

# ISDN Equipment

## Application Overview

### Problem/Solution

Basic Rate Integrated Services Digital Network (ISDN) technology divides the telephone line into 3 digital channels: 2 “B” channels and one “D” channel, all of which can be used simultaneously. The B channels are used to transmit data at rates of up to 64 kbps. The D channel does the administrative work, such as setting up and tearing down the call and communicating with the telephone network. With two B channels, one can make two calls simultaneously. Most of the world’s existing telephone network is already digital. Today, the last mile, the section that runs from the local exchange to the home or office, remains an analog connection. ISDN service makes this final leg of the network digital. Typically, the user must be within 18,000 feet of the central office for ISDN service to be available.

ISDN components include:

- specialized ISDN terminals (TE1)
- terminal adapters (TA) which allow the connection of non-ISDN terminal equipment
- network termination devices (NT1 and NT2).

In North America, the NT1 exists as Customer Premise Equipment. Outside North America, the NT1 function is generally provided by the carrier network.

Figure 1 shows these components in the ISDN system architecture.

The T interface is the reference point between the network termination (NT1) and the subscriber equipment (TA, TE or NT2/PBX). The S interface is the reference point between the NT2/PBX and the customer terminals. In the ISDN Basic Rate Interface (BRI), the ISDN S or T interface uses

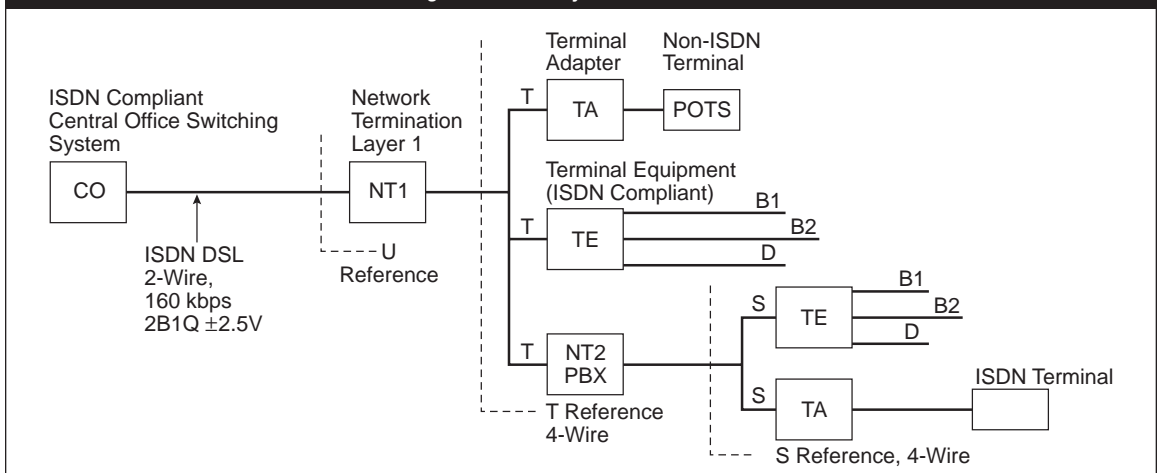
two unshielded twisted pairs to deliver two 64kbps “B,” or bearer, channels and one 16 kbps “D” or data channel. Each of the B channels can carry voice and/or data, while the D channel carries the control and signaling information and up to 9.6 kbps of additional data.

The ISDN U interface is the reference point between the network termination device (NT1) and line-termination equipment in the carrier network. The U interface delivers the same two 64 kbps B channels and one 16 kbps D channel, except that it uses one twisted pair and can operate at 5–10 kilometers from the central office.

Since ISDN 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

3

Figure 1. ISDN System Architecture



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

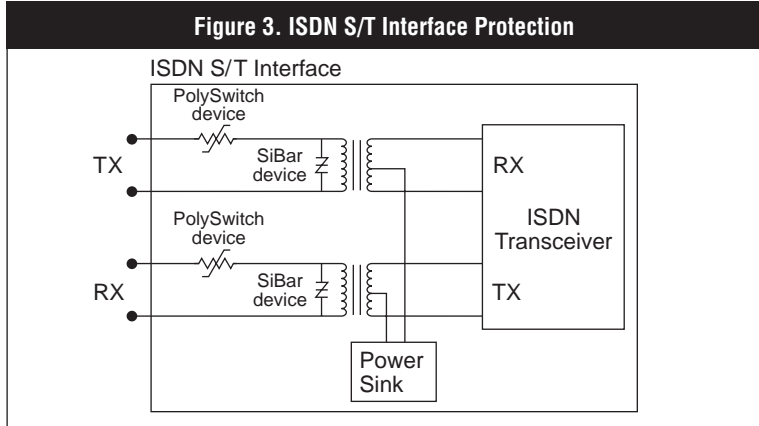
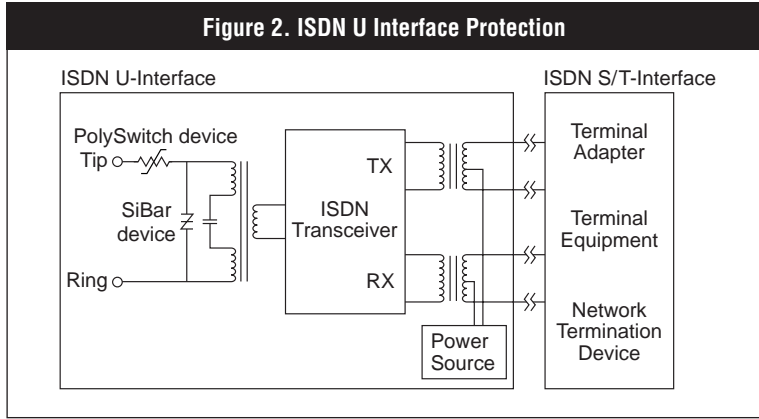
Signaling levels for ISDN are typically +/- 2.5V; however, sealing currents provided to prevent line corrosion and Maintenance Loop Test (MLT) procedures can develop voltages of 150V<sub>RMS</sub> on the line.

3

Figures 2 and 3 provide circuit protection recommendations for ISDN U- and S/T-interfaces.

### 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 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, TSM600, 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 TVB270SA, TVB270SB, and TVB270SC devices with V<sub>DM</sub> ratings of 270V are applicable for systems with MLT voltages up to 150V. For systems with lower expected voltages, designers should consult Section 4 for lower rated devices.

**Table 1. Recommended Circuit Protection Devices**

Regulatory Standard	PolySwitch Device	SiBar Device
Telcordia GR-1089	TS600-200-RA (SMT)	TVB270SB
	TR600-160-RA (Thru-hole)	
UL1459/UL60950, TIA-968-A, (formerly FCC part 68)	TS600-170 (SMT)	TVB270SA (ungrounded)
	TRF600-150 (Thru-hole)	TVB270SB (grounded)
	TS250-130 (SMT)	TVB270SA
Telcordia GR-1089 Intrabuilding	TSV250-130 (SMT)	
	TR250-145 (Thru-hole)	
	TRF250-180 (Thru-hole)	