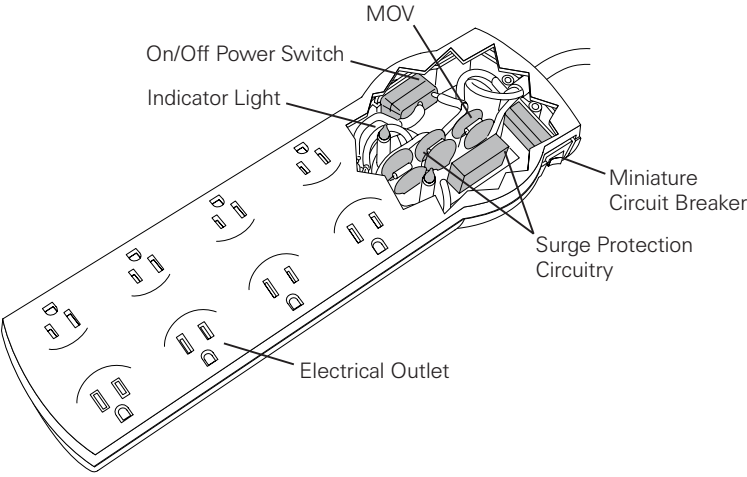


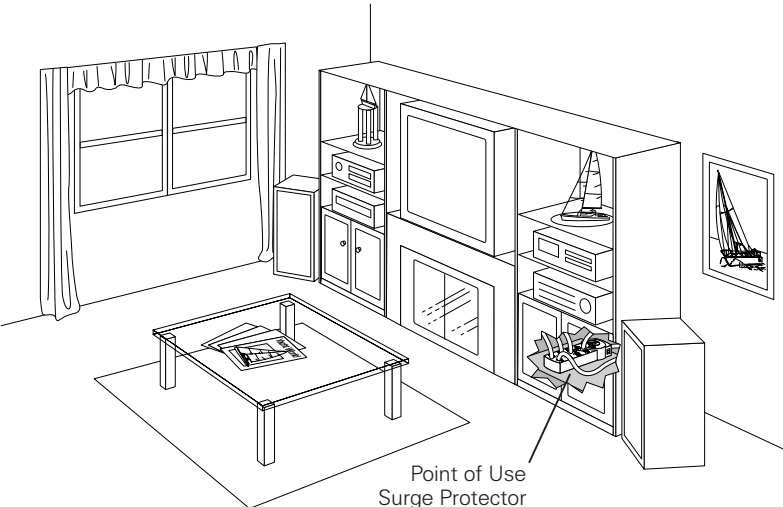
# Point-of-Use Surge Protection

Point-of-use surge protection consists of a power strip with surge protection circuitry incorporated. Point-of-use surge protection should be used anywhere expensive and sensitive electrical equipment is used.



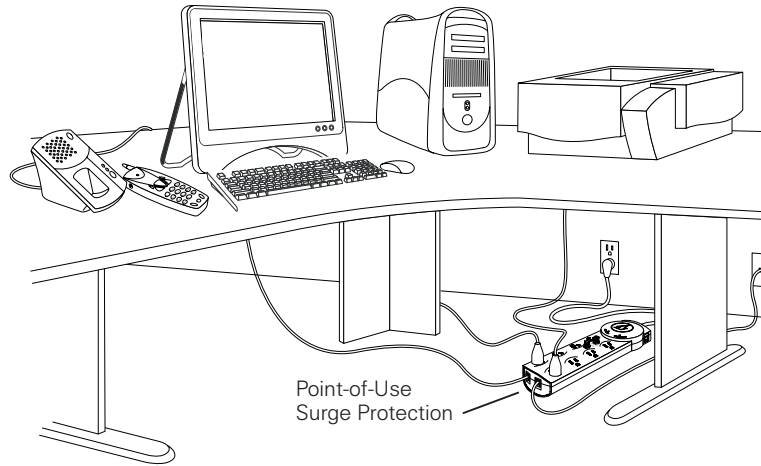
## Home Entertainment

The use of expensive and sensitive electronic equipment in the home is on the rise. Today's home entertainment centers, for example, include television sets, stereo equipment, DVD players, VCRs, and satellite or cable equipment.



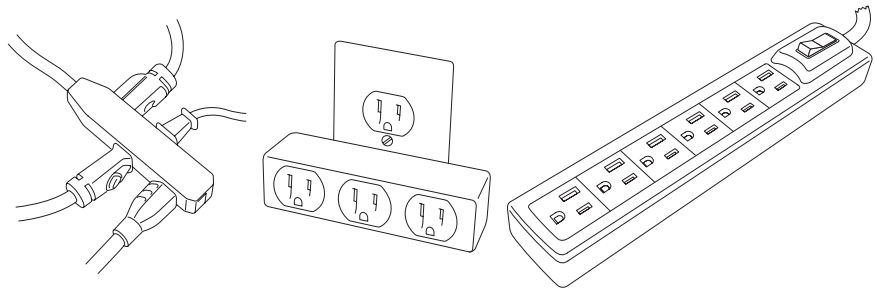
## Home Office

Today, millions of homes have home offices. Home offices include computers, fax machines, printers, copiers, scanners, and telephones. Home offices will benefit significantly from point-of-use surge protection, since the replacement cost of equipment is high. Home offices are frequently associated with a home business. The expense of lost business while equipment is down can be significant.



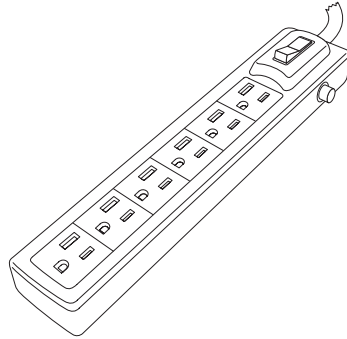
## Basic Power Strips

Too often, home owners seek inexpensive solutions to connecting and protecting expensive equipment. Inexpensive extension cords, add-on outlets, and basic power strips provide no surge protection, leaving equipment susceptible to performance degradation and damage.



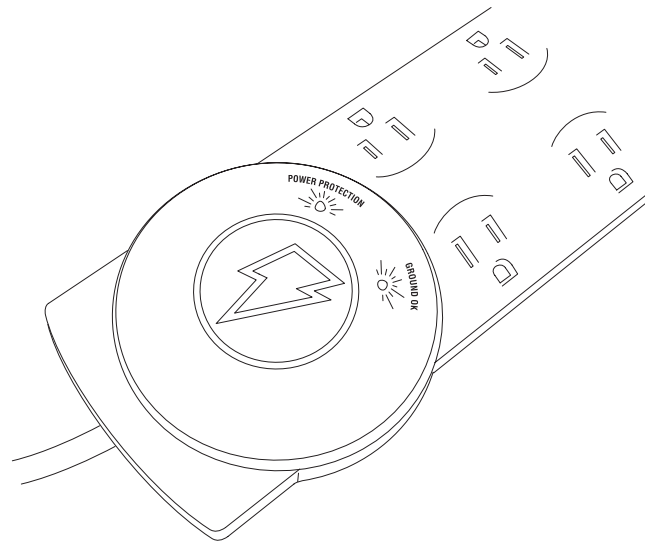
## Basic Surge Protection

Home owners may also settle for an inexpensive surge protected power strip. Some of these may have a fuse or miniature circuit breaker that can be reset, but provide no visual indication that the surge protection circuitry is functioning. A home owner may think the connected equipment is protected, when in reality it is not.



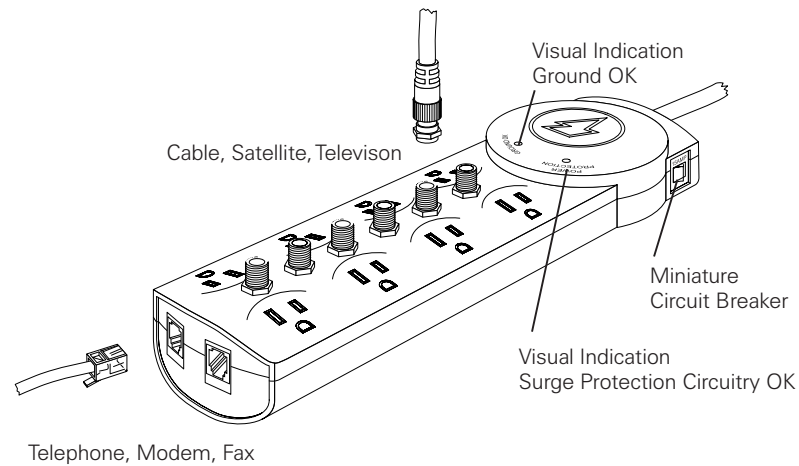
## Visual Indication

Good point-of-use surge protectors, like good point-of-entry surge protectors, will sacrifice themselves and not the connected equipment in the event of a catastrophic surge. It is important to note that in many point-of-use surge protectors, the electrical outlets continue to supply power to equipment even though the surge protection circuitry may have been damaged. Better point-of-use surge protection devices provide visual indication that the surge protection circuitry is functional and protecting the connected equipment.



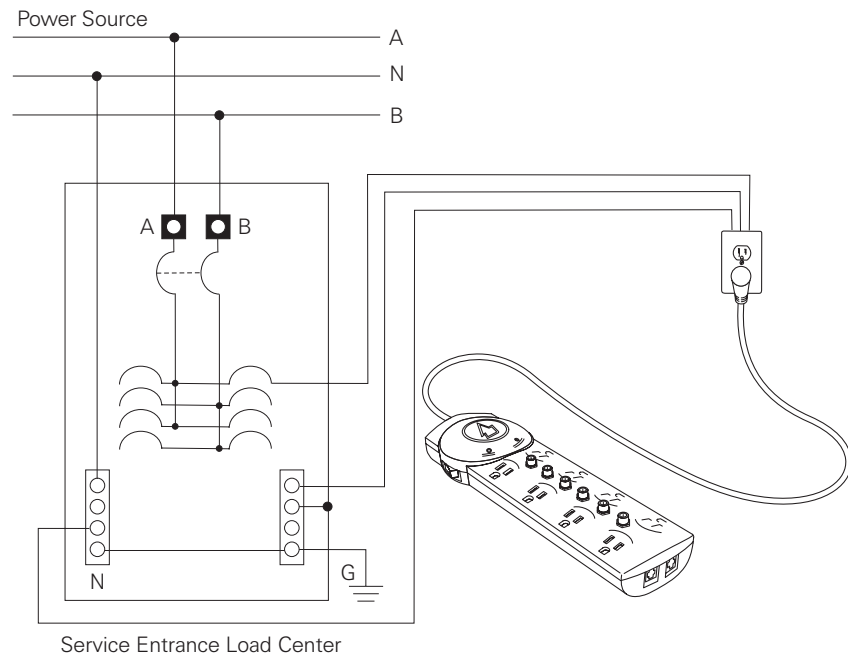
## Other Features

In addition, better point-of-use surge protectors are designed around the equipment they are intended to protect. Equipment is just as susceptible to damage from electrical surges on telephone and cable feeds as from the electrical power supply. Point-of-use surge protectors designed for use with home entertainment equipment should include surge protection circuitry for cable or satellite connections. Surge protection intended for use in the home office should include connections for a telephone, fax, and modem.



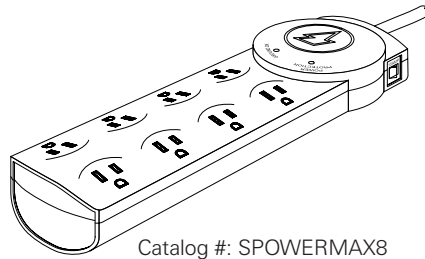
## TVSS

Point-of-use surge protectors are classified as transient voltage surge suppressors (TVSS) according to *NEC*<sup>®</sup> Article 285.21 requirements because they are installed on the load side of the service disconnect overcurrent protection. Point-of-use surge protectors should be UL 1449 listed.

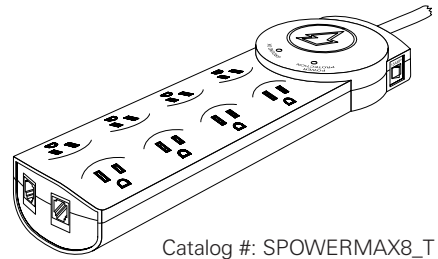


## POWERMAX® 8

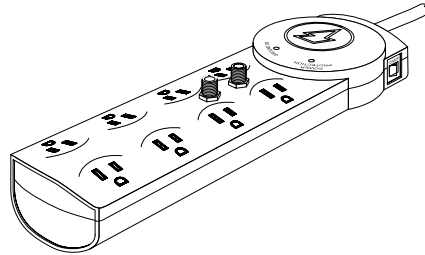
Siemens offers a wide range of point-of-use surge protectors. POWERMAX8 protectors have a single pulse energy rating of 1020 joules. POWERMAX8 surge protectors have a \$100,000 lifetime warranty. Equipment damaged by electrical surge while properly connected to POWERMAX8 products will be repaired or replaced at fair market value. POWERMAX8 surge protectors are available in models specially designed for the home office, home entertainment centers, and satellite systems.



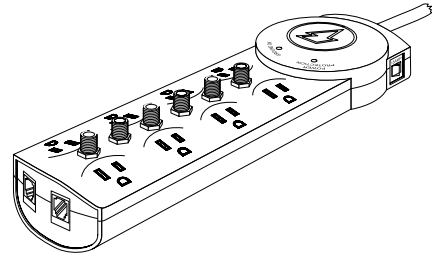
Catalog #: SPOWERMAX8  
Multi-Use



Catalog #: SPOWERMAX8\_T  
Home/Office  
In/Out Telecommunications



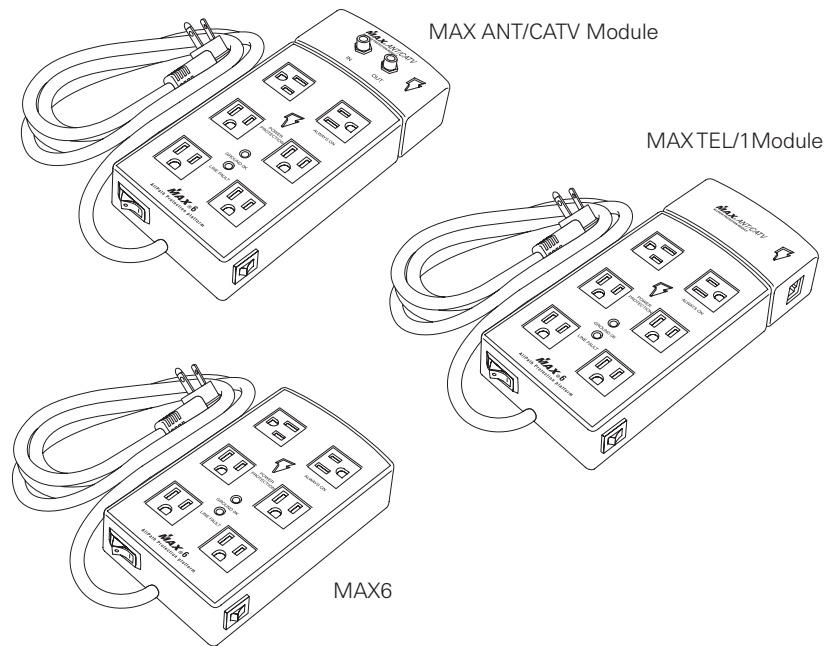
Catalog #: SPOWERMAX8\_C  
Audio/Visual  
In/Out Coax



Catalog #: SPOWERMAX8\_D  
Satellite System  
1 In/Out Satellite  
2 In/Out Coax  
1 In/Out Telecommunications

## MAX® 6

MAX6 surge protectors have a single pulse energy rating of 672 joules and offer a \$1,000,000 warranty. MAX6 products have add on modules for telephone or cable TV (ANT/CATV) connections.

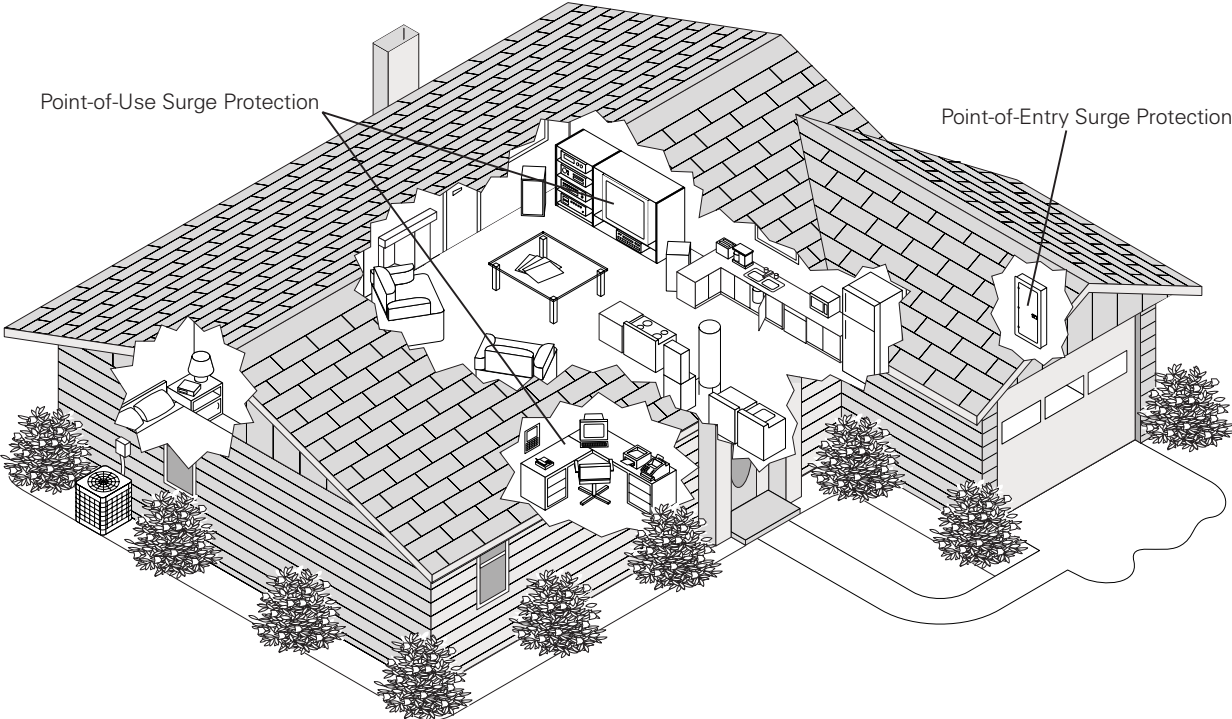


**Note:** See complete warranty for full information on Siemens point-of-use surge protectors

# Whole-House Protection

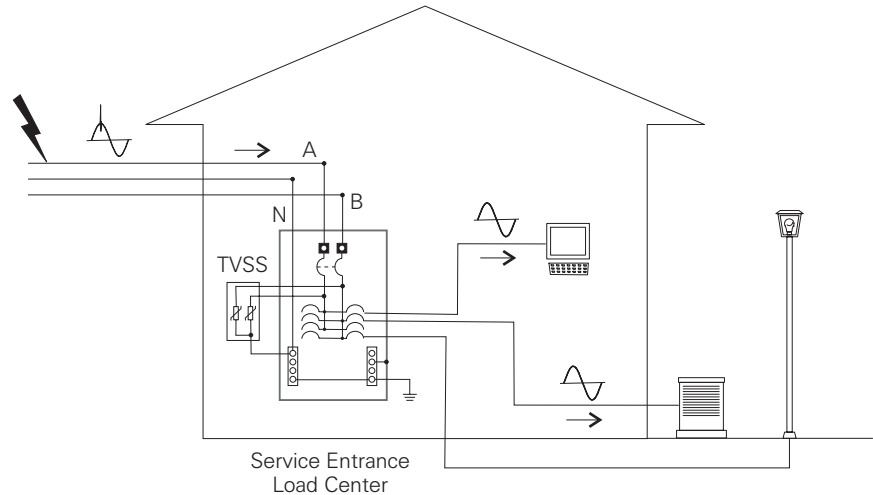
## Surge Protection Plan

No single product can protect equipment in a residence from all electrical surges. In this section we will learn how a tiered protection plan, consisting of point-of-use and point-of-entry surge protectors, help guard against disturbances from inside and outside the home.



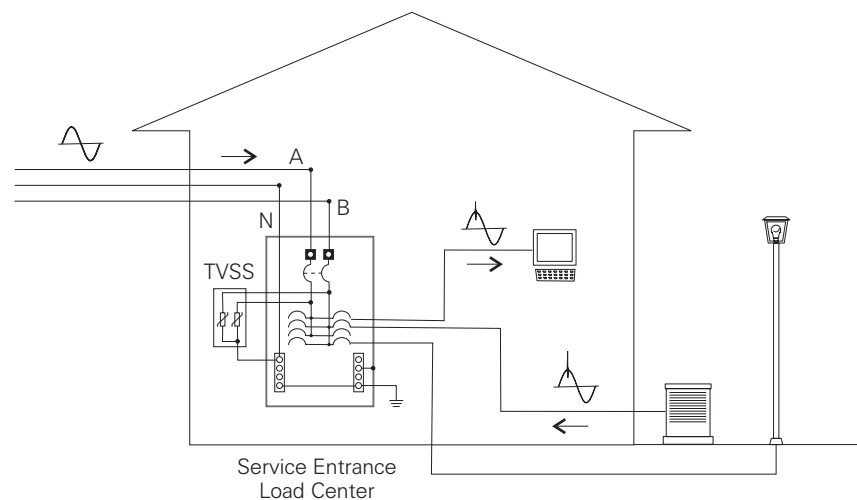
## Point-of Entry Protection is not Enough

We have already learned that point-of-entry protectors can prevent electrical surges on the utility service from entering the home. Electrical surges can come from a lightning strike on or near high-voltage transmission lines or switching of primary circuits by local utilities.



## Surges from Within the Home

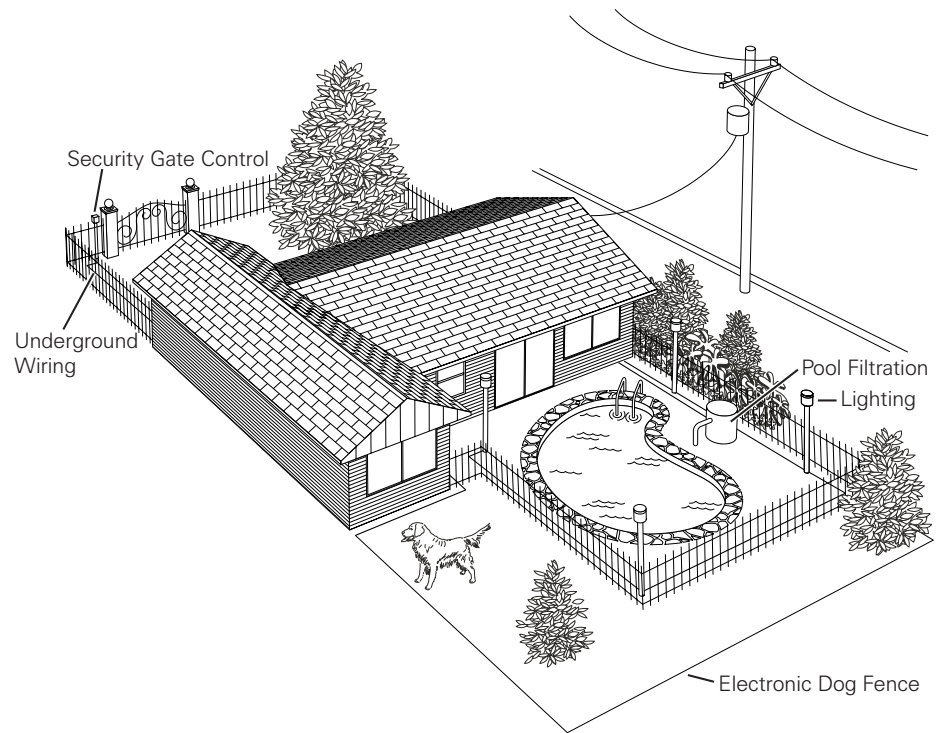
However, point-of-entry surge protectors are not whole-house protectors. Point-of-entry surge protectors cannot eliminate all electrical surges developed within the home. For example, an air conditioner can cause a small electrical surge every time it cycles on and off. Surges caused by equipment within the home are usually weaker than surges caused by lightning, however, they occur more frequently. These surges are distributed throughout the home's electrical system, possibly causing problems with other connected equipment.



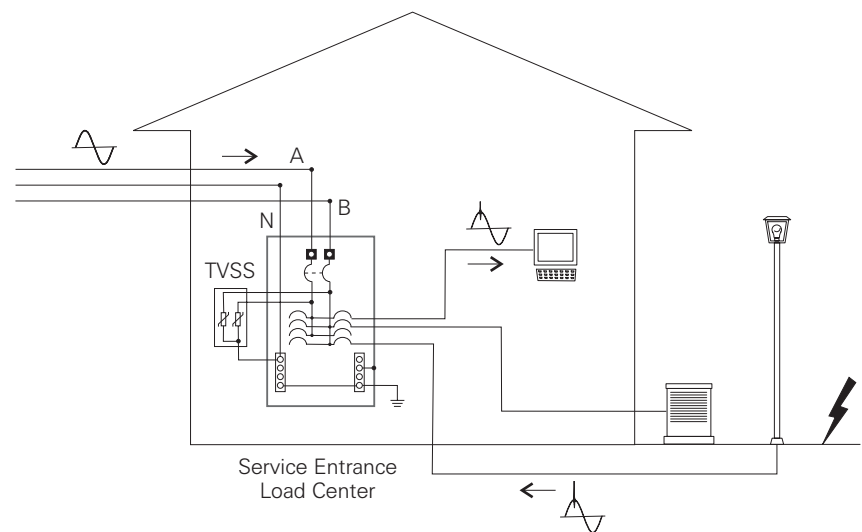


## Exterior Wiring

Additionally, many homes have some form of exterior electrical wiring. Security gates, outdoor lighting, electronic dog fences, and swimming pool filtration equipment are just a few examples of outdoor appliances in use today.



A cloud-to-earth lightning strike in close proximity to underground wiring can cause a voltage surge which has a direct path to the home distribution system.

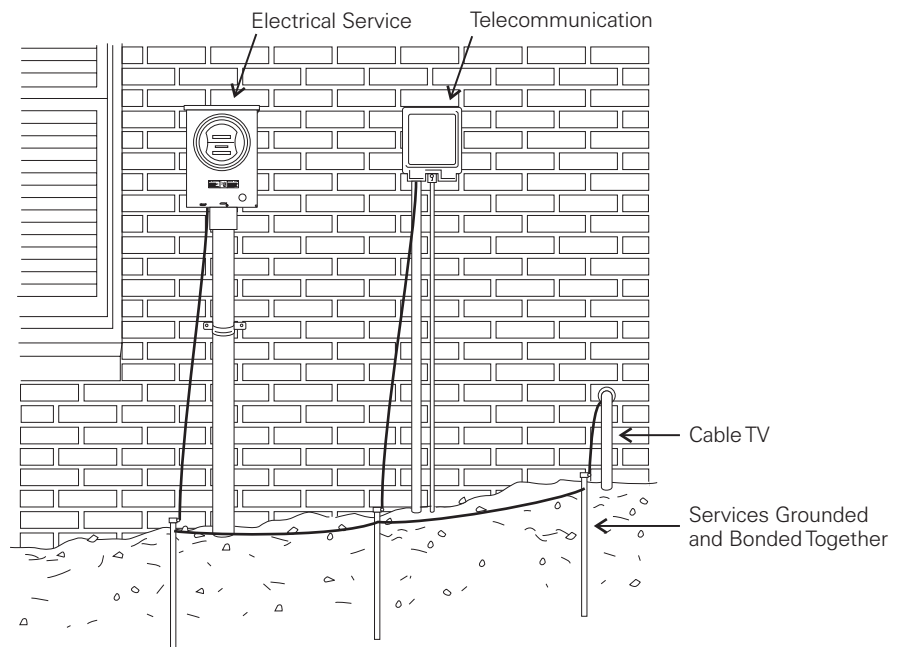


## Surges from Other Services

Most damage occurs from electrical surges that enter the home from outside services. We have already learned how lightning strikes can enter the home through the electrical utility. It is equally important to note that telecommunication and cable services can also conduct electrical surges into the home causing damage to televisions, modems, and telephones.

The *National Electrical Code*® requires services to be grounded and bonded together. The purpose is to reduce fire and shock hazard in the event electric utility power conductors come in contact with communication conductors.

However, this will not protect sensitive electrical and electronic equipment located within the house.

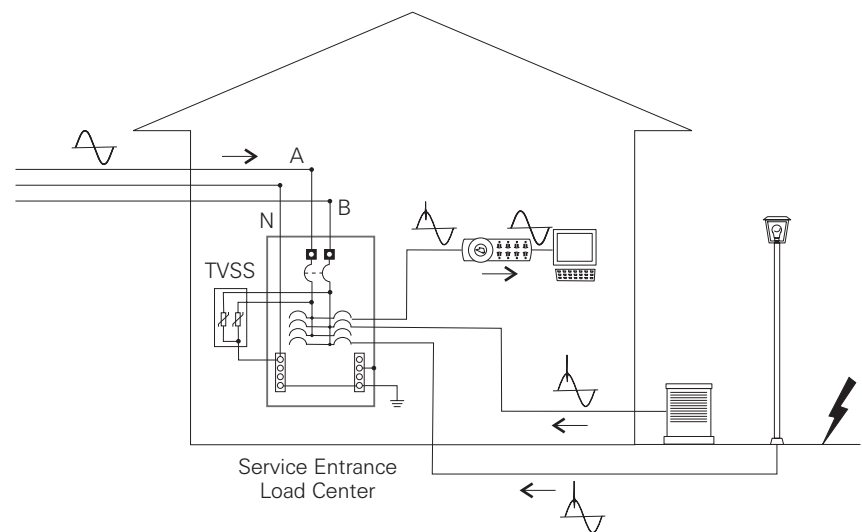


*NEC*® and *National Electrical Code*® are registered trademarks of the National Fire Protection Association.

## Adding Point-of-Use

The addition of appropriate point-of-use surge protectors adds protection to equipment such as computers, home entertainment systems, and telecommunications equipment. These systems would otherwise be vulnerable to surges caused by:

- surges caused by lightning entering the home through unprotected underground wiring.
- surges from cable or telecommunication systems.
- switching, such as an air conditioner or other home electrical equipment.



## Point-of-Use Protection is not Enough

Homeowners often mistakenly think that point-of-use surge protection is sufficient and forgo the extra expense of point-of-entry surge protection. It is impractical to connect point-of-use surge protectors at every outlet to protect appliances such as washing machines, dryers, dishwashers, stoves, ovens, garage door openers, air conditioners, and heaters. Some appliances are hard wired and may require a qualified electrician to install a surge protector.

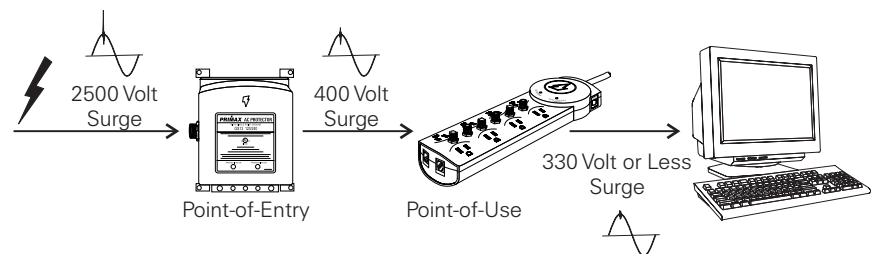
## Surge Current

Point-of-entry surge protectors are generally more robust and able to withstand higher values of surge current. A nearby lightning strike, for example, can result in surge current as high as 10,000 amps at the point-of-entry. Siemens QP and TVSS circuit breaker, installed in a Siemens load center can withstand a current impulse as high as 40,000 amps. Siemens Primax<sup>®</sup> point-of-entry protector can withstand a current impulse as high as 60,000 amps.

Although some point-of-use surge protectors are also capable of handling larger surge currents, it is much better to shunt this high current to ground before it enters the distribution system. In addition, many appliances may not be connected to a point-of-use surge protector.

## Clamping Voltage

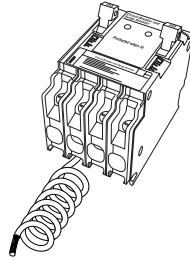
Another advantage to using a tiered system is the ability of point-of-entry surge protectors to reduce surge voltage at the service entrance. Primax point-of-entry surge protectors, for example, have a clamping voltage of 400 volts. An initial 2500 volt surge from a lightning strike would be clamped to 400 volts at the point of entry. Reducing voltage and corresponding surge current makes it easier for point-of-use surge protectors, which have a UL 1449 maximum clamping voltage of 330 volts, to handle the overvoltage. In addition, an extra layer of protection to sensitive and expensive electronic equipment is provided.



## Surge Protection Kits

Siemens offers surge protection kits designed to provide the necessary tiered protection. The basic kit consists of the Type QP and TVSS circuit breaker and two POWERMAX8 surge protectors. The deluxe kit consists of the Primax point-of-entry protector and MAX6 surge protectors with ANT/CATV and TEL modules.

### Basic Kit

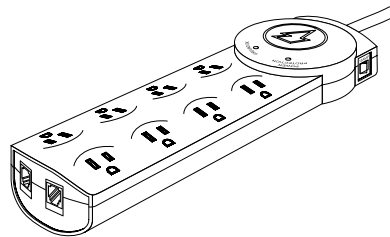


Type QP and TVSS Circuit Breaker

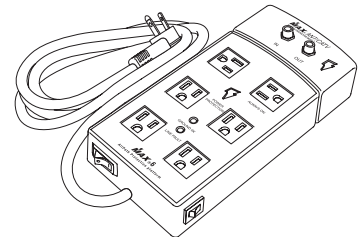
### Deluxe Kit



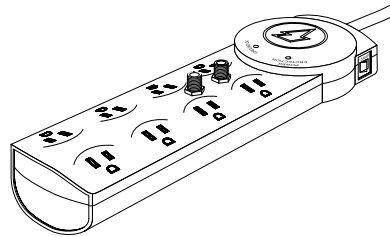
Primax Point-of-Entry Protector



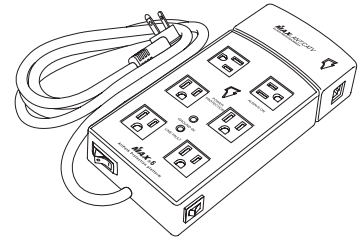
POWERMAX8 TEL



MAX6 with ANT/CATV Module



POWERMAX8 COAX



MAX6 with TEL/1Module

## Review 4

1. \_\_\_\_\_ -of- \_\_\_\_\_ surge protection is typically used with home entertainment centers and home offices.
2. Point-of-use protectors are classified as \_\_\_\_\_  
\_\_\_\_\_ surge suppressors.
3. \_\_\_\_\_ is a POWERMAX8 surge protector typically used in the home office.
4. Surges can also enter the home distribution system from \_\_\_\_\_ .
  - a. outdoor wiring
  - b. telephone service
  - c. cable
  - d. all of the above
5. Point-of-use surge protectors should be \_\_\_\_\_ listed.

# Review Answers

## **Review 1**

1) single-phase, three-wire; 2) 120; 3) lateral; 4) greater;  
5) Prohibited.

## **Review 2**

1) Lightning; 2) 20,000 to 100,000; 3) joules; 4) MOV;  
5) ground; 6) load.

## **Review 3**

1) circuit breakers; 2) Primax; 3) 720; 4) surge arrester; 5) 1920.

## **Review 4**

1) Point-of-use; 2) transient voltage; 3) SPOWERMAX8\_T; 4) d;  
5) UL 1449.

# Final Exam

The final exam is intended to be a learning tool. The book may be used during the exam. A tear-out answer sheet is provided. After completing the test, mail the answer sheet in for grading. A grade of 70% or better is passing. Upon successful completion of the test a certificate will be issued.

1. Sensitive electrical equipment manufactured to ITI (CBEMA) guidelines should be able to sustain a 200% overvoltage surge for \_\_\_\_\_ without sustaining damage.
  - a. 1 ms
  - b. 3 ms
  - c. 20 ms
  - d. 0.5 seconds
  
2. The most damaging source of electrical surges comes from \_\_\_\_\_.
  - a. motor driven equipment
  - b. lightning strikes
  - c. cable and telecommunication services
  - d. utility companies switching primary circuits
  
3. An electrical surge of 1000 volts at 100 amps with a duration of .002 seconds supplies \_\_\_\_\_ joules of energy to the connected equipment.
  - a. .02
  - b. 10
  - c. 200
  - d. 100,000
  
4. \_\_\_\_\_ is a measure of the voltage-limiting capability of a surge protector.
  - a. Peak current rating
  - b. Clamping voltage
  - c. Peak impulse
  - d. Joule rating

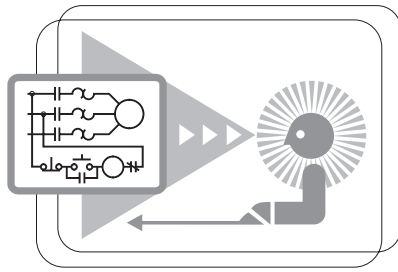


5. A/An \_\_\_\_\_ is a device used in surge protectors that switches from a high resistance to a low resistance when a voltage surge occurs.
- MOV
  - inductor
  - miniature circuit breaker
  - TVSS
6. *NEC*<sup>®</sup> Article 285.21 specifies that a transient voltage surge suppressor be connected \_\_\_\_\_ .
- at the service entrance in front of the main disconnect
  - on the load side of the service disconnect overcurrent protection
  - at the point of use
  - either in front of or on the load side of the service disconnect overcurrent protection
7. According to *NEC*<sup>®</sup> Article 230.82(3), only \_\_\_\_\_ may be connected ahead of the service entrance main disconnect.
- TVSS devices
  - point-of-use devices
  - point-of-entry devices
  - surge arresters
8. Point-of-use surge protectors meet *NEC*<sup>®</sup> Article 285.21 requirements for a TVSS device because they are \_\_\_\_\_ .
- installed on the load side of the service disconnect overcurrent protection
  - portable
  - installed ahead of the service entrance main disconnect
  - installed ahead of the equipment to be protected
9. Surge protectors are rated in \_\_\_\_\_ , which is an indication of how much energy a surge protector can handle.
- watts
  - volts
  - joules
  - amps

10. \_\_\_\_\_ tradename(s) for Siemens point-of-use surge protectors.
- MAX<sup>®</sup> 8 is a
  - POWERMAX<sup>®</sup> 6 is a
  - MAX<sup>®</sup> 8 and POWERMAX<sup>®</sup> 6 are
  - MAX<sup>®</sup> 6 and POWERMAX<sup>®</sup> 8 are
11. \_\_\_\_\_ is a good choice for use in a home/office.
- SPOWERMAX8\_T
  - SPOWERMAX8\_C
  - SPOWERMAX8\_D
  - MAX6 with ANT/CATV module
12. The clamping voltage rating of a Type QP and TVSS surge protector is \_\_\_\_\_ volts.
- 130
  - 250
  - 330
  - 500
13. The impulse rating of a Type QP and TVSS surge protector is \_\_\_\_\_ amps.
- 3000
  - 10,000
  - 40,000
  - 60,000
14. The clamping voltage rating of a Primax point-of-entry protector is \_\_\_\_\_ volts.
- 250
  - 330
  - 400
  - 500
15. The impulse rating of a Primax point-of-entry protector is \_\_\_\_\_ amps.
- 3000
  - 10,000
  - 40,000
  - 60,000

16. Point-of-entry surge suppressors should meet criteria for \_\_\_\_\_ .
- UL 1449
  - NEC® Article 280
  - NEC® Article 285
  - UL 1449 and NEC® Article 280
17. Electrical surges from lightning strikes can also enter the home distribution system from \_\_\_\_\_ .
- outdoor wiring
  - telephone service
  - cable
  - all of the above
18. Point-of-use surge suppressors should meet criteria for \_\_\_\_\_ .
- ITI (CBEMA)
  - NEC® Article 280
  - UL 1449
  - UL OXHD
19. The Siemens Type QP and TVSS surge suppressor is comprised of point-of-entry surge suppression integrated with \_\_\_\_\_
- a single-pole circuit breaker
  - two single-pole circuit breakers
  - a two-pole circuit breaker
  - two two-pole circuit breakers
20. A tiered protection plan, consisting of \_\_\_\_\_ is recommended to protect from electrical disturbances from inside and outside the home.
- point-of-entry and point-of-use surge protectors
  - point-of-use and TVSS surge protectors
  - point-of-entry surge arrester and point-of-entry TVSS
  - point-of-use surge protectors

# quickSTEP Online Courses



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From this site the complete text of all STEP 2000 courses can be downloaded in PDF format. These files contain the most recent changes and updates to the STEP 2000 courses.

A unique feature of the quickSTEP site is our pictorial glossary. The pictorial glossary can be accessed from anywhere within a quickSTEP course. This enables the student to look up an unfamiliar word without leaving the current work area.

