

Vmux-110

Voice Trunking Gateway for Remote Sites



Compressing one E1/T1 or four/eight analog (FXS/FXO/E&M) voice ports, and transmitting them over a serial, fractional E1/T1, or a 10/100BaseT uplink

- Unique TDMoIP multiplexing allows transmission of the compressed voice over Packet Switched Networks and/or TDM Networks
- Fully transparent to signaling and telephony features
- Additional Ethernet port for user LAN connectivity, with voice/data prioritization
- Ideal for satellite applications – fully compatible with VSAT equipment

Vmux-110 is a customer-located device that complements RAD's larger modular Vmux-2100 system. It fulfills the need for a low-capacity remote voice trunking gateway for both IP and leased line TDM networks. Vmux-110 is available with a choice of voice channels.

The voice interface includes one of the following:

- One E1 or T1 port receiving E1 or T1 trunks from PBXs
- Four or eight FXS/FXO/E&M analog ports that connect to POTS, faxes, or PBX.

Vmux-110 compresses the voice traffic and transports it over a serial, a fractional E1/T1, or a 10/100BaseT IP link.

The device employs G.723.1, G.729 Annex A and G.711 compression algorithms together with RAD's unique TDMoIP multiplexing, including transparent CAS and CCS.

The following security protocols are provided by Vmux-110 to ensure client-server communication privacy and correct user authentication:

- RADIUS (client authentication only)
- SSH for Secure Shell communication session.

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Vmux-110 features two 10/100BaseT Ethernet ports, one network and one user. The latter is provided for connecting a user Ethernet LAN to the unit. Together with the Vmux-110 integral Ethernet switch, this allows integrating the user LAN traffic with the compressed voice, over a single uplink (IP, serial, or E1/T1) to the network.

To transfer voice as well as 10/100 Mbps Ethernet data over an uplink with limited bandwidth (such as for satellite applications), the ingress data rate on both Ethernet ports is limited between 128 kbps and 8 Mbps.

Vmux-110 is a compact, 1U-high, half 19-inch wide unit. One or two Vmux-110 units can be mounted in a standard 19-inch rack.

IMPROVED BANDWIDTH UTILIZATION

Voice Activity Detection (VAD) and silence suppression allow Vmux units to dynamically allocate bandwidth for voice traffic. This results in efficient bandwidth usage, leaving more bandwidth for data transport.

By preventing packets from being sent when no voice activity is detected, the VAD mechanism conserves bandwidth. Vmux-110 can transport a higher number of channels than is possible by using conventional voice compression methods alone. By performing TDMoIP multiplexing and grouping the timeslots of G.723.1 compressed voice into bundles with a common IP address, the actual link bandwidth can be reduced to as low as 4 kbps per channel (a reduction of 16:1).

DATA STREAM TRANSFER

Vmux-110 transfers various data streams that are not processed as voice. The following data streams are supported:

- Up to four independent HDLC data streams per E1/T1. Each data stream may occupy one or more timeslots.
- Up to two independent SS7 data streams per E1/T1. Each data stream may occupy one or more timeslots.
- Transparent connection between n x 64 channels over IP and TDM networks. This feature is available for two Vmux-110 units working opposite each other, as well as for Vmux-2100 working opposite Vmux-110. Up to 8 timeslots per E1/T1 can carry transparent data.

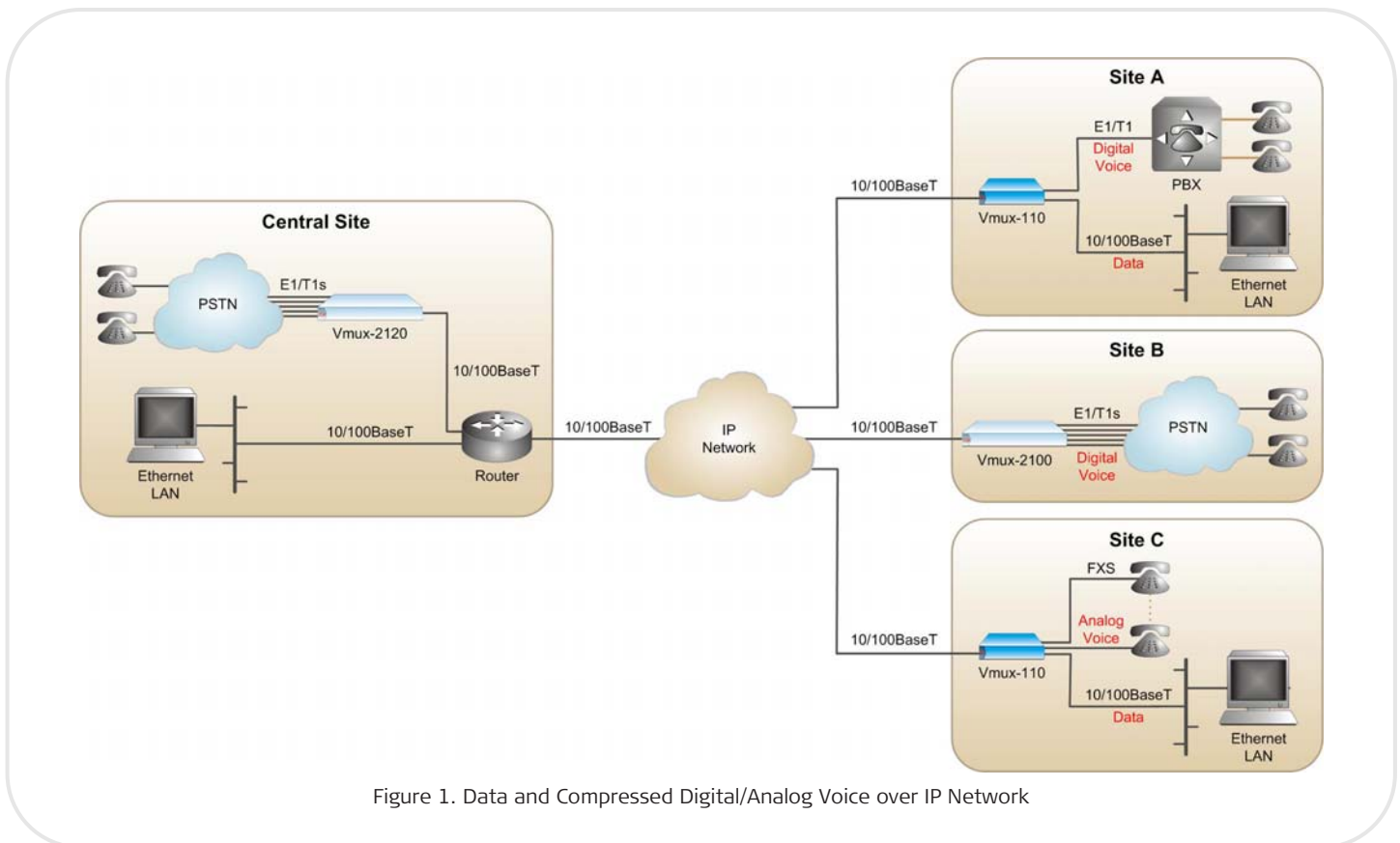


Figure 1. Data and Compressed Digital/Analog Voice over IP Network

PRIORITY MECHANISM

Vmux-110 includes an internal mechanism for identifying and assigning priority to packets containing voice, over those containing other LAN traffic. This ensures that voice packets are not delayed and a high voice service quality is maintained.

QoS SUPPORT

The IP uplink 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 802.1D&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 Vmux-110's IP traffic for delay-sensitive applications.

Assigned, IANA-registered UDP socket number for TDMoIP simplifies flow classification through switches and routers.

VLAN TABLE

Vmux-110 includes a VLAN table that contains up to 64 entries. Each entry defines the egress and tagging policies for packets with a specific VLAN ID, for each port. Packets with a particular VLAN ID can be blocked.

MANAGEMENT

All Vmux-110 operating parameters are configured using simple, menu-based software. For upgrades or backup, software upload and download can be performed via TFTP.

Vmux-110 can be configured and monitored via a local ASCII terminal, Telnet or RADview-SC/Vmux (RAD's network management system). A DB-9 Control port is provided to connect a local terminal used for monitoring and control.

For system security, Vmux-110 offers four different user levels: Monitor, Technician, Operator and Administrator. Up to 20 different usernames with passwords can be defined.

Specifications**NETWORK INTERFACE – ETHERNET****Compliance**

IEEE 802.3, 802.3u, Ethernet, 802.1D&Q

Data Rate

10 or 100 Mbps, half-duplex or full-duplex, autonegotiation

Ingress Data Rate Limit

Can be independently set for each Ethernet port: 128 kbps, 256 kbps, 512 kbps, 1 Mbps, 2 Mbps, 4 Mbps, 8 Mbps, or unlimited

Statistics

According to RFC 2819, RMON-MIB

Copper UTP Interface

Range: up to 100m on UTP Cat.5 cable
Connector: RJ-45 (per port)

Figure 2. Data and Compressed Digital/Analog Voice over Satellite Link

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NETWORK INTERFACE – SERIAL

Data Rate

n x 64 kbps, up to 2048 kbps

Interface

Selectable for RS-530, V.35 or X.21

Connector

DB-25, female

Note: For V.35 or X.21 interface, an adapter cable is required (see Ordering).

Clock Modes

DCE: Vmux-110 provides the clock to connected equipment

DTE: Vmux-110 accepts the clock from connected equipment (requires adapter cable)

NETWORK INTERFACE – E1

Nominal Data Rate

2.048 Mbps

Compliance

ITU-T Rec. G.703, G.704, G.706, G.732, G.823

Framing

G.732N, with or without CRC-4

Line Code

HDB3

Receive Signal Level

With LTU: 0 to -43 dB

Without LTU: 0 to -12 dB

Transmit Signal Level

Balanced: $\pm 3V$ ($\pm 10\%$)

Timing

Internal or loopback

Jitter Performance

Per ITU-T G.823

Line Type

120 Ω : 4-wire balanced






75 Ω : unbalanced (via adapter cable)

Connector

RJ-45 for balanced interface

Note: CBL-RJ45/2BNC/E1 adapter cable is available for converting the balanced E1 port RJ-45 connector into a pair of BNC connectors for unbalanced coax interface (see Ordering).

Table 1. Vmux/Gmux Family Comparison

Feature	Vmux-110 (Ver. 4.2)	Vmux-210 (Ver. 1.2)	Vmux-2100 (Ver. 4.1)	Vmux-2120 (Ver. 1.1)	Gmux-2000 (Ver. 3.6)
					
Maximum compression ratio	16:1	16:1	16:1	16:1	16:1
Maximum number of compressed voice channels	30	30	496/384	496/384	3,472
Voice Interface	E1/T1/FXS/FXO/E&M	FXS	E1/T1	E1/T1	E1/T1/STM-1/OC-3
Network Interface	E1/T1, Serial, Fast Ethernet	E1/T1, Serial, Fast Ethernet	E1/T1, Fast Ethernet	E1/T1, Fast Ethernet	E1/T1/STM-1/OC-3, GbE, GbE/2
Signaling	Any	CAS only	Any	Any	Any
Fax/Modem/DTMF Relay	✓	✓	✓	✓	✓

NETWORK INTERFACE – T1**Nominal Data Rate**

1.544 Mbps

Compliance

ANSI T1.403, AT&T TR-62411,
ITU-T Rec. G.703

Framing

SF, ESF

Line Code

AMI

Zero Suppression

B8ZS

Timing

Internal or loopback

Receive Signal Level

With CSU: 0 to -36 dB
Without CSU: 0 to -15 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

Jitter Performance

Per AT&T TR-62411

Line Type

4-wire balanced, 100 Ω

USER ETHERNET PORT

The specifications are identical to those of the Network Ethernet port above.

USER INTERFACE – VOICE

Note: Vmux-110 is available with a choice of a single E1 or T1 voice ports, or 4/8 FXS, FXO, or E&M analog voice ports.

Compression Algorithms

G.723.1 (5.3 or 6.4 kbps), G.729A (8 kbps), G.711

Silence Suppression

G.723.1A, G.729B

Echo Cancellation

32 ms per channel as per G.168

Fax Relay

Group III: 4.8, 9.6, 14.4 kbps

Modem Relay

V.22/V.22 bis
V.32/V.32 bis
V.34 up to 21.6 kbps

Voice Band Data

Transparent support for modems

Signaling

Transparent CAS, including R2 and E&M
Transparent CCS, including ISDN, QSIG and SS7
Clear channel

MF Signaling

DTMF, MFR2, MFC detection, generation and relay

Caller ID Relay

According to U.S. (Bellcore type 1) or European (V.23) standards, user-selectable

USER INTERFACE – E1 DIGITAL VOICE**Nominal Data Rate**

2.048 Mbps

Compliance

ITU-T Rec. G.703, G.704, G.706, G.732, G.823

Framing

G.732N or G.732S, with or without CRC-4

Line Code

HDB3

Receive Signal Level

With LTU: 0 to -43 dB
Without LTU: 0 to -12 dB

Transmit Signal Level

Balanced: $\pm 3V$ ($\pm 10\%$)

Timing

Internal or loopback

Jitter Performance

Per ITU-T G.823

Line Type

120 Ω : 4-wire balanced
75 Ω : unbalanced (via adapter cable)

Connector

RJ-45

Note: CBL-RJ45/2BNC/E1 adapter cable is available for converting the balanced E1 port RJ-45 connector into a pair of BNC connectors for unbalanced coax interface (see Ordering).

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USER INTERFACE – T1 DIGITAL VOICE

Nominal Data Rate

1.544 Mbps

Compliance

ANSI T1.403, AT&T TR-62411,
ITU-T Rec. G.703

Framing

SF, ESF

Line Code

AMI

Zero Suppression

B8ZS

Timing

Internal or loopback

Receive Signal Level

With CSU: 0 to -36 dB
Without CSU: 0 to -15 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

Jitter Performance

Per AT&T TR-62411

Line Type

4-wire balanced, 100 Ω

Connector

RJ-45

USER INTERFACE – FXS ANALOG VOICE

Number of Ports

4 or 8

Analog Parameters

ITU-T standards: G.712, 2-wire for voice
and signaling

Nominal level: 0 dBm

Nominal impedance: 600 Ω

Return loss (300 to 3400 Hz): Better than
20 dB

Frequency response (Ref: 1020 Hz):

- 300 to 3000 Hz: ± 0.5 dB
- 250 to 3400 Hz: ± 1.1 dB

Level adjustment, soft selectable:

- TX: +5 dBm to -4 dBm
 - RX: +5 dBm to -10 dBm
- Steps: 1 dB (± 0.1 dB), nominal

Signal to total distortion, G.712:

- 0 to -30 dBm0: Better than 33 dB
- +3 to -45 dBm0: Better than 22 dB

Idle channel noise: Better than -70 dBm0
(+20 dBnc)

Signaling

Method: EIA RS-464 Loop-start

On-hook/Off-hook threshold:

- On-hook: Higher than 25V between Tip
and Ring
- Off-hook: 3V to 24V between Tip and
Ring

Feed Current: 24 mA $\pm 10\%$

Ringer:

- Voltage: 50 VRMS ($\pm 10\%$),
overload-protected
- Frequency: 25 Hz ($\pm 10\%$)
- Cadence: 1 sec ON/3 sec OFF (default),
user-configurable

Connectors

4-port version: RJ-12 per channel

8-port version: DB-25 connector
convertible to 8 x RJ-12 connectors via
adapter cable (see *Ordering*)

USER INTERFACE – FXO ANALOG VOICE

Number of Ports

4 or 8

Analog Parameters

ITU-T standards: G.712, 2-wire for voice
and signaling

Nominal level: 0 dBm

Nominal impedance: 600 Ω

Return loss (300 to 3400 Hz): Better than
20 dB

Frequency response (Ref: 1020 Hz):

- 300 to 3000 Hz: ± 0.5 dB
- 250 to 3400 Hz: ± 1.1 dB

Level adjustment, soft selectable:

- TX: +5 dBm to -4 dBm
 - RX: +2 dBm to -17 dBm
- Steps: 1 dB (± 0.1 dB), nominal

Signal to total distortion, G.712:

- 0 to -30 dBm0: Better than 33 dB
- +3 to -45 dBm0: Better than 22 dB

Idle channel noise: Better than -70 dBm0
(+20 dBnc)

Signaling

Method: EIA RS-464 loop start

DC impedance:

- Off-hook:
100 Ω at 100 mA feed
230 Ω at 25 mA feed
- On-hook: Above 1 M Ω

Ring detector:

- Impedance: 20 k Ω @ 20 Hz, 70 VRMS
- Detection: >20 VRMS, 17–25 Hz
- No detection: <5 VRMS
- Dialing: DTMF or pulse

Connectors

4-port version: RJ-12 per channel

8-port version: DB-25 connector
convertible to 8 x RJ-12 connectors via
adapter cable (see *Ordering*)

USER INTERFACE – E&M ANALOG VOICE**Number of Ports**

4 or 8

Analog Parameters

ITU-T standards: G.712, 2-wire or 4-wire
for voice and signaling

Nominal level: 0 dBm

Nominal impedance: 600Ω

Return loss (300 to 3400 Hz): better than
20 dB

Frequency response (Ref: 1020 Hz):

- 300 to 3000 Hz: ±0.5 dB
- 250 to 3400 Hz: ±1.1 dB

Level adjustment, soft selectable:

- TX: +5 dBm to -7 dBm
 - RX: +2 dBm to -17 dBm
- Steps: 1 dB (±0.5 dB), nominal

Signal to total distortion, G.712:

- 0 to -30 dBm0: Better than 33 dB
- +3 to -45 dBm0: Better than 22 dB

Idle channel noise: better than -70 dBm0
(+20 dBnc)

Signaling

Method (software-selectable per channels
1-4 and 5-8): EIA RS-464 Types I, II
(with or without positive E&M
signaling), III, and V (British Telecom
SSDC5)

Signaling voltage: -12 to -60 VDC

Pulse dial distortion: ±2 ms max

Connectors

4-port version: RJ-45 per channel

8-port version: 68-pin SCSI connector
convertible to 8 x RJ-45 connectors via
adapter cable (*see Ordering*)

CONTROL PORT**Standards**

RS-232/V.24 (DCE)

Data Rate

9.6, 19.2, 38.4, 57.6, or 115.2 kbps

Connector

DB-9

INDICATORS**Front Panel**

PWR (green): On when power is on

ETH (green): On when Ethernet line is OK

ALM (red): On when alarm is present in
the system

Ethernet Network and User Ports

LINK (green): On when the link is active

ACT (yellow): Blinking during LAN traffic
activity

GENERAL**Diagnostics**

E1/T1 uplink: Remote loops on entire
E1/T1

Ethernet ports:

- Performance monitoring
- LAN statistics
- Ping

E1/T1 voice ports:

- Local and remote loops on entire
E1/T1
- Tone injection per timeslot towards
local side

FXS/FXO/E&M voice ports:

- Remote loops per channel
- Tone injection per channel towards
local and remote side
- Statistics
- Ping

Physical

Height: 4.3 cm (1.7 in)

Width: 21.5 cm (8.5 in)

Depth: 23.7 cm (9.3 in)

Weight: 2.0 kg (4.4 lb)

Power

AC: 100 to 240 VAC, 50/60 Hz

48 VDC: -40 to -72 VDC

24 VDC: 20 to 32 VDC

Power Consumption

4FXS: AC: 19 VA

DC: 18W

8FXS: AC: 28 VA

DC: 27W

4FXO: AC: 9 VA

DC: 8W

8FXO: AC: 9.5 VA

DC: 8.5W

4E&M: AC: 11 VA

DC: 10W

4E&M/POS: AC: 10 VA

DC: 9W

8E&M: AC: 12.5 VA

DC: 11.5W

8E&M/POS: AC: 11 VA

DC: 10.5W

E1/T1: AC: 10.2 VA

DC: 9W

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

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Ordering

STANDARD CONFIGURATIONS

Vmux-110/AC/E1/30/ETH-UTP

Vmux-110/AC/T1/24/ETH-UTP

Vmux-110/AC/4FXS/ETH-UTP

Vmux-110/AC/8E&M/ETH-UTP

Vmux-110/AC/4E&M/ETH-UTP

Vmux-110/48/8E&M/ETH-UTP

SPECIAL CONFIGURATIONS

Vmux-110/*/+/%/ε

Legend

- * Power supply type:
 - AC 100 to 240 VAC
 - 48 -36 to -72 VDC
 - 24 Temperature-hardened, 20 to 32 VDC
- + Voice port type:
 - E1/30 Full E1 digital voice port
 - T1/24 Full T1 digital voice port
 - 4FXS 4 analog FXS ports
 - 8FXS 8 analog FXS ports
 - 4FXO 4 analog FXO ports
 - 8FXO 8 analog FXO ports
 - 4E&M 4 analog E&M ports
 - 8E&M 8 analog E&M ports
- % Ethernet port type (mandatory):
 - ETH-UTP Ethernet User and Network 10/100BaseT ports
- ε Positive E&M signaling (Default=no positive E&M signaling)
 - POS With positive E&M signaling

SUPPLIED ACCESSORIES

AC power cord (when AC power supply is ordered)

DC adapter plug (when DC power supply is ordered)

OPTIONAL ACCESSORIES

CBL-DB9F-DB9M-STR

CBL-VM110/?

Serial link adapter cable, 40 cm long

Legend

- ? Interface type and clock mode:
 - V35/DCE V.35, DCE mode
 - V35/DTE V.35, DTE mode
 - X21/DCE X.21, DCE mode
 - X21/DTE X.21, DTE mode
 - 530/DTE RS-530, DTE mode

Note: An adapter cable is not required for connecting to RS-530 equipment when Vmux-110 operates in DCE clock mode.

CBL-KVF8/FXOS

Adapter cable for converting the FXO/FXS interface D-25 connector to 8 x RJ-12 connectors

CBL-KVF8/E&M

Adapter cable for converting the E&M interface 68-pin SCSI connector to 8 x RJ-45 connectors

CBL-RJ45/2BNC/E1

Interface adapter cable for converting the balanced E1 port RJ-45 connector into a pair of BNC connectors for unbalanced coax interface

RM-35/@

Hardware kit for mounting one or two metal Vmux-110 units into a 19-inch rack

@ Rack mount kit:

- P1 Mounting one unit
- P2 Mounting two units

To order both P1 and P2 kits, define RM-35 only.

RM-35-23

Hardware kit for mounting one Vmux-110 unit in a 23-inch rack

RM-35-ETSI

Hardware kit for mounting one Vmux-110 unit in an ETSI rack

WM-35-TYPE4

Hardware kit for mounting one Vmux-110 unit on the wall.

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