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MASTERseries

Integrated Access Device Platform

MASTERseries

where wireless meets wire...

CarrierAccess™

MASTERseries

Networking Solutions for Wireless Service Providers

Benefits:

- Reduces backhaul circuit costs with granular channel grooming and optional transcoding
- Reduces operating expenses with remote management, integrated BERT, and test capability
- Eliminates cell site POTS lines with optional IP routing and portable FXS ports
- Reduces service outages with a rugged platform, lightning protection, and automatic protection switching (APS)
- Reduces capital costs of buying single purpose devices with a multi-services modular platform
- Reduces space and power requirements with a compact design

Features:

- Mix-and-match application modules and plug-on adapters provide:
  - T1 or E1 CSUs
  - V.35 or R530 DSUs
  - 1/0 Digital Crossconnect System (DCS)
  - 2:1 ADPCM transcoder
  - IP/IPX router
  - Inverse multiplexer
  - Portable FXS voice ports
  - 10/100 Ethernet hub
- Modules operate in three different chassis:
  - single, dual, and eight module configurations
- Support for up to 32 full or fractional T1/E1 links
- Support for up to 30 data ports
- Support for up to 16 Ethernet ports
- Unrestricted NxN crossconnect of DSO channels
- Optional IP access router on all modules
- Optional DS0-granular ADPCM transcoding
- Supports channelized and unchannelized T1 and E1
- Hot-swappable modules and power supplies
- AC, +24VDC, -48VDC power options with optional redundancy
- Environmentally hardened (-40 degrees C to +65 degrees C) with lightning protection that exceeds Bellcore standards
- Mean Time Between Failure (MTBF) of over 60 years
- Integrated Bit Error Rate Tester (BERT)
- IP-based remote management and control
- Remote software-definable configuration and upgrades
- Event-driven automatic protection switching (APS) across all installed modules
- Future upgrade to ATM services support

Applications:

- Radio Access Network (RAN) hubbing and concentration
- Cell site integrated access
- Cell site LAN extension/IP aggregation
- Site to site ADPCM transcoding (voice compression)
- Fault tolerant SS7 transport

Today's Wireless Market

Wireless service providers are facing new demands on their backhaul networks. Minutes of Use are increasing as revenue derived from these same MOUs is dropping. Operational costs must be controlled and the backhaul network can make up a large percentage of those costs. Network quality must be increased and service outages eliminated. Coverage areas must continually be expanded, while the network must be readied for the introduction of 3G data services – all at the same time.

The challenge of delivering the latest data service offerings, expanding network coverage, and delivering a higher level of customer service has providers scrambling to maximize existing investments and technology platforms. But single function network equipment doesn't have the rugged reliability or the flexibility needed to meet the unique needs of wireless service providers.

This environment demands a backhaul networking solution that is adaptable, reliable, and possesses a multi-service feature set to meet the challenging needs of a network in transition.

A Solution

The ***MASTER***series line from Carrier Access is a great solution for T1/E1 backhaul and access networking needs. With ***MASTER***series, wireless carriers worldwide can minimize the total cost of backhaul networks by reducing leased circuit costs as well as maintenance costs of the network. They can maximize billed minutes and substantially improve service quality with ***MASTER***series' highly reliable architecture, superior lightning protection, and Automatic Protection Switching features. The flexible ***MASTER***series platform also supports rapid deployment of new sites and services, making it a complete solution for cell and hub site networking for wireless carriers.

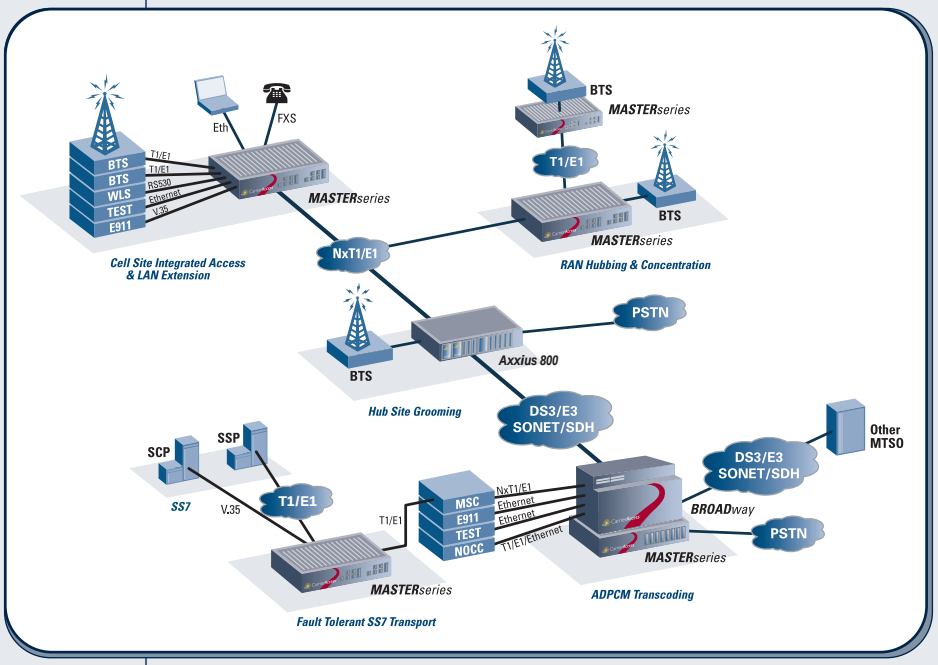
Next Generation Backhaul Networks

Carrier Access has been delivering solutions for carriers since 1992, and the ***MASTER***series platform is designed for critical applications in the T1/E1 backhaul network.

At the cell site, ***MASTER***series handles all integrated access needs – connectivity for analog and digital base stations, E911/location devices, fraud radios, data devices – in a single, highly reliable platform. The integrated CSU/DSUs and DCS, plus optional transcoder, IP router, and Ethernet hub functionality eliminate the need for many separate pieces of equipment. With the ***PACKET***core upgrade, ***MASTER***series provides full LAN access for technicians or IP management for cell site devices. The portable ***TELE***port and ***PACKET***port plug-on adapters let technicians carry an FXS voice port and IP router in their tool kit for voice and LAN access from any ***MASTER***series-equipped site. When a future upgrade is required for 3G-based ATM transport, ***MASTER***series supports a seamless integration.

In the narrowband Radio Access Network (RAN), ***MASTER***series grooms remote cell site traffic onto full T1/E1 circuits for the most efficient networking. Automatic Protection Switching can provide protection for critical traffic. Point-to-point and drop & insert topologies are deployed quickly and easily. ***MASTER***series' remote management and BERT reduce the need for technicians to visit distant sites to diagnose and correct trouble conditions.

MASTERseries can be combined with Carrier Access' ***BROAD***way broadband platform and ***MASTER***view management at the Mobile Switching Center to form a complete backhaul solution. The ***MASTER***series ADPCM transcoding compresses voice traffic over links connecting to the Public Switched Telephone Network (PSTN) or to other MSCs, eliminating circuit costs. For SS7 networks, ***MASTER***series provides highly reliable connections to SCP databases and remote SSP devices, ensuring that this critical traffic is always maintained.



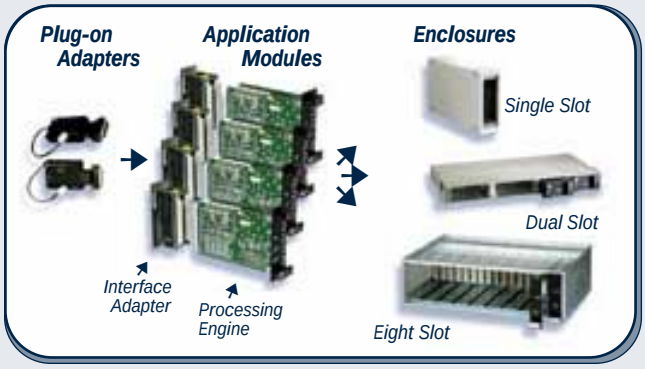
Next Generation Backhaul Networks

IP Access

MASTERseries with PACKETcore uses the backhaul network to provide LAN access from cell sites and other remote locations for technicians. Network operators can eliminate slow and costly POTS lines, external routers, and management effort by using MASTERseries. In fact, one of our customers estimates that they will save over 100,000 U.S. dollars a year in one service area alone since implementing this solution!

Architecture

The ***MASTER***series platform uses a passive mid-plane architecture for the most flexibility. Each application module consists of a front-mounted processing engine and a rear mounted interface adapter module. Different application modules add specific capabilities, such as transcoding or inverse multiplexing, which are available across the full system. Operators can mix and match various application modules to create systems fully tailored to their needs.

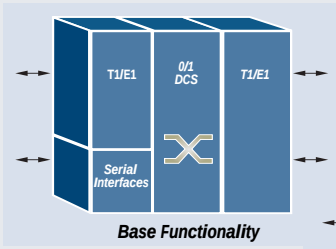


Most application modules are available with the optional ***PACKET***core, which provides a full IP router and an Ethernet port. Carrier Access' unique plug-on adapters provide functional portability. The ***TELE***port plug-on module provides a portable FXS voice port, while the ***PACKET***port provides an IP router and Ethernet port that can be carried from site-to-site.

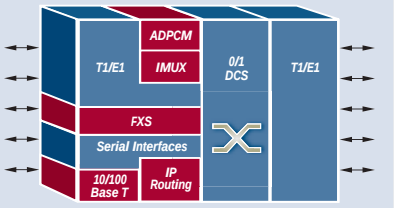
With single slot, dual slot, or eight slot enclosures, ***MASTER***series products use less physical space than any other solution in the industry. A single slot configuration supports up to four T1/E1s of cross connect, one Ethernet, and two data ports. A rack mountable dual slot 1RU system supports up to 8 circuits, 4 Ethernet, and/or 6 data ports. In a full eight slot enclosure configuration, only a 3RU space is required to support up to 32 T1/E1 circuits, 16 Ethernet, and/or 30 data ports.

MASTERseries modules are designed around a DS0-granular crossconnect fabric. Each different type of application module adds to this capability with T1 or E1 ports, data ports, and specialized functions such as ADPCM transcoding, IP routing, and inverse multiplexing. When installed in a multi-slot chassis, the application modules work together to provide an integrated system.

The distributed ***MASTER***series switching capability of the application modules is interconnected over two high-speed buses. The TDM communications bus allows any-to-any connection of network traffic between modules. The inter-module Packet Bus, along with the distributed intelligence of the modules, eliminates the need for a dedicated control module in any shelf.



Base Functionality



Expandable, Modular System Functionality

E911 & Location Systems

__MASTER__series is the best solution for deploying network-based E911 and Wireless Location Systems (WLS). Cell site equipment is connected via V.35 data port, Ethernet or fractional T1/E1 and integrated with the BTS backhaul network. Carrier Access' __BROAD__way platform at the MTSO grooms out the E911/WLS data channels from incoming DS3 or T1/E1 circuits and connects to the MTSO-based location equipment over Ethernet. __MASTER__series has been tested and installed with systems from Grayson Wireless, TruePosition and others.

Application Modules

PATHmaster
–a T1/E1 compact digital crossconnect switch with integrated DSU/CSU functionality targeted at hub locations, base station sites, and customer premises. The ***PATH***master comes in two, three, and four T1/E1 port configurations and each includes two V.35 or RS-530 data ports. Two- and three-port versions are remotely software-upgradeable to activate all four ports.

TRANSmaster
–expands the capabilities of the ***PATH***master by adding 2:1 ADPCM voice compression for supporting dual mode AMPS and digital cell sites. The ***TRANS***master is also used for MTSO-to-MTSO and PSTN connection applications.

BANDmaster
–a four T1/E1 inverse multiplexer with integrated crossconnect capability that is used to front-end microwave radios for high-speed data applications and/or to provide multi-megabyte data connectivity at branch offices.

DATAmaster
–a high-density four port serial module that is used for data channel bank applications such as SS7 channel consolidation between mobile switching center locations.

LINKmaster
–a multi-link CSU that provides connections for up to two full or fractional T1/E1 circuits. The ***LINK***master provides four T1/E1 ports with integral CSU/DSX-1 circuitry on all links. The ***LINK***master functions as a low cost dual CSU or repeater application module and is remotely software-upgradeable to full ***PATH***master functionality.

HUBmaster
–a five-port 10/100 MB Ethernet hub. The ***HUB***master is environmentally hardened and expands the number of Ethernet ports available while conserving space.

PORTmaster
–a quad-port Ethernet 10/100 hub with a quad port asynchronous terminal server that expands the capabilities of the ***PACKET***core IP bridge/router module to provide additional Ethernet hub ports and to network-enable the remote management and control of serial devices that might otherwise be unreachable.

Plug-on Modules & IP Routing

PACKETcore
–a compact, high performance IP/IPX router that is an optional upgrade to the ***MASTER***series application modules, excluding ***HUB***master and ***DATA***master. It features integrated firewall, a single 10/100 Ethernet port, two serial ports, and robust IP/IPX routing.

TELEport
–a portable full function FXS port that is used to eliminate costly POTS lines at BTS sites by integrating standard PSTN connectivity into the T1/E1 backhaul circuit. The ***TELE***port's unique portability allows for the plug-on to be shared between BTS locations and used only when needed – further reducing the costs associated with direct PSTN connectivity at cell sites.

PACKETport
–a full function, portable IP access router designed to provide cost-effective LAN connectivity in cell sites and remote locations.

Application Modules *General Features*

	T1/E1 Ports - CSU	*Data Ports - DSU*	*IP Routing Option*	*Terminal Server*	*Hub*	*Drop & Insert*	*DCS Function*	*ADPCM Transcoding*	*IMUX*	*Integrated BERT*	*Remote Management*	*Temperature Hardened*	*Software Upgrade*
PATHmaster2	2	2	✓			✓	✓			✓	✓	✓	✓
PATHmaster3	3	2	✓			✓	✓			✓	✓	✓	✓
PATHmaster4	4	2	✓			✓	✓			✓	✓	✓	
LINKmaster	4	0	✓							✓	✓	✓	✓
TRANSmaster	4	2	✓			✓	✓	✓		✓	✓	✓	
BANDmaster	4	2	✓			✓	✓		✓	✓	✓	✓	
DATAmaster	0	4									✓	✓	
PORTmaster	0	0		✓	✓							✓	
HUBmaster	0	0			✓							✓	

MASTERseries Solutions

Managing Your Access Network

Managing your backhaul network couldn't be easier or more comprehensive with Carrier Access. ***MASTER***series platforms can be remotely managed via Telnet, SNMP, or ***MASTER***view, Carrier Access' industry-leading Web-based management application. An extensive set of loop-backs, performance monitoring, and integrated Bit Error Rate Tester (BERT) allow for complete diagnostics.

Wireless Carrier Class Reliability

Lightning, extreme heat, and bitter cold – ***MASTER***series can withstand whatever Mother Nature dishes out. With a Mean Time Between Failure (MTBF) measured at over 60 years, ***MASTER***series builds in multiple layers of reliability and redundancy to protect critical traffic.

At the system level, ***MASTER***series exceeds the Telcordia standards for lightning protection, and provides a self-healing capability that restores the circuit after a lightning strike. The platform is environmentally hardened for operating in extreme temperatures from -40 degrees C to 65 degrees C, and is available with redundant power supplies.

Each module is also designed with distributed intelligence so that any and all modules can handle the operation and management of the shelf. Combine all this with integrated Automatic Switching Protection (APS) of 16 individual configurations, a route diversity feature that maintains and prioritizes traffic flow during circuit failure or service degradation, and your WAN is always prepared for the unexpected, whatever the application.

total backhaul solution

Technical Specifications

Physical

Size

- Single Slot – 2.4″W x 10.2″L x 6.2″H
- Dual Slot – 19″W x 10.2″L x 1.75″H
- Eight Slot – 19″W x 10.2″L x 5.25″H

Environmental

- -40 degrees C to 65 degrees C
- Humidity up to 95% non-condensing
- Lightning protection – exceeds Bellcore GR-1089

Power

- AC – 100 - 250 V, 50/60 Hz
- DC – +24V, -48V

Regulatory

- FCC: Part 15, Class A; Part 68
- UL: 60950, 3rd edition
- C-UL: CSA 22.2/60950, 3rd edition
- DOC: ICES-003, ICES-03
- CE: approved devices

External Alarm

- All multi-slot chassis
- Form “C” relay contact closure
- Major/Minor

Network Interfaces

- Line Rate: 1.544 Mb/s (T1), 2.048 Mb/s (E1)
- Framing: SF/ESF per TR54016/TR62411 (T1)
  CRC-4 and CAS per G.703/704 (E1)
- Interface: AMI or B8ZS (T1); HDB3 (E1)
- Termination: Female 8 pin RJ48C
- Timing: Internal or External from any network port
- LED Indicators: YEL/TEST, OOF/LOS, SYNC, AIS, MINOR
- Signalling: Clear channel, bundled or robbed bit (T1)
  Clear channel, CAS2, CCSA, CCSB and CCSAB (E1)

Data Interfaces

- Date Rate: N x 56/64 kb/s, N=1-24 (T1), 1-31 (E1)
- Interface: DCE Synchronous CCITT V.35/RS530,
  RS449/422/423 and X.21 via external cables
- Termination: Female 25-pin DB connector
- LED Indicators: RxD, TxD

Voice Interfaces (TELEport)

- Single FXS voice interface

Management

- SNMP: DS1 MIB and MIB II via PPP,
  Paragon Private MIB
- Remote Access: In band via DS0, Telnet supported
- VT100: RS232 port, 4800-19,200 bps; RJ45 connector,
  external modem supported
- Password control: three levels of access

Diagnostics

- Loopback Types: Bi-directional, Fractional DS0 (T1 only),
  Line, Local, Payload, Equipment, Dataport (local or remote),
  Remote in-band/out-of-band, fixed or timed options
- BERT: All ones, all zeros, alternating, $2^{24}-1$

Performance Monitoring

- Data Storage: Last 24 hours of data in 15 minute increments,
  48 and 72 hour summaries
- Monitors: All network interfaces
- Reports: Based on TR54016 and T1.403 (T1); G.706
  for E1 alarm history, interface statistics

Inverse Multiplexing

- Capacity: 1, 2, 3 or 4 network interfaces;
  full and fractional links supported
- Delay Tolerance: up to 64 ms differential delay
- Automatic Rate Adaptation

Transcoding (Voice Compression)

- Type: 32 kb/s ADPCM per ANSI T1.303 1989 (T1);
  ITU-T G.761 (E1)
- Modes: Encode, Bypass or Alt-encode enhanced

IP Routing (PACKETcore)

- Ethernet Interface: 10/100 Mb as per IEEE 802.3
- LAN Protocols: TCP/IP, IPX, multiprotocol for bridging mode
- WAN Protocols: PPP, Frame Relay (RFC 1490)
- DHCP: Server, relay agent and client
- IPCP: dynamic IP negotiation
- RIP, RIPv2, static routing, OSPF v1
- Support un-numbered IP interface
- Security: PAP, CHAP, NAT
  7 layer, ACL rules-based firewall