Tenor BX
VoIP MultiPath/Gateway Switch

Product Guide
480-0073-00-11

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Chapter 1: Overview

This section gives you a general overview of the *Tenor BX* including feature descriptions and capabilities. Specifically, the following topics are covered:

What is the *Tenor BX?*

The *Tenor BX* is a high-density VoIP (Voice over Internet Protocol) H.323/SIP switch that converts voice, fax, and modem data on digital circuit switched trunks, and transmits it over the IP network. The Tenor BX is suitable for small to medium enterprises and service provider applications by supporting 2, 4 or 8 BRI (Basic Rate Interfaces (2B+D channel) ports with S/T interface, supporting up to 16 voice channels.

Figure 1-1 Tenor BX VoIP Switch

Depending on the port configuration, the *Tenor BX* is available in two configuration types:

- *MultiPath Switch* (intended for PBX, PSTN and VoIP connectivity)
- *Gateway* (intended for VoIP and PSTN trunk port or PBX connectivity)

The *MultiPath Switch* is mainly intended for symmetrical multipath applications. The number of VoIP channels is equal to half the number of PSTN channels. The *MultiPath Switch* configuration enables connectivity between the customer equipment (i.e., PBX), PSTN and VoIP Network. The *Gateway* is mainly intended for trunking applications interfacing between the VoIP network and the circuit switched network (PSTN). The number of VoIP channels equals the number of PSTN channels.

Table 1-1 *Tenor BX* MultiPath Switch configurations

Tenor BX MultiPath/Gateway Configurations	RJ-45 Ports for BRI Connection	BRI Channels Supported	VoIP Channels Supported
BX204	2	4	4 VoIP connections
BX408	4	8	8 VoIP connections
BX816	8	16	16 VoIP connections

Whichever configuration you choose, MultiPath or Gateway, the high performance unit provides one 10/100 BaseT connection and one RS-232 serial console port connection. The unit also incorpo-

rates an intelligent call routing engine which regulates system resources and configuration while coordinating all voice traffic activity in the unit.

Features

The *Tenor BX*'s specific features are explained below.

The gateway converts circuit switched calls to VoIP calls, the gatekeeper performs IP call routing functions, and the border element distributes the call routing directories throughout the network.

Complete Solution in one design

The *Tenor BX* integrates a gateway, gatekeeper, border element, intelligent call routing, and supports H.323/SIP, and QoS all in one solution, which is suitable for small to medium enterprises and service provider applications.

The unit's simple plug and play embedded system architecture brings VoIP technology to your network without changing your existing telephony infrastructure. Your network stays as is, and the call type is transparent to the user. This technology boasts superior voice quality without compromising reliability.

Multipath architecture

With its MultiPath architecture, the *Tenor BX* can intelligently route calls between the PBX, the PSTN, and the IP network to achieve the best combination of cost and quality. It can also route calls over IP to reduce costs, and then transparently "hop off" to the PSTN, to reach off-net locations.

State of the art Management system

The *Tenor BX* is managed by the *Tenor Configuration Manager* and *Tenor Monitor*. Through the *Configuration Manager*, you can configure all options, such as signaling data, trunk groups, dial plans, and call routing numbers. An easy-to-use Java-based installation process enables you to an install the manager and start configuring within minutes. Through the *Tenor Monitor*, you can monitor the health of the system, including alarms, call detail records, etc. Both the *Configuration Manager* and *Tenor Monitor* provide comprehensive on-line help systems that are available at your fingertips.

In addition, you can configure the unit through the *Command Line Interface (CLI*). Through this simple telnet session, you can access all configuration options, including an online help system, built into the CLI, which provides help for all features and functions. Just type *help* with the command name at any prompt, and data about that field will be displayed.

Unique Design

Tenor BX packs powerful VoIP features into one compact unit. The system's embedded design enables you to configure the unit directly without depending on another operating system; it can be either placed on a table or mounted in a 19" rack.

With its MultiPath technology, the Tenor can be installed without upgrades to the existing voice or data network. Tenor connects to the data network through a 10/100 Ethernet interface, and to the enterprise and public voice network through BRI interfaces. In addition, with a wide range of con-

figurations available, it offers the flexibility for you to select a configuration that best matches your needs.

SelectNet™ Technology Safety Net

Quality of service is virtually guaranteed. *Tenor BX* 's built-in patented SelectNet™ Technology provides a "safety net," which virtually guarantees that each call going VoIP will not only be routed successfully, but will deliver high voice quality.

SelectNet monitors the IP network performance for VoIP calls. If the performance characteristics become unacceptable—according to the delay, jitter, and packet loss specifications you configure—the *Tenor BX* will switch the call to the PSTN automatically and transparently. The Tenor continuously monitors your data network for jitter, latency and packet loss, and transparently switches customer calls to the PSTN when required.

Easy Connect to Console

Plugging a serial cable between the unit's RS-232 port and your PC's console port, will allow local unit management. Through the console connection, you are able to assign an IP address. In addition, if you are directly connected to the unit, you are able to configure the unit via *Command Line Interface (CLI).*

Powerful System Monitoring

There are many different ways to monitor the health of the unit, including LEDs and alarms. LEDs appear on the front of the unit. The LEDs light up according to operations and alarms the system is experiencing.

Through the *Tenor Monitor* and the *Command Line Interface (CLI)* you can view a list of active system alarms, as well as view an alarm history. Each alarm indicates the unit's operational status.

PacketSaver™ reduces bandwidth consumption

PacketSaver packet multiplexing technology reduces the amount of IP bandwidth required to support multiple calls flowing between two endpoints. PacketSaver minimizes bandwidth usage by aggregating samples from multiple VoIP conversations and packing them into a larger IP packet with a single IP header. The process removes the need to send a bulky IP header with individual voice packets. As a result, it eliminates the transmission of redundant information.

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Conventional VoIP Transmission Sends Many Redundant Packet Headers

Tenor **Tenor**

Tenor using PacketSaver to Minimize Bandwidth Usage

Virtual Tie Line

Tenor BX can emulate a tie trunk. It provides all of the functionality of a tie trunk, including the considerable cost savings, but eliminates the need for a PBX trunk to be configured, or marked as a tie trunk. A traditional tie trunk is a PBX-configured direct connection between two PBXs in separate locations. The tie trunk bypasses the PSTN network.

Your PBX does not need any additional configuration. *Tenor BX* treats all the trunks the same without compromising voice quality.

SNMP Support

The *Tenor BX* supports Simple Network Management Protocol (SNMP), the standard protocol used to exchange network information between different types of networks. The *Tenor BX* unit acts as an SNMP agent—using HP® Openview™—to receive commands and issue responses to the Network Manager. The Network Manager will then be able to perform certain functions, such as receiving traps from the *Tenor BX*.

Call Detail Recording

Through the Call Detail Record (CDR) feature, the *Tenor BX* generates a call record at the completion of each call, typically for accounting purposes. A CDR is a string of data that contains call information such as call date and time, call duration, calling party, and called party. *Tenor BX* may store Call Detail Records locally or they can be sent to a CDR server within the network. The CDR contains sufficient information to capture billing data, which can be used to create billing reports using third party billing software.

IVR/RADIUS Support

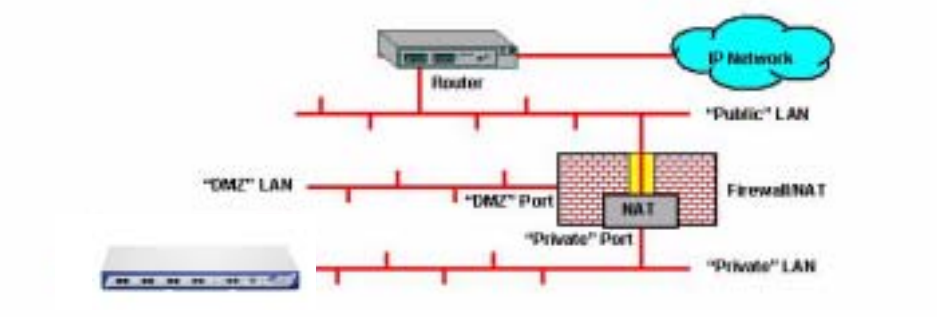
Interactive Voice Response (IVR) is a feature of the *Tenor BX* that enables you to offer services, such as Pre-paid calling cards and Post-paid accounts, to your customers.

The Tenor uses the RADIUS (Remote Authentication Dial-In User Service), for authenticating and authorizing user access to the VoIP network, including ANI Authentication (Types 1 and 2). The RADIUS is a standard protocol which provides a series of standardized message formats for transmitting and receiving dialed information, account data and authorization codes between the network access gateway and the billing server.

NAT*Access*™

NAT*Access* is an intelligent network address translation technology. It enables VoIP networks with multiple H.323 endpoints to operate behind firewalls equipped with H.323 Network Address Translation (NAT); this provides maximum network security. NAT*Access* simplifies deployment by eliminating the need to place the Tenor on a public IP network. Using NAT*Access* provides easy, secure expansion between multiple VoIP sites. In addition, NAT technology in the Tenor permits the use of private subnets at the same time; in-house calls will never go over the public internet.

Figure 1-2 Tenor with NAT*Access* Deployment



Routing Table Options

There are four types of routing databases you can configure: Bypass Directory Numbers (BPN), Hunt Local Directory Numbers (Hunt LDN), Hop-Off Directory Numbers (HDN) and Static Routes.

Bypass Directory Numbers. Bypass Directory Numbers (BDN) are telephone numbers that are automatically routed directly from a line circuit to a trunk circuit (PSTN); they will not be routed VoIP. Some examples of bypass numbers include toll-free calls, emergency calls (i.e., 911), or high security calls.

Hunt Local Directory Numbers. A Hunt Local Directory Number (Hunt LDN) is a phone number reachable through local Line Circuits.

Hop-Off Directory Number. A Hop-off PBX call travels over IP, and then "hops" off into the public network (PSTN) on the distant side to reduce or eliminate public toll charges (also known as Leaky Area Map). A Hop-Off Directory Number is routed over the IP to another Tenor location and then out to the Trunk circuit, possibly to the PSTN as a local call.

Static Routes. Static Routes are used between networks and other H.323 devices that are not registered to the network through the Border Element (such as non-Quintum gateways). A static route associates endpoints (as represented by their IP address (as represented by their IP address) with Directory Number patterns.

Call Management Features

Dynamic Call Routing. *Tenor BX*'s intelligent call routing capabilities are state-of-the-art. The unit automatically detects and supports three call types: voice, fax, and modem.

Tenor BX will first identify the call origination site—trunk circuit, line circuit, or IP routing group—and then route the call according to any parameters you have configured in the routing database. Each call may be routed via circuit switched path between any two circuit groups, or compressed and transported via VoIP when connecting to an IP routing group. Trunk circuits are those that typically connect to another circuit switched network such as the PSTN. Line circuits typically connect to a termination device on the user premises, such as a PBX.

Public/Private Dial Plan Support. The *Tenor BX* supports public and private dial plans. A public dial plan includes numbers which conform to the international dialing plan (E.164) of a country code + city/area code + local number. For a public dial plan, you can define the numbering plan structure for the *Tenor BX* to use for outgoing calls.

A private dial plan does not conform to a public dialing plan (i.e., 3 digit dialing plan); through the *Tenor BX* you are able to configure the unique pattern/dialing plan structure, including number length.

You are able to configure which dial plan to use for incoming and outgoing calls, including whether other options such as hop-off calls, will use a public or private dial plan.

User Programmable Dial Plan Support. The User Programmable Dial Plan Support (UPDP) enables the Tenor to identify a completely customizable set of digit sequences, such as Local, National, International or Private Numbers.

PassThrough support for certain call types. Certain call types can be directly routed to a trunk circuit, without going IP. There are several routing tables you can configure via the *Configuration Manager* to adjust how the *Tenor BX* unit routes these types of "pass through" numbers. For example, you may want to configure 911 as a "bypass number", which means that all 911 calls coming into *Tenor BX* from the line circuit will be routed directly to a Trunk circuit presumably connected to a PSTN. Bypass calls are never routed over IP.

Hop-off PBX Calls. Hop-off numbers are phone number patterns for calls to be routed out through trunks. They are entered in a Hop-off Number Directory and associated with trunks where matching calls should be sent.

Tenor BX supports those hop-off PBX calls where the destination *Tenor BX* is programmed to route the call to the PSTN via Trunk Circuit. (A hop-off PBX call is a toll call which hops through a private network to reduce or eliminate the toll charge.) The destination *Tenor BX* unit is configured with the phone numbers to be "supported" for this feature.

H.323 Gatekeeper Services

The *Tenor BX* unit's built-in H.323 gatekeeper performs IP call routing functions, such as call control and administrative services to another *Tenor BX* unit, or another H.323 endpoint. The gatekeeper's functionality complies with the H.323 industry specifications for voice control and management.

Gatekeeper.A Gatekeeper in an H.323 network provides call control services and other services to H.323 endpoints (i.e., gateways, terminals, and MCUs). The *Tenor BX* has a built-in H.323 gatekeeper which complies to the H.323 industry specifications for voice control and management. The gatekeeper performs call routing functions for calls entering and exiting a site.

The Gatekeeper performs IP call routing functions, such as Call Control Signaling and Call Authorization for Gateways, IP phones, and H.323 terminals. The Gatekeeper communicates with other Gatekeepers through a Border Element. When using a group of *Tenor BX* units, you can assign one unit as the Gatekeeper for the network. We recommend you configure each as its own gatekeeper.

Tenor BX supports gatekeeper to gatekeeper communication using the standard LRQ (Location Request)/LCF (Location Confirm) messaging scheme.

Zone Management. A zone is a group of H.323 defined endpoints controlled by a Gatekeeper. Endpoints can be gateways (i.e., *Tenor BX*), terminals, and/or multipoint conferencing units (MCUs). Endpoints establish control channels with a gatekeeper for registration, admission, and security. Call routing information about the endpoint is sent to the gatekeeper, including: IP address, unit type (gateway, terminal, or MCU) and routing information (such as phone numbers, number patterns, etc.).

A collection of zones is an administrative domain. An administrative domain provides call routing services for its zones through gatekeeper to gatekeeper messages or gatekeeper to border element messages (see below for more information).

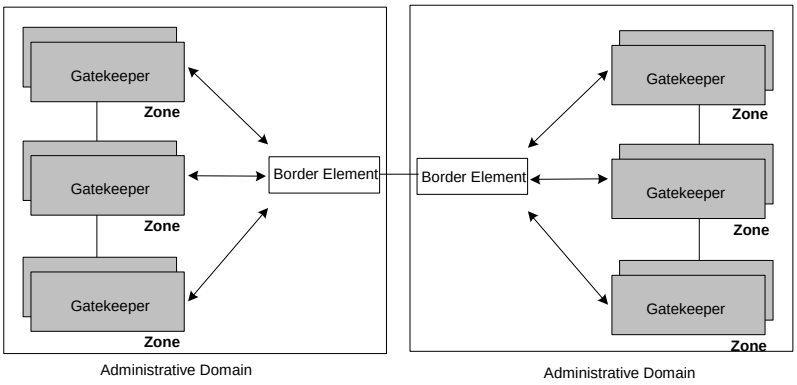
Call Registration. When registration from an H.323 endpoint is complete and a call is originated, the call request is sent to the gatekeeper. The call request provides the Gatekeeper with the dialed number and requests the routing information. The gatekeeper confirms the dialed number and supplies the endpoint with the destination IP address. For example, a *Tenor BX*'s gatekeeper will act as the gatekeeper for that zone and all of the other endpoints will register with it.

Border Element. The *Tenor BX*'s gatekeeper uses a border element to gain access to the routing database of the administrative domain for the purpose of call completion or any other services that involve communications with other endpoints out of the administrative domain. The border element functionality is built into the *Tenor BX* unit, along with the gateway and gatekeeper.

The primary function of the border element is to collect, manage, and distribute call routing information. A gatekeeper will establish a service relationship with a border element; the gatekeeper provides its zones capabilities and the border element shares call routing capabilities of other zones in the administrative domain. Through the border element, gatekeepers from multiple zones will be able to communicate.

A border element also establishes relationships with other border elements to route between administrative domains. If a gatekeeper cannot resolve an address, it contacts the border element.

In addition, if you are using more than one Tenor unit, you can configure one of the border elements for that zone. The *Tenor BX* unit can use two border elements: primary and secondary. These work together as one entity to provide redundancy and fault tolerance; there are no hierarchal differences.



Call Services

Gatekeepers provide services such as addressing, authorization and authentication of terminals and gateways, bandwidth management, accounting, billing, and charging. Gatekeepers also provide call-routing services. Specifically, the *Tenor BX* Gatekeeper provides the functions which follow:

Address Translation. The gatekeeper translates telephone numbers into IP addresses and vice versa. It performs Alias Address (phone number) to Transport Address (IP address) translation when an endpoint requests service. The Gatekeeper uses a translation table to translate an Alias Address (an address such as an H.323 identifier that a user may not understand) to a transport address. The translation table is updated using Registration messages.

Autodiscovery. The gatekeeper is discovered in one of the following ways: An endpoint sends an IP broadcast called a Gatekeeper Request message (GRQ) message (which includes that correct gatekeeper name) to discover a Gatekeeper OR the endpoint will discover a gatekeeper by its IP address.

Routing. The gatekeeper identifies the IP address of endpoints in its administrative domain. The gatekeeper builds a routing database from information obtained from the border element and also from gateways and H.323 endpoints.

Admissions Control. All H.323 endpoints must register and request permission to enter the gatekeeper's zone; the gatekeeper will confirm or deny access to the network. The gatekeeper authorizes network access and protects the integrity of the network using Admissions Request (ARQ), Admissions Confirmation (ACF) and Admissions Reject (ARJ) messages.

SIP User Agent

SIP (Session Initiation Protocol) is a signaling protocol used to establish a session on an IP network for voice control and management; it is a request-response protocol that closely resembles Hypertext Transfer Protocol (HTTP), which forms the basis of the World Wide Web. SIP re-uses many of the constructs and concepts of Internet protocols such as HTTP and Simple Mail Transfer Protocol (SMTP). The purpose of SIP is only to establish/change/terminate sessions. SIP is not concerned with the content or details of the session.

SIP is Transport layer-independent, which means it can be used with any transport protocol: UDP, TCP, ATM, etc. It is text-based, so it requires no encoding/decoding like H.323. And SIP supports user mobility, using proxies and redirecting requests to your current location.

There are three basic components of SIP:

1. User Agent (Endpoint)
   - client element, initiates calls
   - server element, answers calls
2. Network Server (Proxy Server or Redirect Server)
   - name resolution
   - user location
   - redirect and forking
3. Registrar
   - Stores registration information in a location service using a non-SIP protocol.

Chapter 2: Hardware Components

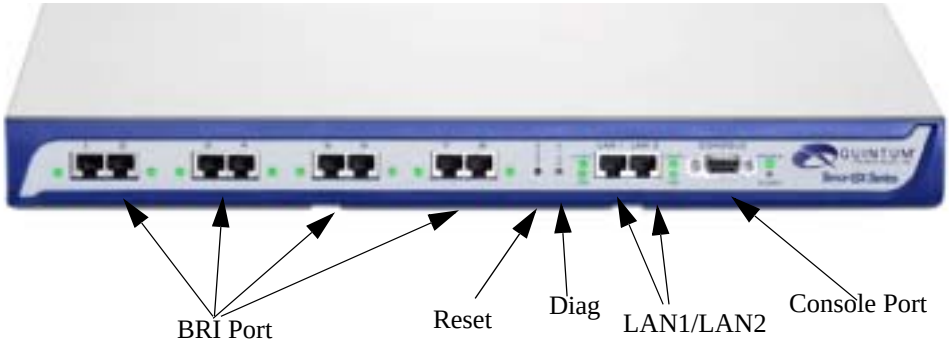
This chapter tells you what is contained in your hardware package. A description of each component is also included. Specifically, the following topics are covered:

The *Tenor BX* is a stackable/rack mountable device which provides PSTN and PBX connections (through BRI lines), as well as connections to the Ethernet LAN and a PC. The unit provides eight RJ-45 BRI S/T ports in which you can connect to a PBX or the PSTN.

The unit's front panel includes connection jacks, LEDs, a reset button, and a diagnostics option; the back panel includes a power cord connection site, an on/off switch, and a label.

Front Panel Connections and Reset Options

Figure 2-1 *Tenor BX* Front Panel



- **BRI Ports 1-8.** One RJ-45 jack for each port supports a connection to a line side (PBX) or other customer equipment via upstream BRI lines, or to the trunk side (PSTN) via downstream BRI lines.

  Each BRI line provides 2 B (Bearer) channels and 1 D (Data) signaling channel. All ports are software configurable as TE or NT.

- **Reset.** Enables you to reset the system.
- **Diag.** Enables you to perform software diagnostic procedures.
- **LAN 1/LAN2. 10/100 Base-T Ethernet ports.** LAN 1 port provides an RJ-45 jack for an individual connection to a 10/100 Ethernet LAN switch or hub via RJ-45 cable; it is individually configured with a unique IP and MAC address. LAN2 Ethernet port is reserved for future use.

Figure 2-2 10/100 BASE-T Ethernet Port Pin Order

Table 2-1 Input/Output 10/100 Ethernet port

Pin #	Signal	Definition	Color
1	TX +	Transmit Data	White w/orange
2	TX -	Transmit Data	Orange
3	RX +	Receive Data	White w/green
4	RSVD	Reserved	Blue
5	RSVD	Reserved	White w/blue
6	RX -	Receive Data	Green
7	RSVD	Reserved	White w/Brown
8	RSVD	Reserved	Brown

- **Console port.** This RS-232 connector is used for connection to a PC's serial port via DB-9 serial cable at 38400 bps 8 N 1, without flow control. The input/output signals are listed in *Table 2-2*.

Figure 2-3 DB-9 Female Connector Pin Order

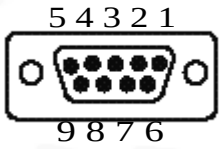


Table 2-2 Serial RS232 DB-9 Connector Pinouts

Pin #	Function	Description
1	DTR	Data Terminal Ready
2	TXD	Transmit Data
3	RXD	Receive Data
4	CD	Carrier Detect
5	GND	Signal Ground
6	N.C.	No Connect
7	N.C.	No Connect
8	N.C.	No Connect
9	N.C.	No Connect

Front Panel LEDs

The LEDs display the health of the system. There are different types of LEDs: network, LAN, Alert and Power. For LED definitions, see *Table 2-3*.

Figure 2-4 Front Panel LEDs

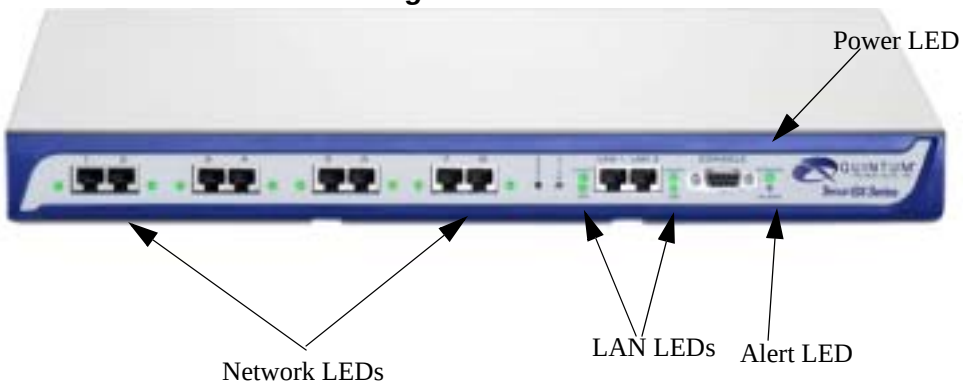
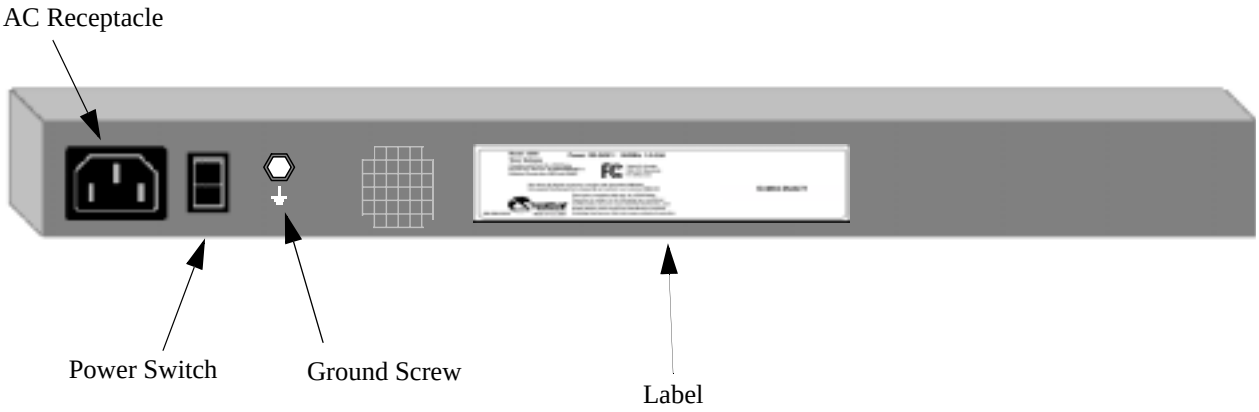


Table 2-3 Front Panel LEDs Definitions

LED	Label	LED Color	Description
Network (PSTN) or PBX	1-8	Flashing Amber	Port is off-line.
		Amber	Receive Path Error Indication. Line is not connected or other receive errors; calls are not going through successfully.
		Amber	Layer 1: up Layer 2: down
		Green	Layer 1 and Layer 2: up
		Off	The port is empty or unconfigured.
LAN1 LAN2 (LAN 2 is reserved for future use)	Link/ACT	Green	On: Link is good. Flashing: Line is working properly and activity is on the line. Off: Link has failed.
	100	Green	On: Activity is being transmitted at 100 Mbps. Off: Activity is being transmitted at 10 Mbps.
Power	Power	Green	On: Indicates power is on. Off: Power is off.
Alert	Alert	Amber	Operational Status. Off: *Tenor BX* is working properly. On: One or more diagnostic tests have failed.

Back Panel



- **AC Receptacle.** Receptacle in which to plug in a power cord; the other end will plug into an AC outlet for power.
- **Power Switch.** Switch to turn power on and off.
- **Ground Screw.** An earth ground screw provided to connect to earth ground using a Ground Safety Cable (if your AC power plug only has two prongs and does not have a third, grounded prong).
- **Label.** A label that displays unit information.

Cables

The cables listed in Table 2-4 are required to connect a *Tenor BX* to various interfaces. Contact Quintum for ordering information, if necessary.

NOTE: A crossover cable is required when connecting to a Line side (PBX, TE device) interface (when supplied by Quintum, this is a purple RJ-45 cable, P/N 303-0021-00). A straight cable is required when connecting to the trunk side (PSTN, NTI) interface. When supplied by Quintum, this is a green RJ-45 cable, P/N 303-5009-00).

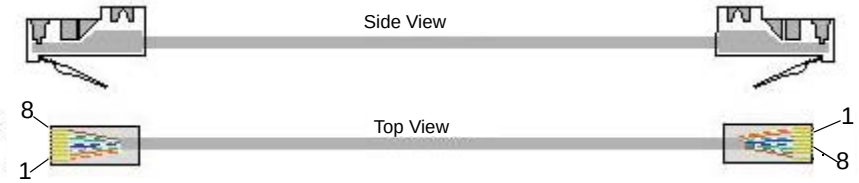
Table 2-4 Cables Supported

Cable	Usage
RJ-45 to RJ-45 Crossover Cable (this cable is purple if provided by Quintum)	BRI connection Line Side (PBX) interface. TE connection.
RJ-45 to RJ-45 Straight Through cable (this cable is green if provided by Quintum)	BRI connection to Trunk Side (PSTN) interface. NT connection.
RJ-45 Ethernet cable (grey or white)	Connection to Ethernet LAN 10/100.
DB-9 Serial RS-232	Connection to PC's asynchronous console port.
Detachable (IEC) AC Power Supply Cord	Connection to AC power jack.

RJ-45 Cables

RJ-45 cable connector pinouts are given in this section to help you identify the proper connector to accommodate your specific networking requirements. The RJ-45 (ISO 8877) connector is the EIA/TIA standard for Unshielded Twisted Pair (UTP) cable; the wiring color codes are UTP Standard Coloring. The pin order is shown in *Figure 2-5*.

Figure 2-5 RJ-45 Pin Order



RJ-45 Ethernet Cable (10/100)

An RJ-45 (10/100BaseT) straight through shielded cable is used to connect *Tenor BX* to an Ethernet LAN. Cable pinouts are listed in *Table 2-5*. Color specifications are applicable to the RJ-45 cable provided.

Figure 2-6 RJ-45 (10/100BT) Connector Pinouts

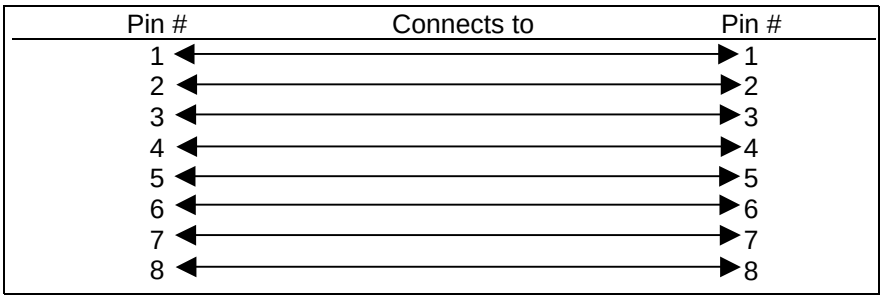


Table 2-5 RJ-45 (10/100BT) Connector Pinouts

Pin #	Signal	Definition	Color
1	TX +	Transmit Data	White w/orange
2	TX -	Transmit Data	Orange
3	RX +	Receive Data	White w/green
4	Unused	Unused	Blue
5	Unused	Unused	White w/blue
6	RX -	Receive Data	Green
7	Unused	Unused	White w/Brown
8	Unused	Unused	Brown

RJ-45 to RJ-45 Straight Cable (BRI WAN to Trunk Side)

An RJ-45 (BRI) straight cable is used to connect *Tenor BX* BRI port to the Trunk Side (PSTN). Cable pinouts are provided below. If this cable is provided by Quintum, the color is green. The color specifications are applicable to the RJ-45 straight cable provided.

Figure 2-7 RJ-45 (BRI) Connector Pinouts

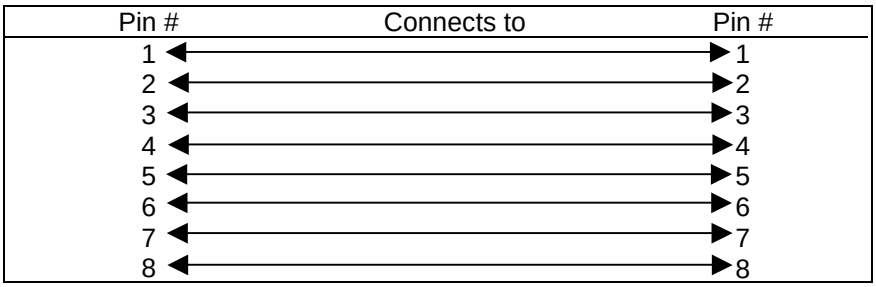


Table 2-6 RJ-45 Connector Pinouts for BRI

Pin #	Signal	Polarity	Color
1	Reserved		White w/green
2	Reserved		Green
3	Transmit	+	White w/orange
4	Receive	+	Blue
5	Receive	-	White w/blue
6	Transmit	-	Orange
7	Reserved		White w/Brown
8	Reserved		Brown

RJ-45 to RJ-45 Crossover Cable (BRI WAN to PBX)

An RJ-45 to RJ-45 (BRI) ISDN crossover cable is used to connect the *Tenor BX* BRI port to the Line Side (PBX). Cable pinouts are provided below. If this cable is provided by Quintum, the color is purple. The color specifications are applicable to the RJ-45 crossover cable provided.

Figure 2-8 RJ-45 Crossover Cable Pinouts

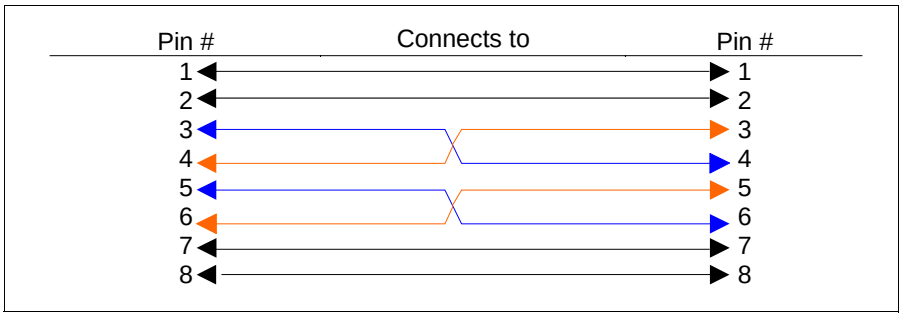


Table 2-7 RJ-45 Connector Pinouts for BRI port

Connector 1 Pin #	Color	Connector 2 Pin #
1	White w/green	1
2	Green	2
3	White w/orange	4
6	Orange	5
4	White w/blue	3
5	Blue	6
7	White w/brown	7
8	Brown	8

DB-9 Serial RS-232 Cable

The Serial RS-232 9-pin cable with a DB-9 male connector (with RS-232 interface) is used to connect the *Tenor BX* to your PC's asynchronous serial port. The pin order for DB-9 male and female connectors are shown in *Figure 2-9* and *Figure 2-10*.

Figure 2-9 DB-9 Male Connector Pin Order

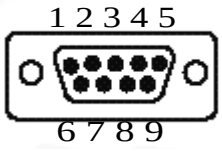


Figure 2-10 DB-9 Female Connector Pin Order

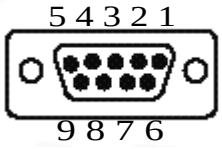


Figure 2-11 DB-9 Connector Pinouts

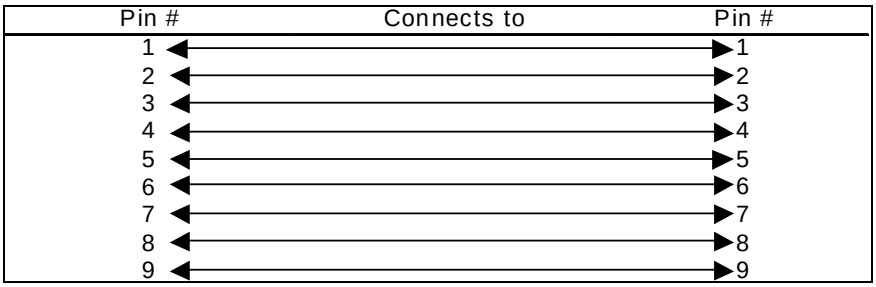


Table 2-8 DB-9 Connector Pinouts

Pin #	Function	Description	Pin #
1	DTR	Data Terminal Ready	1
2	TXD	Transmit Data	2
3	RXD	Receive Data	3
4	CD	Carrier Detect	4
5	GND	Signal Ground	5
6	N.C.	No Connect	6
7	N.C.	No Connect	7
8	N.C.	No Connect	8
9	N.C.	No Connect	9

Specifications

Voice/Fax

Call Routing:	Line Side Interface/Trunk Side Interface
Coding:	A-law, u-law
Voice Algorithms:	G.723, G.723.1A (5.3, 6.3 Kbps), G.726 (16, 24, 32, 40 Kbps), G.729, G.711
Fax Support:	Group III at 2.4, 4.8, 7.2, 9.6, 12, 14.4 Kbps
Automatic Call Detection:	Voice/Modem/Fax

LAN Connection

LAN Support:	10/100 Mbps Ethernet
Connection Type:	Full Duplex/Half Duplex

Physical

Position:	19” (48.7 cm) rack mountable or wall-mountable
Depth:	10 3/4” (27.6 cm)
Width	17 3/8” (44.5 cm)
Height:	1 3/4 ” (4.5 cm)
Weight	7.2 lbs (3.24 kg)

Electrical

Ethernet:	Standard 10/100Base-T RJ-45 interface (IEEE 802.3)
PBX/PSTN	Standard RJ-45
Connectors	8 RJ-45 connectors for BRI connection to the PBX and the digital network
Console Port:	RS-232/DB-9 Female
Power	100-240 VAC, 2-1A, 50-60 Hz

Environmental

Operating Temperature:	40° to 104° F (5° to -40° C)
Operating Humidity:	20% to 80% non-condensing
Operating Altitude:	-200 to 10,000 feet (-60 to 3,000 meters)
Storage Temperature:	14° to 140° F, (-10 to 60°C)

Chapter 3: Installation

This chapter gives you installation instructions, as well as how to position the *Tenor BX* successfully within your network. Specifically, the following topics are covered:

Installation

Before you begin the actual installation, review the pre-installation guidelines which follow and inspect the package contents.

Pre-Installation Guidelines

- Always use an anti-static wrist strap when handling the unit.
- Do not open the unit cover. Inside parts have hazardous voltages and are extremely sensitive to static. If the unit has been opened, your warranty is void.
- Do not connect equipment in wet conditions and keep away from dusty areas.
- The area must not exceed the temperature and humidity guidelines outlined in *Specifications*.
- Avoid exposing the chassis to excessive vibrations.
- Mechanical loading of rack should be considered so that the rack remains stable and unlikely to tip over. Ensure no equipment is put on top of the chassis.

Inspect Package Contents

Before you install the hardware, ensure the following components are included in your shipment:

- *Tenor BX* and Mounting Hardware
- 1 AC Power Cable
- DB-9 RS-232 Serial Cable
- RJ-45 LAN Cable
- Correct quantity of RJ-45 cables associated with your custom configuration
- Product Guide in CD format

If a listed component is not included in your package, contact your customer service representative.

Rack Install

Locate the *Tenor BX* unit within the same area as your PBX, Ethernet hub, switch, router, and/or PSTN patch panel. The chassis is intended to be installed in a 19” rack.

Mounting brackets are attached to the chassis; the rack is not included with your system. Included with the chassis are the screws listed below. The sizes should allow installation in most racks. If your rack does not use the same size screws listed in the table, please consult the instructions you received with the rack.

Required Materials

- 19” rack (optional, not included with system)
- #8 - 32 x 3/8 screws (qty: 2) (included with the system)
- screws as required by your rack manufacturer

Install the chassis in a rack as follows:

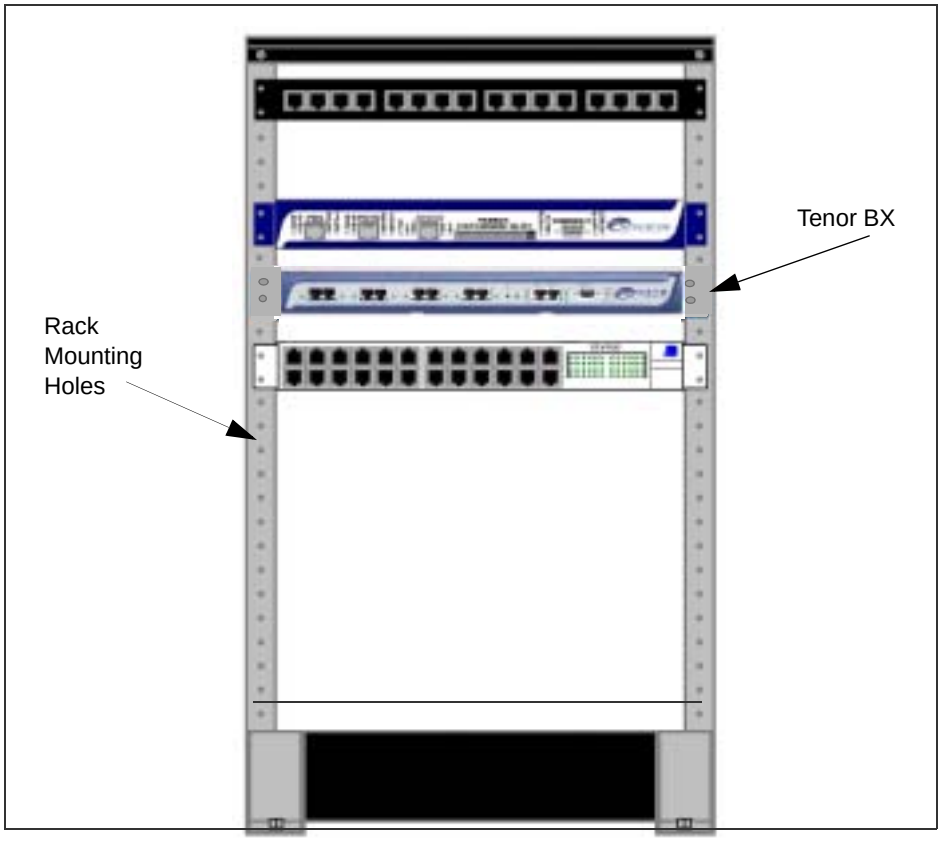
1. Choose a position for the chassis within the rack.

WARNING: If the *Tenor BX* unit is the only equipment installed in the rack, ensure it is level with the rack to avoid the rack from becoming unbalanced. Mount as low as possible to avoid a high center of gravity.

2. Align the unit’s mounting brackets flush with the rack’s mounting holes (see *Figure 3-1*) and follow the vendor specific instructions for rack installation. The screws provided require a Phillips #2 screwdriver.

3. Ensure the chassis is secured firmly to the rack.

Figure 3-1 Rack Installation (Front View)



Wall Mount

There are two mounting brackets available to mount the unit to the wall.

Pre-installation Guidelines

- Ensure the wall is level and stable.
- Do not attach the unit to a temporary wall.
- Ensure the wall mounting area is within cord distance of the power outlet.

Required Materials

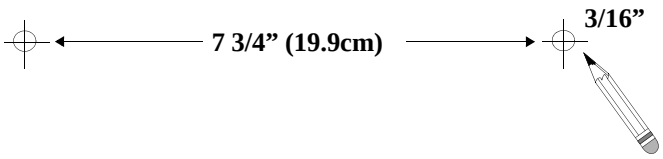
- 2 wall mounting brackets (including 2 screws)
- Drill
- 3/16 drill bit
- Measuring tape or ruler
- Hammer
- Phillips head screwdriver

Attach the unit to the wall as follows:

1. Determine the wall area to mount the unit. With chalk or a soft pencil, mark the install area according to *Figure 3-2*.

NOTE: Ensure the unit is level.

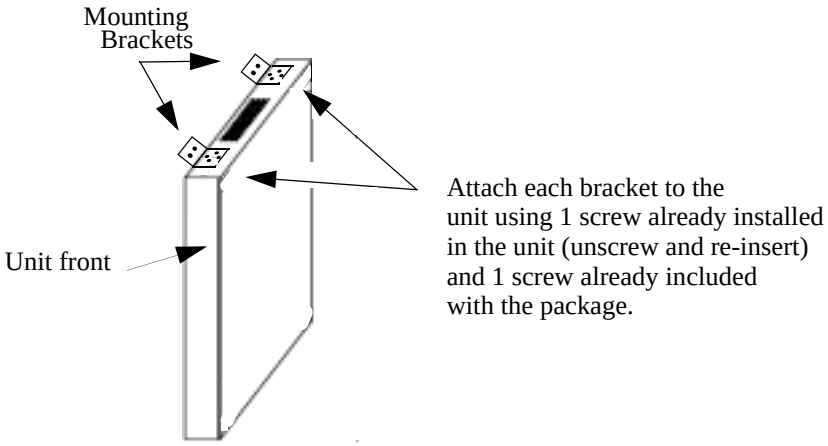
Figure 3-2 Wall Mounting Dimensions



2. Position and attach one mounting bracket to the unit using a screw existing in the system and one screw included with the package. See *Figure 3-3*.

3. Position and attach the other mounting bracket using a screw existing in the system and the remaining screw in the package. See *Figure 3-3*.

Figure 3-3 Wall Mount Installation



Note: Ensure unit is level.

4. Mount the unit to the wall using the four remaining screws included with the system.

5. Ensure the unit is firmly mounted against the wall.

Connect to Line Interface - PBX

NOTE: When the Tenor is software configured as an NT (connecting to a PBX), termination should always be enabled (default). See the *Command Line Interface Guide* for configuration information.

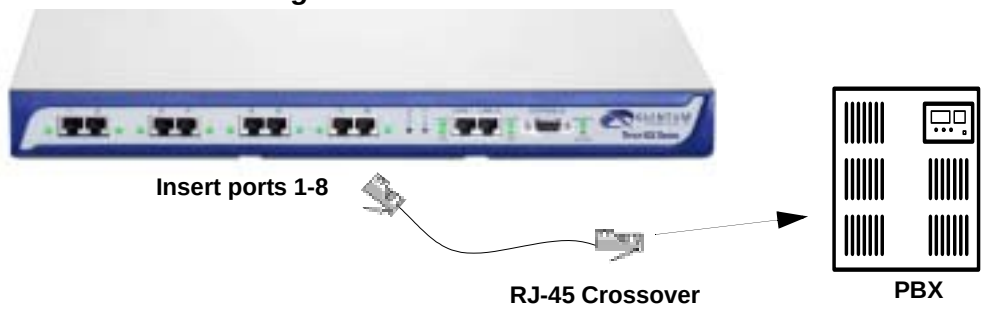
Since there are many different PBX devices and connection methods, your individual PBX will determine the connection method you use to connect to the unit. For example, your PBX may be connected using a patch panel, punch down block, wire wrapped blocks, etc. If you are not sure about installation procedures, contact the network administrator or review the documentation you received with the PBX.

Adjacent port pairs (i.e., 1/2, 3/4, etc.) are configured by default not to connect to each other (Power Off Bypass) when the unit is turned off, or when the unit is in Offline mode. You should set PowerOffBypass to 1 when connecting one of the lines to a PBX, and its adjacent pair to the PSTN. This will ensure connectivity between the PSTN and PBX when the unit is turned off or when in offline mode. However, if you have adjacent port pairs that are connected to similar devices (i.e., both going to PSTN), you do not want the two ports to be connected to each other in case of power off or offline, and you should set the PowerOffBypass = 0. Each pair of ports (1/2, 3/4, 5/6 and 7/8) have their own online/offline and power off bypass control. See the *Configuration Manager* online help or the *Command Line Interface (CLI)* guide for specific configuration information.

You may use your PBX documentation, along with other PBX materials, to determine how to connect the other end of the RJ-45 cable to your PBX. See *Chapter 2: Hardware Components* for the RJ-45 cable pinouts you can use to acquire another cable or adapter that may be required to connect your specific PBX to the unit. No changes are required to the PBX itself; you will need only the correct cable or adapter.

The instructions which follow tell you how to connect an RJ-45 cable (included in your package) between one of the eight network ports on the *Tenor BX* and a PBX. See *Chapter 2: Hardware Components* for a list of RJ-45 cable pinouts you can use to make a custom cable.

Figure 3-4 Connect to Line Interface



Connect to Line Interface as follows:

1. Plug one end of the crossover RJ-45 cable into one of the eight BRI ports on the front of the unit. (This cable from Quintum would be the purple RJ-45 crossover cable, P/N 303-0021-00.) This port should be configured as an NT port. See *Chapter 2: Hardware Components* for cable pinouts if you are making your own cable.

2. Connect the other end of the crossover RJ-45 cable into the appropriate port on the PBX. (If another cable or adapter is required, see *Chapter 2: Hardware Components* for RJ-45 crossover pinout information.)

Connect to Trunk Interface - PSTN

NOTE: When the Tenor is software configured as a TE device (connecting to an NT1), termination is enabled (default) when making a point-to-point connection between the TE port and the NT1. If other TE devices are sharing the bus of the Tenor going to the NT1, termination on the TE port should be disabled. See the *Command Line Interface Guide* for configuration information.

Adjacent port pairs (i.e., 1/2, 3/4, etc.) are configured by default not to connect to each other (Power OffBypass) when the unit is turned off, or when the unit is in Offline mode. You should set PowerOffBypass to 1 when connecting one of the lines to a PBX, and its adjacent pair to the PSTN. This will ensure connectivity between the PSTN and PBX when the unit is turned off or when in offline mode. However, if you have adjacent port pairs that are connected to similar devices (i.e., both going to PSTN), you do not want the two ports to be connected to each other in case of power off or offline, and you should set the PowerOffBypass = 0. Each pair of ports (1/2, 3/4, 5/6 and 7/8) have their own online/offline and power off bypass control. See the *Configuration Manager* online help or the *Command Line Interface (CLI)* guide for specific configuration information.

Figure 3-5 Connect to Trunk Interface

1. Plug one end of the straight through RJ-45 cable (P/N 303-5009-00) into one of the eight BRI ports on the front of the unit. The cable from Quintum would be the green RJ-45 cable. This port should be configured as a TE port. See *Chapter 2: Hardware Components* for cable pinouts if you are making your own cables, or if you wish to attach the table to a punch down block.

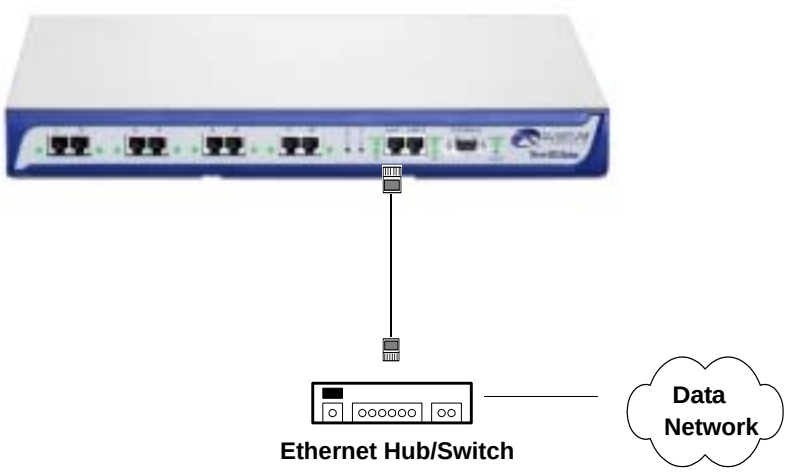
2. Connect the other end of the RJ-45 straight cable to the patch panel which houses your telephone lines.

NOTE: Connecting to the patch panel may require trained telephone personnel.

Connect to Ethernet LAN

You can use these instructions for general connection purposes only. The Ethernet hub/switch manufacturer's documentation should provide specific instructions for connection to another device, such as the *Tenor BX*. Only LAN 1 is available for use; LAN 2 is reserved for future use.

Figure 3-6 Connect to Ethernet Hub/Switch



1. Plug one end of the grey or white RJ-45 Ethernet cable into the port labeled LAN 1.

2. Plug the other end of the cable into one of the Ethernet hub/switch ports. If a custom cable or adapter is required, see *Chapter 2: Hardware Components* for Ethernet RJ-45 10/100.

Connect to PC Console

You will need to connect the *Tenor BX* to your workstation's serial port via RS-232 connection. (This connection will be used when you assign an IP address to the unit.) For the instructions below, it is assumed you are connecting to a Windows PC.

Figure 3-7 Connect to PC Com Port

1. Insert the male end of the DB-9 cable into the port labeled *Console*. (See *Chapter 2: Hardware Components* for RS-232 connector pinouts.)

2. Insert the female end of the DB-9 cable into your workstation's serial port (see your PC documentation for more information about this port).

Install Ground Cable (if required)

The *Tenor BX* provides an additional Earth Ground screw (a #6 screw). This screw provides earth ground to the unit if the AC power receptacle you are plugging into does not contain a ground prong (the Quintum supplied power cable has a three prong connector). To provide ground via the grounding screw, you will need to connect the grounding screw to a Ground Cable, which can then be connected to an approved earth ground.

Connect the Ground Cable (not provided) as follows:

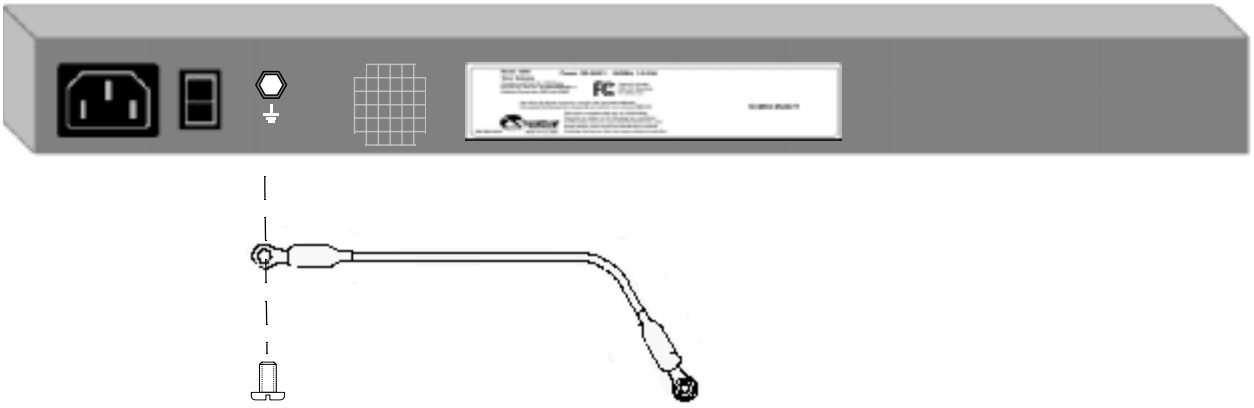
1. Unscrew the existing screw from the grounding hole.

2. Place the screw through the connector of the ground cable.

3. Attach the screw securely to the threaded grounding hole.

4. Connect the other end of the ground cable to a approved electrically grounded point. Consult with a licensed electrician if you are unclear about this operation.

Figure 3-8 Install Ground Cable



Power up the System

Once you have all cables connected properly, you are ready to turn the system on as follows:

1. Plug in the power cord to an AC outlet.

2. Locate the on/off switch on the back of the unit and click the switch to **On**.

The unit will power up and the LEDs will flash and turn off; the power LED will remain lit. For information about the LEDs, see *Chapter 2: Hardware Components*.

Once the unit is powered up, you are ready to assign an IP address. See the following section *Assign IP Address*.

Assign IP Address

Before you can configure a *Tenor BX*, you need to assign a valid IP address. When a *Tenor BX* is shipped to a customer, you will need to assign a valid IP address for each unit. An IP address is a 32 bit (up to 12 numeric characters) address used to identify each network device in the TCP/IP network. If the unit does not have an IP address, data will not be able to be sent to or from the unit.

Communication between the Tenor and the PC is enabled via RS-232 connection and terminal emulation software. The instructions below assume you are running HyperTerminal (running Windows 95 or later) on your PC. For all other terminal emulation packages, the specific Tenor commands used to assign the IP address will be the same, but the software specific instructions will be different. Consult the applicable documentation for more information.

You can re-configure the IP address using the procedure which follows.

NOTE: The instructions below assume you are running Windows 2000 or above.

1. Press the *Tenor BX*'s power switch to **On**.

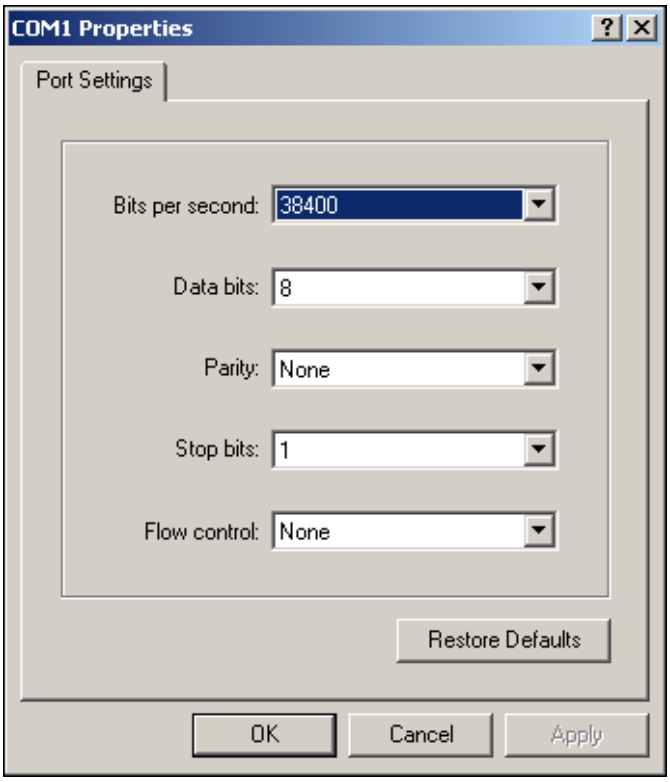
2. Click on *Start> Programs> Accessories> Communications>HyperTerminal> Run.* The *Connection Description* window will be displayed.

3. Enter a connection name (i.e., name for each unit such as *Tenor BX New Jersey*).

4. Click **Ok.**

5. Choose the serial port on your PC from the *Connect Using* drop down list box (i.e., Direct to Com 1). Click **Ok**. The *Com1 Properties* window will be displayed. See Figure 3-9.

Figure 3-9 *Port Settings* Window



6. From the *Bits Per Second* drop down list box, choose *38400*.

7. From the *Data Bits* drop down list box, choose *8*.

8. From the *Parity* drop down list box, choose *None.*

9. From the *Stop bits* drop down list box, choose *1*.

10. From the *Flow control* drop down list box, choose *None.*

11. Click **Ok** and a connection to the Tenor will be established. Information about the unit will scroll on the screen.

12. Enter **login** and **password**. Both are **admin** by default.

13. A message will appear on the screen “Tenor BX does not have an Ethernet interface configured. Would you like to configure an Ethernet Interface?” (y/n).

14. Type **y**.

15. For *IP Address*, enter the IP address for the Tenor unit (i.e., *192.168.1.444)*.

16. For *Subnet Mask*, enter the subnet mask (i.e.,*255.255.255.0)*. This address is used to differentiate the network portion of the IP address from the host portion of the IP address.

17. For *Default Gateway (i.e., 192.168.2.222)* choose whether there should be a default gateway (router) which routes packet data outside of your LAN and enter its IP address.

18. A message will appear on the screen "Tenor BRI Ethernet Interface successfully configured." The Tenor will restart using the new Ethernet settings.

Tenor will restart using the new Ethernet settings.

Change IP Address

You are able to change the IP address in which the unit is attached as follows:

NOTE: The instructions below assume you are running Windows 2000 or above.

1. Press the *Tenor BX*'s power switch to **On**.

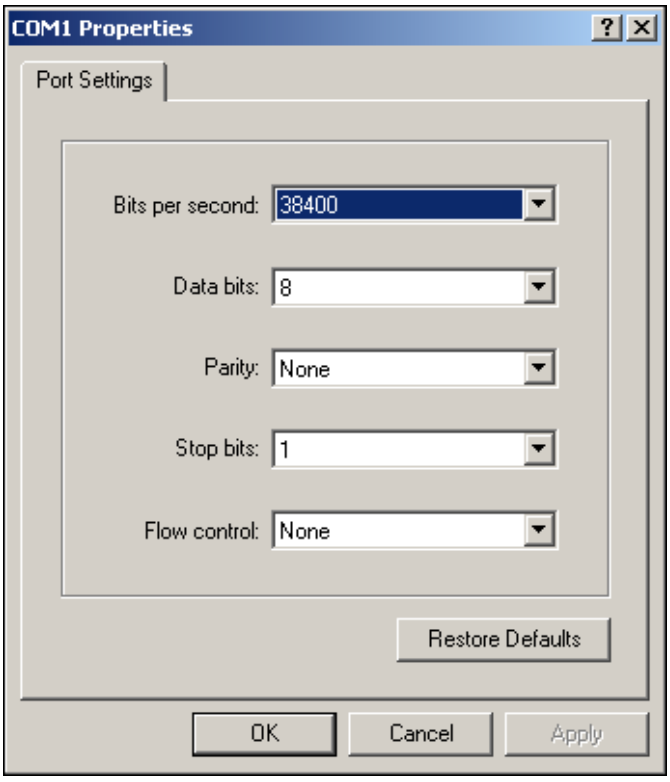
2. Click on *Start> Programs> Accessories> Communications>HyperTerminal> Run.* The *Connection Description* window will be displayed.

3. Enter a connection name (i.e., name for each unit such as *Tenor BX New Jersey*).

4. Click **Ok.**

5. Choose the serial port on your PC from the *Connect Using* drop down list box (i.e., Direct to Com 1). Click **Ok**. The *Com1 Properties* window will be displayed. See Figure 3-10.

Figure 3-10 *Port Settings* Window



6. From the *Bits Per Second* drop down list box, choose *38400*.

7. From the *Data Bits* drop down list box, choose *8*.

8. From the *Parity* drop down list box, choose *None.*

9. From the *Stop bits* drop down list box, choose *1*.

10. From the *Flow control* drop down list box, choose *None*.

11. Press the *Tenor AS* power switch to **On**. After the bootup sequence, the login prompt will appear.

12. Enter a login name. The default login name is *admin*.

13. Enter a password. The default password is *admin*. (Once you are up and running, changing the password is a good idea for security purposes). Step through each of the following parameters and enter the correct values for your installation: IP address, Subnet Mask and Default Gateway.

14. At the **Quintum** prompt, type **ei** to reach the Ethernet prompt and then type **config** to change to the Configuration mode.

15. To set the IP address, type **set ipa** followed by the IP address.

16. To set the Subnet Mask, type **set subnetmask**, followed by the subnet mask.

17. Type **siprd** to change to the Static IP Route Directory.

18. To set the Default Gateway IP, type **change 1 g** followed by the IP address for the default gateway IP.

19. Type **submit**.

20. Type **maint** to reach the maintenance mode and then **mc**. Type **reset**. A confirmation message will ask if you want to reset the unit. Type **yes** to reset the unit. The reboot enables the Tenor to incorporate the new settings.

Load Software Upgrade

To upgrade the software, download the upgrade from the CD ROM you received with the unit, or download the latest software/documentation from *www.quintum.com*.

Chapter 4: Configuration/Monitoring

This chapter tells you how to get started configuring and monitoring the *Tenor BX*, including the following: *Topics include:*

There are different ways to configure and monitor the Tenor BX.

- *Tenor Configuration Manager.* A user-friendly windows-based stand-alone GUI which enables you to configure a number of Quintum products, including the *Tenor BX*. This software was designed to run on any PC; you simply designate the IP address for the *Tenor BX*.
- *Tenor Monitor.* A user-friendly windows-based stand-alone GUI which enables you to monitor the Alarms, Call Detail Records (CDRs) and perform call monitoring functions for the *Tenor BX*.
- *Command Line Interface (CLI)*. Enables you to configure the *Tenor BX* through a CLI telnet-based session.

Basic information is included in this section; for complete information, including all field definitions and extensive usage instructions, see the *Tenor Configuration Manager/Tenor Monitor User Guide* and the *Command Line Interface User Guide* (or the *Online Help* available with the software). Along with the CD you received with the unit, you can also access the latest software and upgrade information from *www.quintum.com*.

Tenor Configuration Manager

The *Tenor Configuration Manager* is used to configure all aspects of the *Tenor BX*, including system, Ethernet, CDR, signaling, circuit, and VoIP configuration. Through the *Configuration Manager,* you are able to configure all aspects of the Tenor unit. The manager is a user-friendly GUI which enables you to configure Quintum products; you designate the IP address of the Tenor product you want to configure.

Get started with the *Configuration Manager* as follows:

NOTE: Ensure the software is installed and running.

1. Access the *Tenor Configuration Manager* icon (located in the area in which you specified during installation). For example, click on *Start* > *Programs* >*Quintum Tenor Configuration Manager*> *Tenor Config Manager.* The *Tenor Configuration Manager* will launch. The *Specify Tenor IP Address* window will be displayed.

2. From the *Tenor IP Address* drop down box, click on *Specify New IP Address* (if the IP address is already listed from a previous login, select that IP address and you will automatically be connected).

3. Enter the IP address of the Tenor unit in which you would like to configure.

4. Enter the Tenor Server Port (the value must match the port numbers set through the CLI; the default entry is **8080**).

5. Click Ok. The *Confirm Login and Password* screen will be displayed.

6. Enter a user name and password (the default user name is **admin**; the default password is **admin**). Click **ok**. You are now ready to configure the Tenor unit.

Once you have connected to the *Configuration Manager,* you can move around and configure data. For complete information about the field definitions, valid entries, and submit information, see the *Tenor Configuration Manager/Tenor Monitor User Guide* or the online help system that came with the system.

Tenor Monitor

The *Tenor Monitor* enables you to view alarms for all Tenor units, as well as Call Event Records, and Call Detail Records. There are three main functions of the *Tenor Monitor*.

- *Alarm Monitor.* Through the *Alarm Monitor,* you are able to view alarms for a specified IP address, as well as display active alarms, alarm history, and deleted alarms. You can configure a database table for the specific unit in which you would like to monitor alarms.
- *Call Monitor.* Through the *Call Monitor*, you are able to view call events for each call passing through the Tenor, including call type, duration, call state, etc. The *Call Monitor* continuously collects active, real-time call event data and displays it on the screen. You are able to select/edit/delete a Tenor to a database table for the specific unit in which you would like to view call events.
- *Call Detail Record (CDR) Monitor.* Through the CDR Monitor, you are able to view the Call Detail Record for each call, including the call connect/disconnect times, call path, and autoswitch information.

Through the *Tenor Monitor*, you can view real-time data for up to three Tenors at the same time. The *Tenor Monitor* can collect up to 500,000 CDR/Call Event Records per day.

View call monitoring information as follows:

NOTE: Ensure the software is installed and running.

1. Access the *Tenor Monitor* icon (located in the area in which you specified during installation. For example, click on *Start > Programs >Quintum Tenor Monitor>Tenor Monitor.* The *Tenor Monitor* will open up. The *User Name and Password* window will be displayed.

2. Enter a user name and password (the default user name is **admin**; the default password is **admin**). Click **OK.**

You are now ready to monitor a specific Tenor unit. See the *Tenor Configuration Manager/Tenor Monitor User Guide* for specific information about adding an IP address, moving around the *Tenor Monitor,* using screens, and switching between IP addresses to view alarms, CDR, and call information.

Command Line Interface

The Command Line Interface (CLI) is a Telnet-based (also accessible via serial port) list of menu options which enable you to configure and monitor any *Tenor BX* unit; you can configure features and capabilities such as numbering plans, channel usage, border element, signaling type, and routing

information. In addition, you are also able to monitor system alarms and run diagnostic procedures. CLI attributes enable you to further configure CLI options; these provide additional configuration items according to the option type.

Through the CLI, there are also commands you execute to simplify the process of configuring and monitoring the *Tenor BX* unit. Some of these commands are globally used, others are specific to the mode in which you are working. For example, the *set* command, available globally from within the Configuration mode, enables you to set attributes for different options.

You can access the CLI through a Telnet session, a terminal-like access to any *Tenor BX* unit. If your PC is directly connected to the *Tenor BX* unit, you can configure the unit directly through the serial port using HyperTerminal. Both methods are described below.

NOTE: Alternatively, you may want to use other telnet clients, such as the Linux telnet client or free programs like Putty. If you choose to do so, you may have to make minor setting changes in the Telnet client in order to make it function correctly.

Telnet Connection. Once the *Tenor BX* has been initially configured with an IP address network and is connected, the easiest way to connect to the *Tenor BX* and use the CLI is through a standard Telnet session from any PC on your IP network. Connect to a *Tenor BX* unit via Telnet as follows:

For Windows 95/Windows 98:

1. Click on *Start> Run*. The *Run* dialog box will be displayed.

2. Type *telnet* and click on **Ok**.

3. Click on *Connect> Remote System*.

4. In the *Host Name field* type, enter the IP address assigned to your *Tenor BX*.

5. Click on **Connect.**

A connection to the *Tenor BX* unit will be established.

For Windows 2000 and above:

1. Click on *Start> Run*.

2. The *Run* dialog box will be displayed. Type *telnet* and click on **Ok**. (Or type *telnet* followed by the IP address and you will connect.)

3. At the telnet prompt, type *open* (followed by the IP address for the unit to which you want to connect.)

A connection to the *Tenor BX* unit will be established.

Serial Port Connection. When the *Tenor BX* is first shipped to you, you must connect to the unit using this method to assign an IP address. Once this is assigned, you can use the CLI to reach the serial port of the Tenor. A null-modem cable must be used to connect to the CLI using this port, if

you are directly connected to the unit. To connect to the *Tenor BX* serial port, locate a workstation (PC) close to the *Tenor BX* unit. Connect as follows:

1. Insert one end of the DB-9 serial null modem cable into the *Tenor BX*'s serial port.

2. Insert the other end of the DB-9 serial cable into your workstation's Com/serial port.

Once the cable is connected and the *Tenor BX* is powered on, open a *HyperTerminal* session (or other terminal emulation program) as follows:

3. Click *Start* > *Programs* > *Accessories* > *Communications* > *HyperTerminal*. The *HyperTerminal* window will be displayed.

4. Click on **Hypertrm**.

5. Enter a connection description (i.e., name for each unit such as *Tenor BX 1*).

6. Click **Ok.**

7. Choose a connection port (on your PC) from the *Connect Using* drop down list box (i.e., Direct to Com 1). Click **Ok.** The *Com 1 properties* window will be displayed.

8. From the *Bit Per Second* drop down list box, choose **38400**.

9. From the *Data Bits* drop down list box, choose **8**.

10. From the *Parity* drop down list box, choose **None**.

11. From the *Stop bits* drop down list box, choose **1**.

12. From the *Flow Control* drop down list box, choose **None**.

13. Click on *Call*>*Call.* A connection to the *Tenor BX* will be established.

14. Enter a login name. The default login name is *admin*.

15. Enter a password. The default password is *admin.* Questions about the unit will scroll on the screen.

NOTE: Steps 16-18 are used for first time assignment of IP address.

16. For IP address, enter the IP address for the *Tenor BX* unit.

17. For *Subnet Mask for LAN* prompt, enter the subnet mask.This address is used to differentiate the network portion of the IP address from the host portion of the IP address.

18. For *Default Gateway* prompt, enter the IP address for the default gateway (router) which routes packet data outside of your LAN.

The *Tenor BX* will reboot automatically.

Once you are connected to the Command Line Interface, you can configure the system, as well as perform diagnostics and monitor system information. For specific information, see the *Online Help* you received with the CD.

Chapter 5: System Alarms

This chapter tells you how to use the *Alarm Manager* to view and understand alarms generated by the system.

Specifically, the following topics are included:

VoIPon www.voipon.co.uk sales@voipon.co.uk Tel: +44 (0)1245 808195 Fax: +44 (0)1245 808299

Overview

There are two ways to view alarms for the *Tenor BX* unit: through the *Command Line Interface (CLI)* or through *Tenor Monitor.* The information for accessing alarms via CLI is detailed in this chapter. see the *Tenor Configuration Manager/Tenor Monitor User's Guide or the* Tenor Monitor's online help system for information about viewing alarms via *Tenor Monitor.*

Alarms are brief text messages that appear on your workstation when the *Tenor BX* unit encounters a problem, such as a failed interface, disconnected call, etc. You can reach the *Alarm Manager* through the *Command Line Interface (CLI)* alarm monitoring system.

How to Read Alarms

The *Alarm Manager* reports alarms according to criteria such as the alarm's severity level, line number the alarm occurred on, channel number, etc. There are two alarm types displayed: Active Alarms and Alarm History. An Active Alarm list displays all the alarms still active on the system; these alarms have not been cleared or deleted. An Alarm History is a list of the last 100 alarms stored in the system since the last time you performed a delete operation.

Definitions for generated alarm fields appear in *Table 5-1*.

Table 5-1 Alarm Fields and Definitions

Field	Definition	Valid Entry
IP #	The unit's IP address (32 bit address).	Example: 192.168.1.34.
Sequence #	Internal number used to identify alarms.	01, 02, 03, etc.
Type (displays only if you generate an Alarm History)	The type of alarm generated.	ALR = Alarm. This indicates an active alarm. CLR= Clear. This indicates an alarm that has been cleared from the system. RPT= Report. This indicates that the alarm has been generated for a report. This entry is for internal use only; if you see an alarm that is causing problems, contact customer service.

Field	Definition	Valid Entry
Severity	Level or alarm severity.	1 = Critical (complete system is affected). 2 = Major (major problem is detected). 3 = Minor (minor problem is detected). 4 = Info (Information about a minor problem).
Desc	A text description of the alarm; see Table 5-2 for detailed description.	Varies.
Slot #	Defines which slot the alarm occurred on.	Slot 1 or 2. Slot 1 refers to the system controller functions; slot 2 refers to DSP/Digital line functions.
Line	Defines which line the alarm occurred on.	Line 1 through 8.
Channel #	Specifies which channel the alarm occurred on.	Channels 1-2
Date/Time	Date/time the event occurred on.	Day of week: name of day. Month: Jan, Feb, March, etc. Day of month: 1 or 2 digits. Time: 6 digits (hour minutes seconds based on a 24-hour clock). Year: 4 digits.

Valid Alarms

The following is a list of all alarm descriptions (text that appears in the Alarm Description field) for all possible alarms the system can generate. In the generated alarm list, the alarm description appears as part of the Description field.

Table 5-2 List of Valid Alarms

Severity (appears as part of severity field)	Alarm Description (text appears in desc field)	Definition
Critical	Loss of Framing (Red Alarm)	Signal is not being transmitted; there is no layer 1 synchronization.
Critical	Remote Alarm indication (Yellow Alarm)	*Tenor BX* is receiving a yellow alarm signal from the network.
Critical	Loss of signal	A loss of signal (32 consecutive zeros) at least once during a 1 second period.
Critical	AIS Reception (Blue Alarm)	Alarm Indication Signal. An all ones condition used to alert the *Tenor BX* that its incoming signal (or frame) has been lost.
Critical	Layer 2 Down	Indicates that Layer 2 protocol is down.
Critical	Ethernet Disconnected	Ethernet cable has been disconnected from the System Controller or CPU Card, or Ethernet connectivity has been lost. No new VoIP calls will be made and existing PSTN calls will be switched to the PSTN.
Critical	Call Handler not registered with Gatekeeper	The Call Handler process cannot be registered with the Gatekeeper.
Critical	Critical Software Error	A software error has occurred that affects the operability of the complete system.
Critical	*Tenor BX* Chassis reset	The chassis has reset.
Critical	Primary Interface Clock Loss	Clock source has been lost for BRI lines. The unit will automatically switch to the secondary digital interface clock source.
Critical	Secondary Interface Clock Loss	All clock sources have been lost, both primary and secondary. Check the BRI lines for the possible cause.
Critical	Configuration Data Missing	Configuration via CLI is missing. Check the configuration data and add the necessary information.

Severity (appears as part of severity field)	Alarm Description (text appears in desc field)	Definition
Critical	IVR Configuration Missing	Appears if an attempt to make an IVR call has been made when a valid IP address is not configured. Occurs if an IVR call has been passed through accidently, without a real intention to use IVR for subsequent calls, while both of the servers were disabled. In order to clear the alarm, a user will have to change one of the IP addresses to some value, and then disable it again.
Critical	RADIUS Configuration Missing	Appears when a RADIUS request is made and one or more required configuration parameters are missing. This alarm is cleared when the required RADIUS parameters are configured via CLI.
Critical	RADIUS Server Not Responding	Appears when none of the configured RADIUS servers respond. This alarm is cleared when any of the RADIUS servers respond or the RADIUS server is disabled via CLI.
Major	Major Software Error	A software error has occurred that affects system signaling, interfaces, or other major operation.
Major	File Missing in the File Server	This alarm will be reported to the system when a particular voice prompt file is not found in the IVR Prompt Server. This alarm applies only to the system with enabled IVR functionality.
Major	Switch to other RADIUS server	Appears when the current RADIUS server stops responding after three consecutive calls end in timeouts and another RADIUS server is configured, the Tenor will then switch to the next RADIUS server.
Minor	Call Event(s) Lost	A call has failed.
Minor	Missing or Incorrect Profile	The configuration profile has caused a problem.
Minor	Minor Software Error	A software error has occurred but will not affect the operation of the complete system.
Minor	No response to seizure	There has been a problem with the BRI line.

Severity (appears as part of severity field)	Alarm Description (text appears in desc field)	Definition
Minor	Remote end did not back off in a glare situation	An incoming and outgoing call went through at the same time, and the remote end call did not back off.
Minor	Unit resource constrained	A shared resource in the unit loads the system.
Minor	Hardware component failed	A hardware component has failed. Check all components, hardware connections, etc.
Minor	Log RADIUS server error	Displayed when the RADIUS server fails to send required data or the data sent by the RADIUS server has improper values. Incorrect information may contain the following: RADIUS Server: Credit amount (-1) RADIUS Server: Credit minus amount RADIUS Server: Not supported currency RADIUS Server: Credit time (-1) RADIUS Server: Credit time < 6 sec RADIUS Server: Invalid error code
Informational	Gatekeeper status	Reports the status of the Gatekeeper.
Informational	Miscellaneous information	Miscellaneous information about the unit is reported. The contents of this alarm will vary.
Informational	Info Software Error	Indicates information about miscellaneous software error. This does not affect system operation.
Informational	Glare occurred	An incoming and outgoing call went through at the same time, and the remote end call did not back off, but the situation was corrected.

View Alarms

The Command Line Interface (CLI) enables you to view alarms through the Monitor mode. You can view active alarms, as well as view an alarm history list.

You are now ready to view active alarms and an alarm history, or both. See the sections which follow:

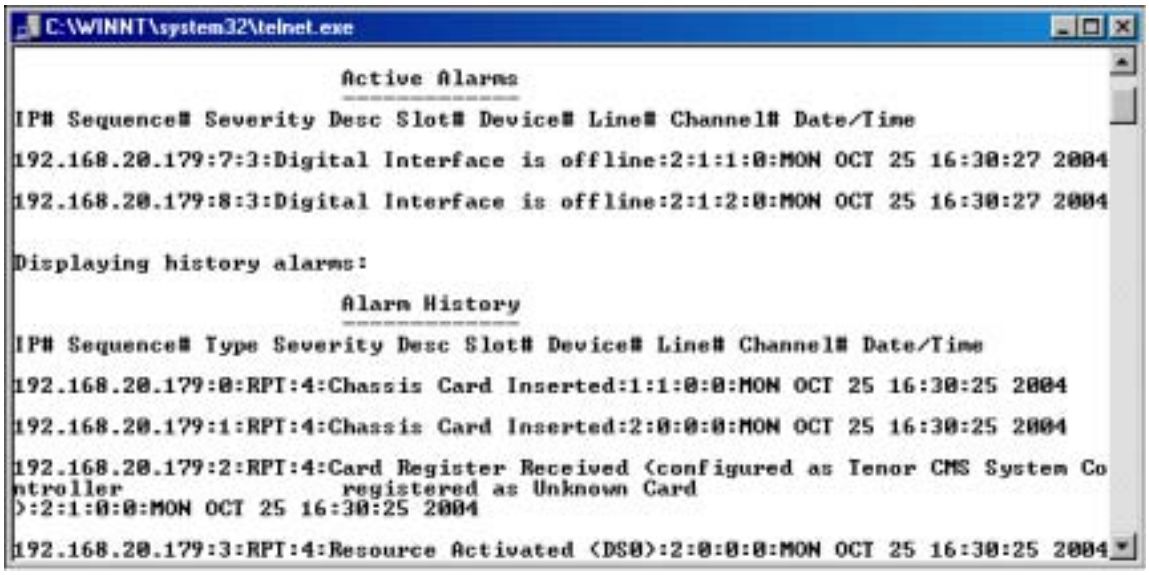
Display all Alarms

You are able to display both active alarms and an alarm history as follows:

1. Through CLI, access the *Monitor* prompt.

2. Type *alarm.* Both active alarms and the alarm history will be displayed. See section *How to Read Alarms* for field definitions.

Figure 5-1 Alarm sample



Display Active Alarms

1. Through CLI, access the *Monitor* prompt.

2. Type *alarm a.* The active alarms will be listed. See section *How to Read Alarms* for field definitions. If you enter *alarm* without a command following it, both active alarms and the alarm history will be displayed.

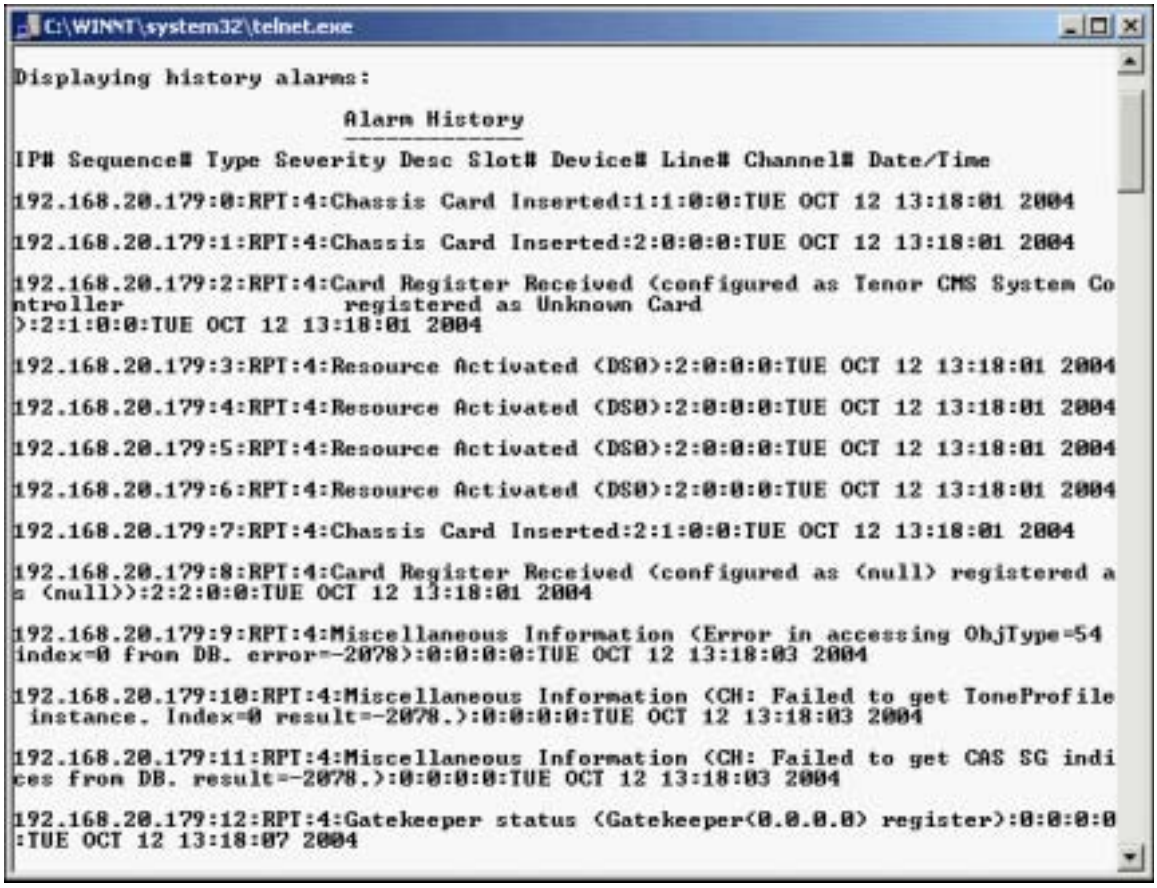
Figure 5-2 Active Alarm Sample

Display Alarm History

1. Through CLI, access the *Monitor* prompt.

2. Type *alarm h.* An alarm history will be displayed. See section *How to Read Alarms* for field definitions. If you enter *alarm* without a command following it, both active alarms and the alarm history will be displayed.

Figure 5-3 Alarm History Sample



Chapter 6: Diagnostics/Maintenance

This chapter tells you how to troubleshoot *Tenor BX* operation, as well as how to maintain the health of your system. You will find information about how to view the unit's LEDs, as well as how to interpret the chassis' alarms and check basic connections.

Specifically, the following topics are included:

Before you Begin

Before you begin troubleshooting a potential malfunction, it is a good idea to check your basic hardware connections. See below.

- Ensure power cord is firmly installed in the back panel's power jack and the other end is plugged into the AC power source.
- Ensure the unit's power switch is in the On position. If the unit is not working, toggle the power switch to reset the system. If the unit is reset, the settings you configured may be lost.
- Verify that all RJ-45 and DB-9 cables fit snugly in each front panel jack. Faulty connections may cause a number of network interfacing or connection issues.

If you suspect the problem to be on the network end, contact your Central Office to verify proper operation.

Common Symptoms/Problems

Below is a list of common symptoms and problems you may encounter. Use this list as a guideline; if your problem is not listed, use the diagnostic procedure explained in the beginning of this chapter.

Table 6-1 Common Symptoms/Problems

Common Symptom/Problem	Description/Solution
Unit will not turn on.	Check AC power source.
Communication between *Tenor BX* and the PBX or PSTN cannot be established.	There are several reasons why communication may not be successful. A few of the most common are listed below. Verify correct cables are installed in the BRI ports. See *Chapter 3: Installation*. Unit configuration may be wrong. Examine the configuration parameters via *Configuration Manager* or CLI. Network issues may cause a number of problems. Contact the Central Office to perform test procedures.
Communication with *Command Line Interface (CLI)* cannot be established using Telnet.	The IP address of the *Tenor BX* unit may be incorrect. Check Ethernet Cable. Verify the IP address of *Tenor BX*. Check the Default Gateway Subnet Mask. Check Ethernet connection via RS-232 connection. See *Chapter 3: Installation* Verify network connectivity using *ping* from another network host. See *Chapter 4: Configuration/Monitoring*.
ALERT LED is on and not flashing.	One or more internal diagnostic tests have failed. Contact customer service. LED will stay on for a minute or so when the unit is powered up.
Communication with Ethernet Hub, or switch cannot be established.	Verify RJ-45 cable is firmly installed in the Ethernet port. Check MDI/MDIX configuration. Check duplex setting on the switch in which they were connected and the speed of 10MB or 100MB.

Common Symptom/Problem	Description/Solution
Communication between computer's COM port and *Tenor BX* serial port cannot be established.	Verify DB-9 cable is firmly placed in the unit's console port and your PC's serial port. Verify Terminal port settings at 38400 BPS 8N1 No Flow Control.
Tenor BX cannot receive or transmit calls.	Check BRI port LEDs. If unlit, it indicates that the BRI lines may be down. Generate alarm list for more information. Contact Central Office for interface issues.

Diagnostic Procedures

Verify Unit Provisioning

An error with *Tenor BX*‘s provisioning may cause a number of problems. It may be a simple error, such as an incorrect IP address or telephone number, or it may be something more complex, such as incorrect BRI parameters.

Evaluate your system provisioning. Check all data provisioning information, and re-configure if necessary. See *Chapter 5: System Alarms*.

Monitor LEDs

LEDs monitor the health of the system; they are the first signal that the unit is not working properly or that an internal or external error has occurred. LEDs appear on the front of the unit (LED descriptions are detailed in *Chapter 2: Hardware Components*).

Check *Chapter 2: Hardware Components* to ensure the correct lighting of each LED and then see *Common Symptoms/Problems* for troubleshooting information. If the LEDs are not lighting at all, check the AC power source to ensure power is being supplied to the unit.

Ping Unit

Ping enables you to ping an IP address. Perform a ping as follows:

NOTE: The instructions assume you are running Windows 2000 or later.

1. Click on *Start> Run*.

2. From the Run box, type **ping <IP address>** and click **Ok**. The ping procedure will start.

If a reply is not displayed on the screen, the connection to the unit is not working correctly. Ensure all cables are connected correctly and an IP address is configured.

Monitor Alarms

Alarms help you identify where a specific problem is occurring with the *Tenor BX* unit. Through the CLI, you can review alarms through the Command Line Interface (CLI). Verify all severity 1 alarms first; these alarms indicate that the unit is in critical condition and the entire system is affected.

See *Chapter 5: System Alarms* for specific information about obtaining and reading alarms.

General Maintenance

Restore Factory Defaults

You can set all system configuration settings back to their factory defaults via *Command Line Interface (CLI)* as follows:

1. Access the CLI through a Telnet session. See *Chapter 4: Configuration/Monitoring* for more information.

2. Access the *Config-VOIPNetwork-1* prompt.

3. Type *setfactory.* You will be asked if you are sure you want to set the unit back to factory defaults.

4. Type **yes** to confirm (type **no** to cancel the restore).

Reset System

Reset the system as follows: turn the power switch to “off” and then back to “on”.

Change Password

For security purposes, you may want to change your password. You can change the password via *Command Line Interface (CLI)* as follows:

1. Access the CLI through a Telnet session. See *Chapter 4: Configuration/Monitoring* for more information.

2. Access the *Maintain* module.

3. Type *password*. A prompt will ask you for the old password.

4. Type the old password and press **Enter.** A prompt will ask you for the new password. Type the new password and press **Enter.** A confirmation will ask you to confirm the new password.

5. Re-type the new password and press **Enter**.

A message will tell you the password that changed successfully.

Change Unit Date and Time

You can change the unit’s date and time via *Command Line Interface (CLI)* as follows:

1. Access the CLI through a Telnet session. See *Chapter 4: Configuration/Monitoring* for more information.

2. Access the Config module.

3. Type *date* followed by *mm/dd/yy/hh:mm:ss* and press **Enter**.

4. For example, type **config# date 06/14/02/22:14:00.** This command will set the current time to June 14, 2004 at 10:14 p.m.

If you need Additional Help

If you suspect the problem to be on the network end, contact your Central Office to verify proper operation.

After completing all troubleshooting/maintenance procedures and reviewing the Common Symptoms/Problems section, you can contact the Customer Service Department at the following:

Quintum Technologies, Inc.
71 James Way
Eatontown, NJ 07724
For domestic calls: (877) 435-7553
For international calls: (732) 460-9399
email: service@quintum.com

GLOSSARY

A

Alarm. A brief message that appears on your screen when the *Tenor BX* encounters a problem (i.e., failed interface). Alarms can be viewed through CLI (see *Command Line Interface*) or a Telnet connection.

Auto Switching. If a network packet delay for an IP call becomes unacceptable, the *Tenor BX* will automatically switch the call to PSTN.

B

Border Element. Provides access into or out of an administrative domain. The *Tenor BX* has two types of Border Elements: Primary and Secondary.

BRI. Basic Rate Interface

Bypass Number. A telephone number that is automatically sent to the PSTN, without going VoIP.

C

CAS. Channel Associated Signaling. A form of circuit switched signaling.

CCS. Common Channel Signaling. A form of signaling that uses the D channel as the signal channel.

CDR. Call Detail Recording. A string of data which contains call information such as call date and time, call length, calling party and called party.

CDR Server. The server (or workstation) responsible for receiving and processing CDRs as they are generated.

CLI. See *Command Line Interface*.

Command Line Interface (CLI). A configuration system you use to configure and monitor the *Tenor BX* unit via telnet connection.

Configuration Mode. A CLI module which enables you to configure all functions in the *Tenor BX*.

Console port. RS-232 connector is used for connection to a PC's serial port via DB-9 null modem cable.

CSU. Channel Service Unit. A component used to terminate a digital circuit (i.e., T1 line) at a customer site.

D

Diagnostic Mode. A CLI module which provides a set of utilities to perform diagnostic and testing procedures.

DSP. Digital Signal which provides the required signal processing for the *Tenor BX*.

E

ESD. Electrostatic Discharge occurs as a result of improperly handled electrostatic components. An ESD Antistatic Strap must be used to prevent ESD.

Ethernet. A Local Area Network (LAN) data network design that connects devices like computers, printers, and terminals. It transmits data over twisted pair or coaxial cable at speeds of 10 to 100 Mbps.

Ethernet port. A port on the Tenor BX which provides RJ-45 jacks for connection to a 10/100 Ethernet LAN switch or hub via RJ-45 cable.

Extranet. Communications with a source outside your company.

G

Gatekeeper. See *H.323 Gatekeeper*.

Gateway. A device (i.e., Tenor BX) which connects IP-based networks and circuit-switched networks.

Ground Strap. A ground connection on the front of the chassis is provided for ESD protection.

H

H.323. A protocol standard for sending multimedia communications (i.e., voice/data) simultaneously over packet-based networks, such as IP.

H.323 Gatekeeper. An H.323 built in gatekeeper which performs IP call routing functions such as call control and administrative services to another *Tenor BX* unit or another H.323 endpoint.

Hop-off PBX Call. A toll call which is "leaked out" of a PBX into a private network in order to eliminate toll charges.

I

Internet. A packet based network which transports voice/video/data over TCP/IP.

Intranet communication. Communication within the same company, usually through an Ethernet hub.

IP Address. A unique 32 bit address that identifies a network device is connected to the network via TCP/IP.

IVR. Interactive Voice Response enables you offer services, such as Pre-paid calling cards and Post-paid accounts to your customers.

L

LAN. Local Area Network. A local area network that carries data between workstations in the same location. Workstations in a LAN are connected together— typically by an Ethernet hub— to share information.

LEDs. Indicators as to the status of the chassis and other components of the system. LEDs appear on the chassis and other components.

M

Maintenance Mode. A CLI module which provides utilities for maintaining the system.

Monitor Module. A CLI module which provides a set of utilities to monitor the network and all system components.

N

NT-1. Network Termination Type 1. Device that is required to connect ISDN terminal equipment to an ISDN line.

Null modem cable. A 9-pin cable used to connect the *Tenor BX* to a PC's asynchronous console port.

P

PacketSaver. A packet multiplexing technology which reduces the amount of IP bandwidth require to support multiple calls flowing between two networks.

PBX. Private Branch Exchange. Telephone switch located on a customer's premises that establishes circuits between users and the PSTN (public network).

Point-to-Point. A single Terminal Equipment is connected to the NT1 which can be up to 1000m away.

Power Inlet. Inlet for which you insert the supplied AC power cord. The unit requires a 110-220 VAC.

PSTN. Public Switched Telephone Network (also known as Central Office). Telephone Company Switching facility.

R

RJ-45. A CAT 5 cable used to connect the *Tenor BX* to an Ethernet, Line Circuit or Trunk Circuit.

RADIUS. When using IVR, the RADIUS (Remote Authentication Dial-In User Service) is used for authenticating and authorizing user access to the VoIP network.

S

SelectNet™. The next generation of TASQ technology; the functionality monitors your data network for jitter, latency, and packet loss, and transparently switches customer calls to the PSTN when required.

SIP. A signaling protocol used to establish a session on an IP network.

SNMP. Simple Network Management Protocol (SNMP) is the standard protocol used to exchange network information between different types of networks.

S/T interface. A four-wire ISDN interface. Runs from TE1 devices to NT.

Subnet Mask. An IP address that determines how an IP address is divided into network and host portions according to the bits.

T

TA. Terminal Adapter. Adapter that allows a TE-2 terminal to connect to an ISDN user-network interface.

TE-1. Terminal Equipment type 1. Uses an interface that complies with the ISDN user-network interface recommmendations. This device can connect and work with ISDN.

TE-2. Terminal Equipment type 2. This equipment uses an interface that complies with interface recommendations other than the ISDN interface recommendations. This device requires a terminal adapter to connect and work with ISDN.

W

WAN. Wide Area Network. A number of LANs connected together through a long distance communications medium. For example, your company may have a LAN in New York, a LAN in Tokyo, and a LAN in Los Angeles. When these sites connect together over

the data network or the public network, it is considered a WAN. As a result, intra-corporate information is passed through the data network from one LAN to another LAN site in a remote location.

Zone. A group of endpoints (e.g, gateways, terminals, etc.) in one corporate site.

QUINTUM TECHNOLOGIES, INC.
LIMITED WARRANTY AGREEMENT

Quintum Limited Warranty

QUINTUM WARRANTY: Quintum warrants that under normal use and conditions (i) the Quintum hardware products covered by this warranty, for a period of one year, and (ii) all software media, also for a period of one year, will be free from significant defects in materials and workmanship from the date of purchase from Quintum or Quintum's authorized reseller or distributor (the "Warranty Period").

SERVICES:
In the event that you believe that you have discovered any such defect during one of the Warranty Periods listed above, you must call the Technical Assistance Center (TAC) at 877-435-7553 within the United States or 732-460-9399 Internationally, 9:00 AM to 5:30 PM, Eastern Standard Time, for initial problem diagnosis. Quintum Technologies will perform warranty service at Quintum Technologies designated facility, provided the customer returns the Quintum Technologies Product in accordance with Quintum Technologies' shipping instructions. Quintum Technologies' sole responsibility under this warranty shall be, at Quintum Technologies' option, to either repair or replace the Quintum Technologies Product within 10 days. All defective Quintum Technologies Products, or defective components thereof, returned under this warranty shall become Quintum Technologies' property. If Quintum Technologies determines that the original Quintum Technologies Product did not contain a Material Defect, Purchaser shall pay Quintum Technologies all costs of handling, transportation, and repairs at Quintum Technologies' prevailing rates, including all costs of providing an interim Quintum Technologies Product.

The customer will also be given shipping instructions and a Return Material Authorization (RMA) number. This number is to be prominently displayed on the shipping container and referenced on all correspondence pertaining to the returned product. Customers are responsible for shipping and insurance charges to return the defective product. Quintum shall pay for shipping and insurance charges for the part being sent to the customer.

Please return any hardware together with the accompanying software media to Quintum following the RMA Procedure set out below (you may also be asked to provide written documentation of your purchase).

CUSTOMER REMEDIES: Quintum and its suppliers' entire liability and your exclusive remedy shall be, at Quintum's option (i) repair or replacement of the software media or hardware that does not meet Quintum's Limited Warranty with new or like-new software media or hardware or (ii) return of the price paid for software media or hardware that does not meet Quintum's Limited Warranty. Quintum shall have no responsibility, warranty or other obligations whatsoever as a result of (i) the use of the hardware and/or software in a manner inconsistent with the accompanying manuals, license and limited warranty terms or this Agreement, or (ii) any modifications made to the hardware or software, or (iii) failure of the hardware or software as a result of accident, abnormal physical or electrical stress, including abuse, negligence, or misuse or (iv) any act of God such as, but not limited to, floods, earthquakes, lighting or (iv) acts of terrorism or war, declared or not.

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MERCE EXPORT ADMINISTRATION REGULATIONS, EXPORT OR OTHERWISE (B) THE PRODUCTS ARE RELOCATED, MOVED, SHIPPED OR EXPORTED TO ANY LOCATION WHICH WOULD RESULT IN (WHETHER AS A RESULT OF THE USE OF THE PRODUCTS OR FOR ANY OTHER REASON) A VIOLATION OF ANY INTERNATIONAL, NATIONAL OR LOCAL LAW, STATUTE, REGULATION, ORDER OR SIMILAR AUTHORITY.

Quintum RMA Procedure

1. Notify Quintum Technical Assistance Center on Telephone: 877-435-7553 within the United States, 732-460-9399 Internationally, Monday through Friday from 8:30am till 5:30pm U.S. Eastern time.

2. Provide Customer Services Department the following information:

    - Customer Name and Contact Name
    - Product Part number(s)
    - Product serial numbers
    - Quantity to be returned
    - Type of return (i.e., warranty return)
    - Reason for return
    - Proof of purchase (invoice or PO)

3. An RMA number will be assigned for each shipment and that number must be quoted in all correspondence relating to the RMA in question

4. Shipment Instructions: Customer must follow any instructions supplied by the Customer Service Representative concerning where the Product is to be returned, how the Product is to be packaged, which carrier is to be used, who should pay for the shipment and any labels to be put on the package. Unless otherwise directed by Quintum's Customer Services Representative, please return product to Quintum at:

    REF RMA Number
    Quintum Technologies, Inc.
    71 James Way
    Eatontown, NJ 07724 USA

5. Following all directions given by Customer Services Representative return the Product to the address given by the Customer Services Representative quoting the RMA number.

6. Any product that is deemed failing under this Warranty and a replacement product has been shipped to the customer, the failing product must be returned and delivered to the address given by the Customer Services Representative within 30 days of the replacement being shipped.

PLEASE NOTE: All shipments require an authorized RMA number.

If the Customer does not comply with this procedure as set out above, Quintum reserves the right to charge Customer for the cost of the replacement Product and/or freight (including duties and taxes) from Quintum regardless of the reason for the return. Quintum also reserves the right to invoice the Customer for a replacement Product at the same time as the replacement is cross-shipped. This invoice will, of course, be canceled if the original Product is returned within 30 days of cross-shipment and if found to be a valid warranty return.

Documentation Notice

Manufacturer/Owner: Quintum Technologies, Inc. 71 James Way, Eatontown, NJ 07724

ACKNOWLEDGEMENTS

FCC WARNINGS

This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interface 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.

· Reorient or relocate the receiving antenna.

· Increase the separation between the equipment and receiver.

· Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

· Consult the dealer or an experienced radio/TV technician for help.

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 68 of the FCC Rules. On the back of this equipment is a label that contains, among their information, the FCC registration number US:6LCPF01AAX-SERIES for this equipment. If requested, this information must be provided to the Telephone Company.

The REN (Ringer Equivalence Number) is used to determine the number of devices that may be connected to a telephone line. Excessive RENs on a telephone line may result in the devices not ringing in response to an incoming call. In most but not all areas, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company. For products approved after July 23, 2001, the REN for this product is part of the product identifier that has the format US:AAAEQ##TXXXX. The digits represented by ## are the REN without a decimal point (e.g., 03 is a REN of 0.3). For earlier products, the REN is separately shown on the label.

Facility Interface Codes For Analog Services supported:

- 02LS2

Service Order Codes For Analog Services supported:

- 9.0F Full protection to the network from systems using live voice. Only approved terminal equipment can be connected to station ports

An FCC compliant telephone cord with a modular plug is provided with this equipment. This device connects to the telephone network via an RJ-11plug and jack. The plug and jack also comply with FCC part 68 rules.

If this device causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But, if advance notice is not practical, the Telephone Company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The Telephone Company may make changes in its facilities, equipment, operations, or procedures that could effect the operation of the equipment. If this happens, the Telephone Company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with this device, for repair and warranty information, please refer to the Technical Support insert for repair information and the warranty section of this Product Manual for warranty information.

In the event of device malfunction, all repairs should be performed by Quintum Technologies, Inc. or an authorized agent. It is the responsibility of users requiring service to report the need for service to our company or to one of our authorized agents. In the event service is required, refer to the Technical Support insert for information.

If the device is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

This registered device is capable of providing users access to interstate providers of operator services through those of equal access codes.

U.S Service Center Information

Quintum Technologies
71 James Way
Eatontown, NJ 07721 USA

Canadian Notice

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operation, and safety requirements. The Department does not guarantee the equipment will operate to the users' satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local Telecommunications Company. The equipment must also be installed using an acceptable method of connection. In some cases, the inside wiring associated with a single-line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make electrical ground connections by themselves, but should contact the appropriate inspection authority or an electrician, as appropriate.

Agency Approvals

EMC	AS/NZS 3548 EN55022:98 Class A EN55024:98 EN61000-3-2:95 EN61000-3-3:95
TELECOM	TBR3 AS/ACIF S031:2001
SAFETY	UL/cUL 60950 EN60950:92 AS/NZS60950:2000

EU Directive on Disposal of Waste Electrical and Electronic Equipment (WEEE)

This equipment is classified as Type 3 IT and Telecommunications Equipment under the terms of EU Directives 2002/96/EC and 2003/108/EC. These directives are now being transposed into law by the individual EU member states.

At the end of life of this equipment it must be disposed of in an approved manner according to the laws of the EU member state in which the equipment is located. The equipment should be returned to the registered producer, from which it was obtained, for disposal.

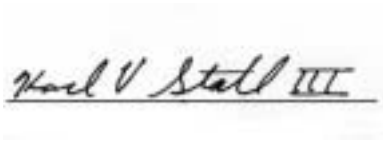
DECLARATION OF CONFORMITY

Application of Council Directives(s)	89/336/EEC, 93/68/ECC EMC Directives 73/23/EEC, 96/68/ECC Low Voltage Directives 99/5/EC, RTTE Directive
Standards to which Conformity is Declared:	EN55022:98, EN55024:98 EN 60950:92 +A1:92+A2:93+A3:95+A4:96 EN 61000-3-2 :95, EN 61000-3-3:95 AS/NZS 60950:2000 TBR3, AS/ACIF S031:2001
Manufacturer:	Quintum Technologies Inc.
Manufactured By:	Quintum Technologies Inc. 71 James Way Eatontown NJ USA
Type of Equipment:	Digital VoIP Gateway
Model Number:	Tenor BX Series

We, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and standard(s) as of this date.

Place: Eatontown, NJ, USA

Date: 8/27/2004



Karl V. Stahl III
EMC/Product Safety Engineer

William J. Truex
Director of Operations

Technical File available through: Quintum Technologies Inc.
71 James Way
Eatontown, NJ 07724
USA

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