



ComCONTROLLER Products

High-Performance Headend Switches

- **ComCONTROLLER 2000**
- **ComCONTROLLER 2100
Main Chassis**
- **ComCONTROLLER 2100
Expansion Chassis**

Product Guide



Features and Benefits of the ComCONTROLLER Family

Features

Benefits

Robust, High-Speed Architecture

The ComCONTROLLER provides 30Mbps downstream and up to twelve 2.56Mbps receive channels on the upstream, providing an aggregate of 30Mbps of upstream capacity.

Allows cable operators to meet the bandwidth demands of their subscribers and provides room for future upstream growth.

Modular, Expandable Design

Each ComCONTROLLER in the family has slots for hot-plug-gable RF, I/O, and WAN modules; and all of the modules are interchangeable in either of the ComCONTROLLER Main chassis. The Expansion Chassis provides an additional 8 slots for RF receive modules.

Modular design allows cable operators to expand system capabilities to meet growing customer bandwidth demands. As network needs change, it's easy to add one or more WAN modules. As demand for upstream bandwidth increases, more Receive modules can be added—or plants can incorporate the Expansion Chassis for even greater upstream bandwidth.

Multiple Service Levels

Com21's architecture provides up to 16 levels of service that can be configured by the cable operator, each with specified upstream and downstream data rates. Each level or tier can be implemented on a constant-bit-rate (for guaranteed delivery) or variable-bit-rate (best-effort) basis.

With the ComCONTROLLER's unique bandwidth tiering capability, cable operators can offer users the quality of service they demand—and bill accordingly. This feature allows operators to increase revenue-per-subscriber, thereby boosting their total revenues.

Superior RF Performance

The system delivers superior modulation with integrated RF up/down-conversion and high-performance, Com21-designed, state-of-the-art tuners. The downstream channel employs a leading-edge transmitter and the upstream utilizes a robust, burst demodulator. Both downstream and upstream provide Forward Error Correction.

Allows the Com21 system to offer best-in-class RF robustness by minimizing spurious noise and interference which maximizes performance. The robust RF design also provides superior immunity to plant impairments such as micro-reflections and allows operation in the "roll-off" spectrum. Data channels do not require guardbands, which preserves precious channel bandwidth.

Secure, Virtual Private Networks

Virtual Private Network building blocks include 40/56-bit DES encryption with Diffie-Hellman public key management, multiple Virtual LANs, and support for optional IP Sec technology.

Provides a secure, robust method of providing multiple public or private networks from a single ComCONTROLLER. Using DES encryption, the VLAN capability allows cable operators to meet the security requirements of higher-margin SOHO and telecommute customers. DES encryption with key management provides data security and integrity across the cable plant.

Wide Area Network (WAN) Support

Supports a wide variety of WAN modules including 10Base-T, 10/100Base-T, and ATM OC-3.

Enables cable operators to build high-speed network connections with commonly available, standard technology. Both packet- or cell-based technologies are supported, allowing extension of leading-edge network services. And by using the ATM OC-3 module, VLANs and QoS can be extended across the WAN.

Upstream Frequency Agility

ComPORT cable modem and Receive channel upstream frequency agility allows cable modems to be automatically moved or hopped from the primary channel to an alternative.

If the system detects noise or excessive loading, it dynamically shifts frequencies in order to locate a clear channel. Avoiding noise on the cable plant minimizes outages and improves overall system reliability.

Multi-protocol support

The versatile ComCONTROLLER chassis provides industry-leading support for protocols such as IP, IPX, AppleTalk, and NetBEUI, with configurable filters to ensure network security.

Supports multiple legacy protocols without sacrificing network security. No additional equipment is required to support different protocols.

ComCONTROLLER Products

High Performance Cable Modem Communications Controllers

The ComCONTROLLER family is an integral component of Com21's ComUNITY Access® system. The ComUNITY Access system provides leading-edge RF solutions for voice, video, and data networking communications over HFC and coaxial cable plants. In addition to being secure and scalable, the system is easy to operate and maintain, thus resulting in lower overall cost of ownership. It provides high-speed performance and end-to-end connectivity from subscribers' computers to the network backbone. The ComUNITY Access system also supports advanced capabilities including up to 16 levels of service which enable profitable multi-tier pricing with guaranteed capacity for power users.

Each ComCONTROLLER headend switch is configured as a multi-slot, rack-mountable chassis that performs all transmit, receive, I/O, and control functions using hot-pluggable modules. The ComCONTROLLER family provides support for up to 2,000 ComPORT® cable modems, one 30Mbps (6MHz) downstream Transmit module, and up to twelve 2.56Mbps (1.8MHz) upstream Receive modules. The upstream modules can be added on an incremental, hot-insertion basis, thus enabling cable operators to respond rapidly and easily to subscriber growth. Various Wide Area Network (WAN) interfaces are available including 10Base-T, 10/100Base-T and ATM OC-3 allowing the system to be easily connected to network backbones. The WAN modules also support Virtual Local Area Networks (VLANs), a feature unique to Com21.

SCALABLE FOR FUTURE GROWTH

The ComCONTROLLER family consists of three chassis models utilizing a modular and scalable design. This gives cable operators flexible configuration options to accommodate a wide array of network architectures and growth in cable modem subscribers. Plants can implement the perfect configuration for today's needs with ample expansion capacity for tomorrow.

The cost-effective ComCONTROLLER 2000 provides a six-slot chassis and is ideally suited for small networks or telephone-return deployments. For larger deployments, the ComCONTROLLER 2100 Main Chassis offers additional slots, along with a migration path to the Expansion Chassis. The high-end ComCONTROLLER 2100

Expansion Chassis allows support for the maximum number of Receive channels to support an aggregate upstream capacity of 30Mbps.

This modular approach means the system can be deployed on a limited budget, then upgraded and scaled as subscriber penetration increases. Ongoing cost of ownership remains low due to use of an extremely robust RF system, cost-effective noise management solutions, and the versatile NMAPS Network Management System which offers remote diagnostics, remote provisioning, and remote cable modem software upgrades.

A COMPLETE SOLUTION

Each ComCONTROLLER chassis performs all transmit, receive, and control functions and supports a variety of different wide area network interfaces. Frequency agility allows upstream channels to frequency hop in the event that noise exceeds operator-defined thresholds. The ComCONTROLLER's Quality of Service (QoS) feature allows the cable operator to set up multiple classes of service with guarantee-type minimum/maximum data rates and traffic prioritization. This enables the cable operator to tailor services and pricing to different end-user demands, thereby capturing additional subscriber revenues.

Each service class can be specified by guarantee-type and minimum/maximum bandwidth levels:

- Constant bit rate (CBR)
- Best-effort variable bit rate (VBR)

For modems assigned CBR guarantees, the minimum bandwidth figure is always available to the modem. In contrast, for modems with VBR or best-effort guarantees, bandwidth levels are dynamically allocated in proportion to the maximum bandwidth figure.

Each chassis contains a high-speed backplane that allows removal and insertion of modules. With a wide array of modules available, the chassis can be configured to support a flexible range of applications within the same high-speed architecture, all with access to features such as QoS, secure virtual private networks (VPN), and multi-protocol support. A variety of interfaces are also available for WAN connectivity, giving the cable operator greater flexibility in providing network backbone connections.

DATA SECURITY

Security features are composed of VPN building blocks, including 40/56-bit DES encryption, Diffie-Hellman public key exchange, and VLANs. This enables secure upstream and downstream data communications between the ComCONTROLLER and associated ComPORT cable modems.

Com21's unique VLAN feature allows the cable operator to easily build multiple private networks by grouping similar users into various VLANs. Each VLAN's traffic is directed to a dedicated port on the ComCONTROLLER, allowing for easy connection to public or private networks. Although users share the same downstream channel, the VLAN feature provides secure peer-to-peer communications and prevents co-mingling of traffic between users in different VLANs, thus protecting sensitive corporate data.

AN INTEGRATED SYSTEM

Each ComCONTROLLER chassis serves as the central control element within the Com21 ComUNITY Access system. The Common Controller module of both the ComCONTROLLER 2000 and 2100 manages the chassis as well as all modules, and monitors all of the hardware and software for the unit and system. The Transmit Main module and Transmit RF module are responsible for modulation and encryption of downstream traffic as well as up-conversion. Additional slots are available for combinations of upstream Receive modules and various WAN interfaces.

Each chassis manages all of the ComPORT cable modems and performs the following functions:

- Management of overall system bandwidth allocation and utilization
- Performance monitoring of all ComPORT cable modems
- Automatic load balancing and frequency hopping of the ComPORT cable modems across defined upstream channels
- Encryption of all upstream and downstream unicast and multicast traffic using encryption keys
- Management of all RF frequency and power parameters with automatic adjustment to compensate for variance in the cable network
- Monitoring of alarms
- Modulation of the baseband signal to RF frequencies
- Maintenance of proper power levels to all cable modems
- Conversion of the IF signal to RF
- Tuning and filtering of the RF frequency

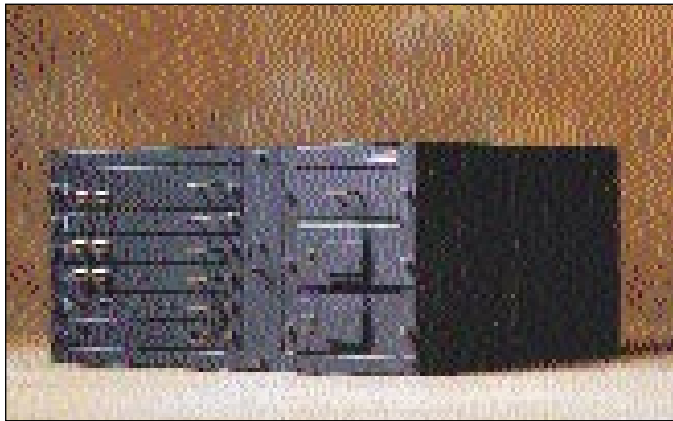
MODULARITY and EXPANSION

The ComCONTROLLER supports expansion when network demands grow or change. Upstream channels can be incrementally added to provide additional bandwidth, and WAN interfaces can be added to either increase the number of VLAN ports or to change the type of WAN interface. All ComCONTROLLER modules are front-mounted for easy access and rapid installation.

Each chassis of the ComCONTROLLER family is powered by redundant power supplies that are available in either AC (110V/220V) or DC (-48V) options. Either of these power supplies can support a fully loaded system. The power supplies share the power load, and either power supply can be removed while the system is operating, without affecting the operation of the ComCONTROLLER. The AC power supply automatically senses and adjusts for voltages from 100 to 220 VAC, while the DC power supply has a -48V input for connection to typical central office types of environments.

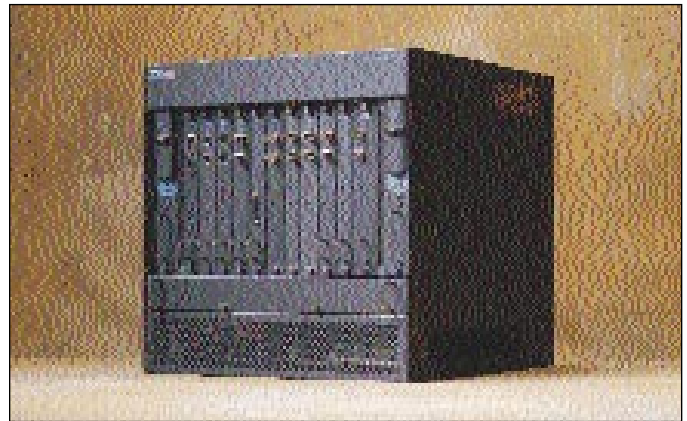
Chassis

ComCONTROLLER 2000 Chassis

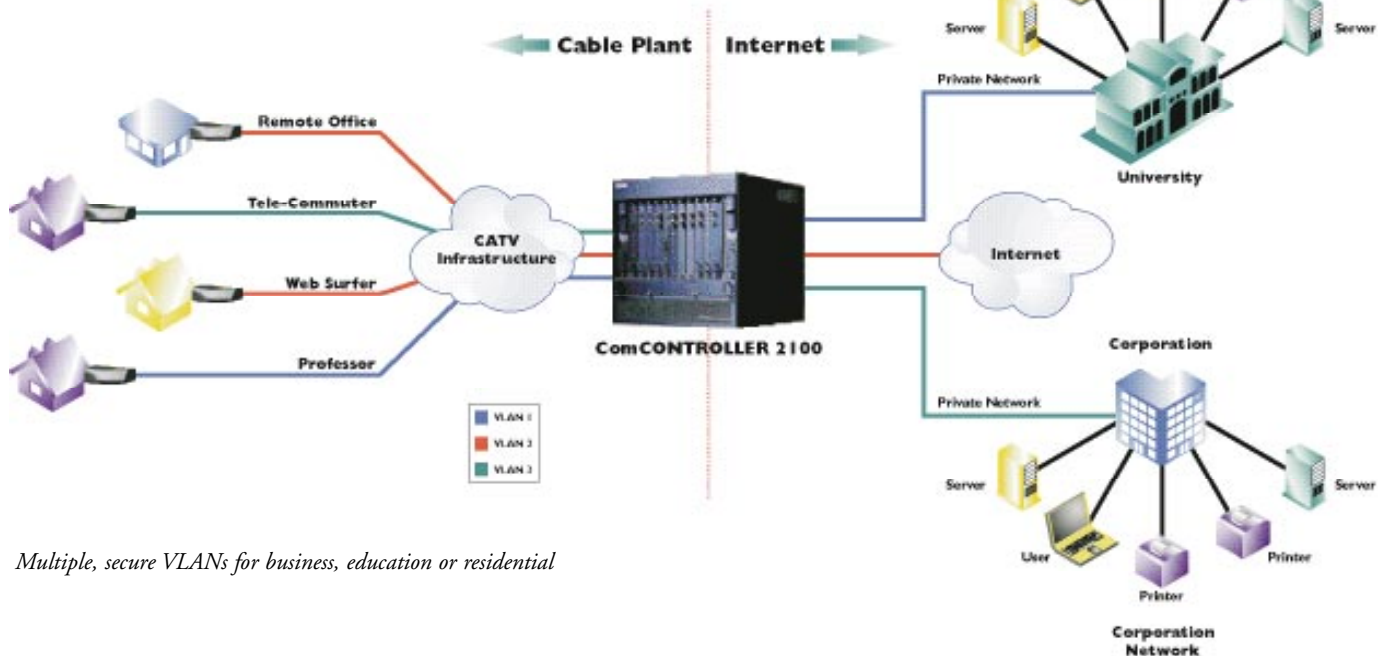


The entry-level ComCONTROLLER 2000 six-slot chassis is functionally identical to the ComCONTROLLER 2100 Main chassis but is smaller in size with fewer slots. It is a cost-effective choice for small cable systems, hotels, schools, or one-way cable plants. This chassis is also useful for limiting initial deployment costs for cable operators with gradual or rolling deployment plans. It supports up to 2,000 ComPORT cable modems and provides 30 Mbps in a single 6 MHz downstream channel. Up to two 2.56 Mbps upstream Receive modules are supported, each operating in 1.8 MHz wide channels. Required are the Common Controller, Transmit Main, Transmit RF modules, and dual redundant power supplies. The remaining three slots can be used for various combinations of WAN and Receive modules.

ComCONTROLLER 2100 Main Chassis



The ComCONTROLLER 2100 Main Chassis is an eleven-slot chassis that provides 30 Mbps in a single 6 MHz downstream channel for up to 2,000 ComPORT cable modems. It serves the needs of medium-sized cable plants that anticipate growth but don't require the maximum configuration now. This chassis can provide up to seven 2.56 Mbps, 1.8 MHz Receive modules for an aggregate upstream throughput of 17.92 Mbps. Required are the Common Controller, Transmit Main, and Transmit RF modules and dual redundant power supplies. The remaining seven slots can be used for various combinations of WAN and Receive modules.



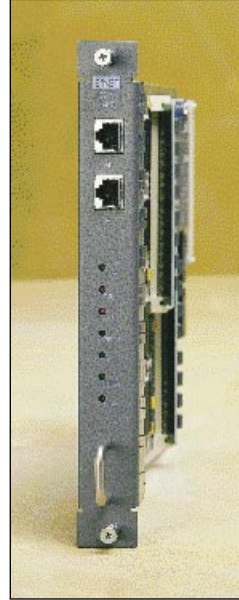
Multiple, secure VLANs for business, education or residential

Network Backbone Connectivity

WAN Modules

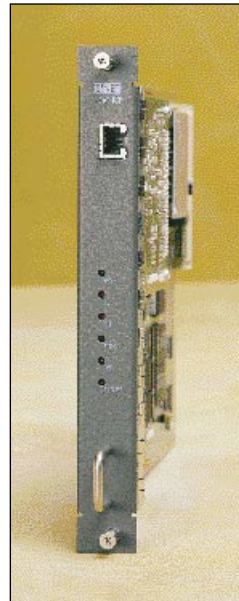
The following WAN modules may be configured into any of the three ComCONTROLLER chassis models.

10Base-T



The dual-port 10Base-T module provides two RJ45 10Base-T interfaces for connection to routers, switches, or servers. This module not only allows cable operators to connect to commonly available 10Base-T WAN ports but also enables them to offer private VLAN/WAN extension services to attract high-margin business customers. The ComCONTROLLER 2000 Chassis supports two modules for up to four VLAN ports, and the ComCONTROLLER 2100 Main Chassis supports five modules for up to ten VLAN ports. The 10Base-T module is hot-pluggable and occupies a single slot in either the ComCONTROLLER 2000 or 2100 Main Chassis.

10/100Base-T

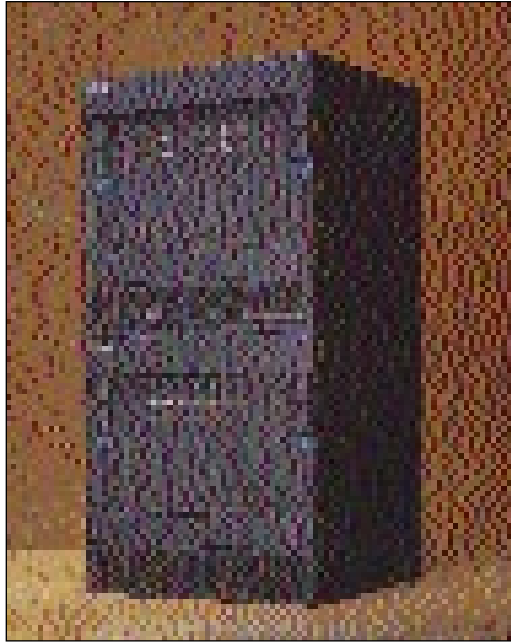


The 10/100Base-T module provides one auto-sensing RJ45 interface for connection to either a 10Base-T or 100Base-T port on routers, switches, or servers. The module is hot-pluggable and occupies a single slot in either the ComCONTROLLER 2000 or 2100 Main Chassis. Up to four 10/100Base-T modules are supported in the ComCONTROLLER 2100 Main Chassis for up to four VLAN ports and up to two in the ComCONTROLLER 2000 chassis.

The module also supports firewall-like Ethernet and IP-layer packet filters including Address Resolution Protocol (ARP) authentication, IP source/destination address filtering, and Dynamic

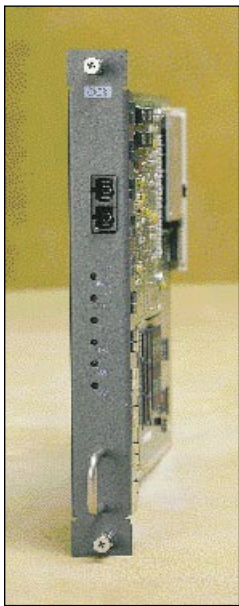
Host Configuration Protocol (DHCP) request/reply filtering. These capabilities increase network security and make the overall architecture of the system more robust and resilient to attack or unintentional misconfiguration.

ComCONTROLLER 2100 Expansion Chassis



For large network needs, the ComCONTROLLER 2100 Expansion Chassis provides additional expansion slots, giving cable operators the option of adding more Receive modules for additional upstream bandwidth and/or Receive redundancy capability. This nine-slot Expansion Chassis connects to the ComCONTROLLER 2100 Main Chassis and supports up to 8 Receive modules. When fully configured, the combined Main and Expansion Chassis support twelve 2.56 Mbps receive channels for an aggregate upstream of 30 Mbps, providing the cable operator a symmetrical headend solution to more fully utilize leased wide area bandwidth. The ComCONTROLLER 2100 Expansion Chassis is connected to the ComCONTROLLER Main Chassis via front cabling of the Main Interconnect Module to the Expansion Interconnect Module and by rear cabling between the two chassis. Required are the Expansion Interconnect Module and dual redundant power supplies.

ATM OC-3



The ComCONTROLLER ATM OC-3 module provides a single multi-mode fiber port for connection to ATM OC-3 (155 Mbps) networks. The module supports up to 4000 separate ATM virtual circuits and up to 16 can be used to build private VLAN/WAN extension services. The hot-pluggable module occupies a single slot in either the ComCONTROLLER 2000 or 2100 Main Chassis, and up to two modules are supported for up to 32 VLANs per chassis. The ATM virtual circuits transport Ethernet packets using RFC 1483 encapsulation and also support raw ATM connections to the WAN for both CBR and VBR data or voice traffic.

The module also supports firewall-like Ethernet and IP-layer packet filters including Address Resolution Protocol (ARP) authentication, IP source/destination address filtering, and Dynamic Host Configuration Protocol (DHCP) request/reply filtering. These capabilities increase network security and make the overall architecture of the system more robust and resilient to attack or unintentional misconfiguration.

Controller Module

Common Controller (CC) Module

As the central element in the ComCONTROLLER headend switch, the CC module controls all of the ComCONTROLLER's hardware and software and manages all ComPORTs connected to the ComCONTROLLER. This module provides one 10Base-T Ethernet and one RS232 Craft User Interface (CUI). The 10Base-T Ethernet interface allows the module to be connected to the NMAPS Network Management System via a private network, while the CUI will typically be connected to a standard terminal. The CC module is hot-pluggable and occupies a single slot in the ComCONTROLLER 2000 or 2100 Main chassis.

RF Modules

Transmit Main (TxMain) Module

The TxMain module is required in every ComCONTROLLER 2000 or 2100 Main Chassis and performs cell processing, alarm monitoring, and DES data encryption. Both 40-bit and 56-bit DES versions of this module are available. The module provides LEDs for at-a-glance status and occupies one slot. High-speed digital data is processed and encrypted before being sent to the Transmit RF module which transmits the data across the CATV network.

Transmit RF (TxRF) Module

The TxRF module performs downstream 64QAM RF transmission, occupies one slot, and is required in every ComCONTROLLER 2000 or 2100 Main Chassis. The module provides two female F connectors: one connects to the CATV network while the other provides a RF test point for cable operator maintenance purposes.

Receive (RxM) Module

The hot-pluggable RxM module occupies a single slot in the ComCONTROLLER 2000, 2100 Main Chassis, or 2100 Expansion Chassis. The module performs QPSK RF processing, demodulation, and DES encryption. Both 40-bit and 56-bit DES versions of this module are available. The RxM module provides two female F connectors: one allows the module to be connected to the CATV network or the output of the Return Path Multiplexer (RPM). The other connector provides a RF test point for cable operator maintenance purposes. This module also provides power, scheduling, and switching signals to the RPM via a 15-pin digital connector.

The ComCONTROLLER 2000 supports up to two Receive modules, the ComCONTROLLER 2100 Main Chassis supports up to seven, and the combination ComCONTROLLER 2100 Main and Expansion chassis supports up to twelve Receive modules.

Expansion Modules

Main Interconnect Module (MIM)

This module resides in the ComCONTROLLER 2100 Main Chassis and provides backplane connectivity to the ComCONTROLLER 2100 Expansion Chassis. The MIM has one connector for linking the EIM via the interconnect cable.

Expansion Interconnect Module (EIM)

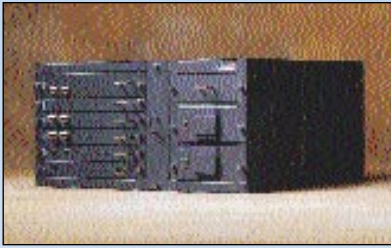
The Expansion Interconnect Module resides in the ComCONTROLLER 2100 Expansion Chassis and is connected via the interconnect cable to the Main Interconnect Module which is housed in the ComCONTROLLER 2100 Main Chassis.

ComCONTROLLER Management

The ComCONTROLLER family is managed by Com21's Network Management and Provisioning System (NMAPS) software. The NMAPS system manages subscriber provisioning, RF performance, quality of service (QoS) provisioning, fault isolation, equipment and network configuration, event and alarm management, and field inventory for the ComUNITY Access system. Its powerful features allow cable operators to remotely manage, maintain and upgrade cable modems in the field while minimizing truck rolls. features easy-to-use screens for managing and provisioning bandwidth and multiple service-level allocations. The NMAPS Remote feature allows operators to manage the system from anywhere in the world with a standard web browser.

THE KEY TO SUCCESS

Com21 has focused its technology to meet the cable industry's needs, both today and in the future. The resulting product solution is Com21's ComUNITY Access system and the ComCONTROLLER product family functions as the cornerstone of that system. The ComCONTROLLER product line is designed to deliver outstanding performance. It withstands the rigorous demands of today's cable networks before, during, and after upgrade to fully interactive HFC networks. As part of a comprehensive Com21 solution, it helps cable operators maximize today's data-over-cable revenues while preparing to capture tomorrow's new market opportunities in voice-, video-, and data-over-cable.



COMCONTROLLER 2000

Required Modules	Number
CC	1
Tx Main	1
Tx RF	1
Power Supplies	2

Configurations

Modules	Number
WAN	1-2
Receive	0-2
Available Slots	3



COMCONTROLLER 2100 Main

Required Modules	Number
CC	1
Tx Main	1
Tx RF	1
Power Supplies	2

Configurations

Modules	Number
WAN	1-5
Receive	0-7
Available Slots	8



ComCONTROLLER 2100 Main & Expansion

Required Modules	Number
CC	1
Tx Main	1
Tx RF	1
Power Supplies	4

Configurations

Modules	Number
WAN	1-5
Receive	0-12
Available Slots	15

NOTE: Not every possible combination or mixture of WAN modules is supported. Please consult your Com21 representative for validation of your desired configuration.

ComCONTROLLER Family Specifications

RF Specifications

	Downstream	Upstream
Operating Frequency Range	88-800 MHz	5-40 MHz
Resolution	200 kHz steps	50 kHz steps
Channel Bandwidth	6 MHz	1.8 MHz
Input Impedance	75 ohms Nominal	75 ohms Nominal
Spurious Emission	minimum -60 dBc	
Signal Level	TX: +45 to +60 dBmV	RX: -15 dBmV to +15 dBmV
Modulation	64 QAM	BURST QPSK
Signaling Rate	30.336 Mbps	2.56 Mbps (per upstream channel; 12 maximum)

RF Performance

Forward Error Correction	Viterbi/Reed Solomon ITU-T J.83 Annex B	Reed Solomon
Bit Error Rate (BER)	1x10E-9 BER at 23dB CNR	1x10E-9 BER at 16dB CNR

Network

Protocol Filtering	IP, IPX, AppleTalk, NETBEUI (Fully configurable)
IP Filtering	Source/Destination Filtering, DHCP snooping, DHCP request/reply blocking, ARP Authentication, IGMP Snooping (with 100BASE-T or ATM OC-3 option)
Traffic Type	Unicast, Multicast and Broadcast

Configurations

ComPORT support	2,000
MAC Addresses	
ComPORT	8
10BASE-T port	8000
10/100BASE-T port	16000
ATM OC-3 port	16000
Virtual LANs	
Port-Based	Up to 10
Virtual Circuit-based	Up to 32
RF-Based	Up to 64
Multiple Service Levels	16 QoS Tiers, CBR or VBR with MIN/MAX settings

Security and Encryption

US	56-bit DES with Diffie-Hellman public key exchange
International	40-bit DES with Diffie-Hellman public key exchange

Standards Compliance

Functional	Ethernet/IEEE 802.3i, 802.3u, 802.3 MAC, 802.2 LLC/SNAP, ATM AAL5, IETF RFC 1483, SDH/SONET
Network Management	SNMP proxy, MIB II (RFC 1213)

Physical Interface

To the Network	RJ-45	10BASE-T
	RJ45	10/100BASE-T
	SC	ATM OC-3 multimode fiber
To the CATV Network	Female "F" type RF connector	

Safety Agency Approvals

UL, cUL, TUV

ComCONTROLLER 2000 Specifications

Physical Specifications

Dimensions	8.63" x 17.15" x 17" (21.92cm x 43.56cm x 43.18cm) (HxWxD)
Weight	35 lbs unloaded (15.88 kg); 55 lbs fully loaded (24.95 kg)

Electrical Specifications

AC Power	110/220V (autosensing), 47-63 Hz
DC Power	-48V
Power Consumption	300 watts (Fully Loaded)

Environmental Specifications

Operating Temperature	0 to 40°C
Storage Temperature	-40 to +75°C
Humidity	10-80% non-condensing
Electromagnetic	FCC Part 15 Class B CE, VCCI, Austel

Operating Specifications

Mean Time Between Failures	15000 hours
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ComCONTROLLER 2100 Specifications

Physical Specifications

Dimensions	17.45" x 17.15" x 18.0" (44.32cm x 43.55cm x 45.72cm) (HxWxD)
Weight	65 lbs (29.4 kg) unloaded, 100 lbs (45.45 kg) fully loaded

Electrical Specifications

AC Power	110/220V (autosensing), 47-63 Hz
DC Power	-48V
Power Consumption	400 watts (Fully Loaded)

Environmental Specifications

Operating Temperature	0 to 40°C
Storage Temperature	-40 to +75°C
Humidity	10-80% non-condensing
Electromagnetic	FCC Part 15, Class A, CE, VCCI, Austel

Operating Specifications

Mean Time Between Failures	15000 hours
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ComCONTROLLER 2100 Expansion Chassis

Physical Specifications

Dimensions	17.45" x 17.15" x 18.0" (44.32cm x 43.55cm x 45.72cm) (HxWxD)
Weight	60 lbs (27.21 kg) unloaded, 95 lbs (43.09 kg) fully loaded

Electrical Specifications

AC Power	110/220V (autosensing), 47-63 Hz
DC Power	-48V
Power Consumption	200 watts

Environmental Specifications

Operating Temperature	0 to 40°C
Storage Temperature	-40 to +75°C
Humidity	10-80% non-condensing
Electromagnetic	FCC Part 15, Class A, CE, VCCI, Aустel

10Base-T

Configurations

Virtual LANs	
Port-based	1 per port

Performance

Bridge Forwarding Rate	14.88 kpps
Bridge Filtering Rate	14.88 kpps
Bridge Filter Table Size	8,000 MAC Addresses

Visual Indicators

LEDs	Power, Test, Fault, Traffic 1, Link 1, Traffic2, Link2
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Standards Compliance

Functional	Ethernet/IEEE 802.3i, 802.2
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Physical Interface

Type	RJ-45
Number of ports	2

10/100Base-T

Configurations

Virtual LANs	
Port-based	1
RF-based	16

Performance

IP Filtering Rate	60 kpps (full duplex, 64byte packets)
IP Forwarding Rate	36 kpps (full duplex, 64byte packets)

IP Filter Table Size	
Per Comport	8 Source/8 Destination
Per System	16,000 Source/16,000 Destination
Bridge Filter Table Size	16,000 MAC Addresses

Visual Indicators

LEDs	Power, Test, Fault, Traffic, Link, 100BT
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Standards Compliance

IEEE 802.3i and 802.3u
IEEE 802.2 LLC, 802.3 MAC

Physical Interface

Type	RJ-45 10/100BASE-T (autosense)
Number of ports	1

ATM OC-3

Configurations

Virtual LANs	Up to 16
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Performance

Cell Transfer Rate	60k cells per second
IP Filtering Rate	30 kpps (full duplex, 64byte packets)
IP Forwarding Rate	30 kpps (full duplex, 64byte packets)
IP Filter Table Size	
Per Comport	8 Source/8 Destination
Per System	8,000 Source/8,000 Destination
Bridge Filter Table Size	16,000 MAC Addresses

ATM Layer

Virtual Connections	4,000
VPI range	0-63
VCI range	0-255

Physical Interface

Type	OC-3/STS-3, multimode fiber
Connector	SC
Number of ports	1

Visual Indicators:

LEDs	Power, Test, Fault, Traffic, Link, LOF, LOS
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Standards Compliance

SDH/SONET standards
ATMF AAL5 and IETF RFC1483 (Bridged Ethernet/802.3 PDUs)

O R D E R I N G I N F O R M A T I O N

ComCONTROLLER 2000



ComCONTROLLER 2000

CC20SC

6 slot main chassis with Fan Tray
North America requires CS0300 System Software License
International requires CS0310 System Software License

6 port ATM Switch

CC0550

6 ports, performs internal ATM switching

AC Power Supply

CC0650 North America
CC0651 International

110V/220V one of two in chassis. Includes US Power Cord
110V/220V one of two in chassis. No Power Cord Included

DC (-48V) Power Module

CC0660

One of two in chassis

Common Controller Module (CC)

CC0300

Performs processing for ComCONTROLLER and ComPORTs

Transmit Main module (Tx Main)

CC0100 North America
CC0110 International

Performs digital processing and 56-bit DES encryption
Performs digital processing and 40-bit DES encryption

Transmit RF Module (TxRF)

CC0101

64QAM Downstream, 88-800MHz range

Receive Module (RxM)

CC0201 North America
CC0211 International

QPSK receive module with 56-bit DES encryption. Performs RF processing, demodulation, and supports CC0250 RPM
QPSK receive module with 40-bit DES encryption. Performs RF processing, demodulation, and supports CC0250 RPM

10Base-T module

CC0400

Dual port 10Base-T WAN module

10/100Base-T module

CC0410

Single port 10/100Base-T WAN module

ATM OC-3 Module

CC0450

Single port ATM OC-3 WAN module

ComCONTROLLER 2100



ComCONTROLLER 2100

CC21MC

11 slot main chassis with Fan Tray
North America requires CS0300 System Software License
International requires CS0310 System Software License

ComCONTROLLER 2100 DC

CC21MC-D

Same as above, but is a DC-only chassis

12 port ATM Switch

CC0500

12 ports, performs internal ATM switching

20 port ATM Switch	CC0501	20 ports, performs internal ATM switching
AC Power Supply	CC0600 North America CC0601 International	110V/220V one of two in chassis. Includes US Power Cord 110V/220V one of two in chassis. No Power Cord Included
DC (-48V) Power Module	CC0610	One of two in chassis
Common Controller Module (CC)	CC0300	Performs processing for ComCONTROLLER and ComPORTs
Transmit Main module (Tx Main)	CC0100 North America CC0110 International	Performs digital processing and 56-bit DES encryption Performs digital processing and 40-bit DES encryption
Transmit RF Module (TxRF)	CC0101	64QAM Downstream, 88-800MHz range
Receive Module (RxM)	CC0201 North America CC0211 International	QPSK receive module with 56-bit DES encryption. Performs RF processing, demodulation, and supports CC0250 RPM QPSK receive module with 40-bit DES encryption. Performs RF processing, demodulation, and supports CC0250 RPM
10Base-T module	CC0400	Dual port 10Base-T WAN module
10/100Base-T module	CC0410	Single port 10/100Base-T WAN module
ATM OC-3 Module	CC0450	Single port ATM OC-3 WAN module

ComCONTROLLER 2100 Expansion Chassis

ComCONTROLLER 2100
Expansion Kit



CC21EK

Includes 9-slot Expansion Chassis, Fan Tray, one Main Interconnect Module, one Expansion Interconnect Module, Interconnect Module cable, and ATM-switch extender cable

ComCONTROLLER 2100
Expansion Kit DC

CC21EK-D

Same as above, but is a DC-only chassis

AC Power Supply

CC0600 North America
CC0601 International

110V/220V one of two in chassis. Includes US Power Cord
110V/220V one of two in chassis. No Power Cord Included

DC (-48V) Power Module

CC0610

One of two in chassis



**Communications for
the 21st Century**

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