

Getting Started

This document outlines the specifications for Cleo customers requiring a Strem digital connection between either a Private Branch Exchange (PBX) or Central Office (CO), and the Strem voice/fax hardware.

Digital Telephony Background and Definitions

The increasing change from analog to digital telephony is prompted by the development of T1/E1 and ISDN technologies, which are all formats for transmitting digital signals. T1 is the standard in the US, Canada, Japan, and Hong Kong, while E1 is used in Europe, Latin America, and most of Asia. T1, E1, and ISDN Primary Rate Interface are high capacity communications links. The ISDN Basic Rate Interface is a low capacity communications link.

T1 - T1 lines transmit digital voice, data, and video signals at the rate of 1.544 Mb/s. T1 is a digital transmission standard in North America, Japan and Hong Kong. T1 transmissions use 24, 64-Kb/s 8-bit bearer channels and one 8 Kb/s data channel ($24 \times 64 \text{ Kb/s} + 8 \text{ Kb/s} = 1.544 \text{ Mb/s}$). Data sent over a T1 line is packaged according to a set of protocols. These protocols are generally grouped into bit-oriented protocols and message-based protocols. Although T1 technically only refers to the type of line the data travels on, it is commonly used to refer to bit-oriented protocols that travel on T1 lines. ISDN signaling is a message-based protocol that travels in T1 (or E1) lines.

T1 ISDN - ISDN stands for Integrated Services Digital Network, which is a set of international standards for digital transmission of voice, data and signaling information. There are two flavors of ISDN: Primary rate (PRI) and basic rate (BRI). PRI is a message-based protocol that travels on T1 or E1 lines.

T1 ISDN PRI protocols place all signaling data on one of the 24 channels and the remaining 23 channels carry data such as voice or video. The entire 24 channels form a packet of information, with the first channel containing addressing information and instructions on how to re-assemble the data at the destination. This configuration is referred to as 23B+ D, where B channels carry data and the D channel carries signaling information.

Since ISDN signals use a full 64 Kb/s channel for signaling, they support applications with potentially high bandwidths. Also, ISDN protocols allow for more flexibility in how voice data is packaged than T1 bit-oriented protocols.

Should still mention E1 since it is mentioned above – maybe something like E1 lines can be supported under special arrangement.

Strem Digital Interface

For digital connections, Strem contains a Network Interface Card (NIC) which serves as the interface between the T1/ISDN line and the Strem server. Strem also contains Dialogic Brooktrout boards which provide the necessary voice and fax resources that utilize the T1/ISDN connection. These cards are available with 2, 4, 8, 12, 16, or 24 channels per board, and communicate with the T1/ISDN NIC across a digital telephony bus. Multiple boards can be used to establish the number of channels required. The physical connection among the T1 /ISDN NIC and Voice/Fax boards is a flat ribbon cable with connectors or "drops" to connect the boards.

The latest versions of the Strem hardware contain both the digital interface and the voice/fax resources on a single card. A single Strem server may contain multiple T1/ISDN NIC boards to accommodate higher density applications.

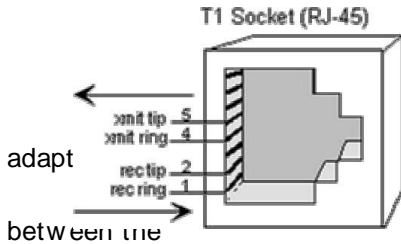
T1 Digital Signaling

When ordering T1 service from your CO or setting up a PBX the following information is recommended:

T1 Service Type	Robbed-bit, four-wire. The type of T1 line that <i>must</i> be supplied is a robbed-bit T1 line , which also may be described as an A/B signaling T1 line or an E&M tie trunk . This type of signaling is in-band , meaning the signaling info is carried on the same channel as the traffic. The physical connection <i>must</i> be a 4-wire connection; no other type of physical connection is supported by the Stream T1 NIC.
Signal Protocol:	E&M Wink (strongly recommended) or E&M Immediate. The T1 NIC needs the signal protocol to be consistent across all T1 channels, in both directions. When we at Stream say E&M , we mean that the signaling bits do whatever the A-bit does; your Telco representative should know what that means. <i>Important note:</i> T1 'Ground-Start' signaling is not supported by the Stream T1 NIC. Additional info on signal regeneration, and CSUs: The distance between the last signal regeneration point on the T1 circuit and its termination point (connector on the T1 NIC) determines whether you must connect the T1 NIC to a CSU (Channel Service Unit) or directly to a T1 circuit. When we say "distance", we mean <i>cable length</i> , not the straight-shot distance from the last point of signal regeneration to the T1
	NIC. The T1 NIC is <i>not approved</i> as a CSU. If the last point of signal regeneration on the T1 circuit is less than 500 feet from the T1 NIC, you do not need to connect the T1 NIC to a CSU. If the distance from the T1 NIC to the last point of signal regeneration exceeds 500 feet, you must connect the T1 NIC to a CSU and the CSU to the T1 circuit. See the section " Do I Need a CSU " for further details.
Line Coding:	B8ZS (Binary 8 Zero Substitution) (recommended) or AMI (Alternate Mark Inversion)
Frame Mode:	Extended Super Frame (recommended) or Super Frame(D4)
Channels:	1-24
Dial Tone:	Optional
CSU:	Not on-board (see Do I Need a CSU?)
DNIS Digits:	DTMF (recommended) or Pulse
SOC:	6.0F
FIC:	04DU9-BN 1.544Mbps SF
	04DU9-DN 1.544Mbps SF+ B8ZS
	04DU9-1KN 1.544Mbps ESF
	04DU9-1SN 1.544Mbps ESF+B8ZS
FCC Registration Number:	EAGUSA-24598-CN-N

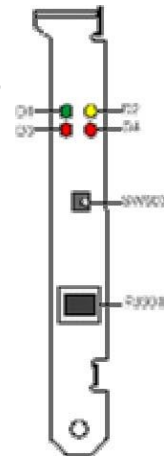
T1 NIC Connector

Pins 1, 3, 9, and 11 of the DB-15 connector (J301) and pins 1, 2, 4, and 5 on the RJ-45 T1 socket provide T1 data paths to and from the T1 NIC.



straight-through. That is, DB-15 pins and 1, respectively.

The pinouts of the DB-15 plug and the RJ-45 socket on the cable same as J301 and the RJ-45 T1 socket, respectively. Connection adapter's DB-15 pins and its RJ-45 pins is

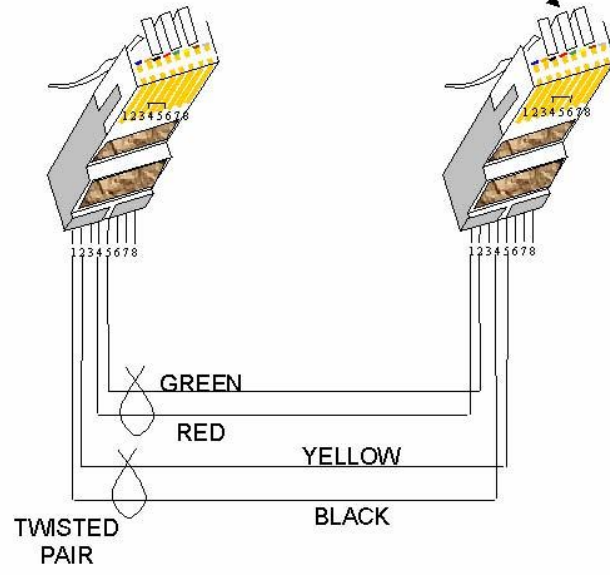


RJ-45 Pin Tip & Ring

- Transmit Tip 5
- Receive Tip 2
- Transmit Ring 4
- Receive Ring 1

The following crossover cable wiring diagram is provided for installations that require a crossover connection between the Stream hardware and the customer's switch.

LATCH FACING AWAY FROM YOU,
PINS UPPERMOST



Stream Telephony Specifications for Digital Connections

When ordering PRI-T1 service from your CO or setting up a PBX the information in the table below is recommended. If the total number of digital channels on the Voice/Fax boards behind your PRI interface board will not allow for all 23 B-channels to be utilized (for instance, if you're using your PRI board with one 16-channel voice/fax digital board), you need to communicate to your Telco provider which B-channels you'll be using. That way, your Telco won't direct traffic down B-channels which aren't mapped to an existing Stream channel. This is typically called a *partial PRI line*.

Signal Protocol (aka trunk type):	Common Channel Switching
Frame Mode:	Extended Super Frame
Line Coding:	B8ZS (recommended) or AMI
Clock Master:	Network/Telco master (<i>network/Telco master is required. The Stream T1 NIC is not designed to provide a sufficient clocking signal</i>)
Number of Channels:	24 (23 "B" channels plus one "D" channel, commonly written "23B+D")
B Channel Provisioning:	Circuit-Switched Voice & Data
B Channel Service:	Voice ; as fax is considered voice, the line would be configured as though voice calls were being placed over it
D Channel Service:	Signaling only with the D-channel on channel 24 of the T1-PRI line
Packet Handlers:	<i>No</i> packet handlers other than the D-channel
Channel Service:	64Kbps clear channel service end-to-end for every call
Called Party Number:	This is what the ISDN world calls 'DID' or 'DNIS'. Normally the last 4 digits of the number dialed; required for inbound routing. Please confirm with your Telco service provider the number of CPN digits they will be providing to you on inbound calls. If you were to only order 4 digit DNIS, the fax number format in the Global Address Book would be xxxx , and the maximum number of users would be limited to 10,000. This can lead to confusion about the exact fax area code and prefix. Stream will attempt to normalize this fax phone number xxxx into aaa-ppp-xxxx , where aaa is the area code, and ppp is the prefix. The
	aaa area code and ppp prefix would have to be the same for all users. Some telephone service providers may change the prefix. This could possibly lead to fax numbers with duplicate xxxx values. Stream cannot resolve this problem of duplicate numbers. In order to provide for maximum flexibility and future expansion, it is highly recommend that you order 10 digit DNIS from your supplier. This will allow using fax numbers in the form xxx-xxxxxxx in the Global Address Book. This has several benefits. The first benefit is that users can use the address book to determine their exact fax phone number including area code and prefix. The second benefit is that users may have different area codes and different prefixes. The last benefit is that this will allow for up to 10,000,000,000 users.

Cables

The cable between the PBX or CO and the Stream T1 interface should always be ISTP (Individually Shielded Twisted Pair). Do not use unshielded cables (UTP) such as CAT-5, Unshielded cables, while it may work, can produce cross talk or other problems either immediately or in the future if there are changes to the environment that may affect the cable.

Do I Need a CSU?

The short answer to this question is, "Unless you're connected to a PBX, you need a CSU." However, in many cases a CSU may not be strictly necessary. Consider the following points when making a decision about a particular installation:

- The primary factor driving the need for a CSU is the loop length, or the distance from the network interface to the source of the T-1 signal, which can be a PBX, a central office switch, or a repeater. If that distance is more than about 500 feet, a CSU may be required in order to maintain a clean signal. This rule is not as straightforward as it sounds, however, because it is often difficult to determine loop length. You can't simply measure "as the crow flies," because the wiring may take a very roundabout path from point A to point B.
- Another factor to consider is that you may have a hard time getting help from your carrier unless a CSU is in place. If you call to report a problem and you're not using a CSU, oftentimes the first thing you'll hear is to install one and see if the problem goes away. If the problem remains after the CSU is installed, you will at least have a device that can generate some data to help determine the nature of the problem.

So, there are a number of situations where you can get away with not having a CSU. Like a filtered and surge protected power strip. However, a CSU provides relatively inexpensive insurance against a variety of problems when the quality of your T-1 trunk is unknown, which is most often the case unless you're directly connected to a PBX in the same room.



Cleo Communications
p 800.325.7732 | f 815.654.8294 | streaminsales@cleo.com | www.cleo.com