DNX Module Sets

Compatibility Matrix

	Module	DNX-11	DNX-88	S-DNX
Optical	OC-3/STM-1 (Backplane Mode)	✓	✓	✓
	OC-3/STM-1/X (X-Link Mode)	✗	✓	✓
Management	System Manager Controller II[1]	✓	✓	✓
	Expansion Node Manager[2]	✗	✓	✓
Expansion	Expansion Cross-Connect[2]	✗	✓	✓
	Expansion Link Controller[3]	✗	✓	✓
Broadband	E3	✓	✓	✓
	Hybrid DS3	✓	✓	✓
Narrow Band	Octal T1/E1	✓	✓	✓
Data	Circuit/Packet eXchange (CPX)	✓	✓	✓
	DS0-DP	✓	✓	✓
	Octal High Speed Data	✓	✓	✓
	Router/8	✓	✓	✓
	Test Access	✓	✓	✓
Protection	PSX-5300 Protection Switch	✓	✓	✓

[1] For DNX-88 and S-DNX, used in Nest 2 through 8. Also used in DNX-11.

[2] For Nest 1 of a DNX-88.

[3] For Nest 2 through 8 of a DNX-88.

OC-3/STM-1 Optical Module Set

- T1/E1 Add/Drop on SONET/SDH Ring

- Port Concentration (Service Platform)

- DS0 and VT1.5 (DS1) / VC11 (DS1) / VC12 (E1) Level Grooming

The DNX OC-3/STM-1 module set consists of a front-mounted application module and a rear-mounted interface module working in concert. These modules provide optical interfacing to DNX multiservice cross-connects.

An optically-equipped DNX enables service providers to groom and concentrate traffic further out in the optical access network, on a platform that delivers high-density, cost-effective electrical interfaces in a protected fashion. The OC-3/STM-1 module set operates as Path Terminating Equipment (PTE), with features that include 3/1/0 switching within any DNX system, embedded link system clocking, and 1+1 and 1:1 Automatic Protection Switching (APS).

In a terminal mux application, using OC-3 or STM-1 interfaces conserves valuable service platform ports. When an OC-3/STM-1-equipped DNX interfaces to Add/Drop Multiplexers (ADMs) or other SONET/SDH-compliant systems, DS1/E1 traffic can be selectively added or dropped as required, preserving ADM slots at the POP. Interfacing with a voice/data service platform, rather than an ADM on a SONET/SDH ring, maximizes the core multiservice access concentration capabilities of the DNX.

When configured for OC-3 mode, the OC-3/STM-1 module supports 155.52 Mbps operation with VT1.5 (DS1) granularity and interfaces equivalent to 84 DS1s per module set. When configured for STM-1 mode, the OC-3/STM-1 module similarly supports 155.52 Mbps operation with VC11 (DS1) and VC12 (E1) granularity on an individual STM-0 payload basis. Cross-connections to other DNX module sets can be performed on a timeslot-by-timeslot DS0 or Clear T1/E1 basis.

The OC-3/STM-1 module utilizes 1310nm Laser/Single Mode Fiber (SMF), is available with either intermediate (nominal 15 km) or long (nominal 40 km) reach laser options, and is equipped with SC interconnects. Alternative patch cord options are available.

SPECIFICATIONS

Model Number
- MKT-006-50302: OC-3/STM-1 (X-Link or Backplane Mode) Application Module (Front)
- MKT-006-50311: OC-3/STM-1 Intermediate Range (IR) Interface Module (Rear)
- MKT-006-50341: OC-3/STM-1 Long Range (LR) Interface Module (Rear)

Line Rate
- 155.52 Mbps

Optical Connectors
- SC/UPC on rear interface card

High-Speed Data Rates
- 155 Mbps

Format (OC-3)
- Telcordia GR-253 (SONET)

Format (STM-1)
- ITU-T G.707 (SDH)

Line Code
- Scrambled NRZ

Tributaries (OC-3)
- Up to 84 x VT1.5

Tributaries (STM-1)
- Up to 63 (VC12), Up to 84 (VC11), and Combination

Free Run Accuracy
- ±20ppm

Receiver - Intermediate Reach
- Detector Type: InGaAs PIN
- Sensitivity: Maximum -31 dBm; Typical -36 dBm
- Saturation: -8 dBm

Receiver - Long Reach
- Detector Type: InGaAs PIN
- Sensitivity: Maximum -34 dBm; Typical -36 dBm
- Saturation: -8 dBm*

Transmitter - Intermediate Reach
- Optical Source: MQW Laser
- Wavelength Range: 1260-1360 nm
- Output Power: Maximum -8 dBm; Typical -11 dBm; Minimum -15 dBm
- Distance: 15 km

Transmitter - Long Reach
- Optical Source: MQW Laser
- Wavelength Range: 1260-1360 nm
- Output Power: Maximum 0 dBm; Typical -3 dBm; Minimum -5 dBm
- Distance: 40 km

Loopbacks
- Facility, Path Facility and Terminal

BERT Tests
- 2^{23}-1 Framed 2^{11}-1 Framed/Unframed; 2^{15}-1 Framed/Unframed
- 2^{20}-1 Framed/Unframed; 2^{20}-1 QRSS Framed/Unframed

Alarms
- LOS, LOF, OOF T1- Red LOS, LOF, Yellow, AIS, E1- LOS, OOF, RAI, AIS, Tributary- LOP, AIS, RDI

Compliance
- CSA/UL-60950-1, FCC Part 15 class A, ICES-003, CE Mark

System Manager Controller II Module Set (SMC-II)

- Internal Stratum 3 Clock with Holdover

- Hitless Switchover between Online and Standby Module

- Accepts Multiple BITS Clock Inputs

- Alarm Contact Closures

- Supports 8 Concurrent Users

The System Manager Controller II (SMC-II) controls operation of the DNX system and the adjunct PSX-5300 Protection Switch. The SMC-II consists of a controller (front SMC-II) module and an interface (rear SMC-IIA) module, which are both single slot cards. The controller module is half height, and the interface module is a full slot height. The SMC-II and SMC-IIA both use the same controller (front) module.

The SMC-II utilizes the dual communication busses on the DNX mid-plane to control modules within the nest and provide several methods for communicating with and controlling the DNX system. The intuitive VT100 terminal interface offers direct or remote connectivity. Remote connections to the System Manager are made using the internal modem, Telnet, or SSH. Additionally, system devices and ports can be configured, monitored, diagnosed, and provisioned using Simple Network Management Protocol (SNMP).

The DNX supports up to three user-defined clock sources. These sources are derived from Network Synchronized Timing or Internal Timing. Network Synchronized Timing includes line timing provided by DNX channel cards or timing provided by a stand-alone source, such as a Timing Signal Generator. The internal timing source is a Stratum 3 clock, which is used as a reference to generate system-clocking signals. In the event of a reference clock failure, the DNX automatically selects an alternate input based on the source clock configuration setting. Any of the following optional channel cards can provide port timing: Octal T1/E1, Octal High Speed, HDS3 and OC-3/STM-1.

When the internal timing source is used to deliver a timing reference to the DNX, the state of operation is called Free Run Mode. As with the requirements of Stratum 3 clock sources, there is a back-up mode for use in the event all defined clock sources are lost. This back-up mode is derived from Holdover timing, which facilitates redundancy switching and allows maintenance actions to be performed on the SMC-II without affecting service. External timing is provided via dual 64 Kbps composite clock inputs, and dual T1/E1 BITS clock inputs.

SPECIFICATIONS

Model Number
- MKT-006-02353: SMC-II Controller Module (Front)
- MKT-006-02018: SMC-IIA Interface Module (Rear)

Internal Timing
- Stratum 3 Source

External Timing
- SMC-IIA: 64 Kbps or 1.544/2.048 Mbps Building Integrated Timing Supply (BITS) Inputs, Dual 3 Position Terminal Blocks, 133 ohm Impedence

Alarm Control
- LED Indicators on Front Bezel

Alarm Cut Off
- Bezel-Mounted Push Button Switch Disables the External Alarms

Management Interfaces
- Serial Port Craft Terminal Interface (RJ-11)
- Internal Modem Interface (RJ-11)
- 10/100BaseT LAN Interface (RJ-45)

Alarm Contacts
- 9-Position Dry Contact Terminal Block Module (Socket and Terminal Block) for Major, Minor and Critical Alarms

PSX-5300 Protection Switch Interface
- Shielded DB-9 Connection Supporting Serial Asynchronous Data

Supported Protocols
- SNMP, Telnet, TFTP, SSH/SFTP

MIB Support
- RFC 1213, MIB II, Sycamore Networks Enterprise MIB

Expansion Node Manager Module Set (XNM)

- Internal Stratum 3 Clock with Holdover

- Hitless Switchover between Online and Standby Module

- Accepts Multiple BITS Clock Inputs

- Alarm Contact Closures

- Supports 8 Concurrent Users

The Expansion Node Manager (XNM) controls operation of the DNX-88 system and the local adjunct PSX-5300 Protection Switch. The XNM is located in Nest 1, the same chassis as the Expansion Cross-Connect modules, and provides the management interfaces to external devices. It also communicates with Nests 2 through 8 via the XCC and XLC modules that make up the remainder of the seven chassis that comprise the node. The XNM provides distributed intelligence in a fault tolerant configuration – with the simplicity of managing a single network element.

In this third-generation module set, increased FLASH memory supports the numerous connections possible in the expansion node environment. An additional communication path is available to support a 1 Mbps supervisory channel between the XNM and XCC modules. The XNM consists of a half-height Controller (front) module and a full slot height interface (rear) module, both single slot cards.

The XNM utilizes dual communication busses on the local DNX midplane to control modules within the nest and provide several methods for communicating with and controlling the DNX system. The intuitive VT100 terminal interface offers direct or remote connectivity. Remote connections to the System Manager can be made using the internal modem or by Telnet. System devices and ports can also be configured, monitored, diagnosed, and provisioned using Simple Network Management Protocol (SNMP).

The DNX supports up to three user-defined clock sources: Network Synchronized Timing, Internal Timing, or Port Timing. Network Synchronized Timing includes line timing provided by DNX channel cards or by a stand-alone source, such as a Timing Signal Generator. The internal timing source is a Stratum 3 clock, which can be used as a reference to generate system-clocking signals. In the event of a reference clock failure, the DNX automatically selects an alternate input based on the source clock configuration setting. Port timing can be provided by any of the following optional channel cards if located in the local Nest 1: Octal T1/E1, Octal High Speed, DS3, and OC-3/STM-1.

SPECIFICATIONS

Model Number
- MKT-006-04353: XNM Application Module (Front)
- MKT-006-02018: SMC-IIA Interface Module (Rear)
- Both SMC-II and XNM Controller Modules use the SMC-IIA Rear Interface Module

Internal Timing
- Stratum 3 Internal Timing with Holdover

Alarm Control
- LED Indicators on Front Bezel

Alarm Cut Off
- Bezel-Mounted Push Button Switch Disables the External Alarms

Management Interfaces
- Serial Port Craft Terminal Interface (RJ-11)
- Internal Modem Interface (RJ-11)
- 10/100BaseT LAN Interface (RJ-45)

Alarm Contacts
- 9-Position Dry Contact Terminal Block Module (Socket and Terminal Block) for Major, Minor and Critical Alarms

Supported Protocols
- SNMP, Telnet, TFTP, SSH/SFTP

MIB Support
- RFC 1213, MIB II, Sycamore Networks Enterprise MIB

When the internal timing source is used to deliver a timing reference to the DNX, the state of operation is called Free Run Mode. As with the requirements of Stratum 3 clock sources, a back-up mode is available for use if all defined clock locations are lost. The back-up mode is derived from Holdover timing, which facilitates redundancy switching and allows maintenance to be performed on the SMC-II without affecting service. External timing is provided via four source connectors on the SMC-IIA rear card. These inputs allow the DNX to use a 64 Kbps or 1.544/2.048 Mbps composite clock from a stand-alone reference.

Expansion Cross-Connect Module Set (XCC)

- Purpose-Built for the DNX-88

- Non-Blocking 3-1-0 Cross-Connect for the Entire DNX-88 Eight-Nest Node

- Communication Channel and Timing Reference

The Expansion Cross-Connect (XCC) module set provides non-blocking 3-1-0 cross-connect resources for the entire eight-nest node that comprises a DNX-88 system. The XCC also supplies the communication channel between Nest 1 and Nests 2 through 8 for configuration statistics and alarms, and the timing reference for Nests 2 though 8.

The XCC front card contains the processor subsystem and provides backplane access for traffic originating and/ or terminating within Nest 1. The rear card contains the cross-connect fabric and eight link interfaces. Seven of the link interfaces are externally cabled to the other seven DNX nests that make up the node. The eighth interface operates between the front and rear cards and connects the cross-connect fabric to the local DNX backplane.

The cross-connect fabric of the XCC module set can establish DS0 and DS1 level connections between any DS0, DS1, or group of DS0s in any nest within the node; and handles various types of connections, including voice or data full duplex, broadcast master, and listeners. The concept of a connection with a DNX-88 node is a source-destination relationship. The DNX-88 source connection is created between the port of interest (DS1, E1, DS3, OC-3/STM-1, etc.) and the Expansion Link Card (XLC). The XLC card directly maps backplane timeslots to the X-link interface destined for the XCC.

The XCC module set supports 1+1 module redundancy.

SPECIFICATIONS

Model Number
- MKT-006-04115: XCC Expansion Cross-Connect (Front)
- MKT-006-04015: XCC Expansion Cross-Connect (Rear)

Physical Interface
- Seven pairs of receptacles for cabling up to seven redundant pairs of XLCs or OC-3/STM-1s (maximum cable length 20 feet)

Electrical Interface
- IEEE 1596

Transport
- Proprietary Framing

Diagnostic
- Integrated 2047 BERT (Automatic monitoring of link status)

Switching Capacity
- 1.2 Gbps Non-Blocking Buss

Environment
- 0° to 55°C Temperature
- 10% to 90% RH (Non-Condensing)

Redundancy
- 1+1

Compliance
- FCC Part 15 class A, ICES-003, CSA/UL-60950-1, EN60950, EN55022, EN55024, EN 300-386

Expansion Link Controller Module Set (XLC)

- Purpose-Built for the DNX-88

- Connects to the XCC Rear Interface Module

- Each XLC Terminates Two X-Link Interfaces that Connect to the XCC

The DNX-88 expansion node Nests 2 through 8 uses an Expansion Link Controller (XLC) module to connect to the XCC rear interface module located in the Node Manager Nest 1. Each XLC module terminates two X-link interfaces that provide the connection to the XCC. Data from the links is mapped directly onto the local DNX midplane, where the data is then connected to the service-bearing modules (e.g., Octal T1/E1, etc.).

The XLC also performs other functions, such as adapting supervisory messages from the X-link format to the DNX midplane format. These messages (configuration, statistic, and alarm information relevant to the local nest) are then forwarded to the System Manager Controller II for further processing. In addition, the XLC extracts timing information embedded within the X-link and distributes it to other modules within the local nest.

In order to preserve application slots for service bearing interfaces, the XLC utilizes the existing DNX Octal T1/E1 rear interface module. The slot now serves a dual function – forwarding backplane traffic to the XCC and delivering additional network interfaces.

The XLC supports optional 1+1 redundancy.

SPECIFICATIONS

Model Number
- MKT-006-04215: XLC Expansion Link Controller (Front)

Physical Interface
- One Pair of RJ-45 Receptacles

Electrical Interface
- IEEE 1596

Transport
- Proprietary Framing

Diagnostic
- Integrated 2047 BERT (Automatic monitoring of link status)

Environment
- 0° to 55°C Temperature
- 10% to 90% RH (Non-Condensing)

Redundancy
- 1+1

Compliance
- FCC Part 15 class A, ICES-003, CSA/UL-60950-1, EN60950, EN55022, EN55024, EN 300-386

Options
- Supports OT1/EI functionality when OT1/E1 rear card is installed

E3 Broadband Module Set

- Supports 16 E1s per E3

- Supports Full or Fractional E1 Payloads

- 3-1-0 Cross-Connect (Clear E1)

- Comprehensive Diagnostics (Loops and BERTs)

For service providers managing global networks, the feature-rich E3 module set for the DNX-11 and DNX-88 provides a cost-effective solution for linking legacy broadband E3 with wider broadband STM-1. High-speed cross-connections enable faster, more efficient broadband and narrowband grooming for fractional and full link E1 services – and enhance the profitability of providing new Internet and voice services to end-users.

Compliance with the ITU-T G.751 standard for framing and multiplexing format ensures seamless international interconnection. The E3 multiplexes/de-multiplexes 16 E1s into a single E3 data stream, with the single E3 port providing E13 framing and HDB3 line coding. The E3 also offers integral loopbacks and BERT diagnostics, and supports performance monitoring, per G.826.

By allowing cross-connections at the E1 and the DS0 signaling levels, an E3-equipped DNX provides a more effective solution for grooming E1 signals. Alternative applications such as standalone transmultiplexers and narrowband multiplexers cannot match its efficiency.

An E3-equipped DNX provides:
- A scalable gateway solution for efficient conversion of multi-national traffic

- An answer to the growing need for grooming and concentration between wireless base stations and MSC locations
  - o Consolidating bandwidth reduces access line costs

  - o Conserving switch ports further reduces costs and allows the ports to be used for revenue-generating traffic

- Carrier broadband access across the network, and the ability to diagnose other network equipment (through the DNX)
  - o Advantages of VC12 mapping within the STM-1, and ability to cross-connect E1s to the end user

SPECIFICATIONS

Model Number
- MKT-006-40301: E3 Application Module (Front)
- MKT-006-40311: E3 Interface Module (Rear)

Physical Interface
- E3: Female BNC 75 ohm 5%
- E1: Integral to Switch Fabric

Electrical Interface
- E1: Integral to Switch Fabric

Line Rate
- E3: 34.368 Mbps 20 ppm
- E1:Integral to Switch Fabric

Line Coding
- E3: B3ZS
- E1: HDB3

Framing
- E3: E1-3
- E1: Transparent, Framed, CAS, CRC

Loopbacks
- E3: Line, LIU, Local, Payload, Backplane
- E1: Line, Local, Payload

BERT Tests
- E3: $2^{15}-1$ Framed; 2047 Framed
- E1: 2047 Framed/Unframed; 2^{20} Framed/Unframed; 2^{23} Framed/Unframed; 2^{15} Framed/Unframed; QRSS Framed/Unframed

Alarms
- E1: RAI, MFRAI, AIS, SEF, Framing Error, CRC, TX Slip, RX Slip

Compliance
- CE Mark, FCC Part 15 class A, ISES-003, ITU-T G.703, ITU-T G.704, ITU-T G.706, ITU-T G.775, ITU-T 732, ITU-T 737, ITU-T 751, ITU-T 796, ITU-T 826, ITU-T 823, ITU-T 921, NEBS Level 3, CSA/UL-60950-1

Hybrid DS3 Broadband Module Set

- 3-1-0 Clear Capable

- End-to-End Monitoring Eliminates Truck Rolls

- Mixed DS1/E1 Configurations for Intercontinental Applications

- Enhanced Diagnostics Support Multiple Loopbacks and One-Time BERT Capability

The Hybrid DS3 module set is a second-generation DNX product with significant feature enhancements, including enhanced diagnostic capabilities and support for multiple DS1 and E1 configurations in the same DS3 facility.

Available features include ITU-T G.747 DS1/E1 compliance and the ability to pass associated framing information transparently for 3-1-0 cross-connects. In addition, comprehensive monitoring and integral diagnostics capabilities, plus automatic module protection, ensure maximum service levels are maintained.

The Hybrid DS3 module suits any CLEC, ISP, or wireless carrier using DS3 facilities. The module can be configured for 28 DS1s, 21 E1s, or a mixture of DS1s and E1s on the same DS3 link. The ability to mix DS1 and E1 on the same link complies with international standards and improves flexibility for global carriers. Diagnostic capabilities of the Hybrid DS3 include an unframed $2^{15}-1$ T3 BERT that tests the whole pipe; and all links can be put in loopback or pass BERT at one time.

The Hybrid DS3 provides a more efficient and scalable backhaul solution. As the market space for fractional T1 increases, an M13 multiplexer wastes unused DS0s. If each DS0 is viewed as a revenue stream, this represents potential income that is not being capitalized. An additional inefficiency of an M13 multiplexer is the need to lease another T3 span when the 29th T1 span is added. The Hybrid DS3, being a 3-1-0 enabler, saves a network operator from adding another DS3 prematurely, producing recurring cost savings that favorably impact the bottom line.

SPECIFICATIONS

Model Number
- MKT-006-45301: Hybrid DS3 Application Module (Front)
- MKT-006-45311: Hybrid DS3 Interface Module (Rear)

Physical Interface
- T3: Female BNC 75 ohm
- DS1/E1: Integral to Switch Fabric

Electrical Interface
- T3: ANSI T1.404
- DS1/E1: Integral to Switch Fabric

Line Rate
- T3: 44.736 Mbps 20 ppm
- DS1/E1: Integral to Switch Fabric

Line Coding
- T3: B3ZS
- DS1/E1: Integral to Switch Fabric

Framing
- T3: M13/C-Bit
- DS1: ESF, SF (D4), Transparent
- E1: Framed, CRC, CAS, Transparent

Loopbacks
- T3: Line, LIU, Local
- DS1/E1: Line, Local, Payload, Remote

BERT Tests
- T3: $2^{15}-1$ Unframed
- DS1/E1: 2047 Framed/Unframed; 2^{20} Framed/Unframed; 2^{23} Framed/Unframed; 2^{15} Framed/Unframed; All Ones; All Zeros; QRSS Framed/Unframed

Alarms
- T3: LOS, LOF, LCV
- DS1/E1: Red (T1)/Multiframe, Yellow/RAI, AIS, TX Slip, RX Slip

Compliance
- ANSI T1.103, ANSI T1.107, ANSI T1.403, AT&T 54016, CE Mark, FCC Part 15 class A, ISES-003, ITU-T G.703, ITU-T G.704, ITU-T G.706, ITU-T G.747, ITU-T G.775, NEBS Level 3

Octal T1/E1 Narrowband Module Set

- End-to-End Monitoring

- Enhanced Diagnostics - Multiple Loopbacks and BERT Patterns

- G.826 Statistics and Performance Monitoring

- Line Build-Outs for Long and Short Haul

- A-law to μ-law Conversion

The Octal T1/E1 module set supports up to eight ports per single slot width, simultaneously terminating both T1 and E1 signals on the same card to provide cost-effective A-law to μ-law conversion. Performance monitoring statistics and extensive diagnostics and testing capabilities can be exposed on a link basis.

The Octal T1/E1 module supports eight links that are per-link user-configurable for T1 or E1 mode and the associated framing. The framing modes are SF (D4) and ESF for T1 links, G.704 with/without CRC and with/without CAS for the E1 counterpart. Additional diagnostics include integral BERT and loopback diagnostics for in-network testing. The Octal T1/E1 provides the ability to monitor ABCD signaling bits at the individual link level for voice applications.

The Octal T1/E1 offers high density T1 or E1 interface deployment with an optional N+1 sparing strategy. Remote test access is not compromised by density, enabling service providers to quickly validate service outages without having to dispatch service personnel.

SPECIFICATIONS

Model Number
- MKT-006-20108: Octal T1/E1 Application Module (Front)
- MKT-006-20118: Octal T1/E1 with APS Application Module (Front)
- MKT-006-20008/20028: Octal T1/E1 Interface Module (Rear)

Physical Interface
- 50 pin, RJ48M, 100(T1)/120(E1) ohm

Electrical Interface
- ITU-T G.703

Line Rate
- 1.544 Mbps/2.048 Mbps

Line Coding
- AMI/B8ZS

Framing
- T1: ESF, SF (D4), Transparent
- E1: Framed, CRC, CAS, Transparent

Redundancy
- Device Level N+1
- Link Level 1+1 and 1:1 (requires Octal T1/E1 with APS Front Module)

Loopbacks
- Line, Local, Payload, Remote, Smartjack

BERT Tests
- 2047 Framed/Unframed
- 2^{15} Framed/Unframed
- 2^{20} Framed/Unframed
- 2^{23} Framed/Unframed
- All Ones
- All Zeros
- QRSS Framed/Unframed

Alarms
- Red (T1)/Multiframe, Yellow/RAI, AIS, TX Slip, RX Slip

Compliance
- AT&T 54016, AT&T 62411, CE Mark, FCC Part 15 class A, FCC Part 68, ISES-003, ITU-T G.703, ITU-T G.704, ITU-T G.826, NEBS Level 3, CSA/UL-60950-1

Circuit/Packet eXchange (CPX) Module Set

- Consolidates Circuit/Packet Processing Functions

- Enables Cost-Efficient Migration from TDM to IP

- Supports Industry-Unique Test Access for IP

- Maximizes Network Reliability and Scalability

- Increases Provisioning Speed and Flexibility

The Circuit/Packet eXchange (CPX) module set adds a unique IP forwarding engine to DNX-11/88 Multiservice Cross-Connect platforms, which offers a higher level of integration than linking disparate devices (digital cross-connect, external router, and standalone hub). By consolidating circuit/packet traffic, eliminating physical WAN interfaces, and integrating Ethernet switch functionality, CPX enables a seamless transition from TDM to IP technology in both fixed line and mobile networks, while reducing operational cost and complexity.

The CPX/DNX solution provides a single chassis solution that supports both circuit and packet traffic grooming. The module supports 32 WAN links, with up to 32 DS0s per link, which can be set up as PPP links or grouped together to create up to 8 Multi-Link Point-to-Point Protocol (ML/PPP) bundles; and is fully interoperable with Ethernet/PPP-compliant routers and signaling elements (STP and SCP). Channelized IP filtering and forwarding functions directly interconnected to a cross-connect fabric distinguish CPX from any competition. CPX also extends the carrier-grade reliability of DNX platforms to Ethernet/IP, with an industry-first implementation of MonE/F Ethernet test access and support for IP SplitE/F provisioning and monitoring.

The ability to groom TDM and Ethernet/IP traffic onto shared T3/E3 or OC-3/STM-1 facilities in a single platform with pay-as-you-grow scalability greatly enhances applications flexibility. Fixed line network operators can use CPX for consolidating network management traffic with user data traffic alongside TDM circuit data onto a single transport medium. The DNX/CPX solution delivers carrier-grade circuit reliability and high-performance packet processing in a single, integrated system, allowing a rapid response to traffic growth with little or no additional equipment or rack space.

Mobile network operators can use CPX to converge data control network (DCN) traffic from individual base stations and associated equipment within the site onto a shared, IP transport, and combine traffic from multiple base stations for long-distance backhaul to the MTSO.

SS7 network operators can scale high-growth links to Sigtran while leaving low-speed and T1 SS7 links in place; and leverage the carrier-grade transport network by carrying Sigtran traffic over bundled T1 links using enhanced ML-PPP.

SPECIFICATIONS

Model Number
- MKT-006-30221: CPX Application Module (Front)
- MKT-006-30028: CPX Interface Module (Rear)

CPX Module Set
- Double slot width: Application Module (front card) and Interface Module (rear card)

Virtual Port Capacity
- 32 PPP links, 8 ML-PPP bundles, 1024 DS0, 32 T1/E1

Switch Port Interfaces
- 8 10/100BaseT, fixed or auto-negotiate speed and duplex

Connection Method
- 8 individual RJ-45 receptacles for 10/100BaseT, single terminal screw strip x3 for alarm contacts

Alarm Contact Inputs
- 3 NO/NC connections for integrated alarming

LAN Protocols
- IP filtering, forwarding

WAN Protocols
- PPP and ML-PPP

IP Test Access
- Multi-port Ethernet MonE/F, IP SplitE/F

Compliance
- NEBS Level 3 design, FCC Part 15 class A, CSA/UL-60950-1, EU, RoHS, CSA, CE

DS0-DP Data Module Set

- 4-Wire Data Interface for Office Use

- High Density Alternative to Channel Banks in a Manageable Grooming Platform

- Developed to/Certified Interoperable with Tekelec Eagle STP (EILA Module)

- Byte Clocked Timing to Maintain Internetwork Operations

The Digital Signal Level 0-DataPort (DS0-DP) module set offers network operators a cost effective solution for the transmission of SS7 information. A DNX configured with the DS0-DP module enables easier access to the STP (Signaling Transfer Point) by replacing channel banks, cross-connect switches, and CSUs, which greatly improves management and connectivity.

Consisting of an application and interface module working in concert, the DS0-DP module supports up to 8 DS0-DP ports operating at 64 or 56 Kbps data rates, all with integral BERT and loopback diagnostics. The interface is a single 50-pin female telco connector with the wrap harness, shield ground screws, and a 3-position terminal block for interfacing to the byte clock.

SPECIFICATIONS

Model Number
- MKT-006-10508: DS0-DP Application Module (Front)
- MKT-006-10058: DS0-DP Interface Module (Rear)

Physical Interface
- One RJ-48M (50 pin)

Electrical Interface
- TR-TSY-000 458

Line Rate
- 64 or 56 Kbps

External Timing
- 64 Kbps Building Integrated Timing Supply (BITS) Composite Clock with Byte Synchronization, 3 Position Terminal Blocks, 133 ohm Impedance

Loopbacks
- Local toward 4-w Drop

BERT Tests
- All Ones to Drop
- 511 to Drop
- 2047 to Drop
- QRSS to Drop
- All Ones to Network
- 511 to Network
- 2047 to Network
- QRSS to Network

Compliance
- CSA 22.2-950, FCC Part 15 class A, FCC Part 68, NEBS Level 3, CSA/UL-60950-1

Octal High Speed Data Module Set (OHSD)

- IAD Feature Set in a Scalable Multiservice Cross-Connect

- Diverse Competitive Wireline and Wireless Solution

- Second Generation, Feature-Rich DNX Data Port

- Comprehensive Support for Legacy and Emerging Data Applications

The Octal High Speed Data (OHSD) module set supports a diverse mix of data applications that address the evolving needs of competitive network service providers, emerging wireless carriers, and corporate enterprises. A front application module and rear interface module provide individual connectivity for industry standard data interfaces operating between 9.6 Kbps and 2.048 Mbps. A number of optional cable assemblies are available to facilitate customer installations.

Data applications are typically not the forte of traditional digital cross-connect systems (DCS), particularly at higher speeds. In contrast, an Integrated Access Device (IAD) often provides a strong complement of high-speed data options. However, the total network capacity an IAD can support tends to be very limited. OHSD features include:

- Single slot-width, DNX application (front) and interface (rear) module

- Eight software-selectable, independent synchronous DCE ports

- EIA-530, EIA-530-A, EIA-422, EIA-232, ITU-T V.35 or ITU-T X.21 interfaces

- Eight individual DB-26 female connectors (optional cables available)

- 9.6 (DS0-A format), 48, Nx56 and Nx64 Kbps to 2.048 Mbps data rates

- Multiple port timing modes, plus system clocking reference support

- Application-specific control signal selection and monitoring

- Integral local/remote loopback and multi-pattern BERT diagnostics

The ability to effectively groom backhaul links and manage remotes sites has become a critical success factor for Cellular/PCS providers. In a typical wireless services infrastructure, in addition to the underlying voice traffic, a DNX transports digital SS7 Common Channel Signaling (CCS) information and router-based CDPD data and site telemetry,

SPECIFICATIONS

Model Number
- MKT-006-10828: OHSD Application Module (Front)
- MKT-006-10838: OHSD Interface Module (Rear)

Physical Interface
- 8 Ports

Electrical Interface
- EIA-232 (DB-26), EIA-422 (DB-26), EIA-422 (DB-26), EIA-449, EIA-530 (DB-26), EIA-530-A (DB-26), ITU-T V.35 (DB-26), ITU-T X.21 (DB-26), ITU-T X.27

Line Rate
- 9.6 Kbps (DS0-A), 48 Kbps, Nx56/64 Kbps

Clocking Modes
- Internal, Internal/External, External (+ Reference)

Loopbacks
- Local: Port/Backplane
- Remote: V.54/OCU-NL
- Local: Port/Backplane
- Remote: V.54/OCU-NL (+ DTE LL/RL Controls)

BERT Tests
- 511; 2047; All Ones; All Zeros; QRSS

Alarms
- Red (FIFO Errors, TX, Clock, Carrier drop on failure, Configuration)

Compliance
- FCC Part 15 class A, CSA/UL-60950-1

such as door security alarming, to the Mobile Telephone Serving Office (MTSO) or Mobile Switching Center (MSC). This configuration is reproduced for each base station within a given service area. At the MTSO/MSC, traffic is directed to the proper data or voice systems and/or networks. SS7 Common Channel Signaling information can be transported to the appropriate internal STP systems and/or outsourced to a third-party CCS network provider. To facilitate collection and dissemination of router-based traffic, a Router 8 (CHR) module is available for the DNX platform.

The OHSD module can benefit an enterprise trying to take advantage of the new competitive multi-services arena by deploying its own or carrier-provided premises equipment. In this application, the DNX functions primarily as an IAD rather than a DCS. In a corporate network spanning a campus setting with a separate disaster recovery site, data applications are typically plentiful and diverse. Router and videoconferencing traffic is groomed and mapped as required to serve the evolving needs of the corporation. In addition, the reconfiguration capabilities of the DNX can be used to redirect mission-critical data via pre-allocated back-up links in the event of a system, facility, or network failure.

Router/8 Module Set

- Channelized IP/IPX Routing with Direct 1-0 Cross-Connect Integration

- Eight Port 10/100BaseT Switch Functionality

- Frame Relay Support on a Single WAN Interface for up to 256 Virtual Circuits

- 32 Virtual WAN Interfaces Operating at Nx56 and Nx64 Kbps

- Three External Alarm Contact Inputs

- Network Address Translation (NAT), IP/IPX Filtering, OSPF, Data Compression, and DHCP

The Router/8 module set consists of an application module and interface module, which offers a higher level of integration than using disparate devices (DCS, external router, and standalone hub). This module consolidates packet traffic from up to 32 distinct paths, reduces cost through the elimination of physical WAN interfaces, and integrates Ethernet switch functionality.

The Router/8 is compatible with other Ethernet/PPP/ Frame Relay compliant routers. IP routing functions directly interconnected to a cross-connect fabric distinguishes the Router/8 Module from competing products. Routed data traverses the backplane and leverages other module sets in the product portfolio as physical WAN interfaces.

Wireless Service Providers can use the Router/8 to manage individual base stations and associated equipment within the site; and to consolidate traffic from neighboring base stations at the IP layer for long-distance backhaul to the MTSO.

Competitive Local Exchange Carriers (CLECs), Internet Service Providers (ISPs), and Integrated Communications Providers (ICPs) can deploy the Router/8 module in remote collocation facilities as part of a remote management strategy. This enables remote provisioning and diagnostic control of the DNX and other collocated equipment, without the expense and delays of dispatching service personnel to the remote facility.

SPECIFICATIONS

Model Number
- MKT-006-30211: Router/8 Application Module (Front)
- MKT-006-30018: Router/8 Interface Module (Rear)

Virtual Port Capacity
- Up to 32, 56 or 64 kbps channels, or a lesser number of Nx56/64 where the total value of N is <=32

Switch Port Interfaces
- Ethernet 10/100BaseT, IEEE 802.3, auto-negotiate speed, duplex and cross-over

Connection Method
- Eight individual RJ-45 receptacles for 10/100BaseT, Single terminal screw strip x3 for alarm contacts

Alarm Contact Inputs
- 3 NO/NC configurable contacts capable of sink or source current

LAN Protocols
- TCP/IP, Novell IPX, IP, RIP, RIP2, IPX RIP, IPX SAP, concurrent bridging of all others

WAN Protocols
- PPP, Multi-Link PPP, OSPF, SLIP, LAPB, Frame Relay, (LMI, Q.933A, T1.617A)

SNMP MIBS Supported
- RFC 1213 MIB II, RFC 1315/2115 Frame Relay DTE, RFC 1406 DSI Interface, Sycamore Enterprise MIB

Compliance
- EN 55022, EN 60950, FCC Part 15 class A, IC, ICES-003, CSA/UL-60950-1

Test Access Data Module Set

- Independent Test Ports for Sending Loopback Codes

- Latching OCU, CSU, DSU, V.54, Smart Jack Loops

- Non-Intrusive (Monitor) Testing for Source or Destination

The Test Access Module (TAM) of the DNX Multiservice Cross-Connect provides four test ports to send DDS Latching Loopback codes at only 56/64 Kbps. Each of these ports has network buss connections that function independently of each other.

The TAM is a non-intrusive test device when monitoring the source or destination. It is an intrusive device when testing split source or split destination. It can also execute and/ or monitor test patterns at 48 Kbps to 2.048 Mbps. The interface module provides the electrical interface for four high-speed ports that can be configured independently for RS-232, V.35, or RS-422 at the system console. Each port has a DB-25 female connector for termination to the attached device.

The TAM's DS0-level testing (DDS) within the DS1 is especially useful when trying to isolate a problem without affecting other users on the T1. Test patterns can be generated internally or by test equipment connected to the interface.

SPECIFICATIONS

Model Number
- MKT-006-60224: Test Access Application Module (Front)
- MKT-006-10034: Test Access Interface Module (Rear Optional)

DNX Module Set
- Single slot width, non-redundant application and interface modules

Interface
- Operational mode is fixed as DCE emulation

Connection Method
- EIA-232, EIA-530, ITU-T V.35 (4 x DB-25)

Loopbacks
- Local, Remote, V.54, Latching DSU, Latching CSU, Latching Smartjack NE1, Latching Repeater

BERT Tests
- 2047
- All Ones
- All Zeros

Compliance
- ANSI T1.107B, AT&T TR 62310, FCC Part 15 class A, TA-TSY-00077, CSA/UL-60950-1

PSX-5300 Protection Switch

The PSX-5300 Protection Switch adds redundant circuit protection and enhanced system alarming and system cooling features to DNX-11, DNX-88, and S-DNX cross-connects. It provides N+1 redundancy on electrical interfaces including T1/E1, DS3, and E3. With this protection in place, DNX systems switch to a standby module – with minimal downtime and without user intervention – if a primary module becomes non-operational. The standby module automatically assumes the configuration and cross-connection maps of the primary module at switchover. This increases service availability and minimizes the number of emergency truck rolls required to maintain and restore network elements.

The three rack unit PSX-5300 chassis stacks cleanly atop the DNX-11 chassis, and within its 11 slots, can support up to one narrowband (10+1) and two broadband (6+1 and 3+1) protection groups, depending on the configurations.

Additional PSX-5300 product highlights include:

■ **Circuit Protection for DNX-11, DNX-88, and S-DNX systems** – increases transmission network resiliency by protecting critical narrowband and broadband interfaces in DNX networks on an N+1 basis.

■ **Additional System Alarming** – includes alarm indicators for fan failures, power supply failures, and user-configurable threshold crossing temperature alarms. Easily accessed, both via menu and SNMP interfaces, these alarms help ensure a rapid response to failures.

■ **Additional System Cooling** – improves temperature control via an integral auto-sensing fan assembly. The three-speed cooling system automatically senses the temperature and changes fan speeds accordingly. Fan speed can also be controlled via menu (low, medium, or high), and an auto alarm notifies operations if fan speeds drop.

The PSX-5300 has one common logic controller slot and two 48 VDC power supply slots. All of the redundant and primary modules are hot swappable (including power supply). The common logic controller serves as the interface between the PSX-5300 and the DNX-11 System Manager Controller (SMC) IIA Module.

Note: Use of a DNX SMC-IIA rear interface module is required with the PSX-5300 Protection Switch. A PSX-5300 should be installed for cooling purposes on each nest containing a CPX module.

SPECIFICATIONS

Model Number
- MKT-006-05300: PSX-5300 Protection Switch
- MKT-006-05203: PSX Controller Module
- MKT-006-05208: PSX -48 VDC Power Supply Module
- MKT-006-05209: PSX Broadband Primary Module
- MKT-006-05210: PSX Broadband Redundant Module
- MKT-006-05204: PSX Narrowband Primary Module
- MKT-006-05206: PSX Narrowband Redundant Module

Physical Interface
- Broadband: Female BNC 75 ohm
- Narrowband: 50-pin, RJ-48M 100(T1)/120(E1) ohm
- Controller: Shielded DB-9 Connection Supporting Serial Asynchronous Data

Equipment Heat Dissipation
- 13.1 Watts/sq.-ft/ft.

BTU/Hour Maximum
- 140 BTU/hr maximum

Dimensions
- 431.8 mm W x 355.6 mm D x 133.4 mm H (17" x 14" x 5.25"); 3 RU height

Weight
- 27.5 lbs. (Loaded)

Mounting
- Rackmount (19" or 23") 23" ordered as Center or Flush Mount

Power
- -40 VDC to -60 VDC, Max. 48 Watts

Chassis
- Rear mounting interface modules, front mounting fan assembly

Environment
- 0° (32°F) to 50°C (122°F) Temperature
- 0% to 90% Humidity (Non-Condensing)

Compliance
- CB Scheme, CE, CTR 12/13, FCC Part 15 class A and Part 68, IC, IC CS-03, IC ICES-003, NEBS Level 3, CSA/UL-60950-1