KVF.4, KVF.4/N

2-Channel Low Bit Rate Voice/Fax Modules

RAD

- Variety of voice interfaces supported
- Optional integral support of DC current feed and ring generation
- Connection-on-demand capability

FEATURES

- Compression of two analog voice/fax, or ISDN voice channels
- KVF.4/N provides added signaling capabilities (Kilomux-2100/2104 only)
- High quality voice at 4.8, 6.4, 7.2, 9.6 or 12.8 kbps
- Fax Group III support with automatic rate fallback
- Support applications requiring double compression (tandeming)
- Transfer modem data relay at 2.4 kbps
- Integral echo canceller
- Low end-to-end delay
- Standard ISDN "S" interface operates as either TE or NT
- Soft gain control for both receive and transmit

DESCRIPTION

- KVF.4 and KVF.4/N are Kilomux voice modules providing high quality compression of two voice channels for maximum utilization of the main link bandwidth.

- KVF.4 and KVF.4/N compress the analog or digital (ISDN) voice signal at selectable rates of 4.8, 6.4, 7.2, 9.6 or 12.8 kbps. The data rate is soft-selectable, according to the quality desired and the available main link bandwidth.

- For data rates of 6.4 kbps and above, voice compression is based on the MPMLQ (Multipulse Maximum Likelihood Quantization) speech coding technique, as defined in the ITU G.723.1 Standard. The compression at 4.8 kbps uses a proprietary compression technique.

- Toll voice quality (comparable to 32 kbps ADPCM) is achieved when using a digitizing rate of 6.4 kbps and above; very high voice quality is achieved when using 4.8 kbps compression ratio.

- KVF.4 and KVF.4/N are available with a variety of interfaces (see *Ordering*), refer to *Table 1* for details.

- The 2-wire or 4-wire E&M module supports five signaling types: EIA RS-464 Types I, II, III and V, and British Telecom SSDC5. The E&M signaling is passed in-band within the compressed data.

- The enhanced KVF.4/N for the Kilomux-2100/2104, enables operation opposite the digital interface KVF.5 module for connection to digital PBXs. KVF.4/N enables signaling manipulation to support added features such as pulse metering for supporting payphones, and reverse polarity for wink start DID applications opposite the KVF.5 (see *Figure 2*).

- KVF.4 and KVF.4/N are equipped with an echo canceller for canceling the near-end hybrid echo. The echo canceller enables acceptable voice quality on voice lines with a long delay, such as long distance calls or calls over non-terrestrial links (e.g. satellite). Delay of up to 15 msec is accommodated. The echo canceller can be disabled by the user.

- Voice quality is maintained at a channel bit error rate of 1×10^{-3} or better (Hamming code error correction).

- Diagnostics include local digital loopback toward the local analog interface and analog loopback toward the remote site. Tone injection for testing is also available. Automatic self-test is performed during power-up and under normal operation.

- KVF.4/S0, with digital ISDN interface, supports super-tandem functionality without requiring multiple compression/ decompression.

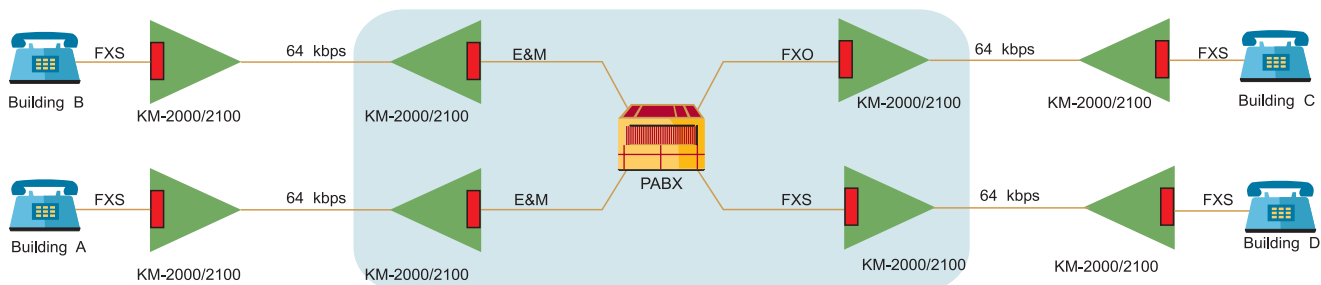## *2-Channel Low Bit Rate Voice/Fax Modules*

APPLICATIONS

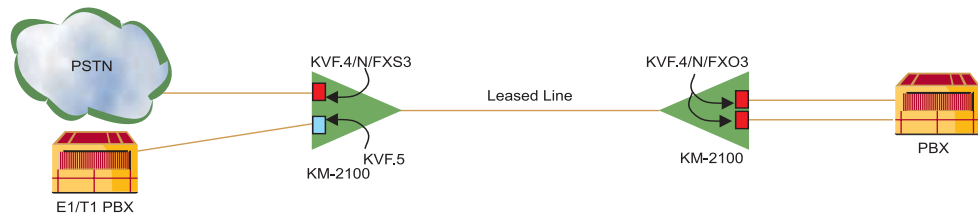**Figure 1. Double Compression Application**

Figure 2. Direct Inward Dialing (DID) including Wink-Start with Reverse Polarity and Pulse Metering, with KVF.4/N working opposite Digital Interface KVF.5

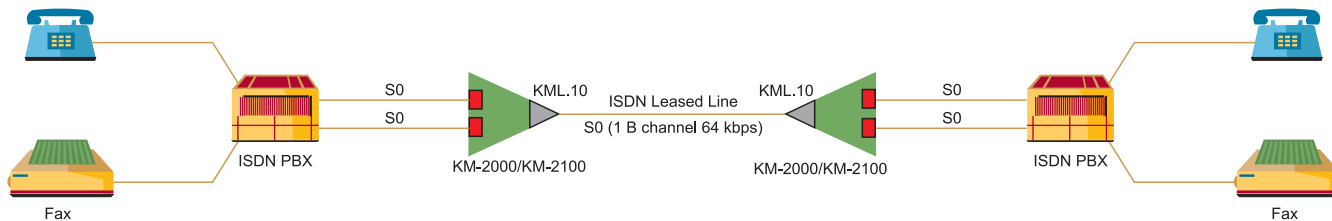**Figure 3. Voice Compression over Leased Line ISDN with S0 Interface**
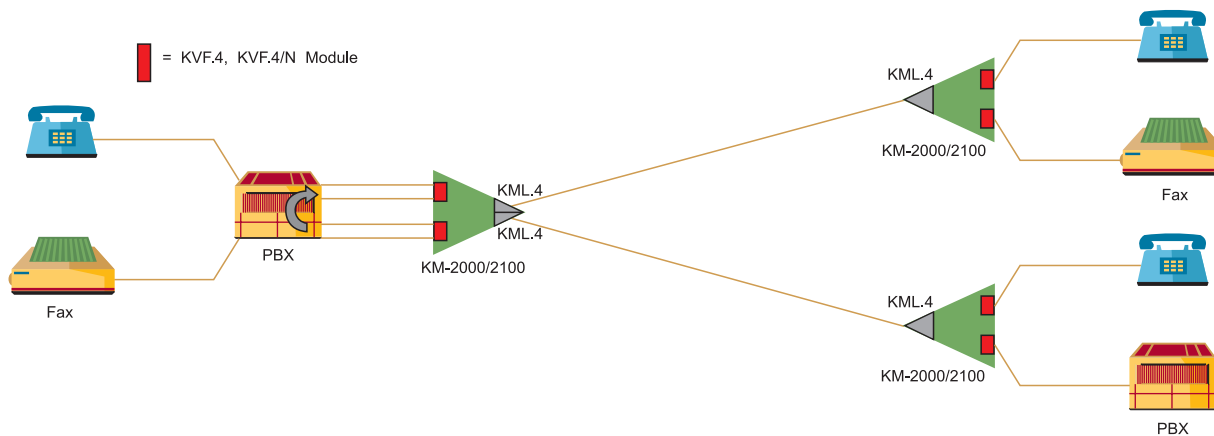
Figure 4. Double Compression/Tandeming for Branch Office to Branch Office Communication

- Applications requiring double compression are supported (i.e. voice communication between remote locations connected in a star configuration to a central PBX). In such a case, the switching is performed by the PBX and requires compression and decompression to be carried out twice. KVF.4 and KVF.4/N support this application for both voice and fax, due to the high quality compression technique (see *Figures 1 and 4*).

- Fax support is provided on both channels. Automatic voice/fax detection ensures that each channel can be used on demand for both voice and fax. By default, the channel operates in voice mode, but will switch to fax operation mode when a fax transmission is detected. After the fax transmission is over, the channel automatically returns to voice mode.

- KVF.4 and KVF.4/N modules take advantage of the cost-effective call-on-demand capabilities provided by Kilomux main link modules (see individual *Kilomux Main Link data sheets* for details).

- V.22 and V.22bis data support is also provided. Any of the two channels will automatically detect and switch to data mode when a modem transmission is detected.

SPECIFICATIONS

- **Number of Channels**
  Two

- **Digitizing Technique**
  G.723.1 MPMLQ low bit rate technique at 6.4, 7.2, 9.6 or 12.8 kbps
  Proprietary technique at 4.8 kbps

- **Fax Compatibility**
  Group III according to ITU Rec. V.29, V.27, V.27 ter

- **Fax Data Rates**
  2.4, 4.8 kbps, 7.2 kbps, 9.6 kbps (all with auto-fallback)

- **End-To-End Processing Delay**
  120 msec

- **Acceptable Channel Bit Error Rate**
  1×10^{-3} or better

- **Analog Interface**
  See *Table 1*

- **Adaptive Echo Canceller**
  Echo path length: 15 msec
  Echo return loss compliments (ERLE): >30 dB
  Convergence speed: Better than ITU G.165

- **D-Channel Bandwidth Allocation (S0 interface only)**
  Selectable data rates: 4.8, 6.4, 7.2, 9.6, 12.8, and 16 kbps

- **Power Consumption (Watts) KVF.4**

	+5 VDC	-12 VDC
E&M	4.1	0.72
FXO	4	0.6
FXS	4	0.72
FXSP	7.5	1.8
FXSW	4.75	0.48
S0	4.5	0.24

  KVF.4/N

	+5 VDC	-12 VDC
E&M	4	0.72
FXO	4	0.54
FXS	4.5	0.72

- **Diagnostics**
  Activated from local or remote site:
  - Digital loopback (toward local)
  - Analog loopback (toward remote)
  - Tone injection
  - Auto self test

- **Indicators (per channel)**
  - E&M E&M/E: E-lead, M-lead
  - FXS, FXS3, FXS0: REM call, LOC O.H.
  - FXO, FXO3: RING, REM O.H.
  - S0, S0P: ACT, TST, ALM
  - FXSW: REM call, LOC O.H., RING, REM O.H.

- **Connectors (per channel)**
  - E&M, E&M/E, S0, S0/P: RJ-45, 8-pin
  - FXS, FXS3, FXO, FXO3, FXSW, FXSP: RJ-11, 6-pin

Table 1. Module Versions

Version	Interface
E&M	Two-wire or four-wire analog interfaces with E&M signaling. Uses internal -12 VDC as signaling battery source
E&M/E	Two or four-wire analog interfaces with E&M signaling. With connector for external -48 VDC signaling battery source
FXO	Two-wire analog FXO interfaces with loop start signaling
FXO3	Two-wire analog FXO interfaces with loop start or wink start signaling, including battery polarity reversal and 12/16 kHz pulse metering detection.
FXS	Two-wire analog FXS interfaces with loop start signaling. Requires external feed and ring voltage source
FXS3	Two-wire analog FXS interfaces with loop start or wink start signaling, including battery polarity reversal and 12/16 kHz pulse metering generation. Requires external feed and ring voltage source
FXSP	Two-wire analong FXS interface with loop start signaling providing internal feed and ring voltage source. The number of FXSP modules supported in a Kilomux-2000/2100 system is limited by power supply output (*KVF.4 only*)
FXSW	Combination of one two-wire FXS interface and one two-wire analog FXO interface; FXS channel can connect to multiplexed link or to FXO channel. Requires external feed and ring voltage source for FXS channel (*KVF.4 only*)
S0	Two voice/fax channels with ISDN "S" interface (*KVF.4 only*)
S0/P	Two voice/fax channels with ISDN "S" interface and internal "phantom feed" (*KVF.4 only*)

2-Channel Low Bit Rate Voice/Fax Modules

- **Configuration**
  Terminal interface or RADview Management System

- **Analog Parameters**
  - Nominal level: 0 dBm
  - Nominal impedance: 600Ω
  - Return loss (300 to 3400 Hz): Better than 20 dB
  - Frequency response (Ref 1020 Hz):
    0 dB ±0.5 dB, 300-3000 Hz
    0 dB ±1.1 dB, 250-3400 Hz
  - Level adjustment (soft-selectable):
    E&M, E&M/E:
      TX: +7 to -17 dBm
      RX: +2 to -17 dBm
    FXS, FXS3, FXSP:
      TX: +8 to -13 dBm
      RX: +2 to -17 dBm
    FXO, FXO3:
      TX: +5 to -16 dBm
      RX: -1 to -17 dBm
    Steps: 1 dB ±0.5 dB
  - Signal to total distortion
    (G.712, G.713 method 2):
    0 to -30 dBm0:
      Better than 33 dB
    +3 to -45 dBm0:
      Better than 22 dB
  - Idle channel noise:
    Better than -70 dBm0
  - Transformer isolation:
    1500 VRMS

- **E&M Interface Characteristics**
  - Signaling methods (user-selectable):
    EIA RS-464, Type I;
    Modified EIA RS-464, Types II, III, and V, British Telecom SSDC5, with -12V, or standard with external -48V (**E&M/E** only)
  - Dial pulse distortion:±2 msec max

- **FXS Interface Characteristics**
  - Signaling methods:
    EIA RS-464 loop start
  - On-hook/off-hook threshold:
    3V to 38V between TIP and RING at off-hook state
    40V to 48V between TIP and RING at on-hook state
  - Feed current (with KM-Ringer):
    25 mA (±10%) for current feed
  - Ringer (with KM-Ringer):
    60 VRMS (±10%)
    [23 VRMS (±10%) for **FXSP**], overload protected,
    22 Hz (±10%), 1sec ON, 3sec OFF

- **FXS3 Interface Characteristics**
  Same as for **FXS** with the following additions:
  - Signaling methods:
    EIA RS-464 loop start or wink start
  - Metering pulse generation:
    Output frequency:
      16 kHz or 12 kHz (±2 Hz), user-selectable
    Output level:
      1.7 VRMS
  - Reversal polarity pulse distortion:
    6 msec max

- **FXO Interface Characteristics**
  - Signaling method:
    EIA RS-464 loop start
  - DC impedance:
    Off-hook: 100Ω at 100 mA feed, 230Ω at 25 mA feed
    On-hook: above 1 MΩ
  - Ring detector:
    20 kΩ @ 20 Hz, 70 VRMS
    Detection: >20 VRMS, 17-25 Hz
    No detection: <5 VRMS

- **FXO3 Interface Characteristics**
  Same as for **FXO** with the following additions:
  - Signaling methods:
    EIA RS-464 loop start or wink start
  - Metering pulse detection frequencies bandwidth (user-selectable):
    16 kHz: 15.76 to 16.24 kHz
    12 kHz: 11.82 to 12.18 kHz
  - Reversal polarity pulse distortion:
    6 msec max

- **FXSW Interface Characteristics**
  See **FXS** *for telephone connection* and **FXO** *for PSTN connection*

- **S0 Interface Characteristics**
  - Receive:
    +1.5 to -7.5 dB relative to the nominal amplitude
  - Transmit:
    ±750 mV

ORDERING

KM-2000M-KVF.4/*
2-Channel Low Bit Rate Voice/Fax Module for KM-2000/2004 and KM-2100/2104

KM-2100M-KVF.4/N/*
2-Channel Low Bit Rate Voice/Fax Module for KM-2100/2104

* Specify voice interface:
  E&M for 2-wire or 4-wire E&M
  EM/E for 2-wire or 4-wire E&M with external -48 VDC
  FXS for 2-wire FXS
  FXS3 for 2-wire FXS with reverse polarity and pulse metering
  FXSP for 2-wire FXS with built-in Ringer (*only for KVF.4*)
  FXO for 2-wire FXO
  FXO3 for 2-wire FXO with reverse polarity and pulse metering
  FXSW for one 2-wire FXS interface and one 2-wire FXO interface (*only for KVF.4*)
  S0 for ISDN (*only for KVF.4*)
  S0/P for ISDN with built-in phantom feeder (*only for KVF.4*)

Note:
- KVF.4/FXS, FXS3 and FXSW modules need an external -48 VDC and +72 VDC source for ring and feed voltages.
- KVF.4/N/FXS and FXS3 modules only require a -48 (-20 to -56) VDC source.

These external power sources can be provided by a KM-Ringer or Ringer-2000.

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