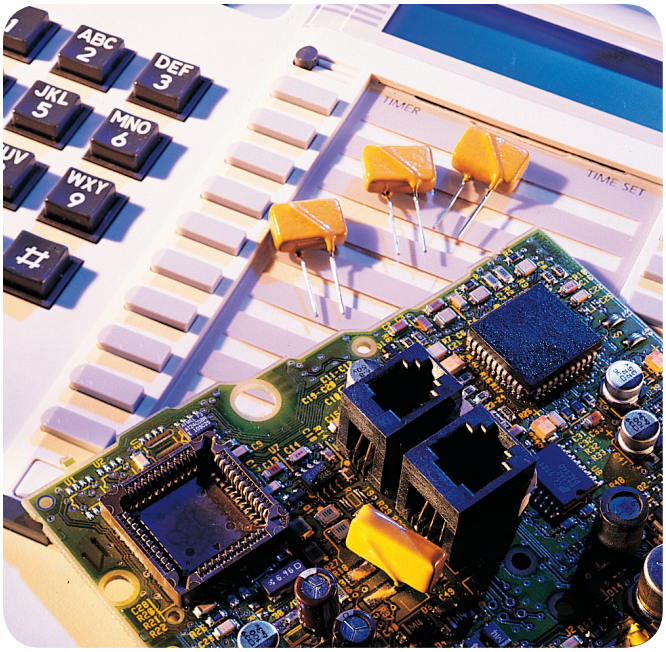
Customer Premise Equipment



Problem and Solution

Customer Premise Equipment (CPE), also known as subscriber equipment, includes any equipment that is connected to the telecommunications network and located at a customer's site. Examples of CPE include: 56k modems, cable modems, ADSL modems, phone sets, fax equipment, answering machines, POS equipment and PBX systems.

Since CPE equipment connects to the copper infrastructure of the Public Switched Telephone Network (PSTN), it is subject to overcurrent and overvoltage hazards from AC power cross, power induction, and lightning surges which may appear on the premise wiring. If left unprotected from these hazards, CPE may fail to operate or may risk the safety of subscribers and maintenance personnel. PolySwitch resettable devices and overvoltage protection devices provide coordinated resettable protection against these faults, thereby protecting equipment from damage and minimizing field services and warranty costs.

Typical Protection Requirements

In most cases, CPE is powered from the central office with nominal battery voltages around –48V$_{DC}$ and 90V$_{RMS}$ ringing signals superimposed when needed. However, TIA-968-A does specify that a CPE system must be designed to also operate with –56.6V$_{DC}$ and a superimposed 150V$_{RMS}$ simulated ringing signal. Thus, the actual system implementation must accommodate maximum voltages as high as 268.8V$_{PEAK}$ — this in turn specifies the rating of the overvoltage device to have a V$_{DM}$<270V. Corresponding system loop currents typically fall in the 20–70mA range.

Customer premise equipment is generally ungrounded and therefore requires only metallic protection architecture against lightning and AC power faults as shown in Figure 1. A PolySwitch device can help provide overcurrent protection against AC power faults. A Littelfuse Gas Discharge Tube (GDT), or an MOV or thyristor can help provide overvoltage protection against lightning hazards. A Littelfuse 2Pro device, by including the PolySwitch device and MOV in a single package, can help provide overcurrent and overvoltage protection in a single, low cost component. This interface circuit is generally placed directly behind the RJ-11 jack (or appropriate system interface) to protect downstream circuit components.

Figure 2 provides recommended protection circuitry for a modem interface, such as may be found on a 56k analog modem, cable modem, set-top box, POS terminal, or digital modem.

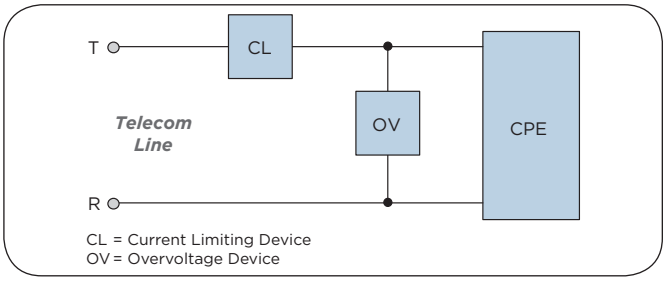


Figure 1. Generic CPE Interface

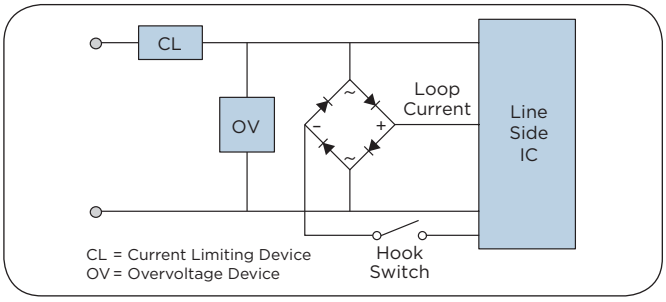


Figure 2. Modem Interface

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Customer Premise Equipment

Device Selection for Agency Approval Requirements

Protection for customer premise equipment is typically designed to meet the requirements of UL60950 and TIA-968-A for North American use and of ITU-T K.21 for rest-of-world use.

PolySwitch devices should be selected with voltage ratings based on the regulatory standards for which the equipment is being designed. Surface-mount TS600 or TSM600 and radial-leaded TRF600 devices are applicable for North American GR-1089 standards and for UL60950 standards, while surface-mount TS250 and TSV250 and radial-leaded TRF250 products are applicable for ITU-T K.21 standards.

Overvoltage devices should be selected with surge current ratings based on the regulatory standards for which the equipment is being designed and with off-state voltage ratings based on normal system operation. Overvoltage devices with off-state voltage ratings of 270V are applicable for CPE with maximum ringing voltages up to 270V peak. For systems with lower expected voltages (when no ringing voltage is present), designers may consider devices with lower voltage ratings. The Littelfuse 2Pro device (part number TM2P-10271) is suitable for these applications. Littelfuse GDTs (Gas Discharge Tubes) are suitable for applications at higher frequencies, where a low capacitance overvoltage protection device is needed.

Table 1. Recommended Circuit Protection Devices

Regulatory Standard	Overcurrent Protection Devices		Overvoltage Protection Devices		Overcurrent/overvoltage Combination Devices	
	Thru-hole	Surface-mount	Thru-hole	Surface-mount	Thru-hole	Surface-mount
TIA-968-A, UL60950, GR-1089 Port Type 3**	TRF600-150	TS600-170F	GTCRxx-xxxx-xxx	GTCSxx-xxxx-xxx	TM2P-10271*	
	TR600-150F-EX	TS600-200F	GTCAxx-xxxx-xxx			
	TRF600-160	TSM600-250F				
	TRF600-400	TSM600-400F				
ITU-T K.21	TRF250-120	TS250-130F	GTCRxx-xxxx-xxx			
	TRF250-120T	TSV250-130F	GTCAxx-xxxx-xxx			
	TRF250-145					
	TRF250-183					
	TRF250-184					

* TM2P-10271 is not designed for GR1089 applications.
** May require additional impedance or coordination with primary protector.