



Tenor[®] AX VoIP MultiPath/Gateway Switch

Product Guide

P/N 480-0062-00-13

NEW HARDWARE SUPPORT

This unit contains new hardware, which requires newer software. This software was installed on the unit prior to leaving the factory.

If you must downgrade the software in this unit, please visit <http://ae.quintum.com/support/rohs/> for a list of latest software patches that support this new hardware. Loading unsupported software will render this unit inoperable and will require physical access to this unit for recovery.

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Table of Contents

About this Guide

What's included?	1-2
Typographical Conventions	1-3
Product Guide Conventions	1-3
Finding Help/More Information	1-4

Chapter 1: Overview

What is the Tenor AX?	1-2
Features	1-4
Unique Design	1-4
State-of-the-Art GUI Configuration and Network Management	1-4
Easy Connect to Console	1-4
Powerful System Monitoring	1-4
Capabilities	1-5
SelectNet™ Technology Safety Net (for Tenor AXM and Tenor AXE configurations).	1-5
PacketSaver™ reduces bandwidth consumption	1-5
Virtual Tie Trunk	1-5
SNMP Support	1-6
Call Detail Recording	1-6
IVR/RADIUS Support	1-6
NATAccess™	1-6
Dynamic Call Routing	1-7
Tenor AX Call Paths	1-8
Tenor AXM MultiPath Switch (AXM800, AXM1600, AXM2400) Configuration	1-8
Tenor AXT Trunking VoIP Gateway (AXT800, AXT1600, AXT2400, AXT4800) Configuration	1-10
Advanced Features/Capabilities	1-12
Call Management	1-12
Dial Plan Options	1-12
H.323 Gatekeeper Services	1-13
SIP User Agent	1-15

Chapter 2: Hardware Components

Hardware Description	2-2
Front Panel Connections and Reset Options	2-2
Back Panel	2-4

Cables	2-6
50-Pin Cable	2-7
DB-9 Serial RS-232 Cable	2-10
Specifications	2-11
Voice/Fax	2-11
PSTN/PBX Connections	2-11
LAN Connection	2-11
Physical	2-11
Electrical	2-11
Environmental	2-11

Chapter 3: Installation/Basic Troubleshooting

Installation	3-2
Pre-Installation Guidelines	3-2
Inspect Package Contents	3-2
Rack Install	3-3
Connect to Phone/FXS Interface	3-6
Connect to Line/FXO Interface	3-8
Connect to Ethernet LAN	3-9
Connect to PC Console	3-10
Power up the System	3-11
Assign IP address	3-12
Change IP Address	3-13
Getting Started with Configuration/Making the First Call	3-16
Load Software Upgrade	3-18
Common Symptoms/Problems	3-19

Chapter 4: Advanced Topic: Diagnostics/Maintenance

Monitor LEDs	4-2
Monitor Alarms	4-2
How to Read Alarms	4-2
Valid Alarms	4-4
Display all Alarms	4-6
Display Active Alarms	4-7
Display Alarm History	4-7
Verify Unit Provisioning	4-8
Maintenance Procedures	4-9
Restore Factory Defaults	4-9
Reset System	4-9
Change Password	4-10
Change Unit Date and Time	4-10

If you need Additional Help 4-11

GLOSSARY

INDEX

Warranty/Approvals

About this Guide

What's included?

This product guide is divided into chapters; each chapter describes a specific topic. The following chapters are included:

- *About this Guide*: Describes what is included in the Product Guide, including typographical conventions.
- *Chapter 1: Overview*. Includes a general overview of the product, including a description of the *Tenor AX*'s features and capabilities.
- *Chapter 2: Hardware Components*. Hardware description, including the front and rear panels, as well as LEDs and required cables.
- *Chapter 3: Hardware Installation/Basic Troubleshooting*. Describes how to install the *Tenor AX* unit, including how to connect, power up, and assign the IP address.
- *Chapter 4: Advanced Topic: Diagnostics/Maintenance*: This chapter describes how to view Tenor Alarms as well as perform maintenance procedures.
- *Glossary*
- *Index*
- *Warranty/Approvals*

Typographical Conventions

Product Guide Conventions

Certain typographical conventions are used throughout this product guide. See below.

- All commands you enter via keystrokes appear in **bold** (e.g., Press **Enter** or Press **Ctrl-I**).
- All text commands you enter via Telnet session or command line typing appear in *italics* (e.g., type *active*).
- There are three types of special text that are designed to reveal supplemental information: Note, Warning, and Caution. See below.



A **NOTE** provides additional, helpful information. This information may tell you how to do a certain task or just be a reminder for how-to's given in previous sections. (i.e., For a list of valid commands at any time, type ?)



A **WARNING** provides information about how to avoid harming your VoIP equipment or other equipment (i.e., Do not stack more than 4 units together.)



A **CAUTION** provides information about how to avoid injury to yourself or to others (e.g., Do not install the equipment during a lightning storm).

Finding Help/More Information

Refer to the Product Guide for help. The Table of Contents and Index tells you where to find information easily.

Extensive configuration help is available via the *Tenor Configuration Manager/Tenor Monitor User Guide* or the *Command Line Interface User Guide*. Both documents are on the CDR ROM you received with the unit or you can download the latest documentation from www.quintum.com.

Chapter 1: Overview

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

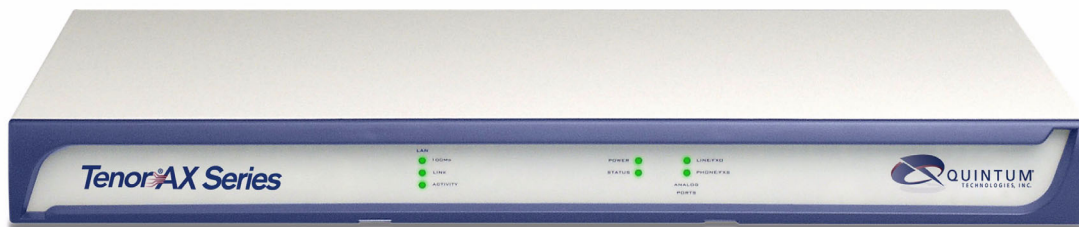
- ❑ *A description of Tenor AX*
- ❑ *Features*
- ❑ *Capabilities*
- ❑ *Call Paths*
- ❑ *Advanced Features/Capabilities*

What is the *Tenor AX*?

The *Tenor AX* is a high-density VoIP (Voice over Internet Protocol) H.323/SIP switch that compresses and packetizes voice, fax, and modem data and transmits it over the IP network. Designed for Enterprises and Service Providers, the *Tenor AX* gives large businesses with analog voice infrastructure an easy, cost-effective way to capitalize on the power of Voice over IP (VoIP).

The *Tenor AX* integrates a gateway, gatekeeper, border element, intelligent call routing, and supports H.323/SIP and QoS all in one solution. 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. Through the FXS port, you can connect to a telephone, key system or PBX; through the FXO port, you can connect to the PSTN (through direct connection to the Central Office).

Figure 1-1 Tenor AX VoIP Switch



The *Tenor AX* is available in four series types:

- **AXM MultiPath.** The *AXM MultiPath Switch* is mainly intended for symmetrical multipath applications for typical enterprise applications. The number of FXS (i.e., PBX) ports is equal to the number of FXO (i.e., PSTN) ports. The number of VoIP channels is half the number of PSTN channels. Calls are routed between the Phone/FXS, Line/FXO, and the IP Network.
- **AXT Trunking VoIP Gateway.** The *AXT Trunking VoIP Gateway* is mainly intended for trunk side connections between the PSTN and the VoIP network. The number of VoIP ports is equal to the number of FXO ports. Calls can be routed in any direction between any of the ports.
- **AXG VoIP Gateway.** The *AXG VoIP Gateway* is mainly intended for applications interfacing between the PBX and the VoIP network. The number of VoIP channels equals the number of FXS ports. Calls can be routed in any direction between any of the ports.
- **AXE Enterprise VoIP Gateway (plus 2 FXO ports).** The *AXE VoIP Gateway* is mainly intended for applications interfacing between the PBX and the VoIP network, but it also includes two FXO ports for autoswitching to PSTN back-up and 911 service.

Table 2-1 Tenor AX Configuration Types

Series	Configuration	FXS Connector - Ports Supported	FXO Connector - Ports Supported	VoIP Ports Supported
AXM MultiPath	AXM800	8	8	8
	AXM1600	16	16	16
	AXM2400	24	24	24
AXT Trunking VoIP Gateways	AXT800	0	8	8
	AXT1600	0	16	16
	AXT2400	0	24	24
	AXT4800	FXS ports not supported. Instead, 24 FXO Ports are supported through this connector. Port labeled "LINE/FXO (1-24)"	24 FXO ports supported. Port labeled "LINE/FXO (25-48)"	48
AXG Series Gateway	AXG800	8	0	8
	AXG1600	16	0	16
	AXG2400	24	0	24
AXE Enterprise VoIP Gateway	AXE800	8	2	8
	AXE1600	16	2	16
	AXE2400	24	2	24

The MultiPath version's architecture enables the *Tenor AX* to intelligently route calls between the FXS, FXO, and the VoIP network to achieve the best combination of cost and quality. The *Tenor AX* also routes calls over IP to reduce costs, and then transparently "hop off" to the PSTN, to reach off-net locations. Calls can be routed in any direction between any of the ports.

Whichever configuration you choose, the high performance unit provides one 10/100 BaseT connection, along with one RS-232 serial console port connection. The unit also incorporates an intelligent call routing engine which regulates system resources and configuration while coordinating all voice traffic activity in the unit.

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.

Features

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

Unique Design

Tenor AX packs powerful VoIP features into one compact unit. The Tenor can be installed without upgrades to the existing voice or data network. You can install the unit anywhere, without affecting the network infrastructure you already have in place. As with all Tenor architecture, the *Tenor AX* provides the power of VoIP in a easy-to-use product that takes just minutes to get up and running.

State-of-the-Art GUI Configuration and Network Management

The *Tenor AX* is managed by a two unique systems: *Tenor Configuration Manager* and *Tenor Monitor*. Through the *Tenor Configuration Manager*, you can configure all options, such as dial plans, call routing numbers, etc. via a simple Graphical User Interface (GUI). An easy-to-use 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 *Tenor Configuration Manager* and the *Tenor Monitor* provide comprehensive on-line help systems that are available at your fingertips.

In addition, you can configure the unit via *Command Line Interface (CLI)*. Through this simple tel-net 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* at any prompt, and data about that field will be displayed.

Easy Connect to Console

Plugging a serial cable between the unit's RS-232 port and your PC's console port, will allow unit management. Through the console connection, you are able to assign an IP address. In addition, through the RS-232 port, 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.

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

Capabilities

SelectNet™ Technology Safety Net (for Tenor AXM and Tenor AXE configurations)

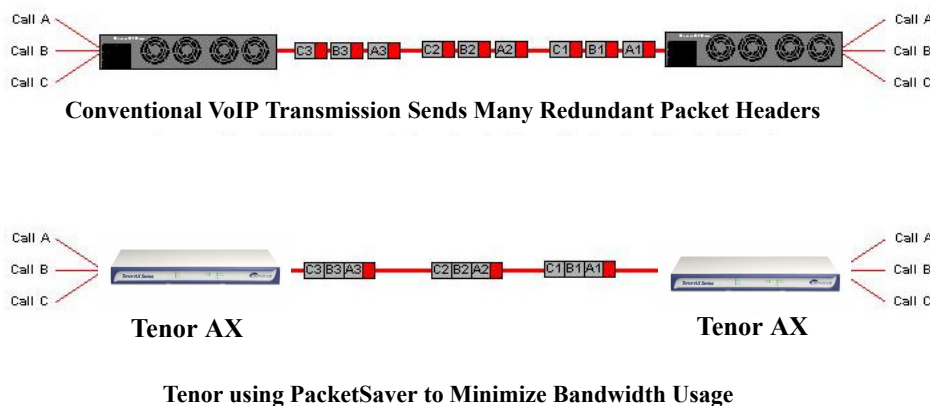
Quality of service is virtually guaranteed. *Tenor AX*'s built-in patented SelectNet™ Technology provides a “safety net,” which virtually guarantees that each call going VoIP will not only be routed successfully, but will deliver high voice quality.

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 AX* will switch the call to the PSTN automatically and transparently. The *Tenor* continuously monitors your data network and transparently switches customer calls to the PSTN when required.

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.

Figure 1-2 PacketSaver



Virtual Tie Trunk

The *Tenor* unit can emulate any 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, which results in considerable savings.)

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

SNMP Support

The *Tenor AX* supports Simple Network Management Protocol (SNMP), the standard protocol used to exchange network information between different types of networks.

Call Detail Recording

Through the Call Detail Record (CDR) feature, the *Tenor AX* 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 AX* 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

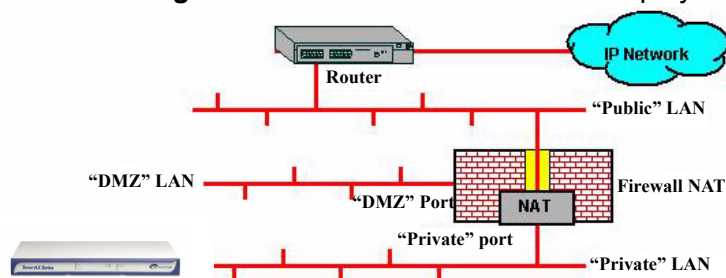
Interactive Voice Response (IVR) is a feature of the *Tenor AX* that enables you to offer services, such as Pre-paid calling cards and Post-paid accounts, to your customers.

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.

NATAccess™

NATAccess is an intelligent network address translation technology. It enables VoIP networks with multiple endpoints to operate behind firewalls equipped with H.323 Network Address Translation (NAT); this provides maximum network security. *NATAccess* simplifies deployment by eliminating the need to place the Tenor on a public IP network. Using *NATAccess* 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 1-3 Tenor with NATAccess Deployment



Deploying the Quintum Tenor with NATAccess on the "Private" LAN

Dynamic Call Routing

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

Tenor AX will first identify the call origination site—Line/FXO, Phone/FXS, or IP routing group — and then route the call according to the 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.

Tenor AX Call Paths

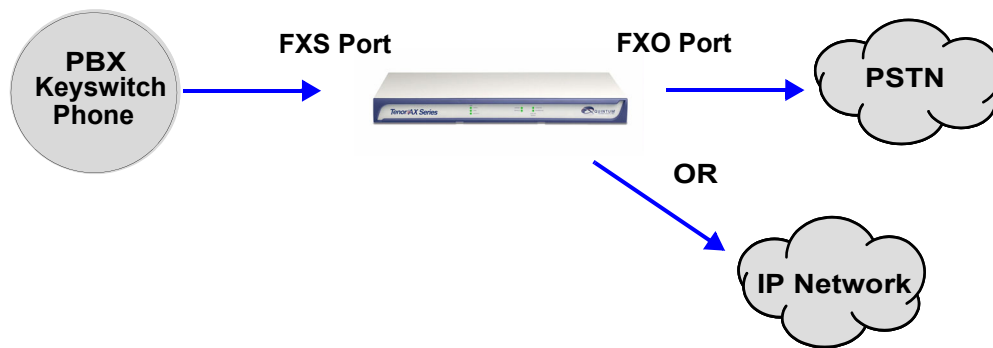
Tenor AXM MultiPath Switch (AXM800, AXM1600, AXM2400) Configuration

The Tenor AX VoIP MultiPath Switch Configuration is symmetrical with an equal number of Phone/FXS and Line/FXO ports. Calls are routed from the Phone/FXS, Line/FXO, or IP Network. Calls can be routed in any direction between any of the ports.

Below are descriptions of the basic call paths from the FXS (Phone), FXO (Line) and IP; the exact call path will be determined by the specific *Tenor AX* configuration you have in your network.

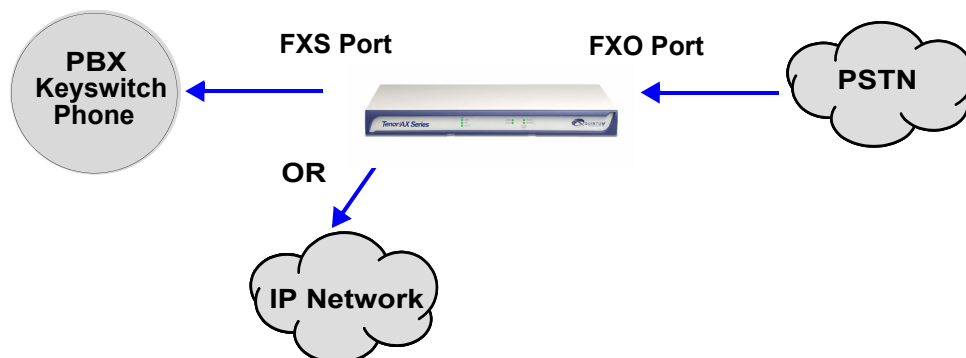
FXS (Phone) Originated Calls. Calls coming from the Phone/FXS interface (i.e. PBX) may be switched to either the data network as a VoIP call or to the FXO interface, typically for connection to another circuit switched network such as the PSTN. The routing decision made by the *Tenor AX* is based upon your configuration and the dialed number. See [Figure 1-4](#) for an example of a call originated from a PBX.

Figure 1-4 FXS (Phone) Originated Calls



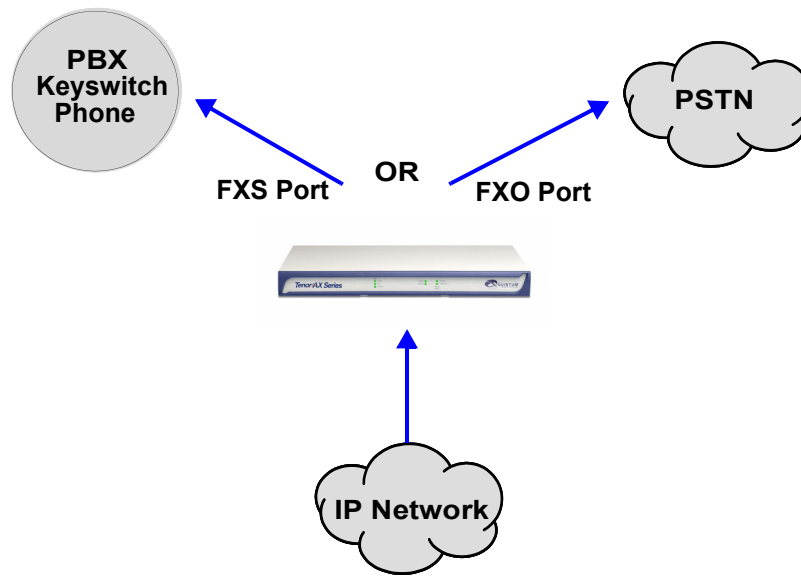
FXO (Line) Originated Calls. A call coming from a Line/FXO interface may be switched to either the data network as a VoIP call, a Line Circuit, or trunk typically for connection to a termination device on the user's premises such as a PBX. The routing decision made by the *Tenor AX* is based upon your configuration and the dialed number. See [Figure 1-5](#) for an example of a call originated from the PSTN.

Figure 1-5 FXO (Line) Originated Calls



IP Network Calls. Calls coming from the IP network data can be routed to the Line/FXO or Phone/FXS interfaces. The Tenor will route calls based upon the dialed number. If the number is configured as a local phone number, the call will be sent to a Phone/FXS circuit for termination, otherwise the call is considered a “Hop-Off call” and the Tenor sends it out through a Line/FXO interface, typically connected to the PSTN. See *Figure 1-6* for an example of a call originated from the IP network.

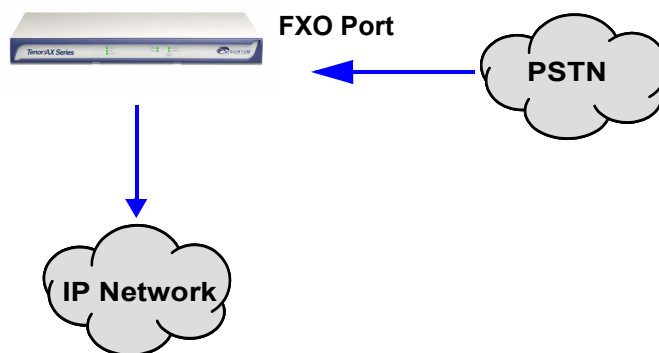
Figure 1-6 IP Network Originated Calls



Tenor AXT Trunking VoIP Gateway (AXT800, AXT1600, AXT2400, AXT4800) Configuration

The Tenor AXT Trunking VoIP Gateway Configuration is used for trunk side PSTN (Line/FXO port) to VoIP connections; calls coming from the Line/FXO interface (i.e. PSTN) may be switched to the data network as a VoIP call. Calls can be routed in any direction between any of the ports. See [Figure 1-7](#) for an example of a call originating from the PSTN.

Figure 1-7 Tenor AXT FXO/Line Originated Call Sample

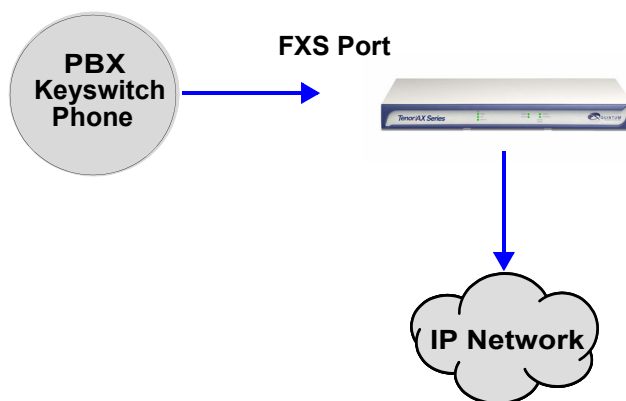


Tenor AXG VoIP Gateway (AXG800, AXG1600, AXG2400) Configuration

The Tenor AXG VoIP Gateway Configuration is used for (Phone/FXS) to VoIP connections; calls coming from the Phone/FXS interface (i.e. PBX) may be switched as a VoIP call. Calls can be routed in any direction between any of the ports. See [Figure 1-8](#) for an example of a call originating from the Phone/FXS side (PBX).

See [Figure 1-8](#) for an example of a call originating from a PBX.

Figure 1-8 Tenor AXG Phone/FXS Originated Call Sample

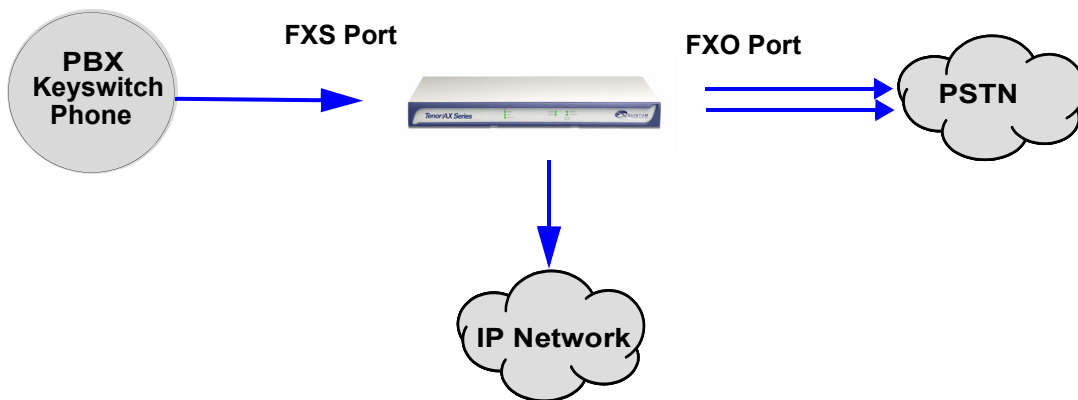


Tenor AXE Enterprise VoIP Gateway (AXE800, AXE1600, AXE2400) Configuration

The Tenor AXE Enterprise VoIP Gateway is mainly intended for applications interfacing between the PBX and the VoIP network, but it also includes two FXO ports for autoswitching PSTN back-up and 911 service provision. The number of VoIP ports is equal to the number of FXS ports. Calls can be routed in any direction between any of the ports.

See [Figure 1-9](#) for an example of a call originating from a PBX.

Figure 1-9 Tenor AXE Phone/FXS Originated Call Sample



Advanced Features/Capabilities

Call Management

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 the 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) with Directory Number patterns.

Dial Plan Options

Public/Private Dial Plan Support. The *Tenor AX* 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 AX* 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 AX* 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 through the *Tenor Configuration Manager* to adjust how the *Tenor AX* 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 AX* 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 to the PSTN. (A hop-off PBX call is a toll call which hops through a private network to reduce or eliminate the toll charge.) They are entered in a Hop-off Number Directory and associated with trunks where matching calls should be sent.

Tenor AX supports those hop-off PBX calls where the destination *Tenor AX* is programmed to route the call to the PSTN. The destination *Tenor AX* unit is configured with the phone numbers to be “supported” for this feature.

H.323 Gatekeeper Services

The *Tenor AX* unit’s built-in H.323 gatekeeper performs IP call routing functions, such as call control and administrative services to another *Tenor AX* 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 AX* 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 AX* units, you can assign one unit as the Gatekeeper for the network. We recommend you configure each as its own gatekeeper.

Tenor AX 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 AX*), 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).

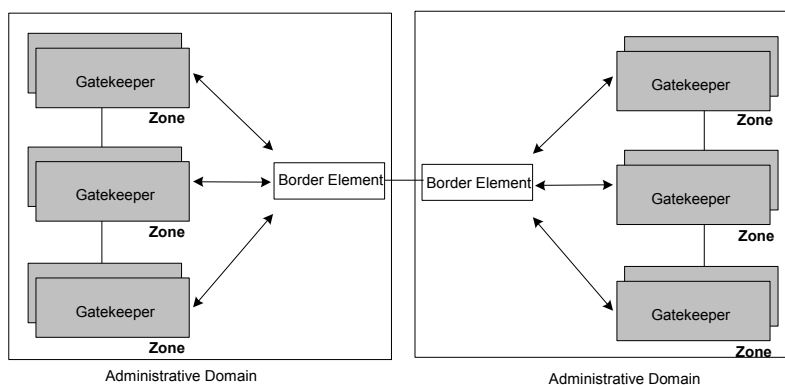
Call Registration. When registration from an H.323 endpoint is complete and a call is originated, the call request is sent to the gatekeeper. The call request provides the Gatekeeper with the dialed number and requests the routing information. The gatekeeper confirms the dialed number and supplies the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

Border Element. The *Tenor AX*’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 AX* 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 AX* unit can use two border elements: primary and secondary. These work together as one entity to provide redundancy and fault tolerance; there are no hierarchical 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 AX* 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.

When configured for SIP the Tenor will act as a SIP User Agent (Endpoint) as defined in IETF RFC3261. Multiple user agents allow for separate agents to be allocated to each SIP call. It will be able to gateway calls to and from the IP network, and Customer Premise Equipment (CPE) such as phones, PBX's, and FAX machines, or the Public Switched Telephone Network (PSTN). The Tenor SIP User Agent will work in conjunction with an external SIP proxy or redirect to route and connect calls over SIP based networks.

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:

- Hardware Description*
- Cables*
- Specifications*

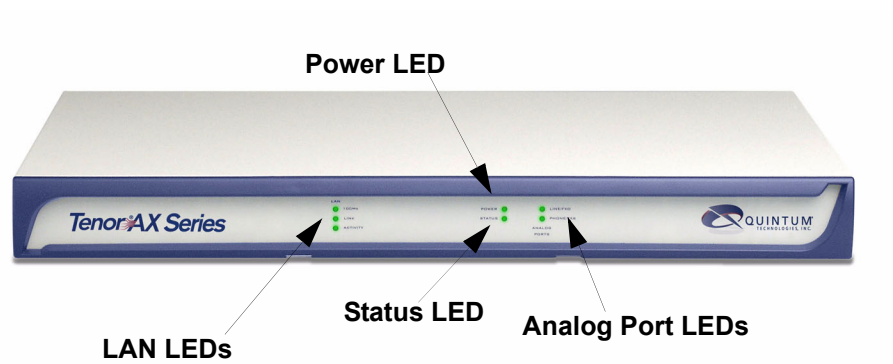
Hardware Description

The *Tenor AX* is a stackable device which provides Phone/FXS and Line/FXO connections as well as connections to the Ethernet LAN and a PC.

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

Front Panel Connections and Reset Options

Figure 2-1 Tenor AX Front Panel



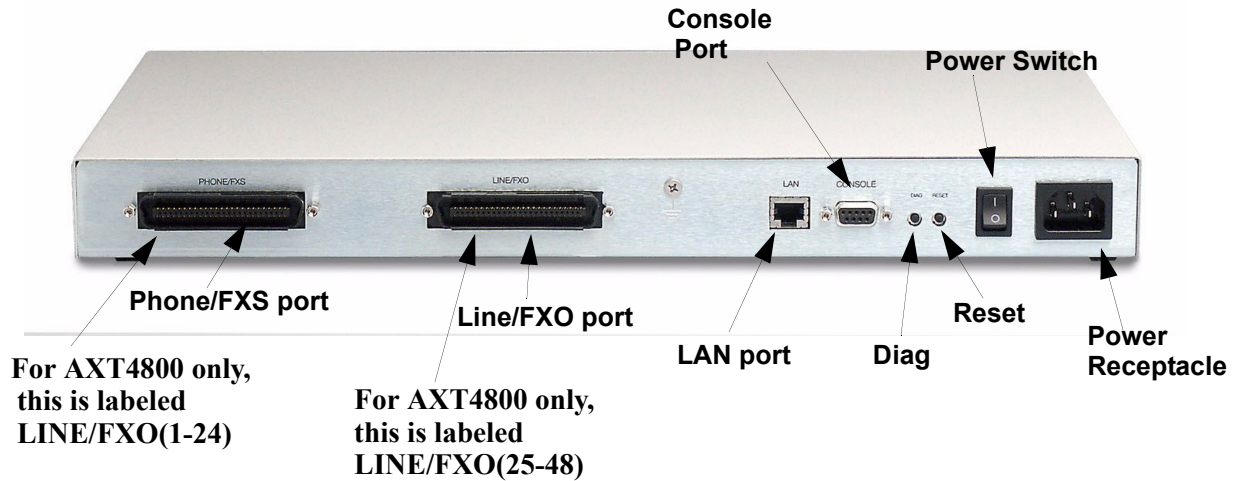
The LEDs display the health of the system. There are different types of LEDs: Power, Status, LAN, and Analog Port. See [Table 2-1](#) for a description.

Table 2-1 Front Panel LEDs Definitions

LED	Label	LED Color	Description
Power	Power	Green	On: Indicates power is on. Off: Power is off.
Status	Status	Green Flashing	Operational Status. Off: Tenor AX is working properly. On: One or more diagnostic tests have failed.
Analog Port	Line/FXO Phone/FXS	Line/FXO LED - Green	On indicates activity is occurring on at least one Line/FXO port.
		Phone/FXS LED - Green	On indicates activity is occurring on at least one Phone/FXS port.

LED	Label	LED Color	Description
LAN	100Mb	Green	On: The advertised link rate is 100Mb if the link is not connected, or the actual link rate is 100b if the link is connected. Off: The advertised link rate is 10Mb if the link is not connected, or the actual link rate is 10Mb if the link is connected.
	Link	Green	On: Link is working properly and there is activity on the line. Off: Link has failed.
	Activity	Green Flashing	On: Indicates there is activity (i.e., transmit/receive) on the line. Off: No activity is occurring.

Back Panel



- **Phone/FXS port.** Provides a 50 Pin Telco connector which supports up to 24 Phone/FXS connections for connecting to the PBX, Keyphone or phones. For the AXT4800, this supports Line/FXO capability, and is labeled **LINE/FXO (1-24)**.
- **Line/FXO port.** Provides a 50 Pin Telco connector which supports up to 24 Line/FXO connections for connection to the Central Office (connection to the PSTN). For the AXT4800, this is labeled **LINE/FXO (25-48)**.
- **LAN port.** 10/100 Base-T Ethernet port. This port provides an RJ-45 jack for 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.

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



Table 2-2 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

Pin #	Signal	Definition	Color
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 8N1, without flow control. The input/output signals are listed in [Table 2-3](#).

Figure 2-3 DB-9 Female Connector Pin Order

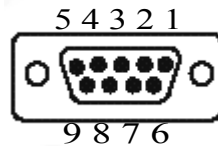


Table 2-3 Serial RS232 DB-9 Connector Pinouts

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

- **Diag.** Enables you to perform software diagnostic procedures.
- **Reset.** Enables you to reset the system. See [Chapter 4: Advanced Topic: Diagnostics/Maintenance](#) for more information.
- **Power Switch.** Switch to turn power on and off.
- **Power Receptacle.** Connection port for connection to an AC outlet for power.

Cables

The cables listed in [Table 2-4](#) are required to connect a *Tenor AX* to various interfaces. Contact Quintum for ordering information, if necessary.

Table 2-4 Cables Supported

Cable	Usage
50-Pin Telco Connector	Connection to FXO/Line Connection to FXS/Phone
RJ-45 Ethernet cable	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.

50-Pin Cable

The 50-pin Telco shielded cable connection pinouts and wire colors are given in this section to help you identify the proper specifications for connection to the FXO/Line and FXS/Phone ports.

For the 50-pin Telco cable, terminate only one end with a Female, AMP 50-pin Telco Connector with 180 degree entry. Cable must consist of 25 twisted pairs color coded per [Figure 2-4](#) and be of 22 or 24 AWG copper wire.

Figure 2-4 50-Pin Cable Connector Specifications

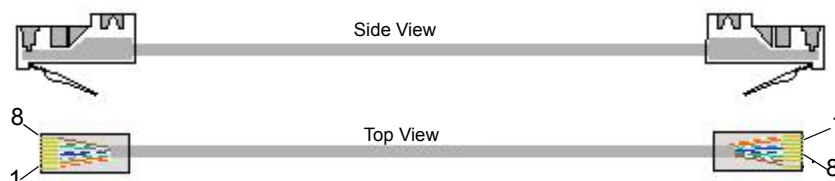
Connector Pin #	Wire Color	Wire Color w/ Band Color	DSO #/s	Pin #/s	Tip wire	Ring wire	
1	Blue / White		1	1 & 26	26	1	Slot 1 line 1
2	Orange / White		2	2 & 27	27	2	Slot 1 line 2
3	Green / White		3	3 & 28	28	3	Slot 2 line 1
4	Brown / White		4	4 & 29	29	4	Slot 2 line 2
5	Slate / White		5	5 & 30	30	5	Slot 3 line 1
6	Blue / Red		6	6 & 31	31	6	Slot 3 line 2
7	Orange / Red		7	7 & 32	32	7	Slot 4 line 1
8	Green / Red		8	8 & 33	33	8	Slot 4 line 2
9	Brown / Red		9	9 & 34	34	9	Slot 5 line 1
10	Slate / Red		10	10 & 35	35	10	Slot 5 line 2
11	Blue / Black		11	11 & 36	36	11	Slot 6 line 1
12	Orange / Black		12	12 & 37	37	12	Slot 6 line 2
13	Green / Black		13	13 & 38	38	13	Slot 7 line 1
14	Brown / Black		14	14 & 39	39	14	Slot 7 line 2
15	Slate / Black		15	15 & 40	40	15	Slot 8 line 1
16	Blue / Yellow		16	16 & 41	41	16	Slot 8 line 2
17	Orange / Yellow		17	17 & 42	42	17	Slot 9 line 1
18	Green / Yellow		18	18 & 43	43	18	Slot 9 line 2
19	Brown / Yellow		19	19 & 44	44	19	Slot 10 line 1
20	Slate / Yellow		20	20 & 45	45	20	Slot 10 line 2
21	Blue / Violet		21	21 & 46	46	21	Slot 11 line 1
22	Orange / Violet		22	22 & 47	47	22	Slot 11 line 2
23	Green / Violet		23	23 & 48	48	23	Slot 12 line 1
24	Brown / Violet		24	24 & 49	49	24	Slot 12 line 2
25 (Unused)	Slate / Violet		N/A	25 & 50	Un-used	Un-used	Un-used
26	White / Blue						
27	White / Orange						
28	White / Green						
29	White / Brown						
30	White / Slate						
31	Red / Blue						
32	Red / Orange						
33	Red / Green						
34	Red / Brown						
35	Red / Slate						
36	Black / Blue						
37	Black / Orange						
38	Black / Green						
39	Black / Brown						
40	Black / Slate						
41	Yellow / Blue						
42	Yellow / Orange						
43	Yellow / Green						
44	Yellow / Brown						
45	Yellow / Slate						
46	Violet / Blue						
47	Violet / Orange						
48	Violet / Green						
49	Violet / Brown						
50 (Unused)	Violet / Slate						

NOTE: Slot 1 is closest to the 50 Pin Telco bulkhead connector on the chassis.

RJ-45 Ethernet Cable (10/100)

The 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



An RJ-45 (10/100BaseT) straight through cable is used to connect Tenor AX to an Ethernet LAN. Cable pinouts are listed in [Figure 2-6](#). Color specifications are applicable to the RJ-45 cable provided.

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

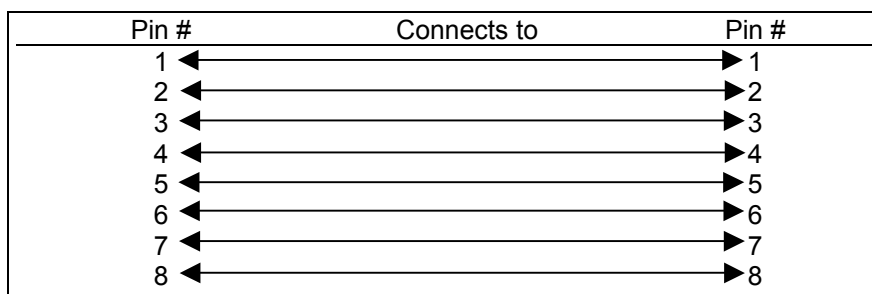


Table 2-5 RJ-45 (10/100BT) Connector Pinouts

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

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 AX* to your PC's asynchronous serial port. The pin order for DB-9 male and female connectors are shown in *Figure 2-7* and *Figure 2-8*.

Figure 2-7 DB-9 Male Connector Pin Order

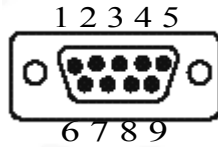


Figure 2-8 DB-9 Female Connector Pin Order

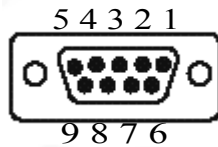


Figure 2-9 DB-9 Connector Pinouts

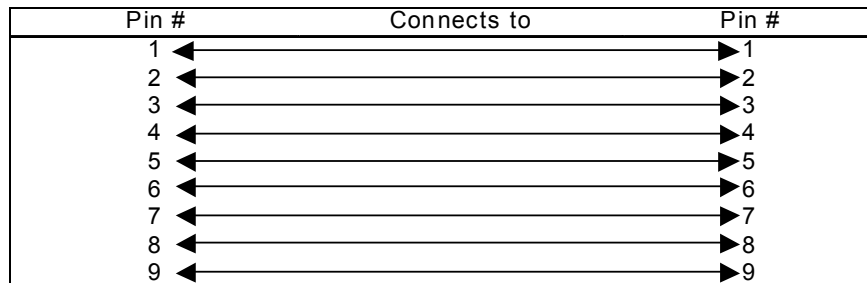


Table 2-6 DB-9 Connector Pinouts

Pin #	Function	Description	Pin #
1	DTR	Data Terminal Ready	1
2	TXD	TransmitData	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:	FXO/FXS/IP
Voice Algorithms:	G.723.1A (5.3, 6.3 Kbps), G.726 (16, 24, 32, 40 Kbps), G.729A, G711
Fax Support:	Group III at 2.4, 4.8, 7.2, 9.6, 12, 14.4 Kbps
Automatic Call Detection:	Voice/Modem/Fax

PSTN/PBX Connections

Interface:	Analog, FXO Interface (PSTN side), FXS Interface (PBX side)
Connector:	50-PIN Telco
Ringing Voltage:	Adjustable/Country-specific
Ringing Cadence:	Adjustable/Country-specific
Maximum Loop Current:	24 mA
Ringer Equivalence Number:	3 up to 1000 feet of 24 AWG or heavier
Ringing Frequency:	Adjustable/Country-specific

LAN Connection

LAN Support:	10/100 Mbps Ethernet
Connection Type:	Autosensing of speed and duplex

Physical

Position:	19" (48.7 cm) rack mountable, desktop stackable, wall-mountable
Depth:	10 3/4" (27.6 cm)
Length:	17 3/8" (44.5 cm)
Height:	1 3/4" (4.5 cm)
Weight:	10 lbs (4.55 kg)

Electrical

Ethernet:	Standard 10/100Base-T RJ-45 interface (IEEE 802.3)
Connectors:	50-pin Telco Connector for FXO connection 50-Pin Telco Connector for FXS connection
Console Port:	RS-232/DB-9 Female
Power:	AC Power at 100-240 volts and 50-60 Hz, 70 Watts max

Environmental

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

Chapter 3: Installation/Basic Troubleshooting

This chapter gives you installation instructions, as well as how to position the *Tenor AX* successfully within your network. In addition, basic troubleshooting techniques are included.

Specifically, the following topics are covered:

- Installation*
- Connect to Phone/FXS*
- Connect to Line/FXO*
- Connect to Ethernet LAN*
- Connect to PC*
- Power up the System*
- Assign IP Address*
- Common Troubleshooting*

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, our 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 [Chapter 2: Hardware Components](#).
- Avoid exposing the unit to excessive vibrations.
- Ensure no equipment is put on top of the unit.
- Ensure there is clearance between the fan intake/exhaust on the side of the unit to avoid airflow being blocked.

Inspect Package Contents

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

- Tenor AX and Mounting Hardware
- 1 AC Power Cable
- 1 DB-9 RS-232 Serial Cable
- RJ-45 Cable
- 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 AX* unit within the same area as your PBX, Ethernet hub, switch, router, and/or PSTN patch panel. The unit 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 unit are the screws 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 (not included with system)
- #8 - 32 x 3/8 screws (qty: 2) (included with system)
- screws as required by your rack manufacturer

Install the unit in a rack as follows:

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



WARNING: If the 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 and follow the vendor specific instructions for rack installation. The screws provided require a Phillips #2 screwdriver.
3. Ensure the unit is secured firmly to the rack.

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

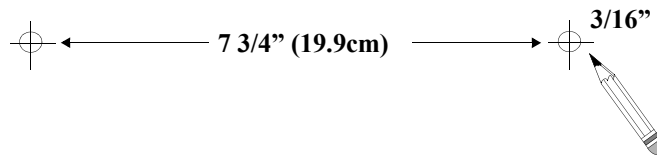
Attach the unit to the wall as follows:

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



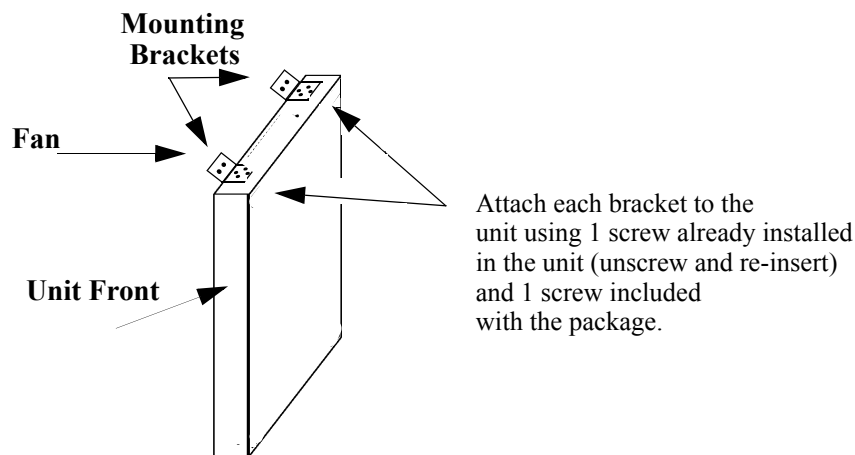
NOTE: Ensure the unit is level.

Figure 3-1 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 3-2*.
3. Position and attach the other mounting bracket using a screw existing in the system and the remaining screw in the package. See *Figure 3-2*.

Figure 3-2 Wall Mount Installation



Note: Ensure unit is level.

Note:

The fan needs to be pointed up (when viewed from the front of the unit, the fan is on the left)

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.

Preparing the Single-ended or Double-ended Telco Cable

Depending on your order, you will have received either a double-ended or a single-ended 50-pin Telco cable. Follow these steps for preparing and installing the cables.

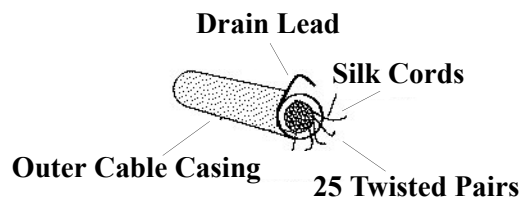
Single-ended 50-pin Cable

If you have ordered a single-ended shielded 50-pin Telco cable, you must prepare it for use with your specific application.

At the opposite end from the 50-pin connector, the cable is taped off. Follow this procedure.

1. Cut into the outer cable casing approximately two inches from the taped off end, and cut lengthwise toward the taped end of the cable. Spread the outer casing to expose the following elements:
 - foil shielding, containing the bundle of 25 twisted pairs.
 - silver braided drain lead
 - silk cords

Figure 3-3 Cross-section of Cut Cable



2. Gather the silk cords and pull back along the cut end of the casing to expose the desired length.
3. Trim back the outer casing, the foil shielding, and the silk cords to fully expose the 25 twisted pairs.
4. Cut the drain lead and twisted pairs past the point of the initial cut into the cable casing. This will prevent the use of any wires that may have been nicked in the initial cut.
5. Terminate the drain lead to an appropriate earth ground.
6. Terminate the twisted pairs to the customer-specific connections (see [Figure 2-4](#) for the color-coded 50-pin cable specification).
7. Ensure the screws on the opposite end are hand-tightened (do not overtighten).

Double-ended 50-pin Cable

1. Ensure that the screws are hand tightened at both ends, including the termination end (do not overtighten).

Connect to Phone/FXS Interface

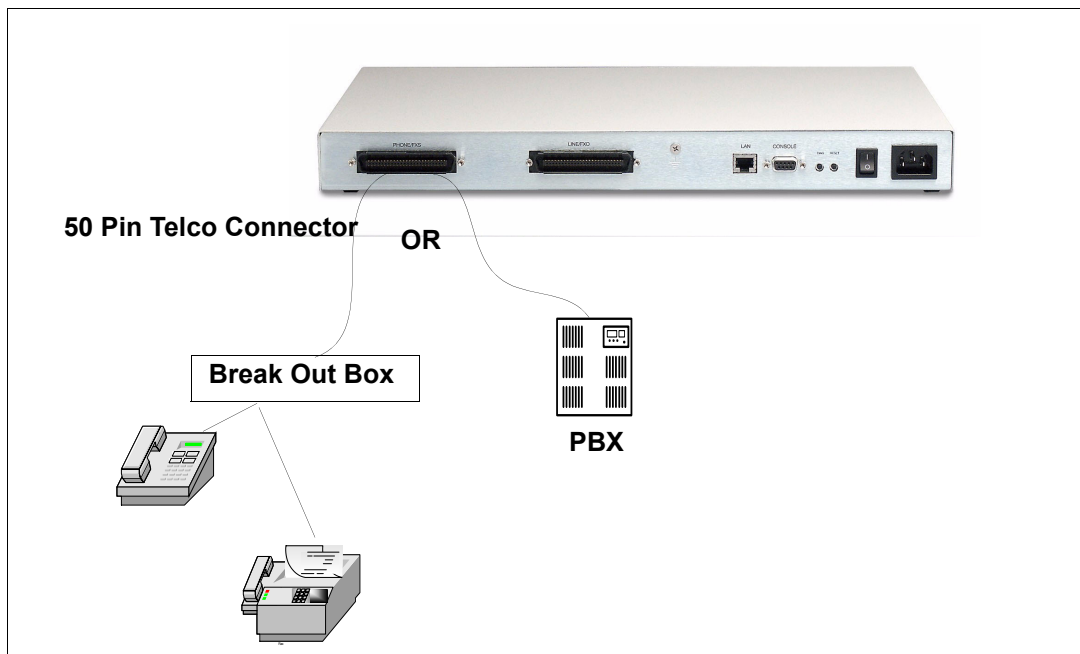


NOTE: For the AXT4800 product only, the Phone/FXS port interface has FXO capability, and is labeled “LINE/FXO (1-24)”.

Since there are many different PBX devices, key systems, fax machines and phones you can connect to the *Tenor AX*, the instructions which follow explain the general procedure for connecting an external device to the Phone/FXS port through the 50-pin Telco connector. Use the phone/FXS ports for on-premise wiring only.

A double ended Telco cable connects to PBXs or phone systems that are equipped with the appropriate 50-pin Telco interface. An un-terminated cable can be used with a break out box or another type of termination device specific to your needs. See [Chapter 2: Hardware Components](#) for the 50-pin connector pinouts you can use to acquire another cable or adaptor that may be required to connect to the specific external device (i.e., PBX).

Figure 3-4 Connect to Phone/FXS port



Connect to Phone/FXS port as follows:



CAUTION: Connect the Phone/FXS ports to a telephone, fax machine, PBX or key system only. Connecting to other devices/networks (i.e., telephone wall jack) will cause damage to the unit.

The instructions below assume you are using a double ended 50-pin Telco cable. See [Chapter 2: Hardware Components](#) for pinout information.

1. Plug one end of the 50-pin Telco cable into the port labeled *Phone/FXS*.

2. Insert the other end of the 50-pin Telco cable into the appropriate port on the PBX, key system, or another device that connects interfaces, such as a break out box. For the PBX connection, see your PBX documentation port requirements for connection specifics.

Connect to Line/FXO Interface



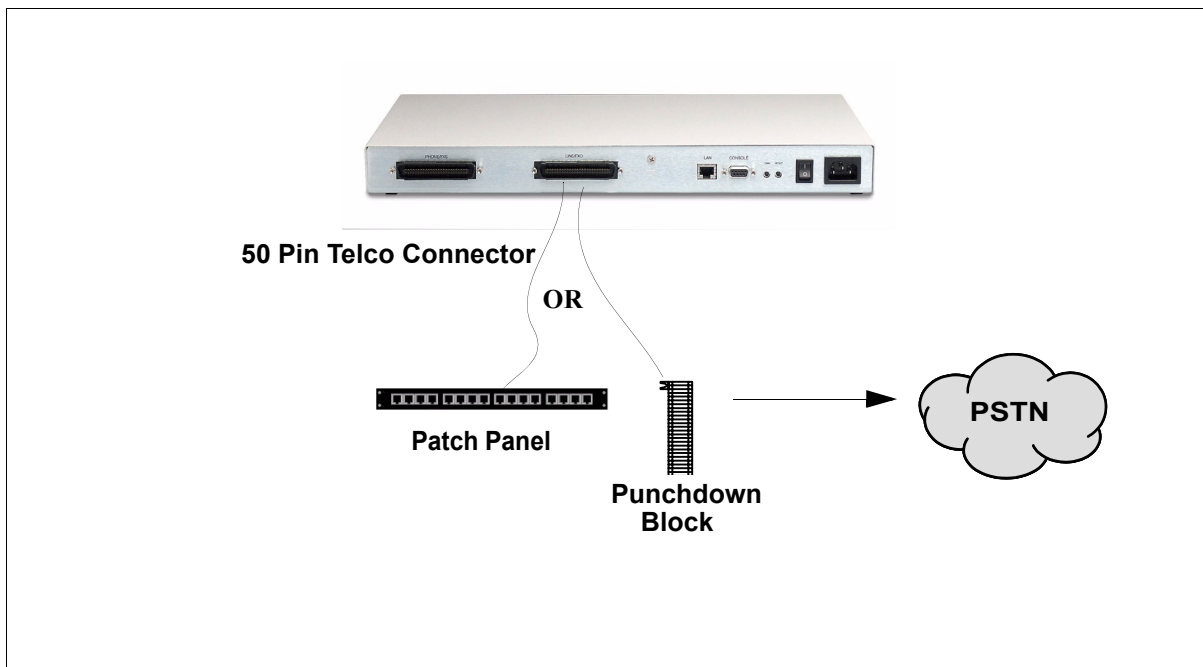
NOTE: For the AXT4800 product only, the Line/FXO interface is labeled “LINE/FXO (25-48)”.

To connect to the Line/FXO port, you must first connect the analog phone lines to another piece of equipment that houses your telephone lines running to the PSTN, such as the patch panel, punch down block or wire wrap blocks. If you are unsure of the installation procedures, contact the network administrator or review the documentation you received with the PBX.

A double ended Telco cable connects to PBXs or phone systems that are equipped with the appropriate 50-pin Telco interface. An un-terminated cable can be used with a punchdown box or another type of termination device specific to your needs.

See [Chapter 2: Hardware Components](#) for the RJ-11 cable pinouts you can use to acquire another cable or adaptor that may be required to connect to the specific external device.

Figure 3-5 Connect to Line/FXO Interface



1. Plug one end of the 50-pin Telco cable into the ports labeled Line/FXO. See [Chapter 2: Hardware Components](#) for cable pinouts.
2. Connect the other end of the 50-pin Telco cable into the networking equipment (i.e., patch panel) which houses your telephone lines.

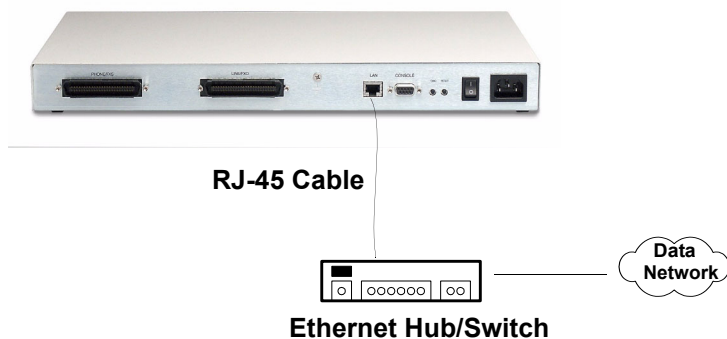


NOTE: Connecting to the patch panel may require trained telephone personnel.

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 AX*.

Figure 3-6 Connect to Ethernet Hub/Switch

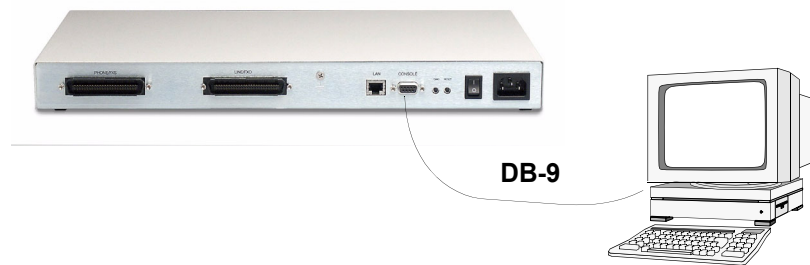


1. Plug one end RJ-45 Ethernet cable into the port labeled *LAN*.
2. Plug the other end of the cable into one of the Ethernet hub/switch ports. If a custom cable or adapter is required, see [Chapter 2: Hardware Components](#) for Ethernet RJ-45 10/100.

Connect to PC Console

You will need to connect the *Tenor AX* 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 console port (see your PC documentation for more information about this port).

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

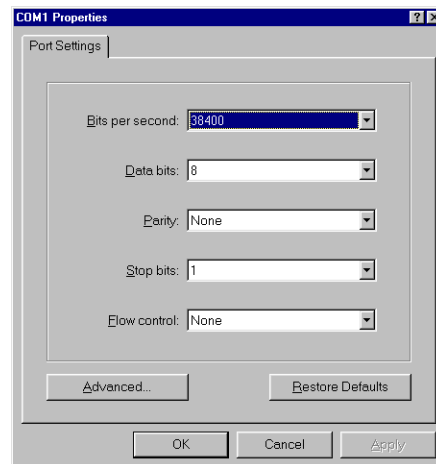
Before you can configure the *Tenor AX*, you need to assign a valid IP address. An IP address is a 32 bit (up to 12 numeric characters) address used to identify each network device in the TCP/IP network. If the unit does not have an IP address, data will not be able to be sent to or from the unit.

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.

1. Press the *Tenor AX*'s power switch to **On**.
1. Click on *Start > Programs > Accessories > Communications > HyperTerminal > Run*. The *Connection Description* window will be displayed.
2. Enter a connection name (i.e., name for each unit such as *Tenor AX New Jersey*).
3. Click **Ok**.
4. 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 3-8](#).

Figure 3-8 Port Settings Window



5. From the *Bits Per Second* drop down list box, choose 38400.
6. From the *Data Bits* drop down list box, choose 8.
7. From the *Parity* drop down list box, choose *None*.
8. From the *Stop bits* drop down list box, choose 1.

9. From the *Flow control* drop down list box, choose *None*.
10. Click **Ok** and a connection to the Tenor will be established. Information about the unit will scroll on the screen.
11. Enter **login** and **password**. Both are **admin** by default.
12. A message will appear on the screen “Tenor Analog does not have an Ethernet interface configured. Would you like to configure an Ethernet Interface?” (y/n).
13. Type **y**.
14. For *IP Address*, enter the IP address for the Tenor unit.
15. For *Subnet Mask*, 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.
16. For *Default Gateway*, choose whether there should be a default gateway (router) which routes packet data outside of your LAN and enter its IP address.
17. A message will appear on the screen “Tenor Analog Ethernet Interface successfully configured.” The Tenor will restart using the new Ethernet settings.”

Tenor will restart using the new Ethernet settings.

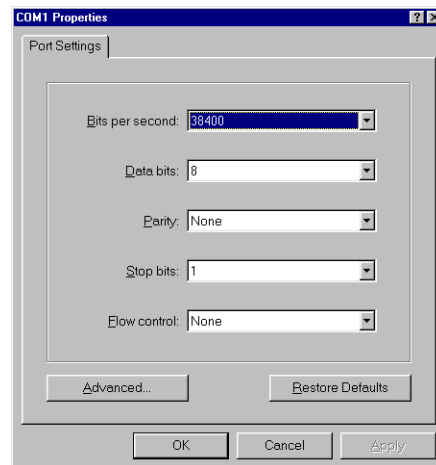
Change IP Address

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 AX*'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 AX 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. Press the *Tenor AX* 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.

Once the IP information is set, you are ready to configure the unit. See the *Tenor Configuration Manager/Tenor Monitor User's Guide* and *Command Line Interface (CLI) User Guide* for specifics. Both documents are on the CDR ROM you received with the unit or you can download the latest documentation from www.quintum.com.

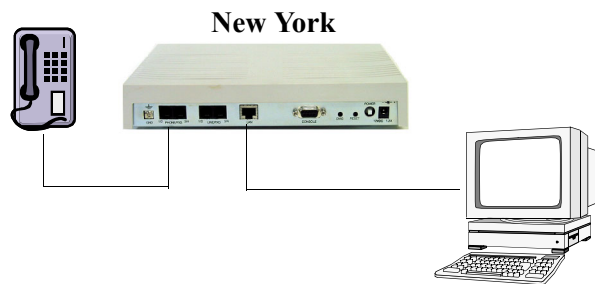
Getting Started with Configuration/Making the First Call

This section includes basic information for making the first call using VoIP and a Tenor AX; for an example, this call will enable you to dial Quintum Technology's test unit and hear a recorded message. Once you have accomplished that, you can modify the configuration to meet your own specific needs.

For future calls, if you require detailed configuration information, see the *Tenor Configuration Manager/Tenor Monitor User's Guide* and *Command Line Interface (CLI)* guide for detailed configuration information (both documents are located on the CDR ROM you received with the unit or you can download the latest documentation from www.quintum.com).

If you are using a cable modem, or a DSL modem and a firewall, specific instructions are included in this section. When configuring a firewall, set up a DMZ (this makes the firewall act as a switch so that all incoming IP traffic for the firewall's WAN IP will be routed directly to the Tenor AX). If you are using a cable modem with No firewall, specific configuration options are also included.

Figure 3-10 Making the First Call



These instructions assume the unit is taken right from the box and in the default state from the factory, and basic connections are made. See below for a list of prerequisites that must be met before making a call from the Tenor.

- An analog phone connected to the port labeled FXS.
- A connection between the Tenor's port labeled *Console* and your workstation's serial console port. See [Installation](#).
- *Tenor Configuration Manager* software is loaded on your workstation.
- Through HyperTerminal, you have configured an Ethernet Interface by assigning an IP Address, Subnet Mask, and Default Gateway (see [Assign IP address](#) for more information).

Execute the first call as follows:



NOTE: If the call does not connect or you encounter a problem, see [Common Symptoms/Problems](#) or [Chapter 4: Advanced Topic: Diagnostics/Maintenance](#) for possible solutions.

1. Start the *Configuration Manager*.

2. At the prompt, enter the **IP address** for your unit and enter the default login and password (**admin/admin**).
3. At the *Phone(FXS)/Line(FXO)> AnalogInterface-Line* screen, enable all four lines (or two lines, depending upon the unit type) under **FXO Channel Assignment**. Click on **Confirm/OK**.
4. At the *System-Wide Configuration> Dial Plan* screen, enter an **Area Code** (default is 732) and check **Use 10 Digit Local Dial**. Click on **Confirm/OK**.

Allows the unit to use the 732 area code for its call without having to dial a “1”.

5. At the *System-Wide Configuration> Time Server* screen, set the **Primary Time Server IP Address** to a standard Time Server IP Address. This is not a required entry for the first call, but it is a good idea to set it at this point.

Set the **Secondary Time server IP Address** to a standard Time Server IP Address.

Set the **UTC Offset** to -5 hours.

Click on **Confirm/OK**.

6. At the *VoIP Configuration> Gatekeeper/Border Element* screen, set the **Primary Border Element IP Address** (i.e., 12.176.187.080 for Quintum’s test unit). Click on **Confirm/OK**.
7. At the *VoIP Configuration> H323 Signaling Group* screen, set the **Primary Gatekeeper IP** (i.e., 208.226.140.40 for Quintum’s test unit) Click on **Confirm/OK**.

Allows the unit to get the information it needs to route your phone call to a specific IP address.

8. At the *System-Wide Configuration> Circuit Configuration> Line Routing Configuration> Hunt LDN Directories> Hunt LDN Directory-pub 1* screen, enter a **pattern**. (i.e., 10 digit phone number that will be assigned to the phone on your end). Click on **Confirm/OK**.

This provides the Gatekeeper with a phone number designation for your unit.

For use with a Cable Modem or DSL Modem and a Firewall only

9. At the *Ethernet Configuration> Ethernet Interfaces> Ethernet Interface-1* screen and enter the **External NAT IP** (this is the IP that the service provider assigns to the firewall WAN port). Click **Confirm/OK**. This was tested with a Linksys™ firewall. Other types may work as well and should be configured similarly.

For use with a Cable Modem and No Firewall only

10. At the *Ethernet Configuration> Ethernet Interfaces> Ethernet Interface-1* screen, check the **Enable DHCP** box. Click **Confirm/OK**.

This provides a way for your service provider to assign an IP to your unit which can then be reached by the Gatekeeper on the public internet.

11. Submit all changes (through *File>Submit Changes*).

12. Pick up the phone and hear dial tone. Dial 7324609000. The call should route to Quintum's test unit and you should hear a recorded message.

When you dial 7324609000 (ten-digits), your unit (the Gateway) consults the Gatekeeper's table of phone number to IP translations (the Gatekeeper is an application or function inside the test Gateway at 12.176.187.080), and sends the appropriate data to the other endpoint (in this case, the Quintum test unit). The Gateway is merely another function or application of 12.176.187.080. The Gateway functions allow the incoming call to be connected to Quintum's PBX.

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.

Common Symptoms/Problems

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.
- Verify that all RJ-45, 50-pin Telco connectors, and DB-9 cables fit snugly in each back 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.

Below is a list of common symptoms and problems you may encounter. Use this list as a guideline; if your problem is not listed, see [Chapter 4: Advanced Topic: Diagnostics/Maintenance](#).

Table 3-1 Common Symptoms/Problems

Common Symptom/Problem	Description/Solution
Unit will not turn on.	Check AC power source.
Communication between <i>Tenor AX</i> and the FXO or FXS cannot be established.	<p>There are several reasons why communication may not be successful. A few of the most common are listed below.</p> <p>Verify correct 50-pin Telco cables are installed in the Phone/FXS and Line/FXO ports.</p> <p>Ensure the unit is on.</p> <p>Network issues may cause a number of problems. Contact the Central Office to perform test procedures.</p>
Communication with <i>Command Line Interface (CLI)</i> cannot be established using Telnet.	<p>The IP address of the <i>Tenor AX</i> unit may be incorrect. Check Ethernet cable.</p> <p>Verify the IP address of <i>Tenor AX</i>. Check the Default Gateway Subnet Mask. Check Ethernet connection via RS-232 connection.</p> <p>Verify network connectivity using <i>ping</i> from another network host.</p>
Communication with Ethernet Hub, or switch cannot be established.	<p>Verify RJ-45 cable is firmly installed in the Ethernet port.</p> <p>Check MDI/MDIX configuration. Check duplex setting on the switch in which they were connected and the speed of 10MB or 100 MB.</p>

Common Symptom/Problem	Description/Solution
Communication between computer's COM port and <i>Tenor AX</i> 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.
<i>Tenor AX</i> cannot receive or transmit calls.	Ensure FXO/FXS ports are working correctly. Generate alarm list for more information. Contact Central Office for interface issues.

Chapter 4: Advanced Topic: Diagnostics/ Maintenance

This chapter explains the advanced topics for monitoring alarms and performing maintenance/diagnostic procedures.

- Monitor LEDs*
- Monitor Alarms*
- Verify Unit Provisioning*
- Perform Maintenance Procedures*
- Finding Additional Help*

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. Check [Chapter 2: Hardware Components](#) to ensure the correct lighting of each LED. If the LEDs are not lighting at all, check the AC power source to ensure power is being supplied to the unit.

Monitor Alarms



NOTE: Information for accessing alarms through CLI's Alarm Manager is included in this chapter; see the *Tenor Configuration Manager/Tenor Monitor User's Guide* for information about accessing alarms through the *Tenor Monitor*.

Alarms are brief text messages that appear on your workstation when the *Tenor AX* unit encounters a problem, such as a failed interface, disconnected call, etc. There are two ways to view alarms for the *Tenor AX* unit: through the *Command Line Interface (CLI)* or through *Tenor Monitor*. Alarms help you identify where a specific problem is occurring with the *Tenor AX* unit.

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 4-1](#).

Table 4-1 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).
Description	A text description of the alarm; see Table 4-2 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 functions.
Device #	Defines which device the alarm occurred on.	Always device 0.
Analog Interface	Defines which interface (line) alarm occurred on.	1 = PBX 2 = PSTN
Channel #	Specifies which channel the alarm occurred on.	Channels 1-4.
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 4-2 List of Valid Alarms

Severity (appears as part of severity field)	Alarm Description (text appears in desc field)	Definition
Critical	Loss of signal	A loss of signal (32 consecutive zeros) at least once during a 1 second period.
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	<i>Tenor AX</i> Chassis reset	The unit has reset.
Critical	Configuration Data Missing	Configuration via CLI is missing. Check the configuration data and add the necessary information.
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 accidentally, 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 responds or the RADIUS server is disabled via CLI.

Severity (appears as part of severity field)	Alarm Description (text appears in desc field)	Definition
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	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.

Severity (appears as part of severity field)	Alarm Description (text appears in desc field)	Definition
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.

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 [Valid Alarms](#) for field definitions.

Figure 4-1 Alarm sample

IP#	Sequence#	Type#	Severity#	Desc#	Slot#	Device#	Analog	Interface#	Channel#	Date/Time
192.166.28.230	944	ALR	3	Border Element connection lost	0	0	0	0	0	TUE OCT 14 14:05:27 2004
192.166.28.230	946	RPT	4	Gatekeeper status (Gatekeeper(0.0.0.0) removed)	0	0	0	0	0	TUE OCT 14 14:05:27 2004
192.166.28.230	947	CLR	3	Border Element connection lost	0	0	0	0	0	TUE OCT 14 14:05:27 2004

Display Active Alarms

You are able to display all active alarms as follows:

1. Through CLI, access the *Monitor* prompt.
2. Type *alarm a*. The active alarms will be listed. See section *Valid Alarms* for field definitions. If you enter *alarm* without a command following it, both active alarms and the alarm history will be displayed.

Figure 4-2 Active Alarm Sample

IP#	Sequence#	Type#	Severity#	Desc#	Slot#	Device#	Analog	Interface#	Channel#	Date/Time
192.166.28.230	944	ALR	3	Border Element connection lost	0	0	0	0	TUE OCT 14	14:05:27 2004

Display Alarm History

1. Through CLI, access the *Monitor* prompt.
2. Type *alarm h*. An alarm history will be displayed. See section *Valid Alarms* for field definitions. If you enter *alarm* without a command following it, both active alarms and the alarm history will be displayed.

Figure 4-3 Alarm History Sample

IP#	Sequence#	Type#	Severity#	Desc#	Slot#	Device#	Analog	Interface#	Channel#	Date/Time
192.166.28.230	944	ALR	3	Border Element connection lost	0	0	0	0	TUE OCT 14	14:05:27 2004
192.166.28.230	945	RPT	4	Gatekeeper status (Gatekeeper(192.168.20.175) removed)	0	0	0	0	TUE OCT 14	14:05:27 2004
192.168.20.175	946	RPT	4	Gatekeeper status (Gatekeeper(0.0.0.0) removed)	0	0	0	0	TUE OCT 14	

Verify Unit Provisioning

An error with *Tenor AX*'s provisioning may cause a number of problems. It may be a simple error, such as an incorrect IP address or telephone number. See the *Command Line Interface (CLI)* guide or the *Tenor Configuration Manager/Tenor Monitor User's Guide* for provisioning information.

Maintenance Procedures

The following are advanced maintenance procedures you can perform through the *Command Line Interface (CLI)* or through the *Tenor Configuration Manager*. See the applicable user documentation you received with the unit for detailed information.



NOTE: The instructions below are given for the *Command Line Interface (CLI)*. You can also accomplish the tasks through the *Tenor Configuration Manager*. See the user documentation you received with the unit for detailed information.

Restore Factory Defaults

A factory default is a default setting that is configured in the factory before the unit is shipped. We do not advise that you reset the system back to factory defaults unless advised to do so or if your system becomes corrupted.

If you choose to restore the factory defaults, all current configuration will be deleted, including your password. Restoring factory defaults does not change or delete the Tenor's IP address, subnet mask or default gateway; you will still be able to communicate with the unit after a reset.

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

1. Access the CLI through a Telnet session. See the *Command Line Interface (CLI)* guide 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

The Reset system feature enables you to reset the system, including hardware and software. You can reset the system through the unit's Back Panel or through the *Command Line Interface (CLI)*.

Back Panel. Use a blunt, thin object to press in the *Reset* button, located on *Tenor AX*'s front panel. The system will reset.

Command Line Interface (CLI). You can reset the system through the *Command Line Interface (CLI)* as follows:

1. Access the CLI through a Telnet session. See the *Command Line Interface (CLI)* guide for more information.
2. Access the *Maintain-MasterChassis-1#* prompt.

3. Type *reset*. 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).

Change Password

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

1. Access the CLI through a Telnet session. See the *Command Line Interface (CLI)* guide 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 was 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 the *Command Line Interface (CLI)* guide 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 06/14/04/22:14:00**. 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 AX* 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 AX* will automatically switch the call to PSTN.

B

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

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

C

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 AX* unit via telnet connection.

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

D

DB-9. Serial RS-232 9-pin male connector (with RS-232 interface) is used to connect the *Tenor AX* to your PC's asynchronous serial port.

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

E

ESD. Electrostatic Discharge occurs as a result of im-

properly 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 AX* 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.

F

FXO port. Provides an RJ-11 jack for connection to the Central Office to provide direct connection to the PSTN.

FXS port. Provides an RJ-11 jack for connection to a PBX, Keyphone or phone.

G

Gatekeeper. See *H.323 Gatekeeper*.

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 AX* 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 unit and other components of the system. LEDs appear on the chassis and other components.

P

PacketSaver. A packet multiplexing technology which reduces the amount of IP bandwidth required 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).

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 AX* to an Ethernet.

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. 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.

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

T

TCP/IP. Transmission Control Protocol/Internet Protocol. TCP/IP is a standard communications protocol divided into seven layers of activity. Each layer defines a different aspect of how two devices should talk to each other (i.e., when a network device should send/receive data). For example, layer one is the physical means of communications (e.g., modem), whereas layer 3 is the network type (e.g., Internet). For TCP/IP, it is a combination of two layers of communication protocol. TCP (layer 4) does the actual transport of data; IP (layer 3) sets the rules for moving the data from one end of the network to another. TCP/IP uses an IP address to identify a location for specific network devices.

Tenor Configuration Manager. A GUI which enables you to configure all functions in the *Tenor AX*.

Tenor Monitor. A GUI which provides a set of utilities to monitor the network and all system components.

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.

INDEX

Numerics

- 50-pin cable
 - prepare double ended **3-5**
 - prepare single ended **3-5**

A

- About this guide **1-1**
- Alarms **4-2**
 - display via CLI **4-6**
 - field definitions **4-2**
 - list of **4-4**
 - monitor **4-2**
- AXE **1-2**

B

- Back panel
 - diag **2-5**
 - LAN port **2-4**
 - Line/FXO port **2-4**
 - Phone/FXS port **2-4**
 - power receptacle **2-5**
 - power switch **2-5**
 - reset **2-5**
- Bypass DN **1-12**

C

- Cables **2-6**
 - 50-Pin **2-7**
 - AC power cord **2-6**
 - DB-9 **2-10**
 - RJ-45 **2-9**
- Call **1-7**
- Call management
 - public/private dial plan **1-12**
 - trunk group support **1-7**
- Capabilities
 - IVR/Radius **1-6**
 - NATAccess **1-6**
 - routing table options **1-12**
 - SNMP **1-5**
- CDR **1-6**
- Configuration **3-16**
- Connection
 - line interface (PBX) **3-6**

D

- DB-9 **2-10**

F

- factory defaults
 - restore **4-9**
- Features **1-4**
 - advanced **1-12**
 - easy connect **1-4**
 - GUI and network management **1-4**
 - IVR/RADIUS **1-6**
 - PacketSaver **1-5**
 - SelectNet **1-5**
 - system monitoring **1-4**
 - unique design **1-4**
- First Call **3-16**
- Front panel
 - ports 1-8 **2-2**
 - reset **2-2**
- FXO Calls **1-8**
- FXS Calls **1-8**

H

- H.323 **1-13**
 - border element **1-13**
 - call registration **1-13**
 - call services **1-14**
 - gatekeeper **1-13**
 - zone management **1-13**
- Hardware
 - back panel **2-4**
 - console port **2-5**
 - description **2-2**
 - front panel **2-2**
- Help **1-4**
 - finding **1-4**
- Hopoff Local DN **1-12**
- Hop-off PBX **1-13**
- Hunt LDN **1-12**

I

- Installation **3-2**
 - ethernet **3-9**
 - guidelines **3-2**
 - Line/FXO port **3-8**
 - package contents **3-2**
 - PC **3-10**
 - Phone/FXS port **3-6**
 - rack install **3-3**
 - required materials **3-3**

- wall mount **3-3**
- IP Network Calls **1-9**
- IVR **1-6**

L

- l **1-6**
- LEDs **4-2**
 - monitor **4-2**

M

- Maintenance **4-9**
 - change date/time **4-10**
 - change password **4-10**
 - reset system **4-9**
 - restore factory defaults **4-9**

N

- NATAccess **1-6**

P

- PacketSaver **1-5**
- Passthrough support **1-12**
- Password
 - change **4-10**
- Public/Private Dial Plan **1-12**

R

- Rack install **3-3**
- RADIUS **1-6**
- Reset **4-9**
- RJ-45 **2-7**

S

- SelectNet **1-5**
- SIP **1-15**
- SNMP **1-6**
- Specification
 - environmental **2-11**
- Specifications **2-11**
 - electrical **2-11**
 - LAN **2-11**
 - physical **2-11**
 - PSTN/PBX **2-11**
 - voice/fax **2-11**
- Static Routes **1-12**
- System
 - AC power up **3-11**
 - reset **4-9**

T

- Tenor AX **1-2**
 - AXG **1-2**
 - AXM **1-2**
 - AXT **1-2**
 - description **1-2**
 - product types **1-2**
 - What is Tenor AX? **1-2**
- Troubleshoot
 - common problems **4-8**
 - unit provisioning **4-8**
- typographical conventions **1-3**

U

- UPDP **1-12**

V

- Virtual Tie Trunk **1-5**

W

- Wall mount
 - install dimensions **3-4**
 - installation **3-3**
 - required materials **3-3**

Warranty/Approvals

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 two years, and (ii) all software media, also for a period of two years, 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).

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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.

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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 interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures.

- 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-11 plug 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

EMI/EMC Standards

FCC Part 15 Class A

ICES-003

EN55022:98

EN55024:98

EN61000-3-2 :95

EN61000-3-3:95

AS/NZS 3548:1995

Safety Standards

UL60950-1

CSA C22.2 No.60950-1

EN60950:99

TS001:1970

Telecom Standards

FCC Part 68

CS-03

AS/NZ 3260:1997

AS/ACIFS002:2001

AS/ACIF S003:2001

European Directives

EMC Directive, 89/336/EEC

Low Voltage Directive, 73/23/EEC

R&TTE Directive, 99/5/EC



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.

RoHS Compliance

EU Directive on Restriction of Hazardous Substances (RoHS)



All Quintum products with Part Numbers in the series 501-1XXX-XX are fully compliant with the requirements set forth in the European Union (EU) Directive 2002/95/EC on the Restriction of use of certain Hazardous Substances in electrical and electronic equipment (RoHS). Compliance with the RoHS Directive is clearly indicated by labels bearing the symbol shown above.

Declaration of Conformity



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, AS/NZS 3548:1995
EN60950:92 +A1:92+A2:93+A3:95+A4:96
EN61000-3-2 :95, EN 61000-3-3:95
FCC Part 68, FCC Part 15 Class A
CS-03, ICES-003 Issue 3,
TS001:1970, AS/NZ 3260:1997
AS/ACIFS002:2001,AS/ACIF S003:2001
NOM-019-SCFI-1998, JATE

Manufacturer: Quintum Technologies Inc.

Quintum Technologies Inc.
71 James Way
Eatontown NJ
USA

Netvox Technology Co., Ltd.
No. 2, Xin Feng 2 Rd., Xiamen
Torch Hi-Tech Industrial
Development Zone,
Xiamen, P.R.C.

Delta Networks Inc.
252, Shang Ying Road,
Kuei San
Taoyuan Hsien, 333
Taiwan, R.O.C

Type of Equipment: Analog VoIP Gateway
Model Number: Tenor AX 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: 8/29/2005

A handwritten signature in black ink, reading "Karl V. Stahl III", written over a horizontal line.

Karl V. Stahl III
EMC/Product Safety Engineer

A handwritten signature in black ink, reading "William J. Truex", written over a horizontal line.

William J. Truex
Director of Operations

Technical File available through: Quintum Technologies Inc.
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