OCM 1000
System Overview

General DataComm

5. OCM 1000 Applications

6. Network Management

7. Technical Specifications

GDC — The Global Choice

Communications networks have become both strategic and tactical assets for modern organizations. Increasingly, business cannot exist without the "network," and making the correct choice for network equipment and service vendors is more important today than ever before.

Network managers and planners are faced with a dizzying choice of technologies, network topologies, wide area services, management options, and support options. Today, there is less of a distinction between Local Area and Wide Area networks due to the accelerating need for multi-vendor internetworking. At the same time, carriers are struggling to keep up with the demand for new services and deal with competitive pressures.

As a result, modern digital communications networks need to be built on a foundation that can accommodate rapid changes in the data communications industry. No longer can one technology, one topology, or one protocol meet the needs of corporations or service providers.

Network product flexibility, scalability, management, and cost-effectiveness are key attributes that allow users to take full advantage of the digital services available today and be in a position to rapidly deploy new and emerging services — when available.

The private backbone networks of yesterday are giving way to hybrid public/private networks. These hybrids combine the most cost-effective services to create reliable, manageable, high-performance networks.

Flexibility, a well defined growth path, adherence to standards, and equipment reliability all ensure that networking equipment will retain its value as communications requirements grow and change over time.

Only General DataComm, Inc. (GDC), a global supplier of advanced communications networking equipment and services to both carriers and end-users, has the product depth and more than 40 years of experience to offer:

- ✓ Scaleable products, including Asynchronous Transfer Mode (ATM) switching and adaptation, T1/E1 bandwidth managers, frame relay switching, low speed and high speed modems, multiplexers, and network access devices
- ✓ Enterprise multi-protocol routing, bridging, concentration, and switching of LANs, voice, data, and video
- ✓ Compliance with international and de facto standards
- ✓ Provisioning products and services for carriers
- ✓ ISO 9001 certified processes, ensuring Total Quality Management
- ✓ Quick Response service, support, and training via telephone or Internet

Around the globe, service providers and end-users alike depend on GDC's innovative products and services.

Document Objectives

The OCM 1000 Product Overview is an in-depth, system-oriented reference document that describes the OCM 1000's architecture and features in detail. It does not, however, replace any of GDC's Technical Publications.

Note:

The information in this System Overview describes the OCM 1000 Management System (OMS) release 3.0 and higher. This information is subject to change. (Earlier software releases may not support all the features described in this document.) GDC is dedicated to the continuous improvement of this product, and new features or improvements may be available. Consult your GDC representative for more information.

The following hardware components for the OCM 1000 are Manufacture Discontinued as of September 30, 1999.

Manufacture Discontinue Components

Discontinued Part Number	Discontinued Part Description	Replacement Part Number	Replacement Part Description
036M410-001	TI LIM	036M411-001	T1 Network LIM
036M410-002	E1 LIM	036M411-002	E1 Network LIM
036M410-003	CSU LIM	036M411-003	CSU Network LIM
036M400-007	CCM-7, OCM 1000	036P404-001	CCM-10
036P462-002	DPV 2W FXO w/ FAX	036P463-001	DPV 2W FXO w/FAX
036P436-003	X.21 LIM	N/A	No direct replacement.
GS936P417-001	OCM Turbo Card, 256K	N/A	No direct replacement.
GS936P417-002	OCM Turbo Card 512K	N/A	No direct replacement.
036P416-001	OCM G.703 Data Channel	N/A	No direct replacement.

Discontinued Part Number	Discontinued Part Description	Suggested Replacement Description
036M491-001	OCM 1510 Split Shelf w/ 2 CCM, N/R, AC	Use 2 OCM 1210 Shelves with CCM, N/R, AC
036M492-001	OCM 1520 Split Shelf w/ 2 CCM N/R, 220 V	Use 2 OCM 1220 Shelves with CCM, N/R, 220V
036M493-001	OCM 1530 Split Shelf w/ 2 CCM, N/R, DC	Use 2 OCM 1230 Shelves with CCM, N/R, DC
036M494-001	OCM 2510 Split Shelf w/ 2 CCM, N/R, AC	Use 2 OCM 2210 Shelves with CCM, N/R, AC
036M495-001	OCM 2520 Split Shelf w/ 2 CCM, N/R, 220V	Use 2 OCM 2220 Shelves with CCM, N/R, 220V
036M496-001	OCM 2530 Split Shelf w/ 2 CCM, N/R DC	Use 2 OCM 2230 Shelves with CCM, N/R, DC

1. Executive Overview

Introduction

Highlights

Introduction

Advances in technology and decentralized data processing have allowed companies to improve business efficiency and performance by automating key functions and introducing new electronic applications at the branch office level. As a result, branch offices need to access the backbone communications network to exchange information. For corporations and carriers alike, the OCM 1000 provides integrated network access while providing value-added service.

The OCM 1000 is a small, multi-function networking multiplexer that serves applications requiring point-to-point, point-to-multipoint, and T1/E1 public network access data multiplexing.

Flexibility

Flexibility was a key design goal of the OCM 1000, which resulted in an architecture that effectively supports a wide variety of network topologies and applications, including:

- ✓ Internetworking of voice, data and LAN traffic
- ✓ Point-to-point connectivity — offering simple, low-cost consolidation of voice, data and LAN traffic between two locations
- ✓ Point-to-multipoint connectivity — offering simple, low-cost consolidation of voice, data and LAN traffic between three locations
- ✓ Point-to-network (T1/E1) connectivity — offering simple, low-cost access to generic digital services, integrated access to public frame relay services and almost unlimited connectivity options
- ✓ Aggregate/trunk line speeds from 9.6 Kbps to 2.048 Mbps — offering a single solution for connectivity over T1 and E1 facilities, narrowband digital circuits, satellite channels and analog modems

Management

A member of the Transport Management System (TMS) family of internetworking products, the OCM 1000 is managed by a user-friendly, windows-based management software program that runs under Windows NT or Windows 98 on a standard IBM-compatible PC and controls up to 93 OCM 1000s.

Future Growth

An OCM 1000 can be upgraded to an OCM 2000 — part of the Transport Management System (TMS), GDC's advanced internetworking platform. The new CCM10 will support both the OCM 1000 and OCM 2000,requiring just a different switch setting.

This approach provides a protected investment, eliminating the need to discard network equipment when requirements grow.

Highlights

Network Interface:	9.6 Kbps to 2.048 Mbps, Channelized T1/E1, FT1/FE1, V.11/RS-422, V.35, RS-232/V.24
Data Channel Modules:	Single and Dual Channel, RS-232/V.24, RS422/V.11, V.35, X.21,
Channel Rates:	300 bps to 1.920 Mbps
Voice Interfaces:	2W FXS, FXO, 2W E&M, 4W E&M
Analog Voice Compression:	32K, 24K, 16K ADPCM; 9.6K, 6.4K, 4.8K GDC CELP (Proprietary); 9.6K, 8.0K CS-ACELP (ITU-T G.729A) CELP and CS-ACELP include Fax Bypass
Digital Voice Compression:	Up to 30 E1 or 24 T1 PCM voice channels can be compressed to 9.6 K or 8.0 K using high-quality CS-ACELP compression. Also includes Group III Fax Bypass.
Alarm Notification:	Relay contact points available for external notification of major and minor alarms.
WAN Capacity:	Up to 2.048 Mbps per network interface Up to two network interfaces per OCM
Management:	Centrally managed via PC; local craft ports
Redundancy:	Common Logic, Power, Network Interface Modules
Configuration:	16-slot shelf (OCM 1210, OCM 1230, OCM 1310, OCM 1330) Optional expansion shelf

2. OCM 1000 DESCRIPTION

Product Definition

Architecture

Key Features

Product Definition

General DataComm's Office Communications Manager (OCM) 1000 is a Hybrid Access Networking Device for point-to-point, point-to-multipoint, and point-to-net-work applications with a growth path to the power of TMS/OCM 2000 networks.

The OCM 1000 is a powerful, cost effective networking platform that can satisfy the rigorous demands of a diverse communications environment. Supporting voice, fax, data, video and LAN applications, the OCM 1000 can be tailored to any organization's network requirements. The OCM 1000's full range of features include:

- A scalable architecture with one or two 16-slot rackmount shelves
- Access to public frame relay and generic data networks
- Up to two physical network interfaces
- Fully channelized T1/E1 connectivity
- Integral T1 CSU
- Integral 56 Kbps DSU (SC 500A)
- Aggregate rates from 9.6 Kbps to 2.048Mbps
- Up to 60 low speed data channels
- Up to 30 high speed data channels
- Up to 30 compressed voice channels
- Total, in-band network management
- Supports voice, fax, video, data, and LAN applications
- Power Supply, Common Logic, and Line
- Interface Module redundancy
- Aggregate diversity
- Software download from a central site
- Automatic dial-up restoral (V.11/35/subrate only)

Architecture

The architecture of the OCM provides the flexibility and growth needed to meet the communications requirements of small remote offices and the changing needs of the WAN. The OCM is capable of supporting up to two full E1 (2.048 Mbps) or T1 (1.544 Mbps) aggregates. The base system accom-modates circuit operations. Plug-in cards utilize the backplane architecture to implement various circuit (e.g., voice, videoconferencing) capabilities.

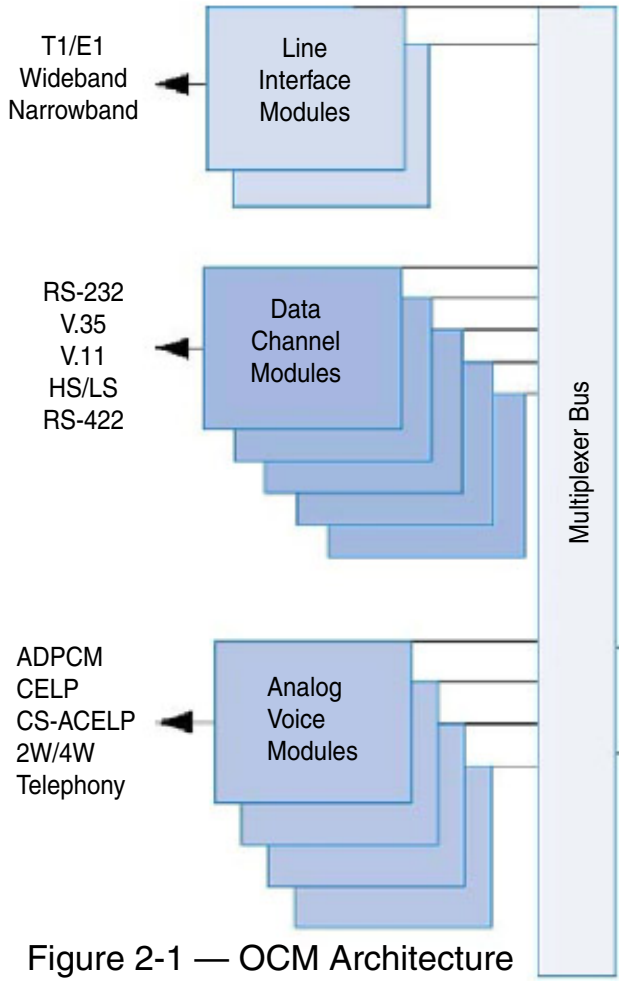


Figure 2-1 — OCM Architecture

Dual Bus

The OCM architecture employs a multiplexing bus. Data and voice modules process traffic for presentation to the multiplexing bus. A Common Control Module (CCM) —optionally redundant — provides timing and control for all OCM modules.

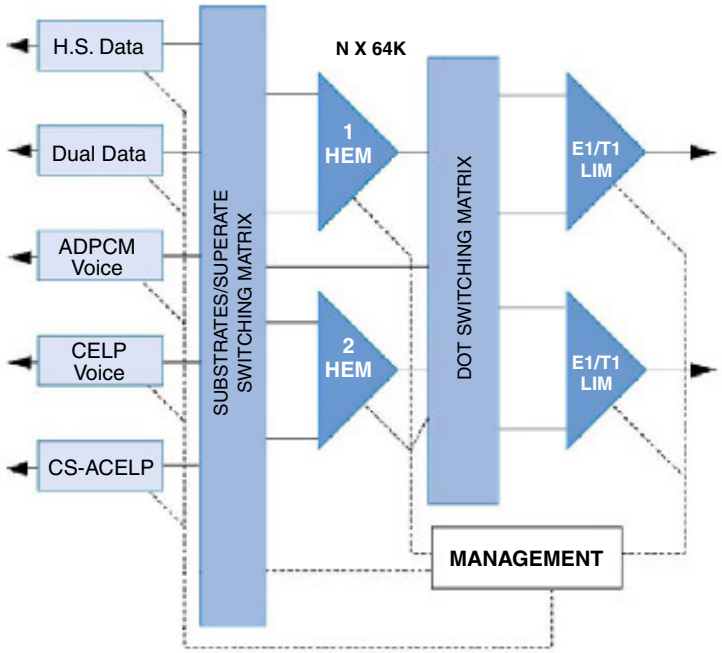


Figure 2-2 — OCM Wideband Architecture

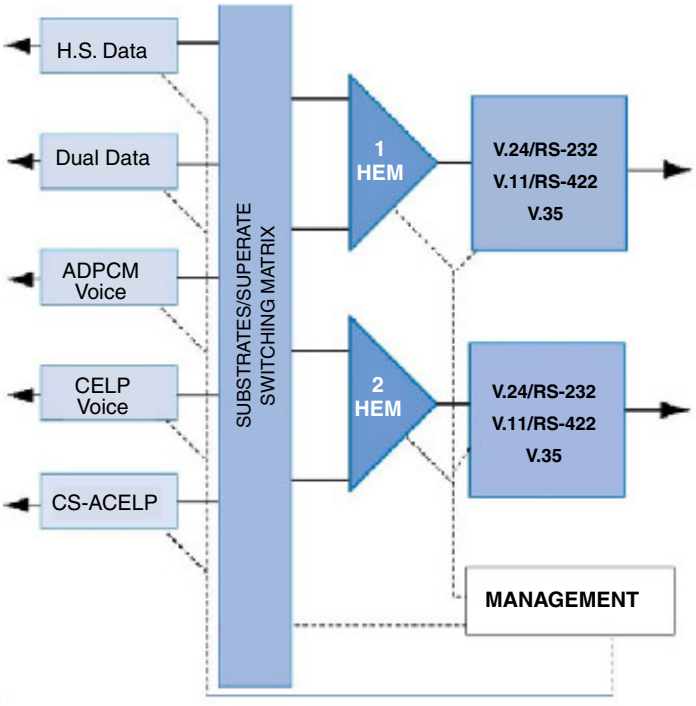


Figure 2-3 — OCM Narrowband Architecture

Wideband Integrated Access

Figure 2-2 depicts the logical organization of the OCM with two active wideband Line Interface Modules (LIMs).

Individual data, and voice modules accept traffic and present it to a subrate/superate switching matrix. The matrix switches this traffic either directly to a DS0 switching matrix, or to one of two High Efficiency Multiplexers (HEMs). Channels routed to a HEM are combined with other channels and delivered as a subaggregate to the DS0 switching matrix. The DS0 switching matrix determines how DS0s are presented to the wideband T1/E1 channelized multiplexers.

Thus, a wideband interface may contain a mix of channel rates and type. These channels could include independent DS0s that are N x 56/64 Kbps originating at a High Speed Data Module. It is also possible that these channels could include one or two subaggregates that span multiple DS0s in a fractional T1/E1 environment.

Narrowband Access

Figure 2-3 depicts the logical organization of the OCM 1000 when configured for non-channelized applications. In this configuration, the OCM 1000 delivers HEM aggregate data via standard electrical interfaces at rates between 9.6 Kbps and 2.048 Mbps.

Individual channels are presented to the switching matrix and are routed to one of two HEMs. The aggregate output of these multiplexers is configured for the proper electrical presentation and is delivered to the network.

The HEM is highly efficient, allowing up to 99% of the aggregate to carry user traffic while maintaining robust framing and complete end-to-end management.

Key Features

OCM User Connectors

To facilitate rapid, simple deployment of services and simplified maintenance, all user cables are connected to the rear of the OCM via standard connectors (see Figure 2-4). T1/E1 network connections and analog voice connections are made via industry standard RJ-45 modular jacks. Data connections are made via industry standard DB-25 connectors.

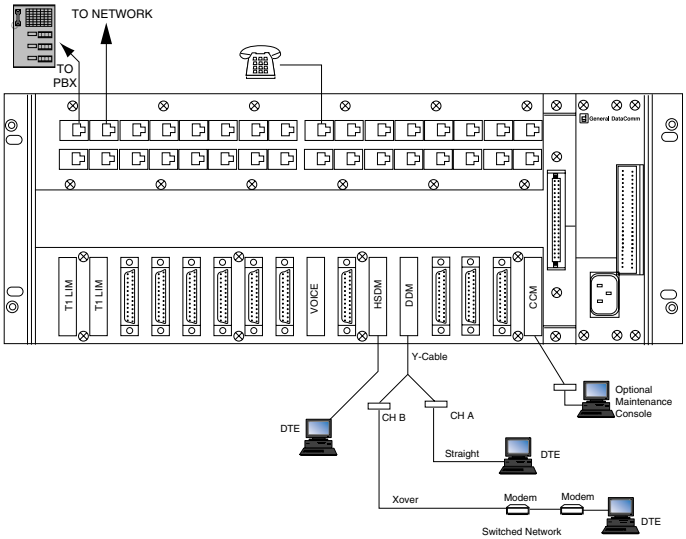


Figure 2-4 — Rear View of OCM Shelf

Aggregate Diversity

For mission-critical applications requiring fail-safe operation, reliable networking equipment is not enough. Most network outages are a result of carrier line failures, not equipment failures. To protect against line failure, the OCM 1000 provides an aggregate diversity feature (Figure 2-5). In the event of primary line failure, the OCM 1000 automatically transfers all traffic to an alternate physical path.

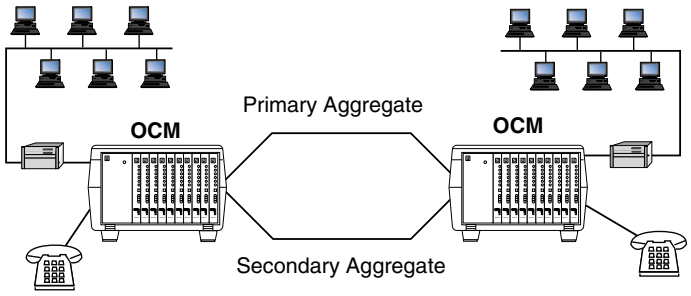


Figure 2-5 — Aggregate Diversity

Dial-Up Restoral

The OCM 1000 can also initiate automatic restoral of failed circuits via the switched network. Upon detection of line failure, the OCM 1000 can signal an ISDN Terminal Adapter, modem, or other device to dial-up a connection. Once the connection is established, the OCM 1000 will use the restored path to resume normal communications. This important feature, coupled with equipment redundancy, ensures continuous communications service.

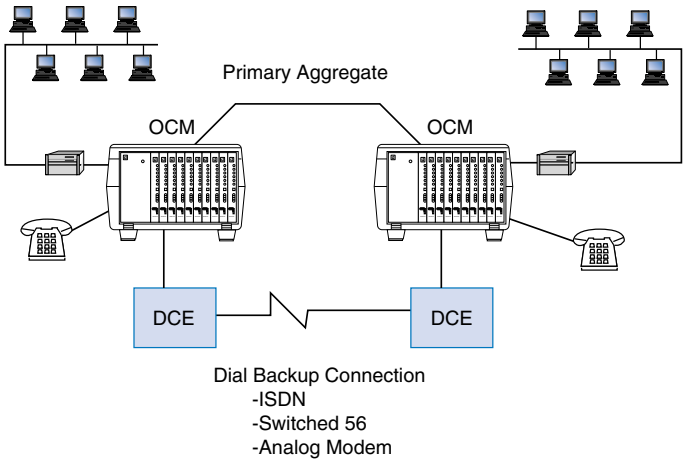


Figure 2-6 — Dial-up Restoral

Compressed Voice

The integration of compressed analog and digital voice with classic data applications represents an opportunity for substantial sav-ings in monthly recurring line charges. Once monthly line charges are justified for data applications, the voice can be carried using remaining aggregate bandwidth for no addi-tional monthly cost. Furthermore, transporting voice for “free” means that the per-call charges may be eliminated.

The OCM 1000 provides a wide range of voice compression capabilities, with a full range of 2-wire and 4-wire analog telephony interfaces, as well as T1 and E1 digital PCM interfaces.

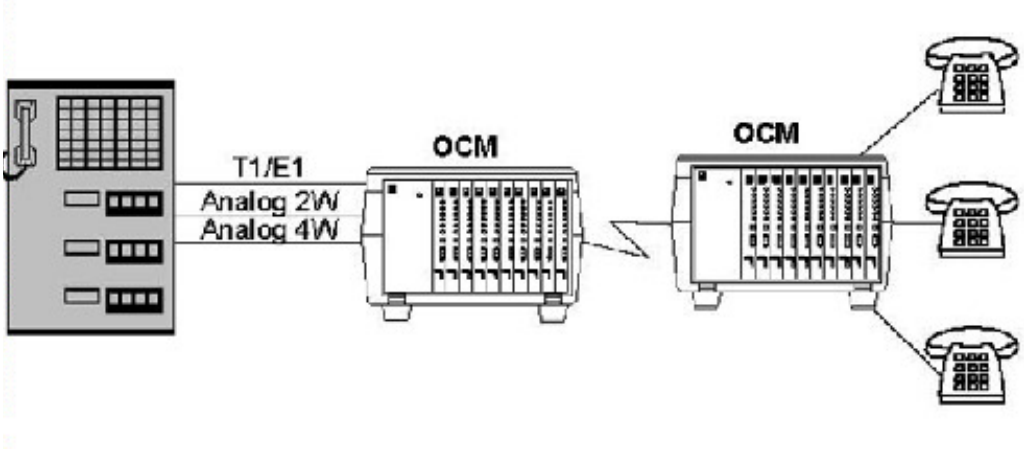


Figure 2-7 — Compressed Voice

3. OCM 1000 Design

OCM Shelf

Expansion Shelf

Power Supply

OCM Shelf

The OCM 1000 is deployed in a 16-slot 19-inch rackmount shelf.

The OCM 1000 16-slot shelf (Figure 3-1) is 7 inches high and 19 inches wide, supports 16 card slots, and can be expanded to include up to a total of 32 card slots. The shelf is designed to be NEBS compliant for carrier Central Office applications. Power is supplied by one or two 96 watt power supplies. The power supplies are load sharing and can be configured for redundancy.

At least one slot is required for a Common Control Module (CCM), and at least one slot is required for a Line Interface Module (LIM). This configuration supports 14 user card slots without expansion, and 30 user card slots in an expanded configuration.

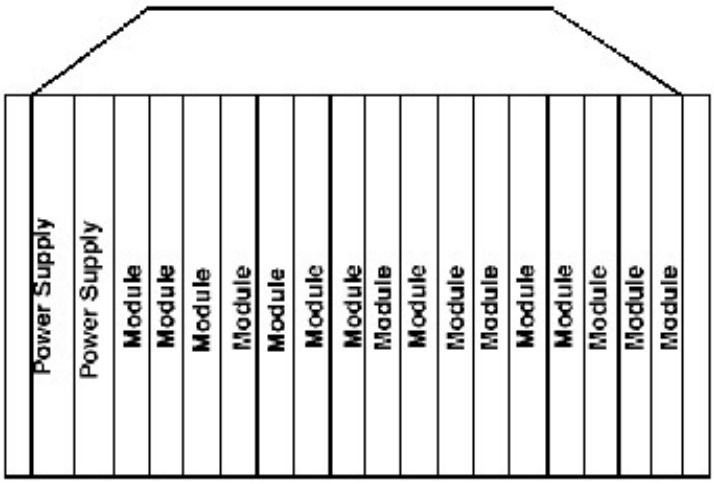


Figure 3-1 — OCM 16 Slot Shelf

Expansion Shelf

The OCM Expansion shelf (Figure 3-2) is identical to the OCM main shelf, including support for redundant power supplies, except it does not require a CCM or LIM. The expansion shelf is attached to the main shelf via a supplied cable.

Power Supply

The OCM 1000 can be configured to support 100/117/220 VAC. The OCM shelf can be configured for redunant, load-sharing power. The OCM Shelf also supports -48 VDC power.

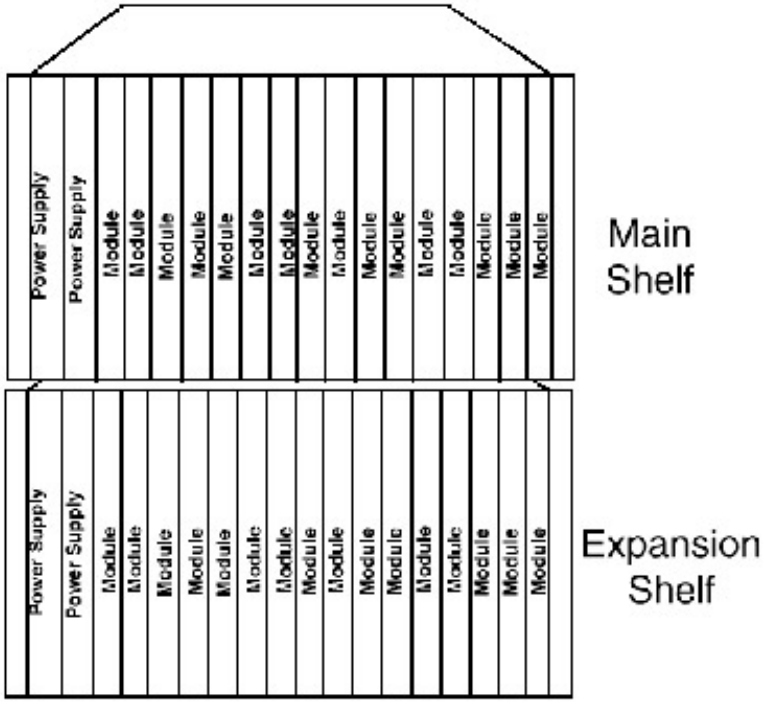


Figure 3-2 — OCM Expansion Shelf

Table 3-1 — OCM 1000 Packaging Specifications

Aggregate Capacity:	One active and one backup aggregate
Aggregate Rates:	Rates from 9.6 Kbps to 2.048 Mbps, including N x 64 Kbps rates
Aggregate Interfaces:	T1/D4/ESF, ITU G.703, G.704, X.21, V.35, V.26, V.11, V.28, EIA-232-D
Channel Capacity*	
Shelf:	Up to 30 slots available (in the two shelf configuration) to support as many as 60 channels
Physical	
	16-slot Shelf
Height	178 mm (7.0 in)
Width:	483 mm (19.0 in)
Depth:	305 mm (12.0 in)
Weight:	46 kg (21 lbs.)**
Shipping Weight:	55 kg (25 lbs.)
Power	
16-slot Shelf:	Each shelf accepts one or two 96-watt power supplies; 100/117 VAC, 220 VAC, 240 VAC
Temperature:	0° - 50° C (32° - 122° F)
Humidity:	Up to 95% without condensation
Altitude:	Up to 3000 meters (12,000 ft)

* Channel capacity varies based on specific configurations.
** Includes two power supplies, no cards.

4. OCM 1000 MODULES

Introduction

All control, network and line interface functions for the OCM 1000 are handled through modules that can be easily inserted or removed from the main or expansion shelves. Modules fall into three categories: Aggregate Modules, which handle network access interface tasks; Common Modules, which handle control and management functions; and Channel Modules, which handle interface to voice and data applications. All modules feature a hot swappable design. Common modules feature complete redundancy. In this section, we will briefly describe the purpose and key features of the modules currently available and provide module specification tables where applicable.

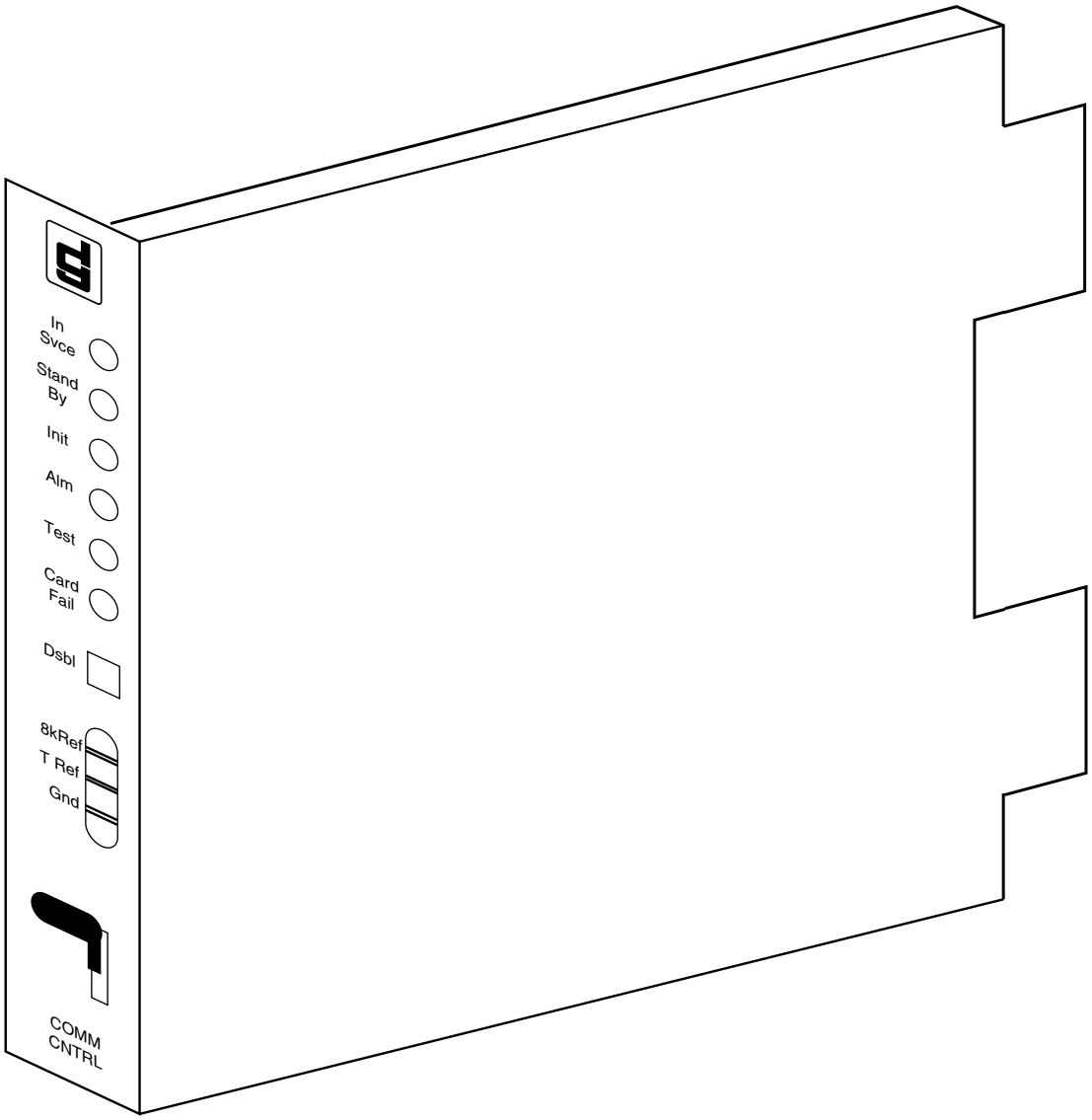


Figure 4-1 — Profile of an OCM Module

Common Control Module 10 (CCM10)

The Common Control Module 10 (CCM10) is the common logic module for the OCM. As the focal point for control and management of the OCM, it provides system timing, monitoring, software distribution, and diagnostic functions within the shelf.

Key Features

A microprocessor based logic module, the CCM communicates with the controlling node; stores operational code, configuration and performance statistics; provides nodal timing; and governs all of the functionality that resides within the OCM. All system software is stored on the CCM in non-volatile, battery-backed RAM, which retains software for 10 years (typically) after loss of shelf power. When configured with redundant CCMs, system software is automatically cross-loaded between the primary and secondary modules. In the event of a fault, the OCM automatically switches to the standby CCM.

In conjunction with the Line Interface Modules (LIMs) and channel modules, the CCM produces one or two High Efficiency Multiplexing (HEM) frames. The CCM directs each HEM frame to the selected LIM for delivery to the network in either channelized format (T1, E1) or as a synchronous serial bit stream (V.35, V.11). Each HEM may contain any mix of channel types and rates such that the sum of the channels equals 99% of the HEM aggregate.

The CCM has a user selectable DIP switch to select between use in an OCM 1000 or an OCM 2000 network.

Table 4-1 — CCM Specifications

Subaggregates:	Up to two
Subaggregate Framing:	HEM
Internal Clock Stability:	5 x 10-5
Maintenance Port:	TIA-232E/V.24 9.6 Kbps DCE
Memory:	RAM: 8 MB Battery-backed

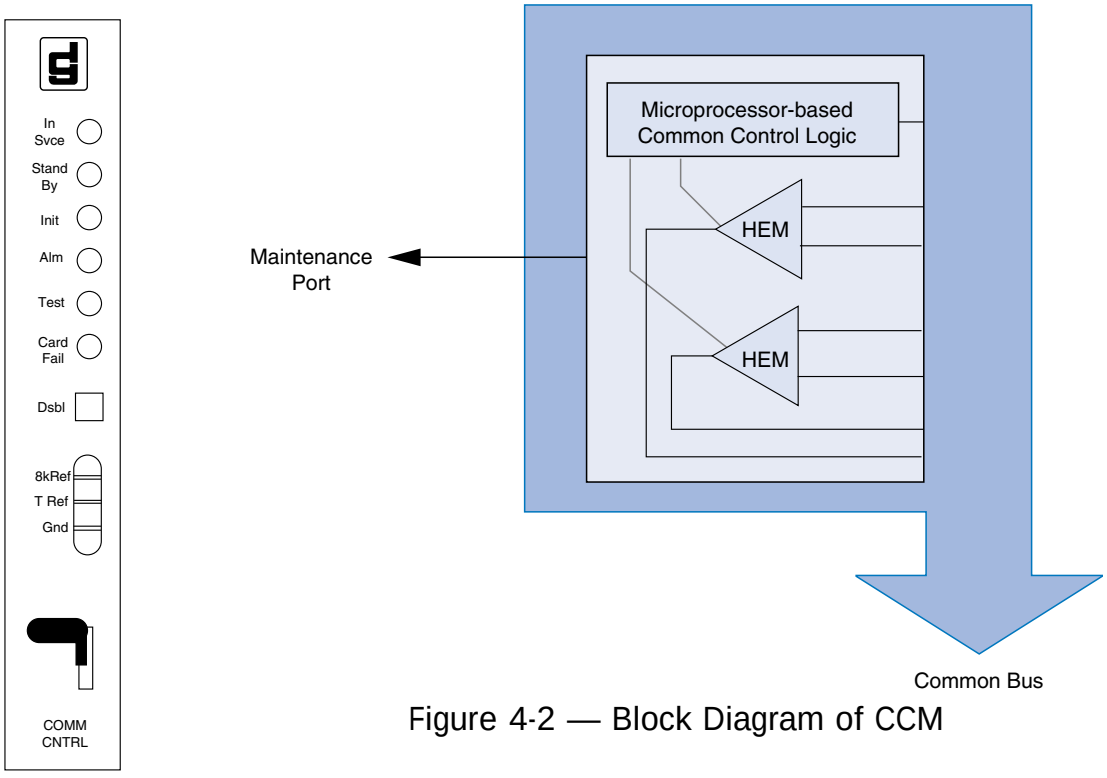


Figure 4-2 — Block Diagram of CCM

T1 Network LIM

The T1 Network LIM interface module provides a DSX-1 channelized serial aggregate interface and is compliant with AT&T Pub 62411.

Key Features

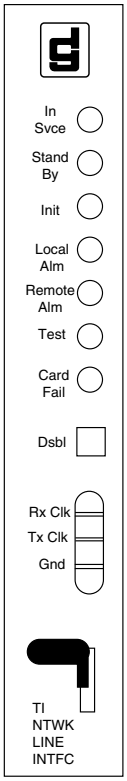
The T1 LIM provides synchronization, framing, signaling and conditioning. It supports full 1.544 Mbps link speed as well as fractional T1 rates in N x 64 Kbps increments. Two T1 LIMs may be paired to provide redundancy. Operating in conjunction with the CCM, the T1 LIM provides a fully channelized network interface. The T1 LIM features line transmit equalization up to 655 feet, support for both AMI and B8ZS line coding, D4 and ESF framing, AT&T or ANSI ESF compatibility, and configurable conditioning codes.

The T1 LIM supports the DSX-1 interface and requires a CSU for connection to a public T1 network. (See T1/CSU LIM)

Configuration and management of the T1 LIM is supported under software control.

Table 4-2 — T1 LIM Specifications

Interface Type:	DSX-1
Interface Connector:	8-position modular, RJ-48C
Compliance:	U.S. FCC Part 68
Line Rate:	1.544 Mbps, full or fractional T1
Framing:	D4 or ESF
Line Coding:	AMI or B8ZS
Line Length:	Up to 655 feet
Electrical:	Meets AT&T Pub 62411
Diagnostics:	Local loopback, Remote loopback, selftest



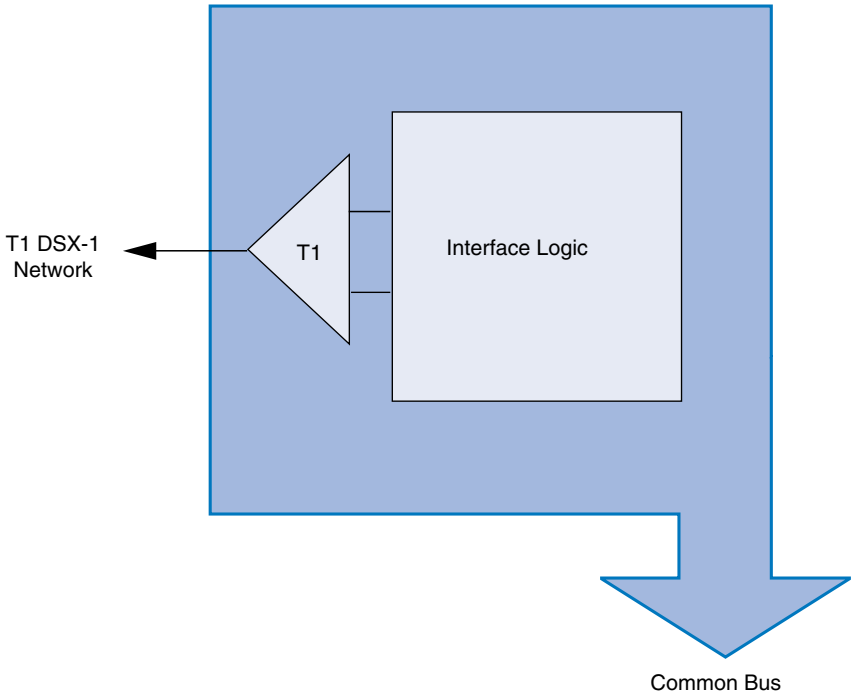


Figure 4-3 — Block Diagram of T1 Network LIM

CSU T1 Network LIM

The CSU T1 Network LIM interface module provides a DS1 channelized serial network interface and is compliant with AT&T Pub 62411. It is identical to the T1 LIM, except that it provides a full function, integral CSU for direct connection to a carrier's T1 network.

Key Features

The CSU T1 LIM provides synchronization, framing, signaling and conditioning. It supports the full 1.544 Mbps link speed as well as fractional T1 rates in N x 64 Kbps increments. Two CSU T1 LIMs may be paired to provide LIM redundancy. Operating with the CCM, the CSU T1 LIM provides a fully channelized network interface. The CSU T1 LIM features support for AMI and B8ZS line coding; D4 and ESF framing; AT&T or ANSI ESF compatibility; selectable Line Build Out; support for both public and private diagnostic registers; and provides configurable conditioning codes.

The CSU T1 LIM supports the DS1 interface and requires no external Channel Service Unit (CSU) for connection to a public T1 network.

Configuration and management of the CSU T1 LIM is supported under software control.

Table 4-3 — CSU T1 LIM Specifications

Interface Type:	DS1
Interface Connector:	8-position modular, RJ-48C
Compliance:	U.S. FCC Part 68
Line Rate:	1.544 Mbps, full or fractional T1
Extended Super Frame:	ESF per AT&T 54016, ESF per ANSI T1.403
Line Coding:	AMI or B8ZS
Line Build Out:	0, 7.5 dB, 15.0 dB, and 22.5 dB at 722 kHz
Receiver Operating Range:	0-26 dB of cable loss at 722 kHz
Span Power:	Loop span current — allows simplex span current to be looped toward the network No loop span current — span current is not looped toward the network
Electrical:	Meets AT&T Pub 62411
Diagnostics:	Local loopback, remote loopback, self test

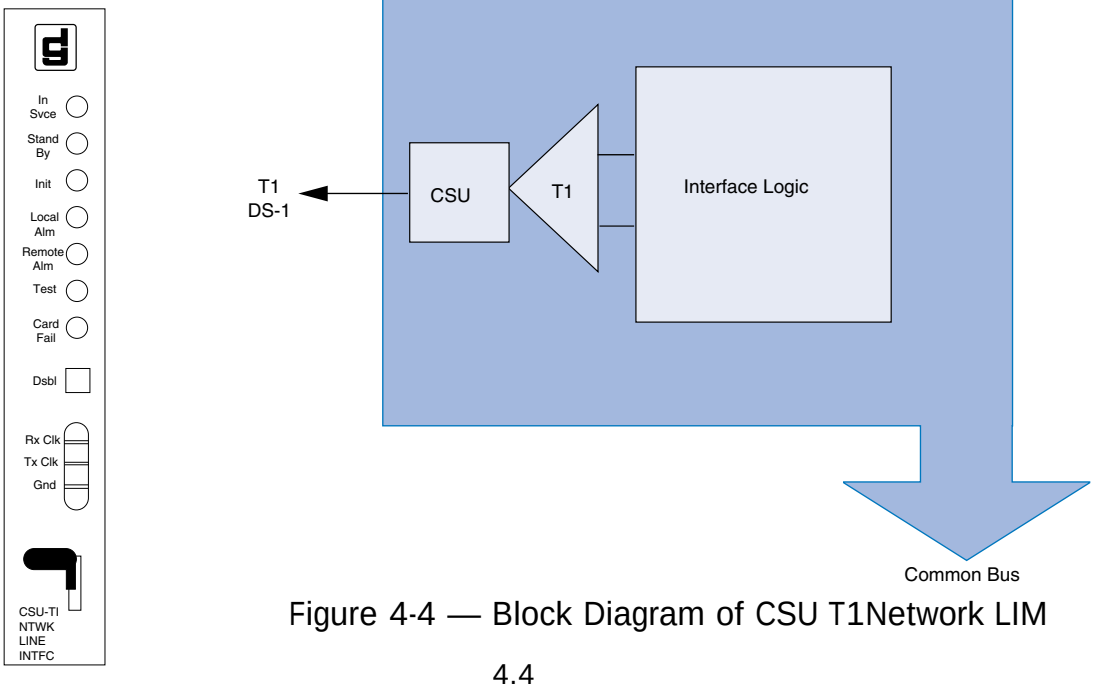


Figure 4-4 — Block Diagram of CSU T1Network LIM

E1 Network LIM

The E1 Network LIM interface module provides a channelized 2.048 Mbps serial aggregate interface and is compliant with ITU-T G.703 (electrical), G.704 (frame structure), and G.706 (CRC-4).

Key Features

The E1 LIM provides synchronization, framing, signaling and conditioning. It supports full 2.048 Mbps link speed as well as fractional E1 rates in N x 64 Kbps increments. Two E1 LIMs may be paired to provide redundancy. Operating with the CCM, the E1 LIM provides a fully channelized network interface. The E1 LIM features selectable transmit and receive line impedance of 120 ohms (twisted pair) or 75 ohms (requires coaxial adapter).

Clocking is recovered from the E1 line when configured for slave timing. The E1 LIM supports the use of CRC-4 error monitoring, which can be enabled or disabled. The frame alignment and CRC-4 procedures are compatible with ITU-Recommendations G.706.

Configuration and management of the E1 LIM is supported under software control.

Table 4-4 — E1 LIM Specifications

Interface Type:	G.703 — Physical/Electrical Characteristics of Hierarchical Digital Interface
Interface Connector:	8-position modular, RJ-48C
Line Rate:	2.048 Mbps, full or fractional E1
Framing:	G.704 — Synchronous Frame Structure Used at Primary and Secondary Hierarchical Levels G.706 — Frame Alignment and Cyclic Redundancy Check Procedures
CAS:	Time Slot 16 may be used for payload, or skipped for CAS use
Alarm Conditions:	Loss of Signal Loss of Frame Alignment
Diagnostics:	Local Loopback, Remote Loopback, Self Test

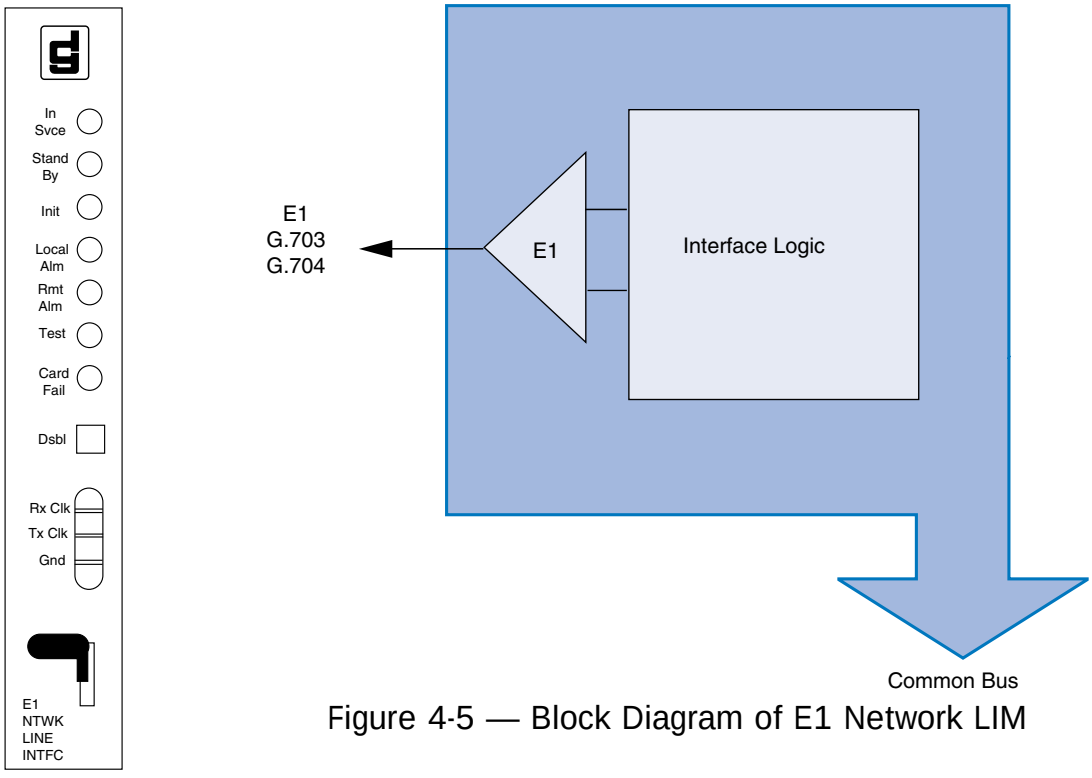


Figure 4-5 — Block Diagram of E1 Network LIM

V.11 LIM

The V.11 LIM network interface module provides a serial, non-byte-aligned aggregate interface, is compliant with the ITU-T V.11, TIA-RS-422 electrical interface standard, and operates at rates up to 1.984 Mbps.

Key Features

The V.11 LIM provides a serial bit stream at N x 64 Kbps (up to 1.984 Mbps) and N x 56 Kbps (up to 1.344 Mbps) bit rate increments. Two V.11 LIMs may be paired to provide LIM redundancy and/or aggregate diversity.

The V.11 LIM accepts clock from the line interface equipment when configured for slave timing, or provides a transmit timing signal when configured for internal clock. The LIM provides visual indicators on the front panel for status and diagnostics, and performs a self-test on power-up for user control. The V.11 LIM presents a DTE interface for connection to the network.

Configuration and management of the V.11 LIM is supported under software control.

Table 4-5 — V.11 LIM Specifications

Interface Type:	V.11/TIA-RS-422 Meets NET1 (X.21)
Interface Connector:	DB-25 female, DB-15 (X.21) with adapter
Controls:	X.21 balanced, C (control) and I (indication)
Line Rate:	56, 64, 112, 128, 168, 192, 224, 256, 280, 320, 336,384, 392, 448, 512, 504, 576, 560, 616, 640, 672, 704, 728, 768,784, 832, 840, 896, 952, 960, 1008, 1024, 1064, 1088, 1120, 1152,1176, 1216, 1232, 1280, 1288, 1344, 1408, 1472, 1536, 1600,1664, 1728, 1792, 1856, 1920, 1984 Kbps

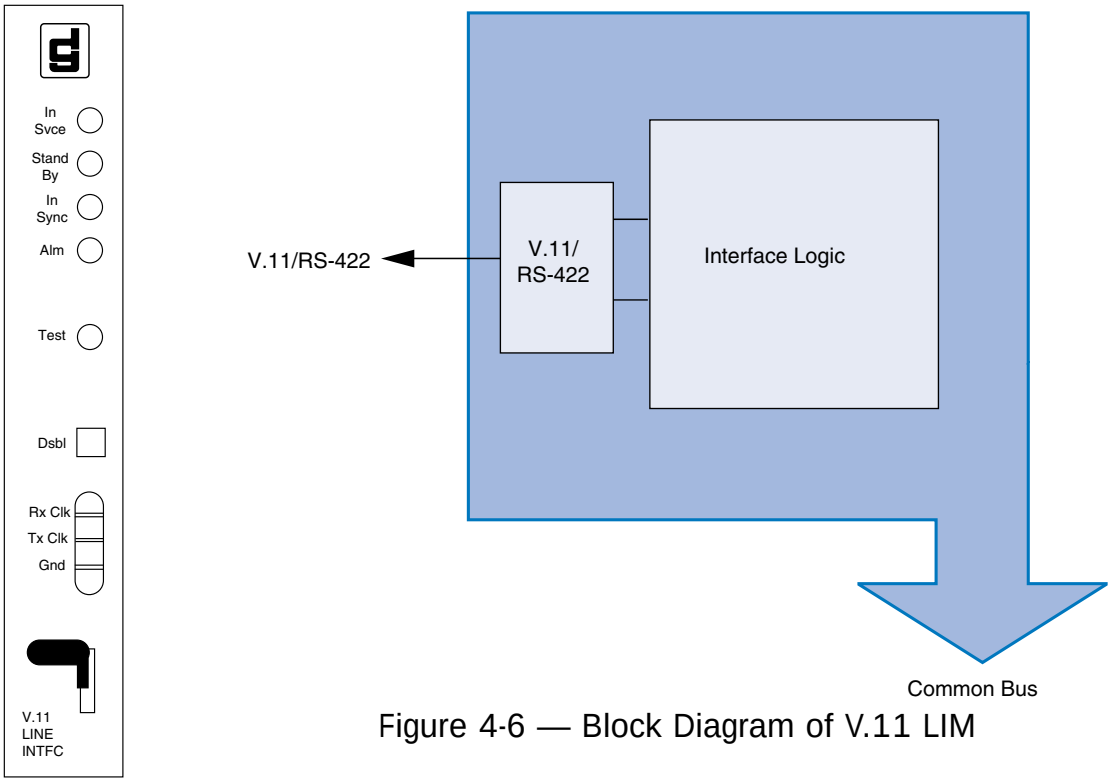


Figure 4-6 — Block Diagram of V.11 LIM

V.35 LIM

The V.35 LIM network interface module provides a serial, non-byte-aligned aggregate interface that complies with the V.35 electrical interface standard and operates at rates up to 1.984 Mbps.

Key Features

The V.35 LIM provides a serial bit stream at N x 64 Kbps (up to 1.984 Mbps) and N x 56 Kbps (up to 1.344 Mbps) bit rate increments. Two V.35 LIMs may be paired to provide LIM redundancy and/or aggregate diversity.

The V.35 LIM accepts clock from the line interface equipment when configured for slave timing, provides visual indicators on the front panel for status and diagnostics, and performs a self-test on power-up for user control. The V.35 LIM presents a DTE interface for connection to the network.

Configuration and management of the V.35 LIM is supported under software control.

Table 4-6 — V.35 LIM Specifications

Interface Type:	V.35
Interface Connector:	DB-25 female, ISO 2593 via adapter
Controls:	RTS, DTR (output); CTS, DSR, DCD, RI (inputs) V.54 diagnostic control LL, RL, TM . Control leads are unbalanced, per V.24/TIA-232E
Line Rate:	56, 64, 112, 128, 168, 192, 224, 256, 280, 320, 336,384, 392, 448, 512, 504, 576, 560, 616, 640, 672, 704, 728, 768,784, 832, 840, 896, 952, 960, 1008, 1024, 1064, 1088, 1120, 1152,1176, 1216, 1232, 1280, 1288, 1344, 1408, 1472, 1536, 1600,1664, 1728, 1792, 1856, 1920, 1984 Kbps

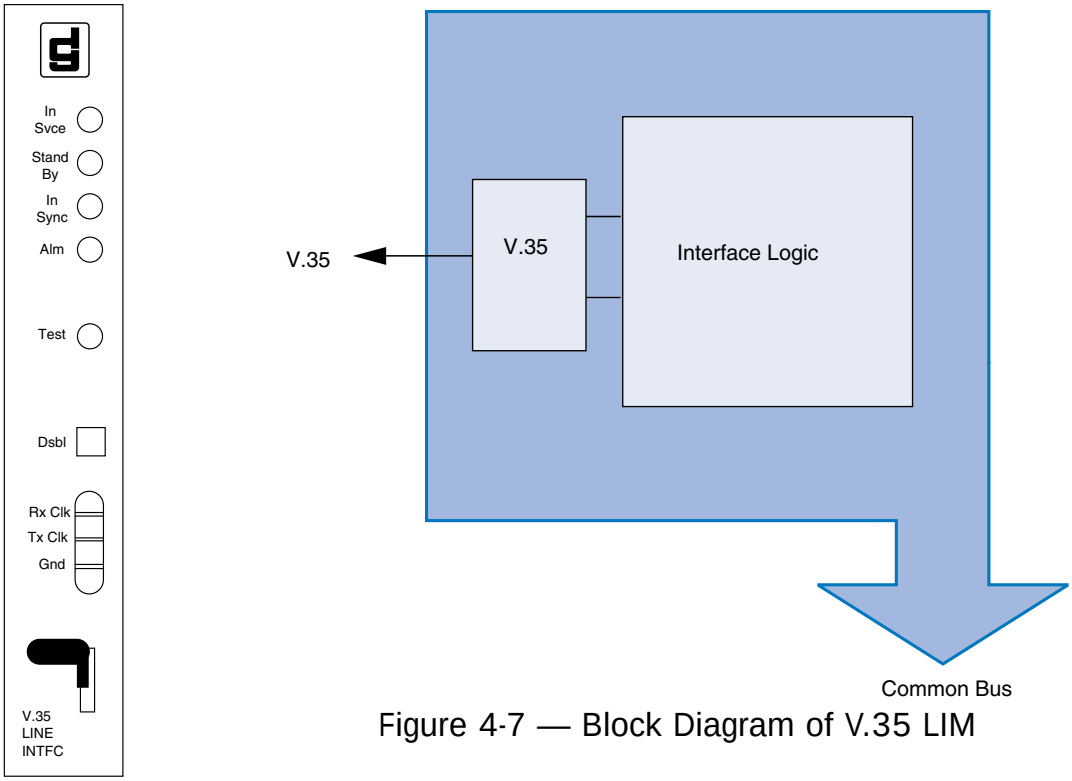


Figure 4-7 — Block Diagram of V.35 LIM

Subrate LIM

The Subrate LIM network interface module provides a serial, non-byte-aligned aggregate interface, is compliant with the ITU-T V.28/EIA/TIA-232-E electrical interface standard, and operates at rates up to 64 Kbps.

Key Features

The Subrate LIM provides a serial bit stream at N x 8 Kbps (up to 64 Kbps) and N x 2.4 Kbps (up to 45.6 Kbps) bit rate increments. Two Subrate LIMs may be paired to provide LIM redundancy and/or aggregate diversity.

The Subrate LIM accepts clock from the line interface equipment when configured for slave timing, or provides a transmit timing signal when configured for internal clock. The LIM provides visual indicators on the front panel for status and diagnostics, and performs a self-test on power-up for user control. The Subrate LIM presents a DTE interface for connection to the network.

Configuration and management of the Subrate LIM is supported under software control.

Table 4-7 — Subrate LIM Specifications

Interface Type:	ITU-T V.28 DTE
Interface Connector:	DB-25 female
Controls:	X.21 balanced, C (control) and I (indication)
Line Rate:	N x 2.4 Kbps: from 9.6 Kbps to 45.6 Kbps N x 8 Kbps: from 16 Kbps to 64 Kbps

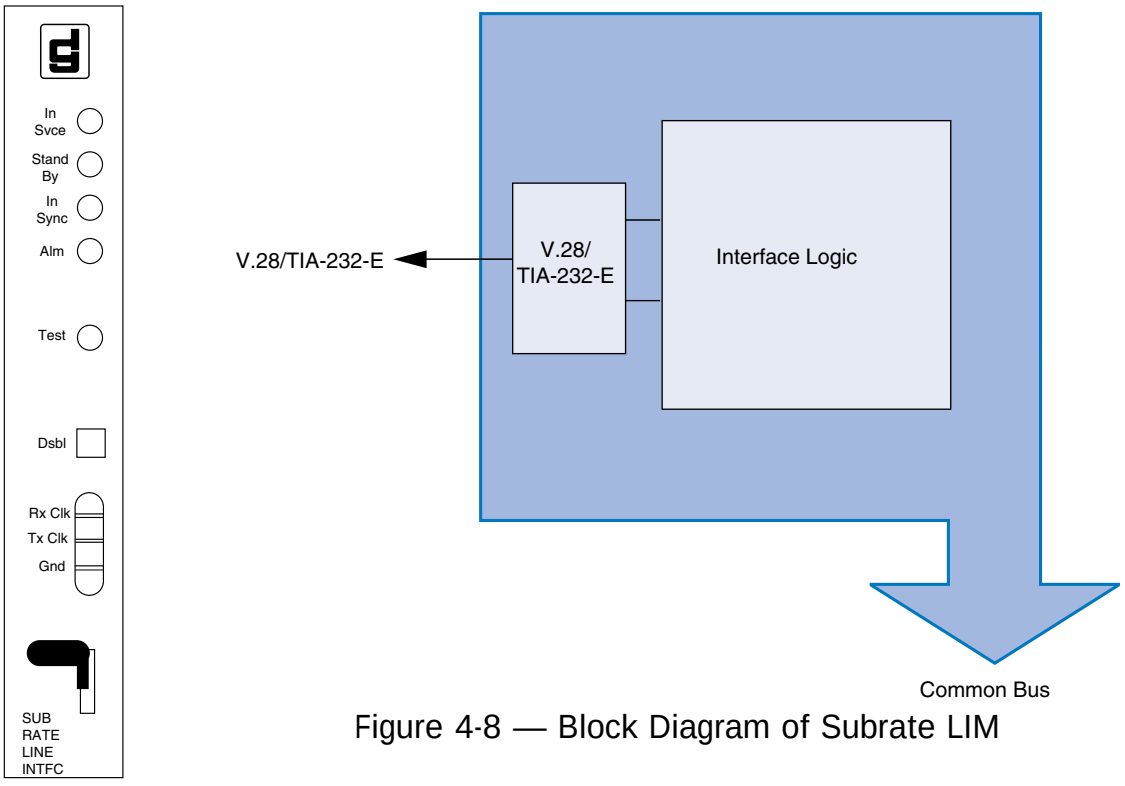


Figure 4-8 — Block Diagram of Subrate LIM

High Speed Data Channel Module

The High Speed Data Channel module is a single channel data interface that provides one serial channel interface at any of 67 standard rates up to 1.92 Mbps.

Key Features

Each High Speed Data Channel module supports one serial interface which can be configured for either EIA/TIA-232E, V.35, or RS-422/V.11, RS-423/ V.10. The interface is presented as DCE. Under control of the system software, the module supports synchronous, asynchronous, and isochronous/transition encoded data formats at rates up to and including 1.92 Mbps.

The High Speed Data Channel module is factory configured to support the required electrical interface through the application of plug-in resistor networks and switch settings.

Connection to the module is via a DB-25 connector on the rear of the OCM. The High Speed Data Channel module may occupy any available slot of an OCM shelf, enclosure, or expansion shelf.

The High Speed Data Channel module delivers data at any supported rate to either of the OCM's two HEMs. N x 56/64 Kbps channel rates may be multiplexed directly into a T1 or E1 frame.

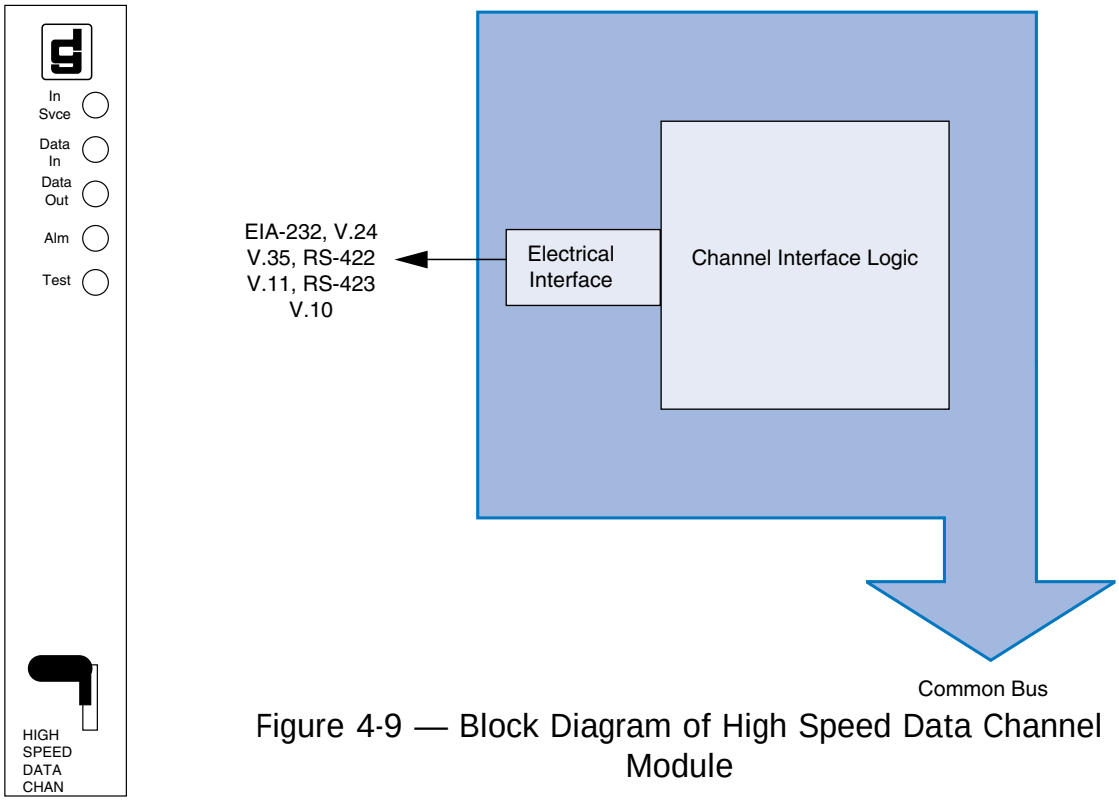


Figure 4-9 — Block Diagram of High Speed Data Channel Module

Table 4-8 — High Speed Data Channel Module Specifications

Data Rates:	Synchronous — any listed rate; Asynchronous — any listed rate up to 38.4 Kbps; Isochronous — any listed rate up to 64 Kbps 300*, 600, 1200, 1600, 1800, 2000, 2400, 3200, 3600, 4000,4800, 6400, 7200, 8000, 9600, 12000, 14400, 16000, 19200, 24000, 28800, 32000, 36000, 38400, 48000, 56000, 57600, 64000, 72000, 76800, 96000, 112000, 115200, 128000, 144000, 153600, 192000,224000, 230400, 256000, 288000, 320000, 384000, 448000, 460800, 512000, 576000, 640000, 704000, 768000, 832000, 960000, 1024000, 1088000, 1152000, 1216000, 1280000, 1344000, 1408000, 1472000, 1536000, 1600000, 1664000, 1728000, 1792000, 1856000, 1920000 bps		
Interface:	EIA/TIA-232E/ITU-T V.24 ITU-T V.35 RS-422/ ITU-TV.11 data & clock RS-423/ITU-T V.10 data & clock		
Interface Type:	DCE		
Controls:	ITU-T	EIA	Direction
	105	RTS	Input
	106	CTS	Output
	107	DSR	Output
	109	DCD	Output
	125	RI	Output
	140	RL	Input
	141	LL	Input
	142	TM	Output
	108.2	DTR	Input

* 75 bps async or lower is supported by oversampling at 300-1200 bps sync

Dual Data Channel

The Dual Data Channel module is a two channel data interface module that provides one or two low to medium speed serial channel interfaces.

Key Features

Each Dual Data Channel module supports two independent EIA/TIA-RS-232E/ITU-T V.24 interfaces, which are presented as DCE. Under control of the system software, the module supports synchronous, asynchronous, and isochronous/transition encoded data formats at rates up to and including 38.4 Kbps.

Connection to the module is via a DB-25 connector on the rear of the OCM. Standard pinout for two channels is provided through an optional "Y" cable.

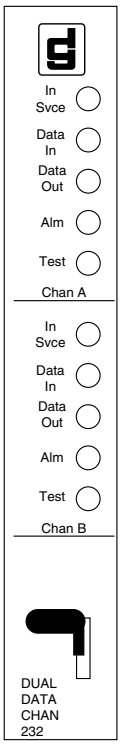
The Dual Data Channel module may occupy any available slot of an OCM shelf, enclosure, or expansion shelf.

The Dual Data Channel module delivers data at any supported rate to either of the OCM's two HEMs.

Table 4-9 — Dual Data Channel Module Specifications

Data Rates:	300*, 600, 1200, 1600, 1800, 2000, 2400, 3200, 3600, 3840, 4000, 4800, 6400, 7200, 8000, 9600, 12000, 14000, 14400, 16000, 19200, 24000, 28000, 28800, 32000, 36000, 38400 bps		
Interface:	EIA/TIA-232E ITU-T V.24 meets NET 2		
Interface Type:	DCE		
Controls**:	ITU-T	EIA	Direction
	105	RTS	Input
	106	CTS	Output
	109	DCD	Output
	141	LL	Input
	142	TM	Output
	108.2/140	DTR/RL	Input
	125/107	RI/DSR	Output

* 75 bps async or lower is supported by oversampling at 300 -1200 bps sync
** Support V.54 controls LL, RL and TM



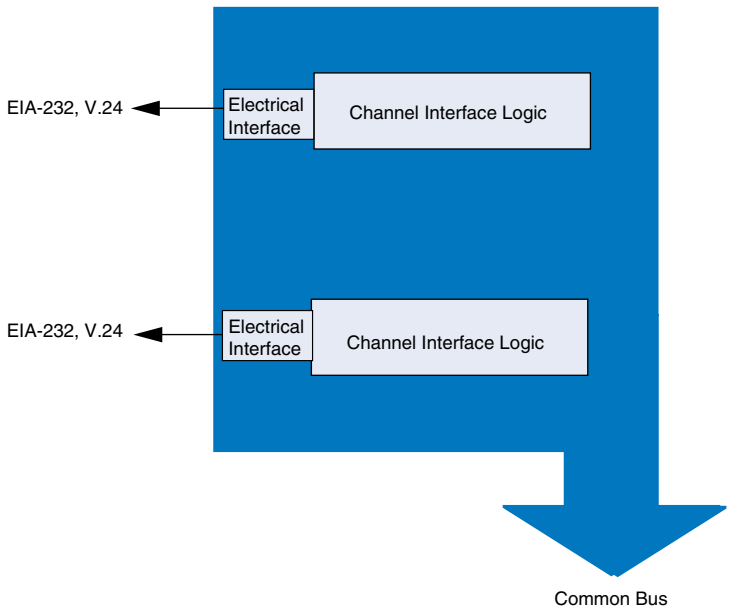


Figure 4-10 — Block Diagram of Dual Data Channel Module

ADPCM Voice Channel Module

The ADPCM Voice Channel Module is an analog voice telephony module. It provides both 2-wire and 4-wire analog compressed voice telephony within a private TMS/OCM or OCM/OCM network.

Key Features

Each ADPCM Voice Channel Module supports one analog interface. Several versions of the module are available, supporting 2-wire FXS, 2-wire FXO, and 2/4-wire E&M interfaces. Battery and ring voltage generators are provided on-board. The ADPCM Voice Channel Module supports voice compression at 16, 24, and 32 Kbps, and also supports 64 Kbps PCM. It is end-to-end compatible with the TMS 3000 ACM and UVC (Universal Voice Card).

Tone Launch

The module features a 1004 Hz diagnostic test tone generator to assist in setting analog levels. This tone is digitally synthesized from a series of PCM words, similar to a T1/E1 channel bank's digital milliwatt, but at lower levels. The level is fixed at -15 dBm0 to meet U.S. FCC Part 68 rules. The module can also measure the level of a single tone and display it on the Network Management System.

Level Adjustments

Input and output levels are adjustable through a broad range, in 0.5 dB increments from +1.5 dB to - 6.0 dB for 4-wire circuits, and from 0.0 dB to -6.0 dB for 2-wire circuits.

Automatic Adaptive Hybrid Balancing

The 2-wire telephony uses an advanced Subscriber Line Audio Circuit (SLAC) which automatically adapts the impedance of the 2-wire interface. Since echoes are caused by impedance mismatches, this feature helps to reduce the need for active echo cancellation by eliminating some of the sources for echoes.

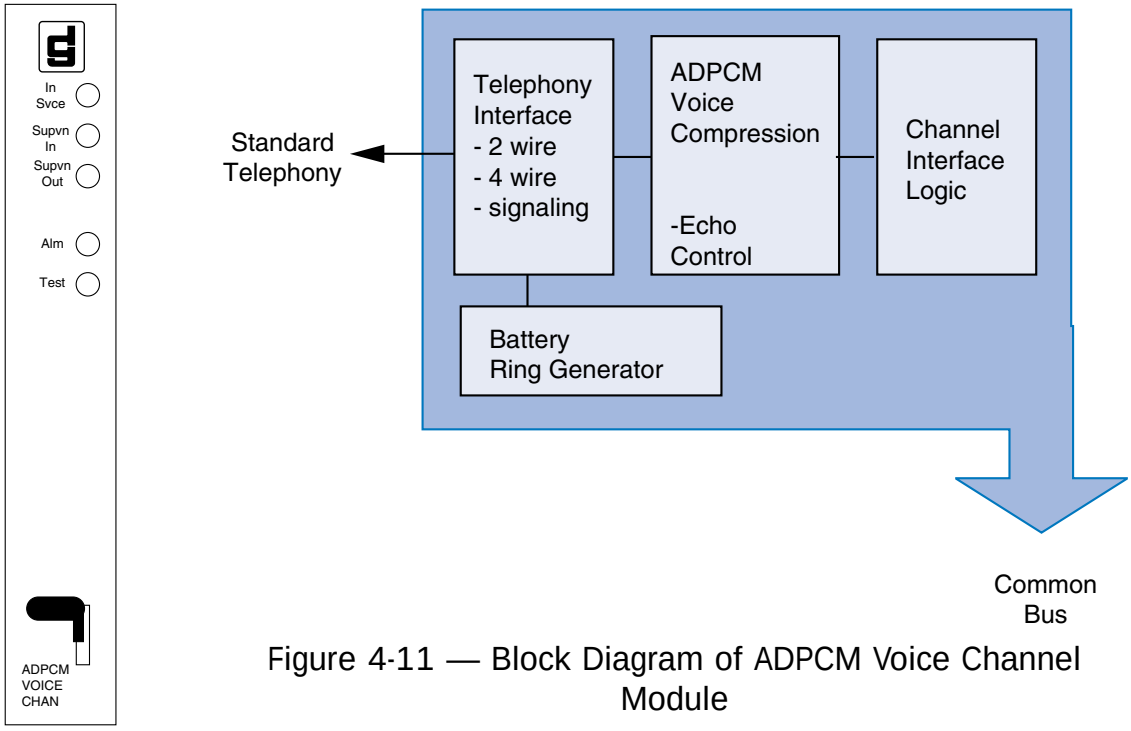


Figure 4-11 — Block Diagram of ADPCM Voice Channel Module

Echo Cancellation

The ADPCM Voice Channel Module supports an optional Echo Canceller module which can cancel echoes with a maximum delay of 16 ms. This delay is not the circuit round-trip delay, but the delay from the echo canceller to the source of the signal reflection (e.g. the connection from the ADPCM Voice Channel Module to a PBX or telephone). The echo canceller adapts to any echo or series of echoes in a 0 - 16 ms window. The delay window can be increased to 7 - 23 or 14 - 30 ms.

Table 4-10 — ADPCM Voice Channel Module

Compression Data Rates:	16, 24, 32, 64 Kbps*
Encoding:	32 Kbps: ITU-T G.721, 1986 ANSI A-law or Mu law
2-Wire FXS Interface	
Battery:	Internal, -37.5 VDC
Max loop resistance (loopstart):	1200 ohms
Max loop length (loopstart):	9000 feet 26 AWG wire
Max loop resistance (ground start):	600 ohms
Loop current:	25 mA
Signaling :	Loop start, Ground start, Dial pulse, DTMF
Ringing Voltage:	75 VRMS, 20 Hz
Ringing Cadence:	2 seconds on, 4 seconds off Transparent (FXS-FSO)
Drive Capability:	1.5 REN (1 2500 type telephone)
Return Loss:	14 dB min, 200 - 3400 Hz, 600 ohm
Impedance:	600 ohms
Registration:	U.S. FCC Part 68 DOC CS-03 UL-1459
2-Wire FXO	
DC Loop Resistance:	100 ohms (approx.)
Max Loop Current:	100 mA
Signaling:	Loop Start only
Ring Detection:	U.S. FCC Part 68, Type B
Impedance:	600 ohms
Return Loss:	14 dB min, 200 - 3400 Hz, 600 ohm
Registration:	U.S. FCC Part 68 DOC CS-03 UL-1459
2W/4W E&M Interface	
Signaling Type Supported:	Type 1, Type 2, Type 5, SSDC5A
Interface Type:	"B" side E&M
M-lead current detector:	2.4 mA
E-lead driver:	250 mA max.
Return Loss:	14 dB min, 200 - 3400 Hz, 600 ohm
Impedance:	600 ohms
Registration:	U.S. FCC Part 68 DOC CS-03 UL-1459
Maximum Input Level:	+3dBm0
Echo Cancellation - typical increase in echo path loss 35 dB	

* Requires an additional 800 bps of aggregate bandwidth for signaling

CELP Voice Channel Module

The CELP Voice Channel Module, an analog voice telephony module, provides highly compressed, near-toll quality voice. It provides both 2-wire and 4-wire analog voice telephony within a private TMS/OCM or OCM/OCM network.

Key Features

Each CELP (Codebook Excited Linear Predictive) Voice Channel module supports one analog interface. Several versions of the module are available, supporting 2-wire FXS, 2-wire FXO, and 2/4-wire E&M interfaces. Battery and ring voltage generators are provided on-board or can be provided externally. The CELP Voice Channel module supports voice compression at 4.8, 6.4, and 9.6 Kbps. It is end-to-end compatible with the TMS 3000 CELP module.

Tone Launch

The module features a 1004 Hz diagnostic test tone generator to assist in setting analog levels. This tone is digitally synthesized from a series of PCM words, similar to a T1/E1 channel bank's digital milliwatt, but at lower levels. The level is fixed at -15 dBm0 to meet U.S. FCC Part 68 rules. The module can also measure the level of a single tone and display it on the Network Management System.

Level Adjustments

Input and output levels are adjustable through a broad range, in 0.5 dB increments from +1.5 dB to - 6.0 dB for 4-wire circuits, and from 0.0 dB to -6.0 dB for 2-wire circuits.

Automatic Adaptive Hybrid Balancing

The 2-wire telephony uses an advanced SLAC which automatically adapts the impedance of the 2-wire interface. Since echoes are caused by impedance mismatches, this feature helps to reduce the need for active echo cancellation by eliminating some of the sources for echoes.

Echo Cancellation

The CELP Voice Channel module supports an integral Echo Canceller module which can cancel echoes with a maximum delay of 8 ms. This delay is not the circuit round-trip

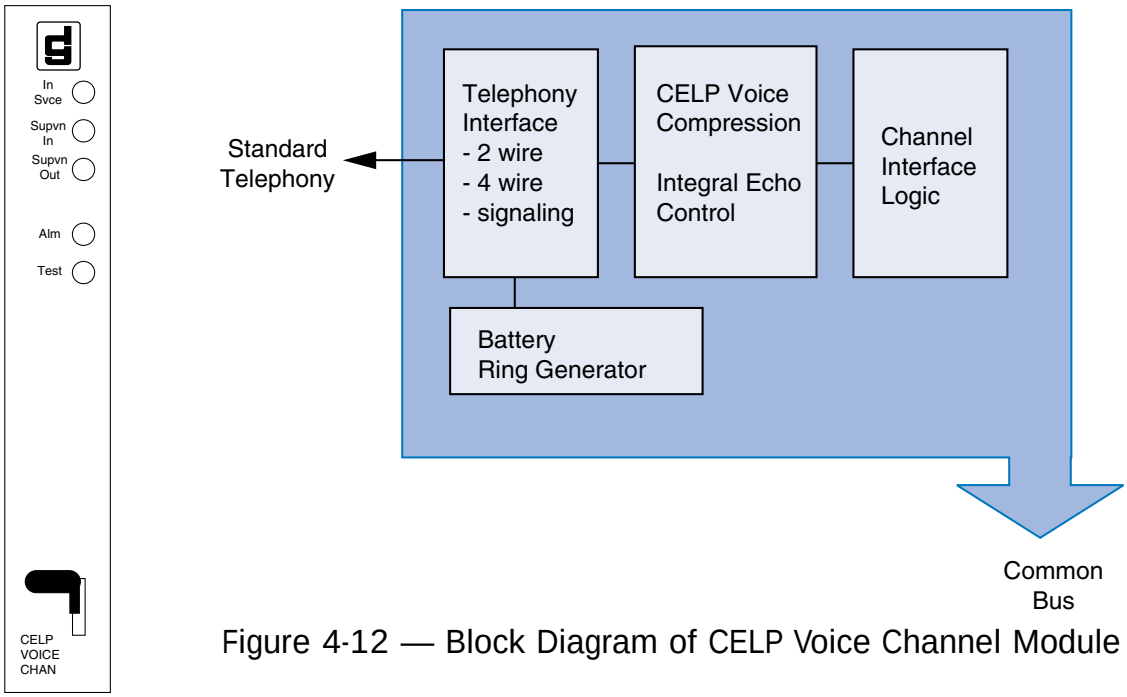


Figure 4-12 — Block Diagram of CELP Voice Channel Module

delay, but the delay from the echo canceller to the source of the signal reflection (e.g. the connection from the CELP Voice Channel module to a PBX or telephone).

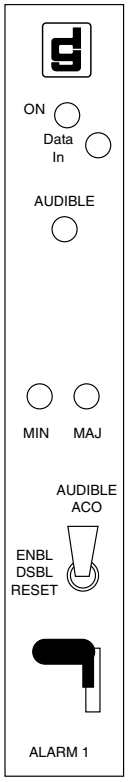
CELP with Fax Bypass Group III

Fax signals (V.21, V.27ter) are automatically bypassed with the 9.6 Kbps CELP Voice Channel module with Fax Bypass. When operating at 9.6 Kbps, the full Group III rate of 9.6 is supported; when operating at 6.4 Kbps, the Group III rate of 4.8 is supported. Operation is automatic and transparent to the user.

Table 4-11 — CELP Voice Channel Module Specifications

Compression:	Data Rates 4.8, 6.4, 9.6 Kbps
Encoding:	Codebook Excited Linear Predictive
2-Wire FXS Interface	
Battery:	Internal, -37.5 VDC
Max loop resistance (loopstart):	1200 ohms
Max loop length (loopstart):	9000 feet 26 AWG wire
Maxloop resistance (ground start):	600 ohms
Loop current:	25 mA
Signaling:	Loop start, Ground start, Dial pulse, DTMF, AC15
Ringing Voltage:	75 VRMS, 20 Hz
Ringing Cadence:	2 seconds on, 4 seconds off Transparent (FXS-FSO)
Drive Capability:	1.5 REN (1 2500 type telephone)
Return Loss:	14 dB min, 200 - 3400 Hz, 600 ohm
Impedance:	600 ohms
Registration:	U.S. FCC Part 68 DOC CS-03 UL-1459
2-Wire FXO	
DC Loop Resistance:	100 ohms (approx.)
Max Loop Current:	100 mA
Signaling:	Loop Start, DTMF, Dial Pulse, AC15
Ring Detection:	U.S. FCC Part 68, Type B
Impedance:	600 ohms
Return Loss:	14 dB min, 200 - 3400 Hz, 600 ohm
Registration:	U.S. FCC Part 68 DOC CS-03 UL-1459
2W/4W E&M Interface	
Signaling Type Supported:	Type 1, Type 2, Type 5, SSDC5A, DTMF, AC15
Interface Type :	“B” side E&M
M-lead current detector:	2.4 mA
E-lead driver:	250 mA max.
Return Loss:	14 dB min, 200 - 3400 Hz, 600 ohm
Impedance:	600 ohms
Registration:	U.S. FCC Part 68 DOC CS-03 UL-1459
Maximum Input Level:	+3dBm0
Echo Cancellation:	Typical increase in echo path loss 35 dB

Alarm Card



The Alarm Card is an optional plug in module that works with the existing shelf or enclosure alarm bus. The Alarm Card provides contacts to activate local and remote customer alarm systems, local and remote indication of alarms in a system and separate cutoff controls for local and remote systems.

Typically, the alarm outputs are used to drive the visual and audible alarms within a central office. There are four types of alarms: Major, Minor, Power Good (Major) and Power Status (Minor).

Major and Minor alarms are defined by the modules used in the system. When an alarm is detected, the associated module activates circuitry on the Alarm Card. To ensure that transient signals do not trigger the alarm, there is a built-in time delay of approximately 100 ms. When an alarm exists, front panel LED indicators light, providing a local indication (minimum on-time of approximately .75 seconds). At the same time, internal relays are activated, providing external control of visual and/or audible indications.

Table 4-12 — Alarm Card Option Settings

PWR GOOD ENA (pos. 1)	Enable/Disable Power Good Detector (Failure in a power supply) — This signal is considered a Major alarm and may be enabled or disabled
PWR STAT RES (pos. 2)	Enable/Disable Power Status Pull-up Resistor (Normally On). This signal comes from the OCM's power supply and should always be set to OFF when an alarm card is installed in the OCM shelf or enclosure
TWO (pos 3) THREE (pos. 4) FOUR (pos. 5)	Power Status Threshold — This option sets the threshold on the power status detector depending on how many power supplies (2, 3 or 4) are installed in the system. When this option is set (pos. 6 ON) and a power supply fails or is taken out of the shelf/enclosure, the Minor alarm is activated. When one power supply is used, set 2, 3 and 4 to OFF.
PWR STAT ENA (pos. 6)	Enable/Disable Power Status Detector — This signal is considered a minor alarm and may be enabled or disabled. When one power supply is used, set to OFF.

Positions 7 and 8 not used.

Power Supply Modules

Power supply modules are available for all OCM models in either 120 VAC or 220 VAC configurations. Each module has a front panel power switch, a green LED power indicator and a red LED fail indicator.

The modules are installed from the front of the OCM shelf or enclosure and all connections are internal. Power supplies can be inserted or removed from an OCM shelf without disruption, if sufficient power is available.

One or two power supplies may be installed in an OCM shelf (OCM-1200, 2200, 1500, 2500). Two power supplies may be configured either for redundancy, or to provide additional power capacity. AC power is delivered to the module via the OCM power cable.

GPS-11

The GPS-11 module is a 96 watt, 120 VAC power supply for the OCM shelf. The GPS-11 supplies up to 16 Amps at +5 VDC, and up to 1.67 Amps for ± 12 VDC.

GPS-11E

The GPS-11E module is a 96 watt, 220/240 VAC power supply for the OCM shelf. The GPS-11E supplies up to 16 Amps at +5volts, and up to 1.67 Amps for ±12 volts.

DPS-19

The DPS-19 is the -48 VDC input voltage version of the GPS-11. It has the same outstanding features and reliability found in its AC counterpart. It is particularly adaptive to telephone company central office environments.

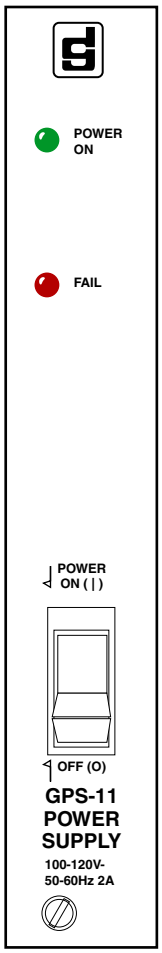


Table 4-13 — GPS-11 Power Supply Module Specifications

	GPS-11	GPS-11E
Number per OCM shelf:	1 or 2	1 or 2
Input Power:	90 - 129VAC (100 - 120VAC nom.) 50/60 Hz	175 - 264VAC (220 - 240 V 50/60 Hz
Output Power:	+5V, 16 Amps ±12V: 1.6	+5V, 16 Amps ±12V: 1.67 Amps

5. OCM 1000 APPLICATIONS

Private Networks

Public Network Access

Hybrid Network Access

Multipoint Networking Narrowband

Voice Applications

The OCM 1000 supports a comprehensive range of applications, including LAN inter-networking, video conferencing and imaging, as well as traditional voice and data applica-tions.

These applications can be consolidated and transported across a single communications path between OCM 1000s.

Private Networks

In a private network, an access device allows user traffic to enter the public network. However, private networks are usually con-structed using public network facilities (e.g., 56/64 Kbps private lines, T1, E1, ISDN, etc.).

Private network access devices must therefore meet certain public network standards for both transmission media and data format.

For private networking applications, the OCM supports T1/E1 network trunk standards, and also supports leading narrowband standards such as V.11, V.35, RS-422 and RS-232.

The OCM 1000 can be configured as a mul-tiple aggregate network multiplexer for small private networks. It may be configured to access this private network over public or private transmission facilities, via either nar-rowband or wideband circuits. In a private network, up to two remote OCM 1000s are supported.

Public Network Access

In a public network, a multiplexer is used to provide T1/E1 bandwidth provisioning ser-vice, as we see in Figure 5-2. A standard data channel bank, for example, can deliver 24 (T1) or 31 (E1) 56/64 Kbps channels that are cross-connected at a carrier's central office. A channel from one T1/E1 interface may be cross-connected to another wideband interface, or provisioned as a narrowband circuit terminating on a CSU or DSU. Channels can also be cross-connected to the carrier's frame relay service.

For the simple transport of N x 64 Kbps traffic without network management, these devices are highly efficient and stable, and are widely deployed by carriers and end users alike.

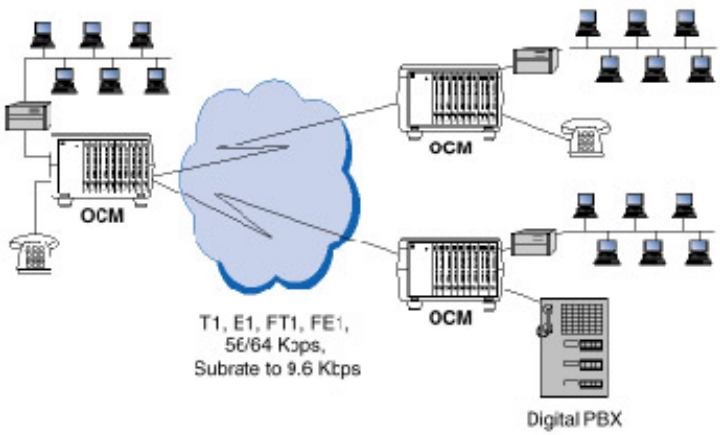


Figure 5-1 — OCM 1000 Private Network with 2 Physical Afggregates

*DACS "grooming" is a widely available service in North America, and increasingly in the rest of the world. Check with your GDC representative to determine if T1/E1 public networking service (DACS "grooming" is available in your area.

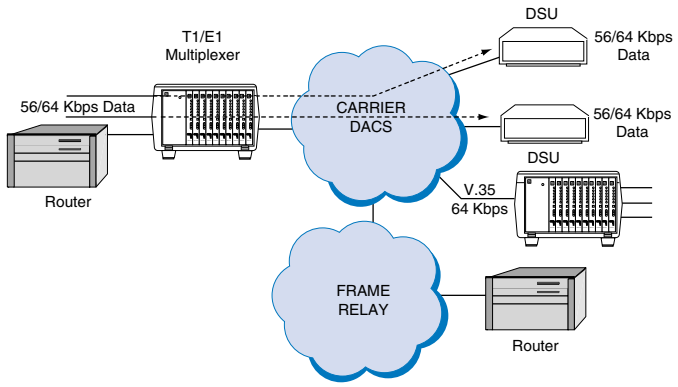


Figure 5-2 — OCM as a Traditional T1 Access Device

devices are highly efficient and stable, and are widely deployed by carriers and end users alike.

Purely public networks, however, suffer from a lack of value-added service, such as voice or data compression, subrate circuit rerouting, and efficient subrate multiplexing. Furthermore, devices which access public services typically cannot be well managed from a central site.

In addition, traditional public networking devices such as standard channel bank-type multiplexers typically transport channel data traffic in a highly inefficient form. These devices make exclusive use of SRDM or X.50 subrate data multiplexing, which wastes up to 25% of the available bandwidth. In addition, these devices may employ "DSOA" rate adaptation, requiring 64 Kbps to transport a single 9.6 Kbps channel with 85% of the available bandwidth wasted.

While the OCM 1000 supports traditional N x 56/64 Kbps T/E1 multiplexing, its ability to combine this enhanced feature enables users to deploy cost effective hybrid networks, as shown in Figure 5-3.

Hybrid Network Access

Hybrid networks ensure economy and flexibility by providing the advantages of both public and private networking.

A hybrid network consists of a T1/E1 interface that carries channels destined for termination within both a private network and a public network. Examples of public network termination include access to public frame relay services and generic digital data service (i.e., 56/64 Kbps DDS-type service, fractional T1/E1 service) and the Public Switched Telephone Network (PSTN). In a hybrid network, the private networking component may be very small or very large. In typical applications, some nodes are primarily served through the public networking component of the network, while others are primarily served through a private component. Traffic flow in a hybrid network is no longer exclusively from a branch to a central concentration point. Rather, the connectivity map is determined by the carrier's DACS. The hybrid arrangement provides enhanced services such as voice compression, data compression, High Efficiency Multiplexing (HEM) for collections of subrate/superate channels, and enhanced network management capabilities.

The hybrid arrangement results in obvious cost savings, since a single T1/E1 access line to the carrier can now carry virtually all data and voice traffic.

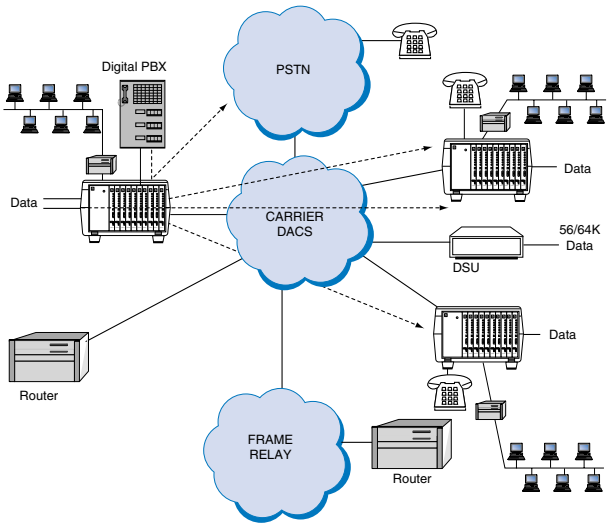


Figure 5-3 — Hybrid Network Access

Midpoint Networking Narrowband

The OCM 1000 interoperates with one or two remote OCM 1000s over low cost digital or analog circuits. Digital network connectivity is via standard V.11/RS-422, V.24/RS-232, V.35 or T1/E1 interfaces. The OCM 1000 also supports an integral V.34 modem for connection over dedicated analog facilities.

Each OCM 1000 supports a full complement of compressed voice, data, and LAN, with traffic flowing between the remote locations and the central site.

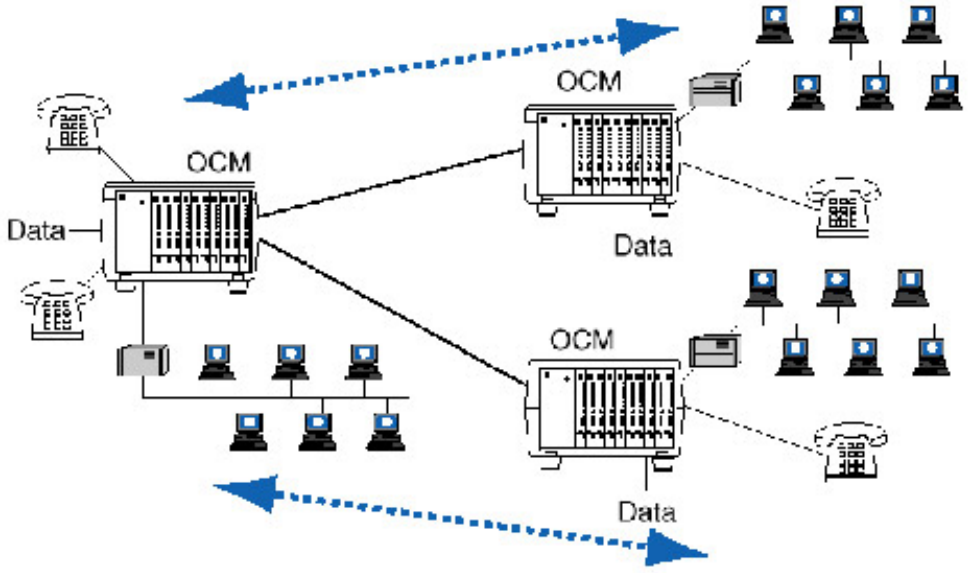


Figure 5-4 — OCM 1000 Narrowband Application

Voice Applications

The OCM supports voice through ADPCM or CELP implementations. The OCM will support both 2W and 4W voice, as well as a variety of signaling techniques. With the OCM, there s no requirement for external voice signaling and terminating equipment.

GDC's voice compression techniques provide acceptable voice quality using as little as 4.8 Kbps of bandwidth, and near toll-quality using only 8.0 Kbps. In addition, automatic full rate Group III fax bypass insures that the voice channels can be used for both voice and fax transmission without manual intervention or reconfiguration.

The OCM also supports ADPCM voice compression at 32, 24 and 16 Kbps. OCM 1000 voice compression modules support automatic hybrid balancing to minimize impedance mismatches and reduce the source of voice echoes. OCM voice compression modules also support integral echo cancellation and suppression to eliminate echoes, should they occur.

OCM 1000 provides a drop-and-insert capability that allows a number of 56/64 K channels to bypass the node, while other channels (4W E&M) terminate at the node.

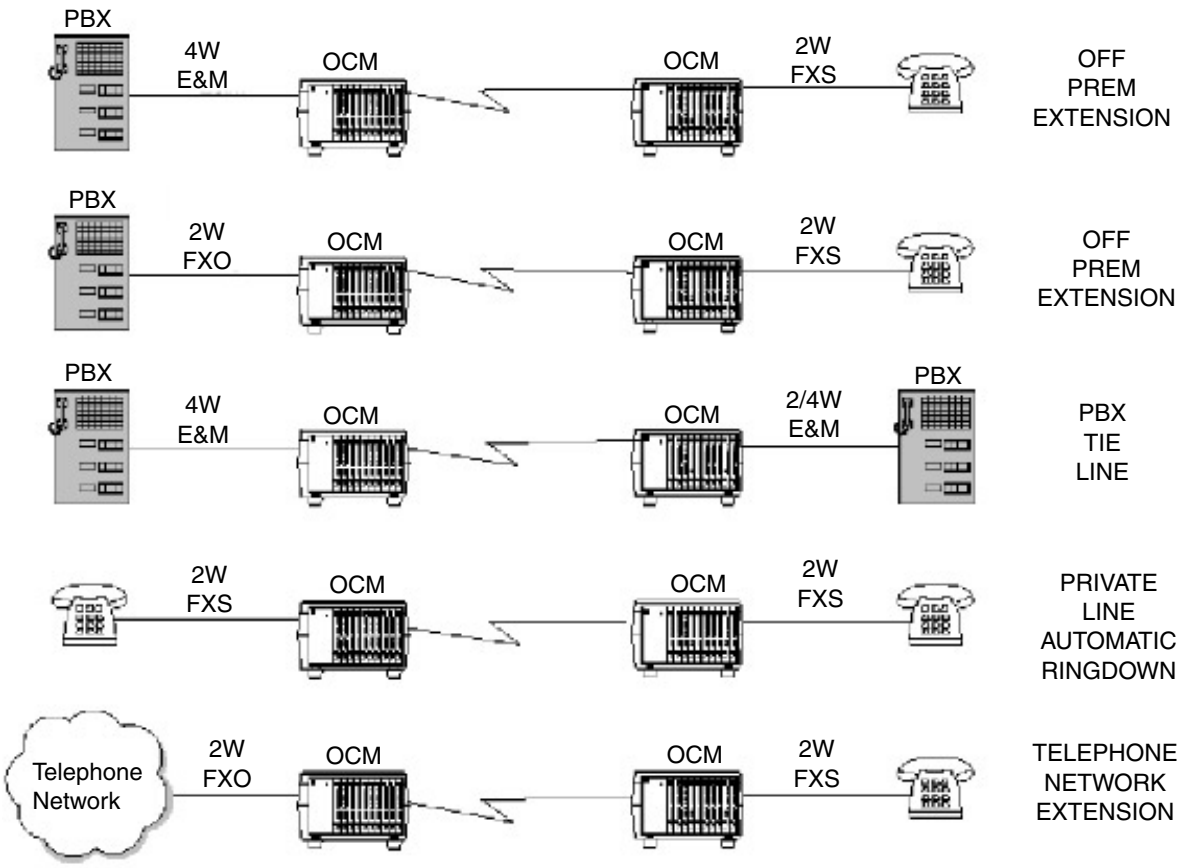


Figure 5-5 — OCM 1000 Voice Applications

6. Network Management

OCM Management System

OCM Management System

The OCM 1000 is managed by GDC's OCM Management System (OMS), which runs on a standard IBM-compatible PC. OMS provides intuitive configuration, alarm reporting, diagnostics, and full management of up to 93 OCM 1000s.

The popular Windows graphical user interface provides simple, pop-up windows and mouse or keyboard commands, making OMS user-friendly, while providing comprehensive functionality.

In-band Management

The OCM performs all management functions in-band, eliminating the need for external communication paths or dial-up modems. All functions, including performance measurements and alarm reporting, are transported between OCM 1000s using a small, user-configurable overhead channel. This in-band management path is transparent to the user.

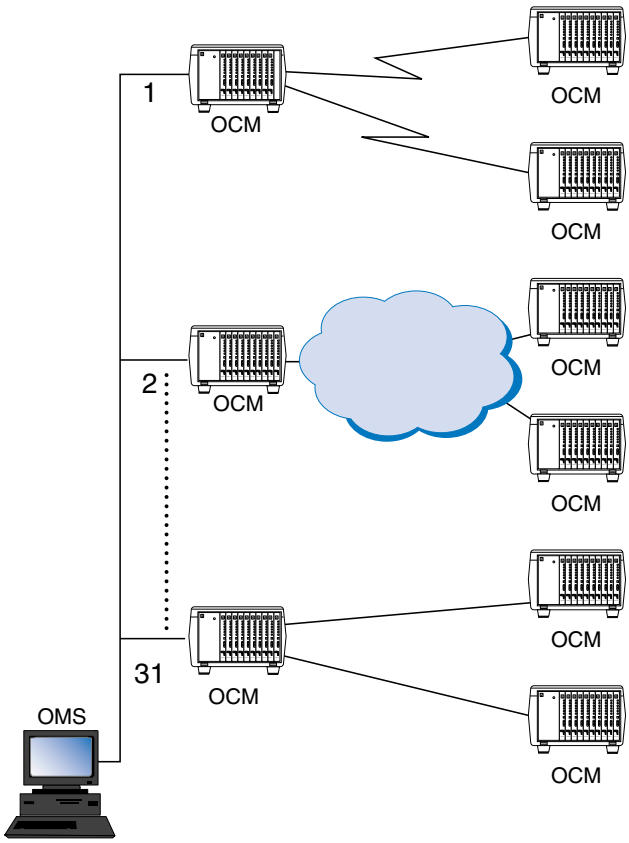


Figure 6-1 — OCM Management

Multiple Networks

OMS supports multiple OCM 1000 networks. A single OMS PC can manage up to 31 local OCM 1000s and 62 remote OCM 1000s. OMS integrates the management of these OCM 1000s and presents a unified view of network performance (Figure 6-1).

Alarm Scanning

Alarms are automatically and quickly discovered by OMS and displayed in an easy to understand format. OMS scans for alarms in both local and remote OCM 1000s.

Configuration

All operation parameters, network configuration data, channel types, channel routing data, and alarm thresholds are entered using OMS. The configuration parameters for all OCM 1000s in the network are automatically stored on the PC's hard drive by OMS, and backup copies of the configuration can be saved on floppy disk.

Network Download

OMS eliminates the difficulties that are present when using a craft port or a terminal interface for configuration. In addition to a simplified user interface, OMS prevents the loss of known network configuration. This is especially important when unauthorized or unintentional parameter changes are made that affect network operation. OMS provides the ability to restore the network to a previously saved state by downloading the stored configuration to all OCM 1000s in the network.

The OMS application and the OCM 1000 system configuration are completely software

downloadable. The actual OCM 1000 software can be downloaded to all units, not just the operation parameters. This important feature eliminates the need to dispatch technicians to remote locations to perform upgrades as new OCM 1000 software becomes available.

Status

In addition to alarms reporting and configuration management, OMS provides extensive support for status monitoring. OMS queries each OCM 1000 and displays the hardware modules present in each OCM 1000, as well as each module's revision level. In addition, the OMS provides details concerning hardware straps, which may be present. OCM 1000 software file revisions are also reported, which enables the user to resolve conflicts with earlier versions of the software.

Diagnostics

Comprehensive network diagnostics may be engaged by OMS to rapidly isolate network or equipment faults. OMS commands the OCM 1000 to perform diagnostics and displays the results in pop-up windows.

In addition to supporting common local and remote loopback functions on all channel cards, OMS can command the data channels to launch a variety of Bit Error Rate Tests (BERTs) by placing a remote channel in loopback and generating a 2047, 511 and other data patterns. The results of a channel BERT are displayed by OMS. Voice channels, such as the DPV module, can be commanded to perform remote loopback while a local module launches a test tone and OMS displays receive audio levels measured in decibels.

At the network interface level, OMS commands local and remote loopback and internal diagnostics for all LIMs.

Table 6-1 — Minimum Requirements to Run OMS 2.1.2

Hardware:	IBM Computer or compatible 486/ 25 MHz CPU-based computer , VGA color monitor One 3.5-inch high density disk drive Hard disk with 4M free space 16M RAM Battery-backed clock One serial Com port
Software:	DOS Verion 5.0 or Windows Version 3.01/3.1

7. TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

Aggregate Capacity: Two aggregates, each up to 2.048 Mbps

Aggregate Rates: Rates from 9.6 Kbps to 2.048 Mbps, including N x 64 Kbps rates

Aggregate Interfaces: T1/D4/ESF, CCITT G.703, G.704, V.22, V.35, V.28, EIA-232-D

Line Interfaces:	Application	No. of Ports	Rates Supported	Interfaces
T1 CSU	T1/D4/ESF with Integral CSU	1	1.544 Mbps	D4/ESF - 8 Pin Modular
T1	T1/D4/ESF	1	1.544 Mbps	D4/ESF - 8 Pin Modular
E1	G.703/G.704	1	2.048 Mbps	G.703/G.704 - 8 Pin Modular
V.11	N x 56/64 Kbps Digital Service	1	N x 56/64Kbps to 1.984 Mbps	CCITT V.11/X.21
V.35	N x 56/64Kbps Digital Service	1	N x 56/64Kbps to 1.984 Mbps	CCITT V.35
Subrate	Analog Services	1	9.6, 14.4, 19.2, 24, and 28.8 Kbps	EIA 232D/V.28

Channel Capacity*:

Shelf: Up to 30 slots available (in the two shelf configuration) to support as many as 60 channels

Channel Cards:	Application	No. of Chls	Rates Supported	Interfaces
Dual Data Card	Low Speed Sync/Async	2	300 bps to 38.4 Kbps	EIA 232 V.24
High Speed Data Card	High Speed Data Sync/Async/Isoc	1	300 bps to 1.984 Mbps	EIA 232, 422, 423 and V.35
ADPCM Voice	High Quality Analog Voice	1	16, 24, 32 , and 64 Kbps	2/4 Wire E&M, FXS, FXO
CELP WITH FAX	Voice and Group 3 Fax	1	9.6, 6.4 and 4.8 Kbps	2/4 wire E&M, FXS, FXO

** Channel capacity varies based on specific configurations*

Physical Dimensions: 16-slot Shelf

Height:	178 mm (7.0 in)
Width:	483 mm (19.0 in)
Depth:	305 mm (12.0 in)
Weight:	46 kg (21 lbs)
Shipping Weight::	55 kg (25 lbs)

Power:

16-slot Shelf: Each shelf accepts one or two 96-watt power supplies; 100/117 VAC, 220 VAC, 240 VAC, or -48 VDC

Power Supplies:	**GPS-11 (N.A.), GPS-11E (Int'l)**	**DPS-19**
Input:	90 to 256 VAC; 47/63 Hz	-42 to 70 VDC -42 to -56 VDC, 3A DC max, input current
Output:	+5 VDC @ 16 amps +/-12 VDC @ 1.67 amps	+5 VDC @ 16 amps +/-12 VDC @ 3.33 amps
Output Power:	96 Watts	96 Watts (max)
Efficiency:	75%	75%
Operating Temp:	0 to 50 deg. C (32 to 122 deg. C)	0 to 50 deg. C (32 to 122 deg. C)
Storage Temp:	-40 to 85 deg. C (-40 to 185 deg. C)	-40 to 85 deg. C (-40 to 185 deg. C)
Weight:	.681 Kg (1.5 lbs)	.681 Kg (1.5 lbs)
Dimensions:		
Height:	177.8 m (7 in)	177.8 m (7 in)
Width:	28.57 mm (1.12 in)	28.57 mm (1.12 in)
Depth:	247.64 m (9.75 in)	247.64 m (9.75 in)
EMI:	EN55022, Class A FCC Part 15, Class A	EN55022, Class A FCC Part 15, Class A
Safety:	UL 1459; CSA C22.2 #225; EN60950	UL 1459; CSA C22.2 #225; EN60950
Cooling:	Convection Cooled	Convection Cooled
Input Connections:	3 Prong IEC Type	Terminal Block (12 AWG Max)

Humidity: Up to 95% without condensation

Altitude: Up to 3000 meters (12,000 ft.)