ORION TELECOM NETWORKS INC.

VCL-MX Version 6
DXC 80 E1, 160Mbps
Digital Access Cross Connect Switch

System Guide

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Warranty

This Orion product is warranted against defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, Orion will, at its discretion, either repair or replace products, which prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by Orion. The buyer shall prepay shipping charges to Orion and the company shall pay shipping charges to return the product to the buyer. However, the buyer shall pay all the shipping charges, duties and taxes for products returned to Orion from another country.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the buyer. The buyer-supplied firmware or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product or improper site preparation or maintenance.

Exclusive Remedies

The remedies provided herein are the buyer's sole and exclusive remedies. Orion shall not be liable for any direct, indirect, special, incidental or consequential damages, whether based on contract or any legal theory.

Notice

Safety Warnings

The exclamation point within a triangle is intended to warn the operator or service personnel of operation and maintenance factors relating to the product and its operating environment, which could pose a safety hazard.

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this instrument. No adjustment, maintenance or repairs should be performed by either the operator or the user.

QUALITY ASSURANCE PROGRAM

Orion's products are designed and manufactured under a strict Quality Assurance Program based on the ISO 9001:2008 philosophy and principles. Orion pays very special attention to its vendor development program which ensures an "end-product" of the highest quality at the most cost effective prices.

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Product Overview

The VCL-MX Version 6 DXC – 80 E1, 160Mbps Digital Access Cross Connect is a modular switch which may be scaled from 8 E1 Ports to up to 80 E1 Ports. The VCL-MX Version 6, E1 DACS (E1 DXC) offers full cross-connect functionality to cross-connect between 64Kbps time-slots (DS-0s), "n"x64Kbps consecutive DS-0s and Fractional E1 channels to full E1 channels.

The VCL-MX Version 6 DXC – 80 E1, 160Mbps Digital Access Cross Connect Switch, occupies 6U high (264 mm) rack-space and is a complete 19-inch standalone unit that provides a 64Kbps time-slot (DS-0) cross-connect fabric for up to 80 E1 ports. This product offers 1+1 -48V DC Power Supply Redundancy, 1+1 Control Card and Processor Redundancy, 1+1 Cross-Connect (TSI) Redundancy, 1+1 Timing (Synchronization Clock Circuitry) Redundancy. This DXC offers “user selectable” clock / timing synchronization priority. The Dual Power Inputs allow the equipment to be powered from two separate power sources. AC input external adapter is an optional for AC mains operation.

Key Features and Highlights

- 160Mbps, 80 E1 fully non-blocking cross-connect at 64Kbps (DS-0) level (2480 DS-0 – any to any time-slot cross-connect)
- Scalable from 8 E1 Ports to 80 E1 Ports
- 1+1 Control Card Processor Redundancy
- 1+1 Cross-Connect / TSI Redundancy
- 1+1 Timing (Synchronization Clock) Redundancy
- 1+1 -48V DC Power Supply Redundancy (Dual Power Input – allows the equipment to be powered from two separate -48V DC sources
- Bit Error Rate (BER) monitoring – BER thresholds to generate BER alarms automatically whenever alarm limits are exceeded
- Telnet remote access. SSH for secured remote access
- SNMP traps
- Maintains Access Security Log
- USB and RS232, Interface for local connection through the serial interface to the "Network Control and Management Software”
- User Selectable Internal, External and Loop-timed clock synchronization priority options
- Local and remote loopback facility.

System Access, Control and Management Options

- Telnet
- SSH
- CLI Control Interface (HyperTerminal or VT100)
- SNMP V2 Traps (MIB File provided)
- GUI (Graphical User Interface).

OAM: Operation and Management Ports

- RS232 Serial Port
- USB COM Port
- 10/100BaseT Ethernet for remote access.

Security and Protection

- Secured Access via SSH V2
- Password Protection: Password Protection in compliance with the mandatory clauses of the GR-815-CORE-2 specifications for secured access control.
- Logging: Maintains a log of all successful and un-successful attempts. Logged information includes the ID and the IP address of the accessing entities. Alerts the administrator if the un-successful logging attempts exceed 3.
- Security Audit: All access logs for up to 30 days are maintained for security audit purposes.
- Security log entry of any request or activity including that user-ID (including IP address, if applicable), to establish user accountability
- Report Generation / Audit Trail
- Security Administration.

System Overview and Architectural Details

VCL-MX Version 6, is a scalable DXC which may be used to cross-connect at DS-0 (64Kbps time-slot level) from 8 E1 Ports to 80 E1 Port (160Mbps). The VCL-MX Version 6 DXC has a multi-slot chassis with TDM backplane. In the chassis, there are ten (10) E1 interface card slots. Each E1 Interface Card has 8 E1 Ports.

Two slots are reserved for 1+1 redundant control cards which includes the redundant cross connect, processor, TSI and clock synchronization / timing functions. One dedicated slot exists for an OAM card and two slots for 1+1 redundant power supply cards.

Chassis / System Backplane

All connections are made at the rear of the chassis, providing interconnections between the various plug-in cards and to the network. VCL-MX Version 6 - 80 E1, 160Mbps Digital Access Cross Connect Switch supports high-density E1 interface cards.

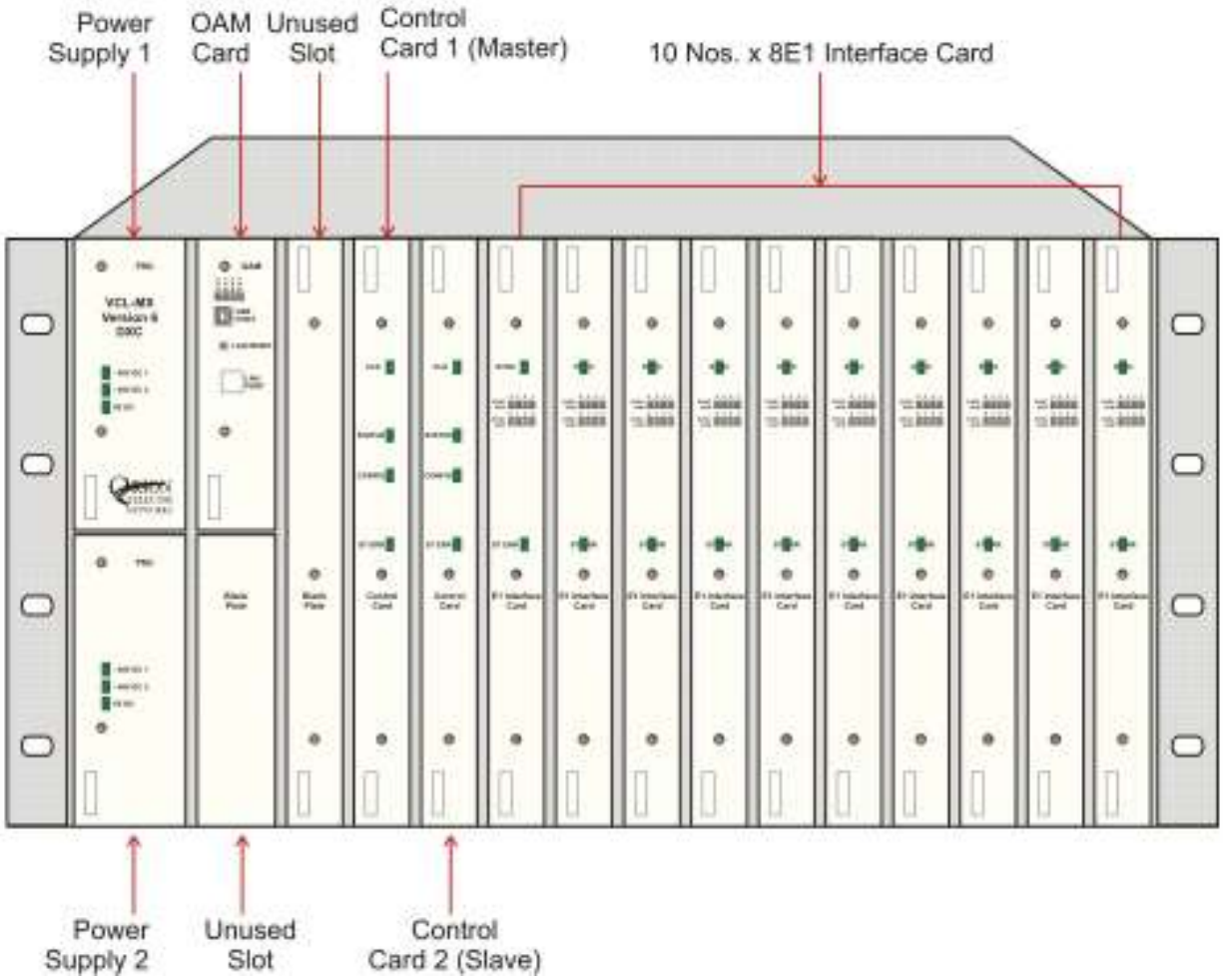
An extensive set of alarms, for easy maintenance are provided in the system.

Timing (Clock) Synchronization

Timing Options	Internal Clock, Loop-Timed Clock, External Clock. User selectable synchronization priority
Synchronization Sources	Internal Clock, span clock timing derived from incoming HDB3 links (Loop-Timed), External Clock, 75 Ohms (TTL), 2.048 Mbits and 120 Ohms (Bits clock)
Default Option	Internal Clock

System Management

VCL-MX Version 6 - 80 E1, 160Mbps Digital Access Cross Connect Switch offers a variety of management options. The equipment may be configured using CLI (English text) commands, or a GUI (Graphical User Interface). The management and configuration commands may be executed from a VT100 terminal, Windows HyperTerminal, any DOS based system, Linux or UNIX based system, or Telnet (remote configuration and management).



The equipment provides a wide choice of access ports for connecting to and executing management and configuration commands through its OAM Card.

The OAM card provides:

a) COM Port (RS232 Serial Port).
b) USB Port
c) 10/100BaseT Ethernet Port (each multiplexer may be assigned an IP address and connected to a LAN / IP network for remote access and management through the 10/100BaseT Ethernet Port for out-of-band configuration, management and access).

The OAM card supports:

a) Telnet
b) SSH
c) SNMP, V2
d) Additionally, a Windows based GUI (Graphical User Interface) for easy configuration, management and access.

The VCL-MX has an effective, CLI (text) and GUI based "Network Management Interface", which may be used for configuring and monitoring multiple systems from a single central location.

Status Monitoring

- Synchronization Clock Selection
- Status of alarms
- Enabled/Disabled status of 2.048 Mbps E1 ports
- Monitoring the 80 Port E1 DACS status and configuration
- Monitoring of E1 Link status: LOS, LOF, AIS, ES, SES, UAS.

Alarm status and monitoring

- Loss of incoming signal at all 2.048 Mbps E1 Ports
- Configuration error alarm

LED indications

- 1 to 80 E1 Ports LED indicators
- 5V DC present
- -48V DC present
- Configuration error

External Alarm - Contact Closures

- 1 Alarm relay Type - form "C

Technical Specifications:

Control Card - Processor, Timing and TSI Card: (Part No. VCL-MX-1500)

Control Card Redundancy	Yes
Processor	1+1 Redundant ARM7 Self Learning Self Healing Automatic Fail-Over and Recovery
Timing and TSI	1+1 Redundant Self Learning Self Healing Automatic Fail-Over and Recovery

OAM - Management Interface Card (Part No. VCL-MX-1504)

- COM Port (RS232 Serial Port)
- USB Port
- 10/100BaseT Ethernet Port - Each multiplexer may be assigned an IP address and connected to a LAN / IP network for remote access and management through the 10/100BaseT Ethernet Port for out-of-band configuration, management and access
- Telnet
- SSH
- SNMP, V2
- Windows based GUI (Graphical User Interface) for easy configuration, management and access.

E1 Interface Card: (Part No. VCL-MX-1520)

Maximum number of interfaces	80 E1 Interfaces with full capability to cross connect at DS-0, 64Kbps time-slot level, as well as to inter-connect to voice and digital data services between 80 incoming E1 Ports (i.e. 80 separate E1 Links, 2480 DS-0 – any to any time-slot cross-connect)
Number of Interfaces pre E1 Interface Card	8 E1 Interfaces with full capability to cross connect at DS-0, 64Kbps time-slot level as well as to inter-connect to voice and digital data services between 80 incoming E1 Ports (i.e. 80 separate E1 Links)
Connectors	DB-25 / RJ-45 / RJ-48C
Conformity (electrical)	G.703
Frame Structure	As per ITU (CCITT) G.704
Bit Rate	2048 Kbps ± 50 ppm
Code	HDB3
Nominal Impedance	120Ω balanced / 75Ω unbalanced
Peak Voltage of a mark For 120Ω Balanced interface 75Ω Unbalanced interface	 3.0 V ± 0.3 V 2.37 V ± 0.237 V
Peak Voltage of a space For 120Ω Balanced interface 75Ω Unbalanced interface	 0 V ± 0.3 V 0 V ± 0.237 V
Nominal Pulse Width	244 ns
Pulse Mask	As per ITU (CCITT) Rec. G.703
Output Jitter	<0.05 UI (in the frequency range of 20Hz to 100 KHz)
Permissible Attenuation	6 dB at 1 MHz
Return Loss at: 51.2 KHz to 102.4 KHz 102.4 KHz to 2048KHz 2048KHz to 3072 KHz	 >12dB > 18dB > 14dB
Jitter Tolerance	As per ITU (CCITT) G.823
Monitoring Connection Line Quality	Loss of Signal (LOS), Loss of Frame (LOF), All Ones Alarms (AIS), Errored Seconds (ES), Severely Errored Seconds (SES), Unavailable Seconds (UAS).
Frame alignment	As per ITU (CCITT) G.732
Loss and recovery of frame alignment	As per clause 3 of ITU (CCITT) G.732
Loss and recovery of multi-frame alignment	As per clause 5.2 of ITU (CCITT) G.732

Power Supply (Part No. VCL-MX-1510)

Input DC Voltage	-48V DC (nominal)
Range of Input	-36V to -72V DC
Output Voltage	5V filtered -48V (for terminal cards)
Full Load Current Rating	4A at 48V DC
Input Voltage Reversal Protection	Provided in the Card
Over Current Protection	4A at 48V DC
Short Circuit Protection	Current limit – 4A. Recovers on removal of short
Efficiency at Full Load	>91%

Power Consumption

Maximum Power Consumption	90 watts

Environmental

Temperature	-10°C to + 60°C
Humidity	95% R.H. (non-condensing)
Altitude	Upto 9,000 feet

Dimensions

Height	266 mm (19 “ 6U high)
Width	482 mm
Depth	270 mm
Weight	7 kgs

Regulation Compliance

- Meets CE requirements
- Complies with FCC, Part 68 and Part 15 sub part A specifications

Optional Interfaces

Multi-service platform

VCL-MX Version 6 - E1 160Mbps Multiplexer supports both data and voice traffic.

For voice traffic, it supports the following interfaces:

- FXO
- FXS
- E&M (2Wire / 4Wire)
- Hot-Line (Ring-Down)
- Ring Generator (75V RMS)
- 15-Way Conference
- Magneto (GEN-GEN)
- BRI ISDN (2B+D).

For data traffic, it supports the following interfaces:

- Channelized E1 / Fractional E1 data
- RS-232 asynchronous data
- V.24 synchronous data / asynchronous data
- G.703, @ 64 Kbps, co-directional
- V.35, V.36, X.21, V.11, RS530, RS449 synchronous, “n”x64Kbps data
- G.SHDSL “n”x64Kbps data
- 10/100BaseT - Ethernet Bridge (Optical and Electrical)
- Analog I/O Card (Dry Contact)
- Digital I/O Card (TTL signal)
- Universal DCE / DTE synchronous “n”x64Kbps data interface
- 8E1 plus 100Mbps Ethernet fiber optical transport interface along with the following:
  - EOW (Engineering Order Wire) channel for end to end installation and maintenance
  - Local and remote loop back test for diagnostics
  - 1+1 Fiber Path protection
  - ALS (Auto Laser Shutdown) facility for eye safety
  - 10/100M Ethernet Port - 100 Mbps Ethernet data transmission rate complies with IEEE8 02.3
- BRI ISDN (2B+D).

Optional Interface Specifications:

FXS, Voice Frequency Interface: (Part No. VCL-MX-1525FXS)

Number of Channels per Card	4 / 8 / 12 / 16
Interface Type	FXS, A-law or Mu-law (user selectable)
Maximum Number of Channels	144
Transmission performance	Fully compliant to ITU (CCITT) G.712 specification
Line Impedance	600Ω (900Ω optional)
Loop resistance	Upto 2000 Ohms
Voice Channel Frequency	300Hz-3400Hz
Insertion Loss / Gain	-2.0 dB Nominal (user adjustable) Adjustable range –30 dB to +3 dB in steps of 0.5dB
User selectable range for gain / insertion loss	0 dB to 18 dB
Idle Channel Noise	≤ - 65 dB
Return Loss	300Hz – 600Hz - ≥ 12 dB 600Hz – 3400Hz - ≥ 15 dB
Longitudinal Balance	≥ 46 dB between 300Hz to 3400Hz
Ring Frequency	16 Hz, 20 Hz, 25 Hz, 50 Hz
Ring Voltage	≥ 75 volts RMS into a load of 5 R.E.N. with a 0.30 Erlang traffic pattern
Subscriber Loop Current	≥ 23mA into a subscriber loop of 1000 Ohms
Overload Level	+3.14 dBm ± 0.5 dBm
Battery Reversal	All channels
Dial Pulse Speed	50 pps - Pulse Dialing ≤ ± 2 ms / DTMF Dialing

FXO, Voice Frequency Interface: (Part No. VCL-MX-1530)

Number of Channels per Card	4 / 8 / 12 / 16
Interface Type	FXO, A-law or Mu-law (user selectable)
Maximum Number of Channels	144
Transmission performance	Fully compliant to ITU (CCITT) G.712 specification
Line Impedance	600Ω (900Ω optional)
Voice Channel Frequency	300Hz-3400Hz
Insertion Loss / Gain	-2.0 dB Nominal (user adjustable) Adjustable range –30 dB to +3 dB in steps of 0.5 dB
User selectable range for gain / insertion loss	0 dB to 18 dB
Idle Channel Noise	≤ -65dB
Return Loss	300Hz - 600Hz - ≥ 12 dB 600Hz - 3400Hz - ≥ 15 dB
Longitudinal Balance	≥ 46 dB between 300Hz to 3400Hz
Overload Level	+3.14 dBm ± 0.5 dBm
Battery Reversal	All channels
Dial Pulse Speed	50 pps - Pulse Dialing ≤ ± 2 ms / DTMF Dialing

Hot-Line Interface Card: (Part No. VCL-MX-1525HTL)

Number of Channels per Card	4 / 8 / 12 / 16
Interface Type	Hot-Line, A-law or Mu-law (user selectable)
Maximum Number of Channels	144
Transmission performance	Fully compliant to ITU (CCITT) G.712 specification
Line Impedance	600Ω (900Ω optional)
Loop resistance	Upto 2000 Ohms
Voice Channel Frequency	300Hz-3400Hz
Insertion Loss / Gain	-2.0 dB Nominal (user adjustable) Adjustable range –30 dB to +3 dB in steps of 0.5 dB
User selectable range for gain / insertion loss	0 dB to 18 dB
Idle Channel Noise	≤ -65 dB
Return Loss	300Hz - 600Hz - ≥ 12 dB 600Hz - 3400Hz - ≥ 15 dB
Longitudinal Balance	≥ 46 dB between 300Hz to 3400Hz
Ring Frequency	16 Hz, 20 Hz , 25 Hz, 50 Hz
Ring Voltage	≥ 75 volts RMS into a load of 5 R.E.N. with a 0.30 Erlang traffic pattern
Subscriber Loop Current	≥ 23mA into a subscriber loop of 1000 Ohms
Overload Level	+3.14 dBm ± 0.5 dBm
Dialing	Ring-down

E&M 2 Wire / 4 Wire Voice Frequency Interface (Part No. VCL-MX-1535)

Number of Channels per Card	4 / 8
Interface Type	2W / 4W E&M, Type II and Type V, A-law or Mu-law (user selectable)
Maximum Number of Channels	72
Transmission performance	Fully compliant to ITU (CCITT) G.712 specifications
Line Impedance	600Ω (900Ω optional)
Voice Channel Frequency	300Hz-3400Hz
Insertion Loss / Gain	-2.0 dB Nominal (user adjustable) Adjustable range –30 dB to +7 dB in steps of 0.5 dB
User Selectable range for gain / insertion loss	0 dB to 18 dB
Idle Channel Noise	≤ -65 dB
Return Loss	300Hz - 600Hz - ≥ 12 dB 600Hz - 3400Hz - ≥ 15 dB
Longitudinal Balance	≥ 46 dB between 300Hz to 3400Hz
Dial Pulse Speed	50 pps - Pulse Dialing ≤ ± 2 ms / DTMF Dialing
Maximum M-Lead Resistance	1200 Ohms
Maximum M-Lead Current Drain	≤ 5 mA
Maximum E-Lead Current	≤ 100mA

Conference Interface Card: (Part No. VCL-MX-1590)

Number of Channels per Card	4 / 8 / 12 / 16
Conference capability	15-Way, Multiport voice conference capability, allows up to 5 user groups or a maximum 15 voice channels to set up multi port voice conferencing. Station calling is selective using DTMF dialing.
Interface Type	15-Way Voice Conference Card
Maximum Number of Channels	144
Transmission performance	Fully compliant to ITU (CCITT) G.712 specification
Line Impedance	600 Ω
Voice Channel Frequency	300Hz-3400Hz
Insertion Loss / Gain	-2.0 dB Nominal (User adjustable) Adjustable range –30 dB to +3 dB
User selectable range for gain / insertion loss	0 dB to 18 dB
Idle Channel Noise	≤ -65 dB
Return Loss	300Hz - 600Hz - ≥ 12 dB 600Hz - 3400Hz - ≥ 15 dB
Longitudinal Balance	≥ 46 dB between 300Hz to 3400Hz
Ring Frequency	16 Hz, 20 Hz, 25 Hz, 50 Hz
Ring Voltage	≥ 75 volts RMS into a load of 5 R.E.N. with a 0.30 Erlang traffic pattern
Subscriber Loop Current	≥ 23mA into a subscriber loop of 1000 Ohms
Overload Level	+3.14dBm ± 0.5dBm
Dialing	DTMF Dialing

GEN GEN / Magneto Interface Card: (Part No. VCL-MX-1587)

Number of Channels per Card	4
Interface Type	Magneto, 2-wire (GEN-GEN)
Line Impedance	600Ω
Voice Channel Frequency	300Hz-3400Hz
Ringing generator frequency	16 Hz, 20 Hz , 25 Hz, 50 Hz
Ring Voltage	≥75 volts RMS
Maximum Number of Channels	36
Transmission performance	Fully Compliant to ITU (CCITT) G.712 specification
Voice Channel Frequency	300Hz-3400Hz
Insertion Loss / Gain	-2.0 dB Nominal (user adjustable) Adjustable range -30dB to +3 dB
User Selectable range for gain / insertion loss	0 dB to 18 dB
Idle Channel Noise	≤ -65 dB
Return Loss	300Hz - 600Hz - ≥ 12dB 600Hz - 3400Hz - ≥ 15dB
Longitudinal Balance	≥ 46 dB between 300Hz to 3400Hz
Overload Level	+3.14 dBm ± 0.5 dBm

Low Speed Data Interface Asynchronous RS232 (Part No. VCL-MX-1559)

Number of Interfaces per Card	4 / 8
Maximum Number of Interfaces	9
Conformity	RS232 (V.24/V.28 line drivers)
Mode	Asynchronous
Bit Rate	50 Kbps to 19.2 Kbps
User Interface	DCE
Character Length	5 / 6 / 7 / 8 (auto-select)
Stop Bits	1 / 1.5 / 2 (auto-select)
Parity	Even / Odd / 0's / 1's / none (auto-select)

64Kbps Data Interface (Part No. VCL-MX-1545)

Interface	V.35 / V.36 / X.21 / RS232 / RS530 / RS485 / V.11 / V.28
Number of Interfaces per Card	4
Maximum Number of Interfaces	9
Conformity	To CCITT Rec. V.35
Mode	Synchronous DCE
Bit Rate	64 Kbps

G.703 @ 64kbps, Synchronous Data Interface: (Part No. VCL-MX-1560)

Interface	G.703 @ 64 Kbps
Number of Interfaces per Card	4 / 8
Maximum Number	72
Conformity	To (CCITT) Rec. G.703
Mode	Synchronous, Co-directional
Bit Rate	64Kbps

Low Speed Data Interface Card V.24 Sync / Async: (Part No. VCL-MX-1546)

Number of Interface per card	4
Maximum Number	36
Conformity	To CCITT Rec. V.24
Mode	synchronous / asynchronous DTE / DCE
For asynchronous interface	
Baud rate	50 / 75 / 110 / 134.5 /150 / 200 / 300 / 600 / 1200/ 1800 / 2400 / 4800 / 7200 / 9600 / 19200bps
Parity	Even /Odd / None
Character Length	6 / 7 / 8
Stop Bits	1, 2
For synchronous Interface	
Data Rate	600 / 1200 / 2400 / 4800 / 9600 / 19200bps
Transmit Clock Source	Interface Clock (Clock derived from the V.24 Interface Card)
Receive Clock Source	Interface Clock (Clock derived from the V.24 Interface Card)

Digital I/O Interface Card: (Part No. VCL-MX-1548)

Description: This interface card provides 8 digital I/Os which may be used to either extend digital I/O's (logic high/low) signals between any two E1 Multiplexers or operate switches remotely (using logic high/low) signals between any two multiplexers. Drivers/Sense Logic operates using External Voltage and Ground references).

Digital I/O's - Type I

Number of Interface per card	16
Digital Drivers (current source type)	8
Max Source current	100 mA
External Ref Voltage Range	5 Volts to 30 Volts DC
External Reference Voltage	Required
Minimum Load Resistance @ 5V	50R
Minimum Load Resistance @ 30V	300R
Digital Sensor (current sink type)	8
Maximum sink current	20mA
Voltage Range	5 Volts
External Ground Reference	Required
Isolation	$\geq$ 2.5 kV

OR

Digital I/Os - Type II

Number of Interface per card	16
Digital Drivers (current sink type)	8
Maximum sink current	100mA
Voltage Range	5 Volts to 30 Volts DC
External Ground Reference	Required
Digital Sensor (current source type)	8
Maximum sink current	30mA
Voltage Range	5 Volts to 30 Volts DC
External Ground Reference	Required
Isolation	≥ 2.5 kV

Analog I/O Interface Card: (Part No. VCL-MX-1547)

Description: This interface card provides 8 Analog I/Os that may be used to extend either Dry Relay Contacts (Relay Normally-Open or Relay Normally-Close) or operate switches remotely (using Dry Relay Contacts rated 2A @ 30Volts DC) between any two Multiplexers using a 64 Kbps time-slot.

Relay Specifications (Drivers)

Maximum Number of Relay Ports	8 / 16
Maximum Switching Power	60 W (approximately)
Maximum Switching Voltage / Current	30VDC, 2 A 60V DC, 1 A 250V AC, 0.25 A
Typical Number of Operations	> 1 million

Dry Contacts Sensors

Maximum Number of Dry Contact Sensors	8 / 16
Maximum Current	50 mA
Typical Current	20 mA
Reference Source Voltage	3.3 Volts

BRI ISDN 2B+D: (Part No. VCL-MX-1550)

“U" Interface	Meets ANSI T1.601-1992 requirements
Line Rate	160 Kbits/s
Frame Format	2B+D as per CCITT Rec.1.430
Line Code	2B1Q as per CCITT Rec.G.961
Accepted Line Attenuation	42dB at 40 KHz
Pulse Shape	As per CCITT Rec.G.961
Multiplexer Emulation	LT Emulation/NT Emulation (user selectable)
Impedance	135 Ohms at 40KHz

Maximum distance: 5 km (4 miles) on 0.5 mm twisted Pan. Distance may vary with cable gauge. For distance using various cable gauges please refer chart below.

Maximum Permissible Distance in kms. (miles) for BRI ISDN links				
Data Rate (Kbps)	Wire Gauge (AWG/mm)			
	19 (.9mm)	22 (.6mm)	24 (.5mm)	26 (.4mm)
160	17.4 (10.8)	11.6 (7.2)	8.1 (5.0)	5.5 (3.4)

Universal Data Interface: High Speed Synchronous "n x 64" Data Interface Type - User Configurable DCE-DTE: (Part No. VCL-MX-1558)

Interface	V.35 (DTE/DCE) V.36 (DTE/DCE) X.21 (DTE/DCE) V.11 (DTE/DCE) RS442 (DTE/DCE) RS530 (DTE/DCE)
Number of Interfaces per Card	4, ("**N**" x 64KBits/sec. per card)
Bandwidth	("**N**" x 64 Kbits/sec. interface maximum value of "**N**" =30)-user selectable
Conformity	Universal user-configurable as above
Mode	Synchronous
Bit Rate	64 Kbps to 1920 Kbps
User Interface	DCE/DTE (User programmable for DTE/DCE mode)

High Speed "n x 64" Data Interface Type: 10/100BaseT Ethernet with both Electrical and Optical Ethernet options: (Part No. VCL-MX-1595)

Interface	10/100BaseT (Electrical / Optical)
Total Number of interfaces per card	4 (3, 10/100BaseT Electrical and 1, 100FX Optical Port)
Application	Point to point
Bandwidth	("**N**" x 64 Kbits/sec. interface minimum value of "**N**" =1 maximum value of "**N**" =248) - user selectable
Aggregate Bandwidth	16Mbps - maximum
Conformity	10/100BaseT Ethernet Electrical / Optical
Mode	Synchronous
Bit Rate	64 Kbps to 16Mbps
User Interface	10/100BaseT

G.SHDSL "n"x64Kbps data (Part No. VCL-MX-1521)

Number of Interfaces per Card	4
Line Rate for 4-channel G.SHDSL	Nx64Kbps
Line Code	16-TCPAM, full duplex with adaptive echo cancellation
Connector	DB-25 / RJ-45
Electrical	Unconditioned 19-26 AWG twisted pair
Sealing current	23 Max. 23 MA source current
Clock Source	From System, Line
Diagnostic Test	BERT: QRSS

8 E1 Plus 100Mbps Ethernet Fiber Optical Transport Interface (Part No. VCL-MX-1551)

Optical	
Number of optical ports	1+1 redundant, automatic link protection
Channel capacity	8E1 Plus 100Mbps Ethernet
Jitter character	ITU-T G.742, G.823 compliant
Type of Transmitter	Class 1 Laser
Transmitter power	-11 dBm to +3 dBm - as ordered 20 km, 40 km, 80 km, 120 km reach – as ordered
Receive sensitivity	- 34 dBm
Bit rate	155 Mbps
Wavelength	850 nm multimode / 1310nm singlemode / 1550nm singlemode (optional)
Optical connector	LC (MSA Compliant SFP Module)
Fully Compliant with ITU-T G.957, G.958 Specification	
Class 1 Laser Product, Compliant with IEC 60825-1	
Compliant with Telcordia (Bellcore) GR-468-CORE	
Safety	
Class 1 Laser	
Auto Laser Shut Down in the event of fiber break.	
Ethernet Interface	
10/100BaseT	
Number of Interfaces	4
Interface	RJ-45 Ethernet 10BaseT or 100BaseT-TX (auto sensing)
Compliance	Ethernet Version 2.0 IEEE802.3 10Base-T & 100Base-TX Activity, Full/half duplex.
Interface Rate	100 Mbps Ethernet data transmission rate
Connector	RJ-45

Order Wire Interface	
Phone set	Standard 2-wire phone set
Bandwidth and Coding	64 Kb/s PCM Channel, A-Law Coding

Protection

Central Office Terminal and Remote Terminal are protected against power surges and transients occurring from lightning and electric induction as per CCITT Rec. Table I/K-20 towards line side.

Technical specifications are subjects to changes without notice.
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