



Carrier VoIP

MG 9000 Basics

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New in this release

The following sections detail what's new in *MG 9000 Basics* for release (I)SN09U.

- "Features" (page 3)
- "Other changes" (page 4)

Features

See the following sections for information about changes that are feature-related.

- "MG 9000 downloadable version of GLC 32" (page 3)
- "NTNY53BA GLC 32 card replaces POTS 32 and NTNY53AB GLC 32 card" (page 3)
- "MG 9000 GLC 12 Line Card providing NA Coin services" (page 4)
- "Global line card field programmable gate array download" (page 4)
- "MG 9000 ABI interface to SMU" (page 4)

MG 9000 downloadable version of GLC 32

This feature introduces the NTNY53BA 32-circuit global line card (GLC 32), which is deployed in either the ATM or IP solution. The NTNY53BA GLC offers field-programmable firmware. Users can upgrade the configuration load of the GLC's Field Programmable Gate Array (FPGA) from the MG 9000 Manager (EM).

NTNY53BA GLC 32 card replaces POTS 32 and NTNY53AB GLC 32 card

The NTNY53BA GLC 32 card replaces the POTS 32 card (the traditional telephone service card with 32 ports) and the NTNY53AB GLC 32 card.

The NTNY53BA GLC can safely replace the GLC NTNY53AA and the WLC 32 without changing the provisioning prior to replacement. References to the NTNY53AB GLC 32 card have been removed from the Basics Guide because this card is discontinued.

MG 9000 GLC 12 Line Card providing NA Coin services

This feature introduces the NTNY53CA 12-circuit global line card (GLC 12), which can be deployed in either the ATM or IP solution. The GLC 12 is based on existing GLC 32 technology. The GLC 12 line card is functionally identical to the NTNY53BA GLC 32, with two exceptions: the NTNY53CA GLC 12 card supports 12 lines (rather than 32), and supports the Coin Line Resource (CLR) feature (which is not offered by the GLC 32 card). The GLC 12 supports all line service types supported by existing MG 9000 line cards.

The GLC 12 replaces the Service Adaptive Access 12-circuit line card (SAA 12). The NTNY53CA 12-line GLC can only safely replace the SAA-12 card without changing the provisioning prior to replacement. The software to support the card is patched back to release SN08.

Global line card field programmable gate array download

This feature provides the software interface for the downloadable GLC 12 and 32 cards. Changes appear in the GLC Card View and the GLC Diagnostic View. The MG 9000 Upgrade Wizard has also been modified to include the GLC cards

MG 9000 ABI interface to SMU

This feature adds the Subscriber Module Urban (SMU) and its subtending Remote Concentrator Urban (RCU) to the list of legacy peripheral modules (PM) supported by the Access Bridging Interface (ABI) program.

When you increase the maxlines on an RDT off MG9000 ABI by modifying the MAXLINES field of table RTDINV, perform double warm SWACTs on the MG9000 GWC to update the internal table of the MG9000 GWC (or you cannot use the newly expanded lines).

The Remote Digital Terminal Inventory (RDTINV) table contains the central control side connectivity and RDT configuration information. When the VARTYPE subfield RDTVAR is configured as GENTMC, the MAXLINES subfield is set from 0 to 2048 lines.

Other changes

Release (I)SN09U contains no other changes.

Functional description

The Nortel Networks Media Gateway 9000 (MG 9000) is an access gateway positioned at the edge of the network, offering a wide range of voice, data, and video services with direct accessibility to the asynchronous transfer mode (ATM) network.

The MG 9000 is a multi-service media gateway that enables leading edge services and transitions revenue-generating voice services into the packet access domain. The MG 9000

- provides a single access platform for multiple services. This is accomplished by combining voice and data services into a single gateway, with a single network interface and single management infrastructure.
- has up to 16 service slots in each shelf
- connects subscriber interfaces directly to backbone networks
- supports the following data connections and services in the master shelf:
 - full-rate asymmetrical digital subscriber loop (ADSL)
 - digital signal level-0 (DS-0) Specials
 - DS1 Private Lines (DS1 cards are not used in the Universal Access - Internet Protocol [UA-IP] solution.)

Note: The private lines application is not supported on an MG 9000 in an IP solution.

- supports emergency stand alone (ESA)
- supports Internodal ESA (assignment to an ESA community of interest [COI]) when the MG 9000 is connected to a LAN switch (Multiservice Switch 15000 or equivalent)
- supports up to four XPMs (ESMA/LGCI) through four pairs of DS-512 cards
- deploys in the following solutions:
 - UA-AAL1 - The Universal Access-AAL1 (UA-AAL1) solution is a multi-service ATM network solution. The UA-AAL1 solution provides

voice, DSL, and private lines services over a unified ATM network in the North American market. The UA-AAL1 solution uses the ATM transport network to carry packetized voice, call control signaling, OAM and data traffic.

- UA-IP - The Universal Access IP (UA-IP) solution provides an end office capability featuring plain old telephone service (POTS), P-Phone, and Coin lines services, trunking services, and DSL services in International and North American markets. The UA-IP solution uses the IP network to carry packetized voice, call control signaling, OAM and data traffic.

The MG 9000 contains a master shelf configuration for the switched lines application, which contains the common equipment cards for the node. This is the first MG 9000 shelf in the node (typically the bottom shelf in the frame). Additional shelves in the node are subtended from the master shelf by use of connections through the Internet telephony processor (ITP) card and Internet telephony extender (ITX) card.

For multiple shelves in the frame using the private lines application, each MG 9000 is considered a standalone shelf. Each shelf has its own connection to the ATM backbone. For mixed services, the master shelf contains the private lines application cards and the common equipment cards for the DSL and switched lines applications. Mixed shelves are provisioned according to private lines standards. Additional shelves in the node are subtended off the master shelf.

The MG 9000 is used as a single or multiple shelf node depending on the customer line capacity requirements. The term node is used to describe a MG 9000 network element connected to an ATM or IP network.

The MG 9000 supports three applications:

- private lines over ATM
- switched lines
- DSL

MG 9000 applications

Each of these applications can reside in the same shelf or in different shelves. There is no physical difference between the shelves used for the private lines and switched lines applications. A single shelf can be provisioned to provide private lines and switched lines applications.

The type and number of individual circuits are limited by the hardware restrictions for each application.

Switched lines

The MG 9000 is a scalable platform providing tip and ring subscriber interfaces and redundant OC-3/STM-1 or DS1 IMA interfaces to the Succession Network.

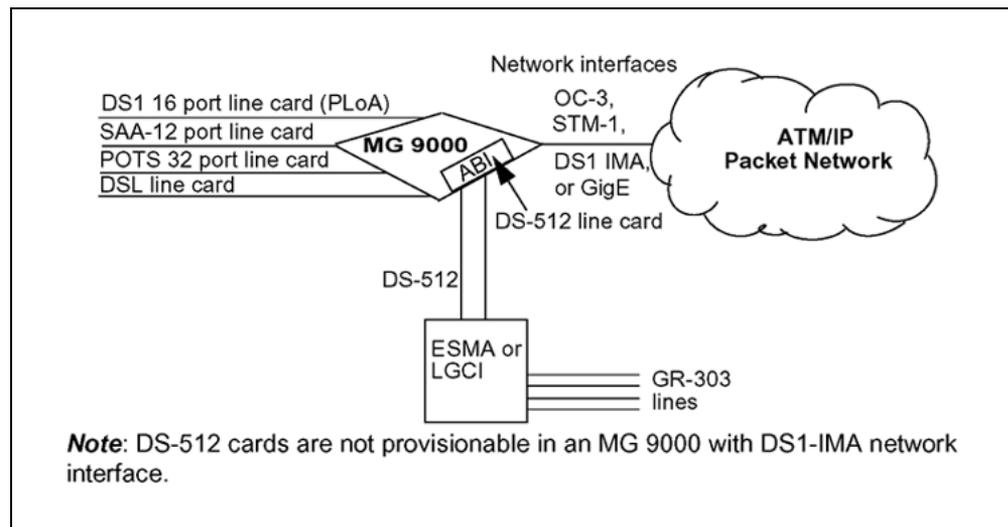
Switched lines services include wireline access on the MG 9000 and the services required to support the lines. The switched lines application brings narrowband voice services onto the Succession Network and acts as a switch replacement.

Support for legacy XMS-based peripheral modules (XPM) is provided using access bridging interface (ABI) over DS-512 card. XPMs and subscriber lines connected to XPMs that are subtended from the MG 9000 over DS-512 links are not managed by the MG 9000. A list of supported XPMs is provided in the "[MG 9000 voice cards](#)" (page 9) table under DS-512.

Note: Broadcast loading/patching is not supported on XPMs hosted by the MG 9000 ABI cards.

The following diagram is an illustration of the switched lines application.

Switched lines application



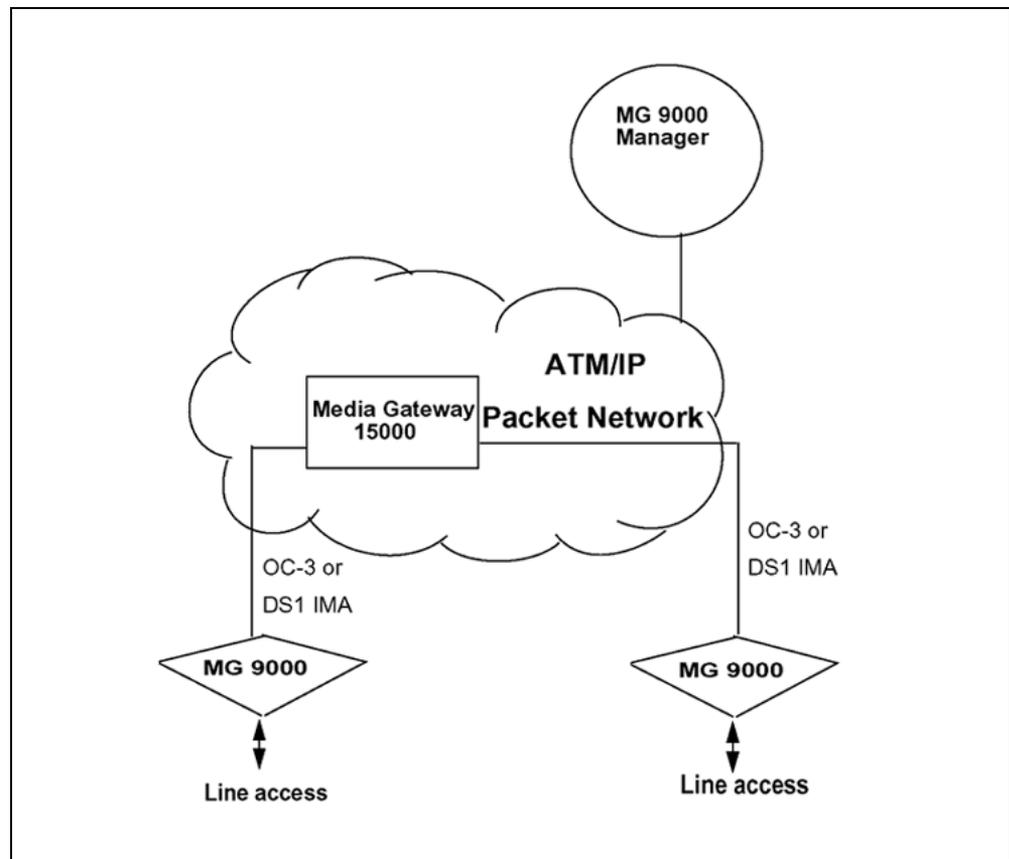
Private lines

The MG 9000 is a scalable platform that supports DS1 private line subscriber interfaces over an OC-3 or DS1-IMA network interface. Private lines are persistent DS1 or DS0 connections that are provisioned by the operating company as persistent connections to the subscriber.

Note: The private lines application is not supported on an MG 9000 in the UA-IP solution.

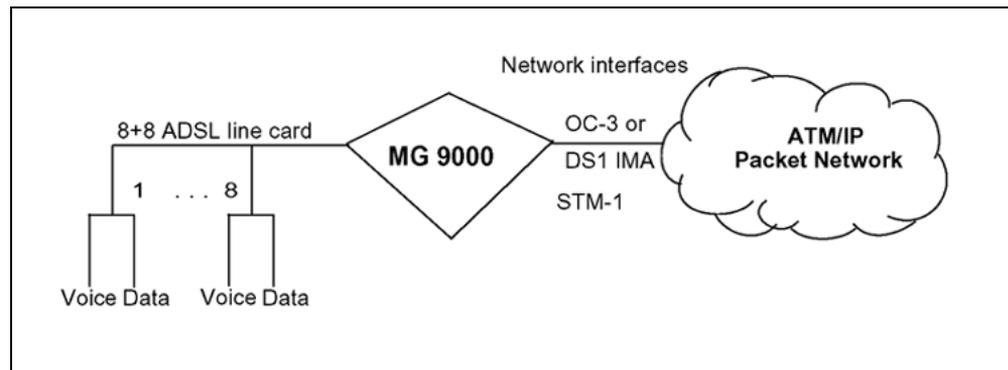
The following diagram is an illustration of the private lines application.

Private lines application



DSL

Digital subscriber line (DSL) services transmit two separate data streams with greater bandwidth devoted to the downstream (subscriber) than the upstream. DSL lines can be provisioned on the same shelf with switched lines and private lines. The 8+8 ADSL card supports DSL lines and terminates eight fully compliant ADSL subscriber loop pairs for analog voice telephone service and standard compliant ADSL data services. DSL cards supporting asymmetric DSL (ADSL) data services are provisioned only in the master shelf. The following diagram is an illustration of the DSL application.

DSL application**Service module types**

This section describes the service module types for the MG 9000.

Voice

The following table lists the cards for the MG 9000 voice service.

MG 9000 voice cards

Card	Description/function	Application
POTS 32	Traditional telephone service card with 32 ports.	UA-AAL1 and UA-IP solutions
GLC 32	Global line card with 32 ports.	UA-AAL1 and UA-IP solutions
GLC 12	Global line card with 12 ports and Coin Line Resource (CLR) services.	UA-AAL1 and UA-IP solutions
SAA-12	12-port service adaptive access line card that support 2-wire services. Example: POTS, P-phone, loop-reversal, and North American Coin (requiring 100 V generator for coin return).	UA-AAL1 and UA-IP solutions
DS1 16	16-port DS1 line card that support private and leased line service over a circuit emulation service (CES) function.	UA-AAL1 solution only
DS-512	Up to four legacy XPMs are supported off the MG 9000 through up to four pairs of DS-512 cards in the master shelf (one pair/XPM). The following legacy XPMs are supported: <ul style="list-style-type: none"> ESMA, SMS, and SMS-R (Mode 1, 2, & 3) LGC, LGCI, LTC, LTCI (supporting the following subtending peripherals: LCM, RLCM, LCME, RSC, Dual RSC and RSC-S, OPM, OPAC, RLCM, and Star Hub), and the Subscriber Module Urban (SMU) and its subtending Remote Concentrator Urban (RCU) 	UA-AAL1 and UA-IP solutions

Card	Description/function	Application
	<p>Note 1: DS-512 cards are not provisionable in an MG 9000 with DS1-IMA interface cards.</p> <p>Note 2: The following limitations apply to ABI SMU support.</p> <p>ABI SMU does not support Line Digit Trunk Public Safety Answering Point (LDT PSAP).</p> <p>ABI SMU does not support Remote Maintenance Modules (RMM). Conduct line testing on the RCUs by using the RMM subtended from an ABI LTC/LGC or an ABI SMA2.</p> <p>MG 9000 Emergency Stand-alone (ESA) feature supports ABI SMU but not ISDN functions while in the ESA state. ISDN is not supported on any ABI XPM while the MG 9000 is in the ESA state. The SMU supports P-Phones by using the D-channels provided by the ISDN signaling processor (ISP) and the D-channel handler (DCH) cards. Because the MG 9000 ESA feature does not support ISDN, the SMU does not support P-Phones when the MG 9000 is in the ESA state.</p> <p>ABI SMU operates only with the UA-IP solution, not the UA-AAL1 solution.</p>	

Integrated voice and data service

The following table lists the cards for the MG 9000 integrated voice and data service.

MG 9000 integrated voice and data cards:

Card	Description/function	Application
ADSL 8+8	ADSL card with 8 full-rate data ports (software selectable) and 8 POTS ports.	UA-AAL1 and UA-IP solutions (not supported on MG 9000 with GigE DCC cards)

Network interfaces

The following table lists the network interfaces for the MG 9000.

MG 9000 network interfaces

Interface	Description/function
OC-3c (UA-AAL1 solution or UA-IP solution) or	Optical network interface with a base transmission rate of 155.52 Mbps, used on data control card for voice and data. The OC3 carrier can be configured as concatenated or channelized. If channelized, the OC3 carrier is divided into three STS-1 channelized carriers with a DS3 payload.
STM-1c (SDH) (UA-IP solution)	SONET digital hierarchy (SDH) base transmission rate of 155.52 Mbps, known as synchronous transport module 1 (STM-1), used on data control card for voice and data.
Gigabit Ethernet (GigE)	Gigabit links connect to IP network and use virtual local area networks (VLAN) to segregate IP traffic into bearer, call processing signaling, OAM signaling, and link integrity signaling paths.
DS1 IMA	Uses T-1 lines to perform inverse multiplexing over ATM (IMA). The data stream splits across one or more DS1 circuits by the MG 9000 data control card (DCC), which has IMA, and is reassembled at the remote. DS1 IMA is used when the MG 9000 is located at a remote site. (DS1-IMA does not support DS-512 interface cards.)

Emergency stand alone

Emergency stand alone (ESA) in the MG 9000 supports basic calls within the MG 9000 while one or more of the virtual media gateways (VMG) in the MG 9000 are out of communication with its assigned Gateway Controller (GWC). ESA also provides basic emergency service access (such as 911, 411, and 611).

For the UA-AAL1 solution, 7 digit and 10 digit dialing plan lengths are supported while in ESA mode. For the UA-IP solution, 6 to 13 digit dialing plan lengths are supported.

ESA is supported on ABI VMGs as well as ITP VMGs. However, ABI VMGs only support Enhanced ESA, meaning ESA data is used from the Core. In addition, ESA on ABI VMGs currently does not support warm exit.

Note: If the Core loses connectivity with the ABI VMG for more than 25 seconds, the VMG and hence the XPM, enters ESA. The XPM becomes System Busy (SysB). Calls warm enter ESA, however ESA warm exit on ABI is not supported and calls drop when the Core completes the restart and resumes connectivity with the ABI and the XPM.

The following table lists the ESA capabilities available on the MG 9000.

ESA capabilities by solution

ESA capability	Supported?	
	North American	Inter-national
Warm entry - calls in a stable state stay up, if the bearer path is not cut, and will tear down gracefully.	Yes	Yes
Warm exit for POTS, P-Phone, Coin, and IBN lines - enables calls that were active (in a talking state) in ESA mode to survive exit and continue to be managed by call control until the call completes.	Yes	Yes
Note: Not supported for ABI VMGs.		
Inter-ITP/VMG ESA - calls between ITP shelves that are in ESA on the same MG 9000.	Yes	Yes
7 digit dialing - any subscriber on an MG 9000 must be able to dial a 7 digit number to reach any other subscriber in the same HNPA on the same MG 9000.	Yes	Yes
10 digit dialing - ability to support multiple HNPAs on a single MG 9000, as a requirement for future trunk support.	Yes	Yes
Variable length dialing - ability to support 6 or 8 digit DN's per market dialing plan.	Yes	Yes
Coin lines supported in ESA, with no coin collection.	Yes	No
911, 411, 611 dialing - service codes translate to a DN per ITP.	Yes	Yes
Multiple appearance directory number (MADN) lines - if a user dials a MADN number, the (ESA) call will terminate to a member if one is available. Also, only this available member will ring in the ESA call. In non-ESA mode, all MADN members will ring.	Yes	Yes
Basic call processing on P-Phone lines in ESA only, primary DN only	Yes	No
<ul style="list-style-type: none"> • the primary DN, Hold, RLS, and digit keys are the only recognized keys supported for P-Phones • the handset and hands-free operation is supported for P-Phones 		
Simultaneous 7/10 digit dialing	Yes	Yes
Multi-length dialing plans available	No	Yes

ESA capability	Supported?	
	North American	Inter-national
Support for hunt groups - multi-line (MLH), Distributed Line (DLH) and Directory Number Hunt (DNH) hunt groups.	Yes	Yes
<p>Note 1: All hunt groups are treated as MLH hunt groups, meaning the hunt group can only be accessed by dialing the pilot DN. Hunting, however, is nonlinear among the VMGs that are in ESA. The call may be terminated to any available member in the group regardless if the group is split across VMGs. A hunt group divided across several VMGs cannot guarantee true linear hunting for the group. The H selector in table ESAPXLA for a hunt group, the sequence number to indicate which hunt group member to start hunting from, is not supported.</p> <p>Note 2: Circular hunting (CIR) is not supported.</p>		
Centrex extension dialing in ESA	Yes	No
The dialing plan allows		
<ul style="list-style-type: none"> The ability to dial members of the same customer group through a Core datafilled extension numbering plan (Centrex extension dialing) is supported. Customer group support - 3-5 digit extension dialing, IBN restricted dialing, per customer group emergency numbers 		
7-digit, 10-digit, or 7-digit and 10 digit simultaneous dialing.	Yes	No
The ESAPXLA table in the Core should be provisioned with the emergency service numbers (such as 911) needed while in ESA. Since each VMG can independently drop into ESA, it is recommended that each VMG (as represented by an LGRP in the Core) represented in the ESAPXLA table be provided with its own emergency service translation and a local terminating DN.	Yes	Yes
Emergency service translations are supported, but not emergency service features.		
Automatic line support - when an automatic line goes off hook, a call is automatically made to a predetermined datafilled directory number.	Yes	Yes

Internodal ESA

Internodal ESA provides the ability to make calls while in ESA between MG 9000 network elements. This means the operating company can provision a community of interest (COI) which defines the MG 9000 network elements can make ESA calls between one another. A community must have access to a LAN switch (Multiservice Switch 15000, or equivalent) for Internodal ESA calls to complete.

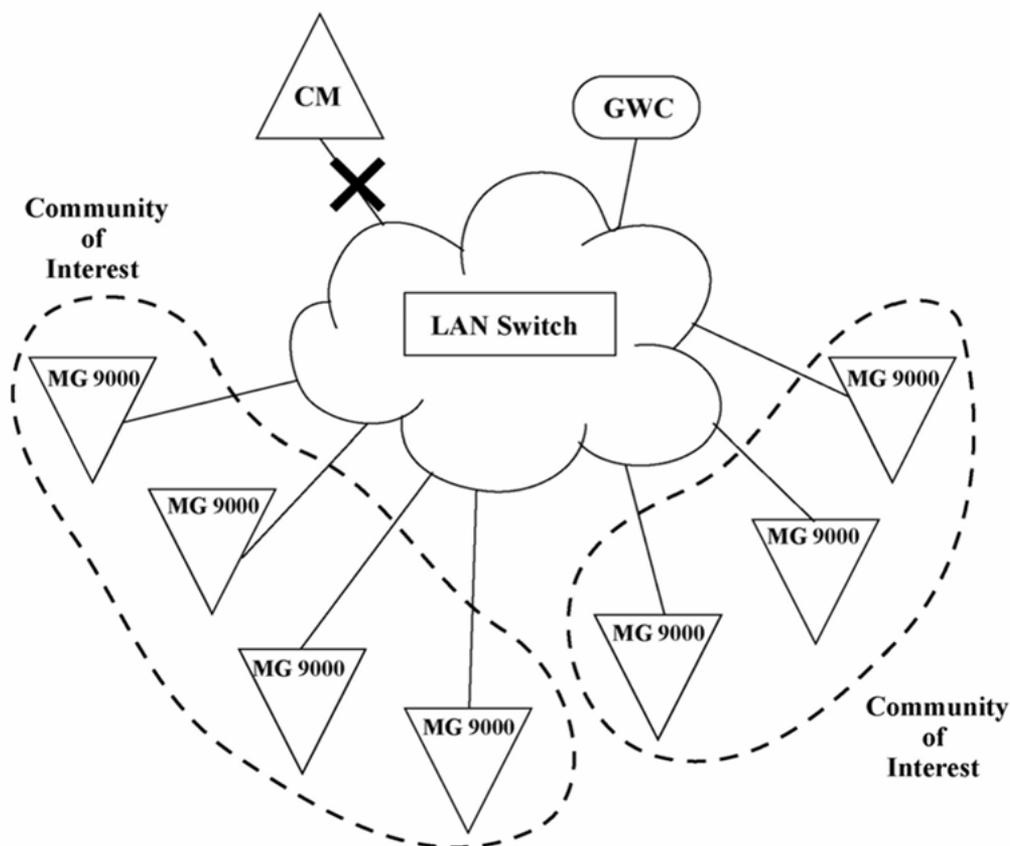
If an MG 9000 does not have access to a LAN switch, the MG 9000 will operate in ESA by routing calls between VMGs within the MG 9000 network element. In addition, though a COI is defined, each network element must be in ESA for it to participate in the community. Network elements are not forced into ESA.

The following information applies to internodal ESA:

- up to 32 COIs can be defined for a network
- up to 15 nodes can be members of a COI
- a network element can only belong to one COI
- the PVR (Multiservice Switch 15000) must be configured through the MG 9000 Manager for internodal ESA to function

The internodal ESA COIs and PVR are provisioned through the MG 9000 Manager. Refer to *MG 9000 Configuration Management*, NN10096-511. The following figure shows a functional diagram of internodal ESA with MG 9000 network elements assigned to a community of interest.

Internodal ESA functional diagram



ESA MLPP

ESA Multiple Level Precedence and Preemption (MLPP) is supported when the MG 9000 is in Enhanced ESA. MLPP interworks with the supported Enhanced ESA line services feature set across all nodes including Internodal ESA, AUL, Hunt Groups, and MADN.

MLPP on MG 9000 requires that two attributes be provisioned, the precedence level of the line and if the line can be preempted. This data is sent from the Core to the MG 9000 Manager and cannot be modified from the MG 9000 Manager. The attributes can be set only on a switch supporting MLPP provisioning and any values and GUI views relating to MLPP are only visible in MLPP offices.

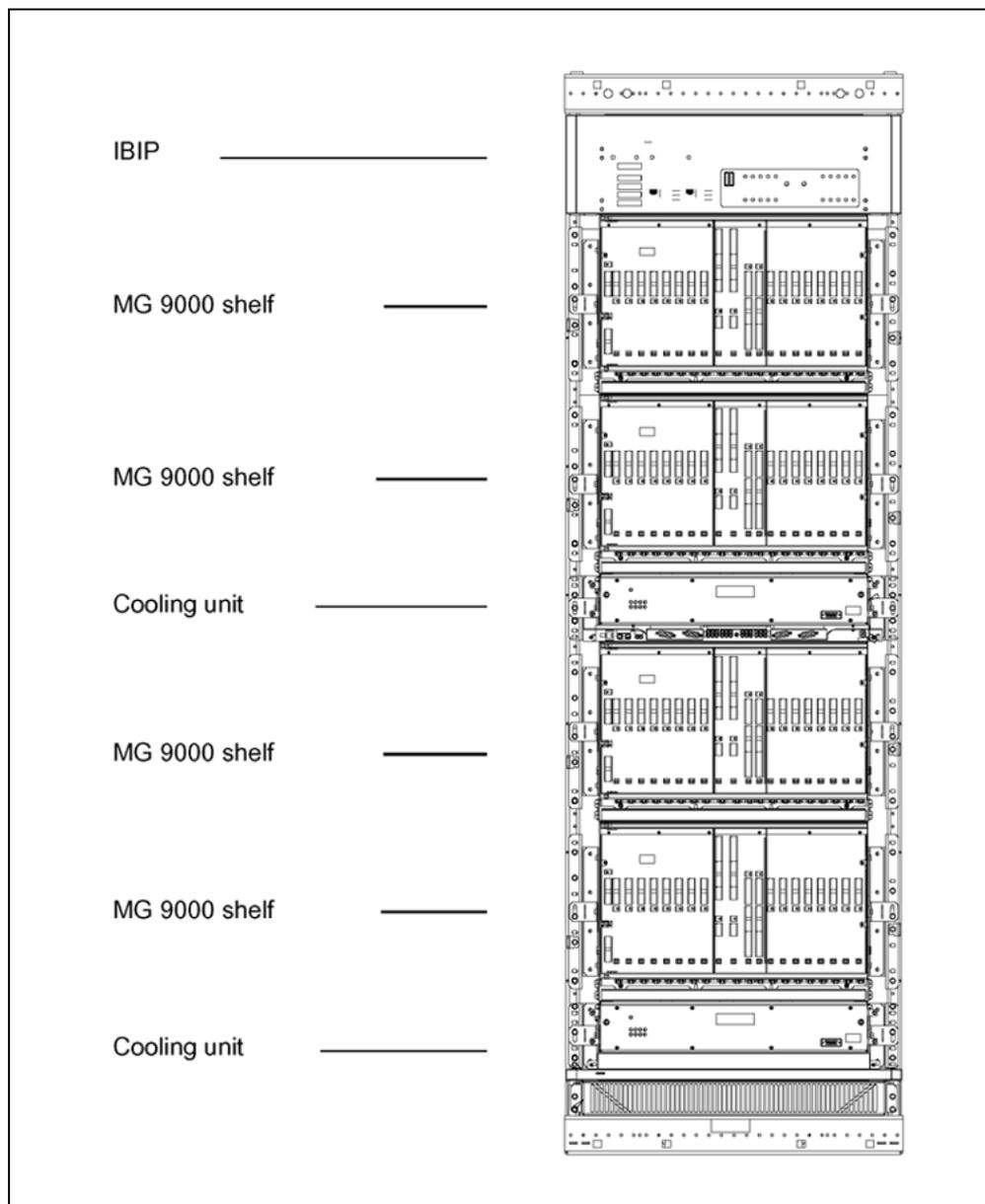
Hardware

NTNY01BB MG 9000 frame

This section describes the frame for the MG 9000. The frame available for the MG 9000 is the NTNY01BB MG 9000 frame.

The following figure shows an NTNY01BB frame configuration.

NTNY01BB frame



The following table lists the frame components for the NTNY01BB frame.

NTNY01BB frame: components

Frame components	Description
IBIP	Intelligent bay interface panel
DCC, ITP, and ITX card	Data control card, Internet telephony processor card, and Internet telephony extender card (up to four sets)

Frame components	Description
Cooling units	2
MG 9000 shelves	<ul style="list-style-type: none"> • 4 • for POTS/combination lines • supports the following applications: <ul style="list-style-type: none"> — Private lines — Switched lines — xDSL services (in master shelf only) — DS-512 (four pairs of cards) connection for up to four subtending XPMs (in master shelf only)

The services available for the NTNY01BB frame include

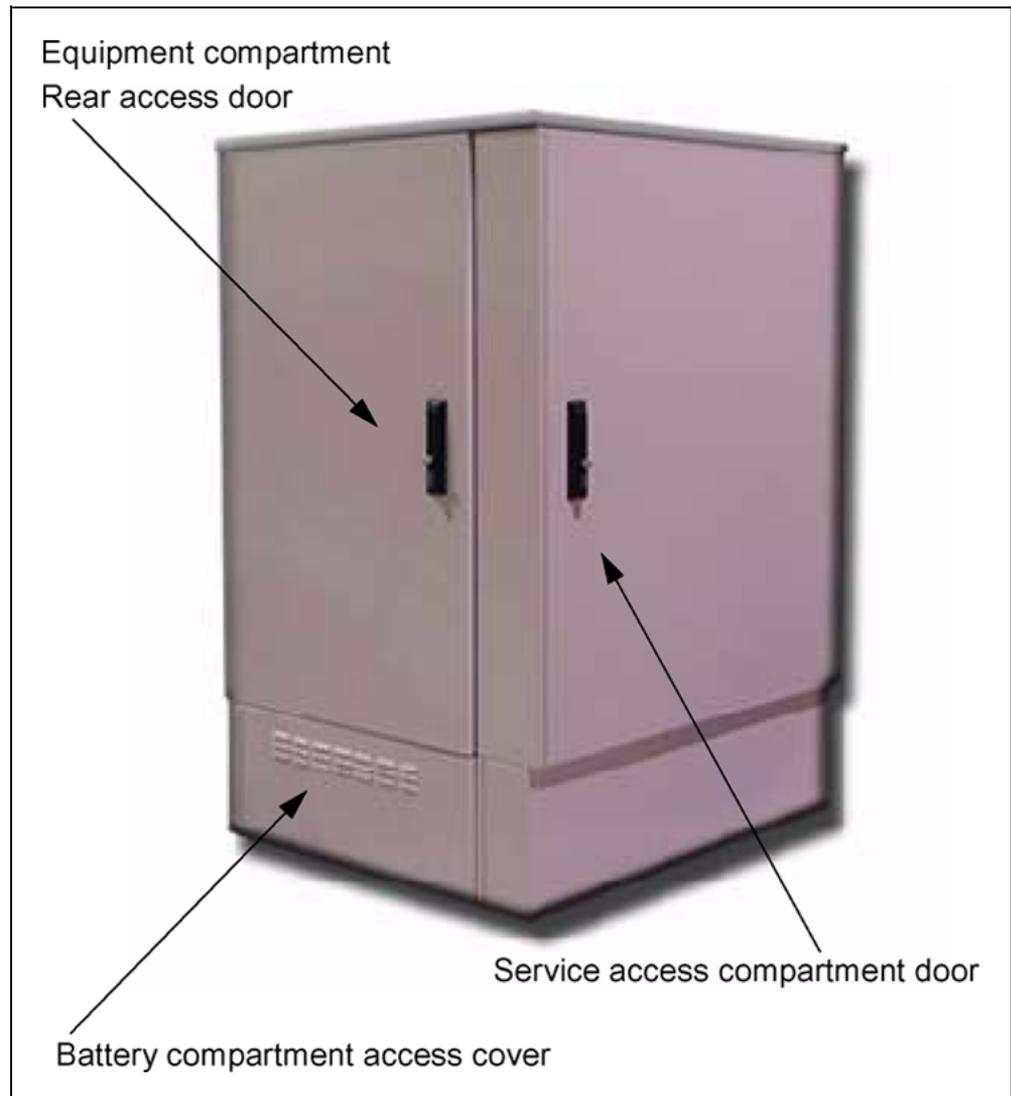
- up to 2016 lines in subtended frames
- up to 1952 POTS lines in the first frame (or exchange for DSL, DS1, or ITX for future growth)

NTNY03AA outside plant cabinet with MG 9000 shelves

The MG 9000 can be deployed in an outside plant cabinet configuration. The NTNY03AA cabinet is an environmentally controlled cabinet that allows the MG 9000 to be located remotely. The outside plant cabinet connects to the network through fiber (OC-3) or copper connections (DS1-IMA T1/E1), or through other customer provided devices. Two MG 9000 shelves are installed in the OPC and support the services noted in the components table. In addition, various optional equipment can be included in the OPC to support.

The following figure shows the outside plant cabinet.

NTNY03AA outside plant cabinet



The cabinet is comprised of three compartments:

- equipment compartment - contains two frames, a fixed frame in the front and a swing frame in the rear. Each frame is accessible from a door. The front fixed frame includes the MG 9000 and all required equipment such as, IBIP, fan tray, fuse panel, and rectifier shelf. The rear swing frame contains optional equipment.
- service access compartment (SAC) - accommodates up to 18x100-pair service protection center (SPC) blocks. The SAC also houses the AC entrance box, the emergency generator outlet, and the battery disconnect panel. Approximately 1000 VF MG 9000 lines will be protected. The remaining block can be used for customer-required lines.

The connection between subscriber lines and the MG 9000 is through 3M MS² 25-pair connectors.

- battery compartment - houses up to three strings of 155 A-Hr batteries for a total battery backup capacity of 465 A-Hr. The compartment is accessible through two panels underneath the equipment compartment doors. Forced ventilation is also provided by a set of fans that exhaust out the compartment on the side opposite the SAC compartment. The battery compartment is passively vented through slots in the removable panels to prevent the buildup of hydrogen gases. The batteries are front-accessible and are housed on top of a battery tray, with battery heater pads available as a option.

Power and communications cabling is routed through holes in the floor of the SAC compartment. Routing of cables to the equipment compartment can be made directly through the SAC equipment wall or through the battery compartment and the equipment floor.

The cabinet is of double-walled construction, having a 1-inch air gap for insulation purposes. The following components are used to control the environment of the cabinet:

- fan shelf - one is required with the MG 9000 shelves. The fan shelf has 8 fans. The fan shelf provides a fan fail alarm. An additional customer-provided fan can be provisioned in the rear swing frame as required for customer-provided equipment.
- heat exchanger - this is an air/air counter flow heat exchanger mounted on the front door, inside the cabinet designed to remove heat from the cabinet.
- optional battery heater pads - when the cabinet is deployed in a region with low temperature extremes (less than 0 C for an extended period of time), an AC powered heater pad is available. The heater pad is thermostatically controlled and activates at 40 F (4.4 C) and deactivates at 60 F (14.5 C)

The following table lists the components for the NTNY03AA outside plant cabinet.

NTNY03AA outside plant cabinet: components

Frame components	Description
IBIP	Intelligent bay interface panel
LCAP	Local craft access panel
DCC, ITP, and ITX card	Data control card, Internet telephony processor card, and Internet telephony extender card (up to two sets)

Frame components	Description
Fuse panel	The fuse panel supports up to eight 0-50 A TPA fuses and up to 20 0-15 A GMT fuses for distribution of dc power to equipment and batteries.
MG 9000 shelves	<ul style="list-style-type: none"> • 2 • for POTS/combo lines • supports the following applications: <ul style="list-style-type: none"> — Switched lines — xDSL services (in master shelf only)
NTM906MA	Fan Tray
Yukon Power System™ rectifier shelf	<p>48 V power rectifier - delivers up to 145 A of redundant dc current at -54.5 V. The unit has an integrated controller, dc distribution, and low voltage disconnect (LVD).</p> <p>The LVD protects the batteries from complete discharge if the rectifier modules become unable to supply load power.</p>
AC protection block	<p>This is an AC entrance box which includes:</p> <ul style="list-style-type: none"> • main entrance breaker rated at 50 A • optional emergency input breaker rated at 50 A • main/emergency breaker selector mechanism • two breakers rated at 25 A to supply the rectifier shelf • one breaker rated at 15 A to supply the optional battery heater pad • one GFCI outlet rated at 15 A • integrated surge protection

The services available for the NTNY03AA frame includes up to 928 POTS lines.

The following table lists the optional components for the NTNY03AA outside plant cabinet. For information, maintenance, configuration, and troubleshooting refer to the documentation provided with the optional equipment.

NTNY03AA outside plant cabinet: optional components

Optional components	Description	Purpose
NTNY03EC	Telect pin field	For a copper-fed system. Provides demarcation point for MG 9000 lines.
NTNY03JC	Siecor Fiber Tray	For a fiber-fed system. Provides demarcation point for MG 9000 lines.
Up to 3 strings of batteries (NTNY03BA or NTNY03BB)	Fiamm 155 A/Hr batteries (NTNY03BA) or GNB 155 A/Hr batteries (NTNY03BB)	Provide a backup time of up to 8 hours under the following traffic and load conditions: 928 switched lines (8 CCS)
NTM906MA	Fan Tray	Optional fan tray for rear swing frame equipment.

MG 9000 shelf description

This section provides the physical descriptions of the shelf configurations associated with the MG 9000.

The MG 9000 shelves are provisioned from the bottom shelf up, starting with shelf MG9K00 and proceeding to shelf MG9K03. Frames with less than four shelves require plenums in the empty shelf spaces to maintain proper airflow for cooling purposes.

The bottom shelf (first shelf) in the frame of an initial MG 9000 is considered the master shelf for the node. An MG 9000 frame supports a maximum of four switched lines shelves.

Refer to the figure titled "[NTNY01BB frame](#)" (page 16) to view the configuration of the frame.

Shelves

This section describes the following shelves in the MG 9000 frame.

MG 9000 shelves

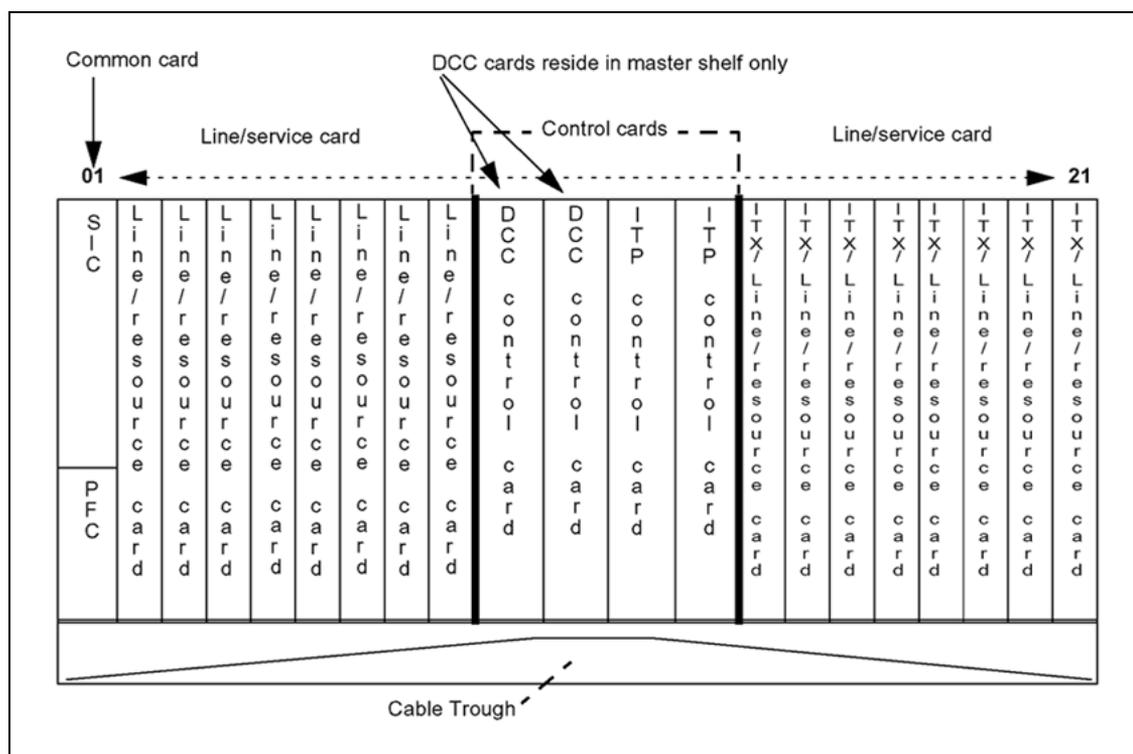
PEC	Description
NTNY11AA	MG 9000 shelf
NTNY15AA	Air filter assembly

PEC	Description
NTNY17BA	MG 9000 Intelligent Bay Interface Panel shelf
NTNY18AA	MG 9000 Cooling Unit shelf with NTNY16AA Local craft access panel (LCAP) (middle cooling unit)

NTNY11AA MG 9000 shelf

The following figure displays the shelf partitioning, card layout, and slot numbering for the MG 9000 shelf. The top numbering of card slots 1-21 is the physical slot numbering. The lower numbering of card slots 0-15 is the logical slot numbering.

MG 9000 shelf layout and card slot numbering



The MG 9000 shelf contains voice and data domains. The domains are independent in the hardware architecture, which prevent traffic conditions in one domain from degrading the operating capacity in the other domain.

- The voice domain includes the voice termination part of each line card and the Internet telephony processor (ITP) common equipment cards. Subscriber traffic and internal control messages pass between the voice band line cards and the ITP common equipment cards.
- The data domain has the same architecture as the voice domain, implemented on ADSL line cards and ATM common equipment cards. Subscriber traffic routes directly between the ATM common equipment card and the data line cards. Internal control messaging routes from the

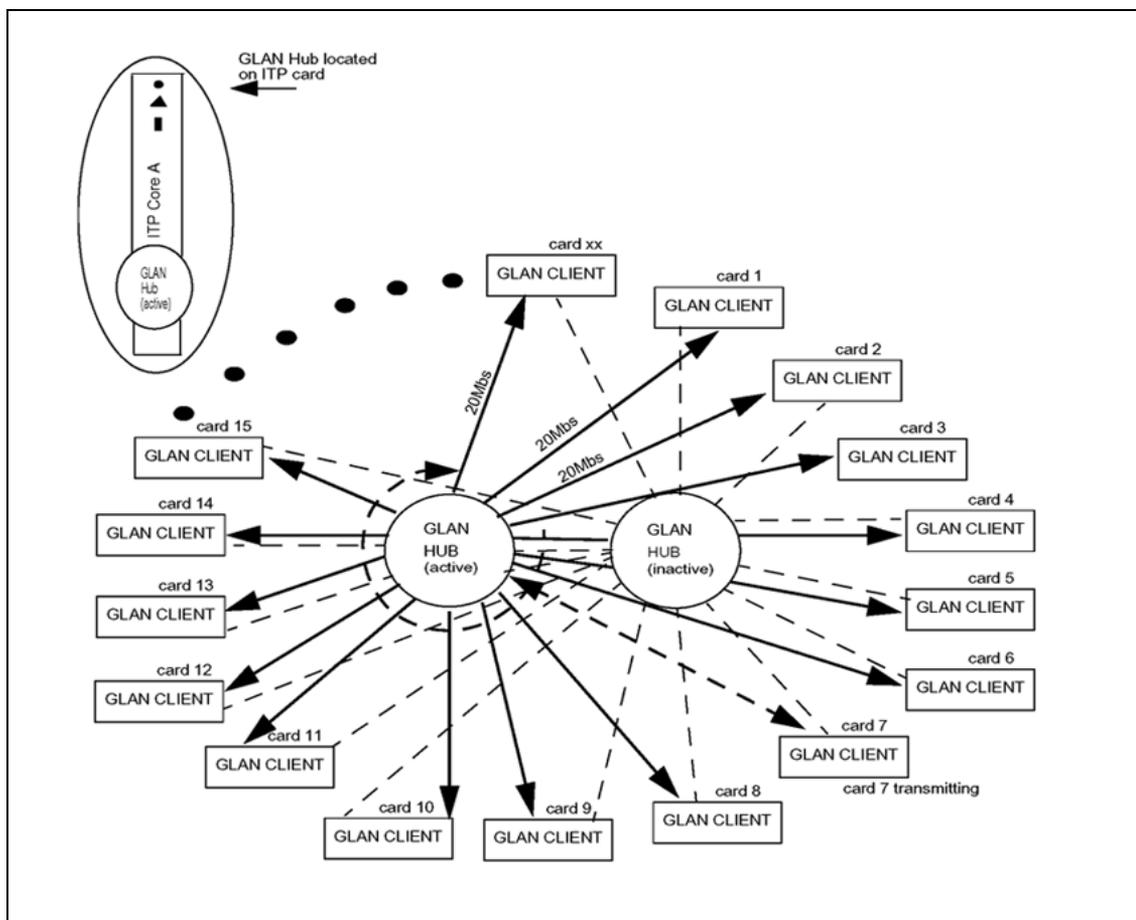
ATM common equipment across GLAN links, through the TDM common equipment cards, to the line cards.

The MG 9000 shelf infrastructure overlaps the voice and data domains to provide the following common resources that support the operations of the voice and data domains:

- The GLAN message link provides a path for circuit cards to communicate with the GLAN hub. The GLAN message link is used for real-time signaling and operations, administration, and maintenance (OAM) messages. No voice or data traffic is transmitted on the GLAN message link.

The GLAN hub is redundant, one each on the pair of ITP circuit cards. Each client is attached to both GLAN planes. The inactive GLAN hub broadcasts a pseudo-random pattern to all clients and verifies a correct loopback from each client. The following figure shows the GLAN configuration.

GLAN configuration



- metallic test access (MTA) interconnection - The MTA buses extend across each shelf to each line card slot. A relay matrix on the Shelf Interface Card (SIC) (NTNY23AA) controls the connection of the MTA buses on each shelf to the system MTA bus. Each line card taps onto the shelf-level bus and includes a relay matrix circuit that bridges the test bus onto the subscriber loop or into the coder-decoder (CODEC) under test. The MTA circuitry can also support line sparing for switched lines application.
- ringing generation on each line card
- shelf-level alarms
- battery power - Both signal and talk battery rails are distributed to the circuit cards in the shelf across the backplane. Power rails originate at the breaker interface panel (BIP), which has circuit breakers for each rail and a talk battery filter (TBF) for each talk battery source. The rails distribute to every shelf where they appear at the power input/output card which performs filtering for the shelf.

Each circuit card has an on-board point-of-use power supply (PUPS) circuit to regulate the local voltage rails from signal battery. The MG 9000 shelf does not contain batteries.

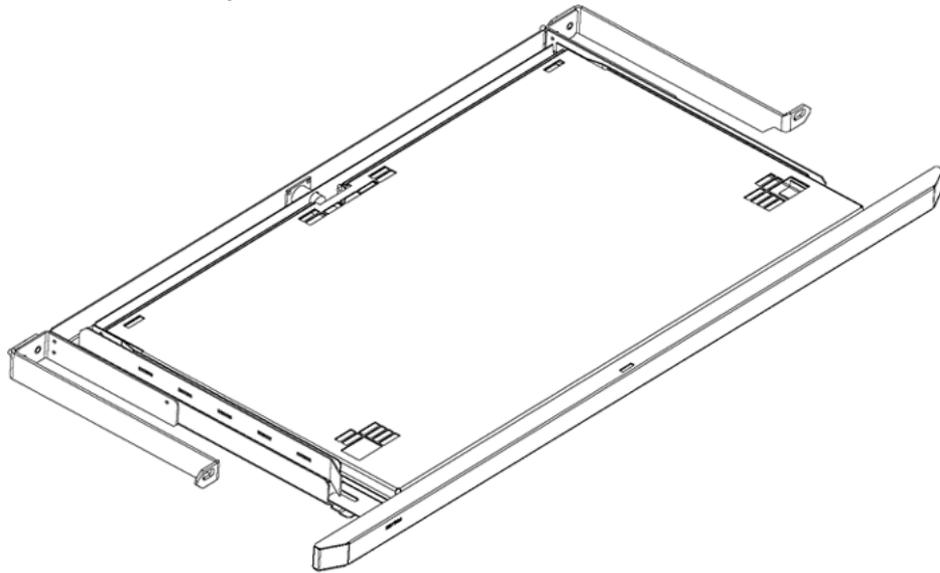
Talk Battery A and B are supplied through the backplane providing fully redundant power to line card slots 02-09 and 14-21.

- synchronization distribution - The voice and data domains derive clock synchronization from their respective core networks, based on software configurations.

All interconnect cables plug into faceplate connectors on the circuit cards in the MG 9000 shelf.

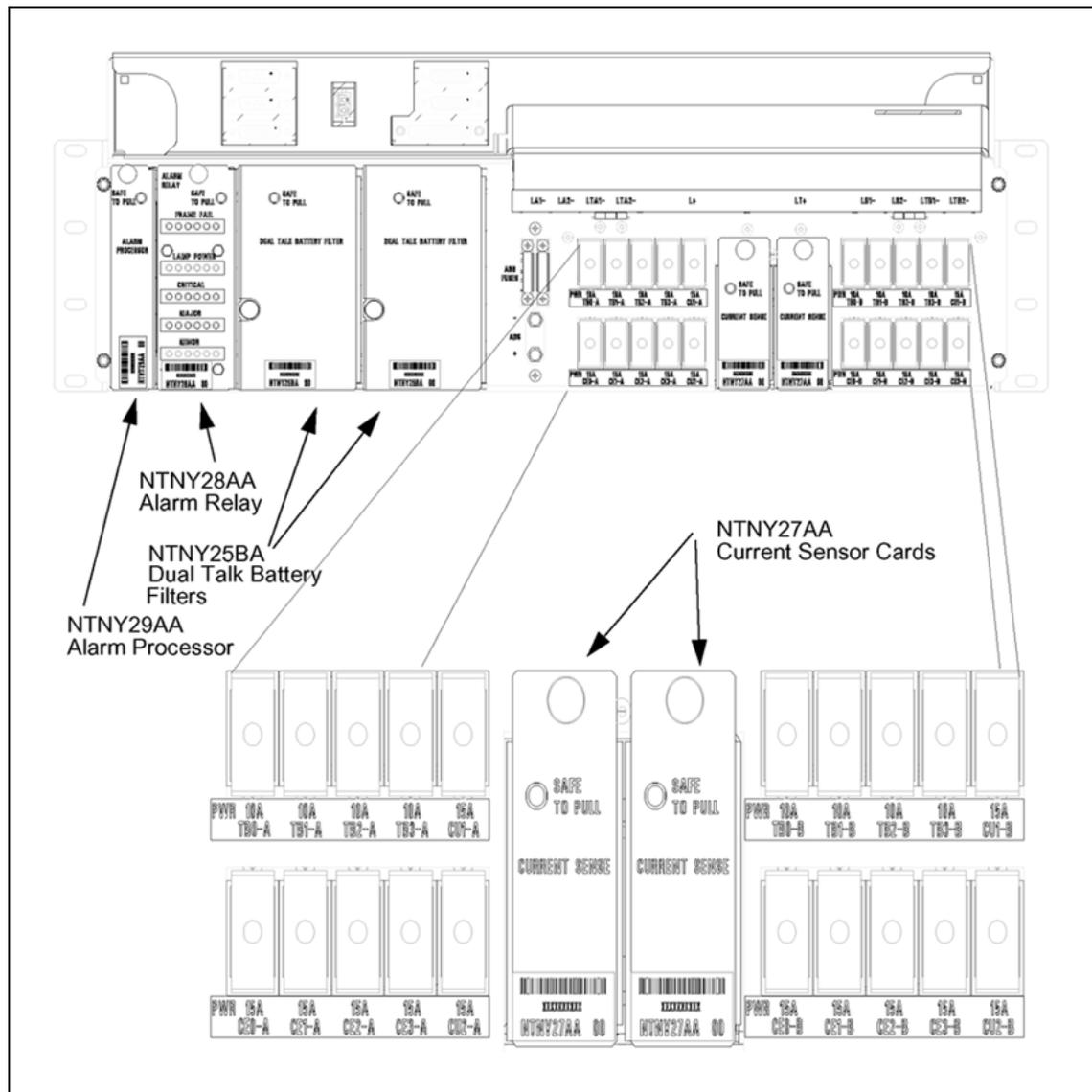
NTNY15AA Air filter assembly

The NTNY15AA Air filter assembly consists of a fixed chassis and removable drawer which houses the air filter itself. The air filter is a replaceable element, using Nortel part number A0379322. The following figure shows the air filter assembly.

Air filter assembly**NTNY17BA Intelligent bay interface panel shelf**

The following figure provides a front view of the IBIP shelf.

NTNY17BA IBIP shelf showing fuse panel



The IBIP includes the following which are discussed next:

- fuse panel
- NTNY25BA Dual Talk Battery Filter cards
- NTNY27AA Current Sensors
- NTNY28AA Alarm Relay card
- NTNY29AA Alarm Processor card

IBIP fuse panel The fuse panel on the IBIP front panel protects the individual dc loads in the MG 9000 frame such as shelves and cooling units and permits them to be disconnected in a maintenance scenario. The assemblies are protected by 20 fuses.

In the signal battery section, there are four fully redundant dc branch circuits for signal or common equipment power. These are distributed into

- two 15 A dc fuses from feeders -LA1 and -LB1 for shelves 2 and 3
- two 15 A dc fuses from feeders -LA2 and -LB2 for shelves 0 and 1

The four 30 A talk battery feeders -LTA1, -LTA2, -LTB1, and -LTB2 are filtered by four filter inductors and two NTNY25BA Dual Talk Battery Filter cards. These talk battery feeders are distributed into

- two 12 A dc fuses from feeders -LTA1 and -LTB1 for shelves 2 and 3
- two 12 A dc fuses from feeders -LTA2 and -LTB2 for shelves 0 and 1

This design provides for a 12 A dual plane redundant shelf talk battery power feed. A fused redundant feed for the cooling units is derived from feeders -LTA1, -LTA2, -LTB1, and -LTB2. Total talk battery feed current includes both the cooling unit current draw and the talk battery current draw. The cooling unit fuses size is 15 A dc to allow for high inrush currents related to the fan motors startup characteristics. Fuse modules on the fuse panel have an LED that indicates a fuse is blown.

NTNY25BA dual talk battery filter card The two NTNY25BA Dual Talk Battery Filter cards in the IBIP provide a clean -48 V dc power supply for POTS loop feed. Each card serves as the talk battery filter capacitor for both A or both B talk battery feeds.

The alarm circuitry in the NTNY25BA card provides monitoring and reporting function for the talk battery filter. The Fail LED on the faceplate indicates a talk battery filter alarm has occurred. The LED is controlled by the NTNY29AA Alarm Processor card in the IBIP.

NTNY27AA shelf talk battery current sensing The NTNY27AA Current sensors monitor both the A and B -48V talk battery power feed currents to each shelf.

The alarm circuitry in the NTNY27AA cards provides monitoring and reporting for the internal current sensor circuitry. The card implements fuse protection for each power input and monitors each fuse. A Safe to Pull LED on the faceplate is illuminated and is controlled by the NTNY29AA Alarm Processor card in the IBIP.

NTNY28AA alarm relay card The alarm and system monitoring functions of the IBIP are split between the NTNY29AA Alarm Processor card and the NTNY28AA. The following represents the functions on the Alarm Relay card:

- fuse fail detection - detects fuse failures on the power provided to each shelf, to each cooling unit, and ABS to the BIP. There will be one signal provided from each of the 21 fuses. Sixteen are for shelf power, four are for cooling unit power, and one is from ABS power. The fuses for the cooling unit and the shelf power all have LEDs on the front of the fuse as a failure signal. Fuse failure signals are multiplexed together into the following five groups:
 - talk battery fuse failure
 - signal battery fuse failure
 - cooling unit 1 fuse failure
 - cooling unit 2 fuse failure
 - ABS fuse failure

These failures are sent to the SIC. Using these signal along with power loss information provided by the SIC, the exact failed fuse is determined.

- lamp driver - indicates system failure severity, frame failure, and lamp power available. Though the signals are provided by the NTNY29AA to drive the lamps, the failure level is not be determined by the NTNY29AA but is determined by one of the ITP cards in the frame. Power for the lamps is provided through the ABS power inputs.
- E2A telemetry interface - The NTNY28AA provides 11 scan points (SC) and 4 signal distribution points (SD) for use as alarm interface to other OEM or environmental equipment.
- OAU interface - There are three visual signal, three audible signal, and an Alarm Cut-Off (ACO) signal. The three visual signals are closed loop contact pairs that used to indicate the status of the visual lamps in the frame. The three audible contacts are closed loop contact pairs used to indicate the severity of the alarms at the frame. The ACO is used by the office alarm unit to cutoff the audible portion of the alarm. This has no effect on the visual alarms.

NTNY29AA alarm processor card The alarm and system monitoring functions of the new IBIP are split between two cards with half of the functionality on the NTNY29AA and the rest on NTNY28AA. The NTNY29AA has the following features:

- micro controller - provides all the intelligence for the IBIP controlling both the NTNY29AA and the NTNY28AA.

- talk battery current monitoring - monitors talk battery current to each shelf and messages the SIC when current on a shelf feed exceeds 25 A.
- incoming feed voltage monitors - monitor all nine incoming power feeds for loss of power. This includes the feeds for signal battery, talk battery, and ABS.
- frame level LED drivers - drives the LEDs on various frame level circuits.
- cooling unit interface - alarm detection circuits for both of the cooling units. One signal is for a fan failure while the other is for high temperature.
- aisle cable Interface - provides the loop signal necessary to activate the aisle alarm in the event of a failure in the associated frame. The aisle alarm is two of the wires provided in the aisle cable.
- shelf ID - provides shelf ID information to the SIC of each shelf to determine the shelf position in the frame.
- frame ID - provides frame ID information to the SIC upon request. The Frame ID will be set on a 4-position switch (S2) that can be read by the micro controller. This switch can provide for 15 possible frames with the 0000 bit setting being a not allowed condition. Switch bank S2 switch positions are provided in the card replacement procedure for the alarm processor card in *MG 9000 Fault Management*, NN10074-911
- power option switch - Since a frame can be physically set to power only two shelves (either shelves 0 and 1 or 2 and 3), then the power monitors have to be set to ignore the feeds that are not to be used. This switch (S1) will use two of the positions to provide the choices. Switch bank S1 switch positions are provided in the card replacement procedure for the alarm processor card in *MG 9000 Fault Management*, NN10074-911

NTNY18AA cooling unit shelf The NTNY18AA cooling unit (CU) shelf provides cooling for the MG 9000. The cooling unit

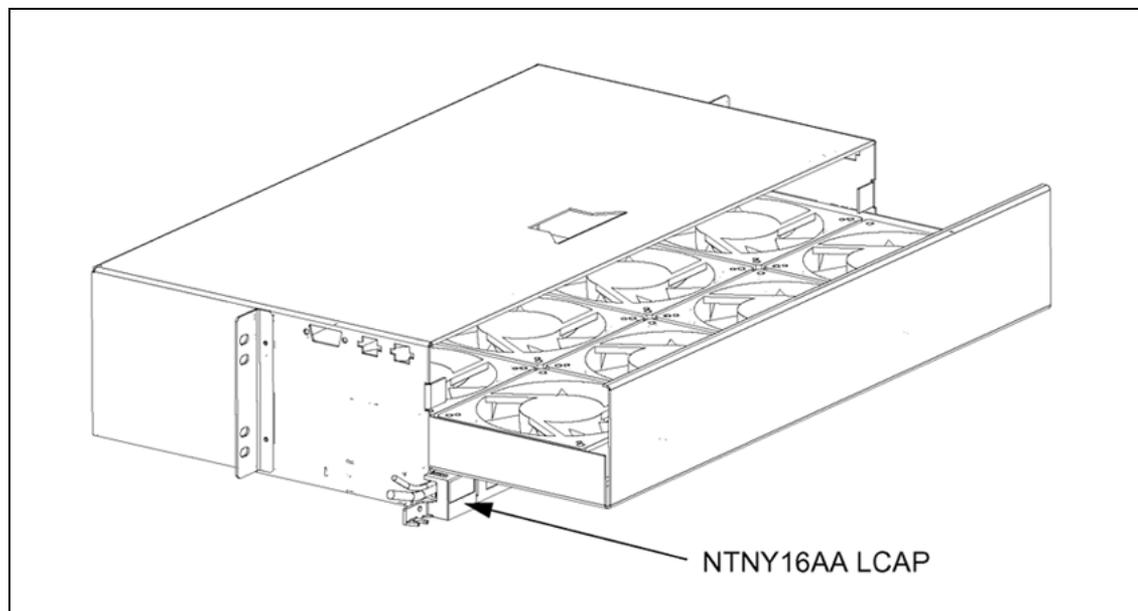
- contains eight fans
- supports low battery shutdown
- has a fan fail indicator for each fan, which allows the replacement of a single fan rather than an entire tray
- monitors for high ambient temperature and fan fail conditions. The BIP alarm card drives this signal over the DCC.
- includes an NTNY16AA local craft access panel (LCAP), which is a part of the middle cooling unit and physically mounts on the cooling unit. Functions and interfaces include
 - three DS1 test jacks for each shelf are used to provide test capabilities for each MG 9000 shelf that provides DS1 private

line service for testing into the line card, testing to the facility and providing DS0 service.

- data jacks provide test capabilities for each MG 9000 shelf that provides DS1 private line service. Three jack pairs are provided for testing into the line card, testing to the facility and providing DS0 service.
- local talk line circuit jacks provide a non-switched communication path that allows communication through the central office (CO) on the office key system.
- alarm cutoff (ACO) push button and light emitting diode (LED) assembly are used with the alarm card located in the BIP
- electrostatic discharge (ESD) jack is used by the technician to connect to ESD wrist straps when performing maintenance tasks

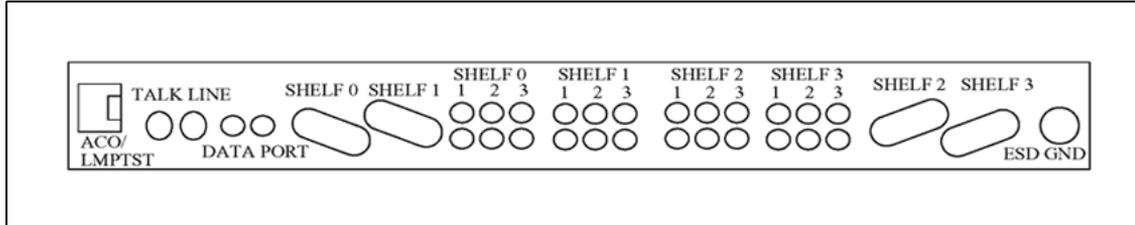
The following figure provides an isometric view of the NTNY18AA cooling unit.

NTNY18AA cooling unit and LCAP



The following figure shows the NTNY16AA LCAP.

NTNY16AA LCAP



Common cards

This section provides a description of the following MG 9000 common cards.

MG 9000 common cards

PEC	Description
NTNY23AA	Shelf interface card
NTNY26AA	Power filter card

NTNY23AA: shelf interface card

The SIC is located in the top half of physical slot 1 (upper part of slot) of the MG 9000 shelf and is always required. The SIC works with the alarm relay card for the MG 9000 BIP. The SIC provides

- the MG 9000 shelf interface to the BIP to provide:
 - alarm inputs (minor, major and critical) that originate from the MG 9000 shelf
 - alarm outputs and indicators that display in the MG 9000 shelf
 - user alarm inputs to the BIP that are available to the MG 9000 shelf
 - status of the cooling unit
- a unique shelf ID from the IBIP alarm card to each of the four MG 9000 shelves in a frame to facilitate auto-discovery at the shelf level
- control for the MTA buses for the MG 9000 shelf

Note: There are two DB9 port connectors on the faceplate of the SIC that are labeled as MTA In and MTA Out. The bottom connector labeled MTA Out connects to the test head to support line testing. The top connector connects to the SIC card in the shelf above.

- the voltage threshold monitoring of both signal battery supplies A and B on board the MG 9000 SIC to report loss of power redundancy on the SIC

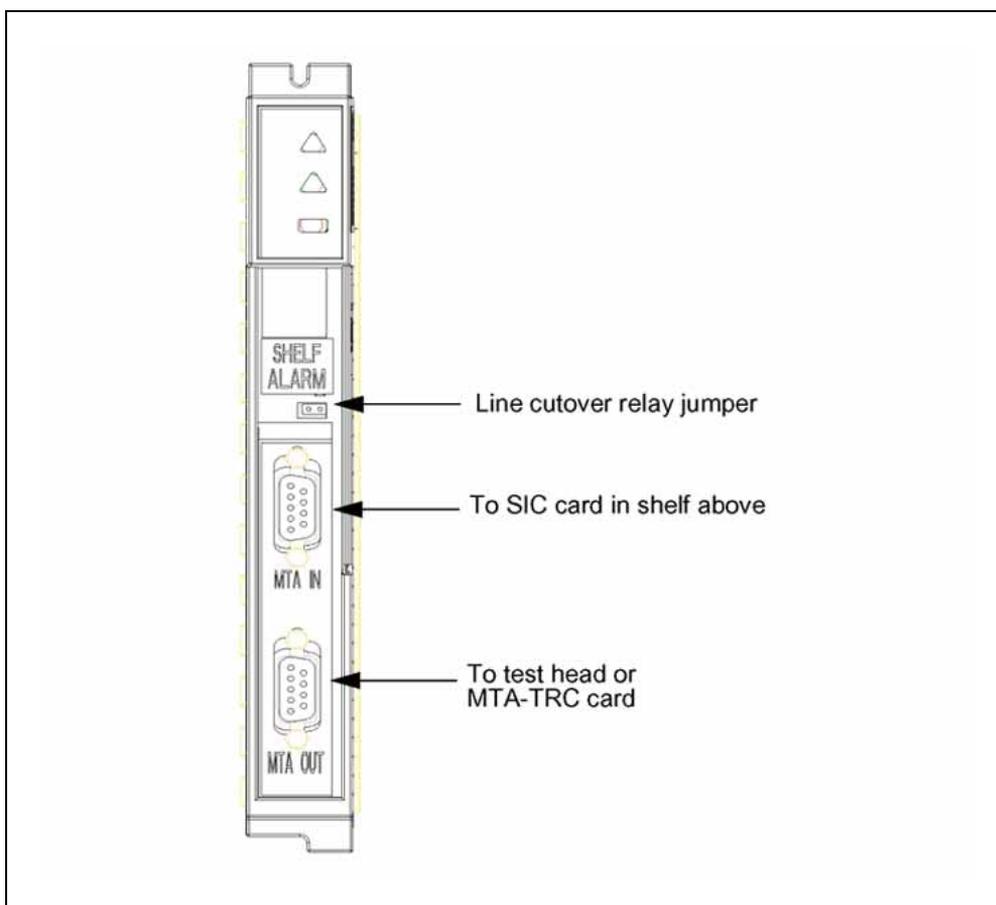
The SIC has the following LEDs on the faceplate.

Indication	Color	Description
OK to pull	Red	Indicates to the operator that the SIC card is in an appropriate state for removal from the shelf.
Shelf Alarm	Red	Indicates that a failure exists on a component that is local to this shelf.
Active	Green	Lights when the SIC is in a normal working state

The SIC interface to the backplane is through the GLAN. The GLAN is a point-to-point LAN from a hub on the ITP control card.

The next figure is an illustration of the SIC and associated connectors.

NTNY23AA: shelf interface card connectors

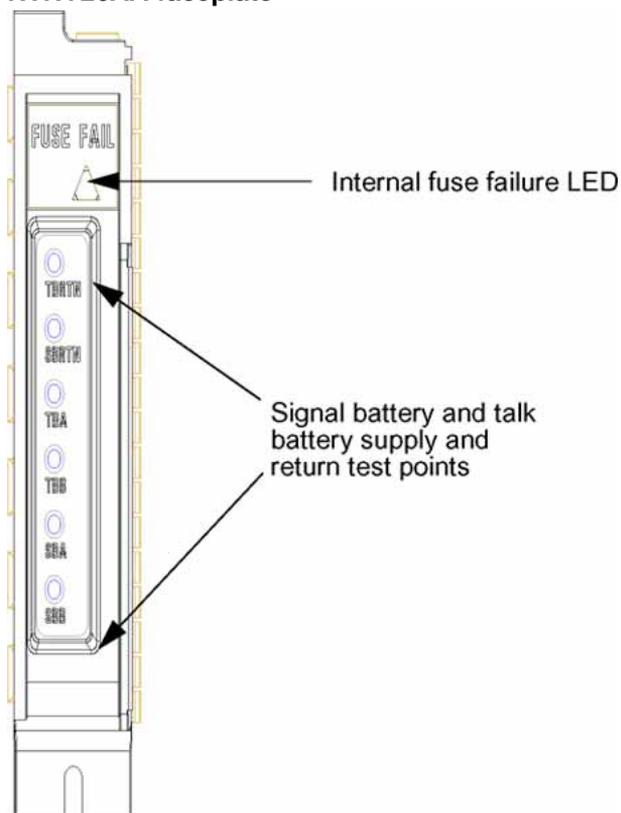


NTNY26AA: power filter card

The NTNY26AA Power filter card (PFC) is always required. The Power filter card provides filtering of talk battery A/B feeds and signal battery A/B feeds. The Power filter card resides in the lower half of slot 1 in the MG 9000 shelf. A Fuse Fail LED on the faceplate indicates a fuse failure on the fused power inputs. The fuses are internal to the card and are not replaceable. Power test points are available on the faceplate of the power filter card for connecting a voltmeter to measure shelf power voltages.

The following figure shows the NTNY26AA faceplate.

NTNY26AA faceplate



Common control cards

This section provides a description of the following MG 9000 common control cards.

MG 9000 common control cards

PEC	Description
NTNY45	Data control card
NTNY30	Internet telephony processor

NTNY45: data control card

Two versions of the DCC card are available for use in the MG 9000 depending on where the MG 9000 is deployed and the interface required to the packet network. The following table lists the DCC cards used in the MG 9000.

DCC cards

PEC	Description	Packet network interface
NTNY45AA NTNY45CA	Data control card - OC-3c WAN	OC-3/STM-1
NTNY45BA	Data control card - 8 port IMA WAN	DS1 IMA
NTNY45FA	Data control card - Gigabit Ethernet	GigE

The NTNY45 is the control complex and wide area network (WAN) for the MG 9000. The DCC contains two sub-packs, the motherboard and daughter board. The motherboard contains the processor, the ATM switch fabric, and the network processors. The daughter board contains the serial ATM links to each card on the shelf, the WAN interface, the BITS interfaces and supports additional frames via high speed links. The WAN interface supports ATM over SONET. The NTNY45 supports the following functions:

- provides an ATM switch fabric
- provides cell interfaces to each slot in the shelf (one to each line card slot, each of the two TDM slots and to the mate DCC cards)
- provides a pair of BITS interfaces for use as a system timing reference. Beginning in SN06.2, the NTNY45 BITS inputs are the preferred interface, including over the NTNY41 ITX card.
- supports ATM and IP traffic management function applied to the WAN interface and the inter ATM-200 links
- supports back pressure signaling for DSL line cards
- supports GLAN interface to ITP card

The DCC is used in pairs for redundancy and is always provisioned in slots 10 and 11 of the MG 9000 master shelf.

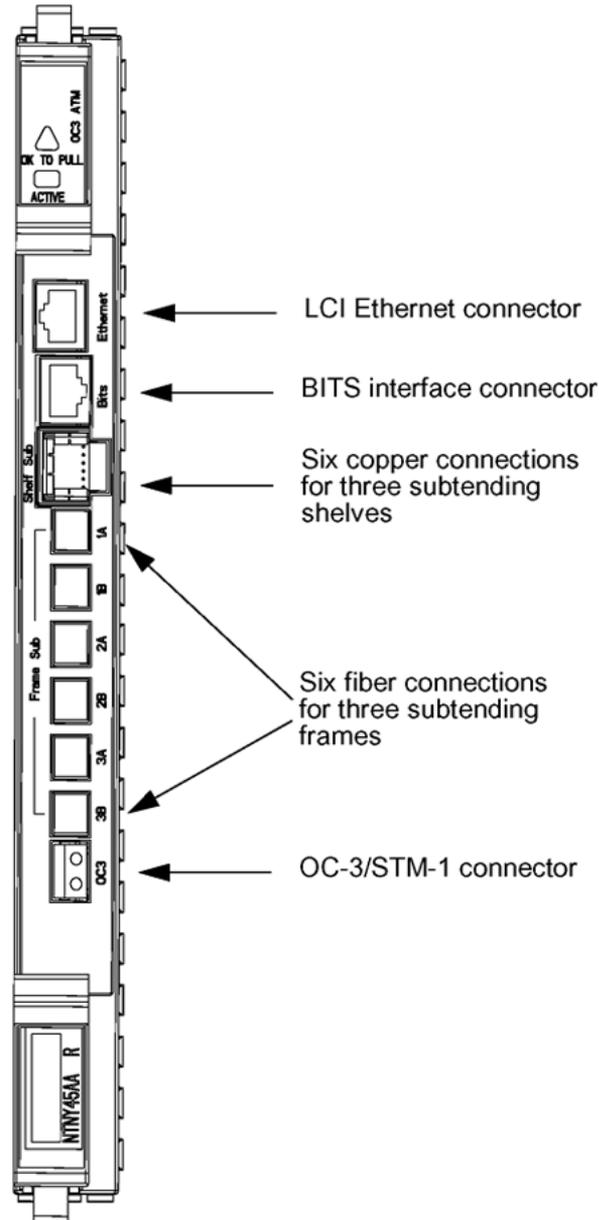
NTNY45AA: data control card with OC-3c WAN The WAN interface supports ATM over SONET. The NTNY45AA contains all the functions listed in the NTNY45 and also supports the following functions:

- provides an automatic protection switched OC-3c/STM-1c WAN physical interface to the network
- supports an ATM cell based interface to the network
- provides a pair of network processors for processing cells and/or packets

- provides six copper subtending interfaces for three subtending shelves
- provides six fiber subtending interfaces for three subtending frames

The following figure shows the faceplate of the NTNY45AA.

NTNY45AA DCC



The following table lists the connectors on the faceplate of the NTNY45AA card.

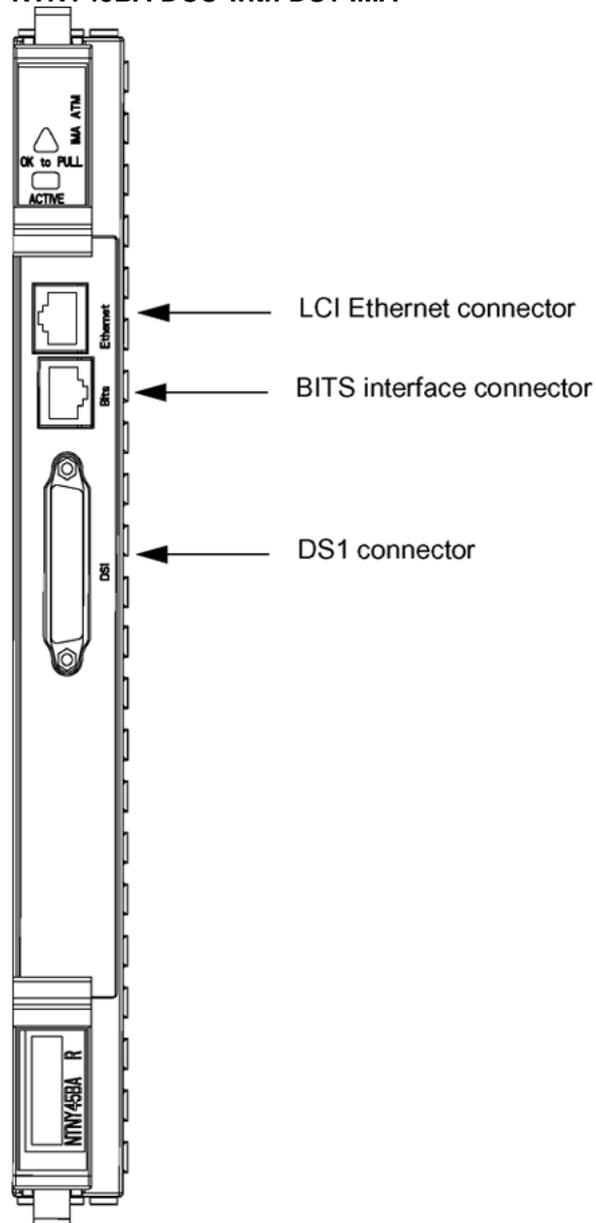
NTNY45AA connectors

Connector	Description
Ethernet	10/100 T Ethernet connector used for the local craft interface (LCI)
BITS	Built-in timing supply (BITS) interface for use as a system timing reference
Shelf Sub	Supports six copper connections for three subtending shelves
Frame Sub	Six fiber connections for three subtending frames
OC-3/STM-1	OC-3/STM-1 optical connector to packet network

NTNY45BA: data control card - 8 port IMA WAN The NTNY45BA is the same card as the NTNY45AA card except for the interface. The WAN interface on the daughter board is a redundant 8 port DS1 IMA interface. In addition to the functions listed for the NTNY45, the NTNY45BA also provides protection switched eight-port DS1 IMA interface for cell transport. The NTNY45BA DS1-IMA card supports up to four shelves.

The following figure shows the faceplate of the NTNY45BA.

NTNY45BA DCC with DS1 IMA



The following table lists the connectors on the faceplate of the NTNY45BA card.

NTNY45BA connectors

Connector	Description
Ethernet	10/100 T Ethernet connector used for the local craft interface (LCI)

Connector	Description
BITS	Built-in timing supply (BITS) interface for use as a system timing reference
DS1	8 port DS1 IMA connector

NTNY45CA data control card with OC-3 WAN The NTNY45CA has all the same capabilities of the NTNY45AA. In addition, the NTNY45CA supports channelization of the OC-3 carrier into three DS3 channels.

Note: Currently the only supported payload for the channelized OC-3 carrier is DS3 clear channel.

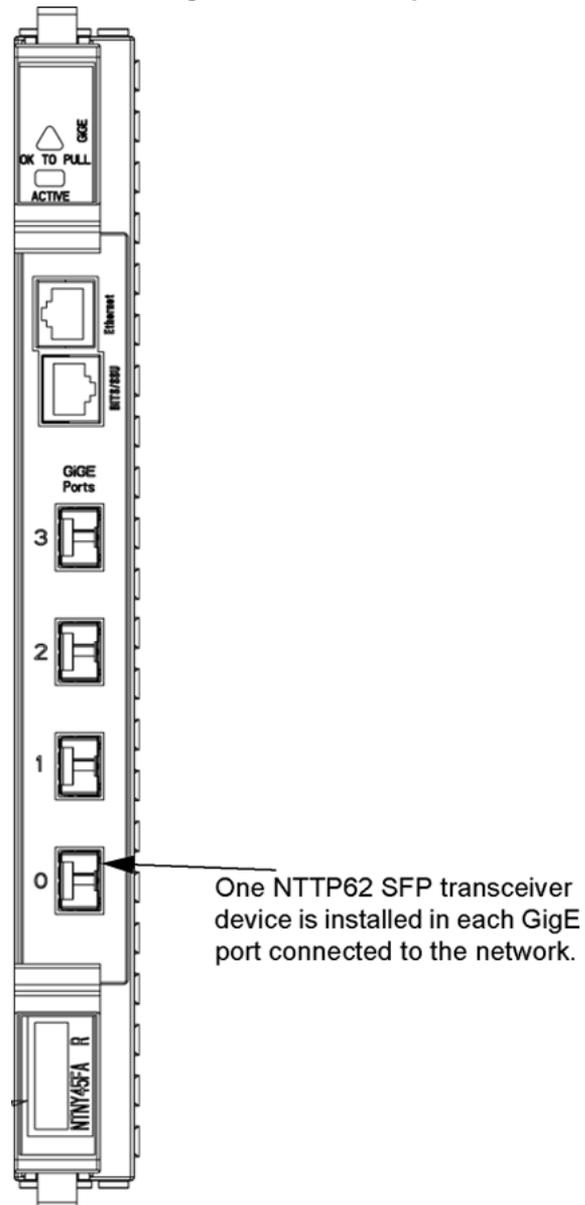
NTNY45FA gigabit ethernet (GigE) data control card The NTNY45FA GigE card has all the same capabilities of the NTNY45AA. In addition, the NTNY45FA supports

- a GigE interface to the IP network. Currently, one GigE port per card connects to the IP network, though in the future this will increase to four. The cards are hot-swappable and provide GigE link redundancy. The NTNY45FA card does not support DS1 private lines services or xDSL services in SN08.
- a connection to an international standard Synchronization Supply Unit (SSU) using 2048 kHz interfaces and sends those 2048 kHz signals to the ITP card as the timing reference source for the MG 9000.

Note: The GigE DCC card does not support network interface timing.

The following figure shows the faceplate of the NTNY45FA GigE DCC card.

NTNY45FA GigE DCC card faceplate



The following table lists the connectors on the faceplate of the NTNY45FA card.

NTNY45FA connectors

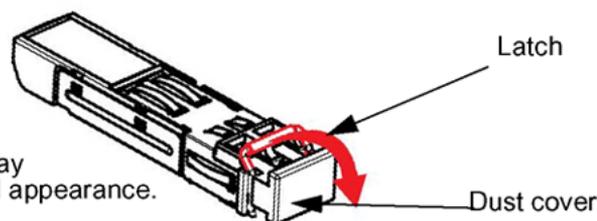
Connector	Description
Ethernet	10/100 T Ethernet connector used for the local craft interface (LCI)

Connector	Description
BITS/SSU	Built-in timing supply (BITS) interface for use as a system timing reference or Synchronization Supply Unit (SSU)
GigE	Four GigE ports to support WAN interfaces and subtending boxes.

For each optical cable connected to a GigE port, an NTP62CF small form factor pluggable (SFP) LX transceiver device or an NTP62AF SFP SX transceiver device (future) connects to the GigE port on the faceplate of the GigE card. The cable connects to the SFP device. The SFP device is monitored by the NTNY45FA GigE DCC card. Any errors detected in the SFP are reported to the MG 9000 Manager in GigE log reports. There is a comparable SFP transceiver device at the other end of the cable which is monitored by the network element at that end.

NTTP62 SFP transceiver device

Note: Example of an SFP device. The device installed in your system may differ slightly in design and appearance.



NTNY30: internet telephony processor

Two ITP cards are available for use in the MG 9000 depending on the solution in which the MG 9000 is deployed. The following table lists the ITP cards used in the MG 9000.

ITP cards

PEC	Description	Application
NTNY30AB	Internet Telephony Processor - ATM Interface card	UA-AAL1
NTNY30BA	Internet Telephony Processor - IP Interface card	UA-IP
NTNY30CA	Internet Telephony Processor	UA-IP

The characteristics that are common to both cards are provided in this section. The specific characteristics for the two card types are addressed separately following this section.

The ITP card

- provides subtending to additional MG 9000 shelves

- processes the ATM-25 line the ITX card creates. The ATM-25 data transmits back to the main control shelf for multiplexing onto the DCC connector.
- works in pairs (for protection). Each MG 9000 shelf contains two ITP cards.
- connects with corresponding ITX cards
- receives timing synchronization from one of six reference sources and distribution to both ITP cards. Timing synchronization is the synchronization of the ITP clock to one of six reference sources. For example the OC-3 (x2) reference source, BITS DS1 (x2) reference source or internal (x2) reference source. The timing synchronization is generated by a voltage controlled oscillator on the ITP card.

The MG 9000 accepts an external BITS DS1 input signal, referenced to a Stratum timing source that is Stratum-3 or better. Line and BITS timing methods are used.

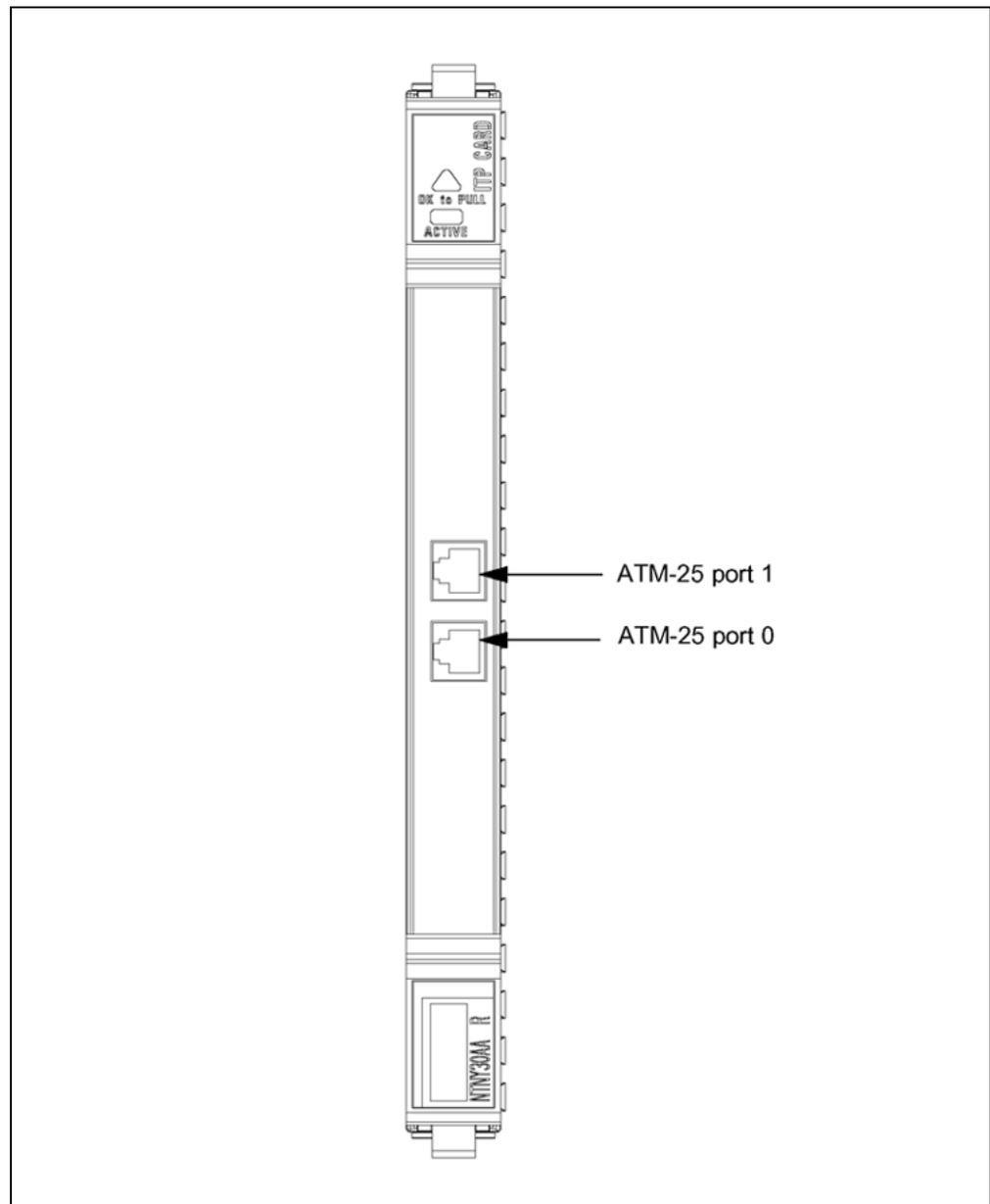
- provides the following maintenance functions for the MG 9000:
 - lights the fail light emitting diode (LED) on the shelf cards
 - monitors the operation of the GLAN messaging links
- resides in the shelf interconnect section of each MG 9000 shelf, including the main controller and subtending shelves, in physical slot positions 12 and 13

The ITP card provides:

- line interface and timing distribution for 16 line cards (32 lines/card) timing distribution refers to the allocation of a clock signal. The clock signal is derived from the main timing source to the line cards, for synchronization of TDM data flow between the line cards and the ITP card.
- GLAN messaging hub interface
- switching for 2048 TDM channels on the line card TDM links
- line-side echo cancellation functionality

The following figure provides a front view of the ITP card and associated connectors.

NTNY30 internet telephony processor



NTNY30AB: internet telephony processor - ATM interface card The NTNY30AB provides the call processing and media coding capabilities of the MG 9000 in the UA-AAL1 solution. Each ITP card is viewed as a virtual media gateway (VMG), that is, the CS 2000/Gateway Controller (GWC) view each ITP card as an individual gateway.

In addition to the functions listed in the general description of the NTNY30, the ITP-ATM interface card

- adapts TDM DS-0s to ATM cells for transmission over a Synchronous Optical Network (SONET) through an OC-3c optical interface
- provides line card control and termination in the MG 9000 shelf platform
- uses AAL-1 SDT to convert TDM PCM data to ATM cells
- is required with an ITX or DCC card in private lines whenever a BITS timing reference is to be used as the master timing reference. The physical DS1 connection for the BITS reference resides on the ITX or DCC card, and the clock synchronization circuitry resides on the ITP card.
- provides plug-in echo canceller module
- provides segmentation and reassembly on the TDM links to ATM cells using AAL-1 adaptation

NTNY30BA internet telephony processor - IP interface card The NTNY30BA is similar to the NTNY30AB except that the NTNY30BA card is designed to support IP functionality.

The NTNY30BA contains the DSP processing hardware for voice over IP capability. This card is used in the UA-IP solution.

In addition to the functions listed in the general description of the NTNY30, the ITP-IP interface card

- supports introduction of the MG 9000 into the international market in the UA-IP solution, the ITP card provides downloading characteristics templates to the POTS card and combo cards in the form of line power templates. This affects the following three areas:
 - CLASS - In addition to the hard-coded support for North America, downloadable parameters that comply with ETSI Specification EN 300-659-1, -2, and -3 are available from the MG 9000 Manager.
 - physical ringing - the existing downloadable ringing patterns for North American are being expanded to provide downloadable market-specific patterns from the MG 9000 Manager.
- supports G.711 CODEC for voice over IP. The NTNY30BA card supports silence suppression but does not support compression.

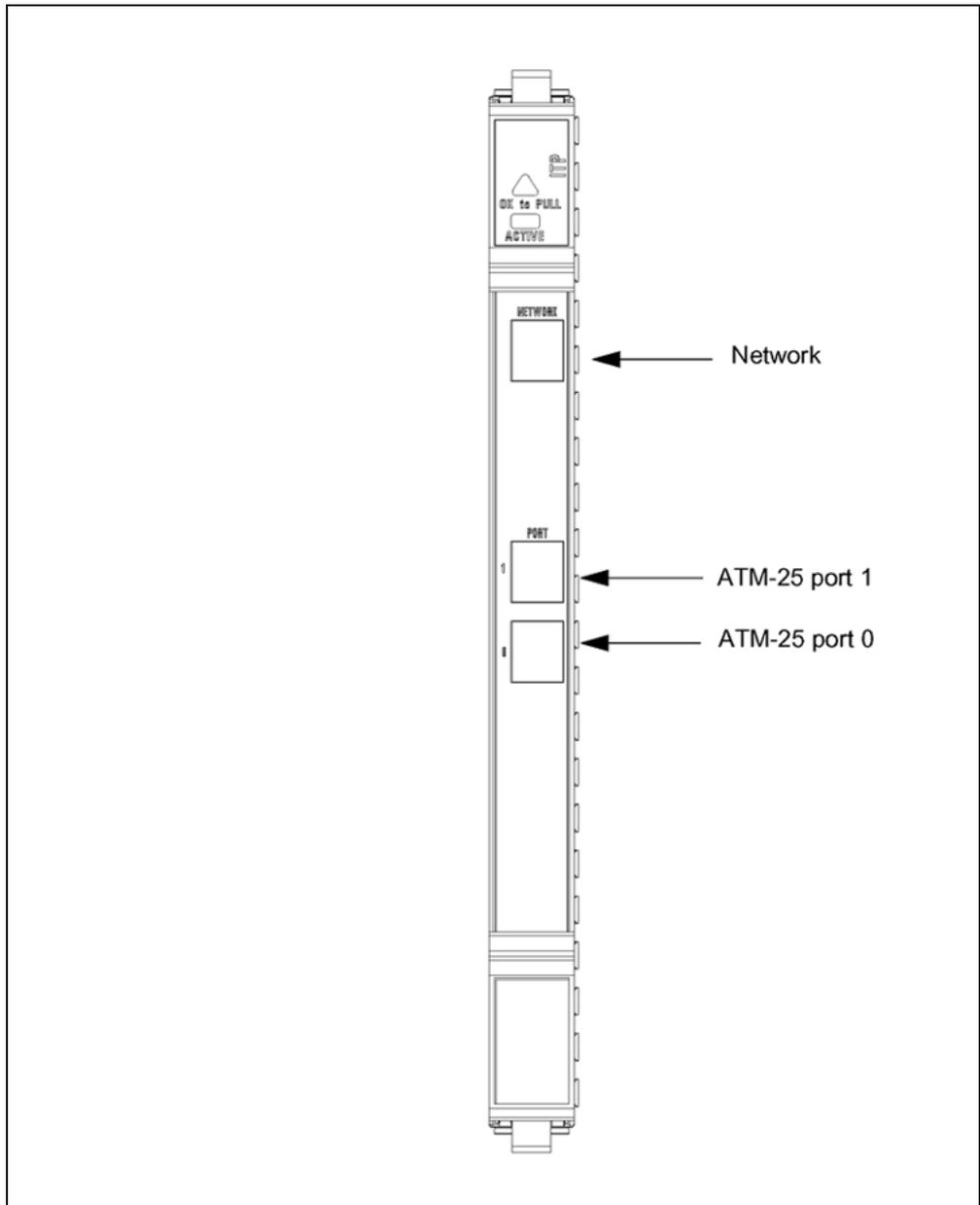
NTNY30CA: internet telephony processor card The NTNY30CA provides the call processing and media coding capabilities of the MG 9000 in the UA-IP solution for North America and international markets. Each ITP card is viewed as a virtual media gateway (VMG), that is, the

CS 2000/Gateway Controller (GWC) view each ITP card as an individual gateway. In addition to the functions listed in the general description of the NTNY30, the ITP interface card

- adapts TDM DS-0s to ATM cells for transmission over a Synchronous Optical Network (SONET) through a OC-3c optical interface
- provides line card control and termination in the MG 9000 shelf platform
- provides 128 Mb of on-board synchronous dynamic RAM (DRAM)
- is required with an ITX or DCC card in private lines whenever a BITS timing reference is to be used as the master timing reference. The physical DS1 connection for the BITS reference resides on the ITX or DCC card, and the clock synchronization circuitry resides on the ITP card.
- provides segmentation and reassembly on the TDM links to ATM cells using AAL-1 adaptation
- supports G.711 CODEC for VoIP. The NTNY30CA card supports silence suppression but does not support compression.

The ITP contains three RJ-45 type connectors. The next figure provides a front view of the ITP card and associated connectors.

NTNY30CA internet telephony processor connectors



Line/service card: ITX card

The following card is a line/service card that supports all line/service cards in the MG 9000 shelf.

Common line/service card

PEC	Description
NTNY41AA	Internet telephony extender

NTNY41AA: internet telephony extender

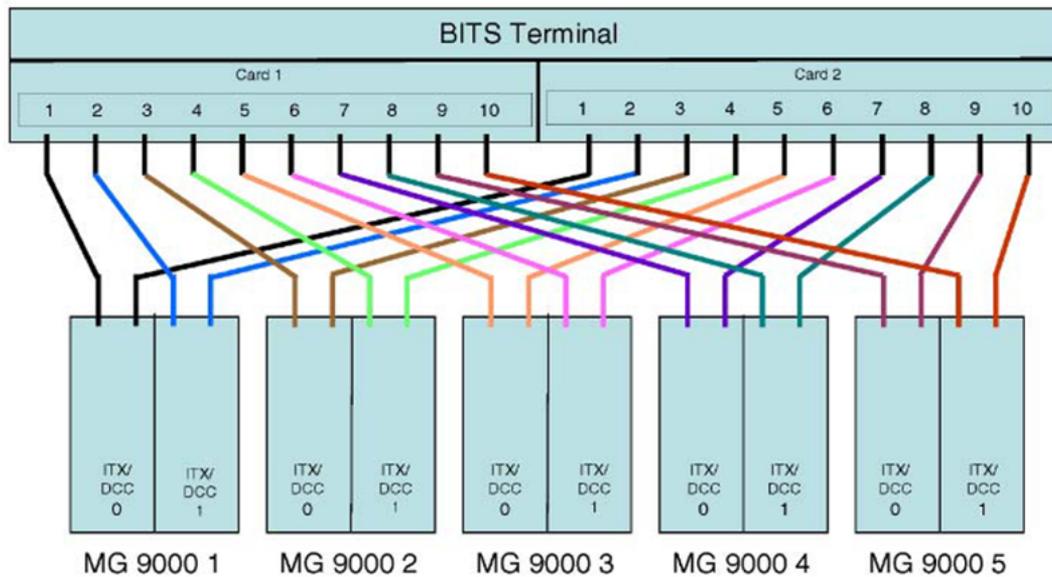
The ITX circuit card

- supports subtended MG 9000 shelves
- creates an ATM-25 link to transmit data to the main control shelf
- connects to corresponding ITP cards
- works in pairs
 - Each MG 9000 master shelf requires a minimum of two ITX cards.
 - Each ITX pair supports a maximum of fifteen additional MG 9000 shelves in a UA-AAL1 solution.
 - The system supports a maximum of four (two pair) ITX cards, and a total of 16 MG 9000 shelves (including the control shelf).
- terminates external BITS timing source (first pair only)

The ITX card contains eight RJ45 type connectors for subtending and one DB-9 connector for a timing source.

The following figure shows the physical connections to the BITS terminal using DB-9 connectors on the ITX card faceplate. If a BITS clock is used, this configuration is required to ensure the MG 9000 is clocked properly.

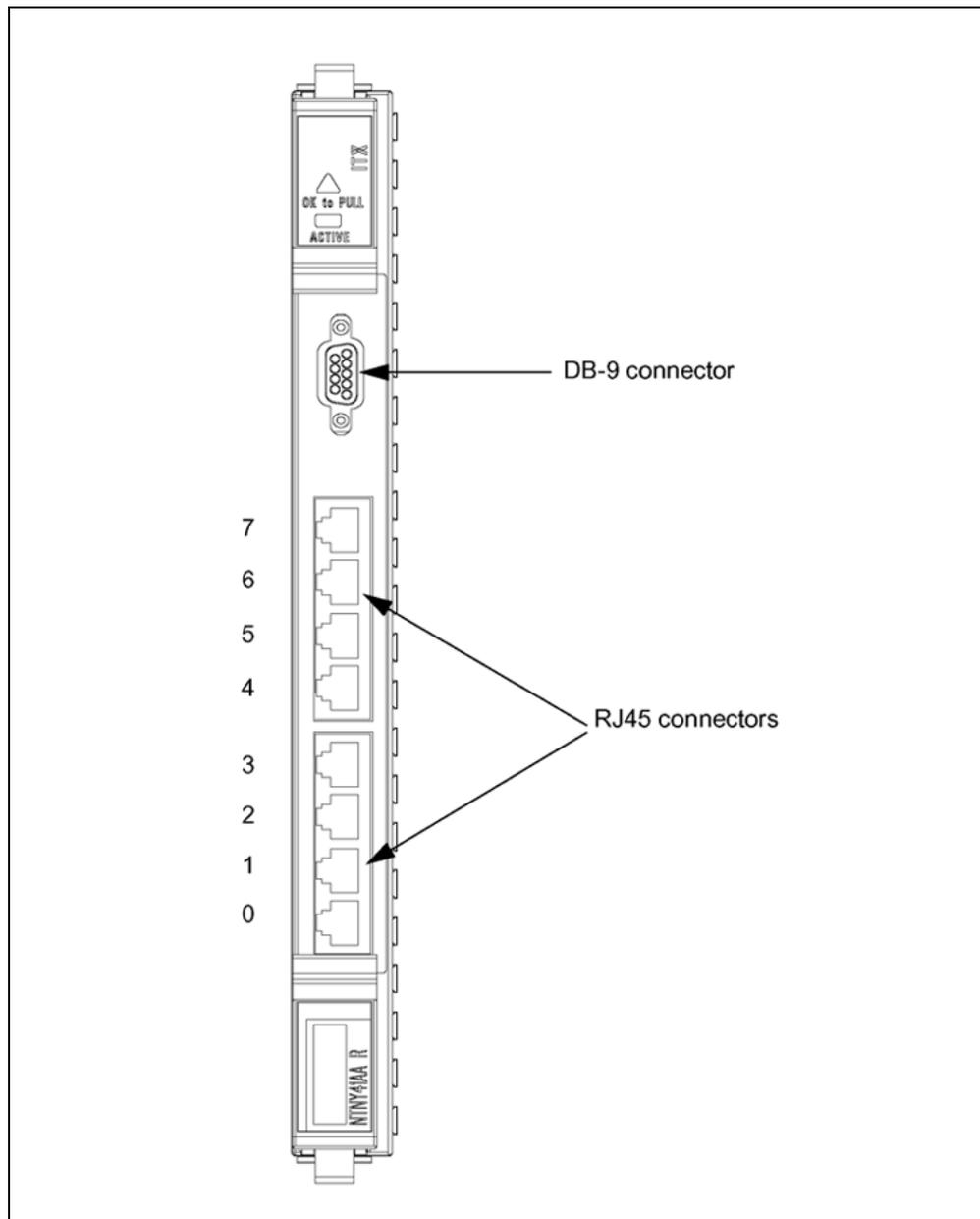
MG 9000 to BITS terminal connection configuration



Note: Each color represents a cable with a DB-9 connector on the ITX card at the MG 9000 end and a wire-wrap capability on the BITS end.

The following figure provides a front view of the ITX card and connectors.

NTNY41AA ITX card



In a multi-shelf switched lines application, ITX cards are provisioned in pairs in the right side of the master shelf. It is recommended that the first pair of ITX cards be provisioned in physical slots 14 and 15, of the master shelf, though they can be provisioned in any two slots as long as they are in even/odd adjacent slots.

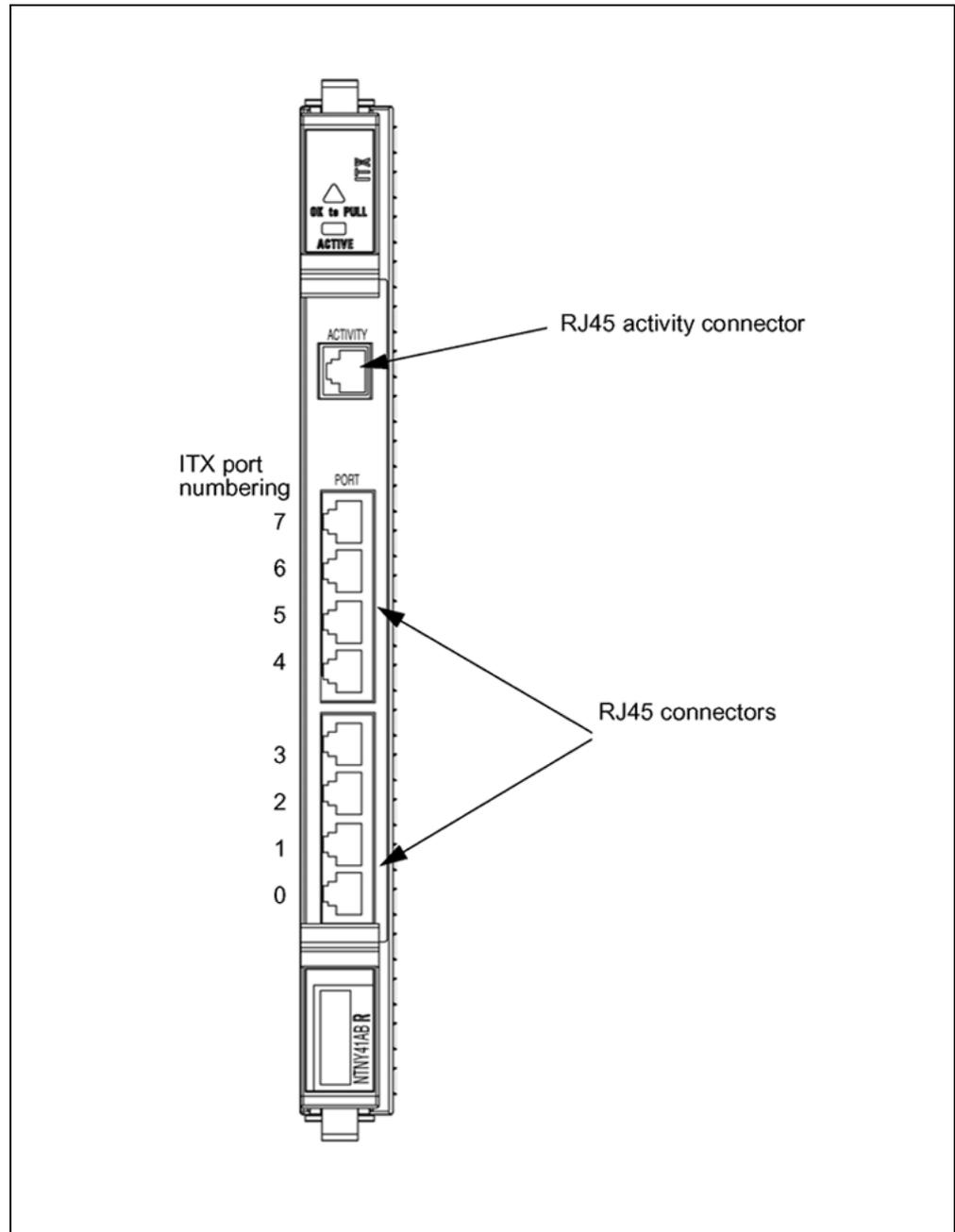
NTNY41BA: internet telephony extender

The ITX circuit card

- works in pairs:
 - Each MG 9000 master shelf requires a minimum of 2 ITX cards
 - Each ITX pair supports a maximum of 8 MG 9000 shelves
 - The system supports a maximum of 8 (four pairs) ITX cards, and a total of 32 MG 9000 shelves (including the control shelf). This is a future capability.
 - The BITS connector has been removed.
- creates a an ATM-25 link to transmit data to the main control shelf.
- connects to corresponding ITP cards
- includes an activity connector to provide improved card activity under control of hardware by communicating card activity state between an ITX pair

The NTNY41BA ITX card contains eight RJ-45 type connectors for subtending and one RJ45 connector for activity connector. The next figure provide a front view of the NTNY41BA ITX card and connectors.

NTNY41BA ITX card connectors



Line/service cards: switched lines cards

This section describes the following cards that support switched lines.

Switched lines circuit cards

PEC	Description	Application
NTNY42AA NTNY42AB	MTA-TRC card	UA-AAL1 and UA-IP solutions
NTNY43AA NTNY43BA	DS-512 Interface card	UA-AAL1 solution UA-IP solution
NTNY50AA	POTS 32-Line Multi-circuit line card	UA-AAL1 and UA-IP solutions
NTNY53AA NTNY53BA	Global line card 32	UA-AAL1 and UA-IP solutions
NTNY51AA	SAA-12 line card	UA-AAL1 and UA-IP solutions
NTNY53CA	GLC 12-line card	UA-AAL1 and UA-IP solutions
NTNY52AA	ADSL combo 8+8 line card	UA-AAL1 and UA-IP solutions

NTNY42AA or NTNY42AB: metallic test access-TRC card

The metallic test access-test response circuit (MTA-TRC) is a component of the MG 9000 metallic test access subsystem. The MTA-TRC card provides a means for external test head equipment to ultimately access, through its matrix of relays, subscriber lines, and associated line card interfaces for testing purposes. It allows for extension of the MTA buses from shelf to shelf and frame to frame. Furthermore, it provides TRC capability used in line card diagnostics.

The MTA provides

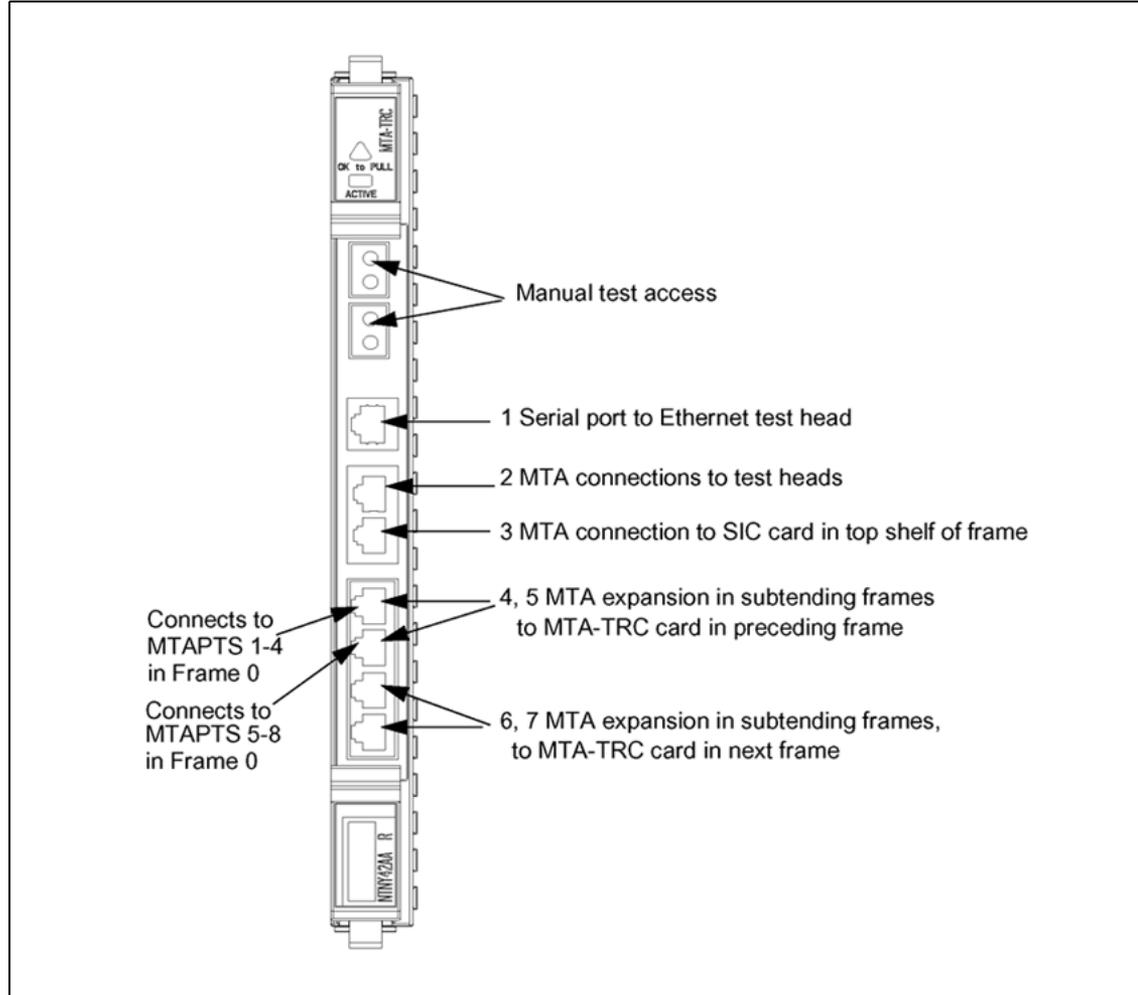
- backplane GLAN interface, which allows the MG 9000 ITP card to communicate with the MTA
- faceplate connector interface for
 - extending metallic test access buses to the SIC, which allows connection to subtending shelves within the same frame
 - extending metallic test buses to additional frames
 - external metallic line test equipment (test head)
- relay matrix for

- selective connectivity of metallic test buses with possible connections to its own shelf, extension shelves, extension frames, or to test head equipment. GLAN messaging from the TDM card controls the matrix.
 - segmenting interframe test buses for wideband tests. Segmenting eliminates stubs that can impair high frequency tests.
- test response circuitry

The primary purpose of a test response circuit is to assist in the testing of line cards. Testing of line cards is accomplished by providing controlled terminations to the line card to simulate live subscriber line connections. By using analog/digital (A/D) converters, the test response circuitry detects voltage responses generated by the line card and reports the voltage responses upon request.

The next figure is an illustration of the MTA-TRC card.

MTA-TRC card



Third party test head requirements The MTA-TRC card provides a dedicated RJ45 faceplate connector for third party test head access. The RJ45 port provides eight pins for a total of four possible tip and ring metallic test access pair connections. Depending on the system configuration, one of the RJ45 faceplate ports can also be used for interfacing to additional test heads. The RJ45 faceplate ports can be used for test head access when the associated MTA is at the end of a MG 9000 frame line up. Figure shows the connectors on the faceplate of the MTA-TRC card and identifies the purpose of each connector.

The following table contains pinout information for the RJ45 faceplate connector.

Pinout for RJ45 test head interface connector

Pin number	Description
1	Test head pair 0 tip
2	Test head pair 0 ring
3	Test head pair 1 tip
4	Test head pair 1 ring
5	Test head pair 2 tip
6	Test head pair 2 ring
7	Test head pair 3 tip
8	Test head pair 3 ring

The purpose of the third party test head is to verify the quality of subscriber lines. The third party test head is mounted external to the MG 9000 frame. The choice of the test head used, is that of the equipment owner.

The third party test head must support:

- POTS and xDSL lines
- receiving commands from the OSS, executing those commands and responding with data or an acknowledgement
- performing various network diagnostic functions, such as load coil detection, loop length measurement and longitudinal balance for single ended loop qualification
- measuring AC and DC voltage, current, resistance and capacitance between a test line's tip and ground, ring and ground, and tip and ring
- measuring tones and levels such as dial tones, dual-tone multi frequency (DTMF) digits and analyze dial pulses
- providing the following tests that measure the electrical characteristics of the subscriber line:
 - dc delta three terminal measurement
 - dc current
 - dc resistance
 - dc voltage
 - ac delta three terminal measurement
 - ac current
 - ac resistance

- ac voltage
- loop length measurement
- load coil detection and location
- longitudinal balance
- hazardous potential detection
- apply ringing
- single sided resistive fault sectionalization
- loop resistance through interactive testing
- providing the following audio tests:
 - interactive callback with talk/monitor
 - electronic voice detection
 - dial tone analysis
 - voice band single frequency tone recognition (intercept tone through switch)
 - metallic tone generation
 - longitudinal tone generation
 - rotary dial testing
 - DTMF dial testing
 - switch hook flash
 - metallic and longitudinal pair ID tones
- providing the following wideband functions:
 - single ended loop pre-qualifications up to 18,000 feet
 - bridged tap detection and location
 - crosstalk and wideband noise measurement
 - ADSL quiet tone generation
- providing the following coin telephone functions:
 - coin telephone totalizer homing
 - coin telephone collect and return
- providing the following network diagnostic functions:
 - integrated services digital network (ISDN) NT1 maintenance mode activation

- load coil detection and location

NTNY43AA: DS-512 access bridging interface card

The NTNY43AA DS-512 ABI card supports DS-512 fiber link connection between ESMAs and LGCI and the MG 9000. Each DS-512 card hosts a single DS-512 fiber link, consisting of one downstream/TX fiber and one upstream/RX fiber.

Note: The ABI card is not supported on an MG 9000 with DS1-IMA cards.

A pair of DS-512 cards is needed to service both planes (0 and 1) of the XPM. Only one DS-512 is active at any given moment. Activity data is exchanged between the two DS-512 cards through a cable connected to the faceplate of each DS-512 card. Bearer and message traffic is sent and received over both planes, through the DS-512 fiber, to the XPM. Only the active DS-512 card is permitted to send bearer traffic upstream to the active DCC card.

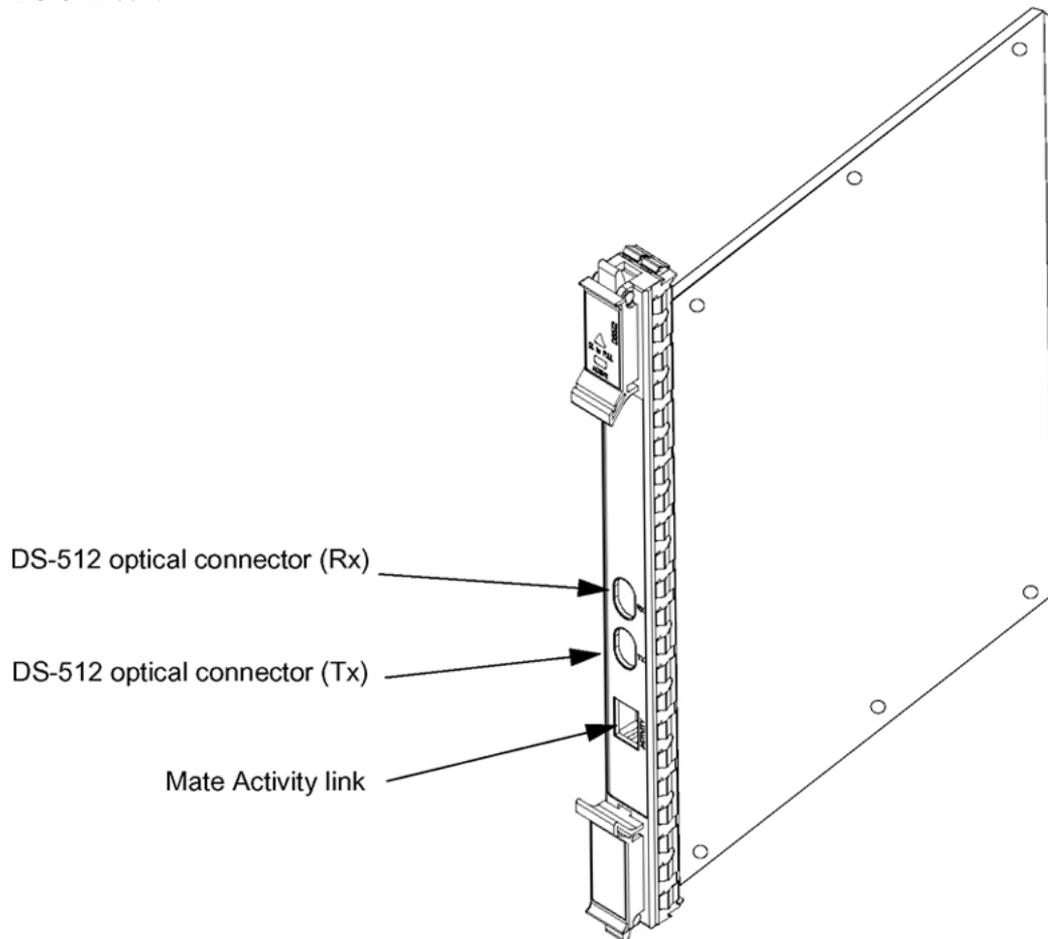
Note: On the DS-512 (ABI) cards, the green Active LED remains continuously for both ABI cards in the protection group. This means both cards are providing service. The active ABI card is labeled in the MG 9000 Manager as Master, while the protected ABI card is labeled as Slave. In the MG 9000 Manager ABI Card View, the master card displays Providing_Service_Master in the Service Status field, while the slave card displays Providing_Service_Slave.

The following table lists the connectors on the faceplate of the NTNY43AA.

NTNY43AA connectors

Connector	Description
Mate Activity	Used to communicate card activity state between a DS-512 pair.
DS-512 pair	Optical connections to subtending XPMs (one transmit and one receive)

The following figure shows the faceplate of the DS-512 card and connectors.

DS-512 card**NTNY43BA: ABI (DS-512) interface card**

The NTNY43BA DS-512 Interface card supports DS-512 fiber link connection between ESMAs and LGCI and the MG 9000. Each DS-512 card hosts a single DS-512 fiber link, consisting of one downstream/TX fiber and one upstream/RX fiber. The NTNY43BA has 128 MB of memory. The NTNY43BA supports G.711 for UA-IP.

Note: DS-512 cards are not provisionable in an MG 9000 with NTNY45BA DS1-IMA interface cards.

NTNY50AA: POTS 32 multi-circuit line card

The POTS 32 line card provides POTS-only service to 32 subscribers. The POTS Multi-circuit line card

- is compatible with terminal sets with input and balance impedance according to North American standards

- includes software selectable loop feed current limit characteristics with software selectable automatic loss equalization for short loops
- has two test-in/test-out busses, test bus 1 and test bus 2, each subscriber interface circuit can access either bus
- has an on-board PUPS
- has a hold clip circuit that allows the MG 9000 shelf to place all loop interface circuits into protection, thereby allowing the circuits to be removed from any external voltages
- has a dedicated ringing generator. The following table lists the characteristics of the on-board ringing generator.

POTS-32 ringing generator characteristics

Characteristic	Value	Purpose
Input	-48 V	Input power
Output	100 Vrms at nominal 20 Hz, superimposed on a dc offset equal to the talk battery voltage	Ringing voltage output. The ringing generator is capable of ringing 15 VA or 15 REN (ringing equivalent number) at the shortest loop length.
	Frequency selective ringing (FSR)	
	Frequencies of 25 Hz or 50 Hz are software selectable	Alternate output frequencies
Zero crossing indicator		Indicates the output dc voltage zero crossing to prolong life of ringing relays.
dc feed resistance	205 Ω nominal	

- can reside in any available line/service card slots, 2-9 and 14-21. The number of line cards used on the master MG 9000 shelf is dependent on the number of ITX cards required for the MG 9000 node. Line cards must be provisioned from the left side of the shelf to the right side of the shelf.

Line loop resistance capabilities The line loop resistance capabilities of the NTNY50AA are summarized as follows:

- Maximum total loop resistance (including telephone set) to detect an off-hook threshold of 21 mA: 1900 Ohms. This is based on the following:
 - a normal talk battery range of -49 to -53.5 V
 - a total loop resistance of 1900 Ohms, including telephone set (assuming a 500-type residential telephone set with 21 mA loop current)
 - a ringing capability versus loop length is a fixed sine wave amplitude of 100 ± 7 Vrms

- Maximum loop resistance (excluding telephone set) to ring a 5 REN load with a minimum of 40 Vrms: 1400 Ohms. This is based on the following:
 - a minimum ringing voltage of the ringing generator of 93 Vrms,
 - an LSSGR requirement of a minimum 40 Vrms delivered to a 5 REN load, and
 - a 5 REN load defined as 1386 Ohms in series with a 40 mF capacitor.

This means the maximum loop resistance, excluding the telephone set, but including all premises wiring between the operating company demarcation point and the telephone set, is 1400 Ohms. This resistance equates to a loop of 17,000 ft with 26 AWG wire.

NTNY51BA: SAA-12 line card

The SAA-12 line card supports 12 subscriber lines.

The SAA-12 line card

- is a programmable line card allowing service changes without modifications to the hardware configurations
- has programmable line card impedance and balance network
- has an on-board PUPS
- supports North American Coin (requiring 100 V generator for coin return), P-Phone, loop-reversal, ground start, and POTS
- has an on-board high voltage generator for each line that eliminates the need for common ringing generator. This high voltage generator also provides high voltage signals for coin control signaling and message waiting lamp control. The ringing capability is described in the following table.

SAA-12 ringing generator characteristics

Characteristic	Value	Explanation
Ringing voltage	40V minimum across a ringing load of 5 REN at the end of any loop with a loop resistance of = 930 O (900 O + 30 O of customer premises wiring)	
Ringing frequency	16 to 67 Hz	16 to 33.3 Hz 54 V rms 40 to 54 Hz 62 V rms 60 to 66.7 Hz 68 V rms
Ringing load	5 REN	Impedance of 1400 O at 20 Hz (A 1386 O resister in series with a 40 μ F capacitor should be used as a 5 REN load.)

Characteristic	Value		Explanation			
	1 REN		Impedance of 7000 O at 20 Hz			
Ringin pattern	Ringin g	Silent	Ringin g	Silent	Ringin g	Silent
A	0.4	0.2	0.4	0.2	0.8	4.0
B	0.2	0.1	0.2	0.1	0.6	4.0
C	0.8	0.4	0.8	4.0		
D	0.4	0.2	0.6	4.0		
E	1.2	4.0				
F	1 ± 0.2	3 ± 0.3				
G	0.4	0.2	0.4	0.2	0.3	4.0

Line loop resistance capabilities The line loop resistance capabilities of the NTNY51BA are summarized as follows:

- Maximum total loop resistance (including telephone set) to detect an off-hook threshold of 21 mA: 1900 Ohms. This is based on the following:
 - a normal talk battery range of -49 to -53.5 V
 - a total loop resistance of 1900 Ohms, including telephone set (assuming a 500-type residential telephone set with 21 mA loop current)
- Maximum loop resistance (excluding telephone set) to ring a 5 REN load with a minimum of 40 Vrms: 1100 Ohms. This is based on the following:
 - a minimum ringing voltage of the ringing generator of 84 Vrms,
 - an LSSGR requirement of a minimum 40 Vrms delivered to a 5 REN load, and
 - a 5 REN load defined as 1386 Ohms in series with a 40 µF capacitor.

This means the maximum loop resistance, excluding the telephone set, but including all premises wiring between the operating company demarcation point and the telephone set, is 1400 Ohms. This resistance equates to a loop of 17,000 ft with 26 AWG wire.

Loop current capabilities The loop current capabilities of the NTNY51BA are as follows:

- POTS - for loop start lines, non-UVG: 1900 Ohms (1500 Ohms cable + 400 Ohms set) at 20 mA. This 1500 Ohms of cable translates to:
 - 8,000 ft of 26 AWG (26 AWG twisted pair is approximately 83 Ohms/kft)

- 28,800 ft of 24 AWG (24 AWG twisted pair is approximately 52 Ohms/kft)
- EBS - for P-Phone lines, the line card operates over the following loop range (between the line card and the EBS terminal):
 - signaling range - 820 Ohms maximum loop dc resistance for 16 Volts across a set, sinking a constant 16 mA current, applies to M5009, M5112, and ac-powered display EBS sets. This 820 ohm resistance translates to:
 - 9,800 ft of 26 AWG (26 AWG twisted pair is approximately 83 Ohms/kft)
 - 15,700 ft of 24 AWG (24 AWG twisted pair is approximately 52 Ohms/kft)
 - transmission range - 15 kft non-loaded cable, limited to 24 dB loss at 8 kft between the card and the EBS set
- Coin - for coin lines:
 - signaling range - 900 Ohms loop + 550 Ohms terminal at 23 mA minimum (a 20 mA in reverse feed). This 1450 Ohms of cable translates to
 - 17,400 ft of 26 AWG (26 AWG twisted pair is approximately 83 Ohms/kft)
 - 27,800 ft of 24 AWG (24 AWG twisted pair is approximately 52 Ohms/kft)
 - transmission range - 900 Ohm loop loaded or non-loaded cable up to the Network Interface

NTNY53AA or NTNY53BA: global line card 32

The GLC 32 provides global services for the MG 9000 and supports 32 subscribers.

General characteristics GLC 32 cards share the following common characteristics:

- can be used in an UA-IP or UA-ATM solution
- terminate subscriber POTS loops for almost any country
- provide a programmable loop interface that can support a wide range of customer requirements
- reside in any available line/service card slots, 2-9 and 14-21. The number of line cards used on the master MG 9000 shelf is dependent on the number of ITX cards required for the MG 9000 node. Line cards

should be provisioned from the left side of the shelf to the right side of the shelf.

- operate over a battery supply voltage range of -42.5 V to -56.7 Volts. The normal operating conditions are a voltage greater than -48 V.
- Global line cards support metering by polarity reversal. For the North American application, metering is not used.
- comply with the protection requirements specified in Telcordia GR-1089 and ITU K.20
- have a dedicated on-board ringing generator. The ring generator provides the ringing for the POTS circuits. The following table lists the characteristics of the on-board ringing generator.

GLC 32 ringing generator characteristics

Characteristic	Value	Purpose
Input	- 48 V	Input power
Output	Software selectable between 50 V and 100 V	Ringing voltage output. The ringing generator is capable of ringing 20 VA at 75 V, 15 VA at 85 V, and 10 VA at 100 V.
	Frequencies of 16.7Hz, 20Hz, 25Hz, and 50Hz are software selectable.	Registers allow selection of ring frequency and five RMS voltages: 65 V, 75 V, 86 V, 90 V, and 100 V
	100 V at 20 Hz	Ringing voltage output for the North American application.
	Unbalanced ringing with ringing occurring on the ring lead. The ac voltage that is output is offset by the -48 Vdc battery supply.	

Each loop supports 5 REN at a minimum of 85V.

- provides voice test access on a per-port basis to the test busses in the MG 9000. The GLC 32 has two test busses. Test-in and test-out can be used on either of these busses, but not simultaneously. The card includes bus select/isolate relays to allow for the connection of each of the test busses to a centralized test head and for card isolation to minimize error when the test subsystem is being used by other cards.

To help improve test capabilities, the GLC 32 card has two load relays (one on each test bus). This 1000 ohm load can be switched into the loop path and used to verify proper operation of the voice circuit without external test head access.

GLC 32 line services The GLC 32 cards support different line services:

- GLC NTNY53AA cards support only POTS loop start and ground start
- GLC NTNY53BA cards support POTS loopstart, POTS groundstart, and P-Phone/Electronic Business Set (EBS)

Backwards compatibility The NTNY53BA card is backward compatible with the NTNY53AA, provided that the appropriate software is used. The NTNY53AA/BA can replace the existing NTNY50AA POTS32 card for North America. The NTNY53BA GLC can safely replace the GLC NTNY53AA and the WLC 32 without deprovisioning prior to replacement.

NTNY53AA/BA Line loop characteristics The line loop characteristics of the NTNY53AA/BA are summarized as follows:

- Loop reach - loop length of 1500 Ohms with customer premise equipment (CPE) load of 430 Ohms.
- Loop currents - a maximum loop short-circuit current of 70mA, and is programmable to meet market requirements.
- Hook detect currents - hook detect current thresholds are programmable. Off-hook and on-hook detect currents from 0 to 30 mA.
- Ring trip currents - consists of two portions:
 - ring trip during ringing - programmable for both ac and dc, from 0 to 20 mA
 - ring trip during the quiet period between rings - controlled by the off-hook threshold
- PCM coding law - selectable between u-law and A-law
- Frequency range - supports a frequency range of 200 to 3400 Hz, as defined in Telcordia GR-507-Core
- Return loss - is programmable, to meet individual country requirements
- Load impedance - supports a wide range of load impedances, including those specified by
 - Telcordia for North America
 - ITU for the European countries.
- Input impedance - supports a wide range of input impedances, including those specified by
 - Telcordia for North America
 - ITU for the European countries.

- Longitudinal balance - supports longitudinal balances greater than 63dB, as defined in Telcordia GR-507-Core
- Transmit and receive gain/loss - supports a wide range of gains and losses in the transmit and receive direction, from -20 to +20 dB

Note: Not all of the previous specifications can be met at the same time. There are interdependencies between several of them. For instance, you cannot provide 75mA on a 1500 ohm loop with a -48 V battery. Ohm's law says you need greater than 112 volts from the battery supply.

- additional characteristics defined for North America:
 - Loop feeding -
 - for normal battery operation (-48 to -57.6V), the GLC-32 supports up to 19.5mA on a 1500 ohm loop into a 430 Ohm CPE load.
 - for emergency battery operation (-42.75 to -48V), supports up to 17.5mA on a 1500 ohm loop into a 430 ohm CPE load. Greater loop currents can be supported on shorter loop lengths.
 - Hook detect:
 - Off hook: > 12mA
 - On-hook: < 10mA
 - Input Impedance: complex
 - Resistance = 900 Ohms
 - Capacitance = 2.16 uF
 - Load Impedance: complex
 - Resistance = 900 Ohms
 - Capacitance = 2.16 uF
 - Return loss -
 - 20dB from 200-500 Hz
 - 26 dB from 500-3400 Hz
 - Transmit gain/loss - 0dB
 - Receive gain/loss - 0dB

NTNY53CA: global line card 12 with coin line resource The NTNY53CA global line card (GLC 12) is a 12-port line card that provides global voice services for the MG 9000 together with Coin Line Resource

(CLR) services for either the IP or ATM MG 9000 solution. It allows the platform to terminate subscriber POTS loops for almost any country. Voice services are designed to comply to both LSSGR and DLC specifications for North America, as well as the applicable specifications for other countries. In addition, P-Phone/EBS sets can be terminated on the GLC 12. The GLC 12 also supports a High Voltage (HV) Coin Line Interface that allows termination at a coin pay phone station.

The NTNY53CA GLC 12 is functionally identical to the NTNY53BA version of the GLC 32 card. The main differences are that the NTNY53CA card supports 12 lines and the Coin Line Resource (CLR) feature.

The NTNY53CA card can replace only the SAA-12 for P-Phone functionality and HV pay phone interface. The NTNY53CA 12-line GLC can only safely replace the SAA-12 card without deprovisioning prior to replacement.

Downloadable FPGA support for NTNY53BA GLC 32 and NTNY53CA GLC 12 cards The NTNY53BA/CA GLC cards feature firmware that can be upgraded in the field. Users can upgrade the configuration load by downloading new firmware for the Field Programmable Gate Array (FPGA) from the MG 9000 Manager (EM).

The GLC cards have two proms: the Factory PROM (FPROM) and the Upgrade PROM (UPROM). The FPROM contains a base image that is loaded at the factory, and cannot be modified in the field. The UPROM contains the latest FPGA image, and can be reprogrammed.

On the MG 9000 Manager, the GLC Card View includes a field which displays the FPGA configuration load of a selected GLC card. The MG 9000 Upgrade Wizard (which you access from the EM), provides the interface for upgrading the firmware on the NTNY53BA/CA GLC cards. If you wish to upgrade one card, you must use the Software Download Manger. For further information, see NN10440-450, *Nortel Carrier Voice over IP Upgrade and Patches*.

Line/service cards: private lines cards

This section describes the following cards that support private lines.

Private lines circuit cards

PEC	Description
NTNY40AA	DS1 AAL-1 Line Card

NTNY40AA: DS1 AAL-1 line card

The DS1 card is a 16-port DS1 circuit emulation service (CES) card for the MG 9000. The DS1 card allows the platform to terminate TDM based DS1s and provides circuit emulation over ATM AAL-1. The DS1 card provides DS1 circuit emulation of 16 independent DS1s.

The DS1 card also provides the following functions:

- line interface for 16 DS1s
- structured DS1 N x 64 kbit/s service
- unstructured DS1 service

The DS1 card can be placed in any line/service slot (2-9 and 14-21), from the left side of the MG 9000 shelf to the right side of the shelf.

Note: For private lines and mixed service applications DS1 slot assignments are limited to shelf 3.

Line/service cards: DSL

This section describes the following card that supports DSL lines.

DSL circuit card

PEC	Description	Application
NTNY52AA	ADSL combo 8+8 line card	UA-AAL1 and UA-IP solutions

NTNY52AA ADSL combo 8+8 line card

The ADSL combo 8+8 (NTNY52AA) line card terminates eight fully compliant ADSL subscriber loops. Each loop interface has a splitter circuit to separate or join the lifeline voice service with the value-added ATM data cell traffic for the subscriber. The data traffic routes to the ATM common equipment MG 9000 shelf. The line card contains no voice or data traffic. The NTNY52AA line card contains four voice circuits and four data circuits.

The 8+8 combo card is supported in UA-AAL1 and UA-AAL-5 (IP over ATM), though it is not supported in an MG 9000 with GigE DCC cards.

The ADSL line card

- is a voice and data interface to the subscriber loop
- terminates eight subscriber loop pairs for analog voice telephone service and standard compliant ADSL ATM data services
- uses an onboard ring generator circuit that provides the ringing for the 8 POTS circuits. The ringing generator provides 10VA at 100 ± 7 Vrms
- uses an onboard PUPS

The 8+8 combo line card is provisioned on the master MG 9000 shelf and is provisioned in any open line card slot 2-9 and 14-21. The number of 8+8 combo line cards provisioned depends on the number of ITX cards required for the MG 9000 node. 8+8 combo line cards are provisioned from the left side of the MG 9000 shelf to the right side of the shelf.

Line loop resistance capabilities The line loop resistance capabilities of the NTNY52AA are summarized as follows:

- Maximum total loop resistance (including telephone set) to detect an off-hook threshold of 21 mA: 1900 Ohms. This is based on the following:
 - a normal talk battery range of -49 to -53.5 V
 - a total loop resistance of 1900 Ohms, including telephone set (assuming a 500-type residential telephone set with 21 mA loop current)
 - a ringing capability versus loop length is a fixed sine wave amplitude of 100 ± 7 Vrms
- Maximum loop resistance (excluding telephone set) to ring a 5 REN load with a minimum of 40 Vrms: 1400 Ohms. This is based on the following:
 - a minimum ringing voltage of the ringing generator of 93 Vrms,
 - an LSSGR requirement of a minimum 40 Vrms delivered to a 5 REN load, and
 - a 5 REN load defined as 1386 Ohms in series with a 40 mF capacitor.

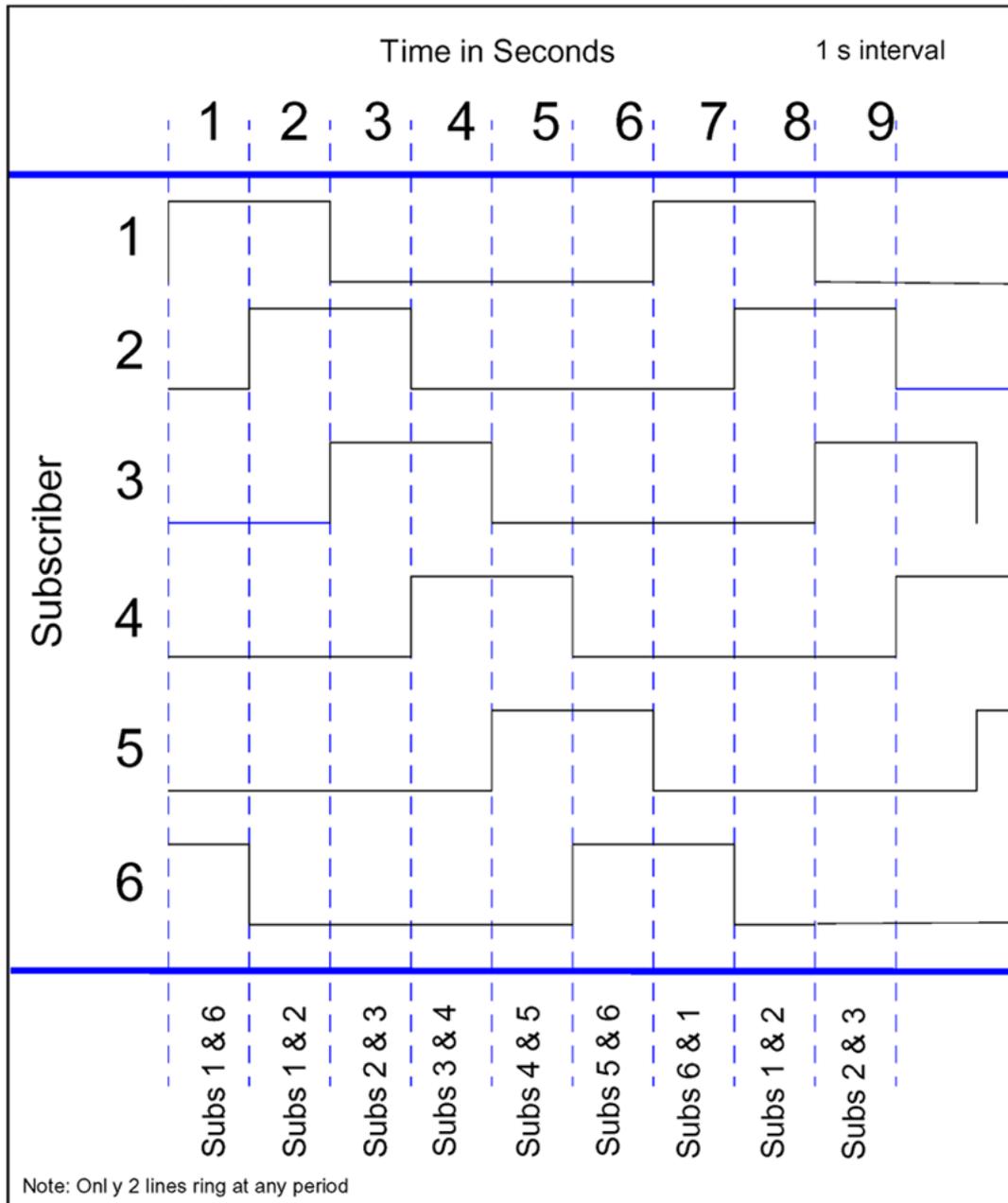
This means the maximum loop resistance, excluding the telephone set, but including all premises wiring between the operating company demarcation point and the telephone set, is 1400 Ohms. This resistance equates to a loop of 17,000 ft with 26 AWG wire.

Additional ringing information

By default the MG 9000 uses scheduled ringing. Scheduled ringing allows six lines to be in the ringing state at any given time. This is accomplished by assigning the ring start to the next available ring slot. As shown in the following figure, two lines are in the power ringing state, while the other four are in the silent state. This figures assumes a normal 2 seconds (s) On, 4 s Off ringing pattern.

Note: Scheduled ringing applies to all line cards except the SAA-12 line card.

Scheduled ringing diagram



Circuit card indicators

The faceplate on each circuit card, except the power input/output card, contains LEDs. The following table lists the color and meaning of each LED. The shelf interface card includes a red Fail indicator for itself, and a red Fail indicator for the entire shelf. The shelf Fail LED is visible through the front cover.

LED indicators

Faceplate marking	Color and shape	Indication
Active	Green rectangle	Activity. When lit, the unit is in use. Indicates that pulling the card from the shelf creates a service interruption. Note: On DS-512 cards, the Active LED remains lit continuously for both cards in the pair. This means both cards are providing service.
Okay to pull	Red triangle	When lit, partial or full failure has occurred and the card has been take out of service (OOS). The card can be pulled from the shelf.

Description of tools and utilities

Tools and utilities for the MG 9000 are accessible through the MG 9000 Manager. Individual tools available through the MG 9000 Manager are described in *MG 9000 Configuration Management*, NN10096-511.

Software

Software loads

This section provides a list of software loads for the MG 9000.

Private lines dependencies

The following table lists the software dependencies for the private lines application.

Software dependencies for private lines

Network element	Software release	Load name or order code	Description
Voice over IP Network	SN09	SN00009	North America Communications Server (NCS)
CS 2000 Core Manager	CS2E09	CS2E0090	Communications Server 2000 Core Manager
Gateway controller SAM21 Platform	GN090BV SCU12	GWCN0090 SAM20090	Gateway controller load Shelf controller unit

Network element	Software release	Load name or order code	Description
MG 9000	MG9K-09	MG9K0090	MG9K0090 load includes SCO (OC-3 ATM interface), SCI (DS1 IMA ATM interface), ITP, ITX, DS1, ABI, MTA, and xDSL loads
MG 9000 Manager	UEEMS09	9KEM0090	MG 9000 Manager loadset that includes the following: <ul style="list-style-type: none"> • master server • mid-tier server • OM Collector
SPFS	SSPFS_2005113 23	SPFS0090	Succession Server Platform Foundation Software

Switched lines dependencies

The following table lists the software dependencies for the switched lines application.

Software dependencies for switched lines

Network element	Software release	Load name or order code	Description
Voice over IP Network	SN09	SN00009	North America Communications Server (NCS)
CS 2000 Core Manager	CS2E09	CS2E0090	Communications Server 2000 Core Manager
Gateway controller	GN090BV	GWCN0090	Gateway controller load
SAM21 Platform	SCU12	SAM20090	Shelf controller unit
MG 9000	MG9K-09	MG9K0090	MG9K0090 load includes SCO (OC-3 ATM interface), SCI (DS1 IMA ATM interface), ITP, ITX, DS1, ABI, MTA, and xDSL loads

Network element	Software release	Load name or order code	Description
MG 9000 Manager	UEEMS09	9KEM0090	MG 9000 Manager loadset that includes the following: <ul style="list-style-type: none"> • master server • mid-tier server • OM Collector
SPFS	SSPFS_200511 323	SPFS0090	Succession Server Platform Foundation Software

Upgrade and patch system

Software upgrade and patches are provided to the MG 9000 through the upgrade and patching processes described next.

Software upgrades

Software upgrades are provided to the DCC, ITP, ITX, DS1, ABI, MTA, and DSL cards through the MG 9000 Manager. Software upgrades are also provided for the MG 9000 Manager. For information and procedures for both refer to NN10440-450, *Nortel Carrier Voice over IP Upgrade and Patches*.

Software patches and updates

Software patches and updates are provided for the DCC (SCO, SCI, SCG), ITP, ITX, DS1, and ABI software loads through the Regional Patch Selector (RPS). Patches are administered at the CS 2000 using the Network Patch Manager (NPM). For more information about how patches and software updates are delivered to the MG 9000, refer to "Succession Patching" in NN10440-450, *Nortel Carrier Voice over IP Upgrade and Patches*. Refer to the same guide for MG 9000 patching information and applying software patches to the MG 9000 Manager using the NPM.

In SN09, when a patch is applied or removed that requires a restart of the affected DCC, ITP, ITX, DS1, or ABI card, a patch alarm fault alarm and a PATC301 log are output at the MG 9000 Manager Alarm Browser. The alarm identifies the affected card and if a restart is required. For information on the alarm and restarting an affected MG 9000 card, refer to NN10074-911, *MG 9000 Fault Management*.

OAMP strategy

This section identifies the components of OAM&P for the MG 9000.

Card OAMP

The Card Diagnostic subsystem provides utilities that the Node and Card Maintenance subsystem uses to diagnose the intelligent MG 9000 cards.

Card Diagnostics available at the MG 9000 Manager are described in *MG 9000 Fault Management*, NN10074-911.

ATM OAMP

The following table lists the components and functions of the ATM OAM&P subsystem.

Components of ATM OAMP subsystem

Component	Functions
ATM performance measurements (PM)	<ul style="list-style-type: none"> network management access statistics for AAL-1 and AAL-5 connections
Connection manager	<ul style="list-style-type: none"> ATM maintenance interworking to handle link or protocol failures connection admission control cross-connections, PVC and SVC management redundancy traffic contract definitions
ILMI	<ul style="list-style-type: none"> ATM addressing and registration ATM maintenance and interworking to handle link failures automatic configuration of signaling parameters with adjacent nodes network management access redundancy
OAM F5 management	Alarm support
Native ATM services API	<ul style="list-style-type: none"> data transfer distribution of connections and associated data to correct application network management access provisioning of PVCs and SVCs traffic management
UNI signaling	<ul style="list-style-type: none"> ATM maintenance interworking to handle link or protocol failures generic signaling handlers redundancy user interaction for setup and release messages

- user-side signaling to allow SVCs through the network

Carrier OAMP

The Carrier OAM&P subsystem consists of the DCC Carrier Maintenance subsystem and the DS1 Carrier Maintenance subsystem.

The Carrier OAM&P subsystem provides

- network management interface through SNMP
- carrier surveillance
 - configuration and maintenance of OC-3 carriers
 - configuration and maintenance of DS1 carriers
 - performance monitoring
 - fault detection and isolation
- automatic protection switching

Interfaces

Network interfaces and protocols

This section identifies the interfaces and protocols used in the MG 9000.

Protocols

The following table lists industry standard protocols applicable to the MG 9000 Manager.

MG 9000 MG protocols

For	Standard	Function
Call control	ITU H.248	The ITU H.248 media gateway control messaging is used between the Communication Server 2000 and the MG 9000 to establish calls.
Bearer path	ATMF UNI 4.0	Switched virtual circuits (SVC) use the ATMF UNI 4.0 protocol to set up connections through the network.
Management	SNMP 2.0	SNMP 2.0 sends management information between the MG 9000 Manager and the MG 9000.
Switched lines over IP	RTP	Real time protocol is an IETF protocol for switched lines over IP solutions.

The bearer, call control, and management paths in the UA-AAL1 solution use ATM backbone while these paths in the UA-IP solution use IP backbone.

Network interfaces

The following table lists the ATM network interfaces for the MG 9000.

MG 9000 network interfaces

Interface	Description/function
OC-3c/STM-1	Optical network interface on data control card for voice and data.
Gigabit Ethernet (GigE)	Gigabit links connect to IP network and use VLANs to segregate IP traffic into bearer, call processing signaling, OAM signaling, and link integrity signaling paths.
DS1 IMA	Uses T-1 lines to perform inverse multiplexing over ATM (IMA). The data stream splits across one or more DS1 circuits by the MG 9000 data control card, which has IMA, and is reassembled at the remote.

User interfaces

The MG 9000 requires the following user interfaces:

- local craft interface
- MG 9000 Manager graphical user interface (GUI)

These interfaces are described next.

Both interfaces are described in further detail in the *MG 9000 Configuration Management*, NN10096-511.

Local craft interface

The LCI is used for initial commissioning and in emergency instances when the MG 9000 Manager is not available. Daily operation, administration, and maintenance of the MG 9000 is performed from the MG 9000 Manager.

MG 9000 manager graphical user interface

The MG 9000 Manager serves as a management system for the MG 9000 within a network. The MG 9000 Manager enables remote management of multiple MG 9000 network elements through a single GUI.

Note: The only user locale setting supported for proper functioning of the MG 9000 Manager application on a Solaris or Windows operating system, is English. The user locale setting is used to display numbers, currencies, dates, and times.

Use of the MG 9000 Manager in clearing MG 9000 faults is described in *MG 9000 Fault Management*, NN10074-911.

In offices with the Integrated EMS, the MG 9000 Manager, along with other component managers are accessible to perform maintenance and configuration management activities through a single user interface.

When instructed to use the MG 9000 Manager in the fault, configuration, performance, and security and administration procedures presented in the MG 9000 documentation suite, go to the Integrated EMS.

The MG 9000 Manager runs on the Sun Netra t1400 server from SUN Microsystems running the Solaris 8 operating system. Beginning in SN06.2, the MG 9000 Manager can also run on the Sun Netra 240 (N240) server from SUN Microsystems running the Solaris 8 operating system. The MG 9000 Manager can be installed on either the Sun N240 simplex or HA (high availability) configuration. The Sun N240 servers reside in the Cabinetized Operations Administration and Maintenance (COAM) cabinet. The Sun platform uses the Succession Server Platform foundation software (SPFS) which is a high-performance, UNIX-based processing platform based on Sun Micro System's Netra line of NEBS compliant servers. The SPFS platform is used as the platform for OAM&P services. For more information on the Sun Netra hardware, the COAM cabinet, and the SPFS software, refer to the ATM/IP solution level documentation.

Carrier VoIP

MG 9000 Basics

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