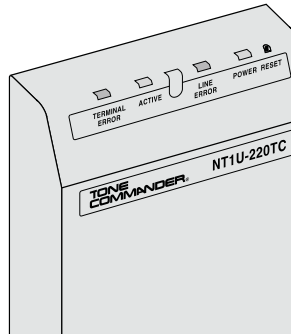


The Tone Commander NT1U-220TC converts an ANSI standard 2B1Q ISDN U-interface from the telco Central Office to an S/T interface to connect to local customer terminal equipment. Both point-to-point and multipoint ISDN terminal equipment configurations are supported.

The NT1U-220TC complies with ANSI T1.601-1992 and T1.605-1991 interface standards, including SC1 and SC2 subchannels, and is compatible with National-1 and National-2 ISDN standards. In addition, it may be used as a drop-in replacement for the AT&T NT1U-220, and is compatible with the Tone Commander NT1-220 Rack and the AT&T NT1M-200 rack.



**Specifications**

**NT1U-220TC**

Operating Voltage	34 – 56.5 VDC
Power Consumption	625 mW typical
Physical Dimensions	6.8" H x 4.4" W x 1.1" D
Weight	0.7 lb.
Operating Temperature	0° – 50° C (32° – 122° F)
Humidity	5% to 95%, non-condensing

**Optional Desktop Power Supply (P/N 901034)**

Power Requirements	120 VAC, 60 Hz, 15 W
Power Output	0.6 A @42 VDC min.
Short Circuit Protection	self-resetting
Physical Dimensions	2.2" H x 2.6" W x 3.3" D
Weight	2.0 lbs.



**Important Safety Instructions**

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone wires.
- When powering the NT1 through the Power connector, use only the Tone Commander Desktop Power Supply (P/N 901034-01).
- Do not mount the NT1U-220TC within 12" of a heat source.

**FCC Requirements**

The Tone Commander NT1U-220TC has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guaranty that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Where it can be done safely, re-orient the receiving television or radio antenna.
- To the extent possible, increase the separation between the telephone equipment and the television, radio, or other equipment.
- If your telephone equipment runs on AC power, plug your product into an AC outlet that is not on the same circuit as the one used by your radio or television receiver.

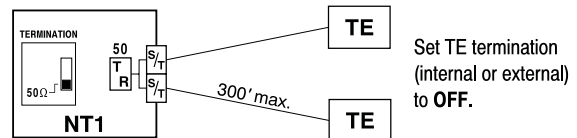
**Termination Switch**

The termination switch is located on the back of the NT1. It must be set prior to mounting the NT1. Available settings are OFF, 100Ω, and 50Ω.

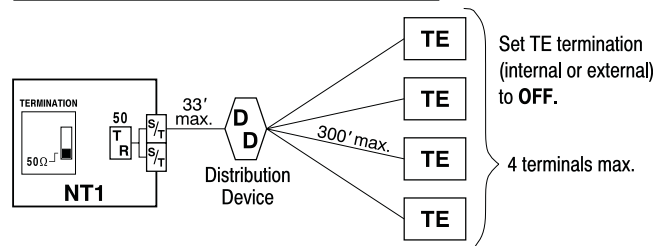
Set the termination switch to match the premises wiring between the NT1 and the terminals. Several typical wiring configurations are shown below, with the appropriate termination switch setting.

Fixed or adaptive timing selection is not required.

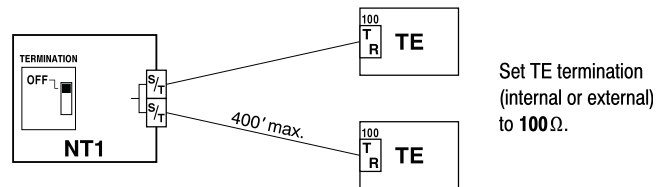
**Basic Multipoint**



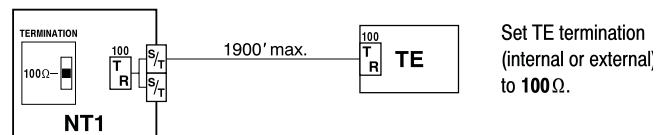
**Basic Multipoint using Distribution Device**



**Short Multipoint**

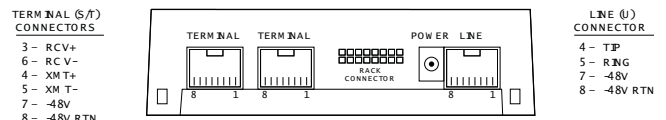


**Extended Point-to-Point**



The use of Category 3 or better unshielded twisted pair cable with T568A or T568B connector wiring is recommended. Distances shown are maximum for 24-gauge wiring cable, and may vary for other cable types.

**Connectors**



Two terminal connectors are provided for convenient terminal installation; both are parallel connected to the S/T interface. Pins 7 and 8 of the Terminal and Line connectors (power pins) also have metallic interconnection.

## Mounting

**Wall Mounting:** Install the supplied mounting screws 5" apart, and leave the heads out from the mounting surface about 1/16". Hang the NT1 on the screws and slide down to secure. If necessary, remove the NT1 and adjust the screws to secure the unit.

**Rack Mounting:** Insert the NT1U-220TC into the appropriate slot in the rack. Any unit may be inserted or removed from an operational rack without affecting the performance of other NT1 units. Power is supplied through the rack.

## Powering Arrangements

The NT1 and terminal equipment may be powered through several different arrangements. In a stand-alone configuration, the optional Tone Commander Desktop Power Supply (P/N 901034) can be used to power both the NT1 and terminal equipment. Plug the power supply barrel connector into the Power jack on the NT1. In a rack configuration, NT1 power is provided by the rack. In either configuration, terminal power can be provided through the NT1 by either of the following methods:

**PS2** – Direct power feed on Terminal jack pin 7 (-) and pin 8 (+), 8 watts maximum per terminal (16 watts total).

**PS1** – Phantom power feed over the transmission pairs, Terminal jack pins 3/6 (+) and pins 4/5 (-), 4 watts maximum (total for all terminals).

Mixed power can be used if maximums are not exceeded.

Alternately, a stand-alone NT1 may be powered from a local power source on the S/T or U interface. The power source must be able of supplying 1.4 watts at 34-56.5 VDC to the NT1 in addition to any other loads. Connect the power source to pin 7(-) and pin 8(+) on the Line or Terminal connectors; metallic interconnection between connectors is provided by the NT1. **CAUTION:** Make sure only one power source is connected to either the S/T or U interface and do not use the Desktop Power Supply or rack power; damage to equipment may result.

## Installation and Troubleshooting

Connect the network U interface from the telco to the Line jack on the NT1 using the supplied modular cord. Connect terminals to either Terminal jack using four pair unshielded twisted pair (UTP) cable, Category 3 or better, with T568A or T568B wiring.

The NT1U-220TC performs a diagnostic self test at power-up or when the reset button is pushed. All four status indicators will light for one second during the test.

Wiring connections to the terminal equipment can be verified before the network line is connected. Connect the terminal equipment to one of the Terminal (S/T) jacks on the NT1 and power-up the equipment. As soon as the terminal equipment attempts to activate, the Line Error LED will flash. After 20 seconds, the NT1 will activate the terminal equipment and the Terminal Error LED will also flash. Connect only one terminal device at a time; repeat the test for each terminal device.

The network line can be verified with or without connecting terminal equipment. Connect the network U interface to the Line jack on the NT1. Initially, only the Power LED will light. After the NT1 synchronizes with the network, the Terminal Error LED will light if no terminal is connected; otherwise, the Active LED will light. Be patient; in some instances, the network may take up to 3 minutes to synchronize with the NT1.

DC Sealing current is applied by the telco to prevent oxidized junctions on the network line. Sealing current is usually present, *but not required* for NT1 operation. The NT1U-220TC will display sealing current status when both the network line and at least one terminal are connected. Lack of sealing current does not conclusively indicate a bad line connection, since sealing current is not always provided by the network.

Incorrect termination on the S/T (terminal) interface is a common cause of unreliable terminal operation. Symptoms include random data errors, intermittent or steady Terminal Error indication, or complete terminal malfunction. Network line synchronization is not affected. Refer to the wiring configuration diagrams in the Termination Switch section for the appropriate termination setting.

To fully operate with the network, the terminal equipment must also be correctly programmed with required operating parameters (such as SPID, directory number, etc.) that are provided by your telco. Consult your terminal equipment documentation for programming instructions.

## Reset Button

Press the Reset button (located next to the Power indicator) to reset the NT1 and force network and terminal resynchronization. **CAUTION:** Pressing the Reset button during normal operation will temporarily disrupt communication services and will disconnect a call in progress.

## Status Indicators

The operating state of the NT1U-220TC is displayed on four status indicator LEDs.

TERMINAL ERROR	ACTIVE	LINE ERROR	POWER	
				No input power
				Power-up self test (1 sec.)
				Self test error
				Input power reversed or too low
				Line error w/o sealing current
				Line error with sealing current
				Terminal error/no terminal
				Normal, line and terminal active
				Line and terminal active, network not Layer 2 ready
				NT1 Maintenance Mode
				Loss of signal w/o terminal present
				Terminal active only (no U) w/o sealing current
				Terminal active only (no U) with sealing current

Off   On   Flash

## Tone Commander Product Warranty

For a period of one year from date of dealer purchase, but not to exceed 16 months from date of manufacture, Tone Commander Systems, Inc. (Tone Commander) warrants its products to be free from defects in material and workmanship under conditions of normal use and service. Tone Commander shall, at its option, repair or replace any defective product which, in its opinion, has not been misused, damaged, or improperly installed.

Repair or replacement under this warranty will be performed at Tone Commander's factory. Authorization must be obtained from Tone Commander prior to returning a product for repair. Freight must be prepaid for all units returned to Tone Commander. Units repaired under warranty will be return shipped UPS Brown Label (or equivalent), freight prepaid by Tone Commander.

Products which are older than the warranty period, but less than 7 years old, or still manufactured by Tone Commander, may be repaired at the factory for a flat rate charge. Repaired out-of-warranty units are warranted for 90 days from the date of repair.

The repair or replacement of a product under this warranty represents the entire obligation of Tone Commander; Tone Commander shall not be liable for any special or consequential damages resulting from or caused by any defect, failure, incapacity or malfunction of any of its products.

*The foregoing express warranty is in lieu of all other warranties, express or implied, including but not limited to any implied warranty of merchantability, fitness, or adequacy for any purpose or use, quality, productiveness or capacity; Tone Commander, to the extent permitted by law, hereby disclaims all such other warranties.*

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