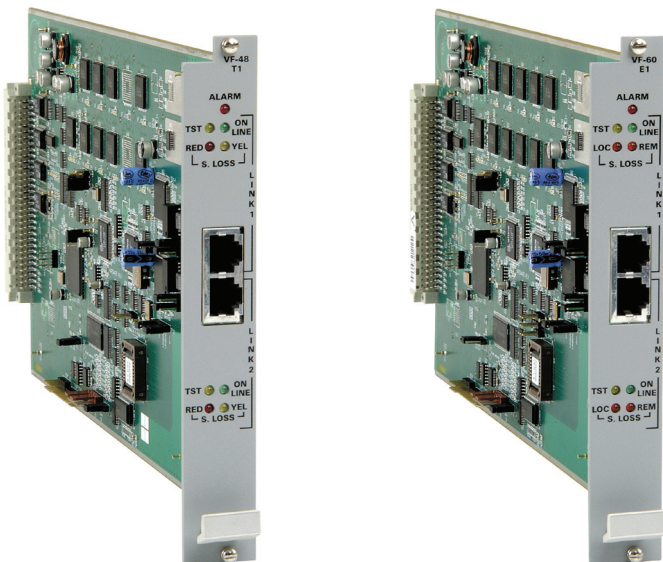




## Single/Dual E1/T1 Digital Voice Compression Modules



### FEATURES

- Digital compression of 24/30/48/60 digital voice channels
- User-selectable compression rates: 8 kbps (G.729A), 5.3 kbps (G.723.1), or 6.4 kbps (G.723.1)
- V.17, V.29 fax relay and automatic voice/fax switching, for all channels
- V22bis, V32bis Data Modem Relay up to 14.4 kbps for each channel
- Onboard framer supports ISDN PRI or T1/E1 PBX trunks, with DSU, CSU/LTU interface
- Voice activity detection, silence suppression, and comfort noise generation for efficient bandwidth utilization
- Signaling supported:
  - CAS, including R2 and E&M
  - Transparent transmission of CCS
- 8 bundles for facilitating point-to-multipoint applications
- Built-in adaptive G.168 echo-canceller tolerating up to 16 msec delay
- DTMF/MFR2/MFC tone signal detection, generation and relay
- Transparent relay mode for data or management channels
- Diagnostics include loopbacks towards local and remote PBXs, and local loop per timeslot bundle
- Plug into any I/O slot of the MP-2100/2104 chassis

### DESCRIPTION

- VF modules connect and compress E1/T1 PBX voice trunks for efficient transmission over IP or TDM networks. Each single-slot VF module provides one or two E1 or T1 ports (external ports). The timeslots received from the E1/T1 trunks are compressed using standard algorithms such as G.723.1 (6.4 or 5.3 kbps per channel), or G.729A (8.0 kbps per channel). Compression methods are user-selectable per bundle.
- VF modules are available in the following versions:
  - VF-24** supports a single T1 trunk
  - VF-30** supports a single E1 trunk
  - VF-48** supports two T1 trunks
  - VF-60** supports two E1 trunks.
- Since the VF modules can compress and transmit an entire E1/T1 trunk using as little as 3 timeslots, Megaplex can utilize the remaining main link bandwidth to provide additional services such as data, Ethernet LAN, POTS and/or management, all on one platform (see *Figure 1*).
- Multiple VF modules enable Megaplex to compress and transmit as many as 300/240 digital voice channels (10 full E1/T1 trunks) over a single E1/T1 link. This results in very efficient utilization of E1/T1 or SDH/SONET networks (see *Figure 2*).

# VF-24/30/48/60

## Single/Dual E1/T1 Digital Voice Compression Modules

- To facilitate point-to-multipoint applications, the PBX voice channel timeslots can be grouped together into up to 8 separate bundles (internal ports). Up to 30 (E1 modules) or 24 (T1 modules) channels can be assigned to each internal port. Each internal port can be routed to a different main link or IP destination (if using ML-IP). Likewise, each internal port can operate at a different voice encoding rate and/or fax rate.
- With regular TDM voice encoding methods alone, much bandwidth is “wasted” when normal periods of silence occur during a telephone call. VF modules feature Voice Activity Detection (VAD) and silence suppression techniques, to maximize bandwidth utilization. After the G.723.1 or G.729A compression

of the PBX channels, silence suppression allows only channels that are transmitting actual conversation to fill main link timeslots; periods of silence are removed. At the remote side “comfort noise” is inserted to recreate the periods of silence that were removed, so that the quality of the call is not noticeably affected.

These methods use less bandwidth to transmit the same amount of voice channel, without degrading the quality of the call. The user can select the amount of bandwidth (number of timeslots on the main link) that will be allocated per internal port, in accordance with the desired compression rate and the statistical periods of silence expected.

- Group III fax relay, as well as all common modem rates and standards, are supported by VF modules. Standard fax transmission rates between 2.4 to 14.4 kbps are available, with rate fallback capability, to automatically switch to the next lower data rate supported by both communicating faxes. Modem transmissions are handled as voice band data.
- A built-in adaptive echo canceller is provided for canceling the near-end hybrid echo. The echo canceller enables acceptable voice quality on voice lines with long delay, such as long-distance calls or calls over non-terrestrial links (e.g. satellite). Echo delays of up to 16 msec are tolerated.

## APPLICATIONS

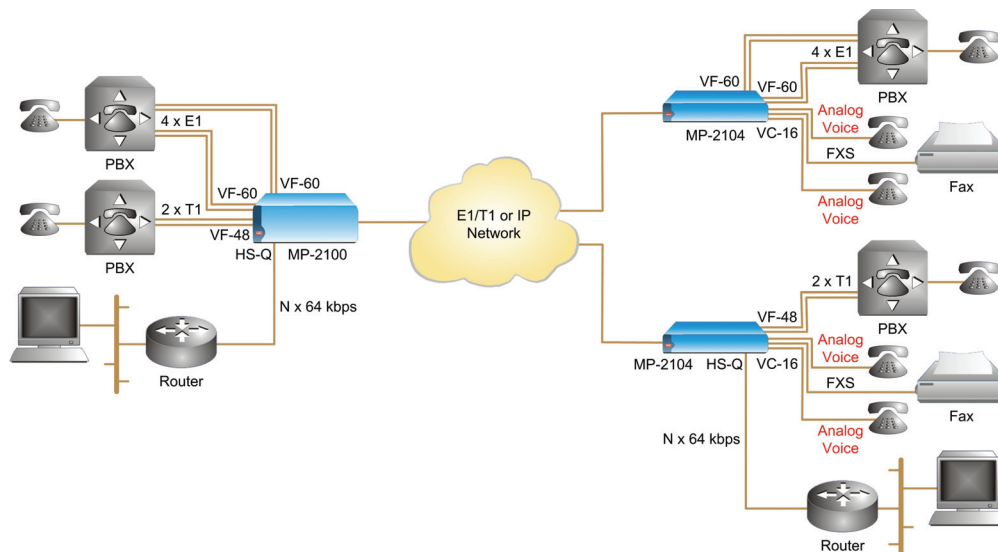


Figure 1. Combining Compressed Digital Voice, Analog Voice and Data

## Single/Dual E1/T1 Digital Voice Compression Modules

### SPECIFICATIONS

#### GENERAL

- Module Versions**  
 VF-24: single T1 port  
 VF-30: single E1 port  
 VF-48: two T1 ports  
 VF-60: two E1 ports
- Number of Internal Ports (Timeslot Bundles)**  
 Up to 8
- Number of Voice Channels (Timeslots) per Internal Port**  
 T1 modules: up to 24  
 E1 modules: up to 30
- Voice Encoding Rate**  
 Selectable per internal port:
  - G.729A: 8 kbps per channel
  - G.723.1: 6.4 kbps or 5.3 kbps per channel
- Supported Fax Rates**  
 Group III rates, selectable per internal port:  
 2.4, 4.8, 7.2, 9.6, 12.0, 14.4 kbps
- Bandwidth Allocation on Trunk**  
 Selectable, according to the programmed voice encoding rate
- Acceptable Channel Bit Error Rate**  
 $1 \times 10^{-3}$  or better

- Adaptive Echo Canceller**  
 Supports delays of up to 16 msec per channel, as per G.168
- Silence Suppression**  
 G.723.1A, G.729B
- Signaling**
  - CAS, including R2 and E&M
  - Transparent CCS
- Transparent Timeslot Mode**  
 Selected timeslots can be transmitted transparently for data or management relay
- Timing Modes**  
 INT Mode: Clock is provided by MP-2100 to the PBX  
 LBT Mode: Clock is provided by the PBX to MP-2100
- Diagnostics**
  - Auto self-test activated upon power-up and during normal operation
  - Local loopback towards the local PBX trunk
  - Remote loopback towards the remote PBX trunk
  - Local loopback on each internal port (bundle)
- Indicators**  
 ALARM (red) – indicates fault detected on module  
*Per port:*  
 ON LINE (green) – lights when port is connected and functioning  
 TST (yellow) – indicates test being performed on port  
 LOC/Red Alarm (red) – indicates local sync loss on port  
 REM (red)/Yellow Alarm (yellow) – indicates remote sync loss on port
- Configuration**  
 Programmable via the Megaplex management system
- Power Consumption**

Module	Current [A]	Power [W]
VF-24	1.0	5.0
VF-30	1.2	5.8
VF-48	1.6	8.0
VF-60	1.7	8.3

*Note:* VF modules utilize the +5 VDC line only.

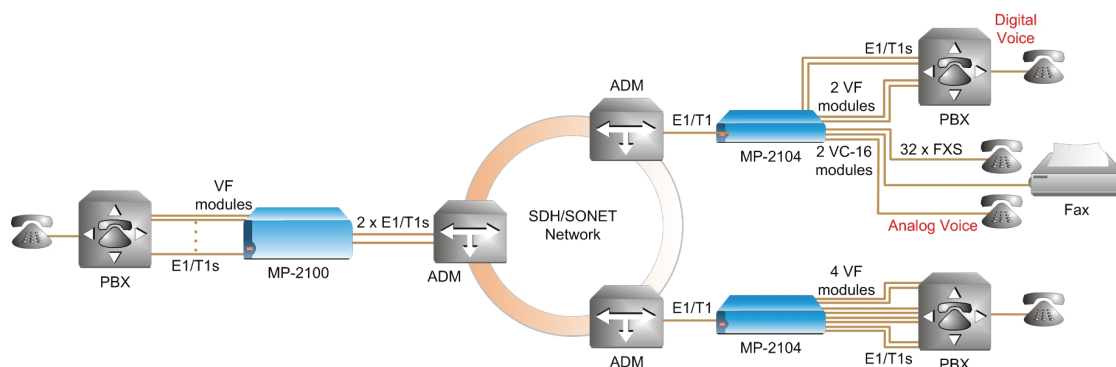


Figure 2. Compressed Voice over SDH/SONET Network

## Single/Dual E1/T1 Digital Voice Compression Modules

### T1 INTERFACE MODULES

- **Voice Channels**  
Up to 24 (per port)
- **Data Rate**  
1.544 Mbps (per port)
- **Standards**  
AT&T TR-62411, Pub. 54016, ANSI T1.403, ITU-T Rec. G.703, G.704
- **Framing**  
D4 (SF), ESF
- **Line Code**  
AMI
- **Zero Suppression**
  - Transparent (AMI coding - no zero suppression)
  - B7ZS
  - B8ZS (software-selectable)
- **Transmit Signal Level**  
Nominal level:  $\pm 2.7V$  ( $\pm 10\%$ ), software-selectable, measured at 0-655 ft
- **Receive Signal Levels**  
0 to -10 dB without CSU
- **Timing**  
Internal or loopback
- **Jitter Performance**  
Per AT&T TR-62411
- **Line Type**  
Balanced 4-wire, 100 $\Omega$
- **Connectors (per port)**  
RJ-45

### E1 INTERFACE MODULES

- **Voice Channels**  
Up to 30 (per port)
  - **Data Rate**  
2.048 Mbps (per port)
  - **Standards**  
ITU-T Rec. G.703, G.704, G.732
  - **Framing**  
G.732N  
G.732N with CRC-4  
G.732S  
G.732S with CRC-4
  - **Line Code**  
HDB3
  - **Transmit Signal Level**  
Balanced:  $\pm 3V$  ( $\pm 10\%$ )  
Unbalanced:  $\pm 2.37V$  ( $\pm 10\%$ )
  - **Receive Signal Levels**  
0 to -10 dB without LTU
  - **Timing**  
Internal or loopback
  - **Jitter Performance**  
Per ITU-T G.823
  - **Line Type**  
Balanced: 4-wire, 120 $\Omega$   
Unbalanced: coax, 75 $\Omega$ , (jumper-selectable)
  - **Connectors (per port)**  
Balanced: 8-pin RJ-45
- Note:* An MP-CBL-RJ45/2BNC/E1 adapter can be ordered to convert an E1 port RJ-45 connector into a pair of BNC connectors for unbalanced coax interface.

## ORDERING

**MP-2100M-VF-24/T1**  
Single T1 Digital Voice Compression Module for MP-2100/2104

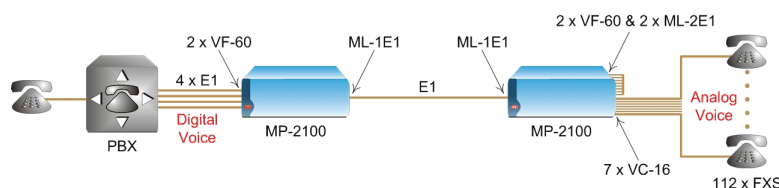
**MP-2100M-VF-30/E1**  
Single E1 Digital Voice Compression Module for MP-2100/2104

**MP-2100M-VF-48/T1**  
Dual T1 Digital Voice Compression Module for MP-2100/2104

**MP-2100M-VF-60/E1**  
Dual E1 Digital Voice Compression Module for MP-2100/2104

### OPTIONAL ACCESSORIES

**MP-CBL-RJ45/2BNC/E1**  
Adapter for VF-30/60 modules converting an E1 port RJ-45 connector into a pair of BNC connectors for unbalanced coax interface



**Figure 3. 112 Analog POTS Compression and Extension on a Single Chassis Using VF-60 Modules**



data communications

www.rad.com

- **International Headquarters**  
24 Raoul Wallenberg Street  
Tel Aviv 69719, Israel  
Tel: 972-3-6458181  
Fax: 972-3-6498250  
Email: market@rad.com
- **North America Headquarters**  
900 Corporate Drive  
Mahwah, NJ 07430, USA  
Tel: (201) 529-1100  
Toll free: 1-800 444-7234  
Fax: (201) 529-5777  
Email: market@radusa.com

764-144-09/06