	<u>1,175 watts</u>
• <b>Total</b>	<b>14.54 amps</b>	<b>1,820 watts</b>

## Definitions – Multi-plug Adapters

- A multi-plug adapter (power tap) is a device that plugs into a receptacle and allows that receptacle to supply power to more appliances or fixtures than that for which it was originally designed.



## Definitions – Extension Cords

- An extension cord is a portable flexible cord of any length with a male connector on one end, one or more female connectors on the other end, and no built-in over current protection.



## Extension Cords Continued

- Most light duty extension cords are only rated for a maximum of ten amps or 1200 watts.
- Overloading can occur when multiple devices are plugged into one cord, or when cords are daisy-chained together, or when the connected equipment is drawing more amps than the cord is rated to handle.



## Definitions – Power Strips

- A power strip, or more accurately, a relocatable power tap (RPT) is simply a variation of an extension cord, where the cord terminates in a row or grouping of receptacles.



## Power Strips Continued

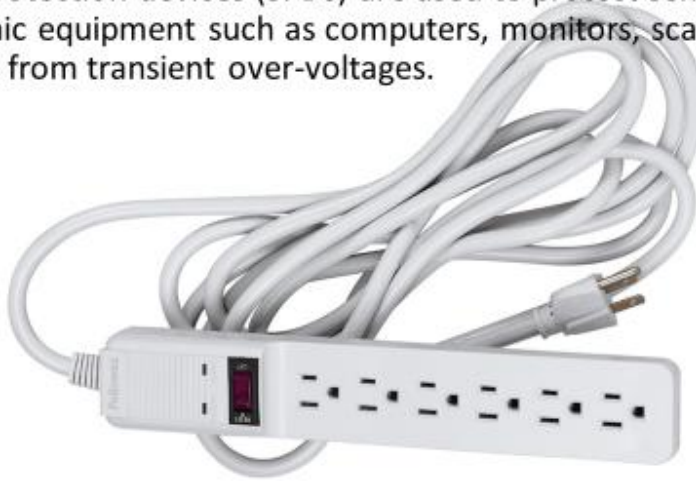
- Power strips as they are most commonly referred to, typically consist of several components:
  - Multiple electrical receptacles
  - On/off power switch
  - Internal circuit breaker
  - Grounded power cord

## Power Strips or RPTs

- Not all power strips are surge protectors. These two devices are quite similar in physical appearance. However, their functions are totally different.
- As mentioned earlier, a power strip multiplies the capability of your power outlets.
- A surge protector acts as a shield to protect your electronic items from power spikes and other electrical deterrents.

## Surge Protectors

- Surge protection devices (SPDs) are used to protect sensitive electronic equipment such as computers, monitors, scanners, and printers from transient over-voltages.



## Surge Protective Device (SPDs) Power Strips

- SPDs can be manufactured as a corded power strip or a wall mount outlet(s).
- Both types, whether corded or wall mount, are considered power strips and adding additional extension cords or power strips is considered daisy-chaining or piggy-backing.
- All surge suppressors have a limited useful life.



## What you need to know about SPDs

- Surge protection devices have metal oxide varistors (MOVs) inside that “clamp down” on energy spikes converting them into heat which is absorbed by the unit. This action degrades the MOVs over time causing them to fail. Once the rated capacity is reached, the unit is no longer able to protect sensitive equipment and must be replaced.
- The Joule Rating on a surge protector is based on the number of MOVs inside the surge protector. A higher number of Joules equates to a greater ability to absorb a surge.
  - The higher the Joule rating the better

## Uninterruptible Power Source (UPS)



## OSHA Regulations and UL Standards

- OSHA standard 29 CFR § 1910.303(b)(2), Installation and use, requires that “Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.”
- Manufacturers and nationally recognized testing laboratories determine the proper uses for power strips.
- UL-listed RPTs are required to be directly connected to a permanently installed branch circuit receptacle.
- RPTs are not to be series-connected to other RPTs or connected to extension cords.

## Uninterruptible Power Source (UPS)

- An uninterruptible power source (UPS) is an electrical apparatus designed to provide emergency power to a device when there is an interruption in the power source or a power failure. Generally this emergency power is provided by a battery backup storage system.
- These units fall under the same requirements as power strips (RPTs) and for all intents and purposes are treated as such.



## Common Violations

- **Daisy-Chaining:** Interconnecting RPTs violates the UL 1363 listing, manufacture's recommendations, the National Electrical Code (NEC), Occupational Safety and Health Administration (OSHA), and National Fire Protection Association (NFPA) standards because it can cause overloads and fires. Extension cords and uninterruptible power supplies also fall under this category.
- **Improper Routing:** Routing cords through walls, ceilings, floors, windows or similar openings is similarly prohibited.
- **Improper Plug Connection:** The RPT must not be suspended from the power cord.

## OSHA Regulations and UL Standards Continued

- Power strips are designed for use with a number of low-powered loads such as computers, peripherals, or audio/video components.
- Power strips **ARE NOT** designed for high power loads such as:
  - Space Heaters
  - Refrigerators
  - Microwave Ovens
  - Toasters/Toaster Ovens
  - Copy Machines

## Violations Continued

- **Improper Mounting:** RPTs must not be mounted with Velcro®, double-sided tape, duct tape, zip ties, etc.
- **Improper Environmental Conditions:** The RPT must not be installed in a moist environment or a location with excessive heat or limited air circulation.
- **Improper Grounding:** The RPT must not have its grounding pin/wire removed or connected to an adapter that defeats grounding.
- **Tripping Hazards:** The RPT must not be installed in a location where it may impede the safe movement of people.

## Violations Continued

- **Signs of Damage or Neglect:** RPT cords and components should not be dirty, stained, crushed, cut, broken, kinked, warped, knotted, twisted, loose, frayed, or otherwise damaged.



# Acceptable Combinations



- The following illustrations depict the only accepted combinations for the use of:

- Extension Cords
- Power Strips
- Surge Protectors
- Uninterruptible Power Source


These are acceptable combinations for extension cords and power strips. Extension cords and power strips are not to be used together.

Power strips are also commonly called Surge Protectors or Relocatable Power Taps (RPT's) although there are some differences in their capabilities. For connection purposes they are treated the same regardless of their capabilities.


**Power strips/Surge Protectors/RPT's can only be used for low power load equipment** such as computers and AV equipment. They are **NOT** allowed to be used for high-power loads such as microwaves, coffee pots, refrigerators, toasters/toaster ovens, or space heaters. Doing so creates a serious fire hazard.



Extension cords are only for temporary use and are not to be left plugged into wall outlets when not being actively used.



Below is an example of a hand-wired power strip you may see in some rooms. These usually have 4-24 outlets. Because this is hard-wired into the electrical system an extension cord may be plugged into it. This is the **only** time it is acceptable to plug an extension cord into a power strip. It is **not** acceptable to plug another power strip in to this type of power strip.



# Unacceptable Combinations

- The following illustrations depict various **UNACCEPTABLE** combinations for the use of:

- Extension Cords
- Power Strips
- Surge Protectors
- Uninterruptible Power Source



## Examples of Daisy-chaining or Piggy-backing



## Daisy-chaining or Piggy-backing Continued



## Daisy-chaining or Piggy-backing Continued



## No Worries Boss, I Got This!

