

# ADSL Equipment

## Application Overview

### Problem/Solution

Asymmetric Digital Subscriber Lines (ADSL) employ an asymmetrical digital line technology to provide a transmission rate up to 6.144Mbps from the Central Office Terminal (COT) to the Remote Terminal (RT) and a 640kbps transmission rate from the RT to the COT at distances up to 12,000 feet. See Figure 1 for a typical ADSL system architecture. Splitters at the central office end of the line separate voice-band traffic from data traffic and route them to appropriate switching equipment. At the customer premise, both splitter and splitterless configurations exist.

Since ADSL 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. PolySwitch resettable devices and

SiBar thyristors provide coordinated resettable protection against these faults, thereby protecting equipment from damage and minimizing field service and warranty costs.

### Typical Protection Requirements

ADSL is designed to run over standard analog phone lines; therefore, the normal POTS subscriber loop voltages and currents can be expected. ADSL signal voltage is nominally  $\pm 3V$ . This voltage is superimposed over the POTS ringing voltage that has a maximum of 269V peak, as defined by FCC Part 68.

In general, ADSL transceivers at the central office and the remote site are ungrounded equipment, thereby requiring only metallic protection. Figure 2 shows a reference schematic for ADSL equipment protection.

A second PolySwitch device on the line interface may provide bet-

ter longitudinal balance and improved ADSL rate performance.

POTS splitters at the central office and the subscriber site consist of a low-pass filter for connection to POTS equipment and DC blocking capacitors for connection to ADSL transmission equipment. Transient protection is supplied at the line interface as shown in Figure 3.

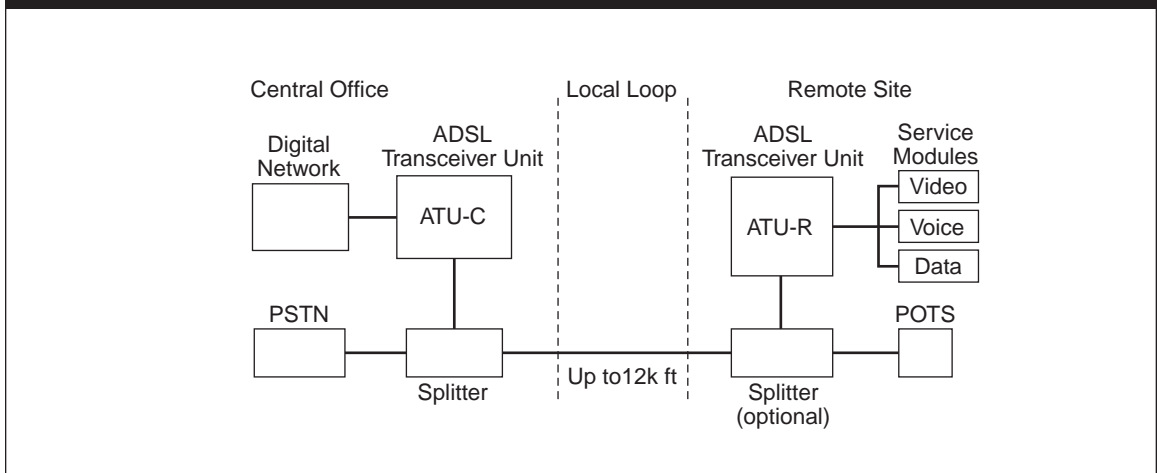
Additional protection against intra-building power faults may be implemented by placing protection devices in the phone and modem interfaces as shown.

### Device Selection for Agency Approval Requirements

Protection for telecommunications network equipment is typically designed to meet the requirements of Telcordia GR-1089 for North America installations and of ITU-T K.20 for

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Figure 1. ADSL System Architecture



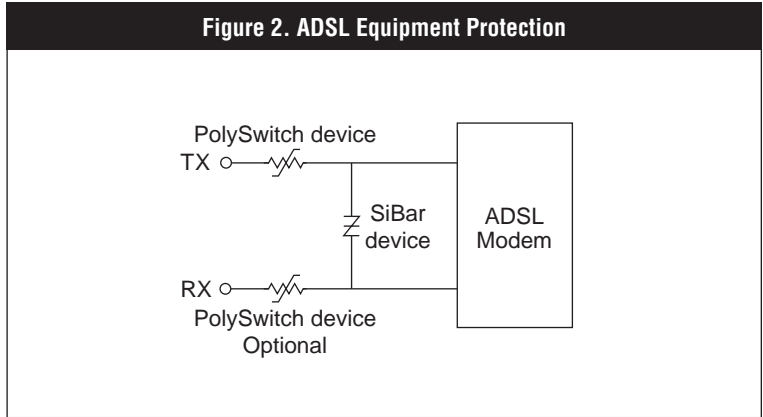
installations in the rest of the world. Protection for customer premise equipment is typically designed to meet the requirements of UL60950 and TIA-968-A for North American use and of ITU-T K.21 for rest-of-world use. Overviews of the requirements for each of these standards can be found as separate application notes in this Databook.

PolySwitch devices should be selected with voltage ratings based on the regulatory standards for which the equipment is being designed. Surface-mount TS600 and radial-leaded TR600 devices are applicable for North American GR-1089 standards and for UL60950 standards, while surface-mount TS250 and TSV250 devices and radial-leaded TR250 devices are applicable for ITU-T K.20/21 standards as well as for Telcordia GR-1089 Intrabuilding level protection.

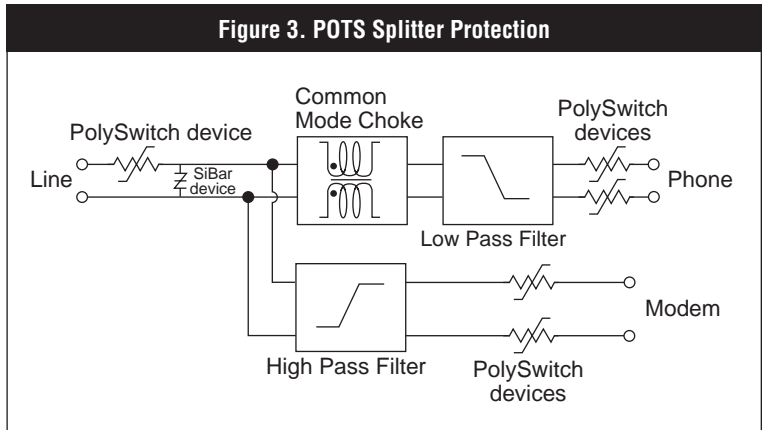
SiBar devices should be selected with surge current ratings based on the regulatory standards for which the equipment is being designed and with off-state voltage ratings based on normal system operation. SiBar TVB270SA, TVB270SB, and TVB270SC devices with off-state voltage  $V_{DM}$  ratings of 270V are applicable for most ADSL systems.

Table 1 provides recommended PolySwitch and SiBar devices for ADSL and POTS splitter applications.

**Figure 2. ADSL Equipment Protection**



**Figure 3. POTS Splitter Protection**



**Table 1. Recommended Circuit Protection Devices**

Regulatory Standard	PolySwitch Device	SiBar Device
Telcordia GR-1089	TSM600-250-RA (SMT)	TVB270SC (with TSM600)
	TS600-200-RA (SMT)	TVB270SB
	TR600-160-RA (Thru-hole)	
UL1459/UL60950,	TSM600-250-RA (SMT)	TVB270SC (with TSM600)
	TS600-170 (SMT)	TVB270SA (ungrounded)
	TS600-200-RA (SMT)	TVB270SB (grounded)
FCC Part 68	TRF600-150 (Thru-hole)	
	TR600-160 (Thru-hole)	
ITU-T K.20/21	TS250-130 (SMT)	TVB270SA
Telcordia GR-1089	TSV250-130 (SMT)	
Intrabuilding	TR250-145-RA (Thru-hole)	
	TRF250-180 (Thru-hole)	

