

# VB-7210

## Voice Trunking Gateway



### Features

- Efficiently transmits up to 16 E1 or T1 voice trunks over a single link
- Simultaneous transmission over IP and TDM networks
- Multiplexing, together with various voice compression algorithms, provides up to 16:1 compression for effective bandwidth utilization
- A2oMPLS multiplexing format provides an additional 5% saving of bandwidth
- Automatic link backup mechanism between TDM and Ethernet links, with Layer-4 TDM line connectivity check, ensures system survivability
- Single Ethernet and optional redundant E1/T1 or Serial uplinks available
- Optional two- or four- port channelized E1/T1 main link module available
- Supports Toll quality voice in multiple compression/decompression cycles using end-to-end compression technology
- LAN data/management traffic can be blocked on TDM links to preserve bandwidth for voice
- Dynamic bandwidth allocation using Voice Activity Detection and silence suppression
- G.168 echo cancellation of up to 32 msec per channel
- Group III fax relay support at rates of 4.8 to 14.4 kbps
- Transparent modem support for all common rates and standards
- QoS support:
  - Labeling IP level priority (ToS)
  - VLAN tagging and priority labeling according to IEEE 802.1p&Q
- DTMF/MFR2/MFC signal detection, generation and relay
- Q.50 protocol and bandwidth control mechanism prevent call saturation
- Signaling supported:
  - Transparent CAS, including R2 and E&M
  - Transparent CCS, including ISDN, QSIG and SS7
- HDLC channel compression for CCS protocols
- Multiple HDLC/SS7/Transparent channels
- Management via user terminal, SNMP, and Telnet
- Enhanced local and remote diagnostic tools
- Hot-swappable voice and optional redundant power supply modules
- Compact 1U-high platform, compatible with 19" racks

# Voice Trunking Gateway

## DESCRIPTION

- VB-7210 is a modular Voice Trunking Gateway that compresses and transports up to 16 E1 or T1 voice trunks over E1, T1, n x 64 kbps serial TDM, or IP links. VB-7210 employs G.723.1, G.729 Annex A and G.711 compression algorithms, together with multiplexing, to transmit up to 496/384 voice channels, including transparent CAS and CCS, over a single E1/T1, n x 64 kbps serial or IP link.
- VB-7210 is unique in that it is a single device that can transmit compressed voice over both TDM and IP networks and can easily switch between them whenever this may be advantageous or if there is a link failure. Switching transmission between TDM and IP links does not require additional investments in equipment, and can be performed automatically upon link failure.

- Voice Activity Detection (VAD) and silence suppression allow VB units to dynamically allocate bandwidth for voice traffic. This results in very efficient bandwidth usage, allowing more bandwidth for data transport. The gateway detects, generates and relays DTMF/MFR2/MFC signaling.
- CAS is transparently transmitted end-to-end.
- When transmitting over non-IP networks (E1, T1, or n x 64 kbps), the A2oMPLS multiplexing format can be used. The smaller A2oMPLS header saves a further 5% in bandwidth. This technique is compliant with the MPLS/Frame Relay Alliance 5.0 Implementation Agreement: I.366.2 Voice Trunking Format over MPLS.
- VB-7210 supports relay of Group III fax, as well as all common modem rates and standards. Modem transmissions are handled as voice band data. The user can enable/disable fax or modem relay; alternatively, the maximum fax transmission rate can be defined.

- Only 1U-high, VB-7210 is a compact modular unit that can be installed in 19" racks. The unit consists of up to four Voice Compression modules, a single Main Link module, and up to two Power Supply modules. All modules are plug-in and field-replaceable. Power supply and Voice Compression modules are hot-swappable.

## DATA STREAM TRANSFER

- VB-7210 supports the transfer of the following data streams that are not processed as voice.
- **Multiple HDLC channels** – VB-7210 supports up to four independent HDLC data streams per E1/T1. Each data stream may occupy one or more timeslots. All CCS protocols, such as SS7, ISDN, and QSIG, are supported.
- **SS7 channels** – VB-7210 supports up to two independent SS7 data streams per E1/T1. Each data stream may occupy one or more timeslots.

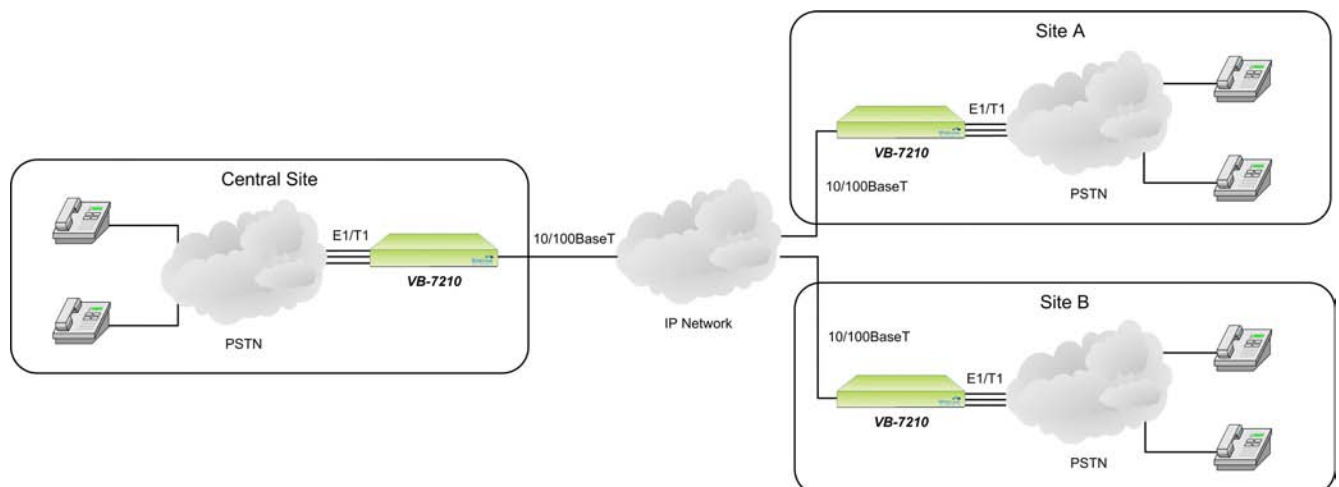


Figure 1. Voice Trunking over IP in Any-to-Any Point Topology

# Fiber Optic Multiplexer

- **Transparent channels** – VB-7210 supports the transparent connection between  $n \times 64$  channels over IP and TDM networks. This feature is supported between two VB-7210 units. Up to 8 timeslots per E1/T1 can carry transparent data.

## MAIN LINK MODULE

- The Main Link module features a single 10/100BaseT UTP or 100BaseF fiber optic Ethernet port with optional auto-negotiation support. The Ethernet port operates at 10/100 Mbps speeds, half- and full-duplex. The Ethernet interface complies with the IEEE 802.3 standard. It supports full auto-negotiation according to 802.3x flow control for full-duplex, and backpressure option for half-duplex.
- Ethernet performance monitoring and statistics are available for packets received from and sent to the IP

network, collisions, deferred transmission and carrier sense errors (RFC 3638).

- In addition to the standard Ethernet port, the Main Link module can also be ordered with a redundant pair of E1, T1, or  $n \times 64$  kbps serial links. TDM link redundancy is controlled by the main board host, based on physical alarm reports, providing automatic switching between the two TDM links in case one link fails.

## ENHANCED LINK BACKUP

- VB-7210 features automatic link backup between the TDM ports and the Ethernet port on the main module (in point-to-point applications only). Primary, secondary and tertiary links are configured so that if the primary link fails, VB-7210 automatically switches to the next link. Once a failed higher link has been restored, the voice traffic is automatically switched back.

## VOICE COMPRESSION MODULES

- Each VB-7210 Voice Compression module features two or four E1/T1 ports. The timeslots received from the PBX E1/T1 trunks are compressed by the modules using standard G.711, G.723.1, or G.729A algorithms. The compressed payload bytes are then encapsulated to run over IP. The packets are forwarded by the integral Ethernet switch to one of the main links: 10/100BaseT, serial, or E1/T1.
- Timeslots are grouped together into bundles. A different destination IP address can be configured for each bundle to support any-to-any connectivity (see *Figure 1*).

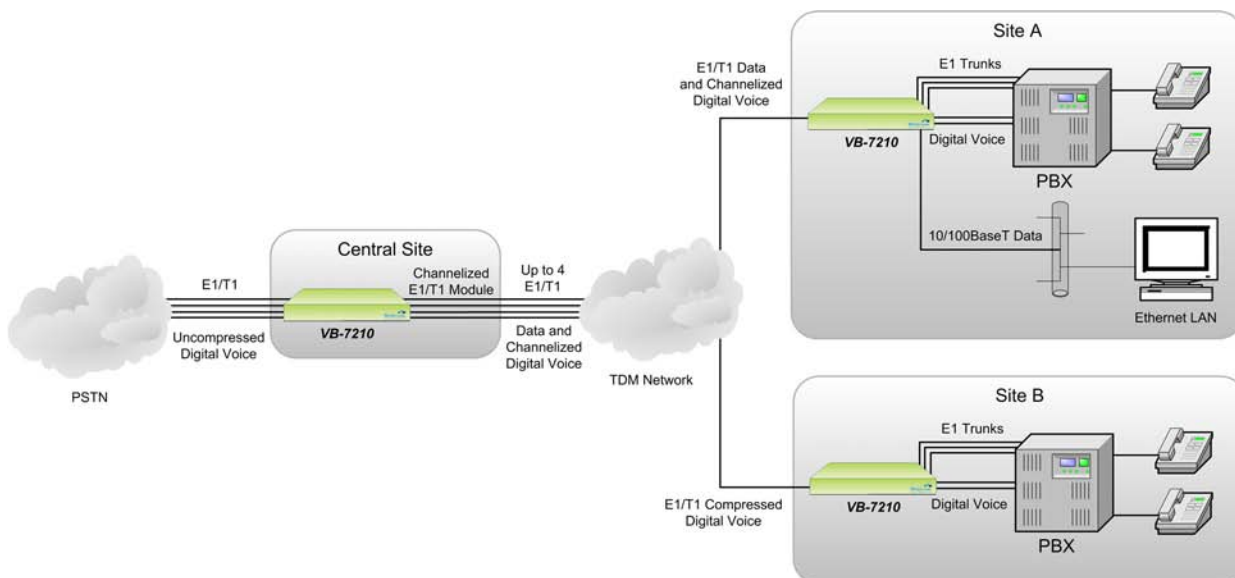


Figure 2. Data and Compressed Voice over TDM Network

# Voice Trunking Gateway

- By preventing packets from being sent when no voice activity is detected, the VAD mechanism conserves bandwidth. Improved bandwidth utilization enables VB-7210 to support a higher number of channels over TDM links than is possible by using conventional voice compression methods alone. By performing A2oMPLS multiplexing, and then grouping the G.723.1 compressed voice timeslots together into bundles with a common IP address, actual link bandwidth used per channel can be reduced to as low as 4 kbps (a reduction of 16:1). This enables a single VB-7210 unit, fully equipped with four 4-port Voice Compression modules, to compress and transmit up to 16 E1 or T1 trunks (496/384 voice channels) over a single E1, T1, or n x 64 kbps serial link.

## CHANNELIZED E1/T1 MAIN LINK MODULES

- Instead of one of the voice modules, VB-7210 can be equipped with a two or four-port channelized E1/T1 main link module. With this module, VB-7210 supports up to four E1 or T1 ports for point-to-multipoint TDM applications.

## BUNDLE CONNECTIVITY CHECK

- VB-7210 checks voice bundle connectivity either using Layer-4 messages or traditional ICMP (pings). Since some routers or firewalls might discard pings, and thus not enable VB-7210 to pass bundles through, the Layer-4 method can be used instead. This method is also preferred since it avoids flooding the network with pings.

## Q.50 & BANDWIDTH MANAGEMENT

- VB-7210 employs two types of bandwidth management methods. The Q.50 protocol can be used with PBXs that support it. The built-in VB-7210 bandwidth control can be used with or without the Q.50 protocol. Bandwidth management is available only on the main modules (not on the channelized modules).
- If enabled, the **Q.50 Protocol** (Annex A and B), is automatically invoked when a requesting PBX uses the Q.50 protocol. When the PBX requests permission to establish a call, VB-7210 accepts or rejects the new call depending on its current level of saturation, so that the quality of already established calls will not be degraded.

The default Q.50 congestion threshold (88%) can be changed by the user so that new calls will not be rejected when ample bandwidth still remains.

- The built-in **Bandwidth Control** mechanism works on the same principle as the Q.50 protocol, without using the protocol. When bandwidth is limited, some voice packets are discarded. This results in a slight reduction in voice quality. The packets are discarded statistically to minimize the reduction in voice quality. This feature reduces the risk of overflowing the uplink, which would cause all voice packets to be lost. The default threshold (94%) by which the bandwidth control mechanism begins to discard voice packets so that the buffer does not overflow, can also be modified.

## SUPER TANDEM

- In super tandem applications where calls are routed through several VB-7210 gateways, the intermediate VB-7210 gateways sense that the voice has already been compressed by another VB, and thus do not uncompress and then recompress the data as it passes through them. This feature ensures that voice is compressed and decompressed only once (at the terminating VB-7210 gateways), avoiding voice degradation or delay.



Figure 3. VB-7210 Supporting Up to 496/384 Voice Channels Over a TDM Link

## QOS SUPPORT

- VB-7210's IP port complies with all relevant Ethernet LAN standards, such as IEEE 802.3 and 802.3u. It provides reliable, high Quality of Service (QoS), by optional VLAN tagging and priority labeling according to IEEE 802.1p&Q.
- The user can configure the Type of Service (ToS) of the outgoing IP packets. This allows an en-route Layer 3 router or switch, which supports ToS (or Diffserv), to give higher priority to VB-7210 IP traffic for delay-sensitive applications.
- An assigned, IANA-registered UDP socket number simplifies flow classification through switches and routers.

## MANAGEMENT

- All VB-7210 operating parameters are configured using a simple, menu-based software. For upgrades or backup, software can be uploaded and downloaded via TFTP.
- VB-7210 can be configured and monitored via a local ASCII terminal, Telnet or via network management system. VB-7210 features a DB-9 Control port for direct connection of a local terminal for monitoring and control.

- Since VB-7210's internal control unit has its own IP address, the Ethernet port can also be utilized for connecting to management systems running over Ethernet networks. Management systems connected to one unit's Ethernet port can even serve a remote unit, by placing the management information in the TDM link (inband management).
- The LAN traffic connected to the Ethernet port can be inhibited to prevent LAN data bursts from monopolizing the TDM link bandwidth and disrupting voice traffic. This ensures that the link bandwidth will be utilized for the voice (and optionally management) traffic only.
- For system security, VB-7210 provides four different levels of users: Monitor, Technician, Operator, and Administrator. Up to 20 different usernames with passwords can be defined.

## DIAGNOSTICS

- VB-7210 supports local (internal) and remote (external) loopback activation on E1/T1 links. The user can also perform tone injection towards the local PBX. In addition, a ping utility is included to confirm IP connectivity to remote units.

## SPECIFICATIONS

### MAIN LINK MODULE

The Main Link Module includes a single Ethernet port by default. A redundant pair of E1, T1, or Serial links can be added as an option.

### ETHERNET PORT

- Number of Ports: 1
- Standards: IEEE 802.3, 802.3u, Ethernet, 802.1p&Q
- Data Rate: 10 or 100 Mbps, half-duplex or full-duplex, auto-negotiate
- Statistics: According to RFC 3638, or RFC 3635
- Indicators: ACT (green) – blinks when traffic is detected over the Ethernet line  
LINK (green) – ON when Ethernet line is active
- Copper UTP Interface: Range: up to 100m (330 ft) on UTP Cat.5 cable  
Connector: RJ-45
- Multimode Fiber Interface: Fiber type: 1310 nm, multimode  
Max range: 2 km (1.2 miles)  
Connector: LC
- Single Mode Fiber Interface: Fiber type: 1310 nm, single mode  
Max range: 20 km (12 miles)  
Connector: LC

**Note:** Maximum range achieved with fiber interface is subject to actual cable conditions.

# Voice Trunking Gateway

## E1 LINKS

- Number of Ports:  
2 (one active, other for backup)  
Connectors: (per port)  
RJ-45 for balanced interface

**Note:** CBL-RJ45/2BNC/E1 adapter cable is available for converting each Main Link module E1 port RJ-45 connector into a pair of BNC connectors for unbalanced coax interface.

## T1 LINKS

- Number of Ports:  
2 (one active, other for backup)
- Statistics:  
Full statistical diagnostics capability according to ANSI T1.403-1989.  
Local support of ESF diagnostics according to AT&T PUB 54016
- Connectors (per port):  
RJ-45

**Note:** Additional E1/T1 interface specifications that are applicable to main links, voice ports and channelized ports are listed under **General**.

## SERIAL LINKS

- Number of Ports:  
2 (one active, other for backup)
- Data Rate:  
n x 64 kbps, up to 2048 kbps
- Clock Modes:  
DCE: VB provides clock to connected equipment  
DTE: VB accepts clock from connected equipment
- Interface:  
Selectable for V.35, X.21, RS-530, RS-530A, V.36/RS-449, or RS-232
- Connector:  
Both ports terminate on a single 50-pin SCSI connector

**Note:** A Y-cable can be ordered for splitting the serial links' single 50-pin SCSI connector into two separate channels with standard V.35, X.21, or RS-530 connectors.

## CONTROL PORT

Located on the Main Link module, for direct connection to terminal

- Standards:  
RS-232/V.24 (DCE)
- Data Rate:  
9.6, 19.2, 38.4, 57.6, or 115.2 kbps
- Connector:  
DB-9, female

## VOICE COMPRESSION MODULES

- Compression Algorithms:  
G.723.1 (5.3 or 6.4 kbps), G.729A (8 kbps), G.711 (A-law or  $\mu$ -law)
- Silence Suppression:  
G.723.1 A, G.729B
- Echo Cancellation:  
32 msec per channel as per G.168
- Fax Relay:  
Group III, 4.8, 9.6, 14.4 kbps
- Voice Band Data:  
Transparent support for modems
- Signaling Support:  
Transparent CAS, including R2 and E&M Transparent CCS, including ISDN, QSIG, and SS7 Clear channel
- MF Signaling Support:  
DTMF, MFR2, MFC detection, generation and relay
- Ports per Module per ordering:  
*E1 Port Modules*  
2 (62 channels max) or 4 (124 channels max)  
*T1 Port Modules*  
2 (48 channels max) or 4 (96 channels max)

## CHANNELIZED E1/T1 MAIN LINK MODULES

- Ports per Module per ordering:  
2E1, 2T1, 4E1, or 4T1

## GENERAL

### E1 Interfaces

- Data Rate:  
2.048 Mbps (per port)
- Standards:  
ITU-T Rec. G.703, G.704, G.706, G.732, G.823
- Framing:  
G.732N  
G.732N with CRC-4  
G.732S  
G.732S with CRC-4
- Line Code:  
HDB3
- Receive Signal Level:  
With LTU: 0 to -43 dB  
Without LTU: 0 to -12 dB
- Transmit Signal Level:  
Balanced:  $\pm 3V$  ( $\pm 10\%$ )  
*For Main Link module only:*  
Unbalanced:  $\pm 2.37V$  ( $\pm 10\%$ )
- Timing:  
Internal or loopback
- Jitter Performance:  
Per ITU-T G.823
- Line Type:  
Balanced 4-wire, 120 $\Omega$
- Indicators (per port):  
LOC (red) – indicates Local Sync Loss on port  
REM (red) – indicates Remote Sync Loss on port
- Connectors (per port):  
RJ-45 for balanced interface

### T1 Interfaces

- Data Rate:  
1.544 Mbps (per port)
- Standards:  
ANSI T1.403, AT&T TR-62411, ITU-T Rec. G.703
- Framing:  
SF, ESF

## Fiber Optic Multiplexer

- Line Code: AMI
- Zero Suppression: B8ZS
- Receive Signal Level:  
With CSU: 0 to -36 dB  
Without CSU: 0 to -30 dB
- Transmit Signal Level:  
With CSU: 0, -7.5, -15, or  
-22.5 dB  
Without CSU:  $\pm 2.7V$  ( $\pm 10\%$ ) at  
0-655 ft
- Timing:  
Internal or loopback
- Jitter Performance:  
Per AT&T TR-62411
- Line Type:  
Balanced 4-wire, 100 $\Omega$
- Indicators (per port):  
RED (red) – indicates Local  
Sync Loss (Red Alarm) on port  
YEL (yel) – indicates Remote  
Sync Loss (Yellow Alarm) on  
port
- Connectors (per port): RJ-45

### OTHER

- E1/T1 Alarms (per port):  
LOS – Loss of Signal  
LOF – Loss of Frame  
AIS – Alarm Indication Signal  
RDI – Remote alarm  
LOMF (E1 only) – Loss of  
Multiframe alarm  
LCV – Line Code Violation
- Unit Panel Indicators:  
TST (yellow) – ON: Indicates  
test is being run. Flashes: Sync  
loss is detected on the TDM  
uplink (if TDM Line Check  
feature is enabled)  
ALM (red) – Indicates alarm is  
present in system  
PWR 1 (green) – ON when  
Power Supply Module 1 is  
providing power  
PWR 2 (green) – ON when  
Power Supply Module 2 is  
providing power
- Diagnostics:  
Main Links:  
IP Diagnostics: Performance  
monitoring, LAN statistics,  
Pings  
E1/T1 Diagnostics: Local and  
remote loopbacks  
Voice Compression Ports:  
Local and remote loopback, per  
E1/T1 channel  
Tone injection towards local  
side: Per timeslot, per entire  
E1/T1 channel, or on all E1/T1  
channels simultaneously  
Channelized E1/T1 Main Link  
Module: Local and remote  
loopbacks per E1/T1 link

- Power:  
Input (according to ordering):  
AC: 100 to 240 VAC, 50/60 Hz  
48: -48 (-36 to -72) VDC  
24: 24 (20 to 36) VDC  
Output (per PS module):  
3.3 VDC: up to 15A  
5 VDC: up to 5A  
Total: 60W

**Note:** Two hot-swappable power supply modules can be installed for redundancy

- Physical:  
Height: 4.3 cm/1.7 in (1.U)  
Width: 43.5 cm/17.1 in  
Depth: 24.0 cm/9.5 in  
Weight: 7 kg /15.5 lb
- Environment:  
Operating temperature:  
0 to 50°C/32 to 122°F  
Storage temperature:  
-20 to 70°C/-4 to 158°F  
Humidity:  
Up to 90%, non-condensing

## Ordering

### **VB-7210 /\*/\$**

Voice Trunking Gateway System

**Note:** System includes chassis, power supplies and power supply cables only. A Main Link Module and at least one Voice Compression Module must be ordered for every VB-7210 system. All modules can be ordered separately.

### **MODULES**

#### **VB-M/M-ETH/@-#**

Main Link Module with single Ethernet port by default, and optional redundant E1, T1, or serial links

#### **VB-M/VC-&/%**

Voice Compression Module

#### **VB-M/ML/&/%**

Channelized E1/T1 Main Link Module

#### **VB-7210 -PS/\***

Power Supply Module

### **ORDERING OPTIONS**

- \* Specify power supply type:
  - AC** for 100 to 240 VAC
  - 48** for -48 VDC
  - 24** for 24 VDC
- \$ Specify R for redundant power supply (of same type)
- @ Specify Ethernet port interface type:
  - MM** for 1310 nm multimode fiber 100BaseF interface
  - SM** for 1310 nm single mode fiber 100BaseF interfaceDefault is copper UTP 10/100BaseT interface
- # Specify optional redundant TDM links on Main Link Modules:
  - E1** for E1 link
  - T1** for T1 link
  - SERIAL\_LINK** for serial linkDefault is Ethernet port only
- & Specify TDM interface type for Voice Compression and Channelized E1/T1 Main Link Modules:
  - E1** for E1 ports
  - T1** for T1 ports
- % Specify number of E1/T1 ports:
  - 2** for 2 ports
  - 4** for 4 ports

### **CABLES**

**Note:** All cables are ordered separately.

#### **CBL-VB7210/?**

Serial link adaptor Y-cable to split the 50-pin SCSI into two link connectors

? Specify interface and clock mode:

**V35/DCE** for V.35, DCE mode

**V35/DTE** for V.35, DTE mode

**X21/DCE** for X.21, DCE mode

**X21/DTE** for X.21, DTE mode

**530/DCE** for RS-530, DCE mode

**530/DTE** for RS-530, DTE mode

#### **CBL-RJ45/2BNC/E1**

Interface adapter cable for converting one Main Link module E1 port RJ-45 connector into a pair of BNC connectors for unbalanced coax interface