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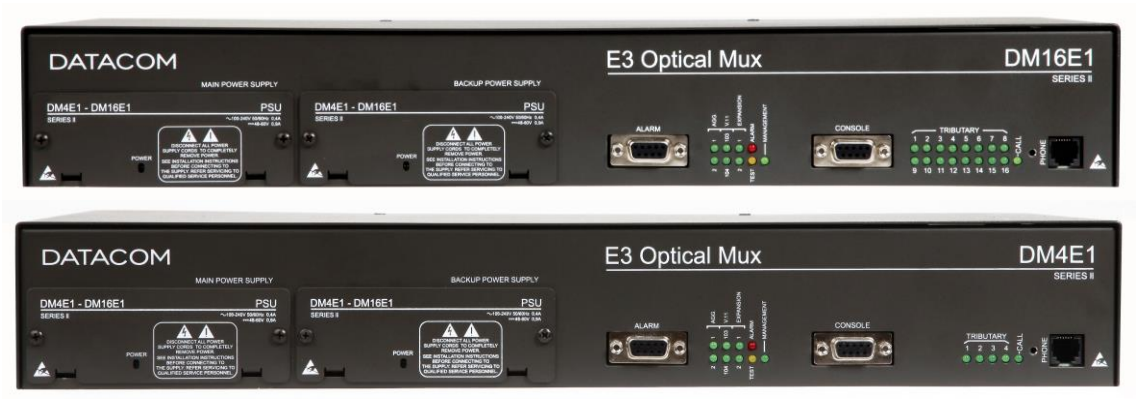


DM16E1 Series II
DM4E1 Series II

Optical PDH Multiplexers

Dec-2013

General Presentation

The DM16E1 Series II and DM4E1 Series II are PDH multiplexers according G.751 e G.742. Operate with E1 multiplexer channels, Ethernet, V. 11 and E3 in electrical or optical beam 34Mbit/s.

Basically the DM4E1 Series II differs from DM16E1 Series II only in number of E1 G.703 tributaries offered: it has four E1 G.703 tributaries against DM16E1 Series II sixteen E1 G.703 tributaries.

The equipments DM16E1 Series II and DM4E1 Series II are fully compatibles with models DM16E1 Series I with Bridge HW1 or DM4E1 Series I with Bridge HW1, only to firmware version 43 (or higher), and DM16E1 Series I with Bridge HW2 or DM4E1 Series I with Bridge HW2, only to firmware version 06 (or higher).

The DM16E1 Series II and DM4E1 Series II are fully supported by DMview 6.8.

Key Features

- DM16E1 Series II and DM4E1 Series II in the same ring, sharing the same E3 link. Useful for sites where there is no need for 16 E1 G.703 tributaries;
- Tributary mapping with each tributary interface using any position in E3 payload;
- Optional Remote Bridge Ethernet 10/100baseT interface featuring inverse multiplex, ring operating or using E1 (G.703) ports, or point to point. Can operate at rates of N x 2Mbit/s and accepts packages with MTU sizes up to 1552 bytes;
- Internal router with 3 interfaces: WAN1-DMLAN, WAN2-PPP/Frame Relay and LAN-Ethernet. Those interfaces may be used for management, software upgrades, interconnect LANs or even provide internet dynamic NATched access;
- Flexible topology configuration allowing point to point, ring, optical modem, line or regenerator/interface converter modes;
- Optical aggregate interfaces operating in single mode (with bidirectional single fiber capability) or multimode;
- Optional E3 G.703 tributary for optical redundant electro-optical conversion. This interface can be used to insert an structured E3 G.703 channel in a DM16E1 Series II/DM4E1 Series II E3 ring;
- Optional aggregate backup with hot swap. There are two aggregate slots for the main and backup links;
- ALS (Automatic Laser Shutdown). Configurable, allowing both higher reliability or higher safety;
- Service voice channel without E3 payload occupation;
- Independent port based alarm selection and 3 external alarm inputs. One alarm output in NO/NC relay;
- Redundant power supply using a secondary power supply. It allows hot swap as well as AC or DC power using the same card;
- Electrical aggregate interface according G.703. All aggregate interfaces are compatible with both DM16E1 Series II and DM4E1 Series II;
- 16 E1 G.703 tributaries (DM16E1 Series II) in 75ohms (IEC169/13 or BNC) or 120ohms (RJ45);
- 4 E1 G.703 tributaries (DM4E1 Series II) in 75ohms (IEC169/13 or BNC) e 120ohms (RJ45);
- 1 V.11 or V.36/V.11 interface;
- Test loops locally or remote activated. BERT for V.35 interface;
- SNMP or VT100 terminal remote management allowing configuration, status checking and test activation;
- Telnet protocol for remote management via its Ethernet network interface;
- Ability to manage up to 8 devices and a remote location via the console or emulator VT100;
- Status led's for aggregate status, E1 tributary, power supplies, Ethernet link, voice channel as well as test or alarm condition;

- PtP Bridge 100M topology to ensure the transmission of the Ethernet frames, from the Bridge interface, at a rate of up to 100Mbit/s, keeping more 16 channels available for the mapping of TDM interfaces (G.703, V.11 or Router);
- Management of multiple connections, which can hold up to three Telnet connections, five DMview connections and a connection in one of the remote equipment. Access via console is always allowed;
- Date configuration to allow for adjust or update the date and time of system via an NTP server;
- Setting the date to allow for adjustment or update the date and time of the system via an NTP server;
- List to check the system event log;
- View activation logs to show information about errors that occurred in an attempt to activate settings in part invalid or void;
- Recall Network Factory values to E2PROM option to load the IP settings to factory (Factory values) and store this setting in the non-volatile memory (E2PROM) equipment;
- Possibility of sending and calculate the CRC of the E3 aggregate to better estimate the error rate on the link;
- Alarm Equipment's based on the status Current or Latched;
- Firmware upgrade via FTP (File Transfer Protocol) through a software that implements this protocol or through DMview;
- Update firmware on remote management through DMview.

General Presentation

a. Physical Dimensions

- height:67mm (with rubber feet) / 65mm, width:483mm (with attachment adapters) / 435mm, depth:210mm”

b. Power Supply

- The equipment has two power supplies slots on front panel. It can operate with one or two power supplies for redundant operation. Hot swap is allowed in both power supplies. The input voltage range is from 93 to 253(VAC) and 36 to 72(VDC) with automatic selection between VAC and VDC.

Aggregate

It is supported up to two aggregate optical and/or electrical interfaces. The aggregate slots are located in rear panel. Aggregate cards allows hot swap; if the backup link is installed the data interruption will be temporary.

The aggregate cards supported by DM16E1 Series II and DM4E1 Series II are: Optical Single mode E3 Single Fiber, Optical Single mode E3 Dual Fiber, Optical Multimode E3 Dual Fiber and Electrical E3 G.703.

The DM4E1 Series II uses the same cards from DM16E1 Series II, reducing stock maintenance costs.

The aggregates have the LDL and LAL tests available.

a. Optical Interfaces

- Optical aggregate interfaces are available in dual fiber (multimode or single mode) or single fiber (single mode only), both using SC/PC connectors. All cards use SC/PC; the only exception are 1310nm-1310nm cards with SC/APC connectors.
    - ✓ Transmission: Laser Diode, with 1310nm or 1550nm wavelengths, featuring three output power ranges.
    - ✓ Single mode Receiver: PIN photodiode. Sensitivity of -34dBm for 10-12 BER, saturating at -8dBm.

- Single mode 1310nm-1310nm Receiver: PIN photodiode. Sensitivity of -31dBm for 10-12 BER, saturating at -8dBm. Those interfaces need SC/APC connections at all fiber way.
- Multimode Receiver: PIN photodiode. Sensitivity of -30dBm for 10-12 BER, saturating at -14dBm.
- As many equipments and dual fiber cards uses PC connectors as standard an installed link can be easily used with single fiber DM4E1 Series II/DM16E1 Series II cards.
- It is offered a single fiber card that works transmitting in 1310nm in both sides. This kind of operation is disencouraged because of acceptation of reflected wavelength, resulting in a poor signal/noise relationship. It also requires APC connectors in all fiber path to reduce reflection.
- Typically SSB13 and SSB15 output power is -10dBm and sensitivity of -37dBm. Accepting an attenuation of 0,36dB/km yields to an estimated range of 65km. The minimum guaranteed values for output power and sensitivity in DM16E1 Series II cards are shown on table below:

Module	Description	Tx [nm]	TX Minimal Potency	Sensitivity	Estimated Range*
MS13	Multimode	1310	-20dBm	-31dBm	~ 2km
SS13	Single mode 2 fibers short range	1310	-15dBm	-34dBm	~ 15km
SS15	Single mode 2 fibers short range	1550	-15dBm	-34dBm	~ 15km
SL13	Single mode 2 fibers long range	1310	-5dBm	-34dBm	~ 40km
SL15	Single mode 2 fibers long range	1550	-5dBm	-35dBm	~ 100km
SLx15	Single mode 2 fibers long range	1550	0dBm	-35dBm	~ 120km
SSB13 SSB15	Single mode monofiber short range	1310 or1550 **	-15dBm	-31dBm	~ 15km
SLB13 SLB15	Single mode monofiber long range	1310 or1550 **	-5dBm	-34dBm	~ 60km

* The average range was estimated considering the following parameters: losses in connectors as 0.7 dBm each, losses amendments as 0.35 dBm and the loss of each fiber as 0.25 dBm per km, disregarding the optical dispersion.

**Transmission 1310nm and reception 1550nm or vice versa. The attenuation at 1310nm is preponderant.

b. Electrical E3 G.703 interface (Aggregate or Tributary) specification

- DM16E1 Series II-E3E – Electrical Aggregate E3 G.703 Interface.
- DM16E1 Series II-E3Ei – Electrical Tributary E3 G.703 Interface.
- Rate: 34368kbit/s
- Codification: HDB3 (as defined in ITU-T G.703 recommendation). Connectors: BNC(default).

c. Aggregate Backup

- Can be automatic switched, semi-automatic switched or user commanded. It takes place when main link goes down; aggregate backup is available in ring, point-to-point and optical modem topologies.

Tributary

All physical connections are made from the back panel, simplifying the installation procedure.

In the DM4E1 Series II any of four E1 G.703 channels can be placed anywhere inside the E3 payload. The twelve lasting channels can be used for V.35, Ethernet Bridge, Router, Management channel or any combination of those features.

In the DM16E1 Series II V.35 interface, Ethernet Bridge, Management and router may be placed in any place inside the E3 payload.

All tributaries may be tested locally or remotely, by terminal port or Management Application (DmView).

a. E1 G.703 (4 ports in DM4E1 Series II, 16 ports in DM16E1 Series II)

- DM16E1 Series II/DM4E1 Series II may be equipped with 75 ohms G.703 interfaces (IEC169/13 or BNC) or 120 ohms (RJ45). In DM16E1 Series II is needed to specify which impedance and connector; in DM4E1 Series II both 120 ohms and 75 ohms interfaces are available, the only specification needed is the connector of 75 ohms interface.
- The data transferred can be framed or unframed; no external clock reference is needed.
- E1 G.703 tributaries indicates both AIS or LOS conditions. It can generate AIS signal as well.
- LDL and LAL tests are available in both local or remote equipments.

b. V.11 (1 port)

- DM16E1 Series II/DM4E1 Series II basic unit has a V.11 at back panel, in an ISO 2110 Amd.1 – RS530 compatible connector. Any 2Mbit/s (E1) E3 payload channel may be used by V.11.
- V.11 tributary port accepts data rates from 64kbit/s to 2048Mbit/s. The data inserted at aggregate link has G.704 compatible frame structure.
- Selection by jumpers between V. 11 or V.35 Compatible interfaces.
- When the WAN2 router port is mapped to aggregate in a Nx64kbit/s V.11 interface can't be configured.
- When used with Ethernet Bridge V.11 control signals (CT106, CT107 and CT109) should be ignored.
- V.35 tributary may be connected directly to WAN2 router port, acting as external router access interface in any of Nx64kbit/s rates (1<N<32).
- BERT 511 pattern (with optional error insertion) can be generated by V.11.

c. Characteristics of Routing between WAN1 (DMLAN), WAN2 (PPP/frame relay) and Ethernet (10BaseT) Interfaces

- Router WAN1 and WAN2 can be used to management or to interconnect LAN purposes. The router data may be redirected for Ethernet interface too.
- WAN1 uses DMLAN protocol, extending management link to equipments connected to DM16E1 Series II/DM4E1 Series II Ethernet interface. It can operate at 40kbit/s (out band) or in a full E1 channel (2Mbit/s).
- WAN2 may either use PPP or Frame Relay protocols, at a maximum rate of 2048kbit/s. WAN2 may use local V.35 Nx64kbit/s, local E1 G.703 ports at 2048Kbit/s or an E1 channel at aggregate E3 channel (in both unframed or framed modes) as interfaces. In aggregate 2048kbit/s and local E1 directions may generate or recover clock from remote router equipment.
- When WAN2 is mapped into aggregate at Nx64kbit/s rate, V.35 interface should not be used.

E3 Electrical Tributary

- E3 Electrical Tributary Interface as G.703.
- Speed 34.368kbit / s, using HDB3 coding, as defined in Recommendation G.703 ITU-TS.
- The interface uses coaxial cable 75ohms. The connection can be made by BNC connector (standard delivery).
- Allows local loop analog and digital local loop through the control port or SNMP management software: DmView.
- The port E3 internal electrical signal received structured (modem optical point to point or ring) or transparent (transparent optical modem).

Remote Bridge Ethernet 10/100BaseT

DM4E1 Series II/DM16E1 Series II Remote Ethernet Bridge 10/100baseT interconnects two Ethernet bridges through an E3 interface. It is able to transmit at up to 32.768 Mbit/s, DM4E1 Series II included, considering VLAN support and the use of standardize protocols. It also supports packets with MTU sizes of up to 1552 bytes.

It can work in transparent or inverse multiplex mode, where the Ethernet data is separated in independent E1 channels. At inverse multiplex mode bridge data can be directed to local E1s; clock for E1 channels may be either internal or regenerated.

Interface statuses can be monitored through a control port and via DATACOM's SNMP management software: DMView.

The equipment allows the segmentation of a LAN interface. It builds a MAC local address table on each end. This avoids the transmission of local packets through the link. Multicast and broadcast transmissions are done normally.

It operates on MAC layer at the Ethernet interface. Doing so, it is completely transparent to upper layer protocols as TCP/IP, UCP, DECnet, etc.

The MAC local address table can hold up to 1000 MAC addresses. In the event of a particular MAC going silent for 5 minutes or more, its address is automatically removed from the table.

The bridge also supports Half Duplex back pressure and Full Duplex flow control. It automatically detects the interface speed and mode.

Management

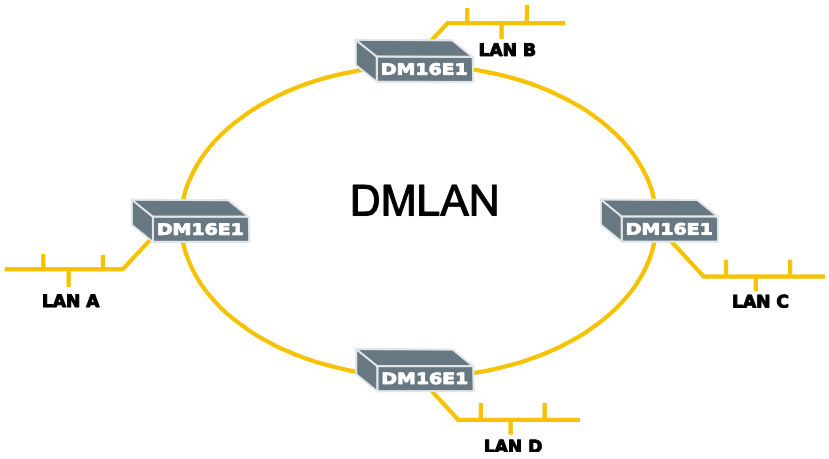
DM4E1 Series II/DM16E1 Series II equipments can be managed by serial interface, Telnet protocol and/or SNMP.

Serial interface configuration takes place through V.24/V.28 (RS232) female DB9 in front panel by means of an VT100 terminal. It can configure, verify status and activate tests in local and remote equipments.

SNMP management can be done using DMView. SNMP data can reach equipment by Ethernet or any WAN interface. In ring topologies all equipment can be managed with in-band management; It is allowed to make software upgrades in local or remote equipments by FTP.

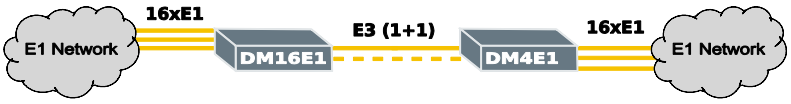
In the example below router WAN2 is used as acess device, connected to V.11 interface (Nx64kbit/s) or an local E1 (G.703, 2Mbit/s) channel.

WAN1 is also active, using DMLAN protocol to reach ring remote equipments. DMLAN creates an IP path to LANs in the Ethernet of DM4E1 Series II/DM16E1 Series II equipment (LAN a,b,c,d); This allows to manage and maintain any equipment with TCP/IP management support. Management can be configured into a inactive E1 channel, performing a 2Mbit/s channel or into a 40kbit/s channel with no payload compromising.

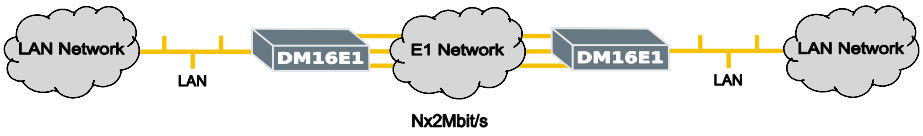


Point to Point Topology

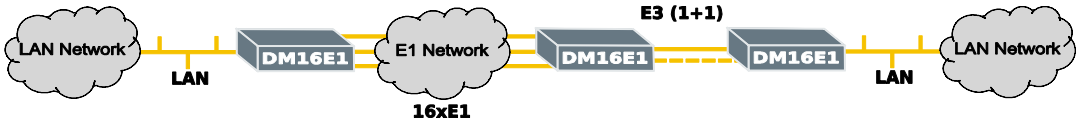
- The equipment leaves the factory configured for this topology, not requiring any type of configuration is used only when the tax E1 (G.703). The aggregate 1 will be considered as the main link and a link aggregate 2 backup, automatic backup.



- On the Inverse Multiplexing mode, Bridge port is able to split the data received E1 channels.

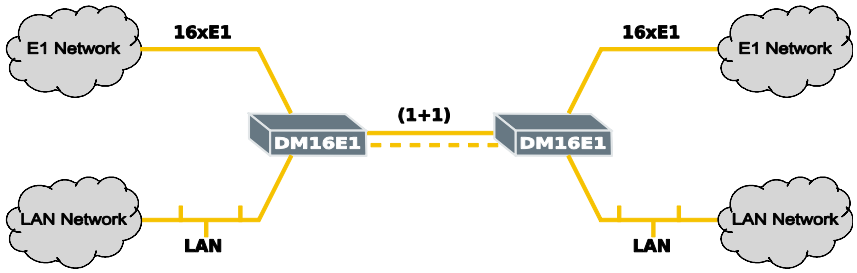


- When in Inverse Multiplexing, some E1's go through different paths (eg SDH or satellite). Thus the DM16E1 Series II and Series II DM4E1 implement greater tolerance for differences in clocks between the E1 tributaries and also for aggregate E3.



PtP Bridge 100M

- Functions as an optical multiplexer that operates at a rate of 155Mbit/s (when using the proprietary protocol).
- The Bridge interface may use a dedicated channel of up to 100Mbit/s (when using the proprietary protocol).
- It is made available up to 16 TDM channels for communication (G.703, V.11 or Router for a dedicated management).
- Still, you can use both interfaces for optical aggregate to ensure redundancy (Operation Main and Backup).

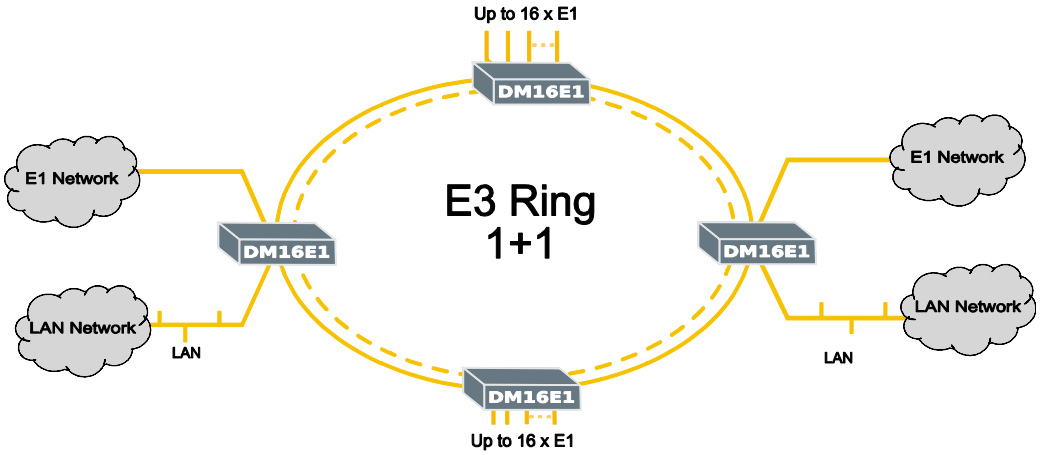


Ring Topology

The cross and regular rings are built bidirectionally (east ring, west ring) like SDH systems: one ring is used for main data link and the other is reserved for use in case of failure. It can be choused any type of aggregate connection between two adjacent equipments in ring (electrical or singlemode/multimode optical).

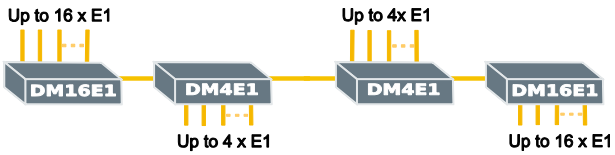
In the cross ring is needed to install two aggregate cards in each equipment. Besides this topology has the advantage of allow the use of single fiber connections in the ring; single fiber optical installation is cheaper and easy. In this topology the aggregate cards may be swapped without breaking the data link.

The regular ring may operate with one or two aggregate cards in each equipment. Even if backup is used in this topology the data link is lost in absence of main link aggregate.



Line Topology

This topology works like a broken cross ring: all line network equipments use two aggregate cards and the line terminal equipments use one aggregate card. Line topology don't have backup and the entire link is lost if a single aggregate connection is down.



Regenerator Topology

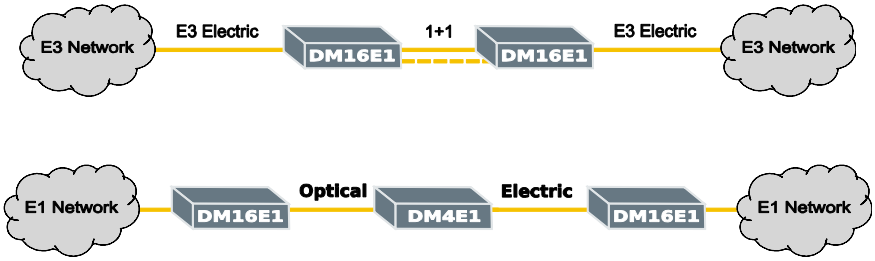
In this topology the equipment act as an optical regenerator, without extract or add any tributary data in the aggregate.

Optical Modem and Interface Converter Topology

The Interface converter is used to convert E3 framed/unframed interfaces.

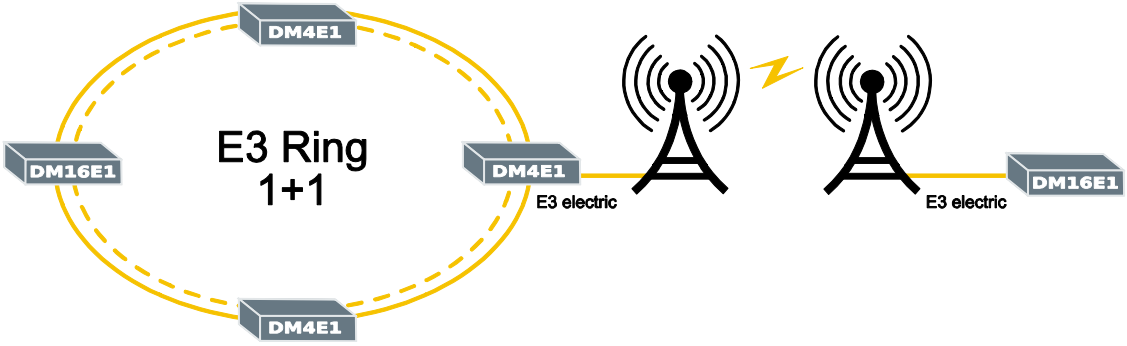
If backup protection is needed in optical side it can be done using the optical modem topologies. In this case both aggregates use optical cards while the electrical E3 G.703 interface is provided by an additional internal E3 card (DM16E1 Series II-E3Ei), positioned in the Ethernet bridge position. The internal electrical E3 interface uses tributary 01 connection.

Transparent Optical Modem topology offers interoperability with another supplier's equipment in E3 electrical interface allowing unframed E3 rate operation; regenerator and transparent interface converters features optical compatibility too.



Ring Optical Modem

Ring optical modem topologies can receive external E3 electrical data to be distributed along the ring. It allows framed electrical E3 (containing framed E2) signals from any source.



Comparative

Below is presented a comparison between the different versions of equipment and its technical characteristics:

	DM16E1 - DM4E1 SERIES I	DM16E1 - DM4E1 SERIES II
Firmware Update		
FTP	NO	YES
Management Channel	NO	YES(PCGAv1)
Management		
Telnet	NO	YES
Multiple Access	NO	YES
General		
External Clock	YES	Optional
Voice Channel	YES	Optional
Logs Menu	NO	YES
Date Configuration	NO	YES
View Activation Logs	NO	YES
Latched Alarms	YES	Configurable
Aggregate CRC	NO	Configurable
Router		
Load Network Factory Configurations	NO	YES
Topology		
PtP Bridge 100M	NO	YES
Hardware		
CE Mark	NO	YES
Cabinet Depth	232 mm	210 mm

Accessories

DB25 x DB37 cable for V.36 ISO 4902 connector.

DB25 x M34 cable for V.35 ISO 2593 connector.

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