

- Inband “Robbed Bit Frame” (RBF). This method is useful for networks not supporting signaling switching
- No signaling – channel signaling is not transferred.
- SFP Socket for Fast Ethernet transceivers. RAD offers a wide variety of SFPs, for meeting a wide range of operational requirements.

To provide feed and ringing signal generation voltages, FXS modules require a nominal -48 VDC (-37 to -75 VDC) source. This power can be provided either by an appropriate DC-powered chassis, or by an external standalone Ringer power supply unit or module for AC-powered chassis, in accordance with the number of ports.

Gain control is user-selectable for both the receive and transmit directions, enabling easy installation in all environments.

ETHERNET INTERFACE

The Ethernet services are provided by means of an internal Layer-2 Ethernet switch.

The external Ethernet ports can be ordered with two types of interfaces:

- 10/100BaseTx interface terminated in RJ-45 connectors.

PSEUDOWIRE

A powerful pseudowire engine saves the need of two additional MPW-1 modules and can act as a server card to other I/O modules. Depending on the card type, the engine provides up to 12 or 16 protected PWs per module with up to 32 timeslots per each PW port.

The module features direct mapping of the local interfaces to PW port with reduced latency and built-in jitter buffer with configurable depth.

A series of PW-enhanced VS modules have independent adaptive clock recovery (ACR) mechanisms for each pseudowire, which recover the original timing (clock rate) of the far-end source of each pseudowire, according to ITU G.8261, G.823, G.824 and MEF 22 recommendations. The clock recovery mechanisms can provide recovered clock signals to serve as timing references for the Megaplex-4.

ETHERNET OVER PDH

VS modules transport Ethernet over PDH infrastructure via the following technologies:

- Generic Framing Procedure (GFP G.8040)
- Virtual Concatenation (VCAT G.7043)
- Link Capacity Adjustment Scheme (VCAT G.7042).

CROSS-CONNECT

The bidirectional broadcast mode enables a user at a central location to communicate with several users connected to remote Megaplex-4 units, using polled communications.

It is used mainly for SCADA applications in which a SCADA controller is polling multiple RTUs/IEDs at a central site (see *Figure 3*).

Each remote device is listening to the traffic sent by the central controller and responds when it is being polled.

At the central site all the traffic from the remote site is aggregated by the VS card.

MANAGEMENT

All module operating parameters are soft-selectable through the Megaplex management.

VS

Specifications

SERIAL INTERFACE

Data Channels per Module

VS-12: 12

Other VS modules: 6

Interface (Electrical)

V.24/RS-232, V.35 or V.11/RS-422

RS-485 (4-wire only)

Interface (Physical)

V.24/RS-232, V.35, V.36/RS-449, RS-530, X.21 (via adaptor cables)

Connectors

Four/two 68-pin SCSI, female
(one per 3 data channels)

Encapsulation Modes

None

V110

R.111

3-bit-transitional

HCM

Interface Control Signals

Local support for all types of control signals

End-to-end transfer of local RTS and DTR lines

Signal Format

Asynchronous or synchronous, full duplex

Data Rates

Depend on encapsulation mode:

- None: n×56 or n×64 kbps (n = 1 to 31)
- V110: 2.4, 4.8, 9.6, 19.2, 38.4 kbps
- R.111: 2.4, 4.8, 9.6, 19.2 kbps
- 3-bit-transitional: 64 kbps, 128 kbps
- HCM: 2.4, 4.8, 9.6, 19.2, 38.4 kbps

Async Character Format

Length: 5,6,7,8

Parity bit: yes, no

Stop bits: 1,2

Clock Mode

DCE (VS channel provides both RX and TX clocks to the user DTE)

Diagnostics (per port)

Local digital loopback

Remote digital loopback

BINARY INTERFACE

Compliance

IEEE 1613 (USA standard for equipment in electrical switching stations)

Inbound Ports

Number: 8

Maximum Input Control voltage: ±60 VDC

Command trip point:

- Above – 24 VDC ON
- Below – 18 VDC OFF8B

Outbound Ports

Number 8

Relay type:

- Electro-mechanical relay (EMR)
- Solid-state relay (SSR)

Closed Contact Parameters:

- Max current 1A
- Impedance: < 0.1 Ohm
- Maximum current:
 - EMR: 1A
 - SSR: 0.12A
- Minimum current (SSR only) 0.1 mA

Maximum DC voltage across open contacts: 60 VDC

Isolation

All input and outputs are galvanically isolated

Connector

DB-44

LED Indicators

Name: CMD IN/OUT

Number: 8

Color: Green/Yellow

Green blinking: cmd-in port is active

Red blinking: cmd-out port is active

Green/Red blinking: cmd-in and cmd-out ports are both active

Off – port is not active or not connected

G.703 INTERFACE

Compliance

ITU-T Rec. G.703, Section 1.1.4.1

Number of Ports

8

Connectors

RJ-45 (one for each channel)

Nominal Data Rate

64 kbps

LED Indicators

ALM (red):

- Lights steadily – the corresponding port detects LOS
- Flashes – the corresponding port detects OOS pattern
- Off – the corresponding port is not connected.

C37.94 INTERFACE

Compliance

IEEE C37.94, optical part

Number of Ports

2

Connectors

Pair of ST connectors, female

Nominal Data Rate

2.048 Mbps

Wavelength

850nm ± 40nm

Fiber Type

62.5/125 μm multimode

50/125 μm multimode

Transmitter Type

LED

Power Coupled into Fiber

62.5/125 μm: -11 to -19 dBm

50/125 μm: -11 to -23 dBm

Minimum Receiver Sensitivity

-32 dBm

Maximum Receiver Input Power

-11 dBm

Receiver Dynamic Range

21 dB

Range (Typical)

2 km/1.25 miles

LED Indicators

SYNC (green/red):

- Lights steadily in green – the corresponding port is operating properly
- Flashes in green – the corresponding port is operating properly, but serves as the standby port when link protection is enabled
- Lights in red – the corresponding port detects loss of synchronization or loss of signal
- Flashes in red – the corresponding port serves as the standby port, and detects loss of synchronization

REM SYNC (yellow):

- On – the corresponding port detects loss of remote synchronization
- Off – the corresponding port is not connected.

Diagnosics (per port)

Local digital loopback
Remote digital loopback

E1/T1 INTERFACE

Ports

8 E1/T1 ports per submodule

E1 or T1 option soft-selectable, same for all module ports

Connectors (per submodule)

DB-44, female for each 8 ports (see *Ordering* for cables available from RAD)

Diagnosics

(per port and per timeslot)

Local digital loopback
Remote digital loopback
BER Test on E1 ports of selected VS modules

E1 INTERFACE

Compliance

ITU-T G.703, G.704, G.732 (Including CRC-4 and E bit)

Framing

2 frames (G732N), or 16 frames (G732S) per multiframe, with or without CRC-4 Unframed

Data Rate (per port)

2.048 Mbps

Line Code

HDB3

Jitter Performance

As per ITU-T G.823

Impedance

Balanced 4-wire: 120Ω
Unbalanced coax: 75Ω

Signal Level

Receive: 0 to -12 dBm
Transmit:
Balanced: ±3V (±10%)
Unbalanced: ±2.37V (±10%)

T1 INTERFACE

Compliance

ANSI T1.107 and T1.403

Framing

ESF

Data Rate (per port)

1.544 Mbps

Line Code

Bipolar AMI

Zero Suppression

Transparent, B7, B8ZS

Signal Level

Receive: 0 to -12 dBm
Transmit: 0.6, 1.2, 1.8, 2.4, 3.0 dBm user-adjustable, measured at 0 to 655 ft

Jitter Performance

As per AT&T TR-62411

Impedance

Balanced 4-wire: 100Ω

Compliance

E1: ITU-T G.703, G.704, G.732 (Including CRC-4 and E-bit)
T1: ANSI T1.107, T1.403

VOICE INTERFACE – GENERAL

Number of Voice Channels

FXS/FXO: 8 ports per submodule
E&M: 4 ports per submodule

Voice Encoding Technique

Per ITU-T G.711 and AT&T Pub. 43801, μ-law or A-law

Bandwidth Requirement

64 kbps (one timeslot) per enabled channel

Analog Interface

Line type:

E&M: 4-wire or 2-wire (soft-selectable)
FXS, FXO: 2-wire
ITU-T standard: G.712

Connectors:

E&M interface: 4xRJ-45
FXS/FXO interface: 4xRJ-12 (one per two channels)

Diagnosics

Local digital loopback for each channel, towards the local user equipment

Remote digital loopback for each channel, towards the remote user equipment

1 kHz, 0 dBm0 test tone injection for each channel, towards the remote user equipment

1 kHz, 0 dBm0 backward test tone injection for each channel, towards the local user equipment

Analog Parameters

Nominal level: 0 dBm
Nominal impedance: 600Ω
Return loss (ERL) at 300 to 3400 Hz: better than 20 dB

Frequency response (Ref:1020 Hz):
±0.5 dB at 300 to 3000 Hz
±1.1 dB at 250 to 3400 Hz

Level adjustment (soft-selectable): see *Table 1*.

Steps: 0.5 dB (±0.5 dB), nominal
Signal to total distortion (G.712):
-30 to 0 dBm0: better than 33 dB
-45 to +3 dBm0: better than 22 dB
Idle channel noise: better than -65 dBm0 (+25 dBnc)

Far-end cross-talk (2W&4W): -65dBm0 max

Go-to-return cross-talk (4W): -60dBm0 max

E&M INTERFACE

Signaling Method (selectable)

EIA RS-464 Type I;

VS

EIA RS-464 Types II, III, and V (British Telecom SSDC5) using -12 VDC in place of -48 VDC

Note: For full support of Types II, III, and V (SSDC5) signaling standards, -48 VDC power supply is required.

Pulse Dial Distortion

±2 msec max

Transformer isolation

1500 VRMS

Indicators

M On when the M line of the corresponding channel is off-hook (channel in use)

E On when the E line of the corresponding channel is off-hook (channel in use)

FXS INTERFACE

Signaling Methods

EIA RS-464 loop-start or wink-start

On-Hook/Off-Hook Threshold

Off-Hook Threshold: Loop current >11 mA

On-Hook Threshold: Loop current <8 mA

Indicators

Number: 8

Color: green/yellow

Name: LOC/REM

Lights steadily in green – Local “OFF-HOOK”

Lights steadily in yellow – Remote “OFF-HOOK”

Flashes in green/yellow – Local and

Remote “OFF-HOOK”/conversation state

Off: port is not connected or both

directions of signaling are “ON-HOOK”

Loop Resistance

Min: 300Ω

Max: 1600Ω

Feed Current

20 mA (±10%) per active channel

Ringer

Overload protected, 1 sec ON, 3 sec OFF

54 VRMS with up to 1 REN load

45 VRMS with up to 5 REN load

Reverse Polarity Pulse Distortion

6 msec max

-48 VDC (nominal) Current Consumption

30 mA (±10%) per active channel

Number of Channels

Ringer-2100R: up to 40

Ringer-2000: up to 100

Ringer-2200N: up to 200

FXO INTERFACE

Signaling Methods

EIA RS-464 loop-start or wink-start

DC Impedance

Off-Hook:

160Ω at 50 mA feed

270Ω at 25 mA feed

On-Hook: 20 MΩ

Ring Detector

Ring Impedance: 20 MΩ

Detection: >16.5 VRMS, 13–68 Hz

No detection: <13.5 VRMS

Reverse Polarity Pulse Distortion

6 msec max

Indicators

Number: 8

Color: green/yellow

Name: RING/REM

Lights steadily in yellow – Remote “OFF-HOOK”

Lights steadily in green – Ringing is received on the corresponding channel

Off: Port is not connected or

Remote “ON-HOOK” state with ringing not

received on the corresponding channel

ETHERNET INTERFACE

Number of Ports

1 UTP copper (RJ-45 shielded) or 1 SFP socket

SFP Transceivers

For full details, see the [SFP/XFP](#)

[Transceivers data sheet](#) on www.rad.com

Note. It is strongly recommended to order this device with original RAD SFPs. RAD cannot

guarantee full compliance to product specifications for units using non-RAD SFPs.

Data Rate

UTP: 10/100 Mbps

SFP: 100 Mbps

Autonegotiation (copper only)

Frame Size

9140 bytes

LED Indicators

LINK On (green): Link is up

LINK Off: Link is down

ACT Flashes (yellow): Data is being transferred

ACT Off: No data transfer

PSEUDOWIRE

Standard Compliance

IETF: RFC 4553 (SAToP), RFC 5086 (CESoPSN)

MFA Forum: IA 8.0.0

MEF 8

Note. Non-E1/T1 VS modules do not support SAToP.

Number of PW Connections

32 per module (up to 640 per chassis)

Jitter Buffer Size

VS-16E1T1/PW and VS-6/E1T1 modules: 0.25–256 msec, in 1 μsec steps with 125 μsec granularity (the value entered by the user is rounded upward to the closest n*125 sec value)

Other VS modules: 0.25–8 msec, in 1 μsec steps with 125 μsec granularity (the value entered by the user is rounded upward to the closest n*125 μsec value).

Diagnostics

Local and remote digital loopback per DS1 port timeslot: all VS modules

Local and remote digital loopback per

entire DS1 port: VS-6/E1T1, VS-

16E1T1/PW, VS-6/703, VS-6/FXS/PW, VS-

6/FXO/PW, VS-6/E&M/PW

GENERAL

Power Consumption (max.)

VS-12

RS-422: 16.7W
RS-232: 13.5W
V.35: 15.9W

VS-6/BIN

RS-422: 14.7W
RS-232: 13.0W
V.35: 14.2W

VS-6/C37

RS-422: 12.9W
RS-232: 11.3W
V.35: 12.5W

VS-6/4E&M

RS-422: 17.0W
RS-232: 15.4W
V.35: 16.6W

VS-6/8FXO

RS-422: 13.9W
RS-232: 12.3W
V.35: 13.5W

VS-6/8FXS

RS-422: 14.7W
RS-232: 13.1W
V.35: 14.3W

VS-6/703

RS-422: 6.0W
RS-232: 4.4W
V.35: 15.6W

VS-8FXS/4E&M: 17.4W

VS-16E1T1-EoP: 14.5W

VS-16E1T1-PW: 14.5W

VS/8E1T1/UTP/PW

RS-422: 16.1W
RS-232: 14.5W
V.35: 15.7W

Configuration

Programmable via the Megaplex management system

Environment

Operating temperature: -10°C to +55°C
(14°F to 131°F)
Storage temperature: -20°C to +70°C
(-4°F to +160°F)
Humidity: up to 95%, non-condensing

Ordering

RECOMMENDED CONFIGURATIONS

MP-4100M-VS/12S/2UTP

MP-4100M-VS/12S/2SFP

Versatile module with 12 serial ports, 2 10/100 BaseT interfaces/empty SFP slots

MP-4100M-VS/6S/BIN/EMR/UTP

MP-4100M-VS/6S/BIN/EMR/SFP

Versatile module with 6 serial ports, 8 binary command ports with electromechanical relay output and Ethernet port, 10/100 BaseT interface/empty SFP slot

MP-4100M-VS/6S/C37/UTP

Versatile module with 6 serial ports, 2 C37.94 ports and Ethernet port with 10/100 BaseT interface

MP-4100M-VS/6S/703/UTP/PW

Versatile module with 6 serial ports, 8 G.703 64-kbps codirectional ports and Ethernet port with 10/100 BaseT interface

MP-4100M-VS/6S/8FXS/UTP

MP-4100M-VS/6S/8FXS/UTP/PW

Versatile module with 6 serial ports, 8 FXS voice ports and Ethernet port with 10/100 BaseT interface, regular/PW-enhanced with ACR support

MP-4100M-VS/6S/8FXO/UTP

MP-4100M-VS/6S/8FXO/UTP/PW

Versatile module with 6 serial ports, 8 FXO voice ports and Ethernet port with 10/100 BaseT interface, regular/PW-enhanced with ACR support

MP-4100M-VS/6S/4E&M/UTP

MP-4100M-VS/6S/4E&M/UTP/PW

Versatile module with 6 serial ports, 8 E&M voice ports and Ethernet port with 10/100 BaseT interface, regular/PW-enhanced with ACR support

Table 1. Transmit and Receive Levels for Voice Interfaces

Interface	Transmit [dbm]		Receive [dbm]	
	min	max	min	max
E&M 2W	-8	+5	-17	+2
E&M 4W (when there is a mix* of 2W/4W ports)	-8	+5	-17	+3.5
E&M 4W**	-17	+5	-17	+9
FXS	-5	+5	-17	+1
FXO	-3.5	+5	-17	+1
*within groups 1-4,5-8				
**all ports				

VS

MP-4100M-VS/8FXS/4E&M

Versatile module with 4 E&M and 8 FXS voice ports

MP-4100M-VS/8E&M

Versatile module with 4 E&M and 8 FXS voice ports

MP-4100M-VS/6S/8E1T1/UTP/PW**MP-4100M-VS/6S/8E1T1/SFP/PW**

Versatile module with 6 serial ports, 8 E1/T1 links, PW support and Ethernet port, 10/100 BaseT interface/empty SFP slot

MP-4100M-VS/16E1T1/PW

Versatile module with 16 E1/T1 links and PW support

MP-4100M-VS/16E1T1/EOP

Versatile module with 16 E1/T1 links and Ethernet over PDH support

SPECIAL CONFIGURATIONS

Please contact your local RAD partner for additional configuration options.

OPTIONAL ACCESSORIES**CBL-SCS68/3/*/#/⊗**

Cable for converting each of the VS 68-pin SCSI connectors into 3 separate channel connectors with the physical interface specified.

Note: A separate cable is required for each of the 2/4 channel connectors.

Legend

- * Interface:
 - 232** V.24/RS-232, 25-pin
 - V35** V.35 interface, 34-pin
 - V36** V.36/RS-449, 37-pin
 - 530** RS-530, 25-pin
 - X21** X.21, 15-pin
- # Length (Default=2m / 6.5 ft):
 - 3M** for 3m (9.8 ft)
 - 5M** for 5m (16.4 ft)
- ⊗ Connector:
 - F** female
 - M** male

CBL-VS-VOICE

Cable for splitting each of the four RJ-12 connectors of FXS/FXO interface into two RJ-12 connectors intended for end-user equipment

CBL-G703-8/RJ45

Splitter cable for splitting each 44-pin VS E1/T1 module connector to 8 E1 or 8 T1 balanced RJ-45 connectors

CBL-G703-8/RJ45/X

Splitter cross-cable for splitting each 44-pin VS E1/T1 module connector to 8 E1 or 8 T1 balanced RJ-45 connectors

CBL-G703-8/COAX

Splitter cable for splitting each 44-pin VS E1 module connector to 8 pairs of unbalanced BNC connectors

CBL-G703-8/OPEN

Open-ended cable with DB-44 connector on the Megaplex side for balanced E1 or T1 applications

CBL-VS-BIN

Open-ended cable with DB-44 connector on the Megaplex side for binary (alarm control) applications

All VS cables listed in this section are 2m (6.6 ft) long. For additional cable lengths available, see RAD catalog.

International Headquarters

24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel. 972-3-6458181
Fax 972-3-6498250, 6474436
E-mail market@rad.com

North American Headquarters

900 Corporate Drive
Mahwah, NJ 07430, USA
Tel. 201-5291100
Toll free 1-800-4447234
Fax 201-5295777
E-mail market@radusa.com

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