



# ORION TELECOM NETWORKS INC.

## VCL-Ethernet over Multi E1 (4/8/16E1) 10/100Base-T / 100Base-FX to 4/8/16E1 Interface Converter

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Product Brochure

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## Product Overview

**Orion's** Ethernet over 4/8/16E1 Converter allows the user to send Ethernet data, between two points, over E1 Links. E1 Interfaces are 75 Ohms / 120 Ohms. Ethernet Interface options may be ordered as 10/100 Base-T Electrical Ethernet or 100Base-FX Optical Ethernet over 850nm / 1310nm / 1550nm single mode optical fiber interfaces.



This equipment is available in 4E1, 8E1 and 16E1 Port versions.

The equipment must be always installed and used in pairs, with one terminal being installed at either end of the E1 Link.

The VCL-Ethernet over 4/8/16E1 Converter is an Ethernet extension device, which utilizes TDM telecom infrastructure (the telecom network of E1s, or of PDH, SDH and E1/E3/SDH microwave etc.) for carrying Ethernet data. It converts the Ethernet data into E1 frame format for transmission over the existing TDM (E1) links and then re-converts the E1 back into Ethernet data at the far-end terminal, to BRIDGE two Ethernet LANs over the existing E1 based telecom network. The device can effectively utilize the existing TDM network to transport Ethernet data at low investment.

## Features and Highlights

- Provides 4 Ethernet 10/100BaseT (Electrical) Ports for each converter
- Optional provides 3 Ethernet 10/100BaseT (Electrical) Ports and 1 Ethernet (Optical) Port for each converter
- Supports Auto Adaptive three working modes of E1 transmission. Un-Framed (Transparent), Framed PCM 30 and Framed PCM 31 formats (Auto Sensing)
- Supports VCAT (virtual concatenation) and LCAS (link capacity adjustment scheme) protocol, and complies with ITU-T G.7042 Specifications
- Mapping to E1 complies with ITU-T G.7043 and G.8040 specifications
- Supports VLAN tagging as per 802.1Q
- Supports 802.1 based QoS feature
- Supports base priority classification for incoming 802.1Q packets
- Supports IEEE 802.1p standard recommended Class of Service traffic categorization
- Supports 802.1P priority classification for ingress packets
- Provides 4 different user selectable ratios (0:1, 1:2, 1:5 and 1:10) for delivery of high and low priority packets
- Supports 802.1 p based classification of 802.1Q based VLAN Packets which provides a Mechanism for implementing Quality of Service (QoS)
- User selectable ports for enabling / disabling the QoS service
- Supports port based priority if the Equipment fails to classify the 802.1Q packets
- Supports port based Ethernet bandwidth limit for ingress traffic
- Port based Ethernet limit allows user to provide different speed for the different customers to utilize bandwidth according to their requirement
- Supports differential delay of up to 120ms on E1 Links
- Complies with IEEE 802.3 specifications
- Supports X.86, LAPS and HDLC transmission protocols
- Supports 10M / 100M, Half / Full duplex and auto-negotiate mode.

- Configurable frame size upto 1916 bytes (MTU size)
- Supports GFP-F encapsulation complying with ITU-T G.7041
- Provides Automatic smooth adjustment of Ethernet bandwidth as per the availability of carrier (E1) links
- Alarm Display select switch
- Provides error frame statistic
- Supports automatic removal and addition of E1 Links without interrupting current services
- Available with MAC address list filtration, learning and updating functions
- A large external SDRAM buffering for handling data bursts
- Supports two synchronization clock modes, Internal clock and Network clock (Loop-Timed clock).

### **Salient Features**

- Data rate recovery after restoration of lost E1 (LCAS)
- Automatic data rate management according to number of available E1 links
- Maximum cable length supported (upto 1000 feet / 333 meters)

### **Alarms and Indicator Monitoring**

- Power Indicator
- General Alarm Indicator for E1 and Ethernet Link
- Descriptive E1 alarm by alarms select DIP switch
- E1 Alarm for individual E1 port (1-16)
- Code Violation History (CV\_HIS) Alarm on E1 port
- Loss Of Signal (LOS) Alarm on E1 port
- Group ID (GID) mismatch alarm
- Generic Framing Procedure (GFP\_LOF) Loss Of Frame Alarm
- Ethernet Link Indicator
- Ethernet Speed Indicator
- Ethernet History Error Alarm (ETH\_ERR)
- SNMP Diagnostic and Monitoring.

### **Management Control**

- 10/100BaseT Ethernet management interface
- RS232 serial management interface
- Remote (Telnet) management interface
- Windows XP based Graphical User Interface (GUI)
- Windows 7 based Graphical User Interface (GUI)
- SNMP V2 Monitoring
- NMS (Network Management System) for monitoring multiple units from a single / central location.

## Application

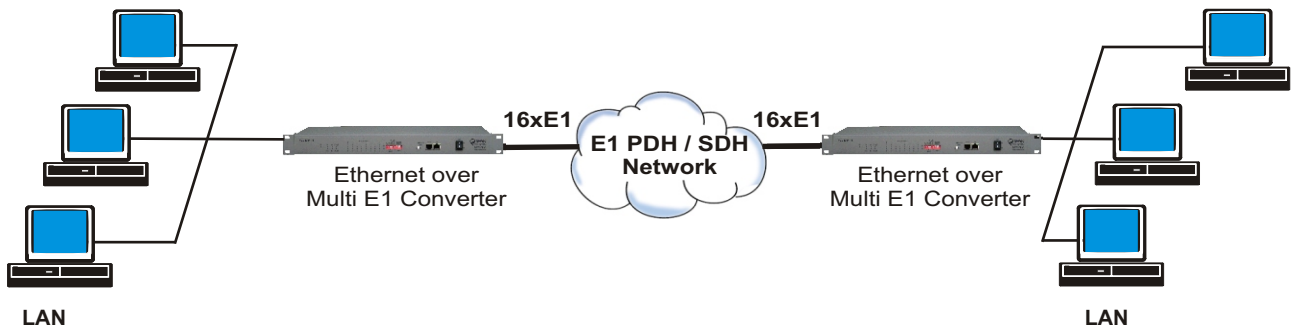
The equipment may be used for the following purposes:

1. Bridging Ethernet LANs over existing TDM (E1) telecom network.
2. Extending Ethernet networks utilizing TDM (E1) landline based telecom infrastructure.
3. Using telecom network of E1s/PDH/SDH microwave etc. carrying E1s to transport Ethernet data.
4. Interconnecting DSLAMS to Central Routers over PDH/SDH telecom networks.
5. Interconnecting IP based GSM base stations.
6. Interconnecting WiMax base stations.

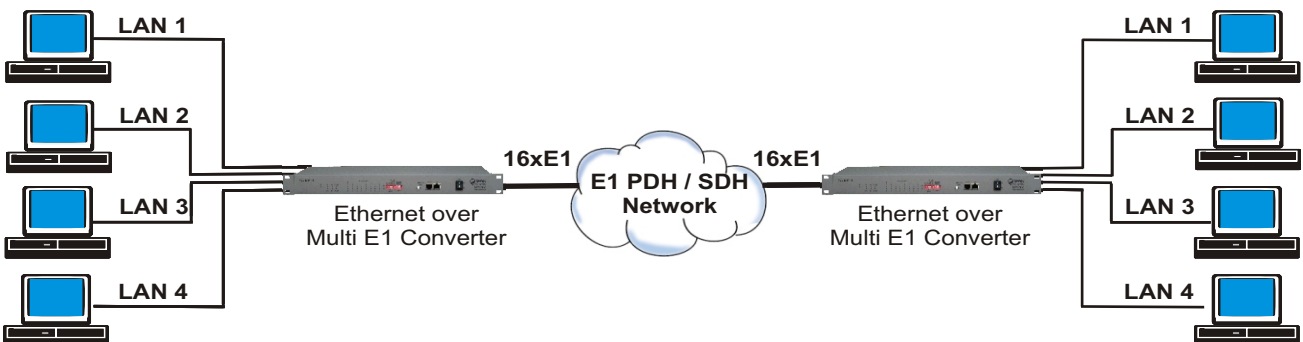
In all cases the equipment must be always installed and used in pairs, with one terminal being installed at either end of the network.

## Typical Application

### Shared link mode



### Discrete Link Mode



**The IEEE 802.1p standard recommends the Class of Service traffic categories described in Table below:**

| Priority    | Type of Traffic                   | Equivalent Application Traffic       |
|-------------|-----------------------------------|--------------------------------------|
| 0 (lowest)  | Best effort                       | Ordinary LAN priority traffic        |
| 1           | Background                        | File transfers, games, AIM           |
| 2           | (spare)                           | Not used                             |
| 3           | Excellent effort                  | For critical users applications      |
| 4           | Controlled load                   | For important applications           |
| 5           | Video, < 100ms latency and jitter | Video application or mix with Voice  |
| 6           | Voice, < 10ms latency and jitter  | Voice application                    |
| 7 (highest) | Network control                   | Critical traffic to maintain network |

## Technical Specifications

### E1 Interface Specifications

|                         |  |
|-------------------------|--|
| Number of E1 interfaces | 4/8/16 E1 interfaces (optional)          |
| Line Rate E1            | (2.048 Mbps ± 50 bps)                    |
| Line Code               | HDB3                                     |
| Framing                 | Un-Framed / Framed (PCM 30 / PCM 31)     |
| Frame Structure         | As per ITU-T (CCITT) G.704               |
| Electrical              | As per ITU-T G.703                       |
| Jitter                  | As per ITU-T G.823                       |
| Impedance               | 120 Ohms / 75 Ohms (optional)            |
| Nominal Pulse Width     | 244ns                                    |
| Connector               | RJ-45 (F) for 120 Ohms / BNC for 75 Ohms |

### Ethernet Interface Specifications

#### Number of Ethernet Interface

|   |                            |
|---|----------------------------|
| 10/100BaseT (Electrical)                        | 4                          |
| 10/100BaseT (Electrical) +<br>100BaseFX Optical | 1 Optical and 3 Electrical |

### Ethernet Interface Specifications - 10/100BaseT (Electrical)

|   |  |
|---|--|
| Interface types   | 10/100BaseT                            |
| Standards compliance  | IEEE 802.3                             |
| Transmission bit rate   | 10/100BaseT limited to Max. 2.048 Mbps |
| MTU size (frame size)   | Upto 1916 bytes                        |
| Connectors  | RJ-45 (10/100BaseT Electrical)         |
| Supports VLAN tagging as per 802.1Q   |  |
| Supports 802.1 based QoS feature  |  |
| Supports IEEE 802.1p standard recommended Class of Service traffic categorization |  |
| Supports Port based Ethernet bandwidth limit for ingress traffic                  |  |

### WAN Protocol

|  |                 |
|--|-----------------|
| Type   | PPP             |
| MTU size   | Upto 1916 bytes |
| Delay compensation   | Upto 120 ms     |
| Supports VCAT (virtual concatenation) and LCAS (link capacity adjustment scheme) protocol, and complies with ITU-T G.7042 Specifications |                 |
| Mapping to E1 complies with ITU-T G.7043 and G.8040 specifications   |                 |
| Supports X.86, LAPS and HDLC transmission protocols  |                 |
| Supports GFP-F encapsulation complying with ITU-T G.7041   |                 |

### Internet Bridge

|                          |                                |
|--------------------------|--------------------------------|
| LAN Table                | Learns upto 5000 MAC Addresses |
| Operation Mode           | VLAN-aware, VLAN-unaware       |
| Filtering and Forwarding | Transparent or filtered        |

### Ethernet Interface Specifications 100Base FX (Optical) - 850nm Multi Mode

#### Transmitter Optical Characteristics

| Parameter                   | Minimum                    | Typical | Maximum |
|-----------------------------|----------------------------|---------|---------|
| Optical Ethernet Data Rate  |                            | 125Mb/s |         |
| Center Wavelength           | 830nm                      | 850nm   | 860nm   |
| Output Spectral Width (RMS) |                            |         | 0.85nm  |
| Average Output Power        | -10dBm                     |         | -3dBm   |
| Output Optical Eye          | Complaint with ITU-T G.957 |         |         |
| Connectors                  | SC                         |         |         |

### Receiver Optical Characteristics

| Parameter                  | Minimum | Typical | Maximum |
|----------------------------|---------|---------|---------|
| Optical Ethernet Data Rate |         | 125Mb/s |         |
| Receive Sensitivity        | -24dBm  |         |         |
| Maximum Input Power        |         |         | -3dBm   |
| Operating Wavelength       |         | 850nm   |         |
| Connectors                 | SC      |         |         |

### Ethernet Interface Specifications 100Base FX (Optical) - 1310nm Single Mode

#### Transmitter Optical Characteristics

| Parameter                   | Minimum                    | Typical | Maximum |
|-----------------------------|----------------------------|---------|---------|
| Optical Ethernet Data Rate  |                            | 125Mb/s |         |
| Center Wavelength           | 1260nm                     | 1310nm  | 360nm   |
| Output Spectral Width (RMS) |                            |         | 6nm     |
| Average Output Power        | -15dBm                     | -12dBm  | -8dBm   |
| Output Optical Eye          | Complaint with ITU-T G.957 |         |         |
| Connectors                  | FC                         |         |         |

#### Receiver Optical Characteristics

| Parameter                  | Minimum | Typical | Maximum |
|----------------------------|---------|---------|---------|
| Optical Ethernet Data Rate |         | 125Mb/s |         |
| Receive Sensitivity        | -32dBm  |         |         |
| Maximum Input Power        |         |         | -15dBm  |
| Operating Wavelength       | 1100nm  |         | 1600nm  |
| Connectors                 | SC      |         |         |

### Ethernet Interface Specifications 100Base FX (Optical) - 1550nm Single Mode

#### Transmitter Optical Characteristics

| Parameter                   | Minimum                    | Typical | Maximum |
|-----------------------------|----------------------------|---------|---------|
| Optical Ethernet Data Rate  |                            | 125Mb/s |         |
| Center Wavelength           | 1480nm                     | 1550nm  | 1580nm  |
| Output Spectral Width (RMS) |                            |         | 4nm     |
| Average Output Power        | -15dBm                     | -12dBm  | -8dBm   |
| Output Optical Eye          | Complaint with ITU-T G.957 |         |         |
| Connectors                  | SC                         |         |         |

## Receiver Optical Characteristics

| Parameter                  | Minimum | Typical | Maximum |
|----------------------------|---------|---------|---------|
| Optical Ethernet Data Rate |         | 125Mb/s |         |
| Receive Sensitivity        | -32dBm  |         |         |
| Maximum Input Power        |         |         | -15dBm  |
| Operating Wavelength       | 1100nm  |         | 1600nm  |
| Connectors                 | SC      |         |         |

## Clock Selection Options

- Internal clock
- Network clock or Looptimed clock (receiving clock from any E1 link)

## E1 RJ-45 (Female) Pinout details

| 120 Ω RJ-45 (Female) Pinout |                          |                  |
|-----------------------------|--------------------------|------------------|
| PIN No.                     | Definition of function   | Signal Direction |
| 1                           | TX+ (transmitted data +) | E1 Data Input    |
| 2                           | TX- (transmitted data -) | E1 Data Input    |
| 3                           | NC                       |                  |
| 4                           | RX+ (received data +)    | E1 Data Output   |
| 5                           | RX- (received data -)    | E1 Data Output   |
| 6                           | NC                       |                  |
| 7                           | NC                       |                  |
| 8                           | NC                       |                  |

## Ethernet RJ-45 (Female) Pinout details

| Ethernet RJ-45 (Female) Pinout |                          |                  |
|--------------------------------|--------------------------|------------------|
| PIN No.                        | Definition of function   | Signal Direction |
| 1                              | TX+ (transmitted data +) | Data Output      |
| 2                              | TX- (transmitted data -) | Data Output      |
| 3                              | RX+ (received data +)    | Data Input       |
| 4                              | NC                       |                  |
| 5                              | NC                       |                  |
| 6                              | RX- (received data -)    | Data Input       |
| 7                              | NC                       |                  |
| 8                              | NC                       |                  |

**Power Supply (Options)**

|                   |                                     |
|-------------------|-------------------------------------|
| AC Mains Input    | 100 V AC to 240 V AC (50Hz / 60 Hz) |
| DC Mains Input    | -48V DC (36V to 72V)                |
| Power Consumption | ≤9W                                 |

**Services Conditions**

|                     |                 |
|---------------------|-----------------|
| Ambient temperature | -20°C ~ +65°C   |
| Relative humidity   | ≤ 90% (at 35°C) |

**Mechanical Specifications**

|        |         |
|--------|---------|
| Height | 44mm.   |
| Depth  | 260mm.  |
| Width  | 480mm.  |
| Weight | 2.7kgs. |

**Ordering Information****Power Supply Options**

| S. No. | Option         | Description                         |
|--------|----------------|-------------------------------------|
| 1      | AC Mains Input | 100 V AC to 240 V AC (50Hz / 60 Hz) |
| 2      | DC Mains Input | -48V DC (36V to 72V)                |

**E1 Impedance Options**

| S. No. | Option   | Description    |
|--------|----------|----------------|
| 1      | 75 Ohms  | BNC Connector  |
| 2      | 120 Ohms | RJ45 Connector |

**Ethernet Connector Options**

| S. No. | Option                   | Description   |
|--------|--------------------------|---|
| 1      | 4 Electrical             | All 4 RJ45 Connectors   |
| 2      | 3 Electrical + 1 Optical | 3 RJ45 Connectors + 1 Optical Connector<br>(850nm / 1310nm / 1550nm Optional) |

**VCL-4 Electrical Ethernet over 4E1, 8E1 and 16E1**

| S.No. | Part #                      | Product Description               |
|-------|-----------------------------|-----------------------------------|
| 1     | VCL-Ethernet over 4E1 DC-E  | DC Input with Electrical Ethernet |
| 2     | VCL-Ethernet over 4E1 AC-E  | AC Input with Electrical Ethernet |
| 3     | VCL-Ethernet over 8E1 DC-E  | DC Input with Electrical Ethernet |
| 4     | VCL-Ethernet over 8E1 AC-E  | AC Input with Electrical Ethernet |
| 5     | VCL-Ethernet over 16E1 DC-E | DC Input with Electrical Ethernet |
| 6     | VCL-Ethernet over 16E1 AC-E | AC Input with Electrical Ethernet |

**One Optical + Three Electrical Ethernet over 4E1**

| S.No. | Part #                          | Product Description                                     |
|-------|---------------------------------|---|
| 1     | VCL-Ethernet over 4E1 DC-850/E  | DC Input, 850nm Optical Ethernet + Electrical Ethernet  |
| 2     | VCL-Ethernet over 4E1 AC-850/E  | AC Input, 850nm Optical Ethernet + Electrical Ethernet  |
| 3     | VCL-Ethernet over 4E1 DC-1310/E | DC Input, 1310nm Optical Ethernet + Electrical Ethernet |
| 4     | VCL-Ethernet over 4E1 AC-1310/E | AC Input, 1310nm Optical Ethernet + Electrical Ethernet |
| 5     | VCL-Ethernet over 4E1 DC-1550/E | DC Input, 1550nm Optical Ethernet + Electrical Ethernet |
| 6     | VCL-Ethernet over 4E1 AC-1550/E | AC Input, 1550nm Optical Ethernet + Electrical Ethernet |

**One Optical + Three Electrical Ethernet over 8E1**

| S.No. | Part #                          | Product Description                                     |
|-------|---------------------------------|---|
| 1     | VCL-Ethernet over 8E1 DC-850/E  | DC Input, 850nm Optical Ethernet + Electrical Ethernet  |
| 2     | VCL-Ethernet over 8E1 AC-850/E  | AC Input, 850nm Optical Ethernet + Electrical Ethernet  |
| 3     | VCL-Ethernet over 8E1 DC-1310/E | DC Input, 1310nm Optical Ethernet + Electrical Ethernet |
| 4     | VCL-Ethernet over 8E1 AC-1310/E | AC Input, 1310nm Optical Ethernet + Electrical Ethernet |
| 5     | VCL-Ethernet over 8E1 DC-1550/E | DC Input, 1550nm Optical Ethernet + Electrical Ethernet |
| 6     | VCL-Ethernet over 8E1 AC-1550/E | AC Input, 1550nm Optical Ethernet + Electrical Ethernet |

**One Optical + Three Electrical Ethernet over 16E1**

| S.No. | Part #                           | Product Description                                     |
|-------|----------------------------------|---|
| 1     | VCL-Ethernet over 16E1 DC-850/E  | DC Input, 850nm Optical Ethernet + Electrical Ethernet  |
| 2     | VCL-Ethernet over 16E1 AC-850/E  | AC Input, 850nm Optical Ethernet + Electrical Ethernet  |
| 3     | VCL-Ethernet over 16E1 DC-1310/E | DC Input, 1310nm Optical Ethernet + Electrical Ethernet |
| 4     | VCL-Ethernet over 16E1 AC-1310/E | AC Input, 1310nm Optical Ethernet + Electrical Ethernet |
| 5     | VCL-Ethernet over 16E1 DC-1550/E | DC Input, 1550nm Optical Ethernet + Electrical Ethernet |
| 6     | VCL-Ethernet over 16E1 AC-1550/E | AC Input, 1550nm Optical Ethernet + Electrical Ethernet |

**Note:** The equipment must be always installed and used in pairs, with one terminal being installed at either end of the E1 Link.

**Note:** Operation and maintenance of network equipment require professional knowledge and experience. We recommend the equipment to be managed only by qualified technicians.

Technical specifications are subject to changes without notice.  
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