Lucent Technologies
Bell Labs Innovations

Lucent Gateway Platform
Planning and Engineering Guide

Part Number 255-400-003R5.1.0.1
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Software Version 5.1.0.1

Notice

Every effort has been made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change.

Mandatory customer information

Safety

Always observe the Safety Instructions when operating the system.

Trademarks

All trademarks and service marks specified herein are owned by their respective companies.

Ordering information

The order number of this document is 255-400-003R5.1.0.1.

Support

Technical support

Please contact your Lucent Technologies Local Customer Support Team (LCS) for technical questions about the information in this document.

Information product support

To comment on this information product online, go to ***http://www.lucent-info.com/comments*** or email your comments to ***comments@lucent.co***m.

Manual Contents

1. Manual Contents

Following is a listing of the tabs and documents of this manual. Documents are listed by name followed with its section number and its issue number and date on the same line.

Planning and Engineering Guide
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List of Tables

1 Safety and Regulations

1.1 Safety Instructions

1.1.1 Admonishments

This manual contains admonishments in the form of ***DANGERs***, ***Cautions***, and ***Warnings***. These admonishments have the following definitions:

***DANGER*:** indicates the presence of a hazard that will cause death or severe personal injury if the hazard is not avoided.

***Caution*:** indicates possibility of causing service interruption if precautionary measures are not taken.

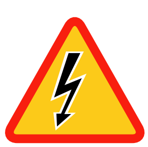
Warning: indicates possibility of equipment damage if precautionary measures are not taken.

1.1.2 Important Safety Instructions

The following list of safety instructions should be observed when working with and around the Switch:

1. Read and understand all instructions.
2. Follow all warnings and instructions marked on the product.
3. Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage.
4. Slots and openings in the cage are provided for ventilation. To protect the product from overheating, these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided.
5. Operate this product from the type of power source indicated on the marking label. For information on proper electrical and power requirements, refer to the Specifications subsection of the Chassis Detailed Description in the Hardware Description section of this manual.
6. Never push objects of any kind into this product through cabinet slots. Objects inserted into the cage may touch dangerous voltage points or short out parts, increasing the risk of fire or electrical shock.
7. Never spill liquid of any kind on the product.
8. To reduce the risk of electrical shock, do not disassemble this product. Only trained personnel should perform service. Removing covers and/or circuit cards may expose you to dangerous voltages or other risks. Incorrect assembly can cause electrical shock when the unit is used.
9. Use only Lucent circuit cards in this system.

1.2 Electrostatic Discharge (ESD)



Warning: All integrated circuit cards can be damaged by static electricity that builds up on work surfaces and personnel. Static charges are produced by various charging effects of movement and contact with other objects. Dry air allows greater static charges to accumulate. Higher static electricity is present in areas with low relative humidity, but static electricity can cause damage anywhere.

The following list of precautions should be observed when handling circuit cards in order to prevent damage by electrostatic discharge:

- Assume all circuit cards contain solid-state components that can be damaged by ESD.
- When handling circuit cards (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, anti-static floor mat.
- Handle all circuit cards by the extractor handle and top or bottom edges. Never touch the components, conductors or connector pins.
- Observe warning labels on bags and cartons. Do not remove circuit cards from anti-static packaging until ready to insert them into slots.
- If possible, open all circuit cards at a static-safe work position, using properly grounded wrist straps and anti-static tablemats.
- Always store and transport circuit cards in anti-static packaging. Shielding is not required unless specified.
- Keep all static-generating materials such as food wrappers, plastics, and Styrofoam containers away from all circuit cards. Upon removal from bay, immediately put circuit cards into anti-static packages.
- Whenever possible, maintain relative humidity above 20 percent.

To eliminate the possibility of ESD damage, units are equipped with grounding jacks to enable personnel to ground themselves using wrist straps while handling circuit cards or working on a unit. An alligator clip adaptor enables connection to bay frame ground when grounding jacks are not provided.

1.3 Laser Safety Notice

This product uses a semiconductor laser system and is classified as an AEL (Accessible Emission Limit) Class 1 Laser Product according to U.S. FDA CDRH Regulations and IEC 60825-1. This product meets Class 1 Laser Safety Requirements of 21 CFR 1040.10 and 1040.11. This product meets the Class 1 Laser Safety Requirements of IEC 60825-1 and IEC 60825-2. To meet laser safety requirements this product must be operated within the Data Sheet Limits. It is eye safe when used within the Data Sheet Limits per FDA CDRH. It is also eye safe under normal operating conditions and under all reasonably foreseeable single fault conditions per IEC 60825-1 and IEC 60825-2.

Warning: Do not look at the laser beam projection area (e.g., end of optical connector) with naked eyes or through optical equipment while the power is supplied to this product. Otherwise, your eyes may be injured.

Caution: If this product is used under conditions not recommended in the specification or this product is used with unauthorized revision, classification for laser product safety standard is invalid. Classify the product again at your responsibility and take appropriate actions.

1.4 Exemption

The switch is intended for tandem switching applications and as such is exempt from CALEA requirements. The switch may not be lawfully used in any application involving terminations directly to individual subscriber stations without a waiver from the FCC. Applications involving terminations to PBXs, channel banks or other similar equipment, where calls to or from individual stations behind the equipment can be uniquely identified, require a similar waiver.

Such waivers may be obtained by applying to the FBI's Flexible Deployment Program Manager, CALEA Implementation Section, at 800-555-0336 or 703-814-4700. The CALEA implementation group of the FBI has informed Lucent that trunks to a PBX that do not provide DID capability or pass station ID to the Plexus are exempt from CALEA requirements. A CALEA enhancement package will be available for the switch in the last quarter of 2002.

1.5 Regulatory Compliance Notices

1.5.1 Federal Communications Commission Notice

1.5.1.1 FCC Part 15 Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

1.5.1.2 Modifications

The FCC requires you to be notified that any changes or modifications made to this device that are not expressly approved by Lucent, Inc. may void your authority to operate the equipment.

1.5.1.3 Cables

Connections to this device must be made with shielded cables in order to maintain compliance with FCC Rules and Regulations.

1.5.2 Canadian Notice

This Class A digital apparatus complies with Canadian ICES-003.

1.5.3 Avis Canadien

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

NOTES:

2 Introduction

2.1 Overview

The *Planning and Engineering Guide* (PN 255-400-004) is part of the overall switch documentation set.

The *Planning and Engineering Guide* provides an overview of the switch and its features. Descriptions and illustrations of the switch hardware is also defined, including system specifications, site engineering information and interconnect drawings, and part numbers and ordering information for all hardware.

This introduction describes the *Planning and Engineering Guide*, and how it relates to other manuals within the switch documentation set. It also describes the switch documentation set. Specifically, these topics are described in this introduction:

- Planning and Engineering Guide Organization
- Documentation Set

2.2 Scope and Audience

This manual is intended for personnel who are responsible for provisioning the switch with TL1 commands. These personnel must have a thorough knowledge of telecommunications.

2.3 Reason for Reissue

This manual was reissued for system software revision 5.1.

2.4 Planning and Engineering Guide Organization

Note: The System Overview is no longer found in the manual. Refer to the *Product Overview Guide* for it and other overview of selected features.

The *Planning and Engineering Guide* contains an overview of the Switching system, as well as the following information:

- Safety and Regulations contains important safety instructions and regulatory compliance notices you should know before operating the switch.
- The Introduction contains a description of the switch manuals and *Planning and Engineering Guide* organization, and general information about the switch documentation.
- System Specifications include physical dimensions and power and wire information about switch hardware, such as chassis slots, IOMs, and the alarm panel.
- System Description depicts the actual rack and describes the physical locations of the front and rear cards, protection slots, LED and push buttons, fan tray, fan filter, rear cables, and power and ground locations.
- The Planning for Installation section describes building requirements, chassis dimensions, space requirements, grounding requirements, power requirements, system interfaces, slot assignments, tools and test equipment, an Installation Planning Checklist, and the switch configuration.
- Interconnect Drawings depict the connectors and cables of the switch.
- Part Information, which provides a list of part numbers for every switch-related product that can be ordered.
- Technical Support describes how to get in touch with Lucent Worldwide Services, and where to return hardware and other Lucent products.
- Acronyms, which provide a list of all acronyms used in reference to the switch and its components.

2.5 Using the CD-ROM

Like many manuals today, this one has a CD-ROM inserted in a pocket on the back of the binder cover. When inserted into a drive, the CD-ROM will automatically open to the main menu page. From this page, you can select the Planning Guide.

When using the Planning Guide you can move to different areas using the bookmarks on the left side of the page. Clicking on the + sign in front of a topic will expand it, clicking on the – sign will minimize it. Table of Contents information in blue font will also move you to that identified topic. Titles in blue font will return to the third page of the Planning Guide. Clicking on the title of the first page (Manual Contents) will return you to the Main Menu page.

2.6 Relationship Between Manuals

The *Planning and Engineering Guide* contains information and many illustrations of the hardware components that must be provisioned before you can use the switch. Therefore, the *Planning and Engineering Guide* can be useful during actual installation and provisioning procedures. Descriptions and illustrations of IOMs, cables and other hardware encountered while following the procedures in the *Installation and Operations Manual* are contained within the *Planning and Engineering Guide*.

While the *TL1 Commands Reference Guide* has no direct correlation to the *Planning and Engineering Guide*, it does contain the TL1 commands needed to provision the software for the switch and its components.

2.7 System Documentation

One set of system documentation on CD-ROM (PN 255-400-007) is sent to you with each switch you purchase. Each set consists of, at a minimum, these core manuals and system release notes:

Table 2-A. System Documentation Set

Product	Part Number	Product Description
Lucent Gateway Platform Operations Manual	255-400-000	Contains the platform provisioning procedures.

Product	**Part Number**	**Product Description**
Lucent Gateway Platform Maintenance and Troubleshooting Guide	255-400-001	Contains the procedures for adding and upgrading modules, and maintaining and troubleshooting switch alarms.
Lucent Gateway Platform TL1 Commands Reference Guide	255-400-002	Description of all the TL1 commands needed to provision the platform, functional entities and services.
Lucent Gateway Platform Planning and Engineering Guide	255-400-003	Contains the information necessary for designing an installation site including: hardware specifications; cabling schematics; and cabling, floor plan, environmental and power requirements.
Lucent Gateway Platform Product Overview Guide	255-400-004	Contains descriptions of the base switching platform, functional entities (Network Controller, Signaling Gateway; Network Gateway, Compact Switch) and supported provisioning methods.
Lucent Gateway Platform System Release Notes	255-400-006	Contains new features and feature enhancements, new and modified TL1 commands, hardware and software limitations and other important release-specific information not available elsewhere.
Lucent Gateway Platform Feature Packages Guide	255-400-012	Contains detailed feature package descriptions.
Lucent Gateway Platform Billing and Traffic Collection (BTC) Guide	255-400-403	Contains installation, upgrade, and applications procedures.
Lucent Gateway Platform BTC Release Notes	255-400-404	Contains software features and release-specific information that is not available elsewhere.
Lucent Gateway Platform System Documentation CD-ROM	255-400-007	Contains all of the manuals and the release notes listed above in Adobe Acrobat PDF format.

Printed versions of these documents can be ordered individually, using the part numbers listed.

Other manuals and release notes, which are available upon purchase of additional software include:

Table 2-B. PlexView Documentation Set

Product Documentation	Part Number	Product Description
Lucent Gateway Platform Element Management System (EMS) User Guide	255-400-400	EMS provisioning reference guide.
Lucent Gateway Platform Element Management System (EMS) Installation Guide	255-400-401	Installing the EMS software on a Sun workstation.
Lucent Gateway Platform EMS Software Release Notes	255-400-402	Contains software features and release-specific information that is not available elsewhere.
Lucent Gateway Platform Billing Traffic Collection (BTC) Guide	255-400-403	Contains installation, upgrade, and applications procedures.
Lucent Gateway Platform BTC Release Notes	255-400-404	Contains software features and release-specific information that is not available elsewhere.
Lucent Gateway Platform EMS/BTC Documentation CD-ROM	255-400-406	Contains: ∉# EMS User Guide 255-400-400 ∉# EMS Installation Guide 255-400-401 ∉# EMS Software Release Notes 255-400-402 ∉# BTC Guide 255-400-403 ∉# BTC Release Notes 255-400-404

Product Documentation	Part Number	Product Description
Lucent Gateway Platform Advanced Reporting System (ARS) User's Guide	255-400-200	ARS provisioning reference guide.
Lucent Gateway Platform Advanced Reporting System (ARS) Installation Guide	255-400-201	Installation and upgrade information for the ARS software.
Lucent Gateway Platform Advanced Reporting System (ARS) with Advanced Traffic Collector (ATC) Installation Guide	255-400-202	Provides installation and upgrade information for the ATC and ARS in sequential order.
Lucent Gateway Platform ARS Software Release Notes	255-400-203	ARS software features and release-specific information that is not available elsewhere
Lucent Gateway Platform ARS Documentation CD-ROM	255-400-204	Contains: ∉# ARS User Guide 255-400-200 ∉# ARS Installation Guide 255-400-201 ∉# ARS with ATC Installation Guide 255-400-202 ∉# ARS Software Release Notes 255-400-203

3 System Specifications

3.1 Specifications

3.1.1 Chassis Slots

Table 3-A. Chassis Slots

Number of Slots	Description
21	Slots total
2	Switch Fabric slots, one working and one protection
2	System Processor slots, one working and one protection
17	Maximum I/O slots, working and protection
1	DS-1 I/O protection slot
2	DS-3/STS-1 I/O protection slots (chassis dependent)
	T6-B

3.1.2 Dimensions

Table 3-B. Dimensions

MECHANICAL SPECIFICATIONS		
Height	22.75”	57.785 cm
Width (with mounting ears)	23.00”	53.975 cm
Depth (cover and tie bars)	18.00”	45.72 cm
Weight (fully loaded)	150 lbs	68.039 kilograms 9

3.1.3 Environmental Specifications

Table 3-C represents the environmental specifications for the system and its plug-in modules.

Table 3-C. Environmental Specifications

3.1.4 Environmental Conditions	**Temp. (°F) Min/Max**	**Temp. (°C) Min/Max**	**Relative Humidity**
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		
Notes: 1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit. 2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year. 1			

3.1.5 Power

The switch requires redundant -48 Vdc power feeds. Refer to Table 3-D for power specifications.

Table 3-D. Plexus 9000 Chassis Power Specifications

Requirement	**With DS1/DS3**	**With Octal DS3**
Input voltage	-40 Vdc to –56.7 Vdc	-40 Vdc to –56.7 Vdc
Thermal output *	Up to 2730 BTUs /hr/shelf	Up to 4505 BTUs /hr/shelf
Current draw *	20 Amperes per shelf	33 Amperes per shelf
Power consumption *	800 Watts	1320 Watts
* Fully loaded at 40 Vdc.		

T11-B

3.1.6 Interfaces

The switch can have DS-1, E1, J1,DS-3/STS-1, Voice Server, Network Access I/O modules (IOMs). Refer to the following tables for IOM specifications.

- Table 3-E for framing and line codes
- Table 3-F for DS1 IOM specifications
- Table 3-G for J1 IOM specifications
- Table 3-H for E1 IOM specifications
- Table 3-I for DS3 IOM specifications
- Table 3-J for STS-1 specifications
- Table 3-K for OC-3/STM-1 specifications
- Table 3-L for single-mode optical ENA specifications
- Table 3-M for multi-mode optical ENA specifications

Table 3-E. IOMs, Framing and Line Codes

IO Module	Framing	Line Code
28-Port DS1/J1 - TDM	SF ESF	B8ZS AMI
21-Port E1 – TDM	CRC, CRC MF, DB, MF	HDB3 AMI
3-Port DS3 - TDM	M13 (normal) C-Bit	B3ZS
3-Port DS3/STS-1 - TDM	M13 (normal) C-Bit	B3ZS
8-Port DS3/STS-1 - TDM	M13 (normal) C-Bit	B3ZS
8-Port DS3/STS-1 - ATM	M13 (normal) C-Bit	B3ZS
4-Port OC-3 - ATM	SONET	NRZ
4-Port OC-3 – IP over ATM	SONET	NRZ
4-Port OC-12c - ATM	SONET	NRZ
4-Port OC-12c – IP over ATM	SONET	NRZ
		T8-D

Table 3-F. DS1 Specifications

Specification	Description
Nominal line:	1.544 Mb/s
AIS line rate:	1.544 Mb/s
Line code:	Half width bipolar AMI or B8ZS (channel selectable)
Line format:	Selectable ESF/SF per channel
Termination:	One balanced twisted pair shall be used for each direction of transmission.
Impedance:	100 ohms ± 5% (balanced)
Pulse shape:	Meets TR-TSY-000499 mask with amplitude of between 2.4 and 3.6 volts. ***Note:*** When measuring the pulse mask, a 100 ohms T1 patch cable is required.
Power level:	For an all-ones pattern, the power in a band no wider than 3 kHz: ∉# Centered at 772 kHz is between 12.6 and 17.9 dBm. ∉# Centered at 1544 kHz is at least 29 dB below the power level at 772 kHz.
Pulse imbalance:	Less than 0.5 db difference between total power of positive and negative pulses
Jitter generation:	Less than 0.3 timeslots RMS
Maximum span:	655 feet to cross connect using 22 AWG cable 400 feet to cross connect using 24 AWG cable
	60

Table 3-G. J1 SPECIFICATIONS

J1 SPECIFICATIONS	
Nominal line:	1.544 Mb/s ± 130 ppm
AIS line rate:	1.544 Mb/s ± 32 ppm
Line code:	Half width bipolar AMI or B8ZS (channel selectable)
Frame format:	Selectable J-ESF/J-D4 per channel
Termination:	One balanced twisted pair shall be used for each direction of transmission.
Impedance:	100 ohms ± 5% (balanced)
Pulse shape:	Meets TR-TSY-000499 mask with amplitude of between 2.4 and 3.6 volts. ***Note:*** When measuring the pulse mask, a 100-ohms T1 patch cable is required.
Power level:	For an all-ones pattern, the power in a band no wider than 3 kHz: ∉# Centered at 772 kHz is between 12.6 and 17.9 dBm. ∉# Centered at 1544 kHz is at least 29 dB below the power level at 772 kHz.
Pulse imbalance:	Less than 0.5 db difference between total power of positive and negative pulses.
Jitter generation:	Less than 0.3 timeslots RMS
Maximum span:	655 feet to cross connect using 22 AWG cable 400 feet to cross connect using 24 AWG cable

Table 3-H. E1 SPECIFICATIONS

E1 SPECIFICATIONS	
Nominal line:	2.048 Mb/s
AIS line rate:	2.048 Mb/s
Line code:	Channel selectable HDB3 or AMI (test only)
Frame format:	Selectable DF, CRCMF, CRC or MF per channel.
Termination:	One balanced twisted pair shall be used for each direction of transmission.
Impedance:	120 ohms ± 5% (balanced)
Pulse shape:	Meets ITU-T I.431 mask with amplitude of between 2.4 and 3.6 volts measured at the output port. .
Power level:	For an all-ones pattern, the power in a band no wider than 3 kHz: ∉# Centered at 1024 kHz is between 12.6 and 17.9 dBm. ∉# Centered at 2048 kHz is at least 29 dB below the power level at 1024 kHz.
Pulse imbalance:	Less than 0.5 db difference between total power of positive and negative pulses.
Jitter generation:	Less than 0.3 timeslots RMS
Maximum span:	6 dB attenuation

T79.A

Table 3-I. DS3 Specifications

Specification	Description
Nominal line	44.736 Mb/s ± 20 ppm
Line code	B3ZS (Bipolar with three-zero substitution)
Framing	M-Frame (M13) or C-Bit parity mode
Termination	One coaxial line for each direction of transmission
Impedance	75 ohms ± 5% (unbalanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 0.36 and 0.85 volts peak.
Pulse imbalance	Less than 3.5 dB difference between total power of positive and negative pulses
Jitter generation	Less than 0.3 timeslots RMS
Cable	728 RG-6U or equivalent
Maximum span	450 feet to DSX-3 cross connect
	69

Table 3-J. STS-1 Specifications

Specification	Description
Line rate	51.84 Mb/s ± 20 ppm
Line code	B3ZS (Bipolar with three-zero substitution)
Framing	A1 and A2 bytes
Mapping	Locked or floating VT (virtual tributary) mode
Termination	One coaxial line for each direction of transmission
Impedance	75 ohms ± 5% (unbalanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 0.36 and 0.85 volts peak.
Pulse imbalance	Less than 3.5 dB difference between total power of positive and negative pulses
Jitter generation	Less than 0.01 unit intervals (UI) RMS
Cable	728 RG-6U or equivalent
Maximum span	450 feet to cross connect
	T76-A

Table 3-K. OC-3 / STM-1 Mb/s Optical Signal Transmission Specifications

Parameter	Specification
Line Bit Rate	155.52 Mb/s
Line Code	NRZ
Fiber Mode	Single mode
Optical Source	Laser
Transmitter Output	-11 dBm typically (–15 to -8 dBm)
Optical Connector	Duplex SC
Optical Detector	PIN Diode
Receive Sensitivity	-34 dBm (BER=1x10^{-10})
Receive Saturation	-8 dBm (BER=1x10^{-10})
Receive Dynamic Range	26 dB
Optical Wavelength λ_{out}	1330 nm typical (1274 to 1356 nm)
Spectral Width ($\Delta\lambda_{rms}$)	2.5 nm maximum
Extinction Ratio (r_e)	8.2 dB
Span Distance (max.)	~ 15 km maximum
	T36-A

Table 3-L.Optical Signal Specifications for GBIC Single-Mode ENA

PARAMETER	SPECIFICATION
Line Bit Rate:	1.25 Gb/s
Fiber Mode:	Single-mode
Optical Source:	Laser
Transmitter Output	-6 dBm typical (–11.5 to -3 dBm)
Optical Connector:	Duplex SC
Optical Detector:	PIN Diode
Receive Sensitivity	-19 dBm (BER=$1x10^{-12}$)
Receive Saturation	-3 dBm (BER=$1x10^{-12}$)
Optical Wavelength λ_{out}:	1310 nm typical (1270 to 1355 nm)
Spectral Width ($\Delta\lambda_{rms}$):	4 nm max
Extinction Ratio (r_e):	9 dB min
Span Distance (typ.):	550 m (50/62.5 µm mmf) 5000m (10 µm smf)

Table 3-M. Optical Signal Specifications for GBIC Multi-Mode ENA

PARAMETER	SPECIFICATION
Line Bit Rate:	1.25 Gb/s
Fiber Mode:	Multi-mode
Optical Source:	Laser
Transmitter Output	-7 dBm typical (–9.5 to -5 dBm)
Optical Connector:	Duplex SC
Optical Detector:	PIN Diode
Receive Sensitivity	-19 dBm (BER=$1x10^{-12}$)
Receive Saturation	-3 dBm (BER=$1x10^{-12}$)
Optical Wavelength λ_{out}:	850 nm typical (820 to 860 nm)
Spectral Width ($\Delta\lambda_{rms}$):	.5 nm max
Extinction Ratio (r_e):	9 dB min
Span Distance (typ.):	550 m (50 um 500MHz-km Fiber) 275m (62.5 um 200MHz-km Fiber)

3.1.7 Test Port

Monitor jacks are available on the rear System Processor modules and can be used monitor DS-0s of multiple DS1s (e.g., ISDN D channels). The DS-0s are typically ISDN D-channels or SS7 signaling channels, although a single DS1 could be monitored. However, ISDN D-channels and SS7 signaling channels cannot be monitored on the same DS-1. The test jacks and the DS-0s to be monitored, which must be on the same IOM, are selected with TL1 commands.

Because there are two pairs of jacks, two different DS-1s can be monitored. J7, labeled "I", allows the user to input a signal and monitor it using J8, labeled "O". J9 is not used and J10, which is labeled "O", is used as a monitor jack. Refer to Figure 3-1.

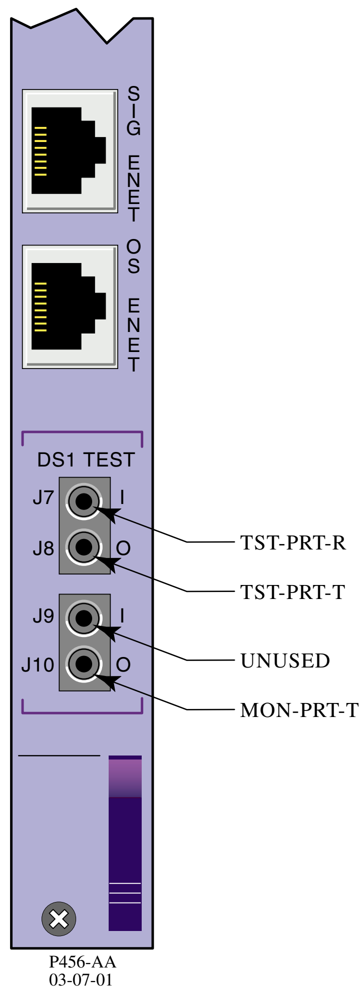


Figure 3-1. Monitor Jacks

3.1.8 Timing

- Redundant BITS interface
- Internal stratum three sources with holdover
- Line timing in slots 1 and 2 and 8 and 10

3.1.9 Signaling

- SS7 ISUP network side (ANSI 1992)
- ISUP call processing (ANSI T1.609)
- ISDN NI2 line side
- GR-1268 PRI
- Channel Associated Signaling (CAS)
- Bearer Independent Call Control (BICC)
- Session Initiated Protocol (SIP)
- GR-303
- Ethernet signaling interface

3.1.10 Management

- Dry contacts for critical, major, minor, audible and visual; bay visual
- Alarm cutoff
- Redundant Ethernet or RS232 craft port
- Redundant Ethernet management port or EMS port
- TL1 management protocol
- TL1 craft port

3.1.11 Compliance

- FCC
- NEBS (Network Equipment Building System) 3 compliant

3.2 Regulatory Compliance Notices

3.2.1 Federal Communications Commission Notice

3.2.1.1 FCC Part 15 Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

3.2.1.2 Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Lucent, Inc. may void the user's authority to operate the equipment.

3.2.1.3 Cables

Connections to this device must be made with shielded cables in order to maintain compliance with FCC Rules and Regulations.

3.2.2 Canadian Notice

This Class A digital apparatus complies with Canadian ICES-003.

3.2.3 Avis Canadien

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

3.3 Voltage Drop/Wire Size Selection

The voltage drop allowable between the Lucent shelf and the power plant must be limited to 2.5 V according to Telcordia GR499. Wire size and resistance are key in maintaining this value. Following are tables to determine wire size. The Lucent shelf is assumed, for these calculations, to have a worst-case load of 30 amps; the maximum power load is 800 Watts. The distances specified are for one wire and calculations are based on round trip needs. Table 3-N is used to determine wire size when the switch is connected directly to a power source and no Power and Alarm Panel is used.

Table 3-N. Wire Sizes For Home Run

Home run to shelf (no Power and Alarm Panel)	
Wire size	Maximum distance to source
6	80
4	157
2	251
1	315
0	393
Note: Shaded table areas represent wire sizes that cannot be directly terminated on the lugs provided on the Telica shelf and/or breaker panel. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.	
	T3-B

Table 3-O can be used to determine wire size when connecting a Power and Alarm Panel to a power source.

Table 3-O. Wire Sizes To Power And Alarm Panel

Power and Alarm Panel Feed	
Wire size	Maximum distance to source
1	102
0	127
00	159
000	198
0000	250
Note: Shaded table areas represent wire sizes that cannot be directly terminated on the lugs provided on the Telica shelf and/or breaker panel. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.	
	T2-B

3.4 Alarm Contacts Closure Ratings

Table 3-P. Relay Contact Closure Ratings

Contact	Rating	Location and Description
MN (minor)	0.6 amp @ 110 VDC	J2 contacts on switch fabric A
MJ (major)	0.6 amp @ 110 VDC	J2 contacts on switch fabric A
CR (critical)	0.6 amp @ 110 VDC	J2 contacts on switch fabric A
		4

NOTES:

4 System Description

4.1 Chassis

4.1.1 Scope

This section describes the Switching System chassis.

4.1.2 Functional Description

There are two types of chassis. One is 13-rack-units high (RU) (22.75 inches high) that requires a 1-RU air baffle mounted directly above. The other is a 14-RU chassis (24.5 inches high) with a built-in air baffle. Both have 18-inch deep shelves (including cabling) for mounting in a 23-inch wide central office bay. Three shelves (with a possible 1-RU air baffle between) can be installed in one 7-foot bay with a 1-RU fuse and alarm panel.

Chassis and Fan Tray part numbers are listed in the following tables.

Switch Chassis

Part Numbers	CLEI Codes	Comments
85-3007-A	BAMFJ00DRA	13-RU chassis with Midplane III
85-3008-A	BAMGL00GRA	14-RU chassis with Midplane III

Switch Fan Tray

Part Numbers	CLEI Codes	Comments
85-3005-B	BAPQAG52AA	High speed fans
85-3009-A	BAMYAAKDAA	High speed fans

Chassis with Midplane II supports Octal DS-3 modules and those with Midplane III support Octal DS-3 and future modules.

The system features a midplane design, with I/O termination modules, processing modules, and switching modules installed from the front. Physical facility traffic terminations are connected on passive rear IOMs. All electrical interfaces are located on the rear of the unit.

The shelf contains 21 module slots. Four slots are used for common cards (active and protect) with up to 17 modules used for various IOMs. IOMs that are supported are dependent upon the version of system software and are as follows:

- DS1/J1/E1 IOMs (28 DS1s or J1s or 21 E1s per module)
- Triple DS-3/STS-1 IOMs (3 DS-3s/STS-1s per module)
- Octal DS-3/STS-1 IOMs (8 DS-3s/STS-1s per module)
- Channelized OC-3 IOM with a Channelized OC-3 Rear Module
- ATM Voice Server Modules
- Ethernet Network Access Module with a 1000BASE-T, 1000BASE-LX, or 1000BASE-LX Rear Module
- Quad OC-3 ATM Network Access Module
- Compute Modules

Typically a line interface module is paired with a rear module that contains the physical interface, allowing all electrical signaling cabling to be installed from the rear of the unit. Optical fibers are connected to the front Quad OC ATM Network Adapter. All 17 I/O slots may be used for unprotected traffic termination. IOMs can be 1:N protected; protection slots are determined by the midplane and the chassis part number.

Forced-air cooling is provided by fans mounted in a removable tray located at the top of the unit. Air is drawn in from the bottom of the chassis through a removable filter and exits the shelf through the top and rear. If slots are not used, blank panels or filler panels must be installed. Fans are monitored for failure and an over-temperature sensor is provided. All the chassis includes high-speed fans.

4.1.3 Hardware Description

The 13-RU chassis, as illustrated in Figure 4.1-1 and including cabling, is 13-RU (22.75 inches) high and 18 inches deep.

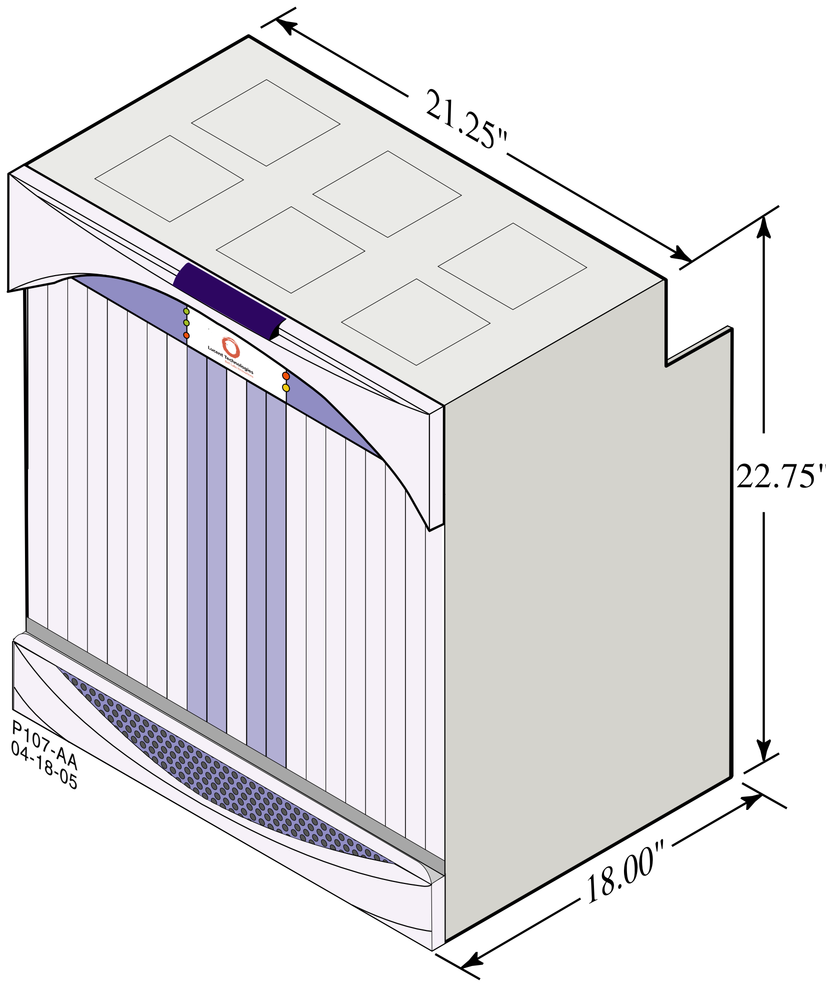


Figure 4.1-1. 13-RU Chassis

The 14-RU chassis, as illustrated in Figure 4.1-2 and including cabling, is 14-RU (24.5 inches) high and 18 inches deep.

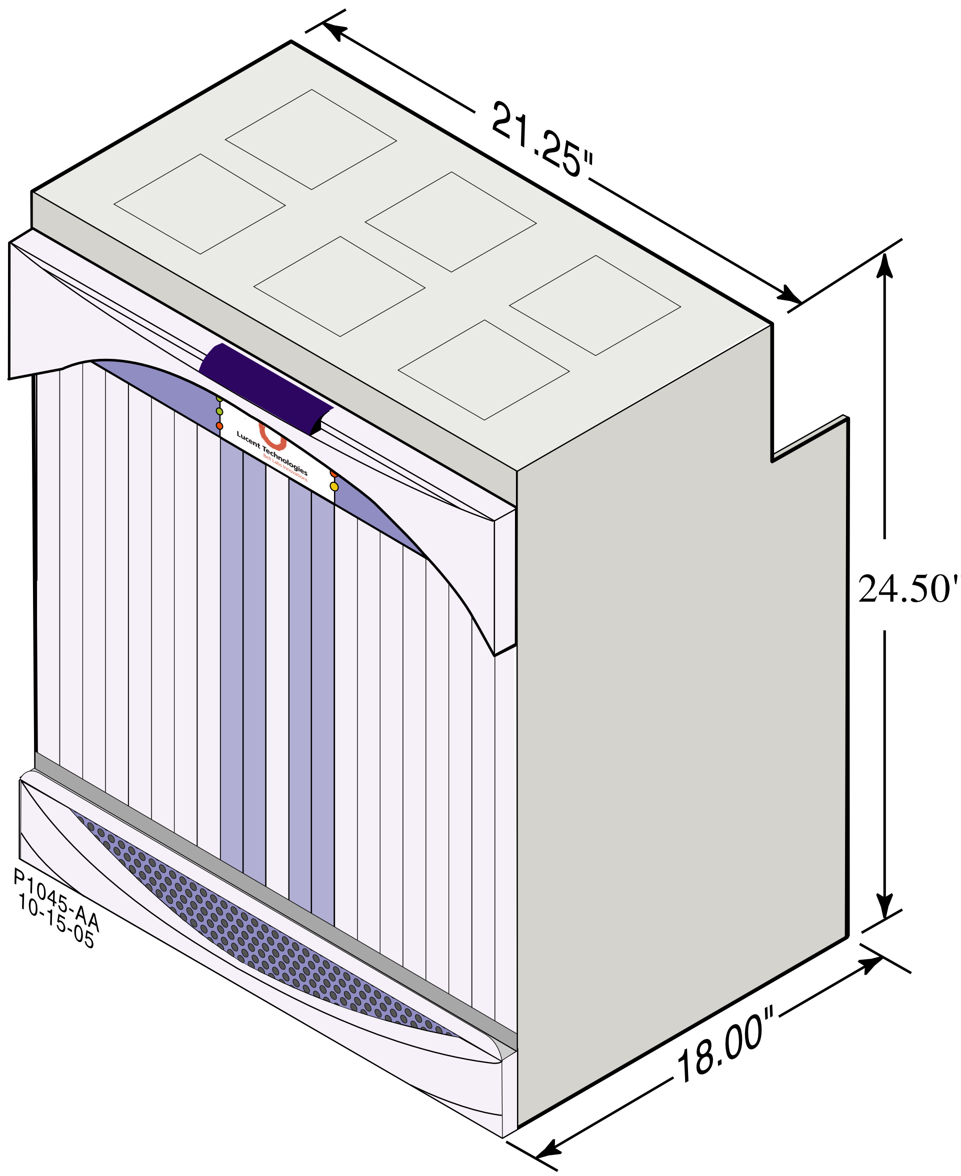


Figure 4.1-2. 14-RU Chassis

There are 21 module slots, which are approximately 9 RU high. The front modules have the most functionality, while the rear interface modules have the I/O connectors.

4.1.3.1 Rack Mounting

The chassis mounts in a 23-inch wide, 43-RU high, unequal flange central office rack. As illustrated in Figure 4.1-3, up to three shelves can be installed in one 7-foot bay. This may include one rack unit of space for an air baffle, while still accommodating a fuse and alarm panel in the same bay.

Note: To accommodate three shelves in a rack, install the units from the bottom up to assure space for proper cable dressing.

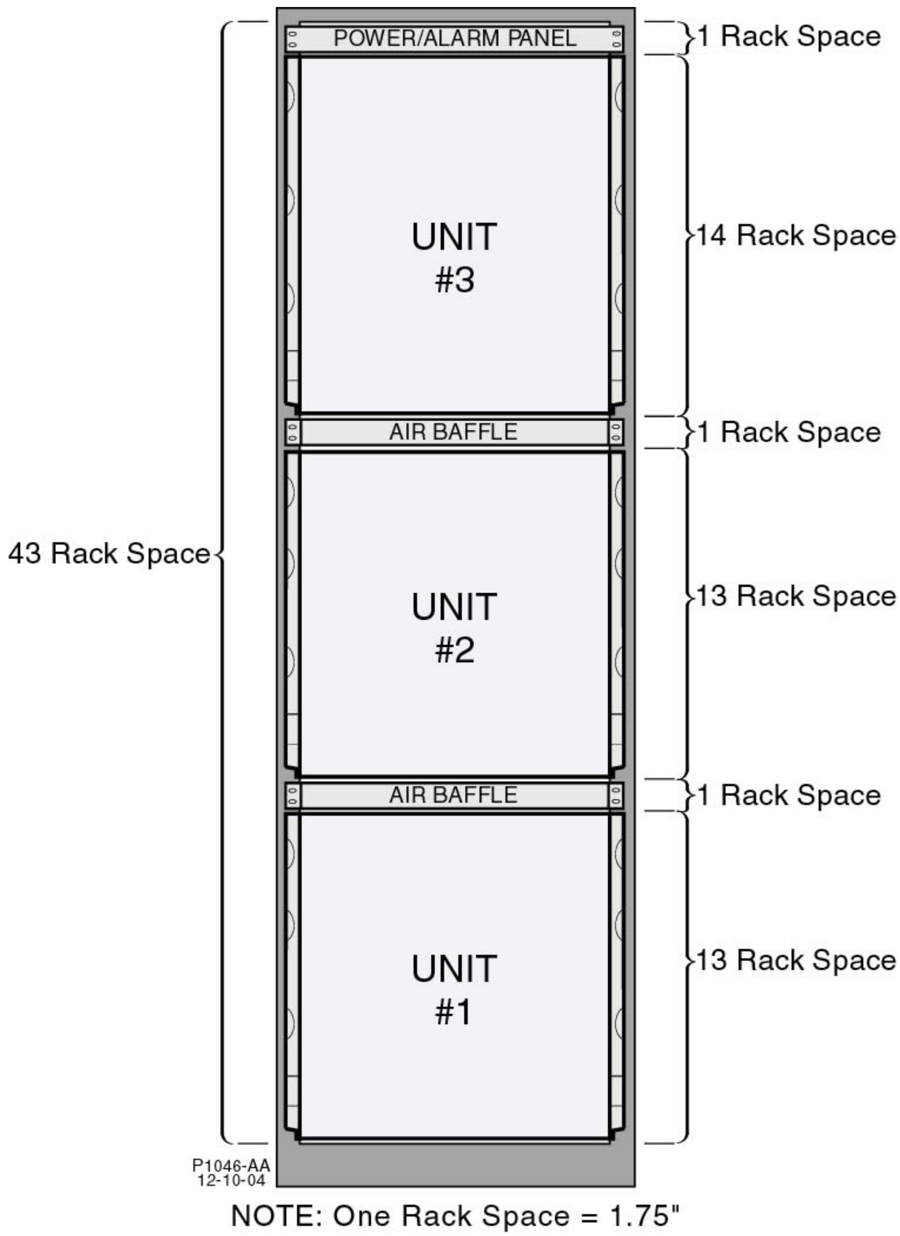


Figure 4.1-3. Three rack-mounted chassis

4.1.3.2 Front Module Locations

Figure 4.1-4 shows the front module slot locations of the chassis. The front slots support:

- 2 SP/TMG modules in slots 9 and 13
- 2 SW/FAB (A, B) modules in slots 10 and 12
- 17 I/O modules in physical slots 1- 8, 11 and 14- 21

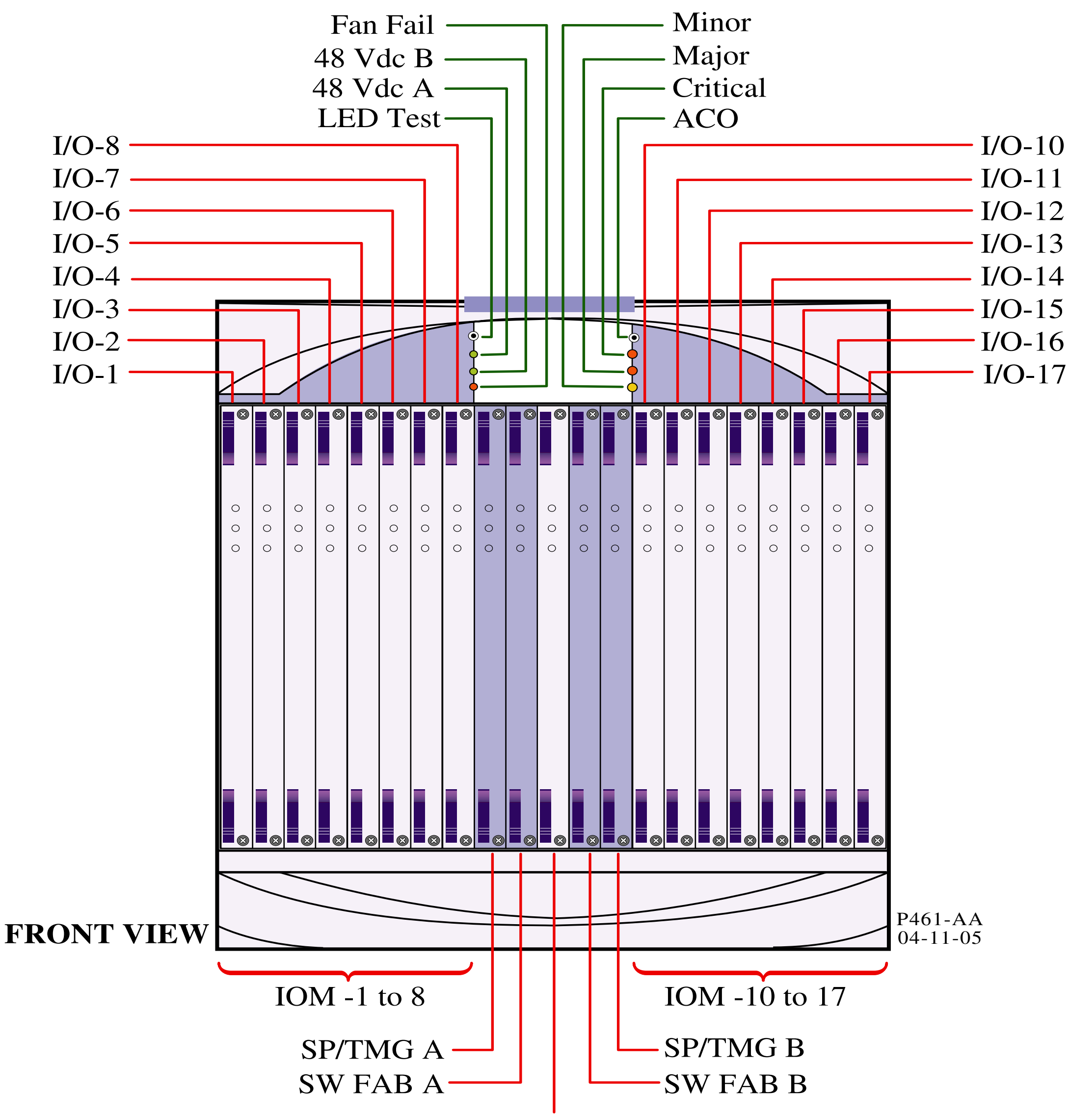


Figure 4.1-4. Front Module locations

4.1.3.3 Rear Module Locations

Figure 4.1-5 shows the rear module slot locations of the 85-3004 and 85-3007 chassis. The 85-3007 chassis looks the same as the 85-3004 chassis except it has Midplane III. The 85-3008 chassis looks like the 85-3007 with the addition of the air baffle on the top. The rear slots support:

- (2) SP/TMG modules in SP/TMG slots (physical slots 9 and 13 – See Note).

  The following connectors are located on this module:

  - USB (not used)
  - Craft
  - COM
  - SIG ENET
  - OS ENET
  - DS1 Test

  Each module is coupled with the SP/TMG directly opposite it on the front of the chassis.

- (2) SW/FAB (A, B) modules in SW/FAB slots (physical slots 10 and 12 – See Note).

  The following connectors are located on this module

  - BITS wire-wrap interface
  - Bay Alarm In (SW/FAB-A only)
  - Bay Alarm Out (SW/FAB-A only)
  - Alarm Contacts (SW/FAB-A only)

  Each module is coupled with the Switch Fabric directly opposite it on the front of the chassis.

- (17) I/O modules in I/O-1 to I/O-17 slots (physical slots 1-8, 11 and 14-21 – See Note).

  Protection slots are determined by midplane and chassis part number.

Note: Some chassis may indicate physical slots as well as SP, SW/FAB, or I/O slots. Recent chassis have physical slot numbers removed.

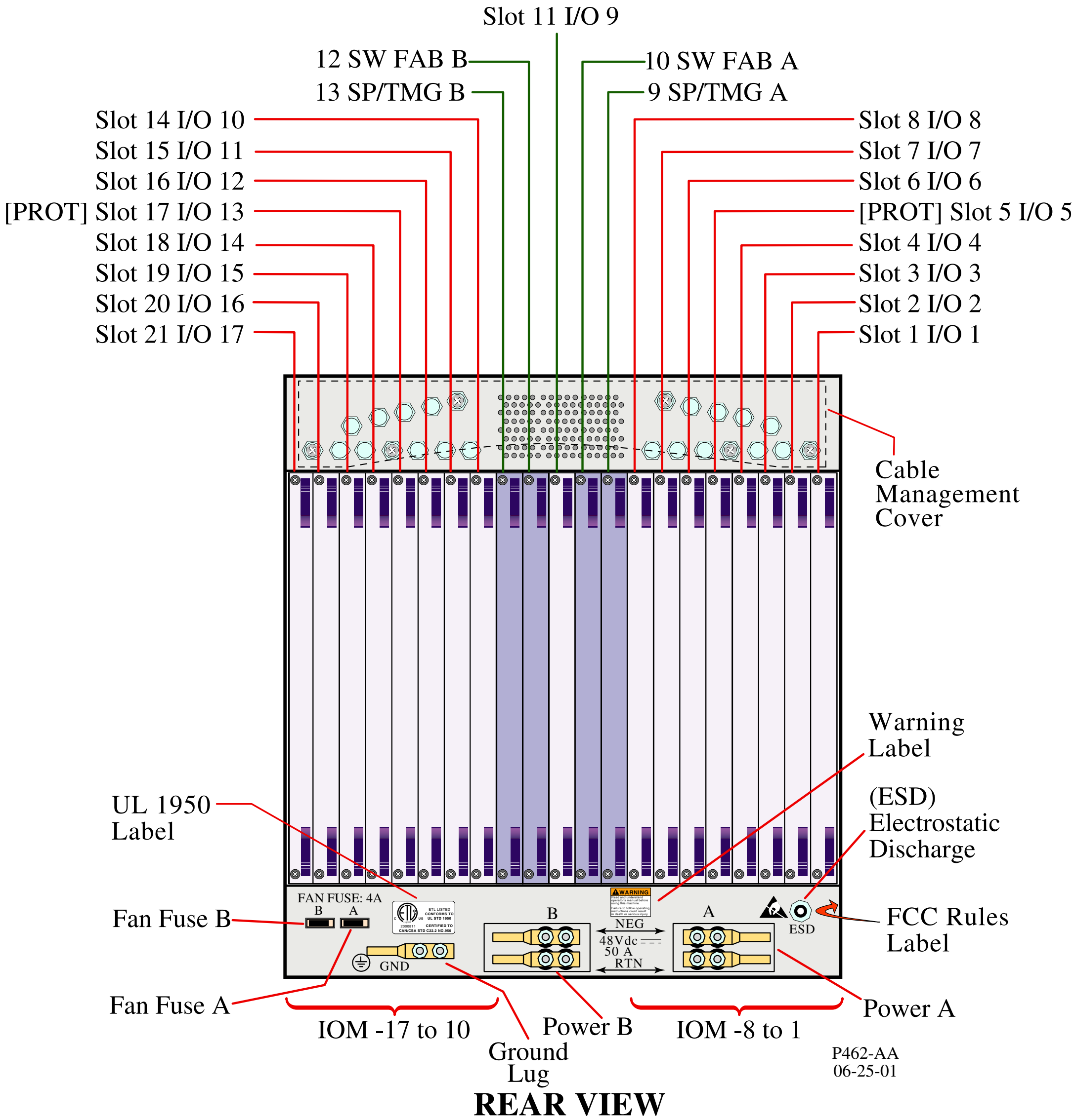


Figure 4.1-5. Rear View of 85-3004/3007/3008 Chassis

4.1.3.4 Protection Slots

All 17 I/O slots may be used for traffic termination. For chassis 85-3007 and 85-3008 with Midplane III, the I/O-5 slot and the I/O-13 slot are DS-3 I/O protection slots if line protection is desired. I/O-5 protects IOM in I/O-1 to I/O-4 and I/O-6 to I/O-8. IOM-13 protects I/O-9 to I/O-12 and I/O-14 to I/O-17. If DS-1 I/O modules are installed, the I/O-7 slot can be used for DS-1 protection. If Ethernet Network Adapters (ENAs) are used, the main module is installed in the I/O-8 slot and the protection module is in the I/O-10 slot. If Quad OC-3c Network Adapters (ANA) are used, the main module is installed in the I/O-1 slot and the protection module is in I/O-2 slot. The protection slot for Voice Server modules is I/O-9. All other I/O slots can be used for any combination of I/O modules. Refer to Figure 4.1-6 for the illustration of slot protection. If DS-3 modules are used, the protection module should be the largest capacity module.

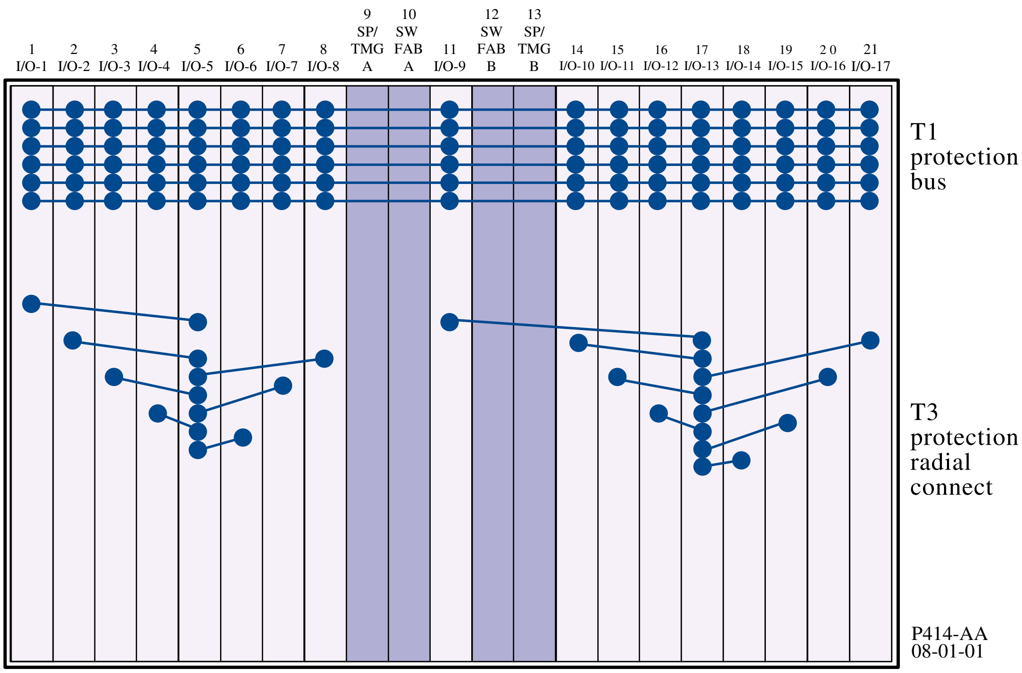


Figure 4.1-6. Protection for 85-3007/3008 Chassis

4.1.3.5 Slot Numbering and Naming Notation

The TL1 provisioning commands and autonomous messages (alarms) will use the slot notation scheme given in Table 4.1-A instead of the physical slot location. The 85-3007/3008 chassis is labeled using both notations as shown in Figure 4.1-7. In addition, the CLEI code, part number and serial number labels for the chassis are located behind the lower front bezel of the chassis. The CLEI code label for a module is next to the bottom ejector handle and the serial and part number labels are next to the top ejector handle.

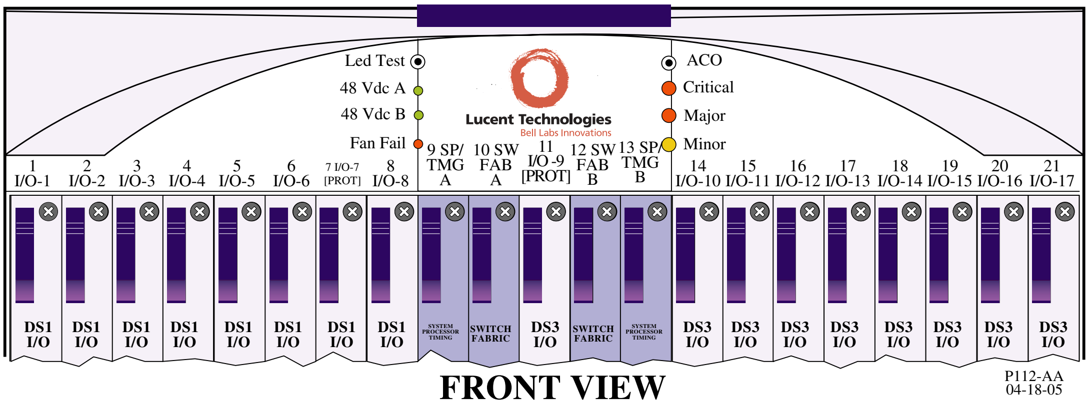


Figure 4.1-7. Front Module Slot Labeling

Table 4.1-A. Slot Numbers and Names

Physical Slot	85-3007/3008 Chassis Slot Notation	TL1 Names
1	I/O 1	IOM-1
2	I/O 2	IOM-2
3	I/O 3	IOM-3
4	I/O 4	IOM-4
5	I/O 5[PROT]	IOM-5
6	I/O 6	IOM-6
7	I/O 7	IOM-7
8	I/O 8	IOM-8
9	SP/TMG A	SP-A/TMG-A
10	SW FAB A	SF-A
11	I/O 9	IOM-9
12	SW FAB B	SF-B
13	SP/TMG B	SP-B/TMG-B
14	I/O 10	IOM-10
15	I/O 11	IOM-11
16	I/O 12	IOM-12
17	I/O 13 [PROT]	IOM-13
18	I/O 14	IOM-14
19	I/O 15	IOM-15
20	I/O 16	IOM-16
21	I/O 17	IOM-17

4.1.3.6 LED and Push Button Locations

Refer to Figure 4.1-8 for an illustration of the top front of the chassis. The LED Test push button is located above the column of LEDs on the left side of the front panel of the Fan Tray. The ACO (Alarm Cut-off) push button is located above the column of LEDs on the right side. Refer to Table 4.1-B for button functions.

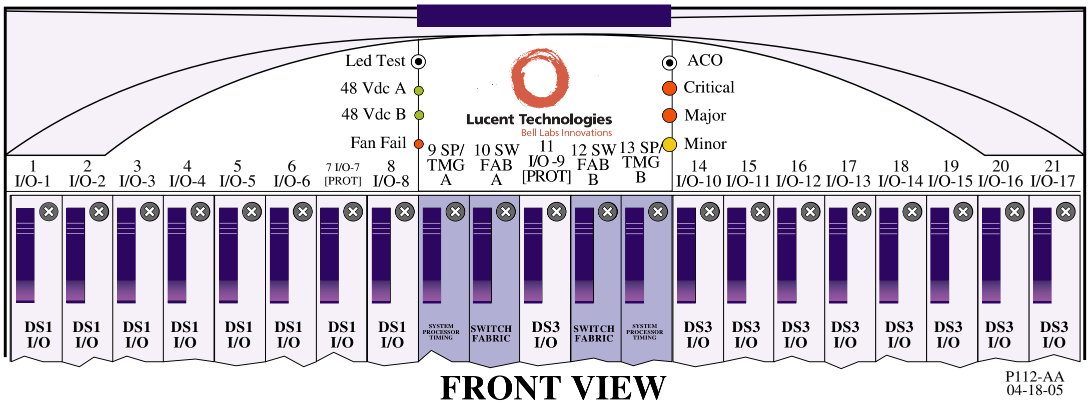


Figure 4.1-8. LED and push button locations

Table 4.1-B. Functions of Pushbuttons

Button	Description
ACO	Alarm Cut-off
LED Test	This causes all of the LEDs to light up for approximately 4 seconds. When this time has expired, all of the LEDs (except for the ones that should remain on) are turned off.

Figure 4.1-8 also shows the location of the front panel LEDs. Table 4.1-C describes their functions.

Table 4.1-C. Chassis LEDs

LEDs	Color	Description
Fan Fail	Red	Indicates a fan failure.
48 Vdc A	Green	Indicates power on for power module A.
48 Vdc B	Green	Indicates power on for power module B.
Critical	Red	Indicates that multiple services have been disrupted. Examples include: ∉# Both switch fabrics, both disks, or both BITS interfaces have faults. ∉# Both system processors have crashed. ∉# An ISP POP has been isolated from the media gateway, caused by either a module failure or a line failure. ∉# There has been an outage on SG<>MG, SG<>EM, or MG<>EM communication. ∉# There was an unprotected I/O module failure. ∉# There have been more than (4) DS1 input/output failures. ∉# There were one or more DS3 input/output failures.
Major	Red	Indicates that there has been a service disruption. Examples: ∉# One, two, or three DS1 input/output failures ∉# A SS7 link set went down when there was more than one link. ∉# An internal timing generator has failed. ∉# A loss of both timing reference inputs from BITS

LEDs	Color	Description
Minor	Amber	Indicates that there was an equipment failure, but without service disruption. Examples include: ∉# One link of the SS7 signaling pair went down. ∉# There was an I/O module failure, but the circuits transferred to the protection I/O module. ∉# There was a protection equipment failure. ∉# There was a loss of one timing reference input from BITS ∉# There was a fan failure. ∉# A loss of a 48V power input, detected at each of the I/O modules. 12

4.1.3.7 Fan Tray

The fan tray is a single, field replaceable tray with six fans on it. The tray is replaced as a unit as illustrated in Figure 4.1-9. Observe the location of the fan tray assembly on the upper front of the chassis.

The 85-3005 and 85-3009 fan trays have high speed fans which are required in the 85-3007 and 85-3008 chassis.

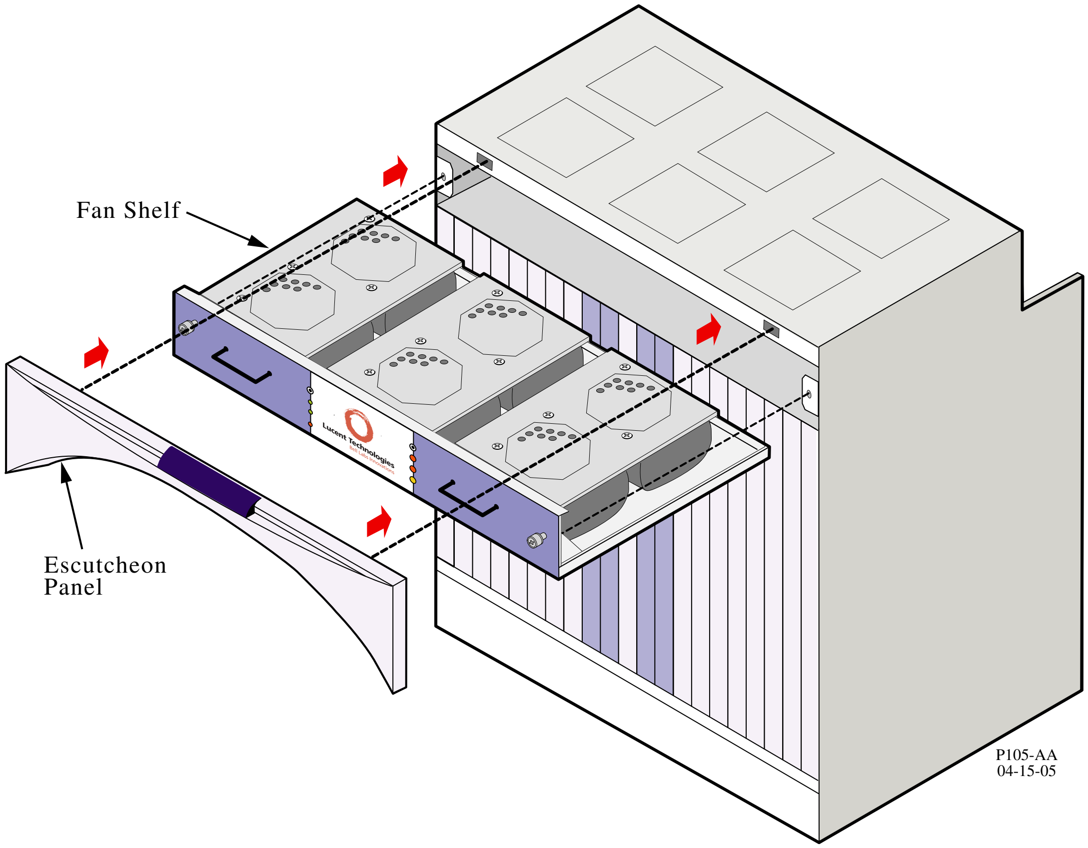


Figure 4.1-9. Fan tray

4.1.3.8 Fan Filter

A fan filter is located behind the bezel and screen on the lower front of the chassis as illustrated in Figure 4.1-10.

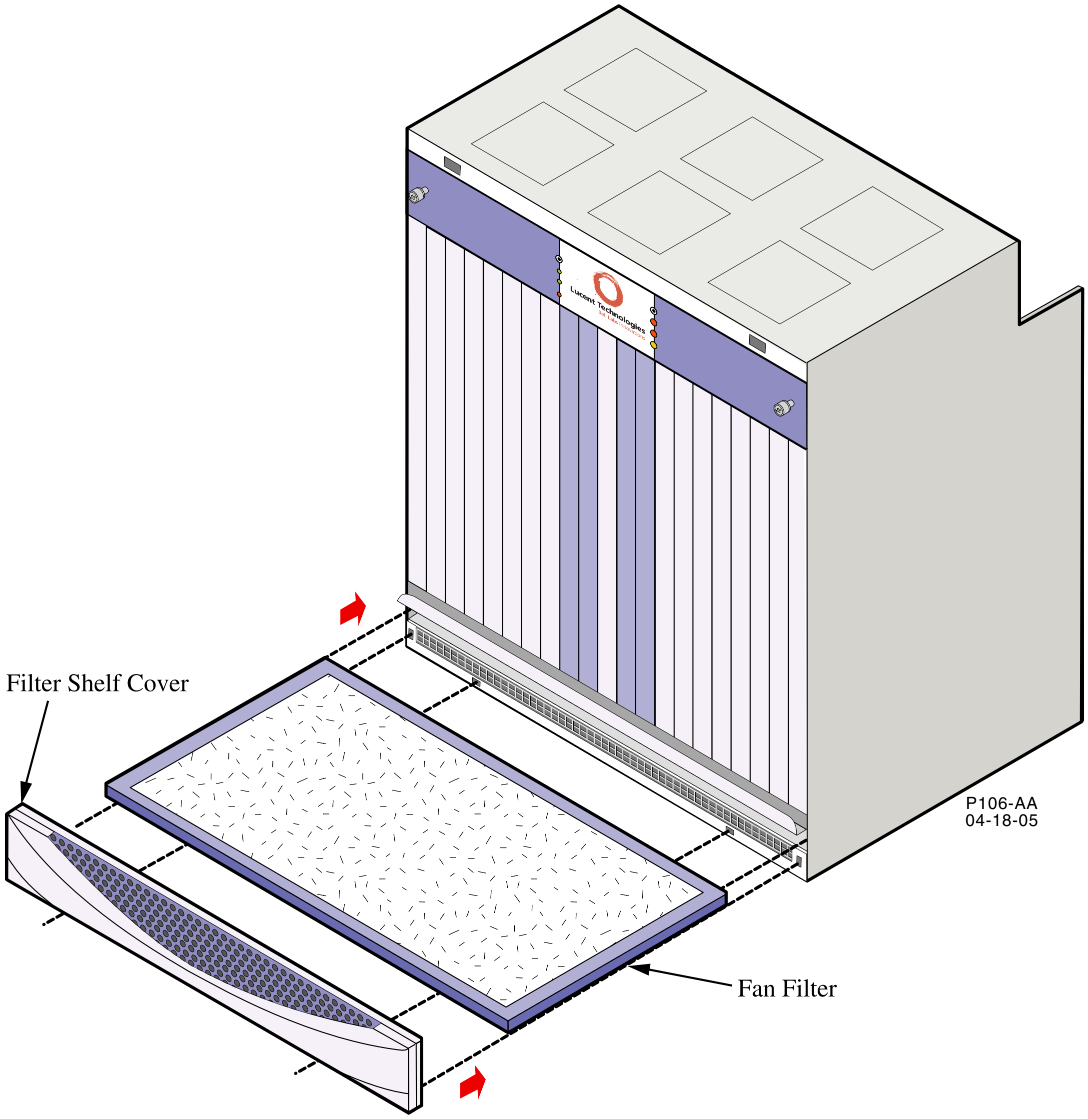


Figure 4.1-10. Fan Filter

4.1.3.9 Rear Cable Management

Cable management is built into the upper rear of the chassis as illustrated in Figure 4.1-11. The cables for the modules in I/O slots 1-8 will dress in from the left and the cables for the modules in I/O slots 10-17 will dress in from the right.

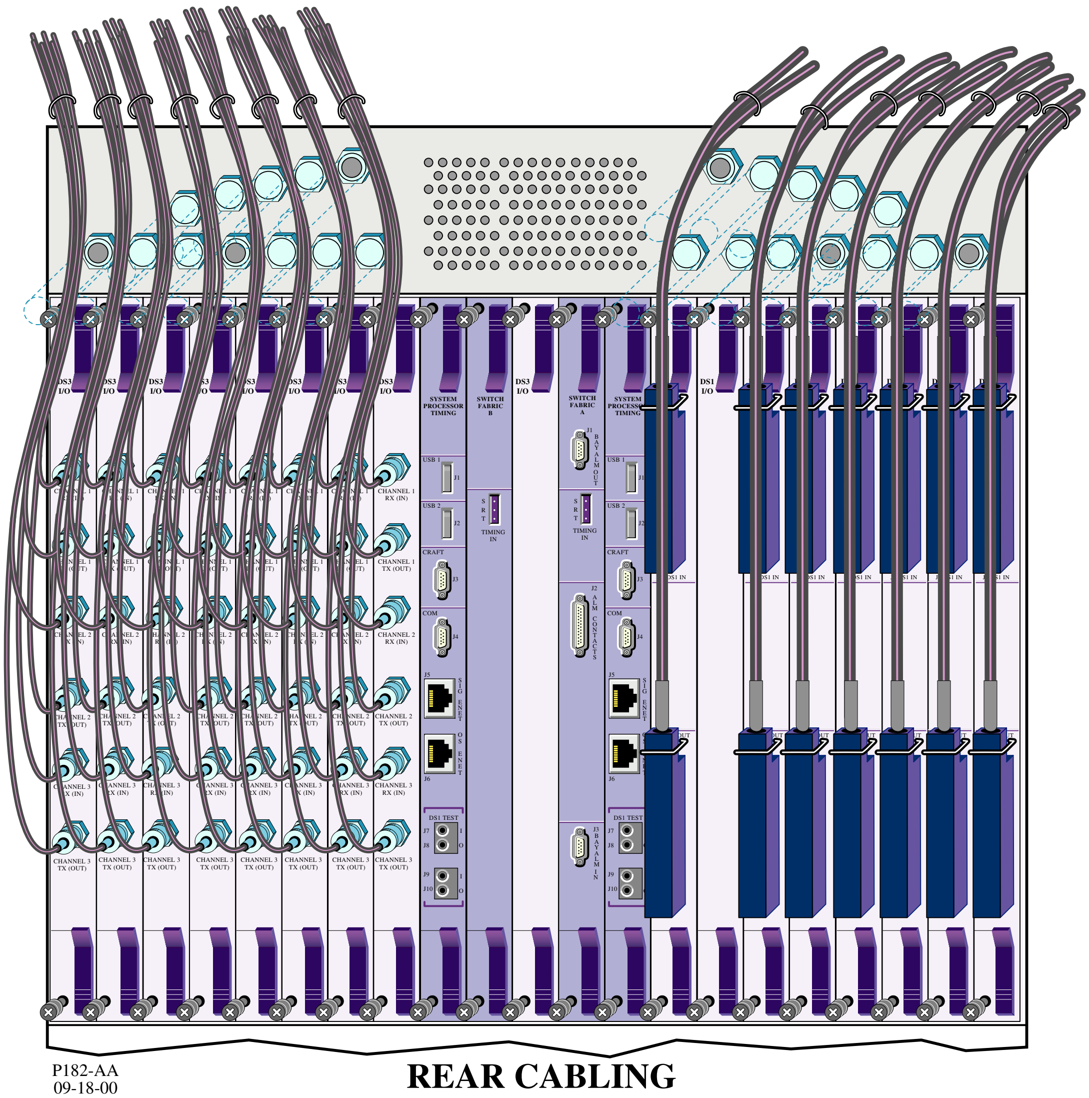


Figure 4.1-11. Cable management

4.1.3.10 Power and Ground Locations

The -48 Vdc power A and B feeds are connected at the lower rear of the chassis. The shelf provides independently replaceable line filters for each power input. Chassis grounding is also supplied in this area.

In Figure 4.1-12 (85-3007 and 85-3008 chassis), observe the location of the following:

∉# A and B power connectors for –48VDC and RTN

∉# GMT Fan fuse A and B

∉# Ground connector

∉# ESD connector

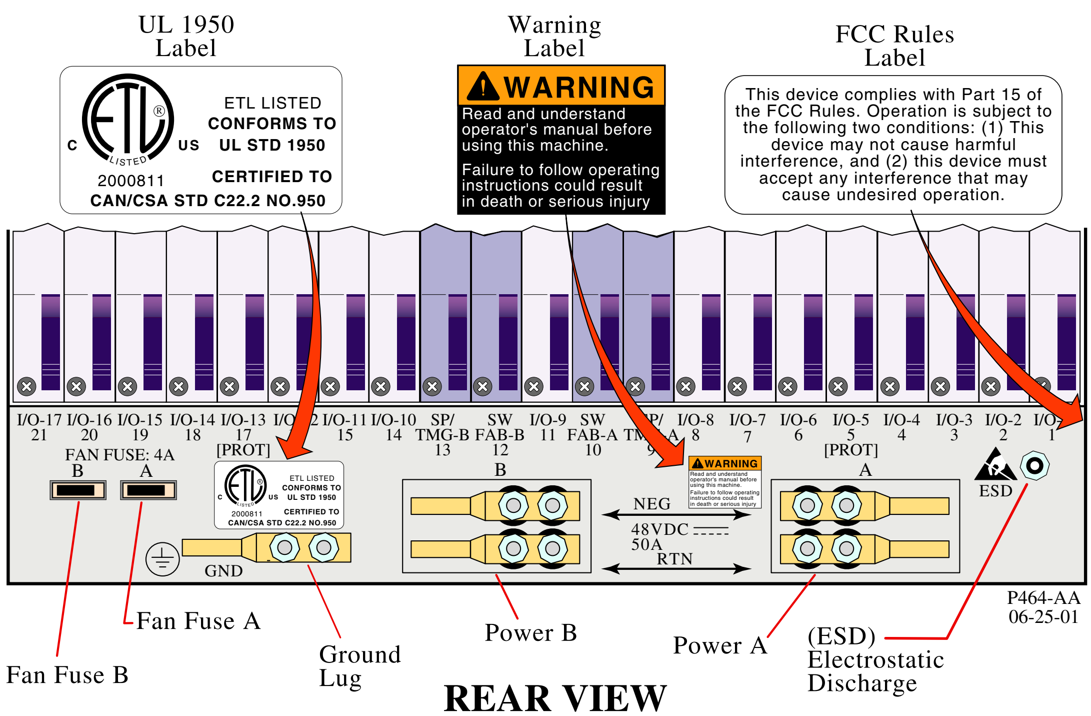


Figure 4.1-12. Power and Ground Locations on 85-3007/3008 Chassis

4.1.4 Specifications

Table 4.1-D provides environmental specifications for the chassis. Table 4.1-E lists mechanical specifications and Table 4.1-F provides power specifications.

Table 4.1-D. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

Table 4.1-E. Mechanical Specifications

MECHANICAL SPECIFICATIONS		
Height	22.75”	57.785 cm
Width (with mounting ears)	23.00”	53.975 cm
Depth (cover and tie bars)	18.00”	45.72 cm
Weight (fully loaded)	150 lbs	330 kilograms

9

Table 4.1-F. Power Specifications

Requirement	With DS1/DS3	With Octal DS3
Input voltage	-40 Vdc to –56.7 Vdc	-40 Vdc to –56.7 Vdc
Thermal output *	Up to 2730 BTUs /hr/shelf	Up to 4505 BTUs /hr/shelf
Current draw *	20 Amperes per shelf	33 Amperes per shelf
Power consumption *	800 Watts	1320 Watts
* Fully loaded at 40 Vdc.		

T11-B

NOTES:

4.2 Front System Processor/Timing Module-3

4.2.1 Scope

This section describes the front Dual SP/TMG-3 module, which will be referred to as System Processor 3 or SP3 in this document. This section explains the module functions, LED indicators, and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0406-A	BA1CUV0HAA	
89-0406-B	BA1CUV0HAB	
89-0406-C	BA1CUV0HAC	1GHz
89-0406-D	BAUCAAEAAA	1GHz

4.2.2 Functional Description

Two Dual SP3 units, each comprising a front and a rear circuit module, are located near the center of the shelf (slots 9 and 13) and provide full 1+1 redundancy for critical processing resources for true non-stop operation. SP3 requires a rear SP3 module, 89-0417, and Midplane III (chassis 85-3007 or 85-3008).

The Dual SPs hold the internal Stratum 3 timing sources. Central office BITS timing is brought into the rear of the switch via two independent connections located on the rear SF modules. Recovered timing from IOM-1 and 2 or IOM-8 and 10 can also be used. The TMG section provides multiplexing control for routing each of the input clock signals to the individual IOMs in the chassis. It also provides control circuitry for selecting the master, supporting failover from the master to the secondary, and generating alarms when failures on the input clock lines occur.

The switch provides complete timing system redundancy for protection against either BITS source, recovered line timing or internal clock failure. Holdover is provided in the event of a complete loss of external BITS timing.

The system processor section with memory provides the processing for the switch. It includes a FAM for processing all system events, an EQM, which keeps track of state information, a TL1 Agent that handles TL1 commands and a System Fault Manager that is responsible for state changes.

The front panel of the SP front module has two craft interfaces:

- An RS-232 serial craft interface operating at a fixed 9600 baud
- A 10/100Base-T Ethernet craft interface.

4.2.2.1 General Mechanical Representation

The Dual SP3 front module is approximately 14 inches high and plugs into the midplane for connections to the rear SP3 module and to the Switch Fabric and IOMs. Refer to Figure 4.2-1 for an illustration of the midplane connector, the SP3 module and the front of the module.

The front plate of the module has three LEDs, an Ethernet connector and a DB-9 RS-232 connector. Refer to Table 4.2-A for a description of the LEDs. Refer to Table 4.2-B for the pin-out of the Ethernet connector and to Table 4.2-C for the pin-out of the craft connector.

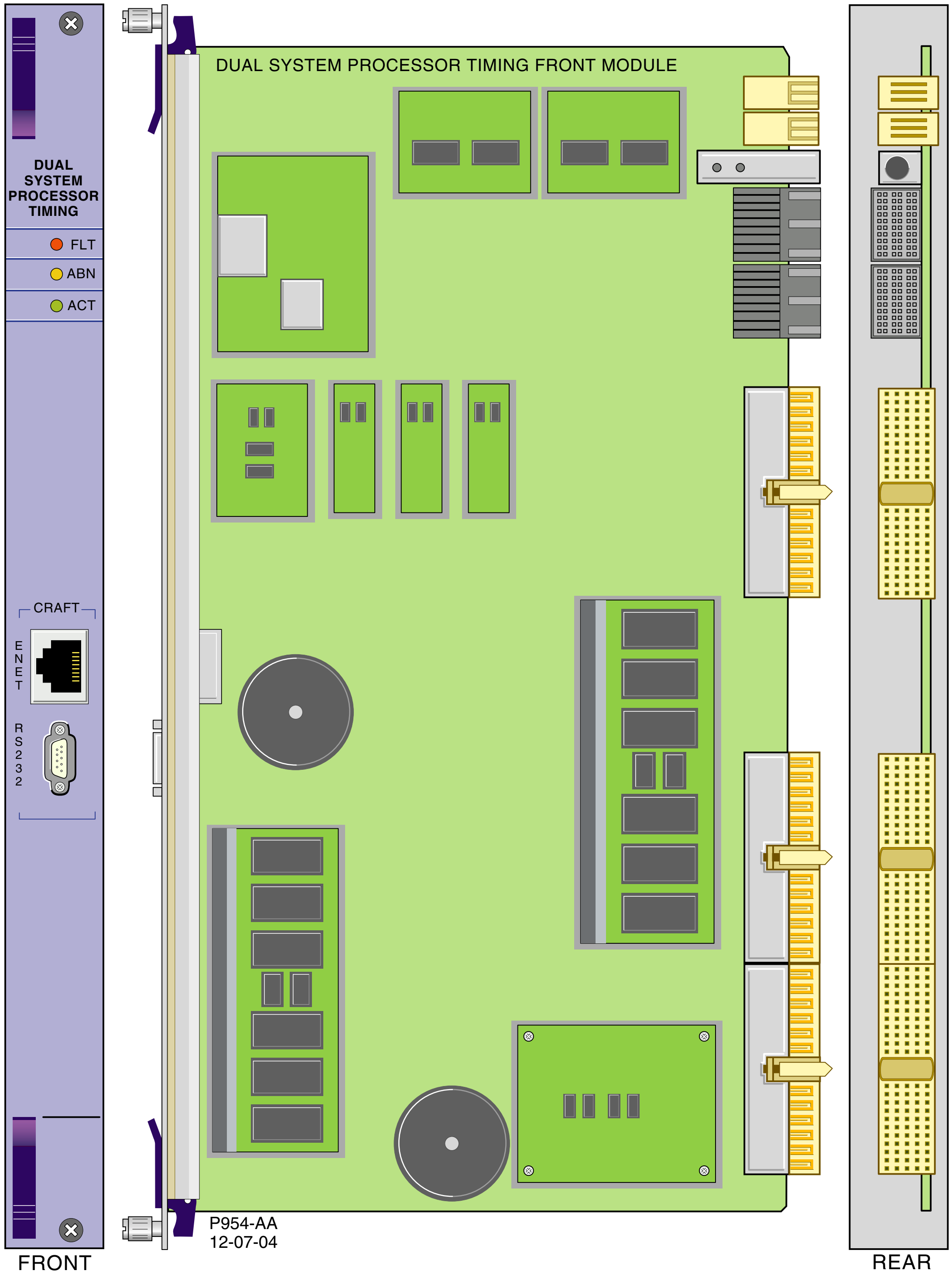


Figure 4.2-1. Dual System Processor Timing Module 3

4.2.2.2 Front Panel

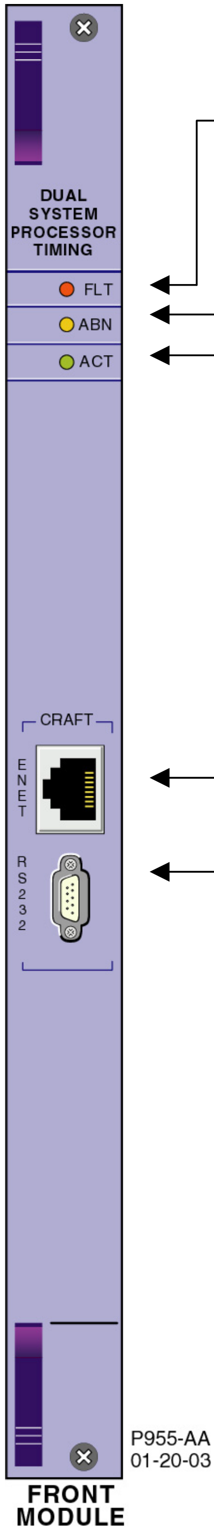


Table 4.2-A. LEDs of the SP/TMG

LEDs	Color	Description
FLT	Red	Indicates a local internal fault
ABN	Yellow	Indicates a remote fault or abnormal condition such as loss of BITS input.
ACT	Green On	Indicates that the module is online and active.
	Green Blinking	Indicates that the module is ready and in standby (STBYH) mode.

Table 4.2-B. Ethernet Connector

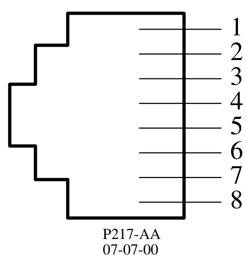
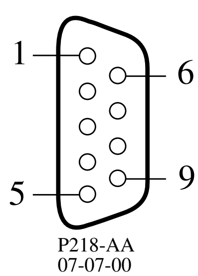
Name	Pin	Description
	1	TX+
	2	TX-
	3	RX+
	4	
	5	
	6	RX-
	7	
	8	

Table 4.2-C. Craft Connector

Name	Pin	Description
	1	DCD
	2	RXD
	3	TXD
	4	DTR
	5	GND
	6	DSR
	7	RTS
	8	CTS
	9	RI

4.3.3 Theory of Operation

Figure 4.2-2 provides a simplified block diagram of the Dual SP3. The SP3 consists of the Timing (TMG) section and the processor section, which are described in the following paragraphs.

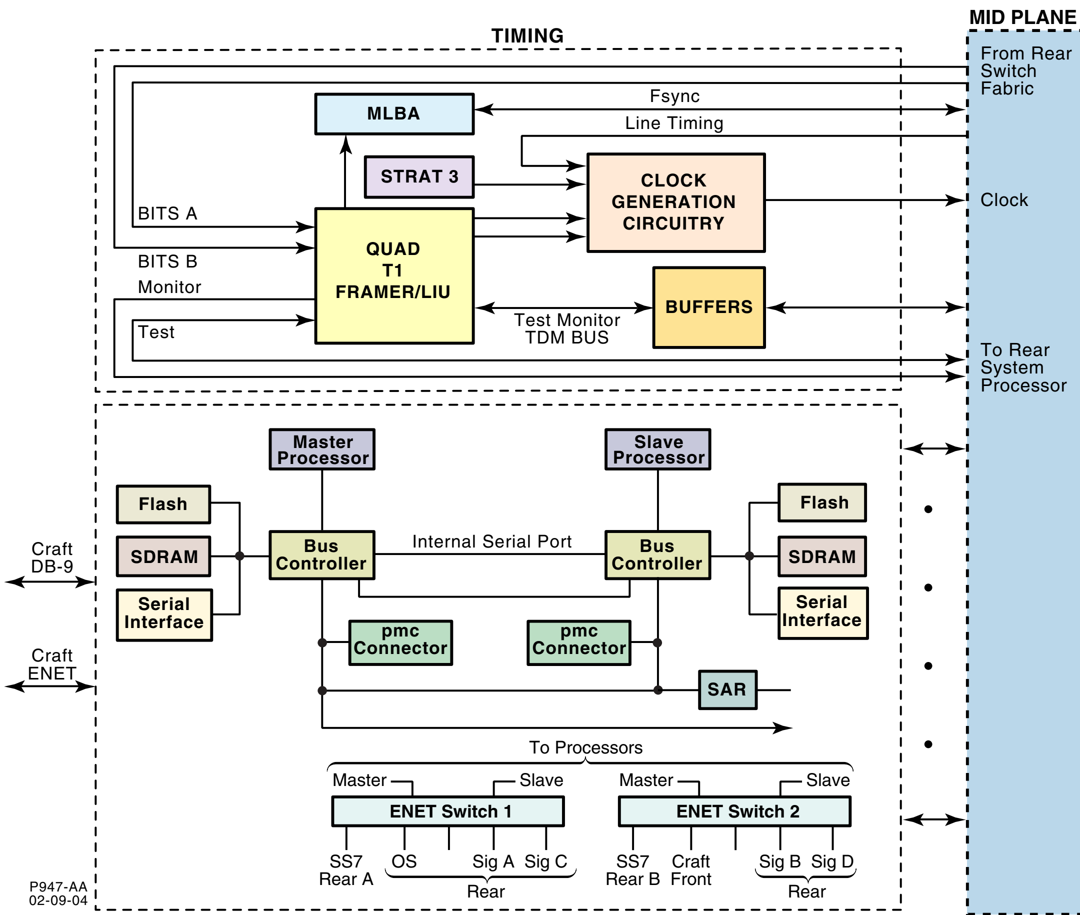


Figure 4.2-2. Block Diagram of SP 3 Dual System Processor and Module

4.2.3.1 Power

The front SP3 module has its own DC-to-DC converter (not shown in Figure 4.2-2), which converts the -48 volts supplied from the backplane to the local voltages required (5V, 3V, etc.) for the module. The front module also supplies these voltages for the rear SP3 module. The SP3 also provides power through a protection bus to the other rear SP3 for SS7 signaling and processing. The front SP3 using the protection bus may also power the bus relays of all DS1 and DS3 rear modules.

4.2.3.2 Timing Section

Clocks and Synchronization

The front SP3 module contains the timing and clock circuitry for the switch. The Quad T1 Framer/LIU receives the primary A and secondary B analog BITS inputs from the wire-wrap inputs of each of the rear SF modules by way of the midplane. It converts them to digital. Recovered timing from IOM-1 and 2 or IOM-8 and 10 can also be used.

The timing circuitry of the SP also contains an internal Stratum 3 clock that is used for system timing. The clocks are provisioned using the ENT/ED T1 TL1 command. The TMG section provides multiplexing control for routing each of the input clock signals and is responsible for routing these clocks to the individual IOMs in the chassis. Each module has a clock fault detector.

The TMG also provides control circuitry for selecting the master clock source, supporting failover from the master to the secondary, and generating interrupts when failures on the input clock lines occur. Even though the clock circuitry resides on the SP module, a failure of the BITS or line timing input does not require an SP failover. Likewise, because the BITS or line timing inputs feed the timing circuitry of both SPs, a failure of the SP module does not require a change over of the BITS or line timing input.

EEPROM

The front SP also has an EEPROM (not shown) that contains the CLEI code for the module. All modules have a CLEI code so that missing and incompatible replaceable equipment can be alarmed.

Monitoring Using the Jacks of the Rear Module

The rear SP3 modules have monitor jacks that are connected to the Quad T1 Framer/LIU of the front module via the midplane as illustrated in Figure 4.2-3. The framer multiplexes the monitored DS-0s from an IOM into a single DS-1. The DS-0s are typically ISDN D-channels or SS7 signaling channels, although a single DS-1 could be monitored. However, ISDN D-channels and SS7 signaling channels cannot be monitored on the same DS-1. The DS-0s to be monitored must be on the same IOM and are selected with TL1 commands. The test jacks are also selected with a TL1 command.

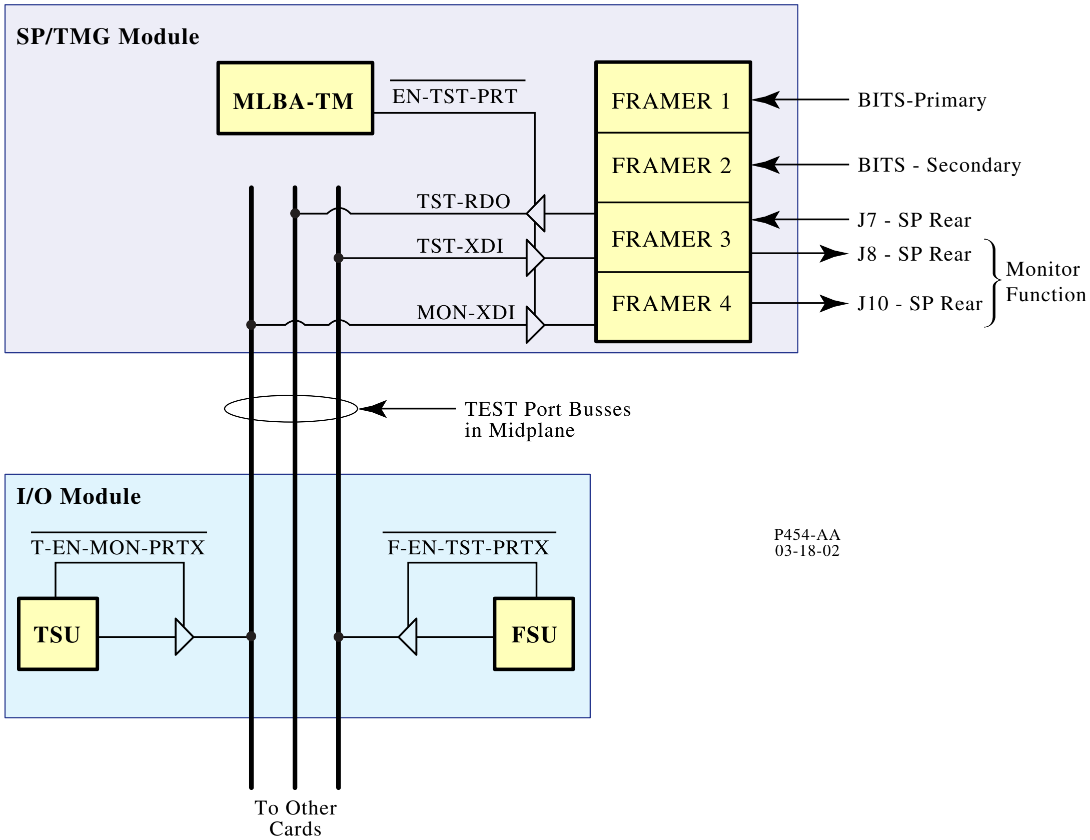


Figure 4.2-3. Monitor Jacks and the Front System Processor

4.2.3.3 Ethernet Switch

This circuitry provides all Ethernet access to and from the master and slave processors allowing either processor connection to any of the Ethernet ports. Connections to the switch include the ENET port on the front of the module and the SIG A, SIG B, SIG C, SIG D and OS ports on the rear module. Shown on the diagram are two connections labeled SS7 that connect to the SS7 processors on the rear modules when using the 89-407 rear SP3s. The front Ethernet port of the SP3 is further described in the Craft Interfaces paragraph.

4.2.3.4 Processor Section

The processor section includes two on-board microprocessors with memory. It provides the Ethernet interface for the front and rear modules, the USB interface for the rear module and the serial RS-232 interface on the front and rear modules. It also contains an IDE controller for the disk drive located on the rear SP3 module and a PCI bridge to the SF module.

Fault Alarm Manager (FAM)

The FAM is responsible for processing all system events that range from informational to critical. For the most part the fault manager simply logs events and reports alarms. In some cases corrective action is issued to other parts of the system based on alarm policy configurations. The FAM runs on both the working and protection SP3s but on the protection SP3, it takes more of a passive role because it does not need to handle errors from equipment.

The FAM determines the active module when booting with two SP3s and communicates the SP3 redundancy state. It is responsible for launching processes during the boot sequence and ensures that files on the disk are adequate for operation.

Heartbeat

The Heartbeat process is a simple message exchange protocol, which will run between System Processors over a communications link to verify that each SP3 is operating

Equipment Manager (EQM)

The EQM keeps track of state information for all IOMs, equipment holders in the chassis and various links that comprise an IOM. It provides the capability to configure equipment that is not present in the system. It provides an interface to perform SP failover; the Fault Manager makes the decision, the EQM does the hardware manipulation and sequencing.

TL1 Agent

The TL1 Agent processes TL1 commands and dispatches requests for management information, or changes of configuration information to the appropriate system resource for processing over an RS-232 or an Ethernet-based connection. The RS-232 connection is through a serial craft port, which is any VT-100 compatible terminal device. Input data streams from the serial craft port are buffered until a TL1 command terminator (;) is found or an error occurs. If a TL1 command terminator is found, the command is passed to the TL1 agent for processing. Ethernet-based communication is direct with the TL1 agent. The remote end of the Ethernet connection can be either a craft port using Telnet or the EMS.

The TL1 agent supports the transmission of autonomous output messages. Autonomous messages are unsolicited messages sent by the switch to indicate the occurrence of an alarm or some other significant event. The TL1 agent detects the condition by either polling the operational code or by some asynchronous notification.

The TL1 agent supports the ability to log TL1 command/ response messages and autonomous messages. Command/ Response messages are stored in one log and autonomous messages are kept in a separate log.

The TL1 agent also communicates with the Security Task interface to authenticate users and manage user sessions. In order to log into the TL1 agent a user must input a valid username and password. The switch is shipped with a default username of "telica", a password of "telica" and ADMIN access privileges. It is recommended that these be changed for security with the TL1 ED/ENT-USER-SECU command. Refer to Table 4.2-D for the access levels and their description.

Passwords by default expire after 90 days. However there is a grace period with a default of 7 days. During this period, you can log in but must change your password before executing any other commands. A user cannot change passwords more frequently than every 20 days and the current and previous five passwords cannot be reused. The preceding parameters can also be changed with the ED/ENT-USER-SECU command. These restrictions do not apply to changes made by a user with ADMIN privileges.

Table 4.2-D. Switch Access Levels

Level	Description
ADMIN	Administrative permits you to perform all TL1 commands including managing user accounts or profiles and downloading new software.
SW	SoftWare permits you to issue COPY-MEM and RTRV commands so the user can download new software.
SA	Service Affecting access level permits you to perform all TL1 commands except security commands (ENT/ED/DLT-USER-SEC).
NSA	Non-Service Affecting permits you to only issue SCHED and RTRV commands to schedule and view the switch's status and statistics information.
VIEW	View permits you to only issue RTRV commands to view the switch's status and statistics information.
	63-A

When using Telnet, twenty users (different user names) can be logged into the switch (i.e., TL1 craft and 19 Telnet sessions). If another user tries to log in, he will be denied access. If a user has not used the keyboard for a specified period, has exited the Telnet session, he will be logged out.

The System Fault Manager receives and records event and fault notifications related to physical and logical system state changes. It provides a readable log format to the TL1 agent upon request. It provides the interface to replication services to allow log replication on protected SP.

Craft Interfaces

There are two craft interfaces located on the front of the SP module. One is a DB-9 RS-232 interface and the other is an RJ-45 Ethernet interface.

DB-9 RS-232 Craft Port

A VT-100 terminal or PC running a terminal emulation program can be connected to the DB-9 connector to configure and retrieve information using TL1 commands and the element manager. Figure 4.2-4 illustrates a connection to a terminal/PC or to a modem for connection to a remote terminal/PC. Refer to Table 4.2-B for a description of the connector. Refer to Table 4.2-E for the parameters when using a terminal emulation program.

There is also a DB-9 craft interface on the rear module. Since this interface is interconnected to the front interface, a craft connection should be made to only one connector, not to both.

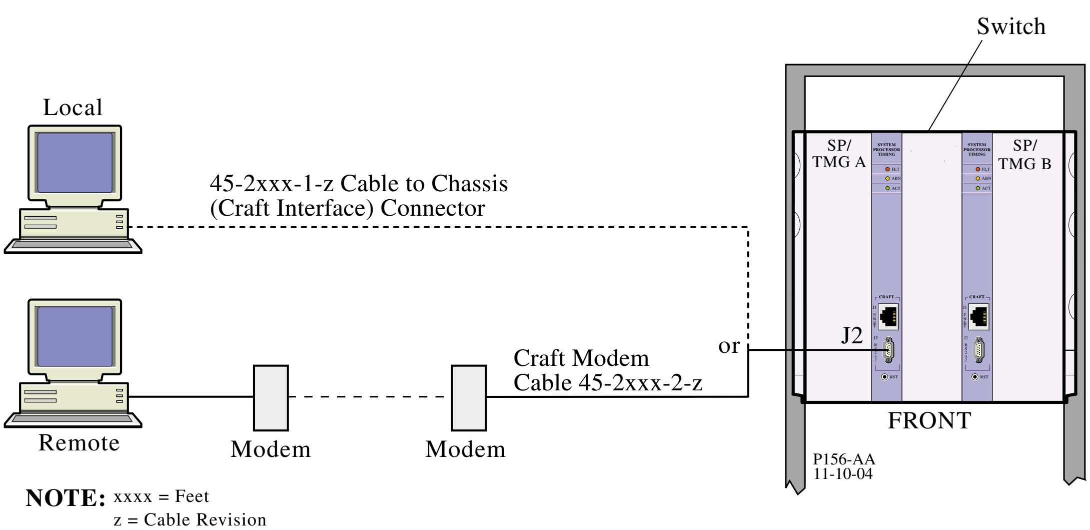


Figure 4.2-4. Craft Connection to Terminal/PC or Modem for Remote Connection

Table 4.2-E. Craft Terminal Parameters

Parameter	Value
Emulation Mode	VT100
Line Wrap	Off
Local Echo	Off
Column Width	80
Rows or Lines	24 to 43
Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	Xon/Xoff
	29-A

Ethernet Port

The front craft Ethernet interface was designed for a temporary connection. It allows you to send via FTP software or configurations or from a locally attached PC without disconnecting from the DB-9 RS-232 connector. It allows you to open a TELNET session through the Ethernet port so that TL1 commands can be used to configure or retrieve information.

The rear SP module also contains four Ethernet connectors labeled SIG ENET (signaling) and another labeled OS ENET (operating system) that are controlled by the system processor. For information about these connectors, refer to the Rear System Processor section of this chapter.

The IP addresses must first be configured using the RS-232 craft interface and TL1. Once provisioned, the addresses can be edited using the craft port TL1 commands or EMS.

4.2.3.5 Redundancy Control

The SP and SF modules are treated as one entity for the purposes of failover. For example, if a switch fabric fault is isolated, then the software will instigate a failover of both modules, and the ATM cell interfaces will start receiving from the former protection switch fabric. This selection is performed in the hardware.

4.2.4 Specifications

Refer to Table 4.2-F for environmental specifications and to Table 4.2-G for craft port specifications.

Table 4.2-F. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

Table 4.2-G. RS-232 CRAFTPORT SPECIFICATIONS

Password protection	Multi-level: ∉# Admin ∉# NSA (non-service-affecting) ∉# SA (service-affecting) ∉# SW (software upgrade) ∉# View
User interface	Command line (TL1)
Terminal supported	VT-100 or equivalent, or a PC using VT-100 terminal emulation
Modem capability	External
Baud rate	9600 Kb/s
Performance monitoring capabilities	Supports full OAM&P
Craft data	RS-232 D
Craft terminal connection	DB-9 5

NOTES:

4.3 Rear System Processor 3

4.3.1 Scope

This section describes the rear System Processor 3 (SP3) module. It explains the functions and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	**CLEI Codes**	**Comments**
89-0417-A	BA1C10WHAA	

4.3.2 Functional Description

Two SP/TMG rear circuit modules are located near the center of the shelf (slots 9 and 13) and provide full 1+1 redundancy for critical processing resources for true non-stop operation. Each rear SP3 module has an IDE disk drive that holds the entire system and circuit provisioning databases.

Each SP3 module has one USB interfaces (reserved for future use), two DB-9 RS-232 serial interfaces, five RJ45 Ethernet interfaces and two Bantam jack pairs for DS-1 (T1) test access.

4.3.2.1 General Mechanical Representation

The rear SP/TMG module is approximately14 inches high and plugs into the midplane for connections to the rear SP/TMG. See Figure 4.3-1 for the 89-0417 SP/TMG module.

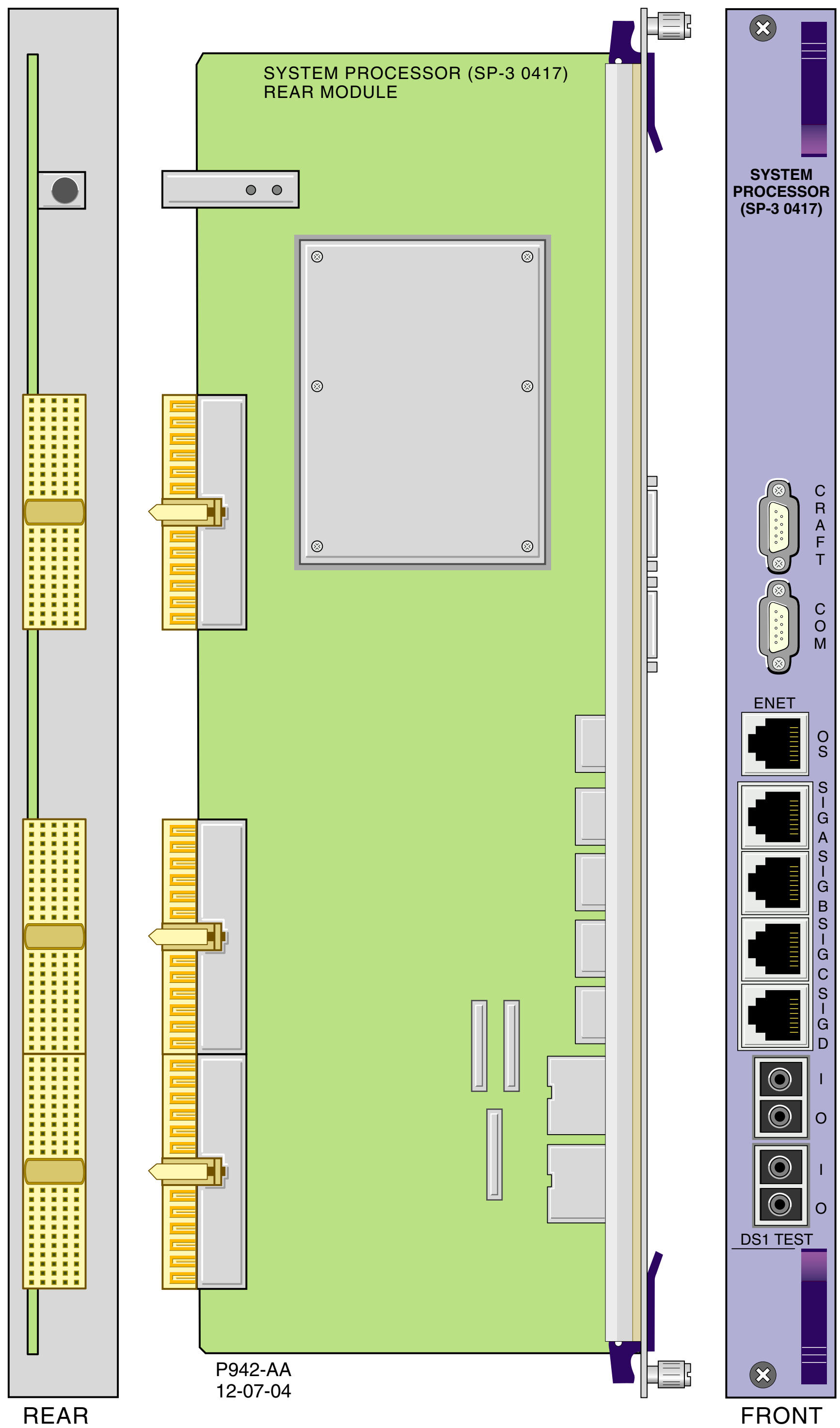


Figure 4.3-1. 89-0417 System Processor 3 Rear Module

4.3.2.2 Front Plate of the SP3 Module

The front plate of the 89-0417 IOM has the following connectors:

- CRAFT - DB-9 RS-232 serial craft interface operating at a fixed 9600 baud. Refer to Table 4.3-A for connector pin-outs.
- COM - DB-9 RS-232 serial interface connected to COM2 and used as an emergency login to the operating system. Refer to Table 4.3-A for connector pin-outs.
- OS – RJ45 10/100Base-T Ethernet interface for OAMP (Operations, Administration, Maintenance, and Provisioning). Refer to Table 4.3-B for connector pin-outs.
- SIG A – RJ45 10/100Base-T Ethernet interface for inter-module signaling. Refer to Table 4.3-B for connector pin-outs.
- SIG B – RJ45 10/100Base-T Ethernet interface for inter-module signaling. Refer to Table 4.3-B for connector pin-outs.
- SIG C – RJ45 10/100Base-T Ethernet interface for inter-module signaling. Refer to Table 4.3-B for connector pin-outs.
- SIG D – RJ45 10/100Base-T Ethernet interface for inter-module signaling. Refer to Table 4.3-B for connector pin-outs.
- DS1 Test – Two bantam jack pairs for DS1 (T1) test access. Refer to Table 4.3-C for connector descriptions.

4.3.2.3 LEDs and Connectors

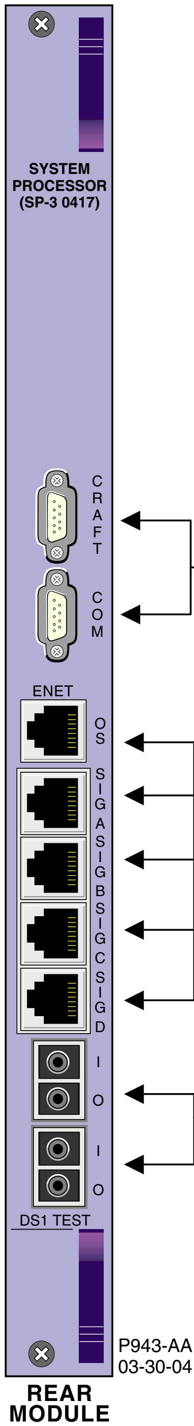


Table 4.3-A. CRAFT and COM Connector

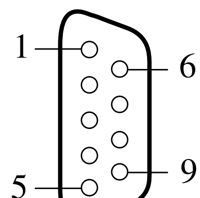
Name	Pin	Description
 P218-AA 07-07-00	1	DCD
	2	RXD
	3	TXD
	4	DTR
	5	GND
	6	DSR
	7	RTS
	8	CTS
	9	RI

Table 4.3-B. ENET Connectors

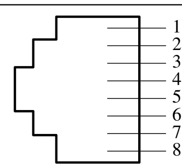
Name	Pin	Description
 P217-AA 07-07-00	1	TX+
	2	TX-
	3	RX+
	4,5	Unused
	6	RX-
	7,8	Unused

Table 4.3-C. DS1 Test Connectors

I	In (Top –monitor)
O	Out (Top –monitor)
I	In (Bottom –test)
O	Out (Bottom –test)

4.3.3 Theory of Operation

Figure 4.3-2 provides a simplified block diagram of the rear SP3, which is described in the following paragraphs.

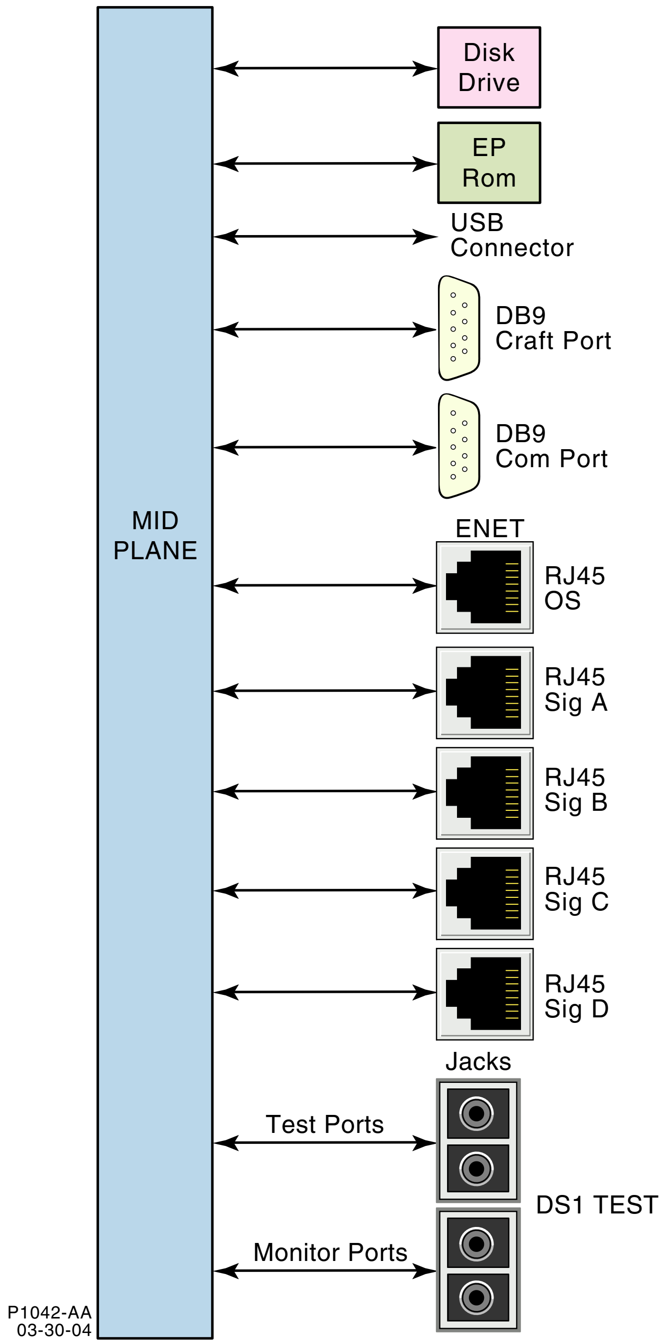


Figure 4.3-2. 89-0417 SP3 Rear Module Block Diagram

4.3.3.1 Power

The rear SP3 module receives its local voltages (5Vdc, 3Vdc, etc.) from the front SP3's DC-to-DC converter, which converts the -48 volts supplied from the backplane.

4.3.3.2 Disk Drive

Each SP3 has an IDE disk drive that holds the entire system and circuit provisioning databases. This strategic location allows for processor replacement without having to reload the system software in the drive. This in turn ensures that the system regains full protection capability once the replacement SP/TMG is inserted.

4.3.3.3 EEPROM

The SP3 rear module has an EEPROM that contains the CLEI code for the module. The CLEI code is read via the FPGA on the front module so that missing and incompatible replaceable equipment can be alarmed. The CLEI code is BA1C10WHAA for the 89-0417.

4.3.3.4 Connectors

RS-232 DB-9

There are two DB-9 RS-232 serial connectors, CRAFT and COM. The topmost connector is "CRAFT" and it provides a connection for a VT-100 terminal or PC running a terminal emulation program. This connector is tied to the craft connector on the front SP3 module. Therefore, a single connection should be made to either connector but not to both at the same time. Refer to Table 4.3-A for a description of the connectors.

Figure 4.3-3 illustrates a connection to J3 from a PC/terminal or a connection using modems to a remote location. Either connection provides access to the craft interface for configuration and maintenance using TL1 commands.

The second DB-9 RS-232 connector is labeled "COM." It is used by Lucent personnel for emergency access.

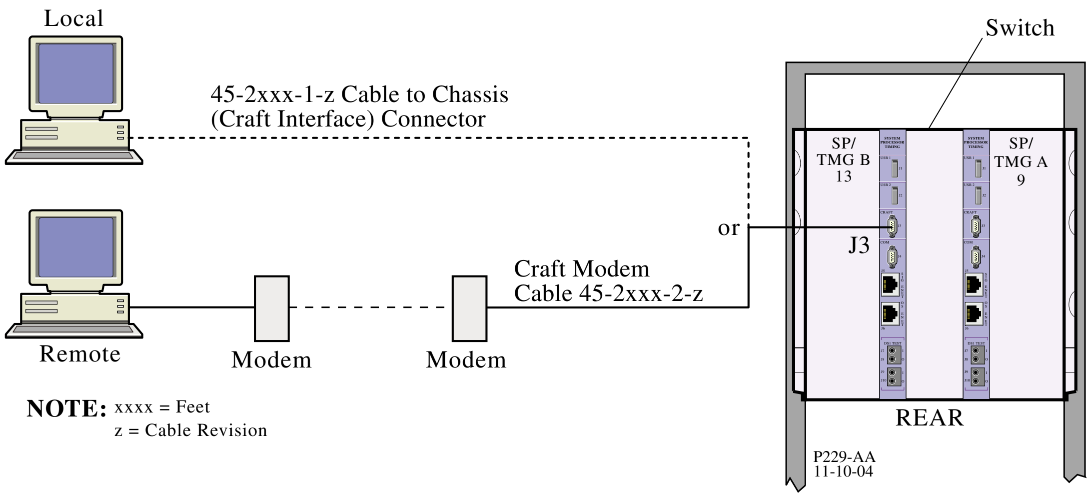


Figure 4.3-3. Craft Connection to Terminal/PC or Modem for Remote Connection

Ethernet

There are four RJ45 connectors, labeled SIG A, SIG B, SIG C, and SIG D, for a 100Base-T attachment. They are used for inter-module signaling and provide a constant interface to the IP signaling networks. The IP signaling network interface allows multiple switches to be connected to a common signaling gateway. The system Signaling network must be dedicated to the switching systems only and not used with other equipment.

The ‘OS’ Ethernet port is a 10/100Base-T attachment. It provides the Ethernet interface for OAMP (Operations, Administration, Maintenance, and Provisioning). The OS connection does not need to be separated from other equipment and can be connected into a corporate LAN. See to Figure 4.3-4 for a LAN network application.

If on the LAN network, you can Telnet into a switch and use TL1 or the EMS to monitor and retrieve status and alarms as well as provision the unit.

All Ethernet connectors have two LEDs that illuminate only on the working SP3 module. The top is yellow and lights when a cable is connected to the network. The bottom is green and lights when data is passing to and from the SP3 module.

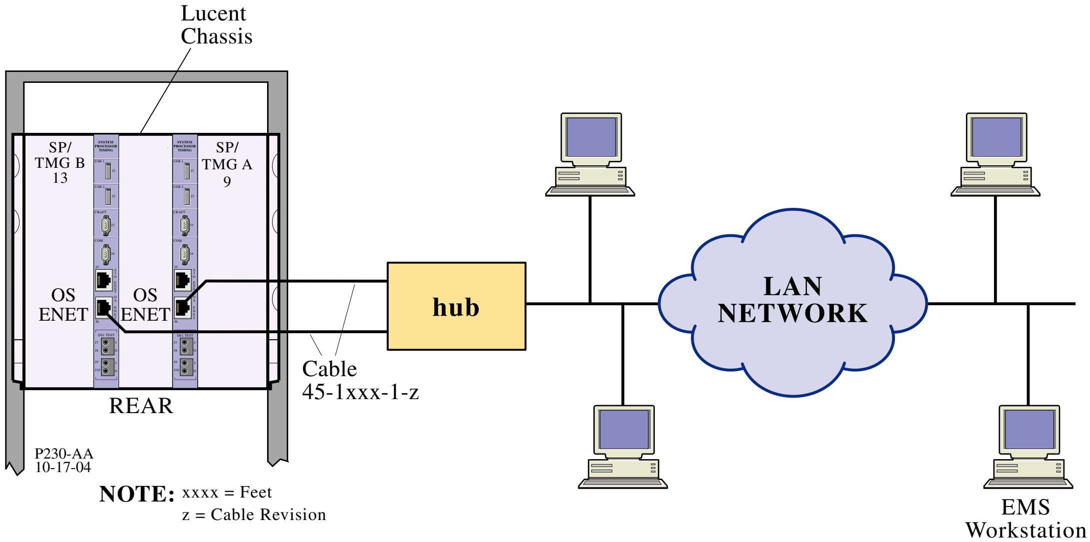


Figure 4.3-4. Switch Connected to a LAN Network

DS1 Test Jacks

There are two pairs of bantam jacks, label “I” and “O.” Refer to Figure 4.3-5. Typically, these jacks are used to monitor DS0s of multiple DS1s (e.g., ISDN D channels). Because there are two pairs of jacks, two different DS1s can be monitored. The top connector, labeled “I,” allows you to input a signal and monitor it using the connector beneath, labeled “O.”

These jacks allow you to monitor a DS-1 or DS-0s of multiple DS-1s entering or leaving the switch. The DS0s are typically ISDN D-channels or SS7 signaling channels, although a single DS-1 could be monitored. However, ISDN D-channels and SS7 signaling channels cannot be monitored on the same DS1. The DS-0s to be monitored must be on the same IOM and are selected with TL1 commands. The test jacks are also selected with a TL1 command.

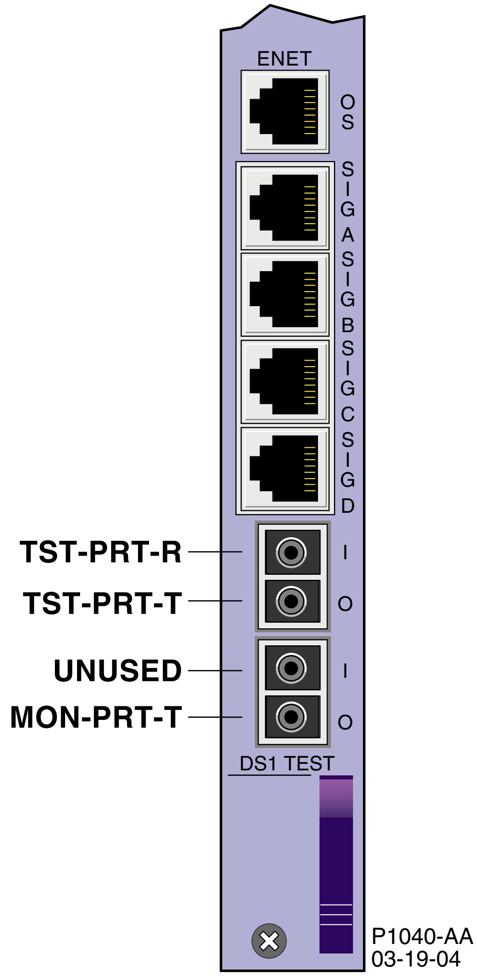


Figure 4.3-5. Monitor Jacks

The monitor jacks are connected via the midplane to the QFALC of the front System Processor module. Refer to Figure 4.3-6. The FALC receives the DS-0s from the IOM, multiplexes them into a single DS-1, and sends the DS-1 to the rear module and the monitor jacks. Test equipment can now be connected to monitor the signals.

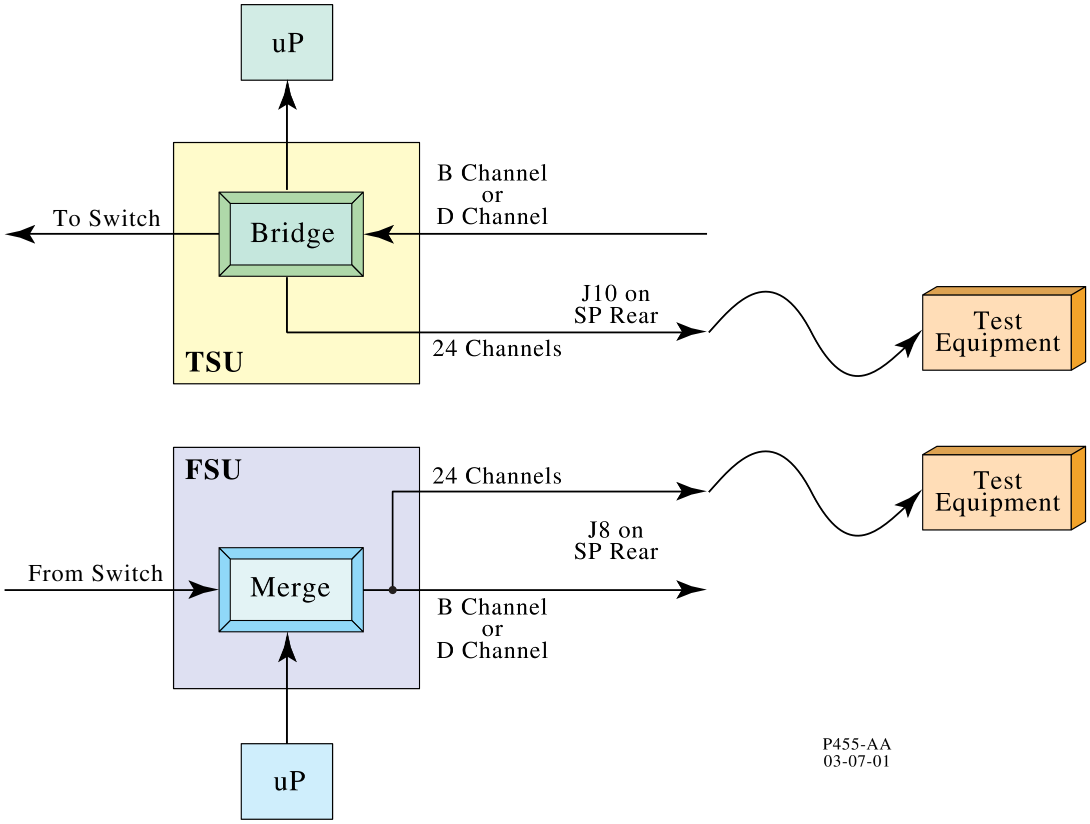


Figure 4.3-6. Monitor Jacks, System Processor and IOM

4.3.3.5 Security

Whether you are using the craft connection or the Ethernet and Telnet, or EMS, you must log in with a valid username and password. The TL1 agent on the Front SP authenticates users and manages user sessions.

The switch is shipped with a default username of “telica,” a password of “telica” and ADMIN access privileges. It is recommended that these be changed for security with the TL1 ED/ENT-USER-SECU command. Refer to Table 4.3-D for the access levels and their description.

Passwords by default expire after 90 days. However there is a grace period with a default of 7 days. During this period, you can log in but must change you password before executing any other commands. Passwords cannot be changed by a user more frequently than every 20 days and the current and previous five passwords cannot be reused. The preceding parameters can also be changed with the ED/ENT-USER-SECU command. These restrictions do not apply to changes made by a user with ADMIN privileges.

When using Telnet, twenty users (different user names) can be logged into the switch (i.e., TL1 craft and 19 Telnet sessions). If another user tries to log in, he will be denied access. If a user has not used the keyboard for a specified period, has exited the Telnet session, he will be logged out.

Table 4.3-D. Switch Access Levels

Level	Description
ADMIN	Administrative permits you to perform all TL1 commands including managing user accounts or profiles and downloading new software.
SW	Software permits you to issue COPY-MEM and RTRV commands so the user can download new software.
SA	Service Affecting access level permits you to perform all TL1 commands except security commands (ENT/ED/DLT-USER-SEC).
NSA	Non-Service Affecting permits you to only issue SCHED and RTRV commands to schedule and view the Plexus 9000’s status and statistics information.
VIEW	View permits you to only issue RTRV commands to view the Plexus 9000’s status and statistics information.

63-A

4.3.3.6 Redundancy Control

The SP3 and SF modules are treated as one entity for the purposes of failover. For example, if a switch fabric fault is isolated, then the software will initiate a failover of both modules, and the interfaces will start receiving from the former protection switch fabric and system processor.

4.3.4 Specifications

Refer to Table 4.3-E for environmental specifications and to Table 4.3-F for craft port specifications.

Table 4.3-E. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

Table 4.3-F. CRAFTPORT SPECIFICATIONS

Password protection	Multi-level: • Admin • NSA (non-service-affecting) • SA (service-affecting) • SW (software upgrade) • View
User interface	Command line (TL1)
Terminal supported	VT-100 or equivalent, or a PC using VT-100 terminal emulation
Modem capability	External
Baud rate	9600 Kb/s
Performance monitoring capabilities	Supports full OAM&P
Craft data	RS-232 D
Craft terminal connection	DB-9 5

NOTES:

4.4 Front Compute Module

4.4.1 Scope

This section describes the front Compute Module, which will be referred to as CM in this document. This section explains the module functions, LED indicators, and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0419-A	BA9ATS0FAA	
89-0419-B	BA9ATS0FAB	

4.4.2 Functional Description

This module is used with the System Processor 3 (SP3) modules in a Lucent Network Gateway Controller (LNC) system. A LNC is used to control many downstream Media Gateways (MGs). This module is similar to an SP but resides in an IOM slot. The CMs operate and are installed in pairs to provide 1 for 1 protection. The switch chassis will allow for 8 protected pairs in a single chassis. Slot I/O-9 cannot be used for a CM. The CM is used with SP3 and 85-3008 chassis with Midplane III.

The CM is made up of four independent processor sub-systems including 1Mbyte of on chip L2 cache. The processor interfaces to a memory controller.

4.4.2.1 General Mechanical Representation

The CM is approximately 14 inches high and plugs into the midplane for connections to the rear CM module and to the Switch Fabric and IOMs. Refer to Figure 4.4-1 for an illustration of the midplane connector, the CM and the front of the module. Refer to Table 4.4-A for a description of the LEDs.

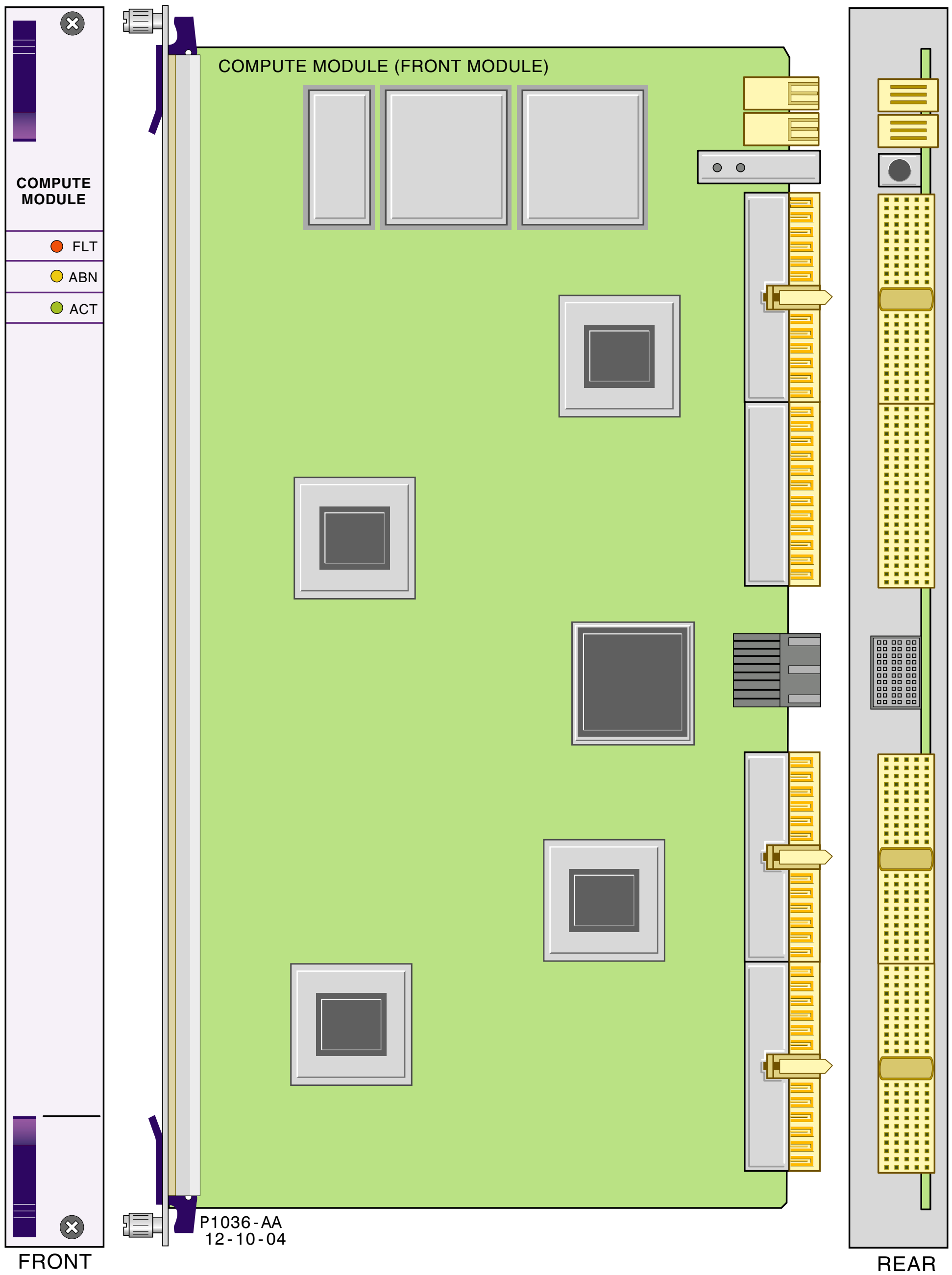


Figure 4.4-1. Front Compute Module

4.4.2.2 Front Panel

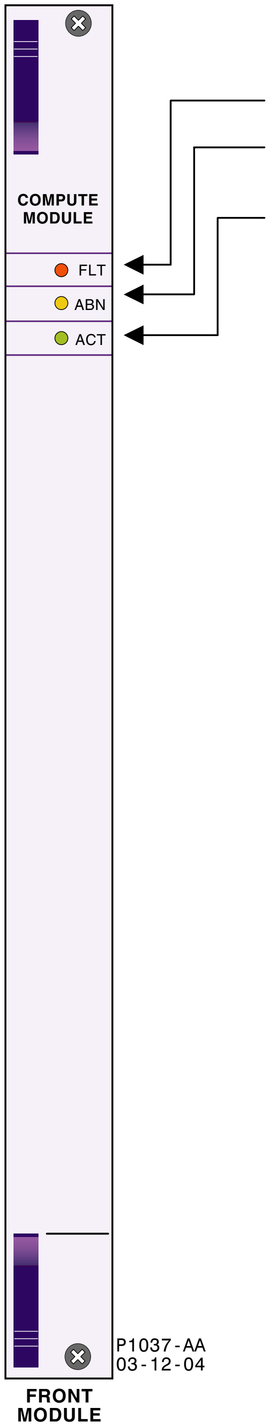


Table 4.4-A. LEDs of the Compute Module

LEDs	Color	Description
FLT	Red	Indicates a local internal fault
ABN	Yellow	Indicates a remote fault or abnormal condition.
ACT	Green On	Indicates that the module is online and active.
	Green Blinking	Indicates that the module is ready and in standby (STBYH) mode.

4.4.3 Theory of Operation

Figure 4.4-2 provides a simplified block diagram of the CM. The CM consists of four processor sections, which are described in the following paragraphs.

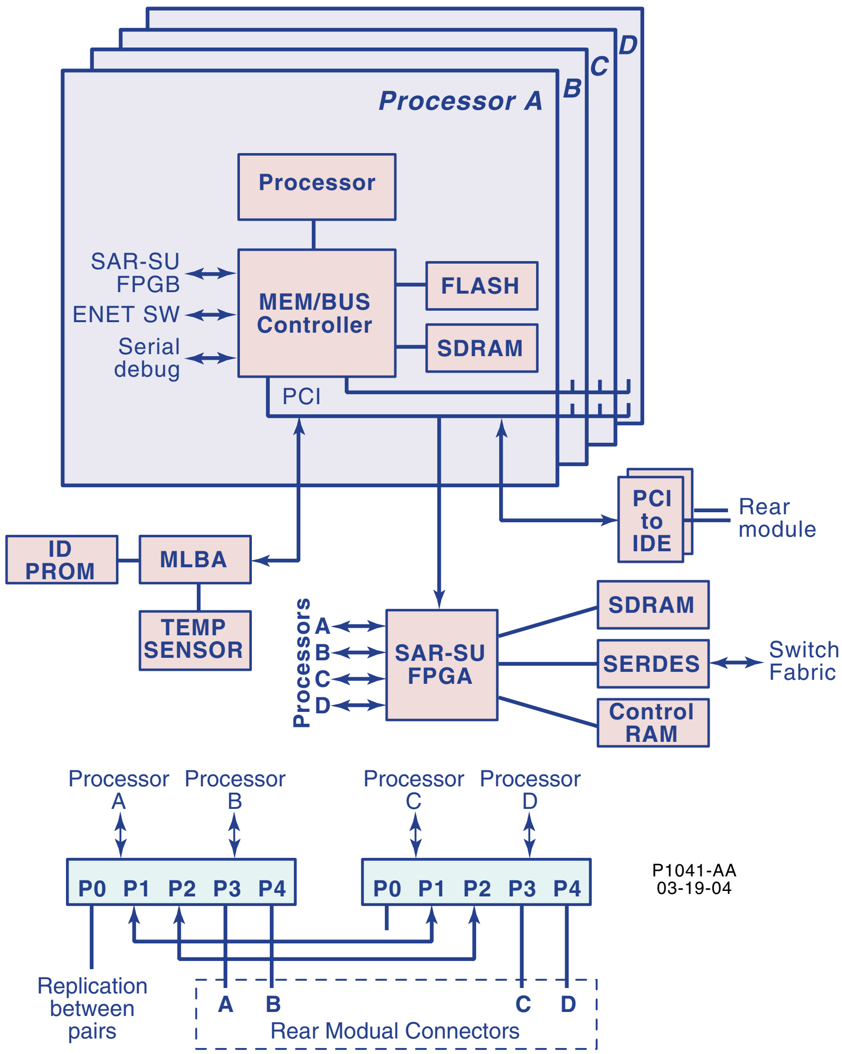


Figure 4.4-2. Block Diagram of Compute Module

4.4.3.1 Processor Subsystems

The CM has four processor sections that consist of a microprocessor with on-chip cache memory, and a memory/bus controller with associated memory.

Processor Section

The processors perform CM Monitor functions and are responsible for initial booting and monitoring of a processor. The CM Monitor process utilizes many of the current IOM libraries for messaging and configuration in communicating with EQM/FAM on the SPs. The CM Monitor is responsible for starting the applications to be run on a CM processor including connection control and signaling (CCS) processes or the subscriber database server and routing.

The CM Monitor of processor A is responsible for communicating the SPs. Processor A does the PCI 0 arbitration and is also the processor that is connected to the Ethernet switch's management interface for setup and configuration.

Memory/Bus Controller

The memory/bus controller has two PCI busses, which connect to the four processors. PCI-0 also connects to the MBLA and SAR FPGA. PCI-1 provides connections to the disks on the rear CM. The memory/bus controller has two Ethernet ports, one connects to the SAR and the other to one of the Ethernet switches. The processors can communicate with each other using ports 1 and 2 of the switch and ports 5 and 6 that connect to the controllers. The memory/bus controller has two serial debug ports for engineering use.

The rear CM has a disk connected to processor A. This disk is accessible by the other processors on the CM using an NFS (Network File System). It is used for storing core and log files over a reboot of CM as well as billing records.

4.4.3.2 Maintenance Link Bus Adapter (MLBA)

The MLBA, like those on the IOMs, is on the PCI 0 bus for processor communications with the SP modules over the maintenance link or the switch fabric. It also provides the interface to the ID proms for both the front and rear card. A second interface connects to a temperature sensor that is used to monitor the chassis temperature and generates an interrupt if the temperature window is exceeded.

4.4.3.3 Segmentation and Reassembly (SAR) FPGA

The SAR-SU FPGA is also on the PCI 0 bus for processor communications with the SF modules over the maintenance link or the switch fabric. Its main job is to segment and reassemble IP packets that will be passed from the CM module to/from the SP3 modules. It includes scheduling and bandwidth management functions.

A SAR-SU FPGA provides the interface between the processor and the Ethernet of the memory/bus controller interface and the ATM switch fabric. It takes Ethernet packets from the memory/bus controller, strips off the Ethernet Mac address, and segments the IP packet for transmission over the SF interface to the SP. This includes adding a VPI/VCI and necessary routing tags.

In the direction from the SF, the SAR-SU gathers ATM cells, strips the ATM header information and reassembles the IP packets from the SP. It will either look at the destination IP address to determine which CPU subsystem or use the incoming VCI to determine the CPU to receive the packet. Then the SAR-SU will append the MAC address and send the data to the memory/bus controller over the Ethernet interface.

The data path from each CPU subsystem to the SAR-SU is over the Port 0 Ethernet interface on the memory/bus controller that is a standard full-duplex 100 Mbps interface. The control and setup of the SAR-SU is done using the PCI 0 bus from any of the CPU subsystems.

The SAR-SU has SDRAM external memory for buffering cells from the SF prior to reassembly. The SAR-also has a bank of SRAM memory for pointers and other control functions.

4.4.3.4 Serializer/Deserializer (SERDES)

The SERDES provide the data interface to the SF.

4.4.3.5 Power

The front CM module has its own DC-to-DC converter (not shown in Figure 4.4-2), which converts the -48 volts supplied from the backplane to the local voltages required (3.3V, 2.5V, etc.) for the module. The front module also supplies these voltages for the rear CM module.

4.4.3.6 EEPROM

The front CM also has an EEPROM that contains the CLEI code for the module. All modules have a CLEI code so that missing and incompatible replaceable equipment can be alarmed.

4.4.3.7 Ethernet Interfaces

The CM has two Ethernet switches that provide Ethernet access between the processor subsystems, a local debug interface, a connection to the IOM replication interface and four rear external interfaces.

The replication port on Port 0 of switch # is used to drive signals across the mid-plane to the paired CM module. Ports 1 and 2 interconnect the two switches. Port 3 and 4 on the two switches provide connectivity to the external RJ45 Ethernet connectors on the rear CM. Ports 5 and 6 provide an interface between the switches and the processor subsystems.

4.4.3.8 Redundancy

The other CM of paired CMs provides 1:1 redundancy. If a processor section fails on a CM, the CM will fail over to the other.

4.4.4 Specifications

Refer to Table 4.4-B for environmental specifications.

Table 4.4-B. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

4.5 Rear Compute Module

4.5.1 Scope

This section describes the rear Compute Module, which will be referred to as the rear CM in this document. This section explains the module functions and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0420-A	BA9AAUT0FAA	Not supported in R6.X TAG, aMG or uMG applications.

4.5.2 Functional Description

This module is used with the front CM modules in a Lucent Network Controller (LNC) system. A LNC is used to control many downstream Media Gateways (MGs). This module is similar to an SP but resides in an IOM slot. The CMs operate and are installed in pairs to provide 1 for 1 protection. The switch chassis will allow for 8 protected pairs in a single chassis. Slot I/O-9 cannot be used for a CM. The CM is used with SP3 and the 85-3008 chassis with Midplane III.

The rear module has a disk subsystem with a second optional disk and four 100 Mbps Ethernet ports.

4.5.2.1 General Mechanical Representation

The rear CM is approximately 14 inches high and plugs into the midplane for connections to the front CM module. See Figure 4.5-1 for an illustration of the midplane connector, the rear CM and the front panel of the module.

The front plate of the module has four RJ45 Ethernet connectors for the front CM. Refer to Table 4.5-A for the pin-out of the Ethernet connector.

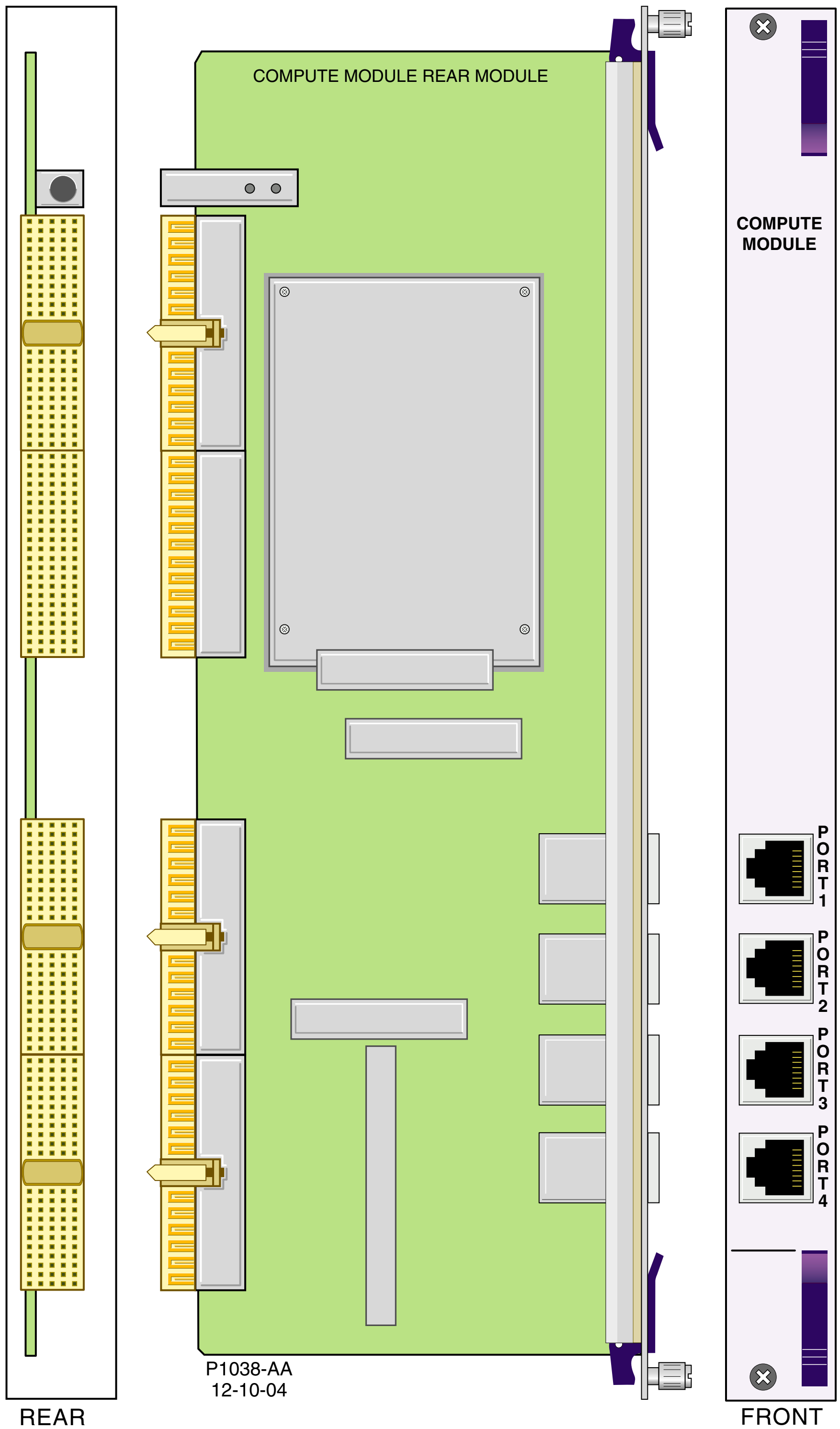


Figure 4.5-1. Rear Compute Module

4.5.2.2 Front Panel

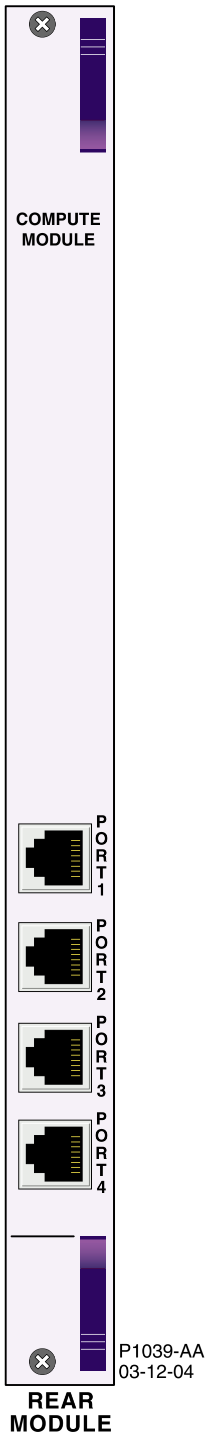
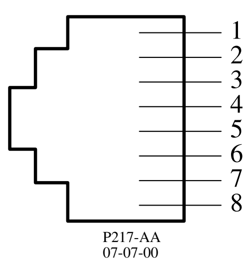


Table 4.5-A. Typical Ethernet Connectors

Name	Pin	Description
	1	TX+
	2	TX-
	3	RX+
	4	
	5	
	6	RX-
	7	
	8	

Note: The table shows the typical pin-out for an Ethernet connector. However, these connectors are auto-sensing.

4.5.3 Theory of Operation

Figure 4.5-2 provides a simplified block diagram of the rear CM. The rear CM has one or two disk drives and four Ethernet connectors.

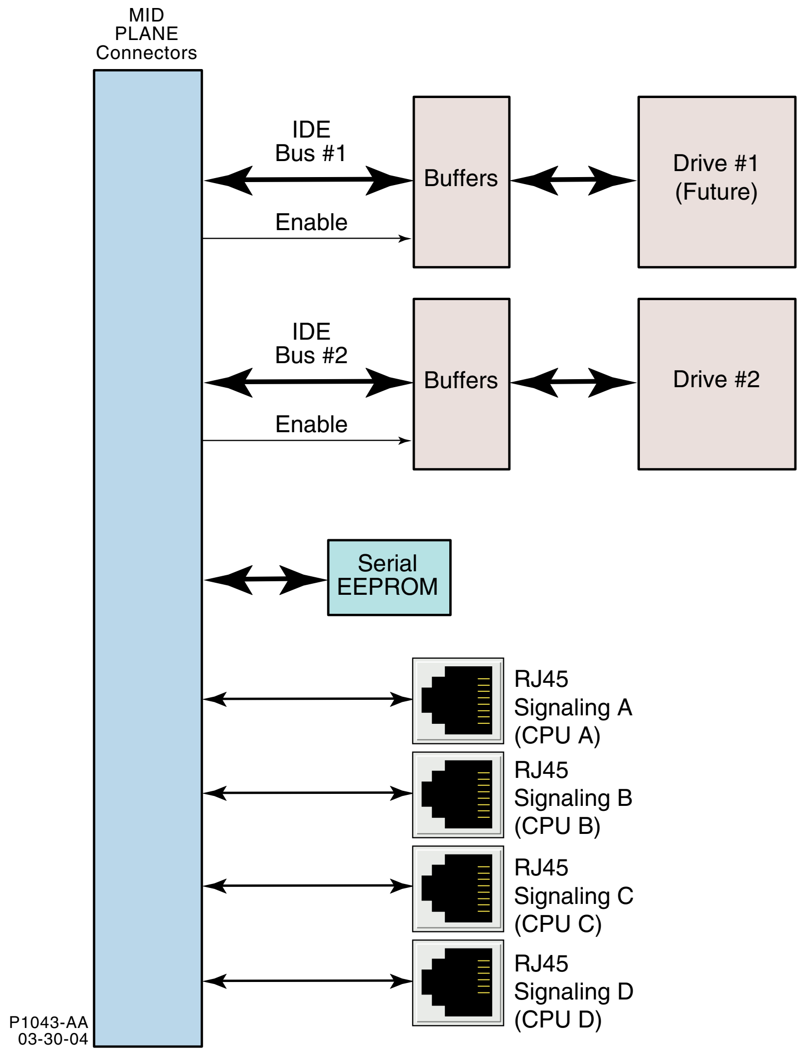


Figure 4.5-2. Block Diagram of Rear Compute Module

4.5.3.1 Disk Section

Each rear CM has an IDE disk drive. The disk is attached to processor A on the front CM using IDE Bus 2. It is accessible by the other processors on the CM using an NFS (Network File System). It is used for storing core and log files as well as to locally store billing records as needed by the CCS billing processes. A second drive connected to IDE Bus 1 may be available in the future.

4.5.3.2 Power

The rear CM receives 3.3 volts from the front CM's DC-to-DC converter. The power supply on the rear CM transforms the 3.3 volts to 5 volts for the disk drive.

4.5.3.3 EEPROM

The CM rear module has an EEPROM that contains the CLEI code for the module. The CLEI code is read via the MLBA on the front module so that missing and incompatible replaceable equipment can be alarmed.

4.5.3.4 Ethernet Connectors

The rear CM has four Ethernet connectors that are connected to the Ethernet circuitry on the front CM. The circuitry for the connector is auto-sensing.

4.5.4 Specifications

Refer to Table 4.5-B for environmental specifications.

Table 4.5-B. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

NOTES:

4.6 Switch Fabric Front Module

4.6.1 Scope

This section contains a description of the Switch Fabric (SWFAB) front module. This section includes an explanation of all of the module functions, LED indicators, and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	**CLEI Codes**	**Comments**
89-0363-D	BAC73WYJAB	

4.6.2 Functional Description

The SWFAB modules are located in slots 10 and 12. These modules provide full 1:1 redundancy for critical switching resources resulting in true non-stop operation. Each switch fabric module has twenty-four 622 Mb/s ports providing a total usable bandwidth of 15 Gb/s.
The switch fabric modules also provide redundant communication interfaces between the system processors and every other module in the chassis. All operations, management and protection messages are converted to ATM cells on each switch fabric module and delivered to the other modules over the cell stream on the midplane.

4.6.2.1 General Mechanical Representation

The front SWFAB module is approximately 14 inches high. Figure 4.6-1 provides an illustration of the midplane, the module and the front plate. Refer to Table 4.6-A for a description of the LEDs.

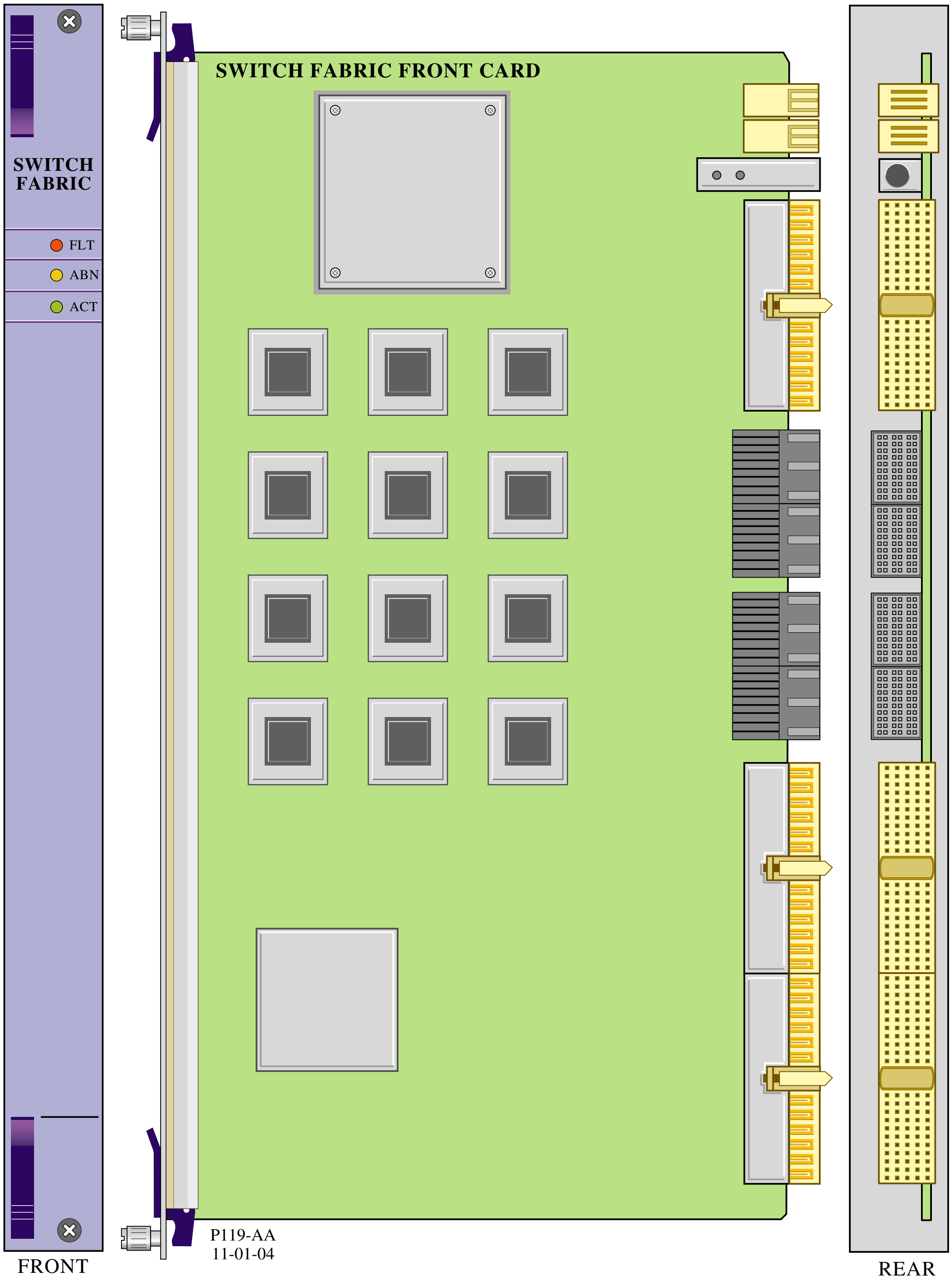


Figure 4.6-1. Switch Fabric Module

4.6.2.2 LEDs

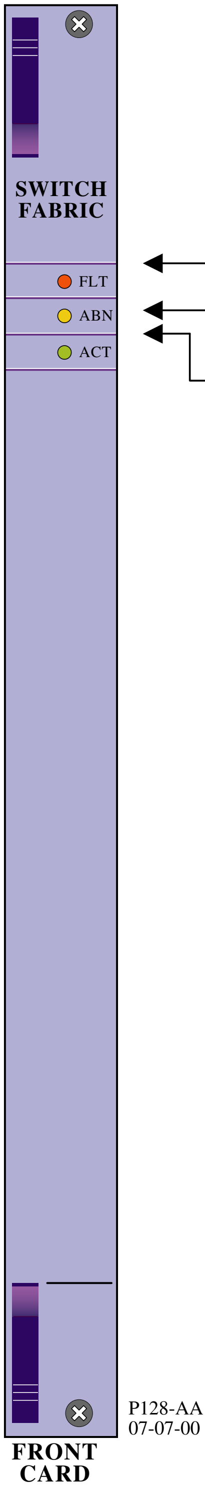


Table 4.6-A. SW/FAB LED Indicators

LED	Color	Description
FLT	Red	Indicates a local internal fault.
ABN	Yellow	Indicates a remote fault or abnormal condition.
ACT	Green On	Indicates that this SF module is the working SF and is active.
	Green Blinking	Indicates that the card is ready and in standby mode.
		62

4.6.3 Theory of Operation

Figure 4.6-1 provides a simplified block diagram of the SF, which is described in the following paragraphs.

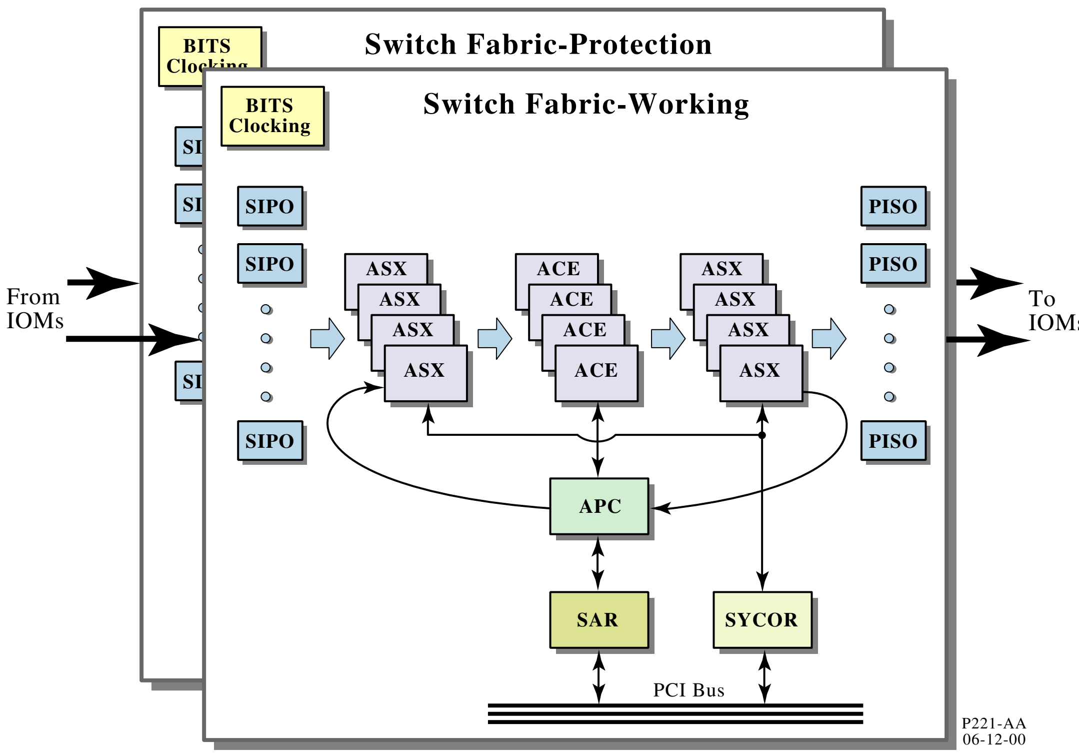


Figure 4.6-2. Block Diagram of the Switch Fabric Module

4.6.3.1 Power

The front SWFAB module has its own DC-to-DC converter, which converts the 48 volts supplied from the backplane to the local voltages required (5V, 3V, etc.). The front module also provides these voltages to the rear SWFAB module.

4.6.3.2 Clocks and Synchronization

The ATM SF, maintenance link, and line interfaces all operate synchronously to the BITS timing from the SP/TMG module.

4.6.3.3 Serial In, Parallel Out (SIPO) Interface

Each switch fabric module features twenty-four 622 Mb/s, OC12 capable, ATM ports providing a total usable bandwidth of 15 Gb/s. The twenty-four ports are used as follows:

- 1 for the working SP/TMG module
- 1 for the protection SP/TMG module (The protection SP can send/receive traffic even when it is in the protection state.)
- 22 for the IO Modules

The SFs run in lockstep. The IOM sends the serial ATM signal to both the working and protection SF.

4.6.3.4 ATM Switch Element (ASX)

The ATM Switch Element provides the switching function for an ATM switch. It is used in conjunction with the ATM Crossbar Element to provide a larger multi-stage, high-performance, nonblocking, lossless, self-routing switch fabric.

Data for each port is clocked into an input processor in the ASX, passed to internal cell buffers, and then routed to the appropriate output processor in the ASX. The internal queue processor, routing and arbitration circuit, and backpressure generation circuit control the movement of data into and out of the cell buffer memory. Control and status are communicated through an internal microprocessor.

On the left of the block diagram, the ASX is called the expander and it increases the number of paths available for switching the data. The ASX on the right is called the concentrator and it concentrates data from the ATM Crossbar Element.

4.6.3.5 ATM Crossbar Element (ACE)

The center of a switch fabric is the ATM Crossbar Element that functions as crossbar allowing construction of non-blocking, lossless switch fabrics. The ACE is functionally similar to the ASX, but without the internal cell buffer because a hand-shake protocol between the ASX and the ACE ensures that the ACE does not need to store data.

4.6.3.6 ATM Port Controller (APC)

The ATM port controller interfaces to the SAR on the SWFAB module and is responsible for inter-module messaging. During initialization the ATM connections to the IOMs are established.

4.6.3.7 Segmentation and Reassembly (SAR) Controller

There is a ATM Adaptation Layer 5 (AAL5) SAR on each switch fabric module. This SAR interfaces to the PCI bus that connects to the SP/TM port on the switch fabric and to the APC. The SAR performs the conversion from/to cells and the SAR is used as a communications transport between modules.

4.6.3.8 System Controller (SYCOR)

The SYCOR communicates to all the Maintenance Link Bus Adapters (MLBAs) on the IOMs . It communicates operational status from the IOMs to the SP. The SYCOR monitors the operational status register and interrupts the SP on changes.

4.6.3.9 Parallel In, Serial Out (PISO) Interface

The PISOs convert the parallel data of the switch fabric back to serial data for the IOMs.

4.6.3.10 Redundancy Control

The SP/TMG and SWFAB modules are treated as one entity for the purposes of failover. For example, if a switch fabric fault is isolated, then a failover of both modules will be initiated, and the ATM cell interfaces will start receiving from the former protection switch fabric.

In addition, when an I/O module failover occurs, a message is sent to the IOM's processor, so that it will change the system processor with which it is communicating.

4.6.4 Specifications

Table 4.6-B provides the environmental specifications.

Table 4.6-B. Environmental Specification

Level	Description
ADMIN	Administrative permits you to perform all TL1 commands including managing user accounts or profiles and downloading new software.
SW	Software permits you to issue COPY-MEM and RTRV commands so the user can download new software.
SA	Service Affecting access level permits you to perform all TL1 commands except security commands (ENT/ED/DLT-USER-SEC).
NSA	Non-Service Affecting permits you to only issue SCHED and RTRV commands to schedule and view the switch’s status and statistics information.
VIEW	View permits you to only issue RTRV commands to view the switch’s status and statistics information.
	63-A

4.7 Switch Fabric A/B Rear Modules

4.7.1 Scope

This section contains a description of the Switch Fabric A rear module. It includes an explanation of all of the module functions and connector interfaces. The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0364-A	BAC7Z30JAA	Switch Fabric A
89-0375-A	BAC7160JAA	Switch Fabric B

4.7.2 Functional Description

The switch fabric modules are located in slots 10 and 12. Both rear Switch Fabric (SWFAB) modules have Building Integrated Timing Supply (BITS) inputs and line protection circuitry. Switch Fabric-A also contains the alarm relay and bay alarm circuitry.

4.7.2.1 General Mechanical Representation

The rear SWFAB modules are approximately 14 inches high. Refer to Figure 4.7-1 for an illustration of the midplane connector, the SWFAB-A module and its front plate. See Figure 4.7-2 for an illustration of the SWFAB-B module.

Both modules have BITS wire-wrap inputs. SWFAB-A has a Bay Alarm In, Bay Alarm Out and an Alarm Contacts connector. Refer to Table 4.7-A and Table 4.7-C for the pin-out of the Bay Alarm connectors, to Table 4.7-B and Table 4.7-E for the pin-out of the BITS wire-wrap pins and to Table 4.7-D for the pin-out of the Alarm Contact connector.

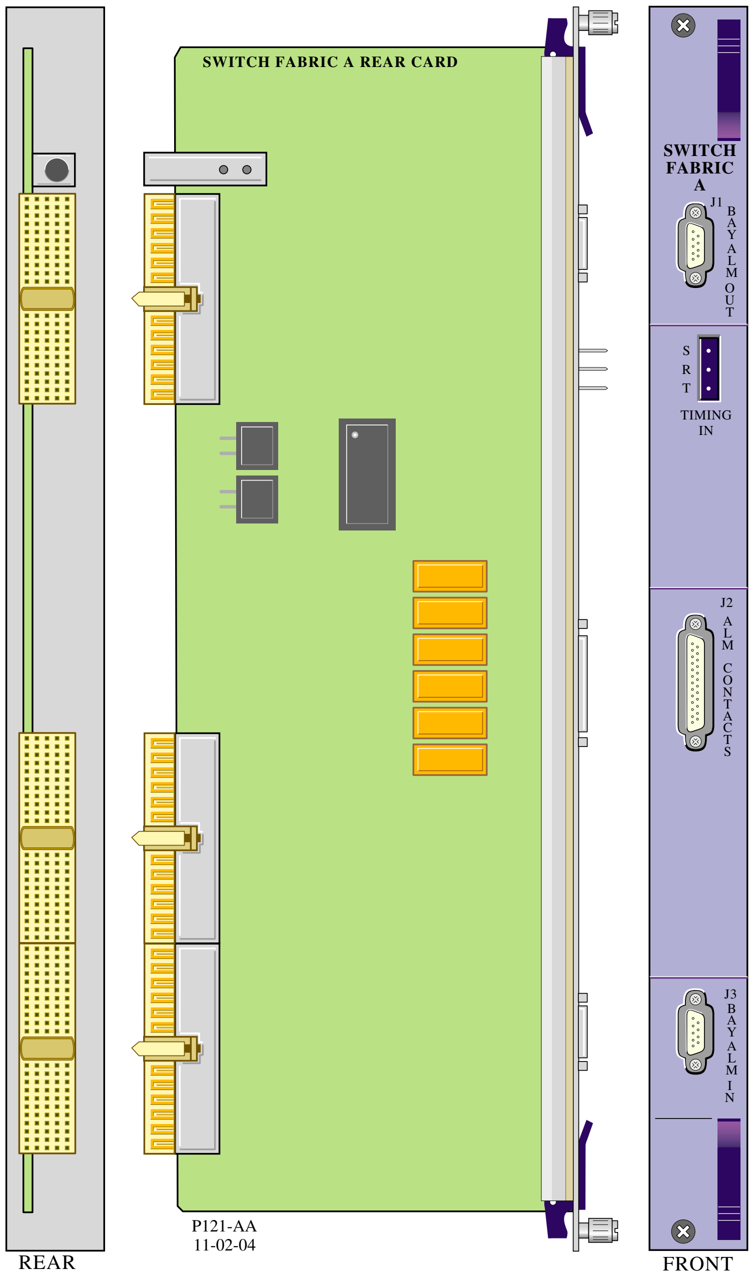


Figure 4.7-1. Switch Fabric A Rear Module

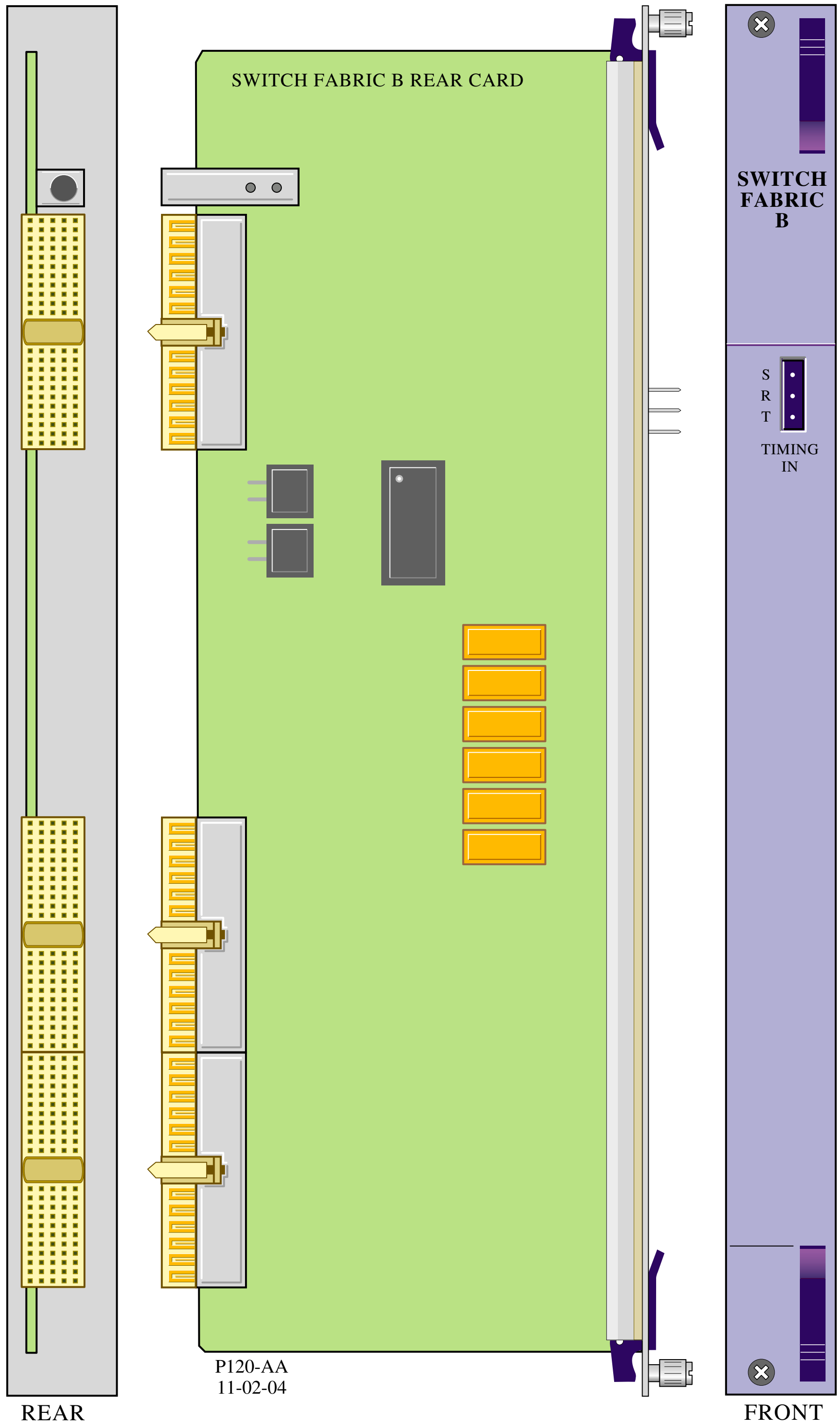
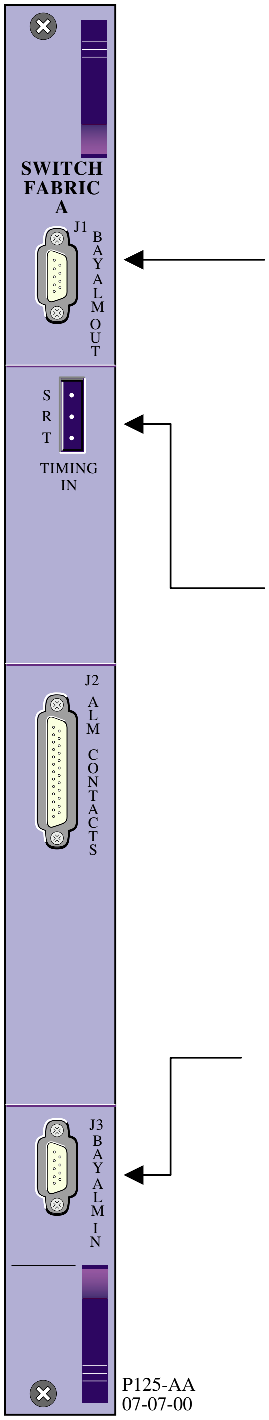


Figure 4.7-2. Switch Fabric B Rear Module

4.7.2.2 SW/FAB A Rear Module



REAR CARD

Table 4.7-A. Bay Alarm Out Connector

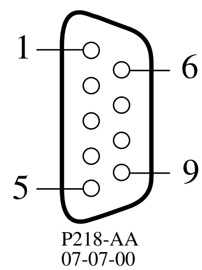
Port	Connector	Pin	Description
J1		1	Common
		2	N/A
		3	N/A
		4	N/A
		5	BAY-LAMP-NO
		6	N/A
		7	N/A
		8	N/A
		9	N/A

Table 4.7-B. BITS Timing Connector

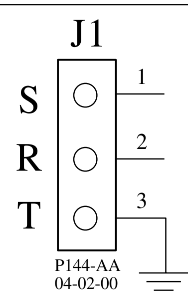
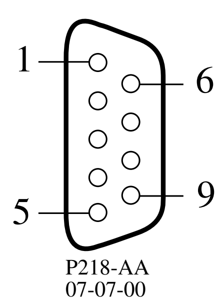
Port	Connector	Pin	Description
SRT		1	Shield
		2	Ring
		3	Tip

Table 4.7-C. Bay Alarm In Connector

Port	Connector	Pin	Description
J3		1	Common
		2	N/A
		3	N/A
		4	N/A
		5	BAY LAMP-NO
		6	N/A
		7	N/A
		8	N/A
		9	N/A

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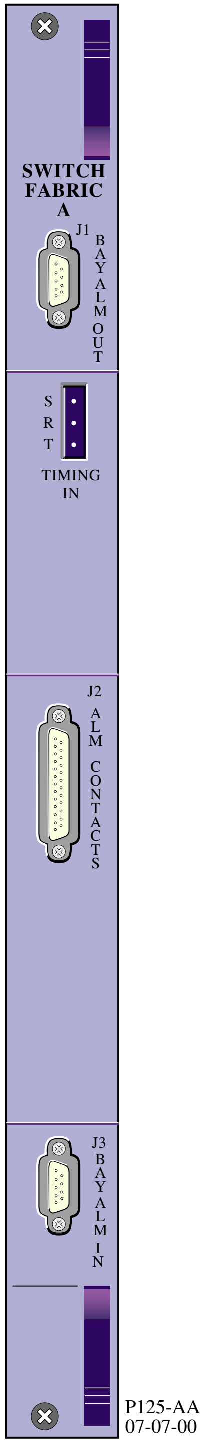
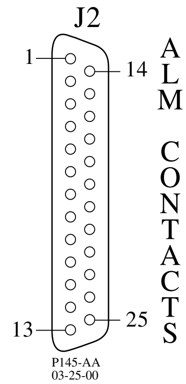


REAR CARD

Table 4.7-D. Alarm Contacts Connector

Port	Connector	Pin	Description
J2	ALM CONTACTS 	14	CRI-AUD-NC
		2	CRI-AUD-COMMON
		1	CRI-AUD-NO
		3	MAJ-AUD-NC
		4	MAJ-AUD-COMMON
		16	MAJ-AUD-NO
		5	MIN-AUD-NC
		6	MIN-AUD-COMMON
		18	MIN-AUD-NO
		21	CRI-VIS-NC
		9	CRI-VIS-COMMON
		8	CRI-VIS-NO
		10	MAJ-VIS-NC
		11	MAJ-VIS-COMMON
		23	MAJ-VIS-NO
		12	MIN-VIS-NC
		13	MIN-VIS-COMMON
		25	MIN-VIS-NO
		7	N/A
		15	N/A
		17	N/A
		19	N/A
		20	N/A
		22	N/A
		24	N/A

Note: Audible only alarms can be silenced or cut off (ACOed). It is recommended that visual alarms be used for an external monitoring/management system.

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4.7.2.3 SW/FAB B Rear Module

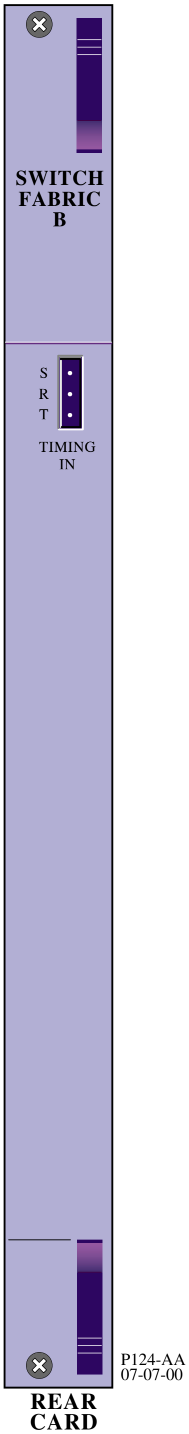
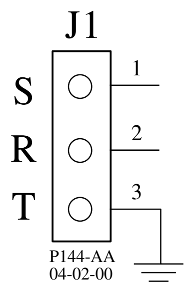


Table 4.7-E. BITS Timing Connector

Port	Connector	Pin	Description
SRT		1	Shield
		2	Ring
		3	Tip
			23

4.7.3 Theory of Operation

4.7.3.1 Module Block Diagram

Figure 4.7-3 provides a simplified block diagram of the rear SF which is described in the following paragraphs.

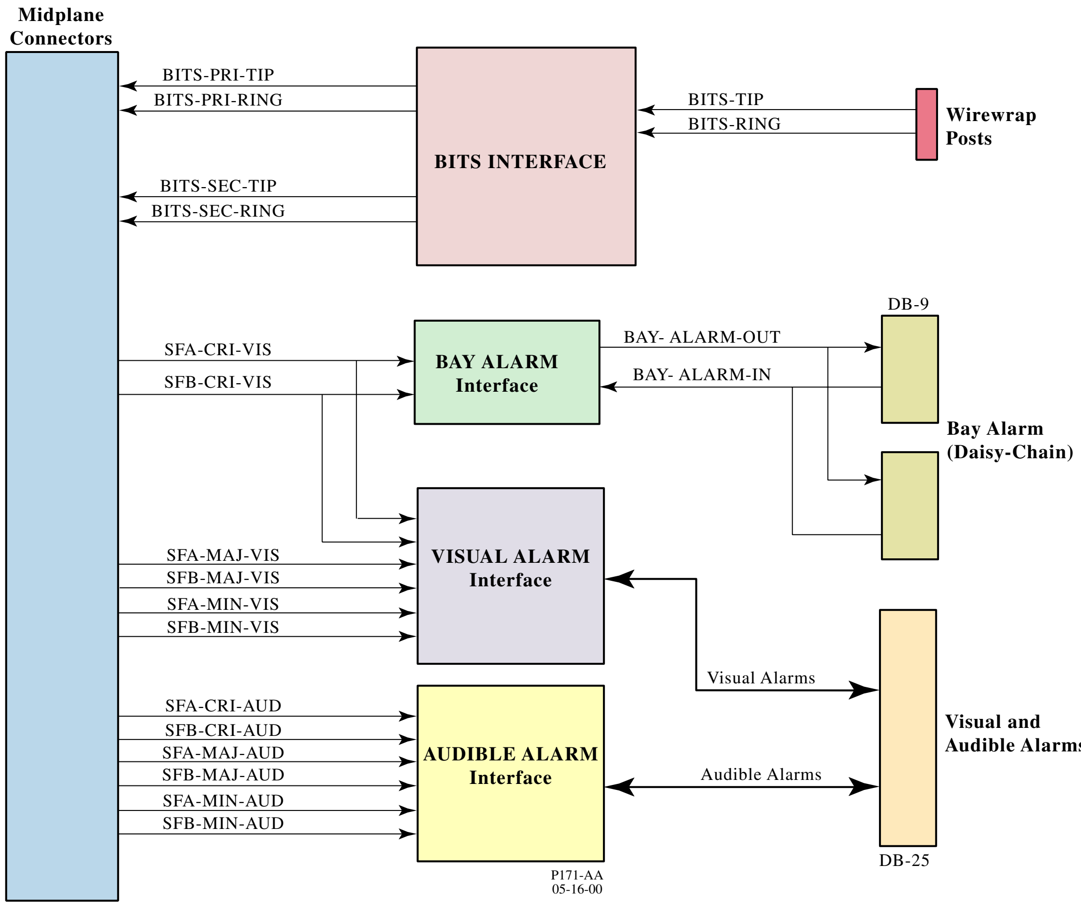


Figure 4.7-3. Block Diagram of Rear Switch Fabric Module

4.7.3.2 Power

Each rear SWFAB module receives the local voltages (5V, 3V, etc.) from the front SWFAB module that has its own DC-to-DC converter, which converts the -48 volts supplied from the backplane.

4.7.3.3 BITS Interface

Both rear SFs have a T1 wire-wrap input for the BITS input. The BITS input passes through lightning protection circuitry to a splitter that sends the outputs to each of the front SP/TMG modules.

4.7.3.4 Bay Alarm Interface

The Bay Alarm Interface is not redundant and is located on the rear SWFAB-A module only. It provides two signals, Common and Bay Lamp (normally open) to light the Bay Alarm lamp on the Power and Alarm Panel when a critical alarm exists in the Plexus 9000.

4.7.3.5 Visual and Audible Alarm Interface

The Visual and Audible Alarm Interfaces also are not redundant and are located on the rear SWFAB- A module. Each interface has three (3) Form C relays. The outputs of the Visual Alarm interface pass to the Fan Shelf to light the Critical, Major and Minor alarm LEDs. They also go to J2, the Alarm Contact connector. It is recommended that these outputs be used for an external management/monitoring system. These outputs cannot be cut off with the ACO (Alarm Cut Off) button located on the front of the Fan Shelf.

The outputs of the Audible Alarm interface also pass to J2, the Alarm Contact connector, for connection to audible alarming equipment. Refer to Table 4.7-F for the pin-out for this connector. These outputs can be cut off and silenced with the ACO button on the front of the Fan Shelf or using a TL1 command.

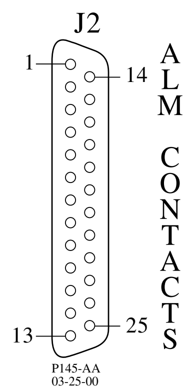
4.7.3.6 EEPROM

Both rear SWFAB modules contain an EEPROM that contains the CLEI code for the module.

4.7.3.7 Switch Fabric B Slot, Chassis ID Transition Module

This module is shipped installed in the chassis. It has only two active components for the BITS input, so its MTBF is greater than the life of the chassis. The SWFAB B module also has an EEPROM that contains the CLEI code and MAC address information for the chassis as well as chassis parameters, such as the number of slots.

Table 4.7-F. Alarm Contacts Connector

Port	Connector	Pin	Description
J2	ALM CONTACTS 	14	CRI-AUD-NC
		2	CRI-AUD-COMMON
		1	CRI-AUD-NO
		3	MAJ-AUD-NC
		4	MAJ-AUD-COMMON
		16	MAJ-AUD-NO
		5	MIN-AUD-NC
		6	MIN-AUD-COMMON
		18	MIN-AUD-NO
		21	CRI-VIS-NC
		9	CRI-VIS-COMMON
		8	CRI-VIS-NO
		10	MAJ-VIS-NC
		11	MAJ-VIS-COMMON
		23	MAJ-VIS-NO
		12	MIN-VIS-NC
		13	MIN-VIS-COMMON
		25	MIN-VIS-NO
		7	N/A
		15	N/A
		17	N/A
		19	N/A
		20	N/A
		22	N/A
		24	N/A

Note: Audible only alarms can be silenced or cut off (ACOed). It is recommended that visual alarms be used for an external monitoring/management system.

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4.7.4 Specifications

4.7.4.1 Relay Contact Closure Rating:

The contact closure rating for the alarm relays is 0.6 Amps @110 Vdc.

4.7.4.2 Environmental Specifications

Refer to following table for environmental specifications.

Table 4.7-G. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		
Notes: 1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit. 2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year. 1			

4.8 DS1, E1 or J1 I/O Front Module

4.8.1 Scope

This section describes the front DS-1, E1 or J1 IOM, part number 89-0414, comm. code 300746922, and CLEI code BA7ATP0FAA. It explains the module functions, LED indicators, and connector interfaces.

4.8.2 Functional Description

The switch accommodates up to 17 IOMs. The DS-1, E1 or J1 IOM can terminate 28 DS-1s, 21 E1s or 28 J1s depending upon the line input. The rear module is the 89-0415. These line signals are converted to ATM cells and sent to the Switch Fabric module. These IOMs can be installed in IOM-1 to IOM-17 (physical slots 1-8, 11 and 14-21). The system's ability to allow any line interface module to occupy any I/O slot, along with the 1:N protection capability, prevents the loss of valuable shelf space.

The system features 1:N protection of the line interface modules. The same front module type is used for both working and protection applications, thus simplifying sparing, maintenance and inventory.

I/O-7 (physical slot 7) is the slot for the DS-1, E1 or J1 protection module. If the user does not desire to protect line- and trunk-side interfaces, the system can be equipped with 17 interface modules.

The front IOMs require rear modules for physical interface terminations. The rear DS1, E1 or J1 modules feature two 64-pin Amp-style connectors, with transmit pairs on one connector and receive pairs on the other. The rear protection does not have any connectors.

This module does not support a mix T1, E1 and J1; all ports must be the same protocol and is provisioned on a per board basis. The maximum cable length for T1 655 ft and cable attenuation for E1 is 6db maximum.

4.8.2.1 General Mechanical Representation

The IOM is approximately 14 inches high and plugs into the midplane for connections to the rear IOM and to the SF and SP modules. Refer to Figure 4.8-1 for an illustration of the midplane connector, the IOM and the front of the module. Refer to Table 4.8-A for a description of the LEDS.

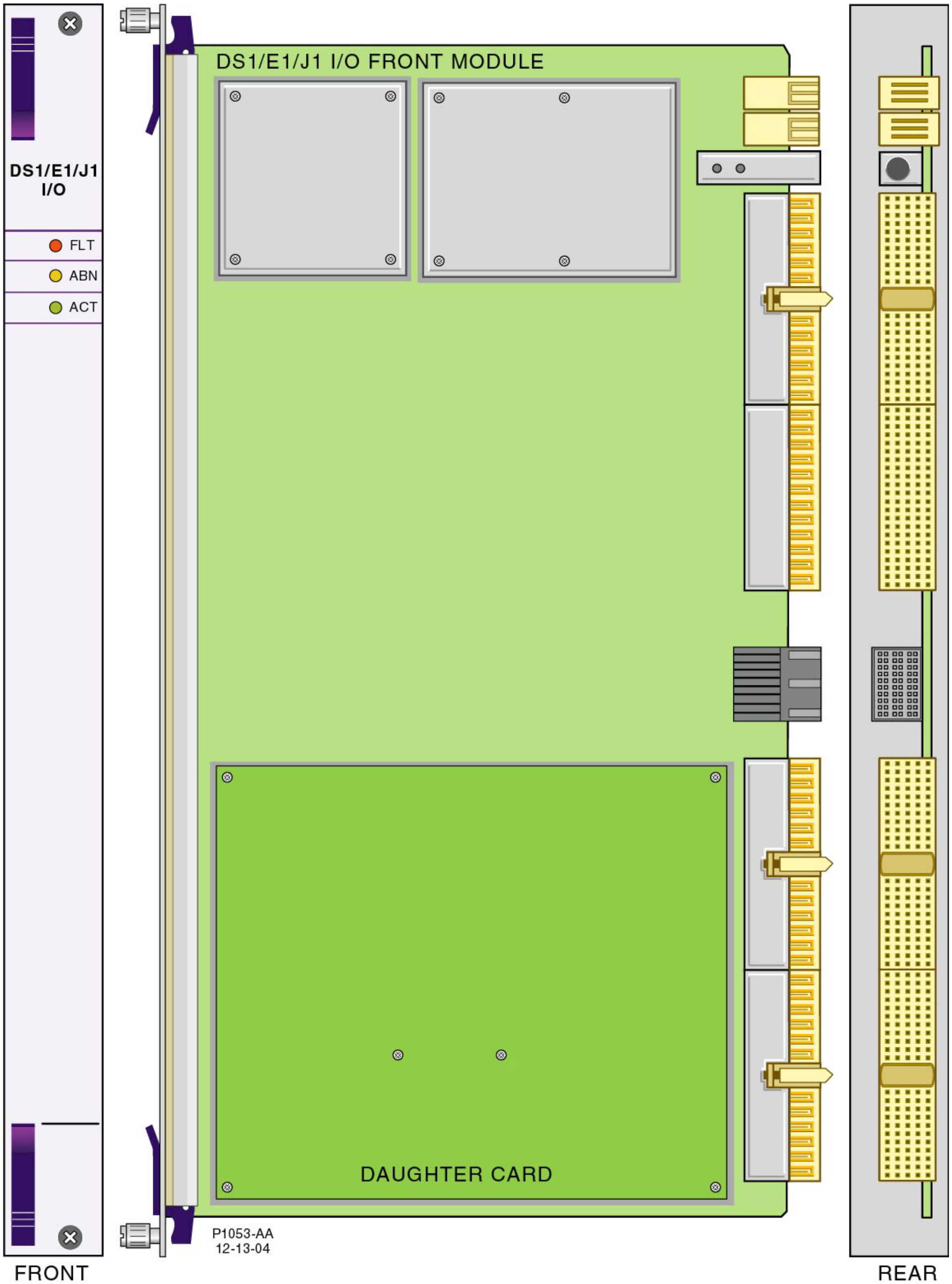

Figure 4.8-1. DS-1, J1 or E1 I/O Front Module

4.8.2.2 LEDs

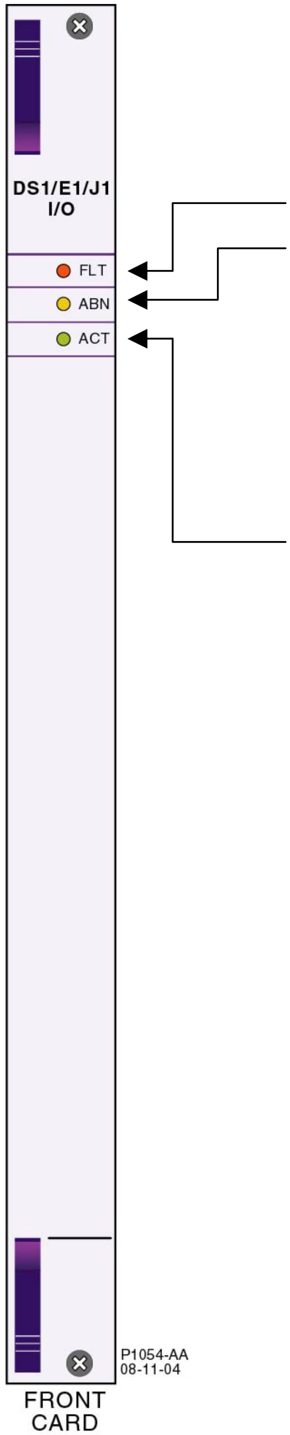

Table 4.8-A. LEDs of Front I/O Module

LEDs	Color	Description
FLT	Red	Indicates a local internal fault.
ABN	Yellow	Indicates a remote fault or abnormal condition. The light appears yellow when: ⊄# An input has an incoming failure; i.e., a Loss of Signal (LOS). ⊄# A port is in loopback.
ACT	Green On	Indicates that the module has been equipped for service. See Note.
	Green Blinking	Indicates that the module is ready and in standby mode.
Note: For some software versions, when a protected IOM fails, the first IOM to fail will switch to protection and its FLT LED will be solid red and the ACT LED will be flashing green. The second IOM to fail cannot switch and only its FLT LED will illuminate.		

4.8.3 Theory of Operation

Each DS1, J1 or E1 IOM has 28 DS1 ports that are controlled by a microprocessor. In the ingress direction, the line interface signal enters LIU for clock and data recovery, line decoding and line code violation from the rear IOM. The line signals are sent to the super-framer where they are demultiplexed to a signals which pass to the TSU (To Switch Unit) circuitry. In the TSU the signals are converted to ATM cells that are sent to the High-speed Interface where they are converted from parallel to serial. The serial data is sent to the SF module for switching.

In the egress direction, the serial data from the SF module is received at the high-speed interface to be converted to parallel data for the FSU (From Switch Unit) circuitry. The FSU converts the ATM cells back to a line signal signals for the Super-framer which sends them to the LIU. The LIU sends them to the mid-plane and the rear module. Refer to Figure 4.8-2 for a block diagram of the IOM.

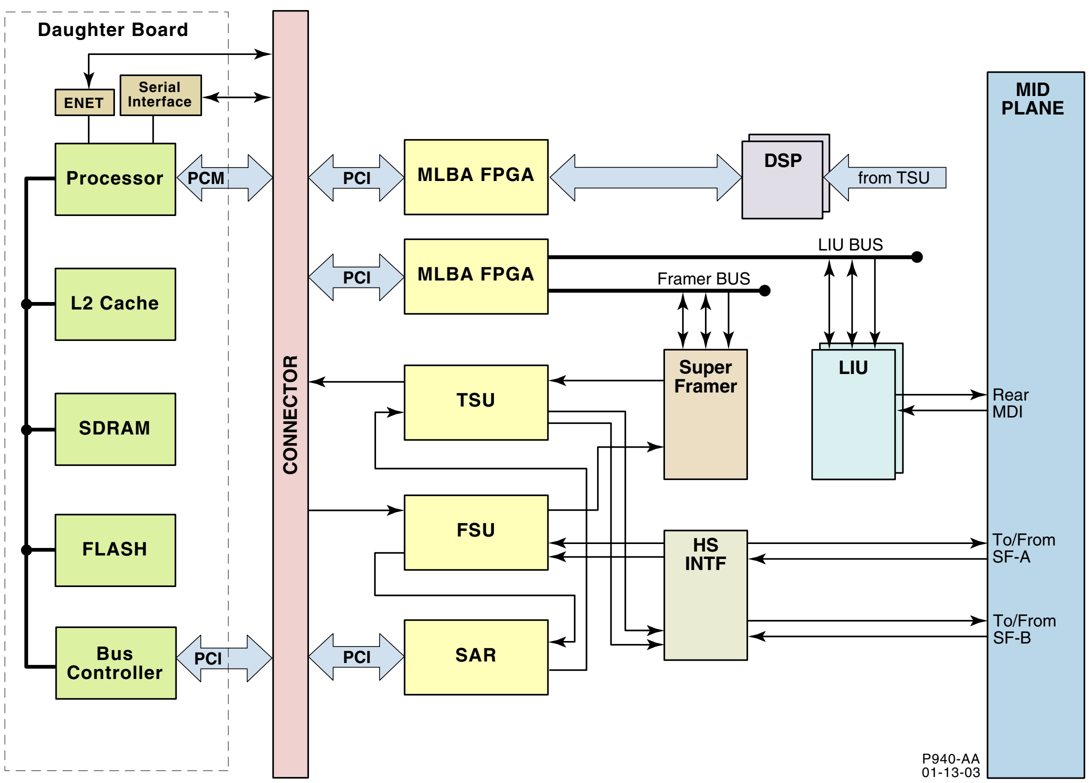

Figure 4.8-2. DS-1, J1 or E1 IOM Block Diagram

4.8.3.1 Line Interface Unit (LIU) and Super-Framer

Each module has LIU circuitry which interfaces the line signal, T1, E1 or J1, to the Super-framer. See Figure 4.8-2 for a block diagram illustration. The primary function of the LIU is for clock and data recovery, line decoding and line code violation detection. The line build-outs (LBO) and line codes of the line signal can be provisioned using TL1 commands. The super-framer multiplexes and demultiplexes the line signal and monitors the line signal for alarms. The super-framers are connected to the processor through the MLBA FPGA (Field-Programmable Gate Array).

The module can loop individual line signals for diagnostic testing of line integrity. Line loopbacks loop the entire line signal to the far-end; payload loopbacks loop the line signal without the framing bits to the far-end. These loops can also be provisioned using TL1 commands.

4.8.3.2 To Switch Unit (TSU) and From Switch Unit (FSU))

The TSU and FSU are circuit to ATM cell translators. The TSU receives either a TDM serial stream from the super-framers or an AAL5 ATM cell from the processor by way of the SAR. The TDM serial streams are converted into ATM cells. The ATM cells from the processor and SAR are passed through the TSU for the SF module.

The ATM output of the TSU passes to the parallel/serial interface that serializes the parallel input to a 622 Mb/s signal for the SF module. The serial/parallel interface accepts the 622 Mb/s signal from the SF module and converts it from serial to parallel for the FSU.

The FSU receives ATM cells from the SF module. The FSU either sends the ATM cell to the SAR or converts it back to a TDM serial stream for the super-framers.

4.8.3.3 Segmentation and Reassembly (SAR))

There is a stand-alone Segmentation and Reassembly (SAR) unit on the PCI bus of each module for inter-module messaging. The SAR connects to the TSU/FSU on the IOM to perform the conversion from/to cells.

4.8.3.4 Maintenance Link Bus Adapter FPGA

The Maintenance Link Bus Adapter (MLBA) provides a connection for the super-framers and LIUs to the processor. It has a serialized point-to-point interconnect between the SF module and each IOM and controls the super-framers and LIUs on each module. This link is used to reset an I/O Module, detect the presence and CLEI code of the rear module, control the LEDs located on the module, download images to the processor's memory, program the circuit switch registers and communicate operational status from the IOM to the SP.

Each module also has an EEPROM that contains the CLEI (BA7ATP0FAA) code for the module.

4.8.3.5 MLBA FPGA and Digital Signal Processor (DSP)

The MLBA FPGA also provides a connection between the Digital Signal Processor and the module processor.

The DSP is used for tone detection. The DSP receives the TDM stream from TSU, which the DSP processes to determine the corresponding tone. The DSP is connected to the PCI bus using its HPI (Host Port Interface) bus thru the MLBA FPGA.

4.8.3.6 Daughter Card with Microprocessor

Each module has a daughter card with a microprocessor and SDRAM, L2 Cache and Flash memory and a bus controller for controlling the module.

4.8.3.7 Power

Each front module has its own DC-to-DC converter (not shown), which converts the 48 volts supplied from the backplane to the local voltages required (5V, 3V, etc.). The front modules supply power for the rear modules.

4.8.3.8 Clocks and Synchronization

Clock and framing information is received from the timing circuitry because the maintenance link, ATM switch fabric and line interfaces all operate synchronously to the timing supplied to the chassis. The clock control circuitry of the IOM distributes these on the module.

4.8.3.9 Protection Module

Slot 7 is the slot for the DS1, E1 or J1 protection module. A protection bus allows the front protection module to transmit/receive signal pairs from any of the rear IOMs. This provides N:1 redundancy for electrical interfaces. The rear DS1, E1 or J1 modules contain relays that pass the line signal either to the front module or to the protection bus. The rear protection module obtains the line signal from the protection bus and passes it to the front protection module.

4.8.3.10 Loopbacks

DS1, E1 or J1 loopbacks can be used as diagnostics to test line integrity. There are two types of loopbacks, line and payload. A line loopback loops the entire signal. Loopbacks can occur at the near or far end facility. The switch can respond to as well as initiate loopbacks. A payload loopback loops the line signal without the framing bit. A framing bit is reinserted before it is transmitted. Refer to Figure 4.8-3 for line loopbacks of the near-end and to Figure 4.8-4 for far-end loopbacks. Refer to Figure 4.8-5 for payload loopbacks of the near-end and to Figure 4.8-6 of the far-end. Loopbacks are initiated or cleared using TL1 commands.

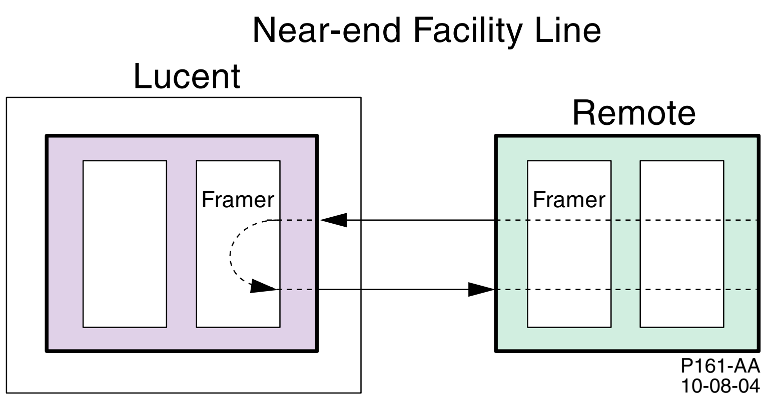

Figure 4.8-3. Line Loopbacks at the Near-end

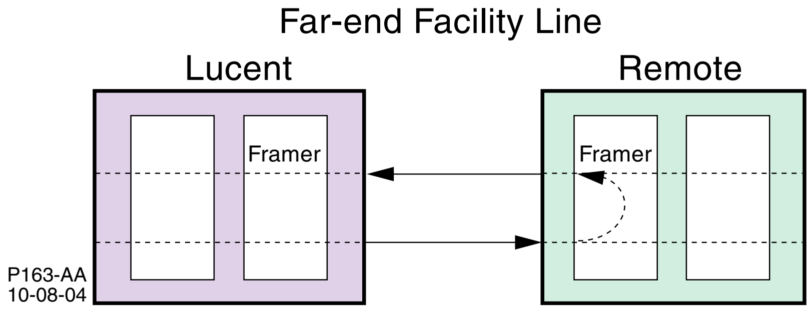

Figure 4.8-4. Line Loopbacks at the Far-end (P163-AA)

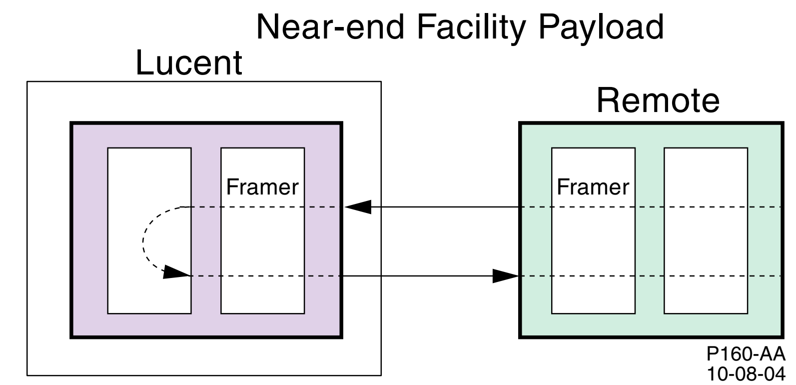

Figure 4.8-5. Payload Loopbacks at the Near-end (P160-AA)

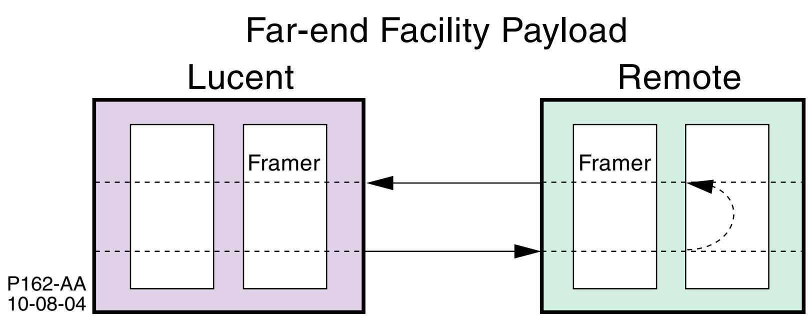

Figure 4.8-6. Payload Loopbacks at the Far-end (P162-AA)

4.8.4 Specifications

Table 4.8-B lists the DS-1 specifications, Table 4.8-C lists the J1 specifications, and Table 4.8-D lists the E1 specifications. Refer to Table 4.8-E for the environmental specifications.

Table 4.8-B. DS-1 Specifications

Nominal line	1.544 Mb/s
AIS line rate	1.544 Mb/s
Line code	Half width bipolar AMI or B8ZS (channel selectable)
Line format	Selectable ESF/SF per channel
Termination	One balanced twisted pair shall be used for each direction of transmission.
Impedance	100 ohms ± 5% (balanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 2.4 and 3.6 volts. ***Note:*** When measuring the pulse mask, a 100-ohms T1 patch cable is required.
Power level	For an all-ones pattern, the power in a band no wider than 3 kHz: • Centered at 772 kHz is between 12.6 and 17.9 dBm. • Centered at 1544 kHz is at least 29 dB below the power level at 772 kHz.
Pulse imbalance	Less than 0.5 db difference between total power of positive and negative pulses
Jitter generation	Less than 0.3 timeslots RMS
Maximum span	655 feet to cross connect using 22 AWG cable 400 feet to cross connect using 24 AWG cable
	60

Table 4.8-C. J1 SPECIFICATIONS

J1 SPECIFICATIONS	
Nominal line:	1.544 Mb/s
AIS line rate:	1.544 Mb/s
Line code:	Half width bipolar AMI or B8ZS (channel selectable)
Frame format:	Selectable J-ESF/J-D4 per channel
Termination:	One balanced twisted pair shall be used for each direction of transmission.
Impedance:	100 ohms ± 5% (balanced)
Pulse shape:	Meets TR-TSY-000499 mask with amplitude of between 2.4 and 3.6 volts. ***Note:*** When measuring the pulse mask, a 100-ohms T1 patch cable is required.
Power level:	For an all-ones pattern, the power in a band no wider than 3 kHz: • Centered at 772 kHz is between 12.6 and 17.9 dBm. • Centered at 1544 kHz is at least 29 dB below the power level at 772 kHz.
Pulse imbalance:	Less than 0.5 db difference between total power of positive and negative pulses.
Jitter generation:	Less than 0.3 timeslots RMS
Maximum span:	655 feet to cross connect using 22 AWG cable 400 feet to cross connect using 24 AWG cable

Table 4.8-D. E1 SPECIFICATIONS

E1 SPECIFICATIONS	
Nominal line:	2.048 Mb/s
AIS line rate:	2.048 Mb/s
Line code:	Channel selectable HDB3 or AMI (test only)
Frame format:	Selectable DF, CRCMF, CRC or MF per channel
Termination:	One balanced twisted pair shall be used for each direction of transmission.
Impedance:	120 ohms ± 5% (balanced)
Pulse shape:	Meets ITU-T I.431 mask with amplitude of between 2.4 and 3.6 volts measured at the output port.
Power level:	For an all-ones pattern, the power in a band no wider than 3 kHz: ∉# Centered at 1024 kHz is between 12.6 and 17.9 dBm. ∉# Centered at 2048 kHz is at least 29 dB below the power level at 1024 kHz.
Pulse imbalance:	Less than 0.5 db difference between total power of positive and negative pulses.
Jitter generation:	Less than 0.3 timeslots RMS
Maximum span:	6 dB attenuation
	T79.B

Table 4.8-E. Environmental Specifications

Environmental Conditions	**Temp. (°F) Min/Max**	**Temp. (°C) Min/Max**	**Relative Humidity**
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

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NOTES:

4.9 DS1, E1 or J1 I/O Rear Module

4.9.1 Scope

This section describes the DS-1, E1 or J1 I/O rear module, part number 89-0415 and comm. code 300730231. The CLEI code of this rear module is BA7A1P0FAA. It explains the module functions and connector interfaces.

4.9.2 Functional Description

The system accommodates up to 17 IOMs. The DS-1, E1 or J1 IOM can terminate 28 DS-1s, 28 E1s or 28 J1s depending upon the line input. The rear modules provide the IN and OUT connectors for the line signal. The rear protection module, which is a different part number, does not have IN and OUT connectors.

The system features 1:N protection of the line interface modules. The same front module type is used for both working and protection applications, thus simplifying sparing, maintenance and inventory.

I/O-7 (physical slot 7) is the slot for the DS-1, E1 or J1 protection module. If the user does not desire to protect line- and trunk-side interfaces, the system can be equipped with 17 interface modules. If the user does not desire to protection, the system can be equipped with 17 interface modules.

The rear DS-1, E1 or J1 IOM has:

- An EEPROM that contains the CLEI code
- Two 64-pin connectors, one for the 28 T1/J1/E1 transmit pairs, one for the 28 T1/J1/E1 receive pairs
- Line protection circuitry (ESD, building protection)
- Relays that pass the DS-1, E1 or J1 to the front module or to the protection bus.

4.9.3 General Mechanical Representation

The rear module has two 64-pin connectors, J1 IN and J2 OUT as shown in Figure 4.9-1 describes the pins and wire color code when connecting to a wire-wrap interface.

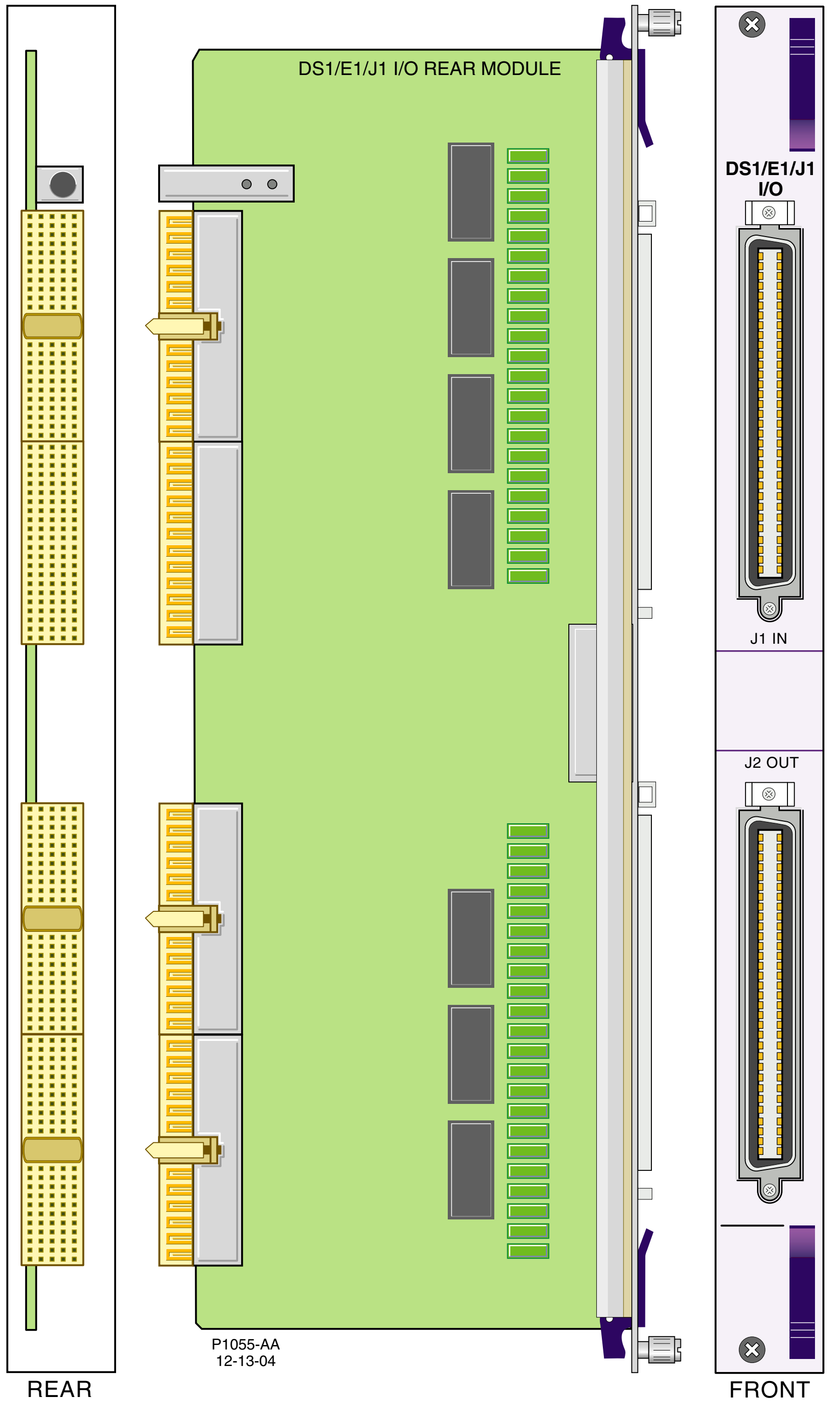


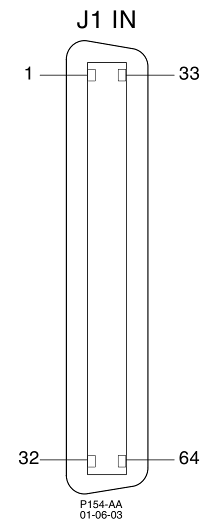
Figure 4.9-1. Rear DS-1/E1/J1 IOM

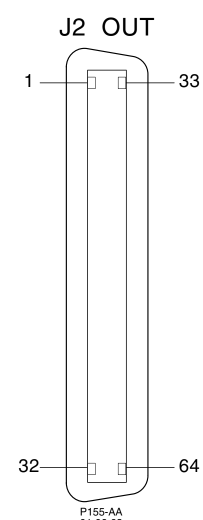
4.9.3.1 Interface

The rear module has two 64-pin connectors labeled IN and OUT for the line interface.

Table 4.9-A. Pins and Wires 64-pin In and Out Cables

Function	Color Code -	Pin Number	Connector
Channel 1 Ring	BLU/WHT	1	
Channel 1 Tip	WHT/BLU	33	
Channel 2 Ring	ORN/WHT	2	
Channel 2 Tip	WHT/ORN	34	
Channel 3 Ring	GRN/WHT	3	
Channel 3 Tip	WHT/GRN	35	
Channel 4 Ring	BRN/WHT	4	
Channel 4 Tip	WHT/BRN	36	
Channel 5 Ring	GRY/WHT	5	
Channel 5 Tip	WHT/GRY	37	
Channel 6 Ring	BLU/RED	6	
Channel 6 Tip	RED/BLU	38	
Channel 7 Ring	ORN/RED	7	
Channel 7 Tip	RED/ORN	39	
Channel 8 Ring	GRN/RED	8	
Channel 8 Tip	RED/GRN	40	
Channel 9 Ring	BRN/RED	9	
Channel 9 Tip	RED/BRN	41	
Channel 10 Ring	GRY/RED	10	
Channel 10 Tip	RED/GRY	42	
Channel 11 Ring	BLU/BLK	11	
Channel 11 Tip	BLK/BLU	43	
Channel 12 Ring	ORN/BLK	12	
Channel 12 Tip	BLK/ORN	44	
Channel 13 Ring	GRN/BLK	13	
Channel 13 Tip	BLK/GRN	45	
Channel 14 Ring	BRN/BLK	14	
Channel 14 Tip	BLK/BRN	46	





64-pin In And Out Cables (Table Continued)

Function	Color Code -	Pin Number	Connector
Channel 15 Ring	GRY/BLK	15	
Channel 15 Tip	BLK/GRY	47	
Channel 16 Ring	BLU/YEL	16	
Channel 16 Tip	YEL/BLU	48	
Channel 17 Ring	ORN/YEL	17	
Channel 17 Tip	YEL/ORN	49	
Channel 18 Ring	GRN/YEL	18	
Channel 18 Tip	YEL/GRN	50	
Channel 19 Ring	BRN/YEL	19	
Channel 19 Tip	YEL/BRN	51	
Channel 20 Ring	GRY/YEL	20	
Channel 20 Tip	YEL/GRY	52	
Channel 21 Ring	BLU/VIO	21	
Channel 21 Tip	VIO/BLU	53	
Channel 22 Ring	ORN/VIO	22	
Channel 22 Tip	VIO/ORN	54	
Channel 23 Ring	GRN/VIO	23	
Channel 23 Tip	VIO/GRN	55	
Channel 24 Ring	BRN/VIO	24	
Channel 24 Tip	VIO/BRN	56	
Channel 25 Ring	GRY/VIO	25	
Channel 25 Tip	VIO/GRY	57	
Channel 26 Ring	BLU/WHT 2	26	
Channel 26 Tip	WHT/BLU 2	58	
Channel 27 Ring	ORN/WHT 2	27	
Channel 27 Tip	WHT/ORN 2	59	
Channel 28 Ring	GRN/WHT 2	28	
Channel 28 Tip	WHT/GRN 2	60	
DRAIN	N/A (bare wire)	64	

T61-B

4.9.4 Theory of Operation

The rear DS-1, E1 or J1 IOM has an EEPROM that contains the CLEI code, two 64-pin connectors, line protection circuitry and relays that pass the DS-1s, E1s or J1s to the front module or to the protection bus.

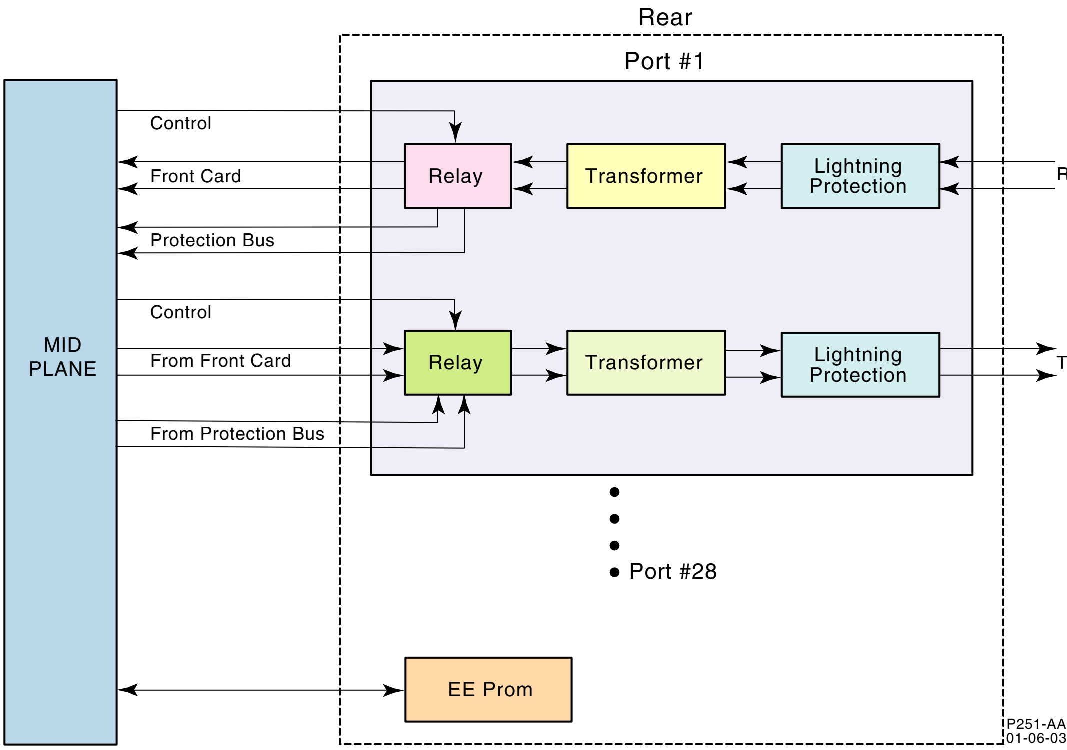


Figure 4.9-2. Block Diagram of Rear DS-1, E1 or J1 IOM

4.9.4.1 Power

Each DS-1, E1 or J1 I/O rear module receives its local voltages (5V, 3V, etc.) from the front IOM that has the DC-to-DC converter for converting the -48 volts from the backplane. The power connection is not shown on the block diagram.

4.9.4.2 Interface Protection Buses

Module protection is accomplished by the midplane design where the line inputs can be routed from the working module to the protection module. This is performed by relays on the working module that either connect the signals straight through to the front module, or connect them onto the midplane and the protection bus. The rear protection module picks the signals off the midplane and routes them to the front protection module.

4.9.4.3 EEPROM

An EEPROM that contains the CLEI code for the module is located on the module. All modules have a CLEI code so that missing and incompatible replaceable equipment can be alarmed. The CLEI code of the working rear module is BA7A1P0FAA.

4.9.4.4 Line protection circuitry

Each rear IOM has circuitry to protect the line from voltage transients due to lightning, switching transients or power line induction.

4.9.5 Specifications

Table 4.9-B shows the specifications for a DS-1; Table 4.9-C shows the specifications for an E1; Table 4.9-D shows the specifications for a J1. Table 4.9-E shows the environmental specifications for the switch.

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Table 4.9-B. DS1 Specifications

Nominal line	1.544 Mb/s
AIS line rate	1.544 Mb/s
Line code	Half width bipolar AMI or B8ZS (channel selectable)
Line format	Selectable ESF/SF per channel
Termination	One balanced twisted pair shall be used for each direction of transmission.
Impedance	100 ohms ± 5% (balanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 2.4 and 3.6 volts. ***Note:*** When measuring the pulse mask, a 100-ohms T1 patch cable is required.
Power level	For an all-ones pattern, the power in a band no wider than 3 kHz: ∉# Centered at 772 kHz is between 12.6 and 17.9 dBm. ∉# Centered at 1544 kHz is at least 29 dB below the power level at 772 kHz.
Pulse imbalance	Less than 0.5 db difference between total power of positive and negative pulses
Jitter generation	Less than 0.3 timeslots RMS
Maximum span	655 feet to cross connect using 22 AWG cable 400 feet to cross connect using 24 AWG cable
	60

Table 4.9-C. E1 SPECIFICATIONS

E1 SPECIFICATIONS	
Nominal line:	2.048 Mb/s
AIS line rate:	2.048 Mb/s
Line code:	Channel selectable HDB3 or AMI (test only)
Frame format:	Selectable DF, CRCMF, CRC or MF per channel.
Termination:	One balanced twisted pair shall be used for each direction of transmission.
Impedance:	120 ohms ± 5% (balanced)
Pulse shape:	Meets ITU-T I.431 mask with amplitude of between 2.4 and 3.6 volts measure at the output port.
Power level:	For an all-ones pattern, the power in a band no wider than 3 kHz: ∉# Centered at 1024 kHz is between 12.6 and 17.9 dBm. ∉# Centered at 2048 kHz is at least 29 dB below the power level at 1024 kHz.
Pulse imbalance:	Less than 0.5 db difference between total power of positive and negative pulses.
Jitter generation:	Less than 0.3 timeslots RMS
Maximum span:	6 db attenuation
	T79.B

Table 4.9-D. J1 SPECIFICATIONS

J1 SPECIFICATIONS	
Nominal line:	1.544 Mb/s
AIS line rate:	1.544 Mb/s
Line code:	Half width bipolar AMI or B8ZS (channel selectable)
Frame format:	Selectable J-ESF/J-D4 per channel
Termination:	One balanced twisted pair shall be used for each direction of transmission.
Impedance:	100 ohms ± 5% (balanced)
Pulse shape:	Meets TR-TSY-000499 mask with amplitude of between 2.4 and 3.6 volts. ***Note:*** When measuring the pulse mask, a 100-ohms T1 patch cable is required.
Power level:	For an all-ones pattern, the power in a band no wider than 3 kHz: • Centered at 772 kHz is between 12.6 and 17.9 dBm. • Centered at 1544 kHz is at least 29 dB below the power level at 772 kHz.
Pulse imbalance:	Less than 0.5 db difference between total power of positive and negative pulses.
Jitter generation:	Less than 0.3 timeslots RMS
Maximum span:	655 feet to cross connect using 22 AWG cable 400 feet to cross connect using 24 AWG cable

Table 4.9-E. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

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NOTES:

4.10 Triple DS3 /STS-1 I/O Front Module

4.10.1 Scope

This section describes the front Triple DS-3 IOMs. Only the 89-0410 modules support DS3 and STS-1. Part numbers are as follows:

Part Numbers	CLEI Codes	Comments
89-0410-A	BA4A60ZFAA	DS-3 or STS-1. Supports tone detection.
89-0424-A	BA9AXW0FAA	DS-3. Supports tone detection.

This section explains the module functions, LED indicators, and connector interfaces. These modules be used in the 85-3004, 85-3007 or 85-3008 chassis.

4.10.2 Functional Description

The switch accommodates up to 17 IOMs. The triple DS3 IOM can terminate 3 DS-3s, which are equivalent to 84 DS-1s. These interfaces support SS7 and ISDN protocols. The line side, which can terminate 3 DS-3s, converts DS-3s to ATM cells and sends them to the SF module.

The Triple DS-3 IOM requires a switch chassis 85-3004, 85-3007, 85-3008. DS-3 IOMs can be installed in I/O-1 to I/O-17 (physical slots 1-8, 11 and 14-21). The system's ability to allow any line interface module to occupy any I/O slot, along with the 1:N protection capability, prevents the loss of valuable shelf space.

The system features 1:N protection of the DS3 line interface modules. The same front module type is used for both working and protection applications, thus simplifying sparing, maintenance and inventory.

In the 85-3004, 85-3007, 85-3008 chassis, I/O-5 (physical slot 5) and IOM-13 (physical slot 17) are the DS-3 protection module slots and IOM-7 (physical slot 7) is the recommended DS-1 protection slot. I/O-5 protects I/O-1 to I/O-4 and I/O-6 to I/O-8; I/O-13 protects I/O 9 to I/O-12 and I/O-14 to I/O-17. I/O-7 when used for DS-1 protection provides protection for DS-1 IOMs in any slot. The system can be equipped with 17 interface modules with no protection.

The front Triple DS-3 IOMs require rear modules for physical interface terminations. The associated rear modules feature two (2) BNC connectors (transmit and receive), per DS-3 or STS-1 for a total of six connectors. The rear protection module does not have any connectors.

4.10.2.1 General Mechanical Representation

The DS-3 IOM is approximately 14 inches high and plugs into the midplane for connections to the rear IOM and to the SF and SP modules. See Figure 4.10-1 for an illustration of the midplane connector, the DS-3 IOM and the front of the module. Labeling on the module may differ with part numbers. Refer to Table 4.10-A for a description of the LEDS.

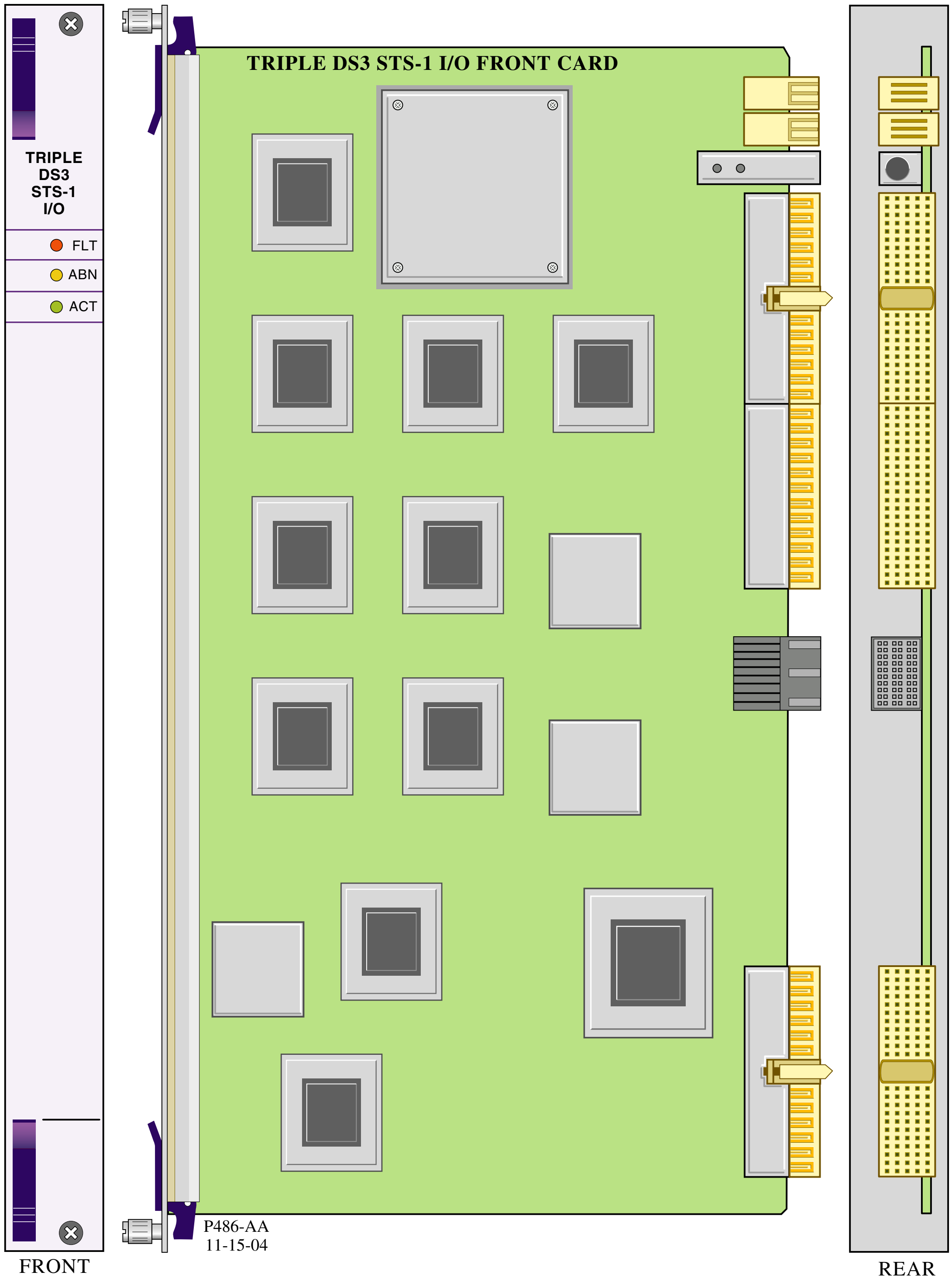


Figure 4.10-1. Front Triple DS-3/STS-1 IOM

4.10.2.2 LEDs

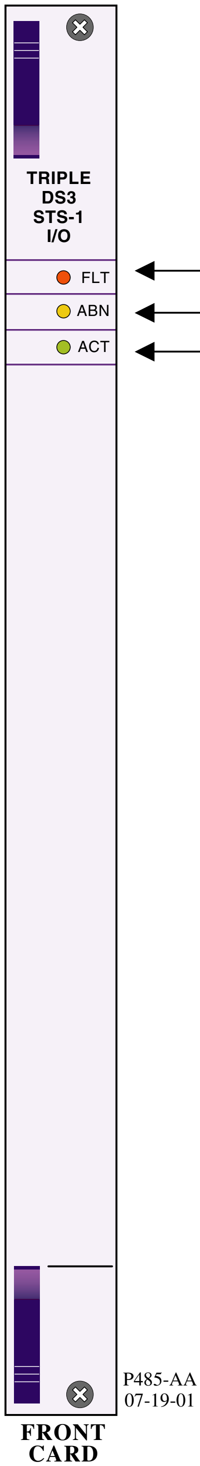


Table 4.10-A. LEDs of Front Module

LEDs of FRONT IOM		
LEDs	**Color**	**Description**
FLT	Red	Indicates a local internal fault
ABN	Yellow	Indicates a remote fault or abnormal condition. The light appears yellow when: • An input has an incoming failure; i.e., a Loss of Signal (LOS). • A port is in loopback.
ACT	Green On	Indicates that the module has been equipped for service. See Note.
	Green Blinking	Indicates that the module is ready and in standby mode.

Note: For some software versions, when a protected IOM fails, the first IOM to fail will switch to protection and its FLT LED will be solid red and the ACT LED will be flashing green. The second IOM to fail cannot switch and only its FLT LED will illuminate.

4.10.3 Theory of Operation

Each Triple DS-3 IOM or Triple DS-3/STS-1 IOM has 3 DS-3 or STS-1 interfaces that are controlled by a microprocessor. In the transmit direction the DS-3s or STS-1s enter the interfaces from the rear module. Each interface demultiplexes the DS-3 or STS-1 into 28 DS-1s that pass to the TSU circuitry. In the TSU, the signals are converted to ATM cells that are sent to the Parallel In/Serial Out Interface where they are converted from parallel to serial. The serial data is sent to the SF module for switching. The 89-0410 and 89-0424 IOMs have digital signal processor (DSP) circuitry on a daughter card for use during DTMF digit collection.

In the receive direction the serial data from the SF module is received at the Serial In/Parallel Out interface to be converted to parallel data for the FSU circuitry. The FSU converts the ATM cells back to DS-1 signals for the DS-3 or STS-1 interface that multiplexes them back to DS-3 or STS-1 for the midplane and the rear module.

See Figure 4.10-2 for a block diagram of the IOM module.

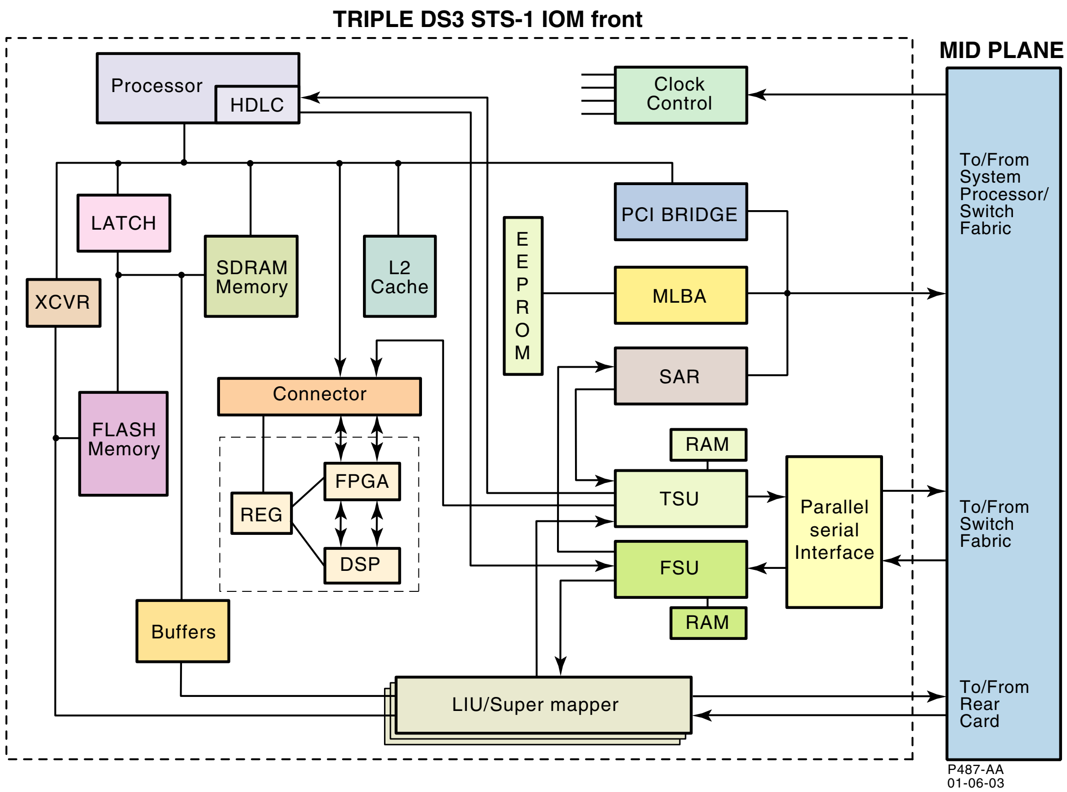


Figure 4.10-2. Triple DS-3/STS-1 IOM Block Diagram

4.10.3.1 DS-3/STS-1 LIU and Super Mapper

Each module has three line interface circuits. See Figure 4.10-2 for the Triple DS-3/STS-1 IOM block diagram illustration. The LBOs of the DS-3s are programmable using TL1 commands.

The Framer and Mapper circuitry demultiplexes each DS-3/STS-1 into 28 DS-1s onto the TDM (Time-Division Multiplexed) bus to the TSU. TDM signals received from the FSU are multiplexed back to a DS-3 or STS-1.

The DS-3/STS-1 interface has programmable thresholds for loss of signal (LOS), alarm indication signal (AIS), control slip seconds (CSS), coding violations (CVs), errored seconds (ES) and severely errored seconds (SES). The circuitry can also be configured to operate in M23 or C-bit parity mode.

The DS-3/STS-1 interface can loop individual DS-3s or STS-1s for diagnostic testing of line integrity. These loops can also be programmed using TL1 commands.

4.10.3.2 To Switch Unit (TSU) and From Switch Unit (FSU)

The TSU and FSU are circuit to ATM cell translators. The ATM output of the TSU passes to the parallel/ serial interface that serializes the parallel input to a 622 Mb/s signal for the SF module. The serial/parallel interface accepts the 622 Mb/s signal from the SF module and converts it from serial to parallel for the FSU.

4.10.3.3 Segmentation and Reassembly (SAR))

There is a Segmentation and Reassembly (SAR) unit on the PCI bus of each module for inter-module messaging. The SAR connects to the TSU/FSU on the IO Module to perform the conversion from/to cells. The TSU has a small Virtual Channel Identifier (VCI) to ATM switch fabric port look-up function to get frames from the IOMs to the SP (SP).

4.10.3.4 Maintenance Link Bus Adapter (MLBA) and EEPROM

The Maintenance Link Bus Adapter (MLBA), which has a serialized point-to-point interconnect between the SF Module and each IOM, controls the Super Mappers on each module. This link is used to reset an IOM, detect the presence and CLEI code of the rear module, control the LEDs located on the module, download images to the processor’s memory, program the circuit switch registers and communicate operational status from the IOM to the SP.

Each module also has a 256 byte EEPROM of non-volatile memory that contains the board specific information such as the CLEI code, part number, serial number and revision number. This information can be retrieved with the `RTRV-INFO-EQPT` TL1 command.

4.10.3.5 Microprocessor and Memory

Each module has a microprocessor with 512Kbyte of L2 Cache 64 Mbytes of SDRAM, and 32 Mbytes of non-volatile Flash memory for controlling the module. The Flash memory contains code that performs initialization, OS boot, diagnostics, and debug monitor.

The microprocessor has an HDLC (High-level Data Link Control) MCC (Multi-Channel Controller). Timeslot 24 of each of the 84 T1s that the module processes is an HDLC D-channel that must be transferred between the processor and the TSU and FSU. The HDLC provides the interface.

4.10.3.6 Digital Signal Processor (DSP)

The DSP is on a daughter card (Shown within the dotted lines below the connector on the block diagram.) of the 89-0410 and 89-0424 modules. The DSP is used for DTMF digit collection or tone detection. The daughter card receives its power from the motherboard and regulates it for card use.

4.10.3.7 Power

Each Triple DS-3 I/O front module has its own DC-to-DC converter (not shown), which converts the 48 volts supplied from the backplane to the local voltages required (5Vdc, 3Vdc, etc.). The front modules supply power for the rear modules and to the daughter card of the 89-0410 IOM.

4.10.3.8 Clocks and Synchronization

Clock and framing information is received from the BITS circuitry because the Maintenance Link, ATM switch fabric and line interfaces all operate synchronously to the BITS timing supplied to the chassis. The clock control circuitry of the IOM distributes these on the module.

4.10.3.9 DS3/STS-1 Protection Module

I/O-5 (physical slot 5) and I/O-13 (physical slot 17) are the slots for the DS-3/STS-1 protection module in the 85-3004, 85-3007, 85-3008 chassis. The T3 protection bus allows the front protection module to transmit/receive T3 signal pairs from rear IOMs. I/O-5 provides protection for I/O-1 to I/O-4 and I/O-6 to I/O-8; I/O-13 provides protection for I/O-9 to I/O-12 and I/O-14 to I/O-17. This provides N:1 redundancy for electrical interfaces.

The rear DS-3/STS-1 modules contain relays that pass the DS-3/STS-1s either to the front module or to the protection bus. The rear protection module obtains the DS-3/STS-1 from the protection bus and passes it to the front protection module.

4.10.3.10 DS-3 and STS-1 Loopbacks

DS-3 or STS-1 loopbacks can be used as diagnostics to test line integrity. Loopbacks are always line loopbacks that loop the entire DS-3 (44.736 Mb/s) or STS-1 (51.84 Mb/s) signal. Loopbacks can occur at the near or far end facility. The switch can respond to as well as initiate loopbacks. The switch only responds to remote loopback requests when operating in C-Bit mode. Likewise, FEND loopbacks on a DS3 port can only be issued when operating in DS-3 C-Bit mode. See Figure 4.10-3 for DS-3 line loopbacks and Figure 4.10-4 for STS-1 line loopbacks of the near-end. Loopbacks are initiated or cleared using TL1 commands.

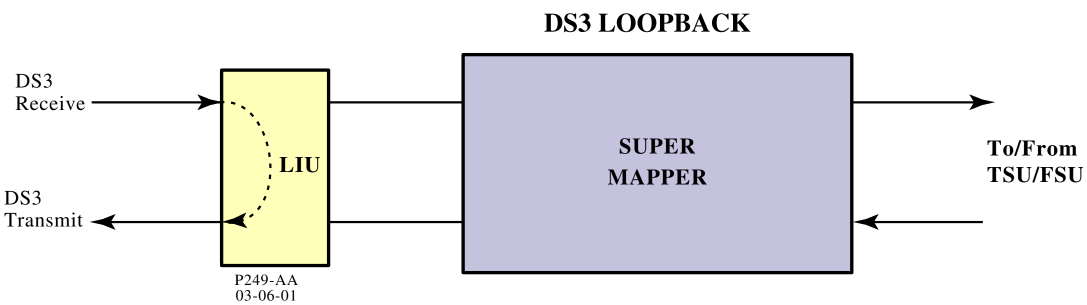


Figure 4.10-3. DS-3 Near-end Loopback

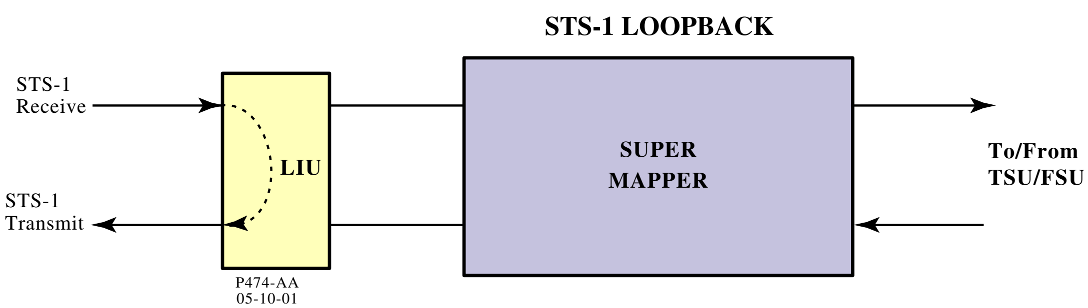


Figure 4.10-4. STS-1 Near-end Loopback

4.10.4 Specifications

Refer to Table 4.10-B for the environmental specifications. Table 4.10-C lists the DS-3 specifications and Table 4.10-D lists the STS-1 specifications.

Table 4.10-B Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

Table 4.10-C . DS3 Specifications

Specification	Description
Nominal line	44.736 Mb/s ± 20 ppm
Line code	B3ZS (Bipolar with three-zero substitution)
Framing	M-Frame (M13) or C-Bit parity mode
Termination	One coaxial line for each direction of transmission
Impedance	75 ohms ± 5% (unbalanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 0.36 and 0.85 volts peak.
Pulse imbalance	Less than 3.5 dB difference between total power of positive and negative pulses
Jitter generation	Less than 0.3 timeslots RMS
Cable	728 RG-6U or equivalent
Maximum span	450 feet to DSX-3 cross connect
	69

Table 4.10-D. STS-1 Specifications

Specification	Description
Line rate	51.84 Mb/s ± 20 ppm
Line code	B3ZS (Bipolar with three-zero substitution)
Framing	A1 and A2 bytes
Mapping	Locked or floating VT (virtual tributary) mode
Termination	One coaxial line for each direction of transmission
Impedance	75 ohms ± 5% (unbalanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 0.36 and 0.85 volts peak.
Pulse imbalance	Less than 3.5 dB difference between total power of positive and negative pulses
Jitter generation	Less than 0.01 unit intervals (UI) RMS
Cable	728 RG-6U or equivalent
Maximum span	450 feet to cross connect
	T76-A

4.11 Octal DS3/STS-1 I/O Front Module

4.11.1 Scope

This section describes the front Octal DS-3 IOM. It explains the module functions, LED indicators, and connector interfaces. This module must be used in the 85-3004, 85-3007, or 85-3008 (85-3004/7/8) chassis.

The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0411-A	BA4A701FAA	DS-3/STS-1. Supports tone detection.
89-0425-A	BA9AXY0FAA	DS-3 only. Supports tone detection.

4.11.2 Functional Description

The switch accommodates up to 17 IOMs. The Octal DS-3 IOM can terminate 8 DS-3s, which are equivalent to 224 DS-1s. These interfaces support SS7 and ISDN protocols. The line side, which can terminate 8 DS-3, converts them to ATM cells and sends them to the SF module.

The Octal DS-3 IOM requires a switch chassis with a part number of 85-3004/7/8. Octal DS-3 IOMs can be installed in physical slots 1-8, 11 and 14-21. The system's ability to allow any line interface module to occupy any I/O slot, along with the 1:N protection capability, prevents the loss of valuable shelf space.

The system features 1:N protection of the DS-3 line interface modules. The same front module type is used for both working and protection applications, thus simplifying sparing, maintenance and inventory.

I/O-5 (physical slot 5) and I/O-13 (physical slot 17) are the DS-3 protection module slots and I/O-7 (physical slot 7) is the DS-1 protection slot of the 85-3004 and 85-3007 chassis. I/O-5 protects I/O-1 to I/O-4 and I/O-6 to I/O-8; I/O-13 protects I/O-9 to I/O-12 and I/O14 to I/O-17. If the user does not desire to protect line- and trunk-side interfaces, the system can be equipped with 17 interface modules.

The front Octal DS-3 IOMs require rear modules for physical interface terminations. The associated rear modules feature two (2) BNC connectors, transmit and receive, per DS-3 or STS-1 for a total of sixteen connectors. The rear protection module does not have any connectors.
General Mechanical Representation
The Octal DS-3 IOM is approximately 14 inches high and plugs into the midplane for connections to the rear IOM and to the SF and SP modules. See Figure 4.11-1 for an illustration of the midplane connector, the DS3/STS-1 IOM and the front of the module. Labeling may differ depending upon part number. Refer to Table 4.11-A for a description of the LEDS.

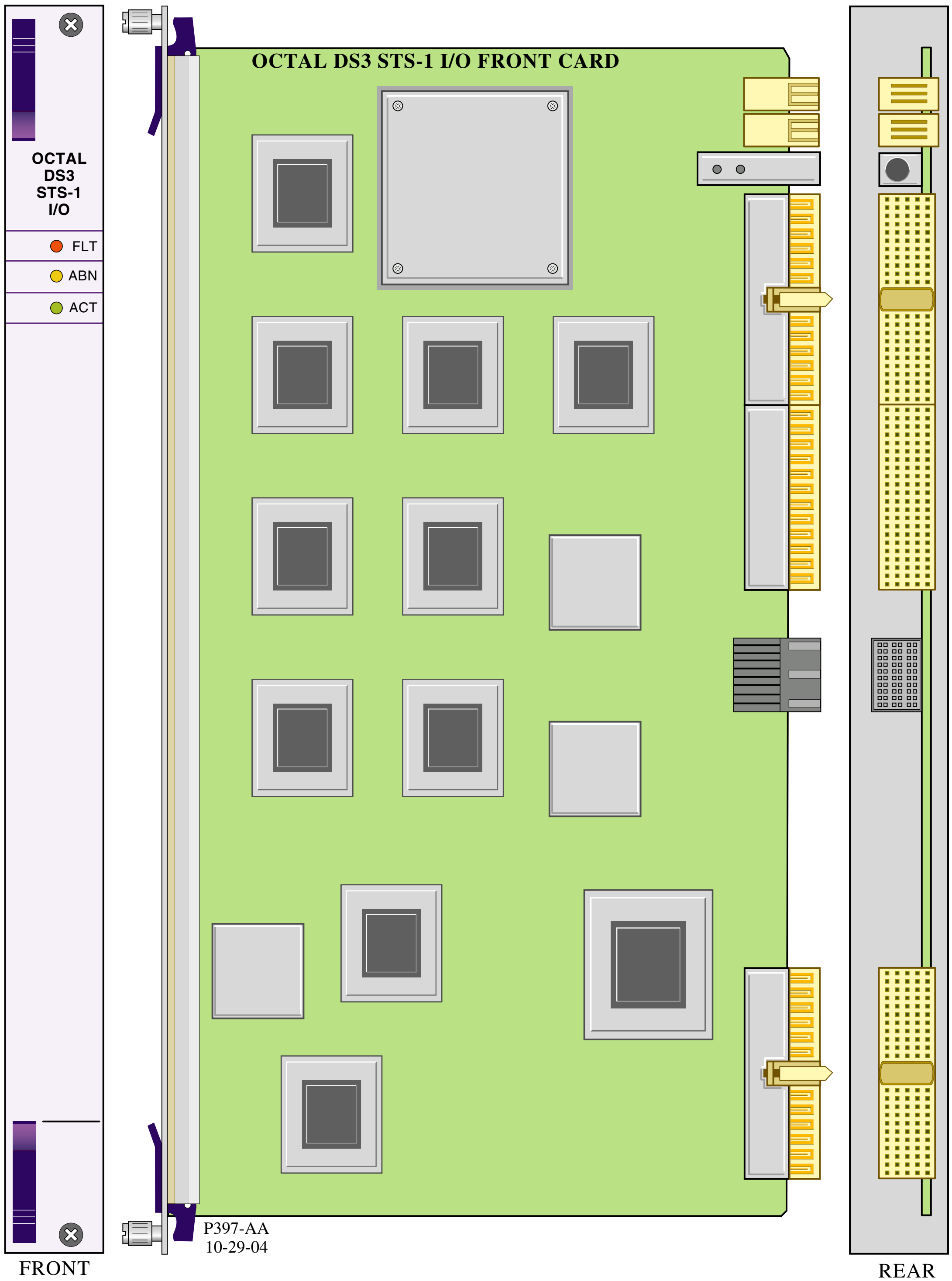
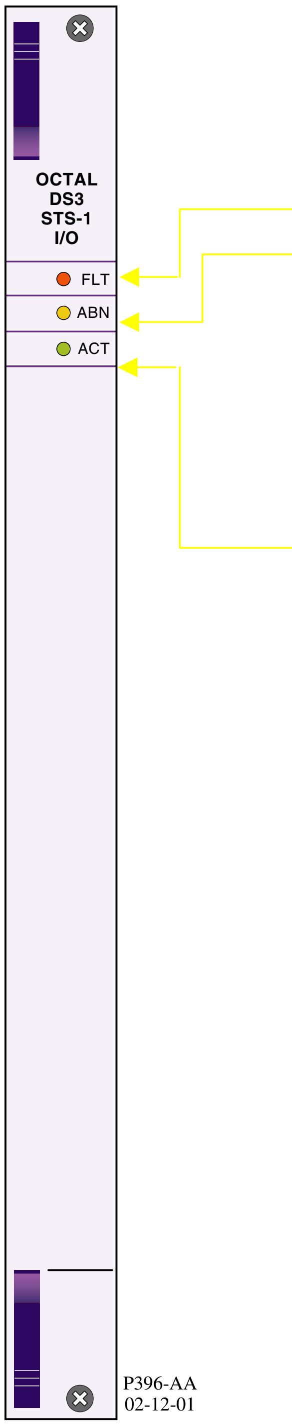


Figure 4.11-1. Front Octal DS-3/STS-1 IOM

4.11.2.1 LEDs



FRONT CARD

Table 4.11-A. LEDs of Front IOM

LEDs	Color	Description
FLT	Red	Indicates a local internal fault
ABN	Yellow	Indicates a remote fault or abnormal condition. The light appears yellow when: - An input has an incoming failure; i.e., a Loss of Signal (LOS). - A port is in loopback.
ACT	Green On	Indicates that the module has been equipped for service. See Note.
	Green Blinking	Indicates that the module is ready and in standby mode.
Note: For some software versions, when a protected IOM fails, the first IOM to fail will switch to protection and its FLT LED will be solid red and the ACT LED will be solid green. The second IOM to fail cannot switch and only its FLT LED will illuminate.		

4.11.3 Theory of Operation

Each Octal DS-3/STS-1 IOM has 8 DS-3 or STS-1 interfaces that are controlled by a microprocessor. In the transmit direction the DS-3s or STS-1s enter the interfaces from the rear module. Each interface demultiplexes the DS-3 or STS-1 into seven VT groups of 4 DS1s or VT1.5s that pass to the TSU circuitry. In the TSU, the signals are converted to ATM cells that are sent to the Parallel In/Serial Out Interface where they are converted from parallel to serial. The serial data is sent to the SF module for switching.

Refer to Figure 4.11-2 for a block diagram of the IOM.

The 89-0411 and 89-0425 IOMs have digital signal processor (DSP) circuitry on a daughter card for use during DTMF digit collection.

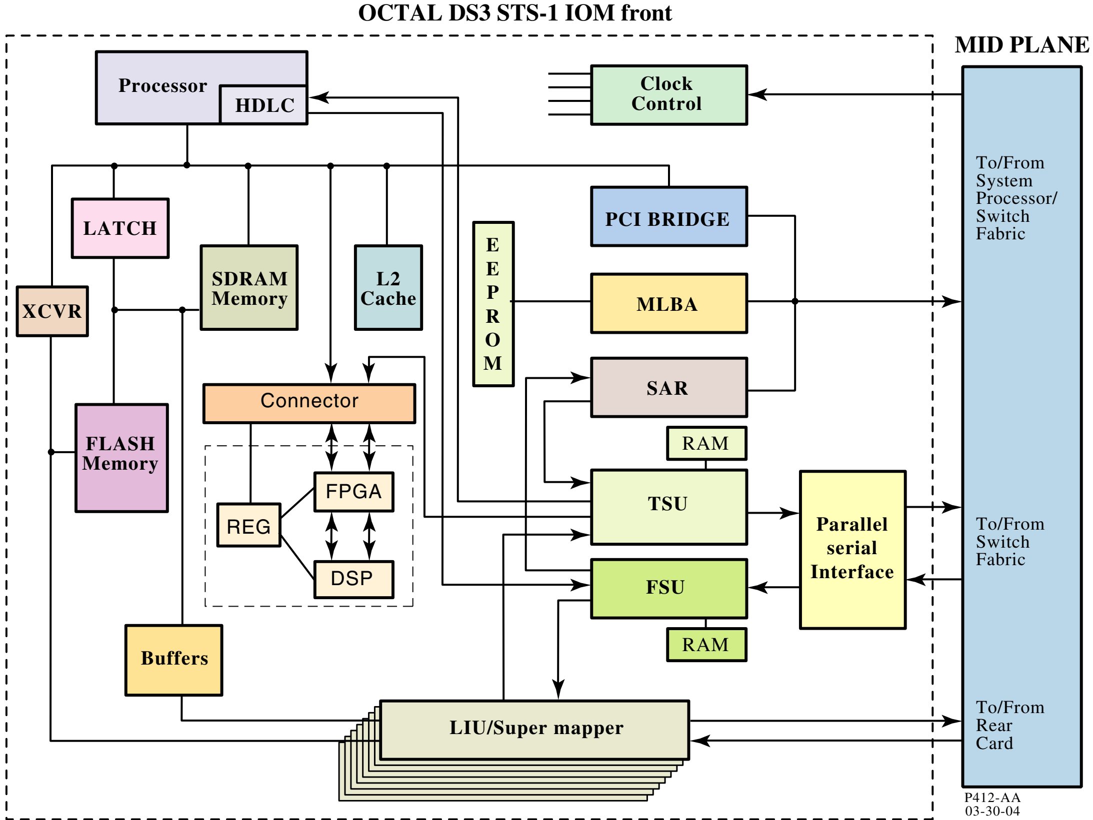


Figure 4.11-2. Octal DS-3/STS-1 IOM Block Diagram

In the receive direction the serial data from the SF module is received at the Serial In/Parallel Out interface to be converted to parallel data for the FSU circuitry. The FSU converts the ATM cells back to a VT signal for the DS-3 or STS-1 interface that multiplexes them back to DS-3 or STS-1 for the midplane and the rear module.

4.11.3.1 DS-3/STS-1 LIU and Super Mapper

Each module has eight line interface circuits. See Figure 4.11-2 for the Octal DS-3/STS-1 IOM block diagram illustration. The LBOs of the DS3s are programmable using TL1 commands.

The Framer and Mapper circuitry demultiplexes each DS-3/STS-1 into seven VT groups onto the TDM (Time-Division Multiplexed) bus to the TSU. TDM signals received from the FSU are multiplexed back to a DS-3 or STS-1.

The DS3/STS-1 interface has programmable thresholds for loss of signal (LOS), alarm indication signal (AIS), control slip seconds (CSS), coding violations (CVs), errored seconds (ES) and severely errored seconds (SES). The circuitry can also be configured to operate in M23 or C-bit parity mode.

The DS3/STS-1 interface can loop individual DS3s or STS-1s for diagnostic testing of line integrity. These loops can also be programmed using TL1 commands.

4.11.3.2 To Switch Unit (TSU) and From Switch Unit (FSU))

The TSU and FSU are circuit to ATM cell translators. The ATM output of the TSU passes to the parallel/ serial interface that serializes the parallel input to a 622 Mb/s signal for the SF module. The serial/parallel interface accepts the 622 Mb/s signal from the SF module and converts it from serial to parallel for the FSU.

4.11.3.3 Segmentation and Reassembly (SAR))

There is a Segmentation and Reassembly (SAR) unit on the PCI bus of each module for inter-module messaging. The SAR connects to the TSU/FSU on the IOM to perform the conversion from/to cells. The TSU has a small Virtual Channel Identifier (VCI) to ATM switch fabric port look-up function to get frames from the IOMs to the SP.

4.11.3.4 Maintenance Link Bus Adapter (MLBA) and EEPROM

The Maintenance Link Bus Adapter (MLBA), which has a serialized point-to-point interconnect between the SF module and each IOM, controls the Super Mappers on each module. This link is used to reset an IOM, detect the presence and CLEI code of the rear module, control the LEDs located on the module, download images to the processor's memory, program the circuit switch registers and communicate operational status from the IOM to the SP.

Each module also has a 256 byte EEPROM of non-volatile memory that contains the board specific information such as the CLEI code, part number, serial number and revision number. This information can be retrieved with the `RTRV-INFO-EQPT` TL1 command.

4.11.3.5 Microprocessor and Memory

Each module has a microprocessor with 512Kbyte of L2 Cache 64 Mbytes of SDRAM, and 32 Mbytes of non-volatile Flash memory for controlling the module. The Flash memory contains code that performs initialization, OS boot, diagnostics, and debug monitor.

The microprocessor has an HDLC (High-level Data Link Control) Controller. Timeslot 24 of each of the 224 T1s that the module processes is an HDLC D-channel that must be transferred between the processor and the TSU and FSU. The HDLC provides the interface.

4.11.3.6 Digital Signal Processor (DSP)

The DSP is on a daughter card (Shown within the dotted lines below the connector on the block diagram.) of the 89-0411 and 89-0425 modules. The DSP is used for DTMF digit collection or tone detection. The daughter card receives its power from the motherboard and regulates it for card use.

4.11.3.7 Power

Each Octal DS-3/STS-1 I/O front module has its own DC-to-DC converter (not shown), which converts the 48 volts supplied from the backplane to the local voltages required (5Vdc, 3Vdc, etc.). The front modules supply power for the rear modules.

4.11.3.8 Clocks and Synchronization

Clock and framing information is received from the BITS circuitry because the Maintenance Link, ATM switch fabric and line interfaces all operate synchronously to the BITS timing supplied to the chassis. The clock control circuitry of the IOM distributes these on the module.

4.11.3.9 DS3/STS-1 Protection Module

I/O-5 (physical slot 5) and I/O-13 (physical slot 17) are the slots for the DS-3/STS-1 protection module in the 85-3004 or 85-3007chassis. The T3 protection bus allows the front protection module to transmit/receive eight T3 signal pairs from rear IOMs. I/O-5 provides protection for I/O-1 to I/O- 4 and I/O-6 to I/O-8; I/O-13 provides protection for I/O-9 to I/O-12 and I/O-14 to I/O-17. This provides N:1 redundancy for electrical interfaces. The rear DS3/STS-1 modules contain relays that pass the DS3/STS-1s either to the front module or to the protection bus. The rear protection module obtains the DS-3/STS-1 from the protection bus and passes it to the front protection module.

4.11.3.10 DS3 and STS-1 Loopbacks

DS-3 or STS-1 loopbacks can be used as diagnostics to test line integrity. Loopbacks are always line loopbacks which loop the entire DS3 (44.736 Mb/s) or STS-1 (51.84 Mb/s) signal. Loopbacks can occur at the near or far end facility. The switch can respond to as well as initiate loopbacks. The switch only responds to remote loopback requests when operating in C-Bit mode. Likewise, FEND loopbacks on a DS3 port can only be issued when operating in DS3 C-Bit mode. See Figure 4.11-3 for DS3 line loopbacks and Figure 4.11-4 for STS-1 line loopbacks of the near-end. Loopbacks are initiated or cleared using TL1 commands.

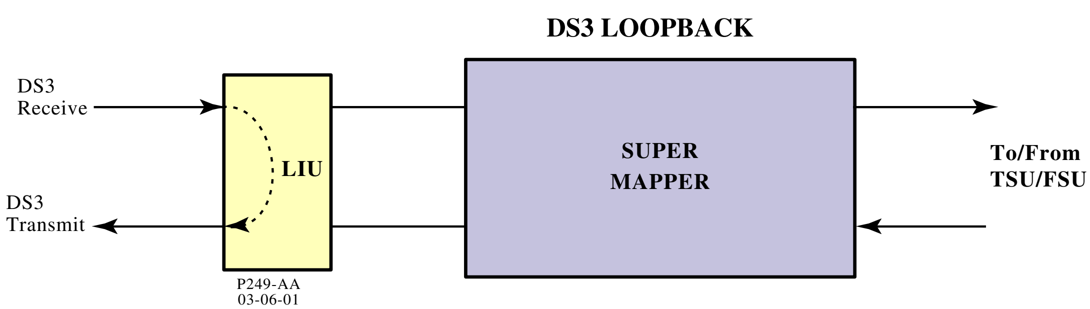


Figure 4.11-3. DS-3 Near-end Loopback

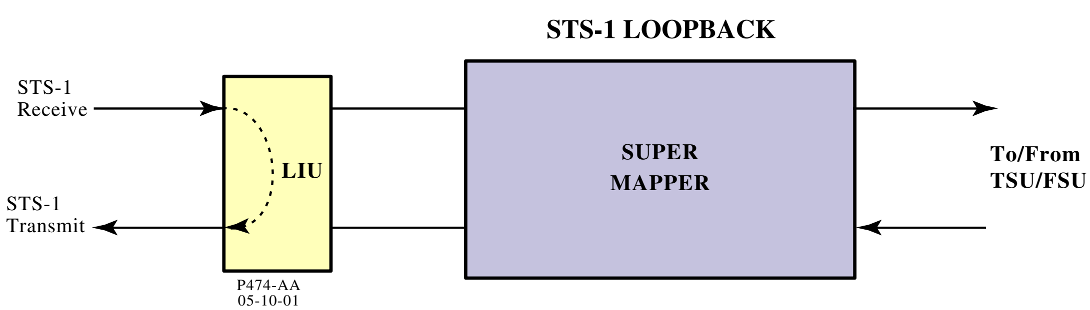


Figure 4.11-4. STS-1 Near-end Loopback

4.11.4 Specifications

Refer to Table 4.11-B for the DS-3 specifications. Table 4.11-C lists the STS-1 specifications and Table 4.11-D lists the environmental specifications.

Table 4.11-B. DS3 Specifications

Specification	Description
Nominal line	44.736 Mb/s ± 20 ppm
Line code	B3ZS (Bipolar with three-zero substitution)
Framing	M-Frame (M13) or C-Bit parity mode
Termination	One coaxial line for each direction of transmission
Impedance	75 ohms ± 5% (unbalanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 0.36 and 0.85 volts peak.
Pulse imbalance	Less than 3.5 dB difference between total power of positive and negative pulses
Jitter generation	Less than 0.3 timeslots RMS
Cable	728 RG-6U or equivalent
Maximum span	450 feet to DSX-3 cross connect
	69

Table 4.11-C. STS-1 Specifications

Specification	Description
Line rate	51.84 Mb/s ± 20 ppm
Line code	B3ZS (Bipolar with three-zero substitution)
Framing	A1 and A2 bytes
Mapping	Locked or floating VT (virtual tributary) mode
Termination	One coaxial line for each direction of transmission
Impedance	75 ohms ± 5% (unbalanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 0.36 and 0.85 volts peak.
Pulse imbalance	Less than 3.5 dB difference between total power of positive and negative pulses
Jitter generation	Less than 0.01 unit intervals (UI) RMS
Cable	728 RG-6U or equivalent
Maximum span	450 feet to cross connect
	T76-A

Table 4.11-D. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

4.12 DS3/STS-1 I/O Rear Module [je1]

4.12.1 Scope

This section describes the DS-3 I/O rear module and the DS-3 Protection rear module. These modules are used with both the Triple DS-3 front module and the Octal DS-3 front module. This section explains the module functions and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0383	BAA9TW0GAA	Triple/Octal DS-3/STS-1 Rear
89-0386	BAA9TU0GAA	Triple/Octal DS-3/STS-1 Protection

4.12.2 Functional Description

The switch accommodates up to 17 IOMs. The rear DS-3 IOM can terminate 3 DS-3s or 3 STS-1 signals when used with the Triple DS-3 front module or up to 8 DS-3s or 8 STS-1 signals when used with the Octal DS-3 front module. This is equivalent to 84 DS-1s or 224 DS-1s, respectively. The rear module provides up to eight DS3 In and Out connectors. The rear protection module, which is a different part number, does not have In and Out connectors.

The system features 1:N protection of the DS-3 line interface modules. The same front module type is used for both working and protection applications, thus simplifying sparing, maintenance and inventory. Physical slot 5 (I/O-5) and slot 17 (I/O-13) are the DS-3 protection module slots and slot 7 (I/O-7) is the recommended DS-1 protection slot of the 85-3004, 85-3007 and 85-3008 chassis. I/O-5 protects I/O-1 to 4 and 6 to 8 and I/O-13 protects I/O-10 to 12 and 14 to 17. I/O-7 when used for DS-1 protection provides protection for DS1 IOMs in any slot. If the user does not desire to protect line- and trunk-side interfaces, the system can be equipped with 17 interface modules.

The rear Triple/Octal DS-3 IOM has:

- An EEPROM that contains the CLEI code.
- Sixteen BNC connectors, eight for the T3 transmit channels and eight for the receive channels.
- Relays that pass the DS-3s to the front module or to the protection bus.

The rear Triple/Octal DS-3 protection IOM has:

- An EEPROM that contains the CLEI code.
- Relays that pass the DS-3s to the front module from the protection bus.

4.12.2.1 General Mechanical Representation

The rear module has sixteen BNC connectors, Channels 1 to 8 RX (IN) and Channels 1 to 8 TX (OUT) as shown in Figure 4.12.1.

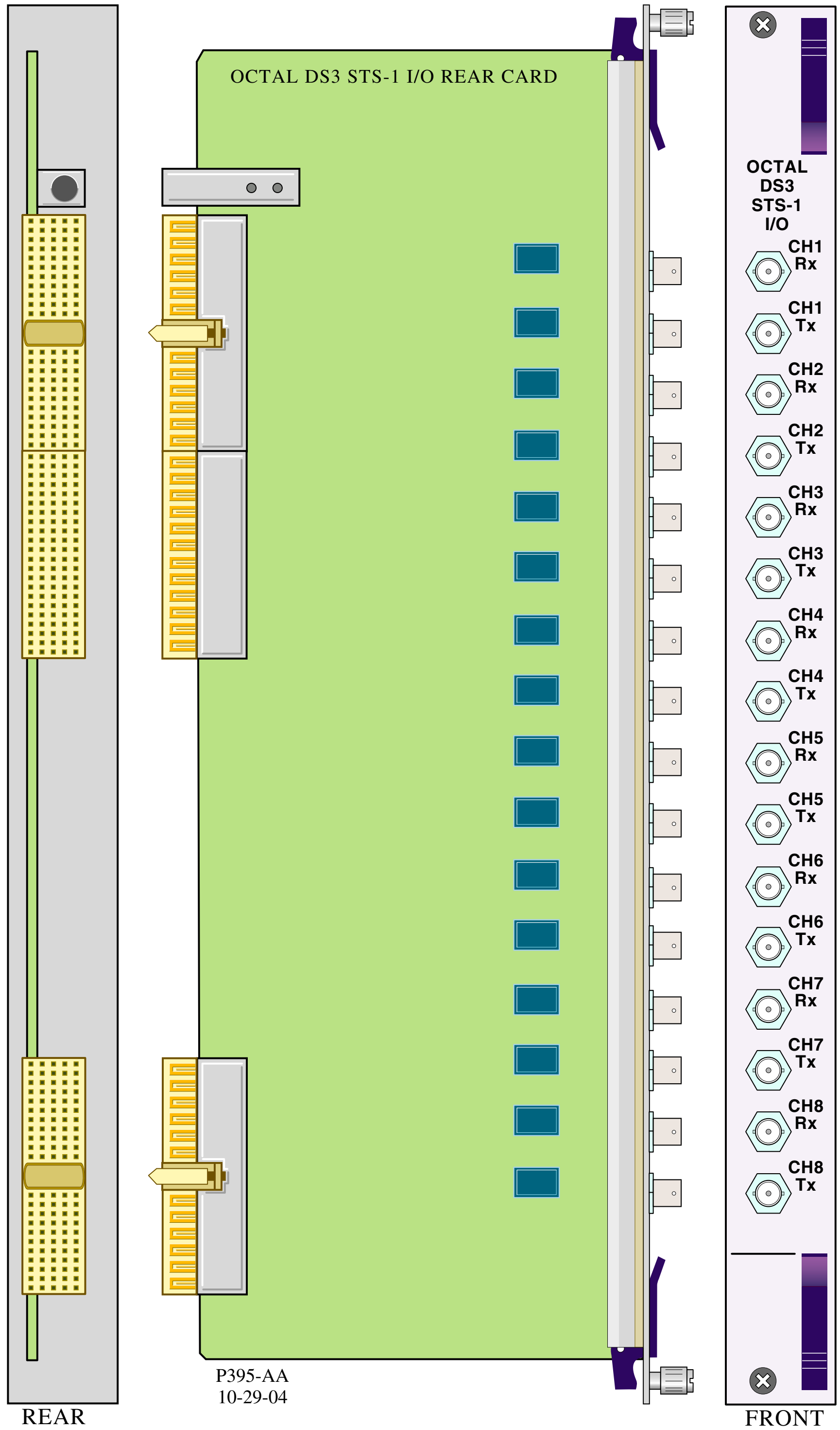


Figure 4.12.1. RearDS3/STS-1 IOM

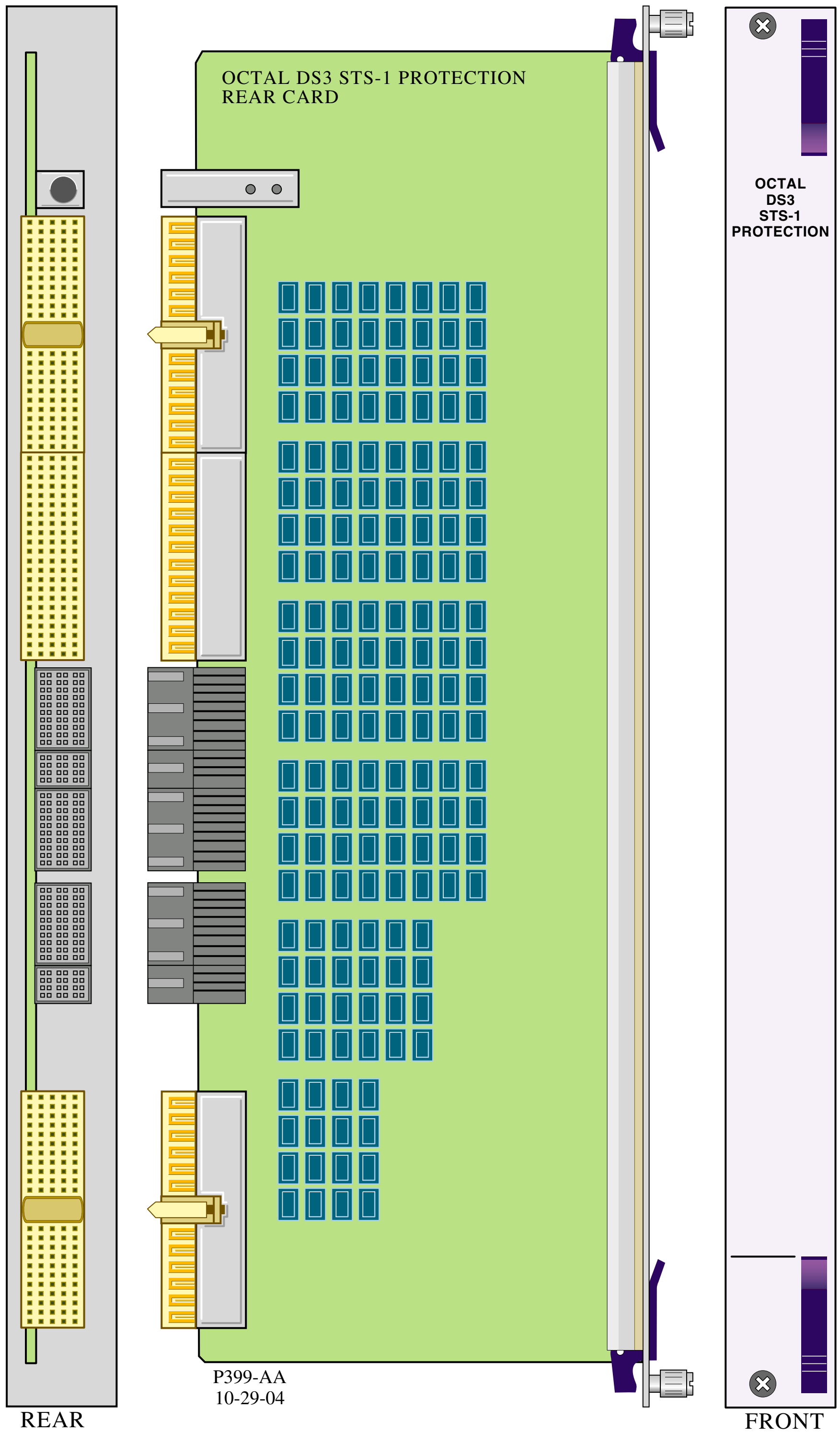


Figure 4.12.2. Rear Protection DS-3/STS-1 IOM

4.12.3 Theory of Operation

Figure 4.12.3 provides a block diagram of the IOM which is described in the following paragraphs.

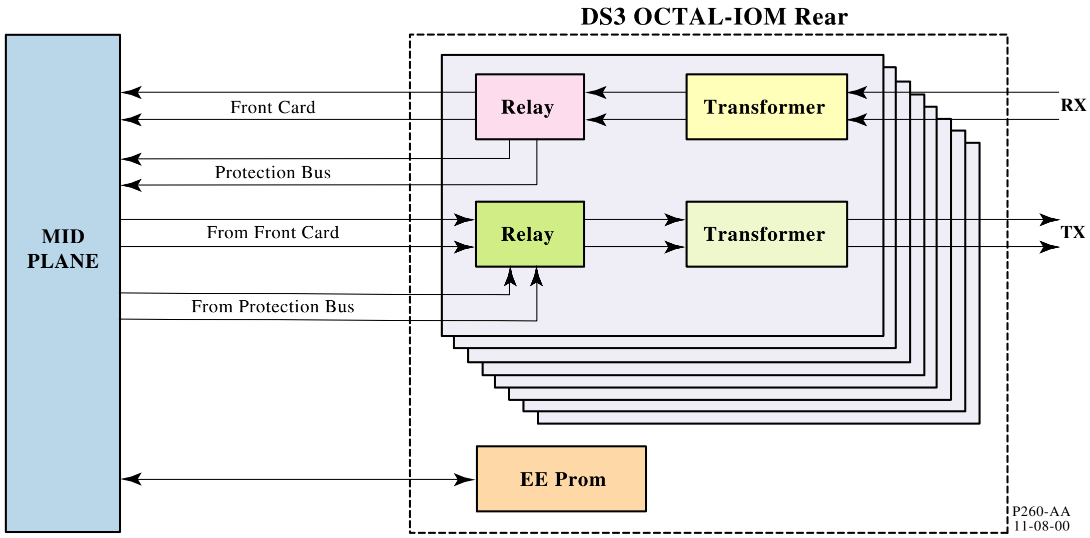


Figure 4.12.3. Block Diagram of Rear Triple/Octal DS-3 IOM

4.12.3.1 Power

Each Triple/Octal DS-3 I/O rear module receives its local voltages (5V, 3V, etc.) from the front IOM that has the DC-to-DC converter for converting the -48 volts from the backplane.

4.12.3.2 Interface Protection Buses

Module protection is accomplished by the midplane design where the line inputs can be routed from the working module to the protection module. This is performed by relays on the working module that either connect the signals straight though to the front module, or connect them onto the mid-plane and the protection bus. The rear protection module picks the signals off the midplane and routes them to the front protection module.

4.12.3.3 EEPROM

An EEPROM that contains the CLEI code for the module is located on the module. All modules have a CLEI code so that missing and incompatible replaceable equipment can be alarmed.

4.12.4 Specifications

Table 4.12-A. DS-3 Specifications

Specification	Description
Nominal line	44.736 Mb/s ±20 ppm
Line code	B3ZS (Bipolar with three-zero substitution)
Framing	M-Frame (M13) or C-Bit parity mode
Termination	One coaxial line for each direction of transmission
Impedance	75 ohms ±5% (unbalanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 0.36 and 0.85 volts peak.
Pulse imbalance	Less than 3.5 dB difference between total power of positive and negative pulses
Jitter generation	Less than 0.3 timeslots RMS
Cable	728 RG-6U or equivalent
Maximum span	450 feet to DSX-3 cross connect
	69

Table 4.12-B. STS-1 Specifications

Specification	Description
Line rate	51.84 Mb/s ±20 ppm
Line code	B3ZS (Bipolar with three-zero substitution)
Framing	M-Frame (M13) or C-Bit parity mode
Termination	One coaxial line for each direction of transmission
Impedance	75 ohms ±5% (unbalanced)
Pulse shape	Meets TR-TSY-000499 mask with amplitude of between 0.36 and 0.85 volts peak.
Pulse imbalance	Less than 3.5 dB difference between total power of positive and negative pulses
Jitter generation	Less than 0.3 timeslots RMS
Cable	728 RG-6U or equivalent
Maximum span	450 feet to cross connect
	T76-A

Table 4.12-C. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

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NOTES:

4.13 Channelized OC-3 Module

4.13.1 Scope

This section describes the Channelized OC-3 module, part number 89-0400-A and CLEI code BA4AW60FAA. This document explains the module functions, LED indicators, and connector interfaces.

4.13.2 Functional Description

The Channelized OC-3 module provides 224 DS1 interfaces capable of supporting SS7 and ISDN protocols in a Lucent Network Gateway (LNG) or Lucent Signaling Gateway (LSG). The Channelized OC-3 module requires a corresponding rear OC-3 (89-0402) module. The module can terminate four OC-3 lines. Only the first eight STS-1s can be provisioned. STS-1 through STS-6 can be bulk provisioned; STS-7 and STS-8 cannot be bulk provisioned, but must be provisioned individually.

The Channelized OC-3 module can be used in the 85-3007 or 85-3008 chassis with Midplane III. If a module is paired for protection (1:1), the fiber is protected but not the module because the signal must enter the Ultramapper of the first module of the pair. A maximum of four protected pairs of Channelized OC-3 modules are supported. A Channelized OC-3 cannot be provisioned if there is the card in its mated I/O slot is not a Channelized OC-3 module. Protection can be used for the following paired slots:

- I/O-1 and I/O-2
- I/O-3 and I/O-4
- I/O-14 and I/O-15
- I/O-16 and I/O-17

4.13.2.1 General Mechanical Representation

The Channelized OC-3 module is approximately 14 inches high and plugs into the mid-plane for connections to the Switch Fabric and System Processor modules. Refer to Figure 4.13-1 for an illustration of the midplane connector, the Channelized OC-3 module and the front of the module. Refer to Table 4.13-A for a description of the LEDs.

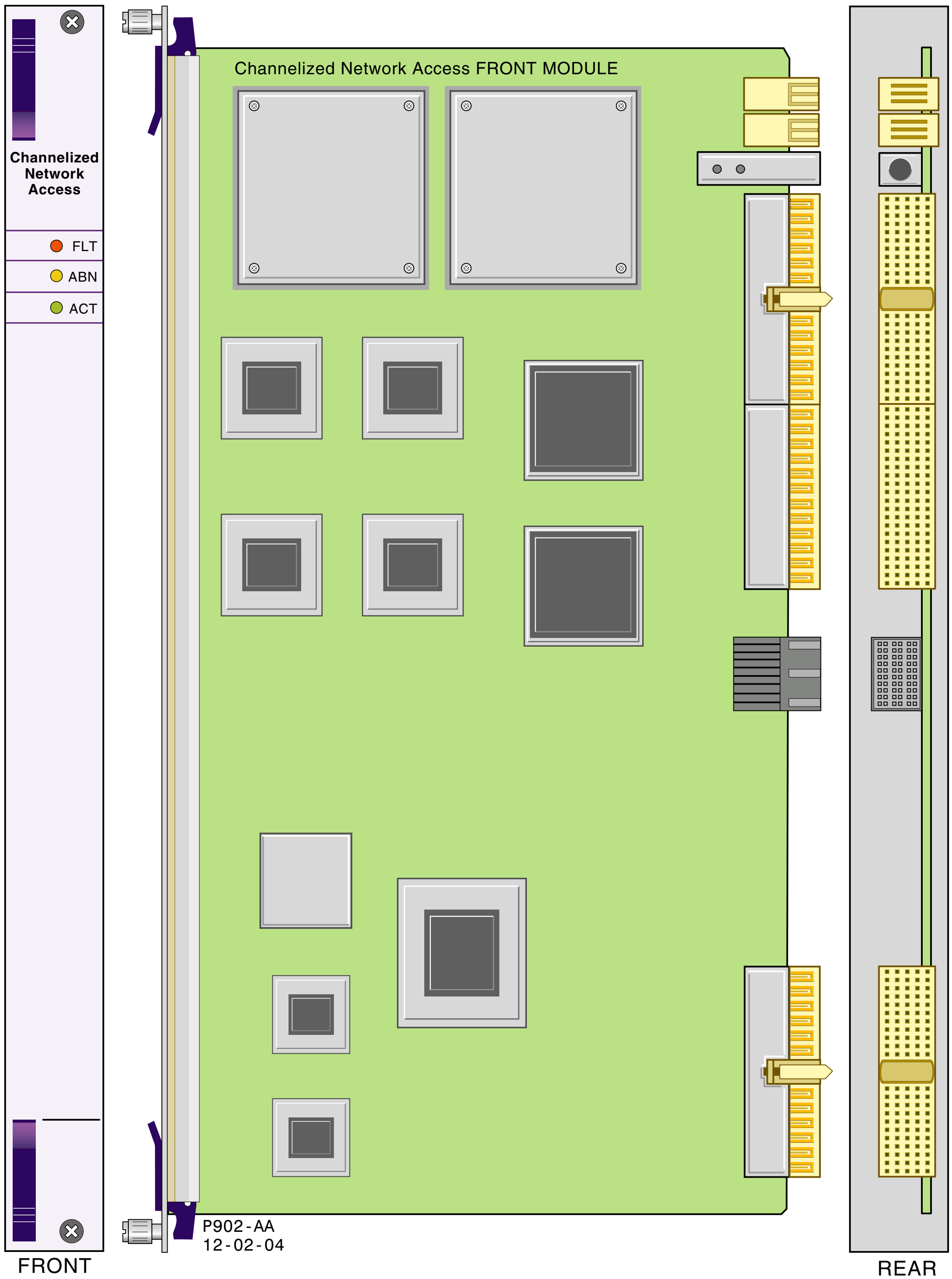

Figure 4.13-1. Channelized OC-3 Front Module

4.13.2.2 LEDs

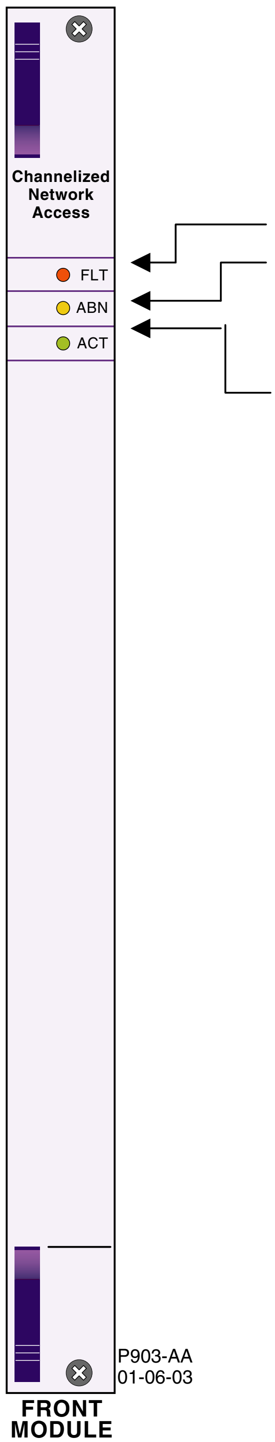

Table 4.13-A. Channelized OC-3 IOM LEDs

LEDs of Channelized OC-3 IOM		
LEDs	**Color**	**Description**
FLT	Red	Indicates a local internal fault
ABN	Yellow	Indicates a remote fault or abnormal condition.
ACT	Green On	Indicates that the module has been equipped for service.
	Green Blinking	Indicates that the module is ready and in standby mode.

4.13.3 Theory of Operation

Refer to Figure 4.13-2 for a block diagram of the Channelized OC-3 module.

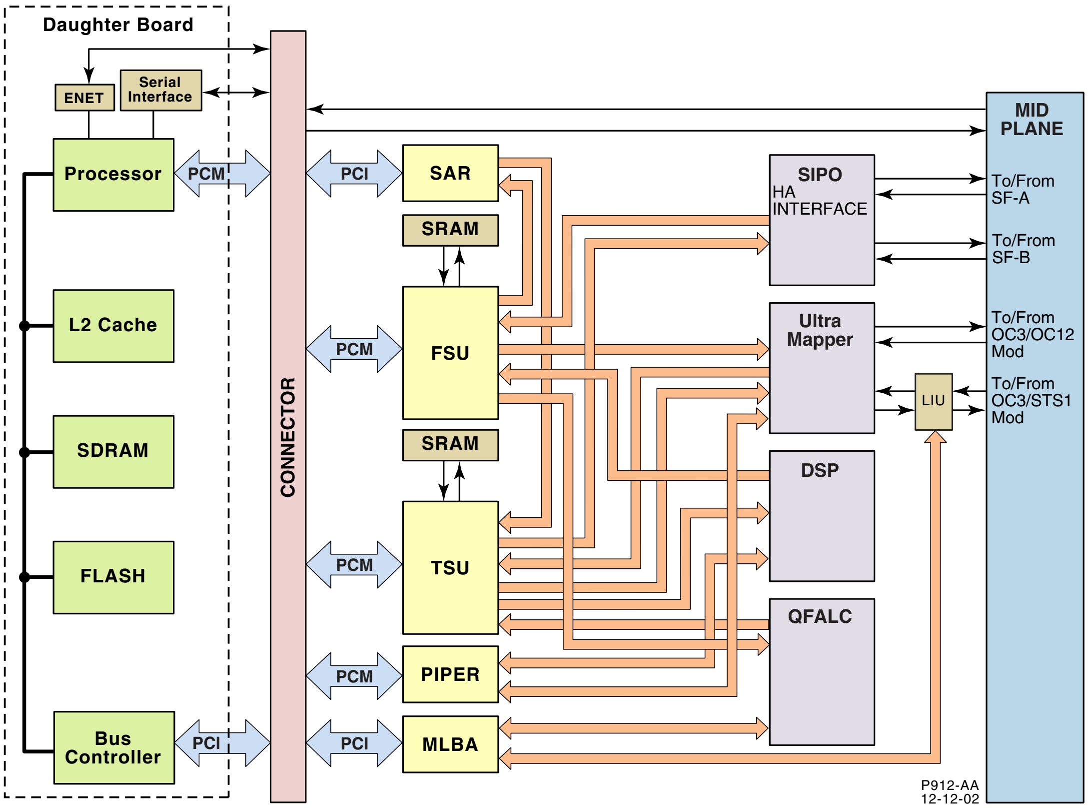

Figure 4.13-2. Channelized OC-3 Module Block Diagram

4.13.3.1 Line Interfaces

Module function is determined by the rear module and provisioning. The rear module is a Channelized OC-3 Rear Module (89-0402).

OC3 Interface

In Quad OC-3 mode, the electrical OC signals connect to the Ultramapper from the Midplane and the rear module. In OC-3 mode, the 224 DS1 channels are contained in the three STS1s in Port 1, the three STS1s in port 2, and the first two STS1s in port 3.

4.13.3.2 Ultramappers

The Ultramapper circuitry demultiplexes the OC signals received from the rear module to T1s for the TSU. T1 signals received from the FSU are multiplexed back to a OC signals for the rear module.

Ultramappers are connected to the module's processor through the Piper FPGA. The Ultramapper operates asynchronously with the microprocessor.

4.13.3.3 FSU (From Switch Unit) and SIPO

One of the primary functions of the FSU and TSU is to provide interface between the IOM and the switch fabric thru the SIPO (Serial In Parallel Out) interface. The FSU circuitry consists of the following components:

- FSU FPGA
- Serial In Parallel Out (SIPO) Switch Fabric Interface
- Control RAM (2-Mbytes)
- Buffer RAM (2-Mbytes)
- Announcement SDRAM (64-Mbytes).

The SIPO converts the high-speed serial data stream from the switch fabric into a byte parallel stream that the FSU can process. The Buffer RAM is used to temporarily store the data coming from the switch fabric. The Control RAM contains data structures that the FSU FPGA uses when processing the data streams. The Announcement SDRAM is used for storing data, which FSU used to create announcement.

4.13.3.4 TSU (To Switch Unit)

TSU circuitry consists of the following components:

- TSU FPGA
- Serial In Parallel Out (SIPO) Switch Fabric Interface
- Control RAM (2-Mbyte)
- QDR (Quad Data Rate) SRAM for scratch registers and buffers (2-Mbyte).

The TSU provides a byte-parallel stream to the SIPO to send to the switch fabric as a serial data stream. The Buffer RAM is used to temporarily store the outgoing data to the switch fabric. The Control RAM contains data structures that the TSU uses when processing the data streams. The TSU does not have announcement SDRAM, however it does have QDR SRAM, which is used for scratch pad register.

4.13.3.5 MLBA (Maintenance Link Bus Adapter) and EPROM

The MLBA (Maintenance Link Bus Adapter) provides a serialized point-to-point interconnect between the Switch Fabric Module and the Channelized OC-3 module and its microprocessor. This link is used to reset a module, detect CLEI code, control the LEDs located on the module, download images to the processor's memory, program the circuit switch registers and communicate operational status to the System Processor. It also provides a bridge between the PCI bus and the non-PCI-Bus-based peripherals, such as the Ultramapper, DS3/STS1 LIU and QFALC devices.

The Serial EEPROM provides the module with 256-bytes of non-volatile memory for storing board specific information (e.g. CLEI code, board revision, etc.). It is connected directly to the MLBA FPGA.

4.13.3.6 PIPER

The major function of the PIPER FPGA is to be an interface between microprocessor and Ultramapper for interrupts, resets, and mode control. It also interfaces with the DSPs (Digital Signal Processors) for the tone collection process and tone Registers via the DSP HPI (Host Port Interface).

4.13.3.7 DSP (Digital Signal Processor)

The Channelized OC-3 module supports tone-detection, which is implemented using two DSPs. The DSPs are connected to the PCI bus through the PIPER FPGA. The PIPER translates the PCI bus cycle into an HPI (Host Port Interface) bus cycle for use by the DSP. The DSP receives a TDM data stream from the TSU, which the DSP then processes to determine the corresponding tone. The DSP is also connected to FSU, which the DSP can use to generate tone. The tone generation is not implemented in the DSP but in the FSU itself

4.13.3.8 SAR (Segmentation and Reassembly) Controller

The AAL5 SAR interfaces to the microprocessor via the PCI bus and provides a communication bridge between the microprocessor and the switch card. The SAR integrates ATM terminal functions, PCI Bus Master and Slave controllers, and the UTOPIA interface. It generates and terminates ATM traffic as well as automatically scheduling cells for transmission. The ATM cell transport mechanism enables large numbers of virtual channels or VCC's to be multiplexed onto a single physical interface. The segmentation process converts user data into ATM cells.

4.13.3.9 Processor Daughter Module

The Microprocessor, Memory Bus Controller and Memory are located on a daughter module that interfaces to the Channelized OC-3 module. They provide the intelligence and processing power to the module. The processor module contains:

- Microprocessor
- 128 Mbytes of SDRAM
- 64 Mbytes of Flash storage memory
- 512Kbytes Level 2 Cache
- PowerSpan PCI bus Support
- 10/100 Ethernet support
- Two serial ports

There are two serial ports and a10/100 Ethernet port for debug purposes. These ports are accessible via a DB9 connector on the rear module.

4.13.3.10 Power

Each Channelized OC-3 module has its own DC-to-DC converter (not shown), which converts the 48 volts supplied from the backplane to the local voltages required (5Vdc, 3Vdc, etc.).

4.13.3.11 Clocks and Synchronization

Clock and framing information is received from the System Timing module located on the System Processor. The clock control circuitry of the IOM distributes these on the module.

4.13.3.12 Protection

The Channelized OC-3 module can be used in the 85-3007 or 85-3008 chassis with Midplane III. If a module is paired for protection (1:1), the fiber is protected, not the module because the signal must enter the UltraMapper of the first module of the pair. A maximum of four protected pairs of Channelized OC-3 modules are supported. A Channelized OC-3 cannot be provisioned if there is the card in its mated I/O slot is not a Channelized OC-3 module. Protection can be used for the following paired slots:

- I/O-1 and I/O-2
- I/O-3 and I/O-4
- I/O-14 and I/O-15
- I/O-16 and I/O-17

4.13.4 Specifications

Table 4.13-B. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

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NOTES:

4.14 Rear Channelized OC-3 Module

4.14.1 Scope

This section describes the Rear Channelized OC-3 modules. The OC-3 module is part number 89-0402 and CLEI code BA4A50VFAA. This section explains the module functions and connector interfaces.

4.14.2 Functional Description

The Rear Channelized OC-3 modules are a rear IOMs with physical connections for a front Channelized OC-3 (89-0400) module. The module provides one or four SC fiber optic ports as well as a DB-15 connector for a DS-1 A-link port (not currently supported).

4.14.3 General Mechanical Representation

The Rear Channelized OC-3 modules are approximately 14 inches high and plugs into the midplane for connections to the front Channelized OC-3 module. See Figure 4.14-1 for an illustration of the midplane connector, the rear module and the front of the module.

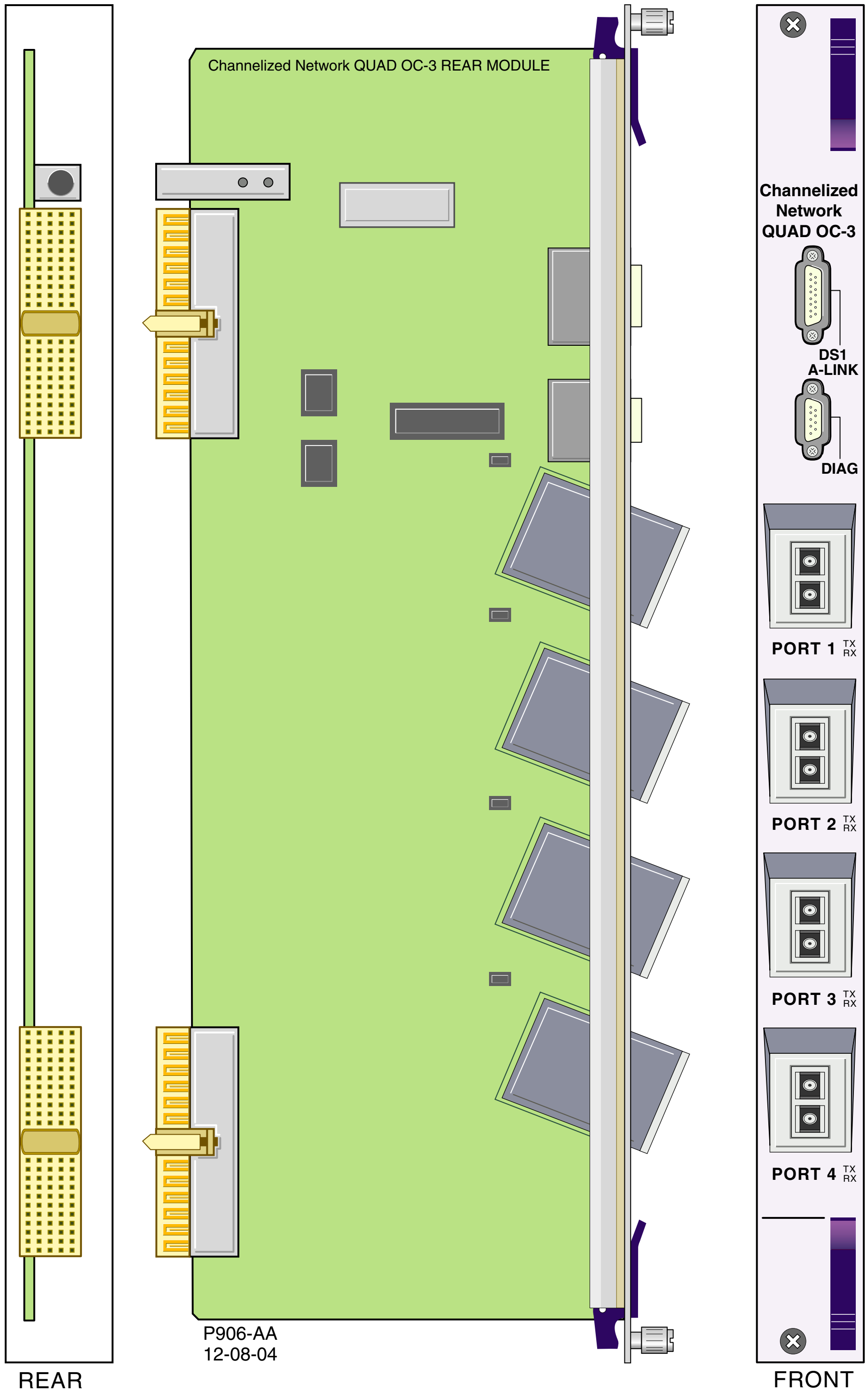

Figure 4.14-1. Rear OC-3 Channelized OC-3 Module

4.14.4 Theory of Operation

Each Rear Channelized OC-3 module has a DB-15 connector to pass DS-1 A-links (not currently supported) to the front module, a DB-9 connector or Ethernet data and two serial lines and four pairs of optical connectors for OC-3 data. Refer to Figure 4.14-2 for a block diagram of the Rear OC-3 module.

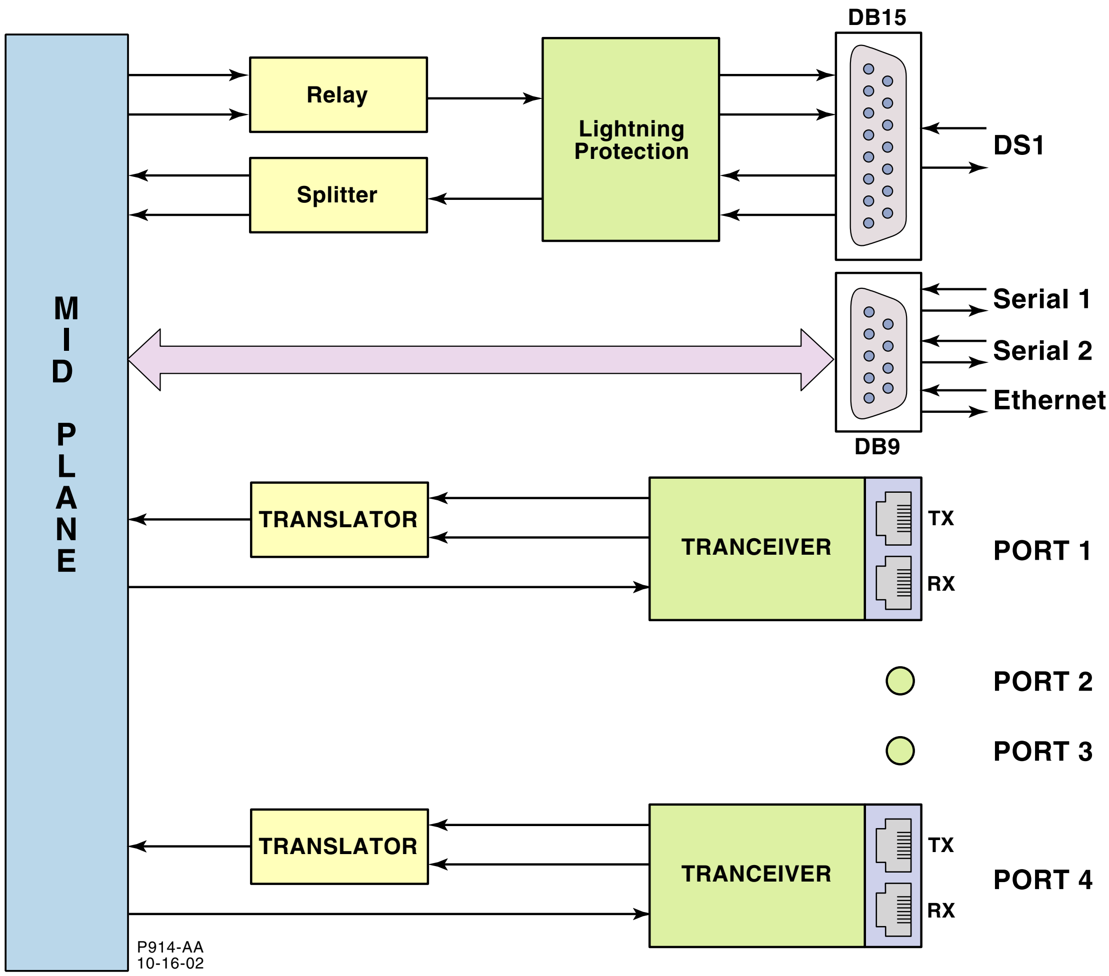

Figure 4.14-2. Rear Channelized OC-3 Module Block Diagram

4.14.4.1 Protection

The Channelized OC-3 module can be used in the 85-3007 and 85-3008 chassis with Midplane III. If a module is paired for protection (1:1), the fiber is protected, not the module because the signal must enter the UltraMapper of the first module of the pair.

Protection for OC-3 using Midplane III can be used for the following paired slots:

- I/O-1 and I/O-2
- I/O-3 and I/O-4
- I/O-14 and I/O-15
- I/O-16 and I/O-17

4.14.4.2 Ethernet and Serial DB-9 Connector

The DB-9 connector on the rear module provides an Ethernet port and two serial ports for debug purposes.

4.14.4.3 Transceivers

The rear Channelized OC-3 module has four OC-3 transceivers that interface to the front module via the midplane connector.

4.14.4.4 Power

The rear Channelized OC-3 module receives its power from the front module.

4.14.5 Specifications

Table 4.14-A lists the environmental specifications of the switch and its modules.

Table 4.14-A. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

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Table 4.14-B lists the OC-3 specifications of the optical transceivers.

Table 4.14-B. OC-3 Optical Signal Transmission Specifications

PARAMETER	**SPECIFICATION**
Line Bit Rate:	155 Mb/s (OC-3)
Fiber Mode:	Single-mode
Optical Source:	Laser
Transmitter Output	-11 dBm typical (–8 to -15 dBm)
Optical Connector:	Duplex SC
Optical Detector:	PIN Diode
Receive Sensitivity	-28 dBm
Receive Saturation	-8 dBm
Optical Wavelength ə$_{out}$:	13000 nm typical (1274 to 1356 nm)
Spectral Width (φə$_{rms}$):	02.5 nm
Extinction Ratio (r_e):	8.2 dB maximum
Span Distance (typ.):	Short haul, intermediate reach

4.15 Voice Server Modules

4.15.1 Scope

This section describes the front Voice Server modules (VS). It explains the module functions, LED indicators, and connector interfaces. Part numbers and CLEIs are as follows:

Part Numbers	CLEI Codes	Comments
89-0395-B	BA1AX60AAA	2688 channels

4.15.2 Functional Description

The Voice Server module provides the processing to take voice traffic to/from the TDM network and transmit/receive packetized voice to the packet/ATM network via the ATM Network Access (ANA) module or Ethernet Network Access (ENA) module.

The Voice Server does not have a corresponding rear module. The rear slot of the corresponding VS module must contain a blank panel to meet the electromagnetic interference (EMI) and system-cooling requirements. If there are any unused slots in the front or rear of the chassis, blank panels must be installed in those slots.

The system features 1:N protection of the Voice Server modules. In the 85-85-3004, 85-3007 or 85-3008 chassis, I/O-17 (physical slot 21) is the Voice Server protection slot. I/O-5 (Physical slot 5) and I/O-13 (physical slot 17) are the DS-3 protection module slots and I/O-7 (physical slot 7) is the DS-1 protection slot.

4.15.2.1 General Mechanical Representation

The Voice Server module is approximately 14 inches high and plugs into the midplane for connections to the SF and SP modules. See Figure 4.15-1 for an illustration of the midplane connector, the Voice Server module and the front of the module. Refer to Table 4.15-A for a description of the LEDs.

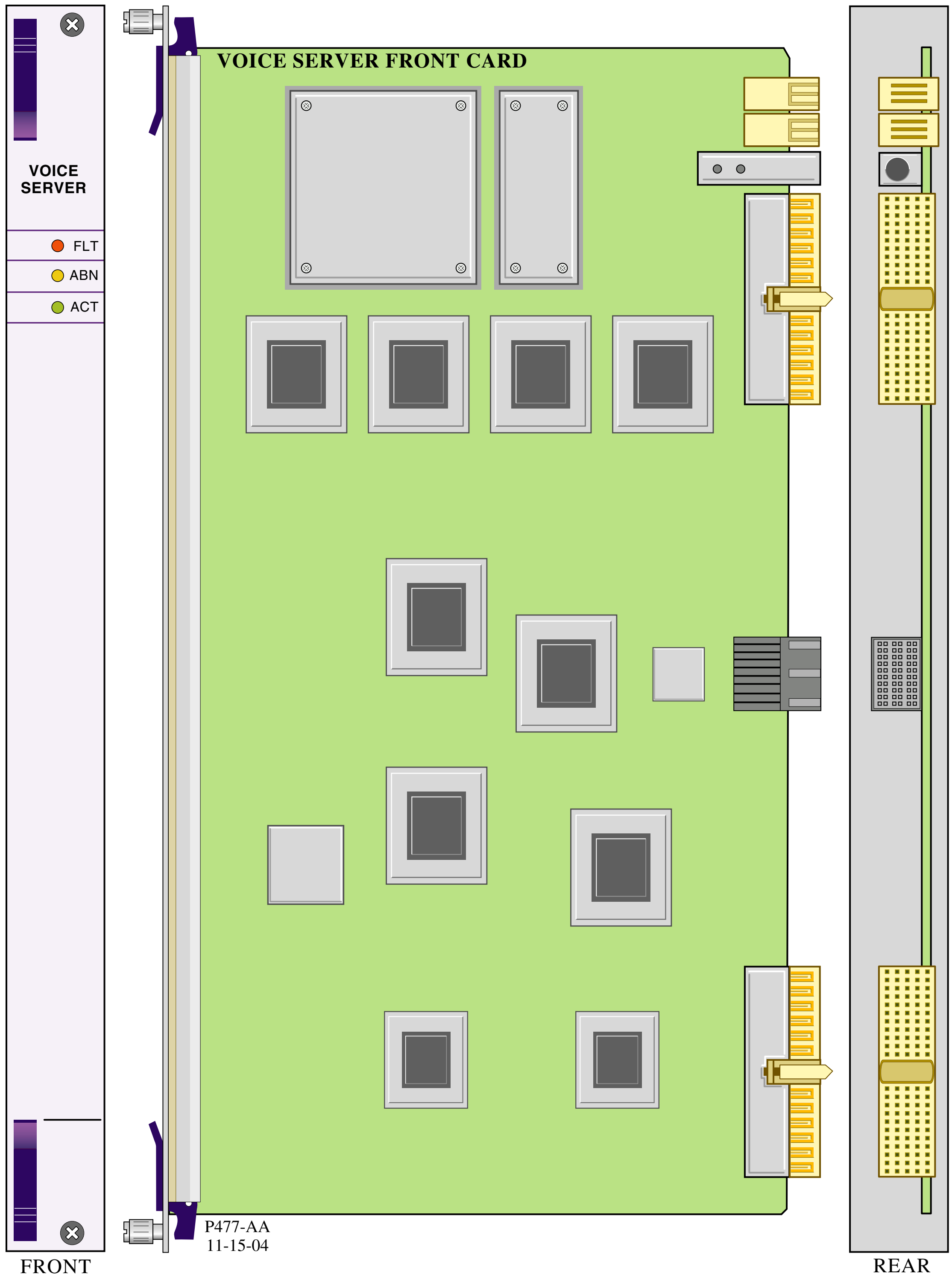

Figure 4.15-1. Voice Server Module

4.15.2.2 LEDs

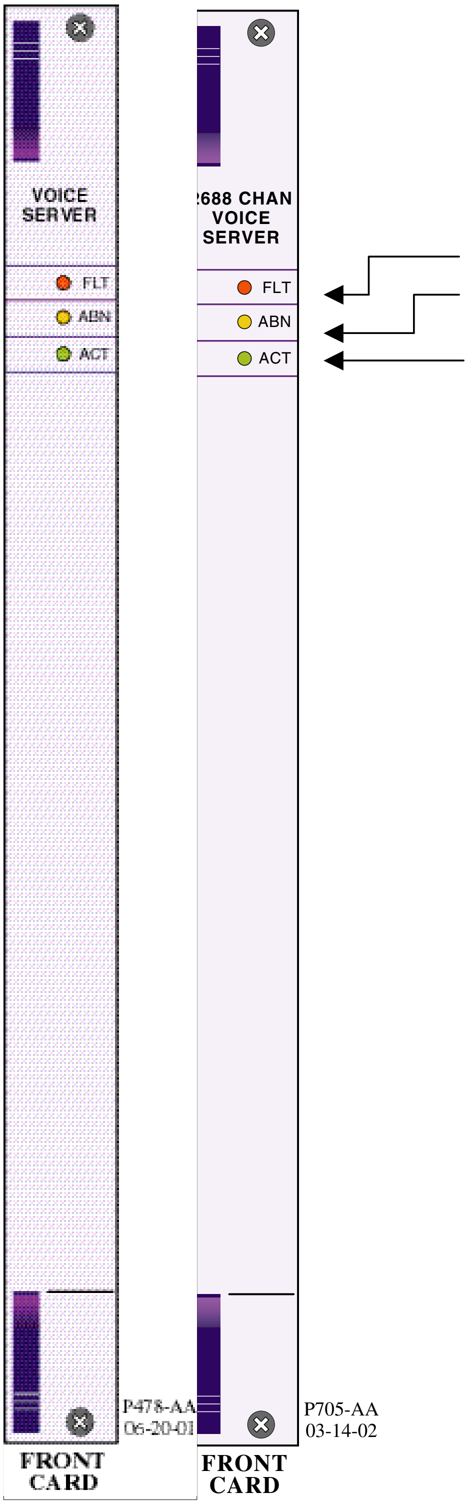

Table 4.15-A. LEDs of Voice Server Module

LEDs	Color	Description
FLT	Red	Indicates a local internal fault.
ABN	Yellow	Indicates a remote fault or abnormal condition.
ACT	Green On	Indicates that the module has been equipped for service.

4.15.3 Theory of Operation

Each Voice Server module has on-board circuitry to take 2688 channels of voice traffic to/from the Time-Division Multiplexing (TDM) network and transmit/receive packetized voice to the packet/ATM network via the ATM Network Access module. See Figure 4.15-2 for a block diagram of the Voice Server module.

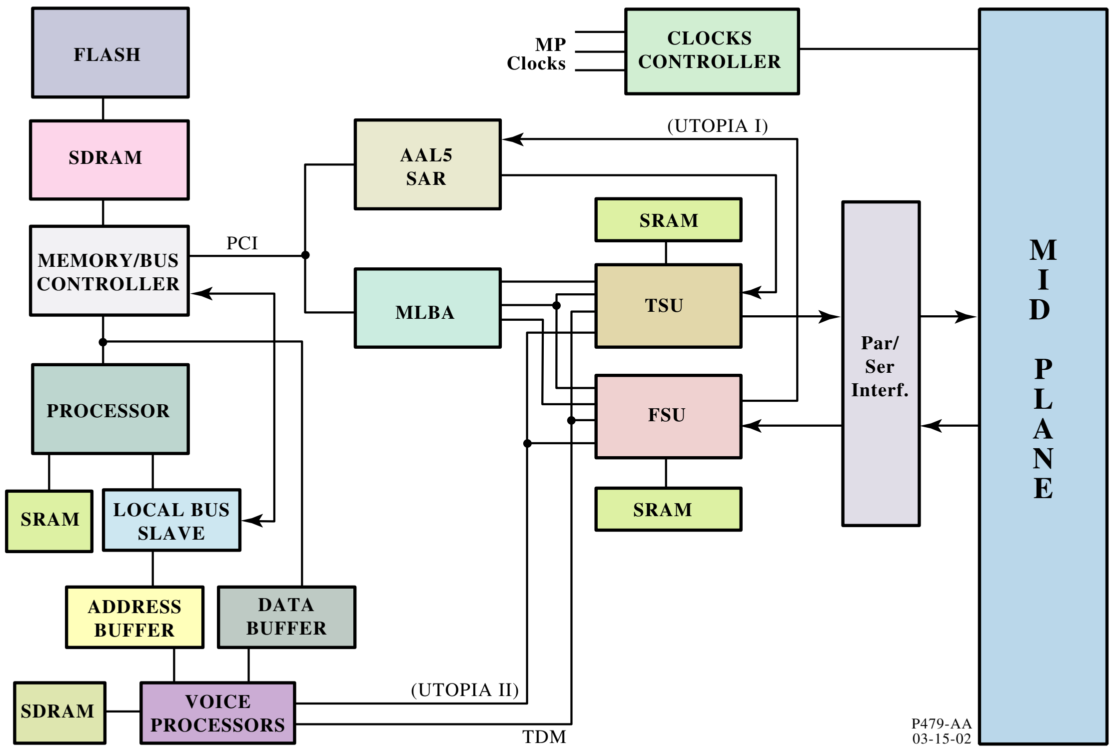

Figure 4.15-2. Voice Server Module Block Diagram

4.15.3.1 Microprocessor and Memory

The processor section has a microprocessor with 1-Mbytes of SRAM for L2 caching, a microprocessor controller and 256 Mbytes of SDRAM and 64 Mbytes of Flash memory for controlling the module. Each module also has an EEPROM that contains the CLEI code for the module.

4.15.3.2 Local Bus Slave (LBS)

The LBS provides the interface between the microprocessor and its controller and the voice processor circuitry.

4.15.3.3 Voice Processors and Memory

The voice processors are a new generation of voice processing chips, which integrate highly specialized DSP (Digital Signal Processing) cores for voice CODEC type processing. The voice processing chips support G.711, G.726, G.728, and G.729A/B encoding; G.165, G.168 echo cancellation up to 128ms, silence suppression, and comfort noise generation. The 89-0384 module has six voice processors and the 89-0395 has eight. Each voice processor supports up to 336 full-duplex Pulse Code Modulated (PCM) channels for a total of 2,016 or 2688 channels per module.

The voice processors are basically two port devices with a bi-directional TDM interface and a packetized voice interface. Depending on the configured mode, the packetized voice interface supported is either AAL2 or IP/UDP/RTP over AAL5. A DS-0, which is routed on the TDM interface into the voice processor, is processed by the DSP which echo cancels, compresses, and packetizes the voice content into either AAL2 cells or IP/UDP/RTP packets encapsulated into AAL5 ATM cells. The ATM cells are sent to the TSU and routed through the ATM switch fabric to the network access module. There are two types of network access modules – ATM or Ethernet. For an ATM network access, it places the ATM cells into SONET payloads for forwarding over a SONET optical transport. For an Ethernet network access, it reassembles the ATM cells back into AAL5 frames, strips off the AAL5 overhead fields, and places the IP/UDP/RTP payload into an Ethernet frame for forwarding over a 10/100/1000Mbps Ethernet interface.

In the reverse direction, the network access module either removes ATM cells from the SONET payload (ATM network access) or removes IP packets from Ethernet frames and places the IP packets into AAL5 ATM cells (Ethernet network access). The network access module then forwards the ATM cells over the ATM switch fabric to the FSU on the Voice Server module which routes the cells to the voice processor. Depending on the mode, the voice processor extracts the voice payload either from an AAL2 cell or IP/UDP/RTP AAL5 reassembled packet, decompresses, and encodes it into PCM format. The PCM-encoded voice is placed onto the TDM bus and sent to the TSU for routing to a TDM IOM.

4.15.3.4 To Switch Unit (TSU) and From Switch Unit (FSU)

The TSU and FSU are circuit to ATM cell translators. A call enters the switch through the DS-3 module where it is converted to ATM cells (proprietary low latency Lucent AALT format) and is sent to the Voice Server module through the SF module. The serial/parallel interface of the Voice Server module accepts the 622 Mb/s signal from the SF module and converts it from serial to parallel for the FSU. The AALT ATM cell received by the FSU is converted to a TDM data stream and sent to the voice processor circuitry.

The TSU receives TDM serial streams or voice packets in ATM cells from the voice processors, or IP over AAL5 ATM cells from the microprocessor via the AAL5 SAR. The TDM serial streams are converted into ATM cells and transported via the Switch Module to the TDM IOM. The ATM cells received from the voice processors are transported via the SF module to the network access module. The IP over AAL5 ATM cells from the AAL5 SAR are generally internal control packets that are transported over the SF to the SP.

The FSU receives ATM cells from the SF module. It determines whether they are voice bearer cells, which will be transferred to the voice processors, or control cells from the SP intended for the microprocessor, which will be sent to the AAL5 SAR, or Lucent AALT (TDM embedded) ATM cells which will be converted into Time Division Multiplexed (TDM) serial streams and sent to the appropriate voice processor TDM interface.

4.15.3.5 Segmentation and Reassembly (SAR)

There is a stand-alone Segmentation and Reassembly (SAR) unit on the PCI bus of each module to provide the microprocessor a means of communication to the SP.

4.15.3.6 Maintenance Link Bus Adapter (MLBA)

The Maintenance Link Bus Adapter (MLBA) has a serialized point-to-point interconnect between the SF module and each Voice Server module and its microprocessor. This link is used to reset a module, detect the presence and CLEI code of the rear module, control the LEDs located on the module, download images to the processor's memory, program the circuit switch registers and communicate operational status from the Voice Server module to the SP.

4.15.3.7 Power

Each Voice Server module has its own DC-to-DC converter (not shown), which converts the 48 volts supplied from the backplane to the local voltages required (5Vdc, 3Vdc, etc.)

4.15.3.8 Clocks and Synchronization

Clock and framing information is received from the BITS circuitry because the Maintenance Link, ATM switch fabric and line interfaces all operate synchronously to the BITS timing supplied to the chassis. The clock control circuitry of the IOM distributes these on the module.

4.15.4 Specifications

Table 4.15-B Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

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4.16 Ethernet Network Access Module

4.16.1 Scope

This section describes the Ethernet Network Access (ENA) module. It explains the module functions, LED indicators, and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0390-A	BA2A30TGAA	Supports the old call model.
89-0390-B	BA2A30TGAB	Contains RAM chip required for new call model. Supports both the old and new call models.
89-0432-A	BAUIADPEAA	Supports the new call model only.

Note: Shaded part numbers have been "manufacture discontinued," but are still supported.

4.16.2 Functional Description

The ENA module is a front IOM and requires a rear module for physical connections. The rear card could be a rear Quad 1000BASE-T or a Quad 1000BASE-SX Ethernet Interface Module.

The ENA module is installed in slots I/O-8 and I/O-10, but it can be used in other I/O slots. The slot choice is limited by the desire for active gigabit ports. Other I/O slots will only accommodate one active gigabit port.

The ENA module will detect which version of rear card is installed and configure itself accordingly. The ENA card cannot operate in mixed-mode, i.e., with some ports operating at gigabit rates and other ports operating at the 10 or 100 megabit rate. If a quad version of the interface module is installed, then the ENA assumes 1000BASE-T or BASE-SX is the desired mode.

Some older routers are limited by packet per second performance (i.e., they cannot perform wire speed routing for GigE interfaces). The maximum packets per second performance is configurable per GigE interface. No additional calls will be established over a particular GigE interface if the packets per second limit would be exceeded.

4.16.2.1 General Mechanical Representation

The ENA module is approximately 14 inches high and plugs into the midplane for connections to rear module and the SF and SP modules. Refer to Figure 4.16-1 for an illustration of the midplane connector, the ENA module and the front of the module. Refer to Table 4.16-A for a description of the LEDs.

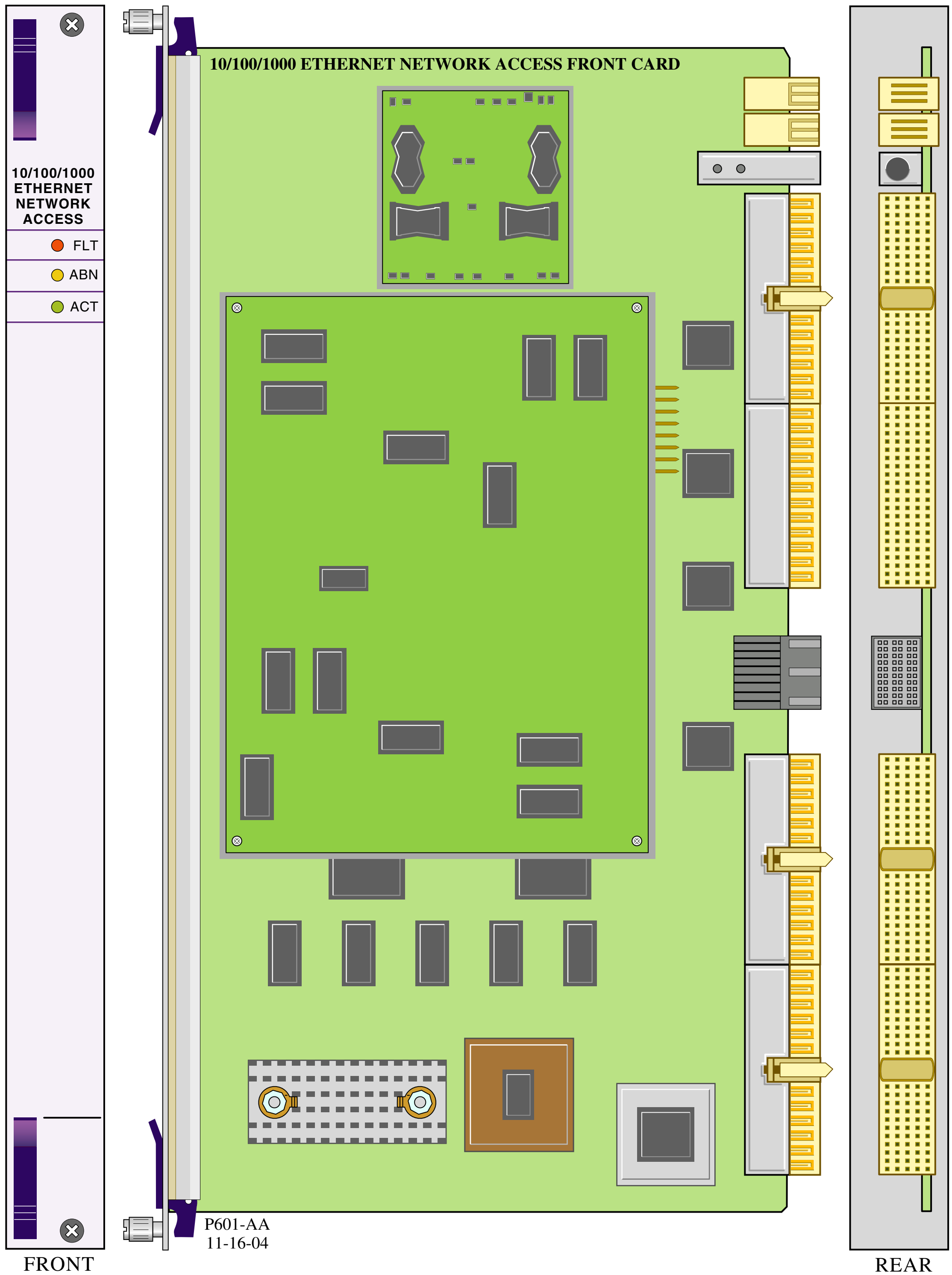


Figure 4.16-1. Ethernet Network Access Module

4.16.2.2 LEDs

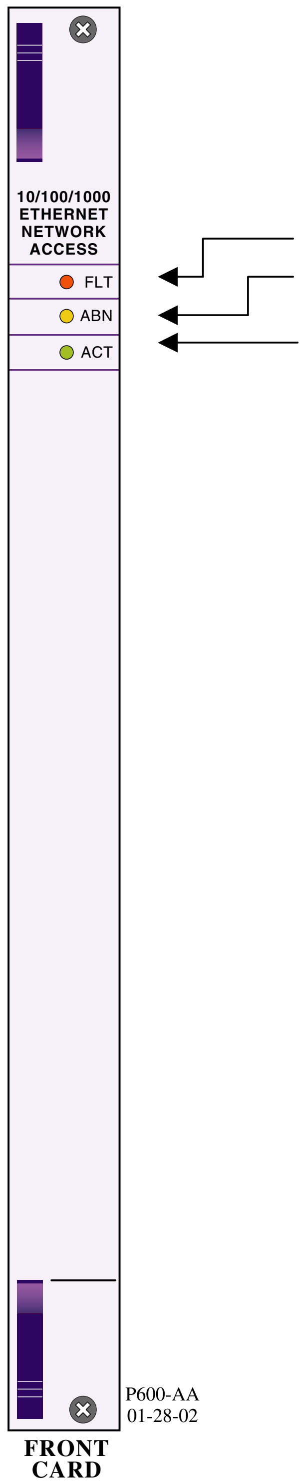


Table 4.16-A. LEDs of ENET Module

LEDs	Color	Description
FLT	Red	Indicates a local internal fault.
ABN	Yellow	Indicates a remote fault or abnormal condition.
ACT	Green On	Indicates that the module has been equipped for service.

4.16.3 Theory of Operation

Each ENA module channels the Ethernet ports to their destinations. Refer to Figure 4.16-2 for a block diagram of the ENA module.

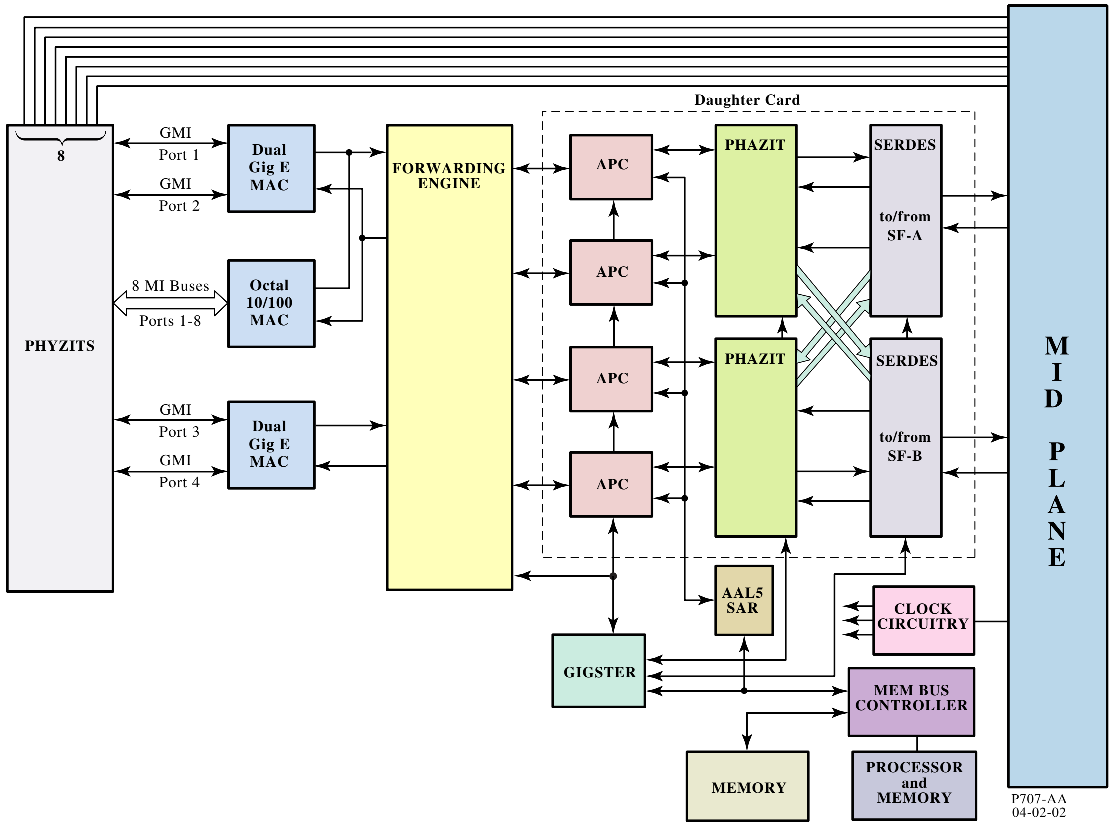


Figure 4.16-2. Ethernet Network Access Module Block Diagram

4.16.3.1 PHYZIT

The ENA module has four PHYZITs that act as the interface between the Media Access Controllers (MACs) and the quad transceivers located on the rear module. Each PHYZIT inputs or outputs one Gigabit Media Independent (GMI) and two Media Independent (MI) interfaces on the MAC side of the device. Bus usage on the midplane side is determined by the rear module.

4.16.3.2 Media Access Controllers (MACs)

The ENA module has three Ethernet media access controllers (MACs) for interfacing via the PHYZITs and midplane to an Ethernet transceiver on the rear module. There are two gigabit Ethernet MACs and one octal 10/100 MAC. IP packets from the rear module must be segmented in the forwarding engine before being sent to the SF module. Cells coming from the switch fabric must be reassembled in the forwarding engine and packets sent to the PHYZIT for transmission through the rear card Forwarding Engine

The main function of the forwarding engine is to examine incoming packets or cells and based on the incoming IP address and the UDP source or destination address, and make a forwarding/routing decision. Because the ENA supports many Voice Server modules, it must determine the module slot for the incoming packets.

4.16.3.3 ATM Port Controllers (APCs)

The APCs maintain and manage the ATM Virtual Connections. They perform the scheduling and policing of ATM functions on the data flowing through the module.

4.16.3.4 PHAZITs

The PHAZIT's main function is a 4:2 switch fabric multiplexer for the APCs and links the SERDES devices to the APCs. In the egress direction, the Phazits switch the active switch fabric ports to the APCs, synchronize transfers between the SERDES and the APCs and check the integrity of the data from the midplane.

In the ingress direction from the network, it is designed to interface each APC to both A and B SF modules. Ingress data will be sent from an APC to the Phazit, where the Phazit will then pass the cell data to both A and B Serdes for SF A and B modules.

4.16.3.5 Serializer/Deserializer (SERDES)

The SERDES provide the data interface to the SF. They take the 1.0GHz embedded clock/data stream from the SF and extract a clock from it and provide 8-bit-wide data to the PHAZIT circuitry or take the 8-bit wide data from the PHAZIT and embed the clock and send the clock/data stream to the SF module.

4.16.3.6 GIGSTER

The GIGSTER implements the maintenance link functionality of the MLBA (Maintenance Link Bus Adapter), which provides a serialized point-to-point interconnect between the SF module and each Network Access module, and its microprocessor. This link is used to reset a module, detect CLEI code, control the LEDs located on the module, download images to the processor's memory, program the circuit switch registers and communicate operational status to the SP. It also provides a bridge between the PCI bus and the non-PCI-bus-based peripherals, such as the MACs, forwarding engine and APC devices.

4.16.3.7 Microprocessor, Memory Bus Controller and Memory

The processor section has a microprocessor with memory and a microprocessor controller for controlling the module. Each module also has an EEPROM that contains the CLEI code for the module.

4.16.3.8 Segmentation and Reassembly (SAR)

There is a stand-alone Segmentation and Reassembly (SAR) unit on the PCI bus of each module to provide the microprocessor a means of communication to the SF module.

4.16.3.9 Power

Each ENA module has its own DC-to-DC converter (not shown in block diagram), which converts the 48 volts supplied from the backplane to the local voltages required (3.3Vdc, etc.).

4.16.3.10 Clocks and Synchronization

Clock and framing information is received from the SP clock circuitry. The Maintenance Link, ATM switch fabric and line interfaces all operate synchronously to the BITS timing supplied to the SP clock circuitry. The clock control and distribution circuitry of the IOM distributes these on the module.

4.16.4 Redundancy

The ENA module is installed in slots I/O-8 and I/O-10. The module in I/O-8 is the active/primary module and the ENA module in I/O-10 is the standby/secondary module. The front modules are paired with the rear modules that provide the physical interfaces the network via Layer 2 or 3 hubs, routers or switches.

If the active ENA in I/O-8 fails because of an internal fault, it will fail over to the standby ENA in I/O-10. The standby ENA then broadcasts a gratuitous ARP to map the standby MAC address to the IP address. Both ENAs use the same IP address, but have different MAC addresses.

The ENA modules, active/standby, check on the link status by pinging the router. If the active ENA cannot ping the router and the standby ENA can, the active ENA will fail over to the standby ENA. The standby ENA then broadcasts a gratuitous ARP to map the standby MAC address to the IP address. If neither ENA module can ping the router, there is a loss of connectivity to the IP network. If the stand-by has more active ports than the active ENA module then a failover will occur.

When the ENA in I/O-8 is replaced, the standby ENA in I/O-10 will automatically fail over if the switch is not running 3.9.X.X system software. If the switch is running 3.9.X.X software, then a restore command, RST-EQPT::IOM-8, must be executed using TL1 or EMS.

4.16.5 Specifications

Table 4.16-B. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

NOTES:

4.17 Quad Rear 1000BASE-T Ethernet Interface Module

4.17.1 Scope

This section describes the Rear Quad 1000BASE-T Ethernet Interface module. It explains the module functions, LED indicators, and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0391-A	BA2A20SGAA	

4.17.2 Functional Description

The Quad 1000BASE-T Ethernet Interface module is a rear IOM with physical connections for the front Ethernet Network Adapter (89-0390) module. The module has four RJ-45 Ethernet ports that operate at 1000 Mbps in accordance with IEEE 802.3. This module is restricted to slots 8 and 10 if all four ports are used for 1000BASE-T connections. If used in any other slots and 1000BASE-T is used, only the first port is available.

4.17.2.1 General Mechanical Representation

The Quad 1000BASE-T Ethernet module is approximately 14 inches high and plugs into the midplane for connections to the Ethernet Network Adapter module. See Figure 4.17-1 for an illustration of the midplane connector, the Ethernet module and the front of the module. See Table 4.17-A for a description of the LEDs on Ethernet ports and Table 4.17-B for the pins of the 1000BASE-T Ethernet jacks.

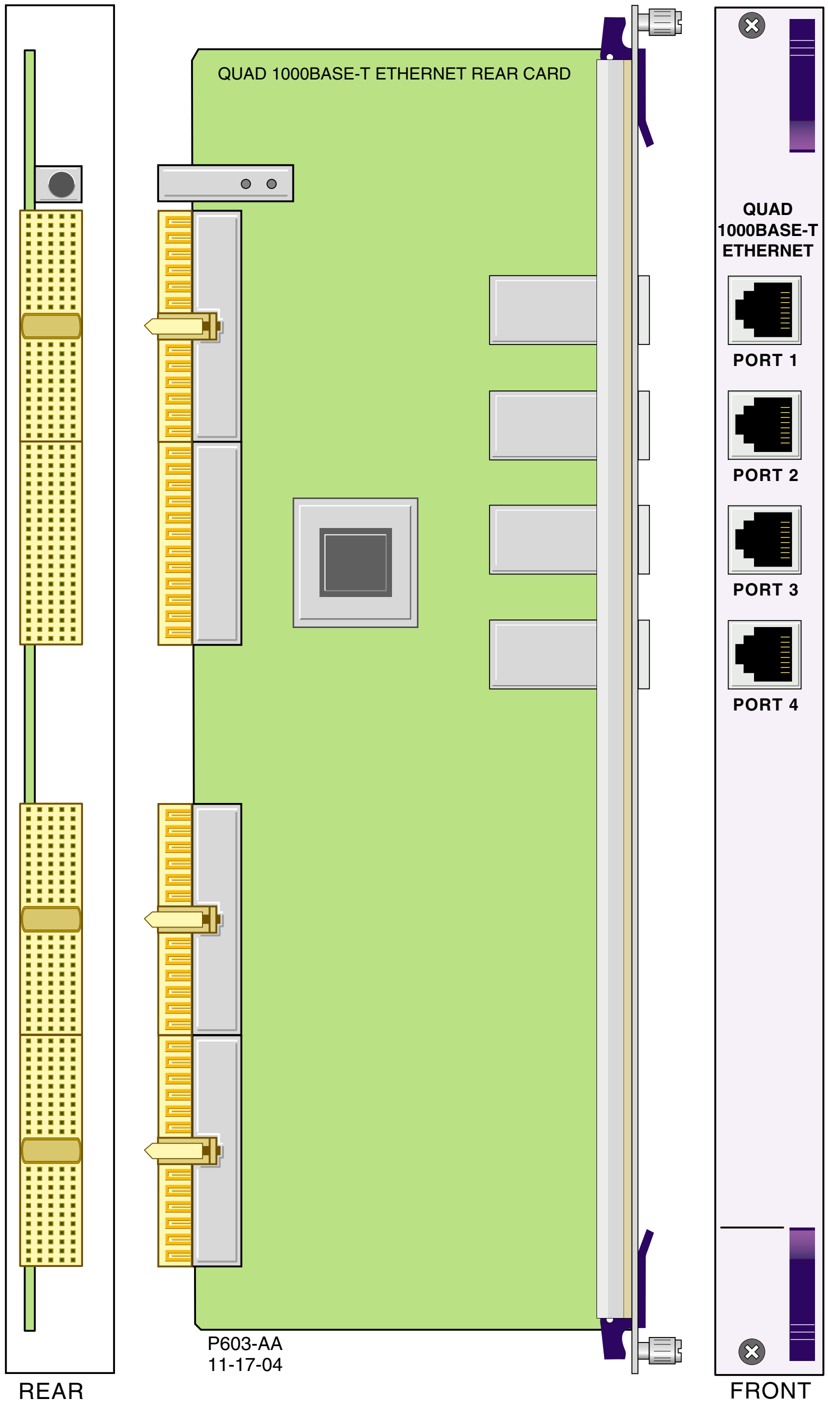
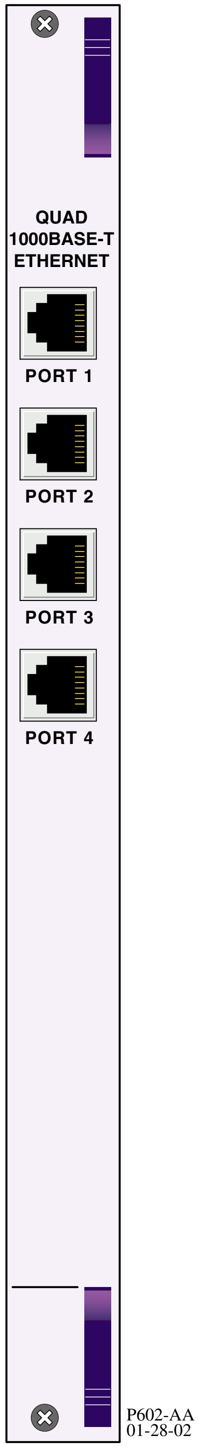


Figure 4.17-1. Rear Quad 1000BASE-T Ethernet Module

4.17.2.2 LEDs

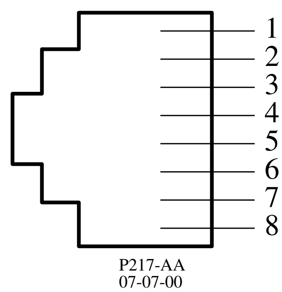


REAR
CARD

Table 4.17-A. LEDs of Ethernet Ports

LEDs	Color	Description
Both	Green	Link established at 1000 Mb/s

Table 4.17-B. 1000BASE-T Connector

Connector	Name	Pin
	BI_DA+	1
	BI_DA-	2
	BI_DB+	3
	BI_DC+	4
	BI_DC-	5
	BI_DB-	6
	BI_DD+	7
	BI_DD-	8

4.17.3 Theory of Operation

Each Rear Quad 1000BASE-T Ethernet module has on-board circuitry to pass Ethernet data from the connector port to the front Ethernet Network Adapter. Refer to Figure 4.17-2 for a block diagram of the Rear Quad 1000BASE-T Ethernet module.

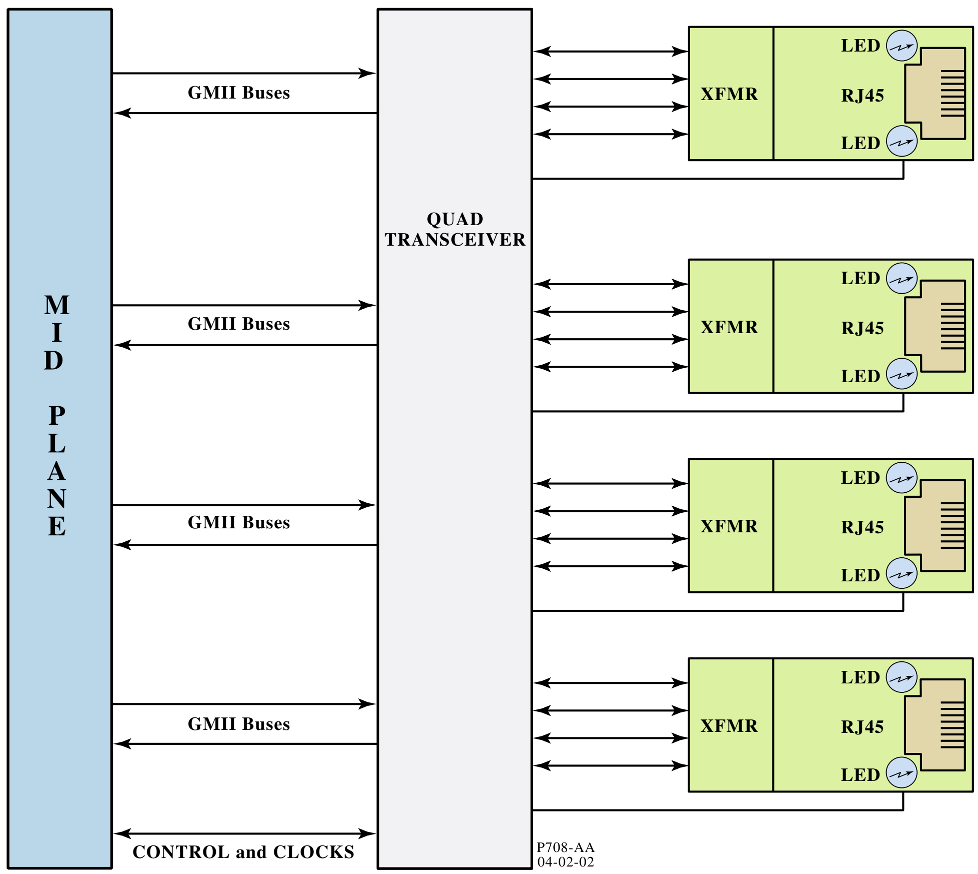


Figure 4.17-2. Quad 1000BASE-T Ethernet Interface Module Block Diagram

4.17.3.1 RJ-45 Ports

There are four RJ-45 jacks on the rear of the module for connecting to an Ethernet network. All eight pins of the connector are used for 1000BASE-T. Refer to Table 4.17-B for the pins of the 1000BASE-T Ethernet jacks. Each connector has two green LED indicators and both are illuminated for a 1000 Mbps connection.

4.17.3.2 Ethernet Transceivers

The Quad 1000BASE-T Ethernet module has a quad gigabit Ethernet transceiver that interfaces to the front Ethernet Network Adapter module via eight (two per port) data buses and the midplane connector. A management bus also links the transceivers of the rear module to the Ethernet Media Access Controller (MAC).

4.17.3.3 Power

The Quad 1000BASE-T Ethernet module receives is power from the front Ethernet Network Adapter.

4.17.4 Specifications

Table 4.17-C. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

1

NOTES:

4.18 Quad Rear 1000BASE Fiber-Optic Ethernet Interface Modules

4.18.1 Scope

This section describes the Rear Quad 1000BASE Fiber-Optic Ethernet Interface modules. There are two versions of these modules, one using single-mode fiber and the other using multi-mode fiber. This section explains the module functions, LED indicators, and connector interfaces.

The CLEI codes of the modules are as follows:

Part Numbers	CLEI Codes	Comments
89-0399-B	Single-mode	
89-0421-A	Multi-mode	

4.18.2 Functional Description

The Quad 1000BASE-LX Ethernet Interface module (89-0421) is a rear IOM with physical connections for a front Ethernet Network Adapter (89-0390) module. The module provides four SC multi-mode fiber optic ports that operate at 1000 Mbps in accordance with IEEE 802.3.
The Quad 1000BASE-SX Ethernet Interface module (89-0399) is a rear IOM with physical connections for a front Ethernet Network Adapter (89-0390) module. The module provides four SC single-mode fiber optic ports that operate at 1000 Mbps in accordance with IEEE 802.3.

The interface modules are usually installed in IOM slots 8 and 10, but they can be used in other I/O slots. The slot choice is limited by the desire for active gigabit ports. Other IOM slots will only accommodate one active gigabit port. When all four ports of the module are used, an IOM cannot be used in IOM slot 11.

4.18.2.1 General Mechanical Representation

The Quad 1000BASE-LX Ethernet module and Quad 1000BASE-SX Ethernet modules are approximately 14 inches high and plug into the midplane for connections to the ENA module. See Figure 4.18-1 for an illustration of the midplane connector, the Ethernet Interface module and the front of the module. See Table 4.18-A for a description of the LEDs.

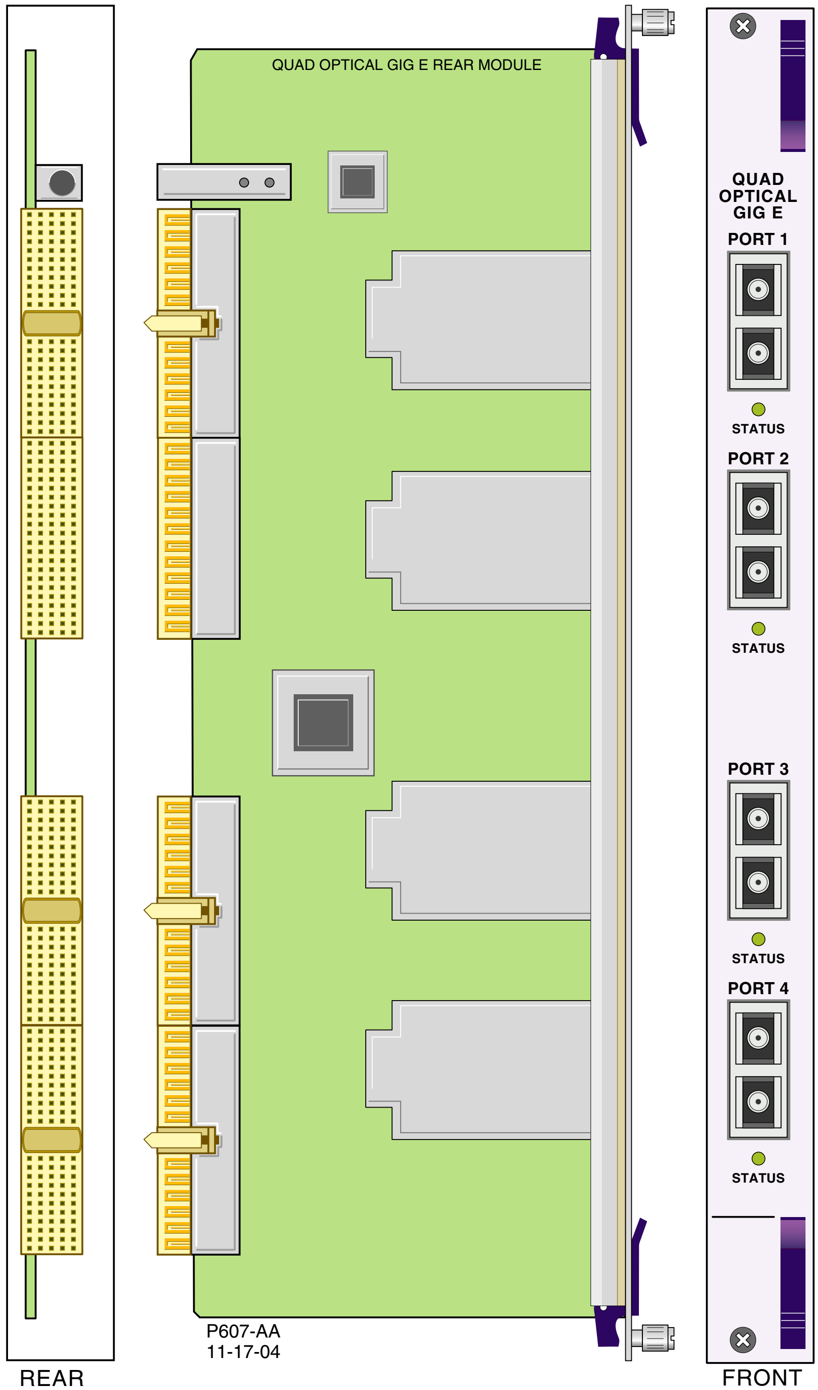
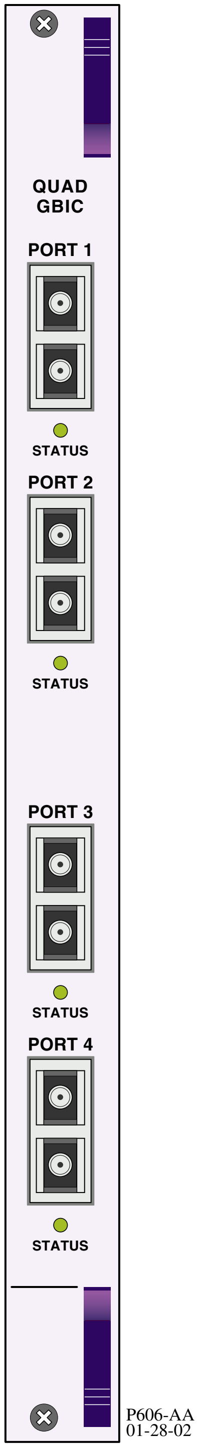


Figure 4.18-1. Rear Quad 1000BASE-XX Ethernet Interface Module

4.18.2.2 LEDs



REAR CARD

Table 4.18-A. LEDs of GBIC Ethernet Ports

LEDs	Color	Description
Status	GREEN SOLID	A LINK condition exists on that GBIC port.
	GREEN BLINKING	A LINK condition with Transmit or Receive activity
	YELLOW	Transmitter is disabled on that GBIC port.
	OFF	No LINK exists on that GBIC port.

4.18.3 Theory of Operation

The Rear Quad 1000BASE-LX and 1000BASE-SX Ethernet modules have on-board circuitry to pass Ethernet data from the connector port to the front Ethernet Network Adapter. Refer to Figure 4.18-2 for a block diagram of the Rear Quad 1000BASE-XX Ethernet module.

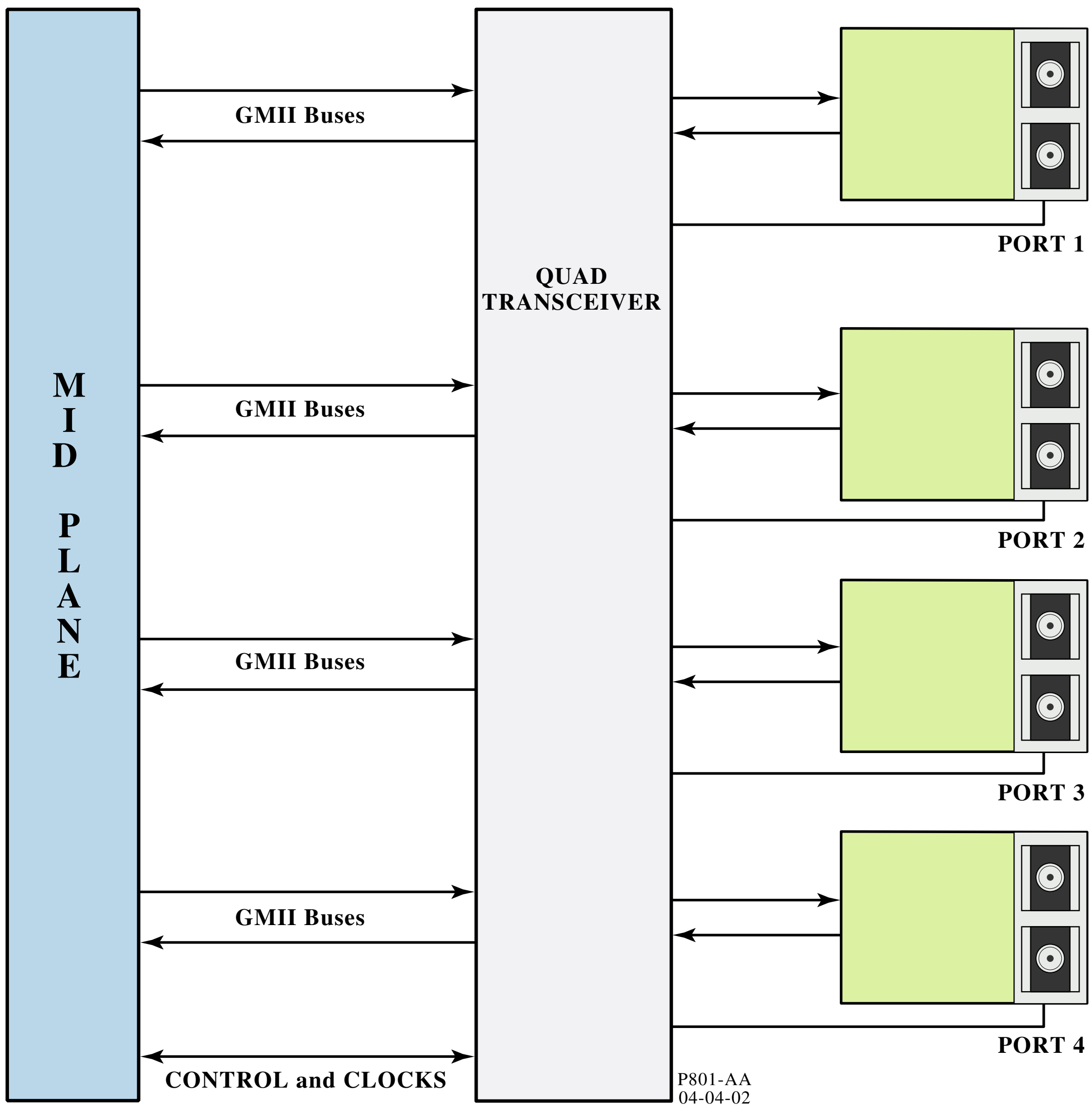


Figure 4.18-2. GBIC 1000BASE-XX Ethernet Interface Block Diagram

4.18.3.1 GBIC Ports

There are sockets for four-gigabit interface converters (GBICs) each with Class-1 Laser, 1310 nm (single-mode) or 850 nm (multi-mode) fiber optic transceivers. The fiber optic connectors on the rear of the module are SC-style for connecting to an Ethernet network. Below each set of connectors is a status LED indicator. Refer to Table 4.18-A for a description of the LED.

4.18.3.2 Ethernet Transceivers

The Quad 1000BASE-LX and Quad 1000BASE-SX Ethernet module have quad gigabit Ethernet transceivers that interface to the front Ethernet Network Adapter module via eight (two per port) eight-bit data buses and the midplane connector. A management bus also links the transceivers on the rear module to the Ethernet Media Access Controller (MAC).

4.18.3.3 Power

The Ethernet Interface modules receive power from the front Ethernet Network Adapter.

4.18.4 Specifications

Refer to Table 4.18-B for the environmental specifications.

Table 4.18-C lists the single-mode optical specifications and Table 4.18-D lists the multi-mode optical specifications.

Table 4.18-B Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

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Table 4.18-C. Single-Mode Optical Signal Transmission Specifications

PARAMETER	SPECIFICATION
Line Bit Rate:	1.25 Gb/s
Fiber Mode:	Single-mode
Optical Source:	Laser
Transmitter Output	-6 dBm typical (–11.5 to -3 dBm)
Optical Connector:	Duplex SC
Optical Detector:	PIN Diode
Receive Sensitivity	-19 dBm (BER=1x10^{-12})
Receive Saturation	-3 dBm (BER=1x10^{-12})
Optical Wavelength λ_{out}:	1310 nm typical (1270 to 1355 nm)
Spectral Width ($\Delta\lambda_{rms}$):	4 nm max
Extinction Ratio (r_e):	9 dB min
Span Distance (typ.):	550 m (50/62.5 µm mmf) 5000m (10 µm smf)

Table 4.18-D. Multi-Mode Optical Signal Transmission Specifications

PARAMETER	SPECIFICATION
Line Bit Rate:	1.25 Gb/s
Fiber Mode:	Multi-mode
Optical Source:	Laser
Transmitter Output	-7 dBm typical (–9.5 to -5 dBm)
Optical Connector:	Duplex SC
Optical Detector:	PIN Diode
Receive Sensitivity	-19 dBm (BER=1x10^{-12})
Receive Saturation	-3 dBm (BER=1x10^{-12})
Optical Wavelength λ_{out}:	850 nm typical (820 to 860 nm)
Spectral Width ($\Delta\lambda_{rms}$):	.5 nm max
Extinction Ratio (r_e):	9 dB min
Span Distance (typ.):	550 m (50 um 500MHz-km Fiber) 275m (62.5 um 200MHz-km Fiber)

Table 4.18-C. Single-Mode Optical Signal Transmission Specifications

PARAMETER	SPECIFICATION
Line Bit Rate:	1.25 Gb/s
Fiber Mode:	Single-mode
Optical Source:	Laser
Transmitter Output	-6 dBm typical (–11.5 to -3 dBm)
Optical Connector:	Duplex SC
Optical Detector:	PIN Diode
Receive Sensitivity	-19 dBm (BER=1x10^{-12})
Receive Saturation	-3 dBm (BER=1x10^{-12})
Optical Wavelength λ_{out}:	1310 nm typical (1270 to 1355 nm)
Spectral Width ($\Delta\lambda_{rms}$):	4 nm max
Extinction Ratio (r_e):	9 dB min
Span Distance (typ.):	550 m (50/62.5 µm mmf) 5000m (10 µm smf)

Table 4.18-D. Multi-Mode Optical Signal Transmission Specifications

PARAMETER	SPECIFICATION
Line Bit Rate:	1.25 Gb/s
Fiber Mode:	Multi-mode
Optical Source:	Laser
Transmitter Output	-7 dBm typical (–9.5 to -5 dBm)
Optical Connector:	Duplex SC
Optical Detector:	PIN Diode
Receive Sensitivity	-19 dBm (BER=1x10^{-12})
Receive Saturation	-3 dBm (BER=1x10^{-12})
Optical Wavelength λ_{out}:	850 nm typical (820 to 860 nm)
Spectral Width ($\Delta\lambda_{rms}$):	.5 nm max
Extinction Ratio (r_e):	9 dB min
Span Distance (typ.):	550 m (50 um 500MHz-km Fiber) 275m (62.5 um 200MHz-km Fiber)

5.1 Planning for Installation

5.1.1 Introduction

This document contains the information required to plan for a Lucent switch installation, and provides a list of tools required for installation and a checklist for planning. It includes the physical dimensions of the unit, power, air conditioning and other environmental requirements. It describes all equipment and cables necessary for switch operation, which can be obtained from Lucent if required. The information is for all personnel involved in site planning and preparation for the switch installation.

5.1.2 Location of the Switch

The switch is designed for installation and operation in a central office environment. The switch shelf is NEBS level 3 compliant for central office equipment.

5.1.3 Building Requirements

Standard telephony industry building requirements for equipment installation should be used for the switch. The room selected for system installation should be large enough so that the system racks can be at least 2.5 feet (76 cm) from the walls for front and rear access, and at least 12 inches (31 cm) from the walls for side access.

In addition, 4-foot (1.2 meter) side aisles should be created to allow the maneuvering of racks into place, and to provide ample workspace around the system.

5.1.3.1 Earthquake Resistance

All configurations should be designed to assure that the system remains operational during and after an earthquake, even when the system is located on the upper floors of a Class 4 central office.

5.1.3.2 Lighting

Adequate lighting must be provided in the room where the equipment will be located. However, lighting fixtures must be far enough from the equipment and cables to prevent heat damage, as well as to allow safe access to equipment and cables.

5.1.3.3 Electrical Outlets

The location where the switch will be installed must have an adequate number of AC electrical outlets for tools and test equipment.

5.1.3.4 HVAC Requirements

In order to maintain the required temperature range, HVAC equipment should have the capacity to compensate for up to 2730 BTUs per hour (using DS-1 and triple DS-3 modules) or 4505 BTUs per hour (using octal DS-3/STS-1 modules) for each installed switch shelf.

To calculate the required HVAC capacity, determine the wattage of all installed equipment, and then use the following formula:

Watts x 3.413 = BTUs/hour

5.1.3.5 Environmental Requirements

Table 5.1-A specifies the required environmental conditions for the switch. Special requirements necessary to obtain these conditions must be considered.

Table 5.1-A. Environmental Specifications

Environmental Conditions	Temp. (°F) Min/Max	Temp. (°C) Min/Max	Relative Humidity
Standard temperature operation	+41 to +104	+5 to +40	Up to 85% non-condensing
Standard temperature short term operation	+23 to +122	-5 to +50	Up to 95% non-condensing
Standard temperature storage	-40 to +158	-40 to +70	Up to 95% non-condensing
Operational altitude	From 200 feet below sea level to 13,000 above sea level.		

Notes:

1. Temperature ranges refer to the conditions 5 feet above the bottom of the equipment rack in which the unit is mounted, and 15 inches in front of the unit.
2. Short-term operation refers to a period of not more than 96 consecutive hours, with a total of not more than 15 days per year.

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5.1.4 Chassis Dimensions

The switch chassis is a 23-inch rack-mounted unit with EIA spacing and is 13 RU high (22.75 inch). Refer to Table 5.1-B for chassis dimensions and to Figure 5.1-1 for an illustration of the chassis without the mounting brackets. The switch fits an 18-inch equipment depth profile, which means that the chassis extends 5 inches in front of the rack rail mounting point and 13 inches behind the front of the rail.

Table 5.1-B. Chassis Dimensions

Dimension	Inches	Centimeters
Height	22.75	57.79
Width	21.25	53.98
Depth	18	45.72
Note: Width does not include mounting brackets for the 23 inch rack.		

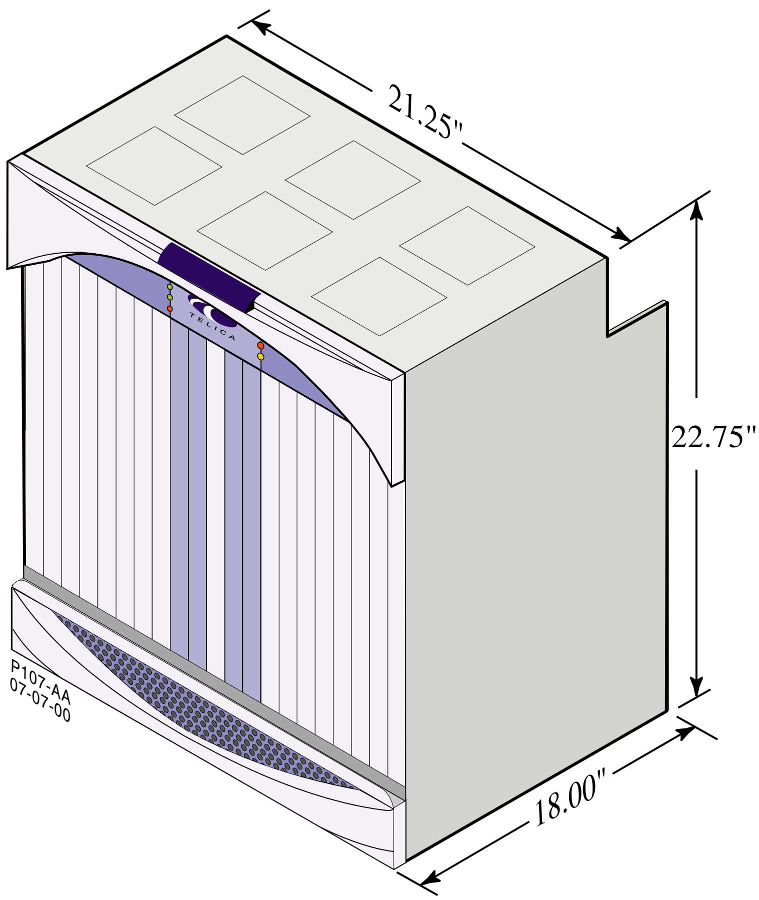


Figure 5.1-1. Chassis

5.1.5 Space Requirements

The switch equipment is typically housed in a 7-foot high unequal-flange rack for mounting EIA standard 23-inch equipment. The floor area for one rack is typically 26 inches wide by 18 inches deep, which is 468 square inches (3.25 square feet). Refer to Table 5.1-C for a listing of the rack and associated hardware.

Additional space requirements should be considered for mounting auxiliary equipment, such as Ethernet hubs, modems, terminals, and cross-connect panels.

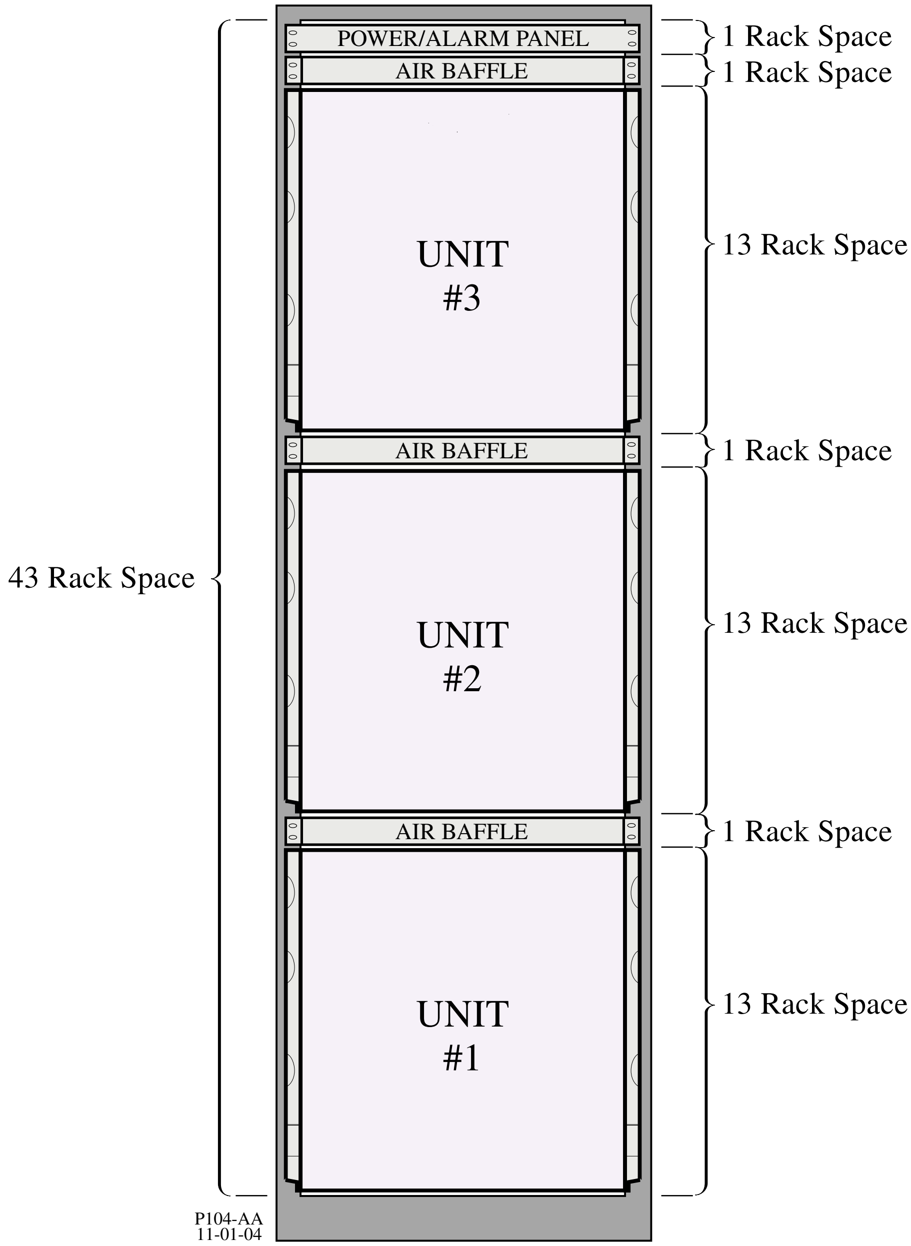
Table 5.1-C. Rack and Hardware

Component	Description	Required
43 RU (75.25") Relay Rack	Unequal flange with 5" side rails or vertical channel data racks with 3" side rails	1 rack holds 3 switches
Auxiliary hardware	Cable mounting standoffs	As required
	Cable mounting accessories	As required
	Cable support hardware	As required
Rack bottom guards Per rack	Front	Optional
	Rear	Optional
Note: Racks, guards and hardware can be obtained from Lucent.		

5.1.5.1 Rack Details

The switch equipment is typically installed in an upright, floor-supported 7-foot high, unequal-flange rack. Although the use of unequal-flange racks (5-inch side rails) is recommended, vertical-channel data racks (3-inch side rails) can be used. Racks and auxiliary hardware, such as cable mounting and cable support hardware, can be obtained from Lucent if necessary.

When the switch is mounted in a rack, an additional 1 RU (1.75 inch) is required above the unit for the air baffle. When mounting more than one switch in a rack, it is recommended that the first unit be installed at the bottom of the rack to facilitate mounting and cable routing. Up to three switch units can be installed in one 7-foot bay with one rack unit of space between for a recommended air baffle, while still accommodating a fuse and alarm panel in the same 43 RU (75.25 inch mounting space) equipment bay as illustrated in Figure 5.1-2. Air baffles, power and alarm panels and cables can be obtained from Lucent.



NOTE: One Rack Space = 1.75"

Figure 5.1-2. Rack details (P104-AA)

5.1.5.2 Servicing Requirements

Servicing clearances must be provided at the front and rear of an installed chassis; they are not needed at the sides. It is recommended that there be 2.5 feet (30 inches) of open space in front of and behind the unit to support access to the equipment for installation and removal of modules and for maintenance. Aisle ways should be 4-feet wide. Refer to Table 5.1-D.

Additional space must be provided for service personnel in which to work, including space for tools and flat surfaces for modules prior to installation.

Table 5.1-D. Space Requirements

Item	Requirement
Floor area of rack	26” x 18” (468 sq.”)
Service clearance	2.5 feet in front
	2.5 feet in rear
Aisles	4 feet

5.1.5.3 Guard Panels

Rack bottom guard panels for equipment protection may be required in front, rear, or both. Unequal flange telephone racks usually have a 5-inch front bottom guard, but often do not include a rear bottom guard.

5.1.5.4 Associated Equipment

Additional rack space requirements may be necessary for mounting auxiliary equipment, such as Ethernet hubs, modems, terminals, and cross-connect panels that may be required for switch operation. If required, this equipment can be obtained from Lucent. Refer to Table 5.1-E for a list of auxiliary equipment.

Table 5.1-E. Auxiliary Equipment

Component	Purpose	Number Required
Cross-Connect Panels	DS-1 demarcation	Dependent on # of DS-1s and DSX capacity
Signaling Ethernet Hub	LAN interconnection	Dependent on configuration
OS Ethernet Hub	LAN interconnection	Optional
Modem	Remote access	Optional
VT-100 Terminal or PC	Craft connection	1
Note: Auxiliary equipment can be obtained from Lucent if necessary.		

DS-1 and DS-3/STS-1 cross connects are required as demarcation points and connections to other equipment. The number of cross-connects needed is dependent upon the size (number of DS-1s and DS-3/STS-1s supported) and the number being connected to the switch.

A 10/100Base-T Ethernet hub may be required for connecting the switch's OS Ethernet connector to a network for monitoring the equipment. Lucent recommends a DC-powered rack-mounted hub, which requires -48 Vdc, fused at 2-amps. This LAN could be a corporate network or a dedicated network of equipment surveillance and control. Access to the OS Ethernet connection also allows access to the switch using a Telnet session or Element Management System (EMS) to configure and monitor the unit.

Modems may be required to provide remote access to the equipment using the craft ports of the switch for monitoring and retrieval of alarms and status.

A VT100 terminal or a PC with a terminal emulation program is required to initially provision the switch using the craft port. There are no Ethernet address defaults and these must be set through the craft port connection.

5.1.6 Grounding Requirements

The switch is suitable for installation in either the integrated ground plane or isolated ground plane system in a central office environment. Only a single connection to the central office ground plane is required. The switch power return is isolated from the chassis ground. The frame/chassis ground path is a non-current carrying path under normal (no fault) conditions. Lucent can provide ground wire with lugs as necessary.

5.1.6.1 Frame/Chassis Ground for the Switch

The frame/chassis ground path provides a low impedance connection for all metal parts of the switch. The frame/chassis ground connection within each switch should be terminated to the main ground bar.

Each switch chassis is connected to the earth/frame ground via a 6 AWG wire, with a double-hole lug at the chassis end. Non-oxidizing grease should be put on the ground lugs to ensure a good connection.

5.1.6.2 Frame/Chassis Ground for the Power and Alarm Panel

The frame/chassis ground connection for the Power and Alarm Panel should be terminated to the main ground bar. Each Power and Alarm Panel is connected to the earth/frame ground via a 6 AWG wire, with a double-hole lug at the chassis end. Non-oxidizing grease should be put on the ground lugs to ensure a good connection.

5.1.7 Power Requirements

5.1.7.1 Basic Power Requirements

For redundancy, each switch requires that power be provided from two separate (A and B) 50-amp breakers at -48 Vdc (for a total of four wires). Therefore, each breaker requires wiring sized to handle up to 50-amps at -48 Vdc. Refer to Table 5.1-F for power requirements. The A and B power returns provide the return path for all –48 Vdc loads. This path is isolated from chassis grounds.

The Lucent shelf may be powered directly from customer-furnished power distribution (home run) or via a power and alarm panel mounted in the equipment bay. Lucent can provide power and alarm panels as necessary.

Table 5.1-F Chassis Power Specifications

Requirement	With DS1/DS3	With Octal DS3	With Compute Modules
Input voltage	-40 Vdc to –56.7 Vdc	-40 Vdc to –56.7 Vdc	-40 Vdc to –56.7 Vdc
Thermal output *	Up to 2730 BTUs /hr/shelf	Up to 4505 BTUs /hr/shelf	Up to 6141 BTUs /hr/shelf
Current draw *	20 Amperes per shelf	33 Amperes per shelf	36 Amperes per shelf
Power consumption *	800 Watts	1320 Watts	1800 Watts
* Fully loaded at 40 Vdc.			

T11-B

5.1.7.2 Power and Alarm Panel (PAP)

A Lucent power and alarm panel, which is 1 RU (1.75 inch) high and normally mounted in the top position of the relay rack, may be used to provide power to the switch. Each switch requires that power be provided from two separate (A and B) 50-amp (at –48 Vdc) breakers.

The input power wire sizing at the power panel must support a 150-amp bus rating and thus must have a minimum of size #1 AWG. The primary system breaker must have a minimum rating of 120 amps and the voltage drop allowable between the Lucent PAP and the power plant must be limited to 2.5V.

The required wire sizes for the power and alarm panel inputs can be calculated using Table 5.1-G. The distances specified are from the power source to the power and alarm panel. Shaded table areas represent wire sizes that cannot be directly terminated on the lugs provided on the Lucent power and alarm panel. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.

Table 5.1-G. Wire Sizes To Power And Alarm Panel

Power and Alarm Panel Feed	
Wire size	Maximum distance to source
1	102
0	127
00	159
000	198
0000	250
Note: Shaded table areas represent wire sizes that cannot be directly terminated on the lugs provided on the Telica shelf and/or breaker panel. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.	
	T2-B

Table 5.1-H lists the cables required, the panel connector, the cable connector and the size and cable length when using a Power and Alarm Panel (PAP).

Table 5.1-H. Power and Alarm Panel Power Connections

Cable/Lucent Part Number	**System Connector**	**Cable Connector**	**Size and Length (Max)**
Chassis ground/ 45-5XXX-1-0	Two terminal studs for mounting lug	Double hole long-barrel ground lug with two mounting holes spaced 5/8 (or ¾) center-to-center	#6 AWG and no max. length
Power (-48 Vdc) (two for each power source)/ 45-4XXX-1-0	Two terminal studs for mounting lugs	Double hole long-barrel ground lug with two mounting holes spaced 5/8 (or ¾) center-to-center	Determine by using Table 5.1-J
Power (Return) (two for each power source) 45-4XXX-1-0	Two terminal studs for mounting lugs	Double hole long-barrel ground lug with two mounting holes spaced 5/8 (or ¾) center-to-center	Determine by using Table 5.1-J
Note: XXX indicates the cable length in feet. The above cable part numbers are #6 AWG. Cables of other sizes can be obtained from Lucent if necessary.			

5.1.7.3 Switch Chassis

The chassis has a maximum power load rating of 50-amps at –40 Vdc and must be supported by circuit breakers rated at 50-amps per feeder at the intermediate power and alarm panel. The maximum current requirement for three fully loaded chassis is 150-amps at -40 Vdc.

The switch may be powered by a Lucent Power and Alarm Panel mounted in the equipment bay or directly from customer-furnished power distribution (home run). In the event of loss of power on one of the buses, the other bus must be able to supply current for the entire switch chassis. Therefore, each bus requires wiring sized to handle up to 50-amps at –48 Vdc. Each switch requires that power be provided from two separate A and B 50-amp breakers at –48 Vdc (four wires).

Table 5.1-I. Switch Power Connections

Cable/Lucent Part Number	System Connector	Cable Connector	Size and Length (Max)
Chassis ground/ 45-5XXX-1-0	Two terminal studs for mounting lug	Double hole long-barrel ground lug with two mounting holes spaced 5/8 (or ¾) center-to-center	#6 AWG and no max. length
Power (-48 Vdc) (two for each power source)/ 45-4XXX-1-0	Two terminal studs for mounting lugs	Double hole long-barrel ground lug with two mounting holes spaced 5/8 (or ¾) center-to-center	For PAP, use <10 feet of #6 AWG. For Homerun, determine by using Table 5.1-J
Power (Return) (two for each power source)/ 45-4XXX-1-0	Two terminal studs for mounting lugs	Double hole long-barrel ground lug with two mounting holes spaced 5/8 (or ¾) center-to-center	For PAP, use <10 feet of #6 AWG. For Homerun, determine by using Table 5.1-J
Note: XXX indicates the cable length in feet. The above cable part numbers are #6 AWG. Cables of other sizes can be obtained from Lucent if necessary.			

5.1.7.3.1 Power and Alarm Panel Cabling

When the power panel is located in the same rack as the switch then #6 AWG wires with double-hole lugs on the switch chassis end can be used to connect the chassis to the power panel.

The Lucent power and alarm panel provides a DB-9 female connector interface to connect shelf alarms to the bay alarm indicator on the power and alarm panel. Lucent can provide DB-9 male-male cables for this purpose as necessary.

5.1.7.3.2 Direct Home Run Power Cabling

When the switch is powered directly from customer-furnished power distribution (home run), the allowable voltage drop between the Lucent shelf and the power plant is limited to 2.5V. The shelf has a maximum load of 50-amps at -40 Vdc and requires different wire sizes depending on the distance between the power source and the switch. The required wire sizes can be determined using Table 5.1-J. The distances specified are from the power source to the Lucent shelf. The Lucent shelf is assumed for these calculations to have a worst-case load of 33 amps at -40 Vdc.

Table 5.1-J. Wire Sizes For Home Run

Home run to shelf (no Power and Alarm Panel)	
Wire size	Maximum distance to source
6	80
4	157
2	251
1	315
0	393
Note: Shaded table areas represent wire sizes that cannot be directly terminated on the lugs provided on the Telica shelf and/or breaker panel. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.	
	T3-B

5.1.8 System Interfaces

5.1.8.1 DS-1

The switch DS-1 interfaces can be provisioned for the following modes of operation: Primary Rate ISDN, SS7 links/linksets, or as Inter-Machine Trunks (IMT). Lucent recommends that the first DS-1 port (#1 of 28) on the module, with a user-selected DS-0, in each of the first two IOM slot positions (chassis slots 1 and 2) be used for SS7 links.

Notes:

- CAS and ISDN, CAS and MTP-2, CAS and GR-303 can be intermixed on an IOM. ISUP trunks can be configured on an IOM regardless of CAS, MTP2, ISDN, or GR303.

- IDSN D-channels or GR-303 signaling CANNOT be mixed with SS7 MTP2 channels on the same IOM due to a software configuration limitation.

- Call processing capability diminishes as more T1s are configured for CAS.

- If CAS and PRIs co-exist on an IOM there can be a maximum of 140 CAS DS1s and 84 PRIs.

- The table below lists the number of SS7 MTP-2 messages per second that can be supported by various IOMs at different IOM CPU utilization rates, assuming that the IOM is ONLY handling SS7 signaling and IMTs. The table does not indicate the calls per second for SS7 links since these performance numbers are a function of TCAP transactions as well as ISUP (or BICC) usage. The total number of messages per second per chassis is limited to 8,500 messages/sec (85% utilization).

Description	Part Number	MTP-2 Msgs/sec (80%)
3 DS-3/STS-1	89-0397	544
8 DS-3/STS-1	89-0398	544
3 DS-3/STS-1 w digit collect	89-0410	544
8 DS-3/STS-1 w digit collect	89-0411	544
28 T1/E1/J1	89-0414	768
3 DS-3 w digit collect	89-0424	768
8 DS-3 w digit collect	89-0425	768

The DS-1 I/O rear interface modules provide the DS-1 terminations. Each DS-1 IOM terminates 28 DS-1 channels via two 64-pin connectors (28 pairs for transmit, 28 pairs for receive). Typically, the DS-1 cables terminate at a DSX-1 cross-connect panel via wire-wrap or 64-pin connectors. The cable distance to the DSX-1 cross-connect panel cannot be greater than 655 feet using 22-gauge T1 cable. 24-gauge cable may also be used for distances up to 400 feet. Refer to Table 5.1-K for Lucent part numbers of the cable.

Provisioning information must be provided to create the configuration database within the switch. Information that may be required for provisioning can be found in the "Planning for Provisioning" section of this manual. Provisioning procedures are provided in the Installation and Operations Manual. Information about TL1 commands can be found in the TL1 Commands Reference Guide.

Table 5.1-K. DS-1 Cables

Part Number	Description	Number Required
43-1XXX-1-1	DS-1 cable, 64-pin connectors, 22-gauge solid wire (28 pairs terminated), XXX feet long, shielded connectors, male, male, screw fasteners	2 per DS-1 module
43-2XXX-1-1	DS-1 cable, 64-pin connectors, 24-gauge solid wire (28 pairs terminated), XXX feet long, shielded connectors, male, male, screw fasteners	
Note: XXX is the length of the cable in feet.		

5.1.8.2 DS-3/STS-1

Like the DS-1 interfaces, DS-3/STS-1 interfaces can be provisioned for the following modes of operation: Primary Rate ISDN, SS7 links/linksets, or as InterMachine Trunks (IMT).

Notes:

- CAS and ISDN, CAS and MTP-2, CAS and GR-303 can be intermixed on an IOM. ISUP trunks can be configured on an IOM regardless of CAS, MTP2, ISDN, or GR303.

- IDSN D-channels or GR-303 signaling CANNOT be mixed with SS7 MTP2 channels on the same IOM due to a software configuration limitation.

- Call processing capability diminishes as more T1s are configured for CAS.

- If CAS and PRIs co-exist on an IOM there can be a maximum of 140 CAS DS1s and 84 PRIs.

- The table below lists the number of SS7 MTP-2 messages per second that can be supported by various IOMs at different IOM CPU utilization rates, assuming that the IOM is ONLY handling SS7 signaling and IMTs. The table does not indicate the calls per second for SS7 links since these performance numbers are a function of TCAP transactions as well as ISUP (or BICC) usage. The total number of messages per second per chassis is limited to 8,500 messages/sec (85% utilization).

Description	Part Number	MTP-2 Msgs/sec (80%)
3 DS-3/STS-1	89-0397	544
8 DS-3/STS-1	89-0398	544
3 DS-3/STS-1 w digit collect	89-0410	544
8 DS-3/STS-1 w digit collect	89-0411	544
28 T1/E1/J1	89-0414	768
3 DS-3 w digit collect	89-0424	768
8 DS-3 w digit collect	89-0425	768

There are different types of DS-3 IOMs. The triple DS-3/STS-1 IOM, part number 89-0410-A, provides three (3) DS-3s or STS-1s per module. The triple DS-3/STS-1 IOM, part number 89-0424-A, provides three (3) DS-3s per module. The octal DS-3/STS-1 IOM, part number 89-0411-A, provides eight (8) DS-3s or STS-1s per module. The octal DS-3/STS-1 IOM, part number 89-0425-A, provides eight (8) DS-3s per module. The rear IOM interfaces provide the DS-3/STS-1 terminations. Each triple DS-3 IOM terminates three DS3 channels via two BNC connectors (one for transmit, one for receive) per DS-3 for a total of six connectors. The octal DS-3/STS-1 IOM terminates eight DS-3/STS-1 channels via two BNC connectors per DS-3/STS-1 for a total of sixteen connectors. Typically, the DS-3 cables terminate at a DSX-3 cross-connect panel via BNC connectors. The cable distance to the DSX-3 cross-connect panel cannot be greater than 450 feet. Refer to Table 5.1-L for Lucent part numbers of the cable.

Provisioning information must be provided to create the configuration database within the switch. Information that may be required for provisioning can be found in the "Planning for Provisioning" section of this manual. Provisioning procedures are provided in the Installation and Operations Manual. Information about TL1 commands can be found in the TL1 Commands Reference Guide.

Table 5.1-L. DS-3/STS-1 Cables

Part Number	Description	Number Required
44-1XXX-2	Single DS-3 734-series cable, XXX feet long with BNC shielded connector at both ends	2 per DS-3
44-2XXX-1	DS-3 735-series cable, XXX feet long with BNC shielded connectors at one end	2 per DS-3
44-3XXX-1	DS-3 735-series cable, bundle of three, XXX feet long with BNC shielded connectors at one end	2 per DS-3 module
44-3XXX-2	DS-3 735-series cable, bundle of three, XXX feet long with BNC shielded connectors at both ends	2 per DS-3 module
44-8XXX-2	DS-3735-series cable, bundle of eight, XXX feet long with BNC shielded connectors at both ends	2 per Octal DS-3/STS-1 module
Note: XXX is the length of the cable in feet.		

5.1.8.3 Ethernet Network Access Modules

The Ethernet Network Access (ENA) module, Lucent part number 89-0432 is a front IOM and requires a rear module for physical connections. The rear card could be a rear Quad 1000BASE-T or a Quad 1000BASE-SX Ethernet Interface Module. The ENA module is installed in slots I/O-8 and I/O-10, but it can be used in other I/O slots. The slot choice is limited by the desire for active gigabit ports. Other I/O slots will only accommodate one active gigabit port.

The ENA module will detect which version of rear card is installed and configure itself accordingly. The ENA card cannot operate in mixed-mode, i.e., with some ports operating at gigabit rates and other ports operating at the 10 or 100 megabit rate. If a quad version of the interface module is installed, then the ENA assumes 1000BASE-T or BASE-SX is the desired mode. The Quad 1000BASE-T Ethernet Interface module, Lucent part number 89-0391, is a rear IOM with physical connections for the front Ethernet Network Adapter (89-0390) module. The module has four RJ-45 Ethernet ports that operate at 1000 Mbps in accordance with IEEE 802.3.

The Quad 1000BASE-LX Ethernet Interface module (89-0421) is a rear IOM with physical connections for a front Ethernet Network Adapter (89-0390) module. The module provides four SC multi-mode fiber optic ports that operate at 1000 Mbps in accordance with IEEE 802.3. The Quad 1000BASE-SX Ethernet Interface module (89-0399) is a rear IOM with physical connections for a front Ethernet Network Adapter (89-0390) module. The module provides four SC single-mode fiber optic ports that operate at 1000 Mbps in accordance with IEEE 802.3.

5.1.8.4 Voice Server Modules

Voice Server modules (VSM-2), Lucent part number 89-0395, provide the processing to take voice traffic to/from the TDM network and transmit/receive packetized voice to the Ethernet network via the ENA module. It has no external interfaces. The Voice Server does not have a corresponding rear module. The rear slot of the corresponding VS module must contain a blank panel to meet the electromagnetic interference (EMI) and system-cooling requirements.

5.1.8.5 Primary Rate ISDN (PRI) Interface

The switch supports National ISDN-2 PRI, Lucent 5ESS™ and Nortel's DMS100 interfaces. Each PRI allocates DS-0 channel #24 as the ISDN D-channel. DS-0 channels 1 to 23 are available as ISDN B-channels.

5.1.8.6 SS7 Links

The physical interfaces for the SS7 links on the switch chassis are DS-1 signals. Lucent can provide appropriate conversion equipment as necessary for customers who are not set up for DS-1 format. Two DS-1 I/O modules are used to provide for SS7 redundancy. The SS7 pair requires four cables with connectors to terminate TX and RX DS1 signals

When selecting the DS-1 SS7 links, Lucent recommends that the system use the first DS-1 port (#1 of 28) on the module, with a user-selected DS0, in each of the first two IOM module slot positions (chassis slots 1 and 2).

5.1.8.7 InterMachine Trunks (IMTs)

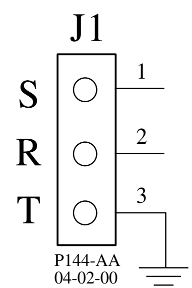
Intermachine trunks are DS-1 or DS3 circuits from another switch. To provision the point code and trunk group information for IMTs, terminations must be known.

5.1.8.8 BITS Clock Interface

The switch can have different sources for system timing: external BITS timing, recovered line timing from IOMs in I/O-1 and I/O-2 or I/O-8 and I/O-10 or internal timing. The timing source is provisioned using a TL-1 command.

When using BITs, the switch requires two external BITS timing inputs for protection. These connections are provided on the rear SF modules, using wire wrap pins. Refer to Table 5.1-M for an illustration of the connector and a description of the pins. When installing and cabling the modules, the BITS cabling is connected and configured during provisioning of the switch. The Lucent part number for the BITS cable is 45-6XXX-1-0, where XXX is the length of the cable in feet. The BITS or line interfaces typically operate with ESF-framed DS-1 all-ones clock signals.

Table 5.1-M. BITS Timing Connector

Port	Connector	Pin	Description
SRT		1	Shield
		2	Ring
		3	Tip
			23

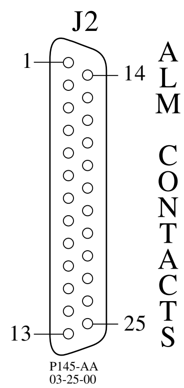
5.1.8.9 Alarm Contact Closures and Bay Alarm

The switch also provides Bay In and Bay Out connectors on the rear SF-A module for daisy-chaining three units in a rack to the Power and Alarm Panel to illuminate its Bay Alarm lamp. Refer to
Table 5.1-N for the cable part number and to Table 5.1-P for a pin-out of the connector.

Table 5.1-N. Required AlarmCables

Part Number	Description	Number Required
45-3xxx-1-0	Bay Alarm Cable, DB9M to DB9M	1, if using Power and Alarm Panel
45-3xxx-2-0	Alarm Contacts Cable, DB25M to Bare Wire	1, if using Alarm Contacts
Note: XXX indicates the length of the cable in feet.		

Table 5.1-O. Alarm Contacts Connector

Port	Connector	Pin	Description
J2	ALM CONTACTS 	14	CRI-AUD-NC
		2	CRI-AUD-COMMON
		1	CRI-AUD-NO
		3	MAJ-AUD-NC
		4	MAJ-AUD-COMMON
		16	MAJ-AUD-NO
		5	MIN-AUD-NC
		6	MIN-AUD-COMMON
		18	MIN-AUD-NO
		21	CRI-VIS-NC
		9	CRI-VIS-COMMON
		8	CRI-VIS-NO
		10	MAJ-VIS-NC
		11	MAJ-VIS-COMMON
		23	MAJ-VIS-NO
		12	MIN-VIS-NC
		13	MIN-VIS-COMMON
		25	MIN-VIS-NO
		7	N/A
		15	N/A
		17	N/A
		19	N/A
		20	N/A
		22	N/A
		24	N/A

Note: Audible only alarms can be silenced or cut off (ACOed). It is recommended that visual alarms be used for an external monitoring/management system.

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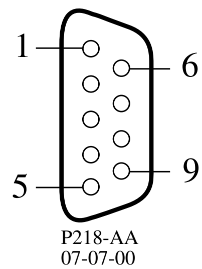
Table 5.1-P. Bay Alarm Out Connector

Port	Connector	Pin	Description
J1		1	Common
		2	N/A
		3	N/A
		4	N/A
		5	BAY-LAMP-NO
		6	N/A
		7	N/A
		8	N/A
		9	N/A
			22

The switching system provides contact closures for critical, major, and minor alarms, both audible and visual. These alarm dry contacts (form C) are provided on a DB-25 female connector on the rear SF-A module. Refer to Table 5.1-O for the pin-out of the connector and to Table 5.1-N for cable part number. Only Audible alarms can be silenced or cutoff (ACOed). It is recommended that visual alarms be used for an external monitoring/management system.

5.1.8.10 Craft Interface Terminal

Craft interface connections are made using the DB-9 RS-232 DTE connector on the front or rear System Processor modules. Connection can be made to one or the other but not to both on the same set of SP. Refer to Table 5-1.Q for the pin-out of the connector. A VT100 terminal or PC/laptop with a terminal emulation program and craft port cables must be available for local provisioning using TL1.

The craft port can also be connected to a modem and telephone circuit for remote access. Refer to Table 5.1-R for part numbers of cables.

Table 5-1.Q. Craft Connector

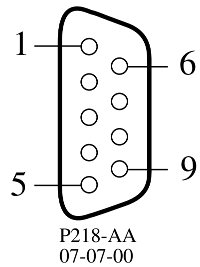
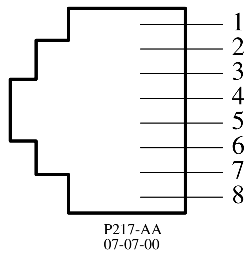
Name	Pin	Description
	1	DCD
	2	RXD
	3	TXD
	4	DTR
	5	GND
	6	DSR
	7	RTS
	8	CTS
	9	RI

Table 5.1-R. Required Miscellaneous Cables

Part Number	Description	Number Required
	Crossover Ethernet Cable, RJ45 to RJ45	1 if using Craft ENET port
45-1xxx-1-0	Ethernet Cable, RJ45 to RJ45	1 per ENET connector
45-2xxx-1-0	Craft Cable, DB9M to DB9F	1 minimum
45-2xxx-2-0	Craft Modem Cable, DB9M to DB25M	Optional
Note: XXX is the length of the cable in feet.		

A 10/100Base-T Ethernet connector labeled CRAFT ENET is also available on the front of each SP. Refer to Table 5.1-S for an illustration of the connector and its pins. These ports were designed as a temporary connection for provisioning and maintenance. By connecting a PC/laptop, using a crossover Ethernet cable to this connector, a user can Telnet into the craft interface for provisioning and monitoring. Because this connector does not ship with a default IP address, the address and subnet mask must first be configured using the DB-9 craft port interface. Refer to Table 5.1-R for part numbers of cables.

Table 5.1-S. Ethernet Connector

Name	Pin	Description
	1	TX+
	2	TX-
	3	RX+
	4	
	5	
	6	RX-
	7	
	8	

5.1.8.11 Ethernet Interfaces

A 100Base-T interface is required for the signaling LAN and a 10/100Base-T interface is required for the OS (operations systems) LAN connections. Recommended cables are shielded CAT-5 Ethernet cables. The Ethernet addresses have no defaults and the addresses and subnets masks must be provisioned using the craft port. Addresses are typically assigned by a system administrator. Personnel who will provision the switch will need to know the Ethernet addresses and subnet masks to be assigned.

Each rear SP module has an Ethernet port labeled SIG ENET for connection to a signaling LAN hub. This LAN is dedicated and connects the System Processors of Media Gateways (MGs) to SPs of Signaling Gateways (SGs).

The switch provides two redundant 10/100Base-T management ports, one on each rear SP, for remote operations system access. These ports typically connect into a customer-provided management LAN.

5.1.9 Slot Assignments

There are three switch chassis: part number 85-3004 with Midplane II; 85-3007 with Midplane III and 85-3008 with Midplane III. Each chassis have a high-speed fan shelf (85-3005). Each chassis has 21 slots for modules. The SPs are always installed in physical slots 9 and 13 and the SF modules are installed in physical slots 10 and 12. The other 17 slots are for I/O modules.

Unprotected IOMs installed in chassis 85-3004 with Midplane II and chassis 85-3007/85-3008 with Midplane III can be installed in any slot. If the IOMs are protected, the DS-3 protection slot is I/O-5 (physical slot 5) and I/O-13 (physical slot 17) as illustrated in Figure 5.1-3. I/O-5 provides DS-3 protection for I/O-1 to I/O-4 and I/O-6 to I/O-8 (physical slots 1-4 and 6-8). I/O-13 (physical slot 17) provides DS-3 protection for I/O-9 to 12 and I/O-14 to 17 (physical slots 11, 14-16 and 18-21). A DS1 protection slot is I/O-7 (physical slot 9).

If DS-3 (triple) and Octal DS-3/STS-1 modules are used in the same chassis, the protection module should be an Octal DS-3/STS-1 module. However, if only triple DS-3 modules were installed, the corresponding protection module could be a triple DS-3 module.

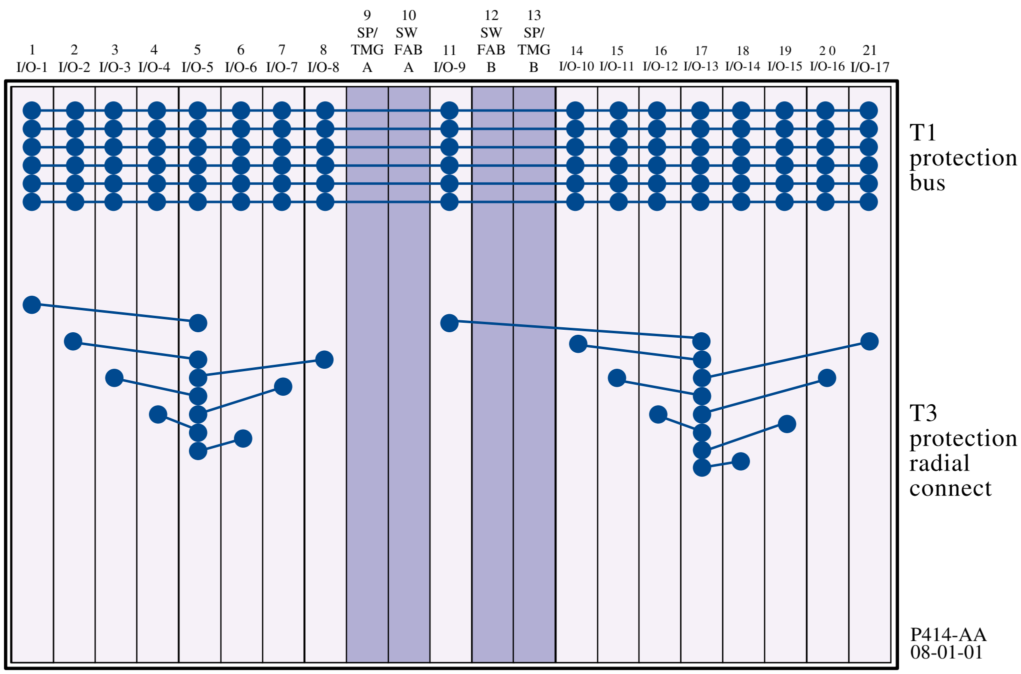


Figure 5.1-3. Protection for 85-3004/3007/3008 Chassis

5.1.10 Tools and Test Equipment

Basic test equipment, such as a DS-1 test set and digital multimeter, is needed for turn-up. Refer to Table 5.1-T for a list of tools required for installation. Additional equipment for protocol testing may be used during acceptance testing, for example, SS7 and ISDN protocol testers, and call generators. Assorted hand tools and crimpers are required for installation and test. Lucent can provide test equipment and hand tools if required.

Table 5.1-T. Tools Required for Installation

Tool	**Purpose**
ESD protection device: either wrist strap or heel strap.	ESD protection
Safety glasses	Eye protection
Multimeter	Voltage measurement and verification
Screwdrivers: Standard and Phillips-head	Attach the chassis, power and alarm panel, and air baffle to the rack. Loosen and tighten the thumbscrews on the modules. Remove and install the fan tray. Remove and install cover over electrical terminals. Attach cables to modules.
Cable or Wire strippers	Prepare power and chassis ground cables Prepare bare wire ends of alarm and DS-1 cables if required.
Wire wrap tool	Attach alarm cables to alarm contacts or DS1 cables at cross connects if required.
Non-oxidizing grease	Prepare power and ground connections.
Crimp tool with #2, #6, and #8 dies for a ground lug, #6 for ground wire and Office Power	Secure the cable lugs to the power and chassis ground cables.
#12-24 x ¾-inch bolts (4 for Power and Fuse Panel and 12 for Chassis)	Use to attach the chassis, power and alarm panel, and air baffle to the rack.
Wrenches or nut drivers	Attach power panel mounting bolts.
Round waxed lacing cord #12 or nylon cable ties with a flush cutter	Use for cable management.
Heavy-duty cart or other vehicle with a level platform at least 2 feet by 3 feet (0.61 by 0.914 meters) and capable of supporting 150 pounds (68 kg).	Move the chassis and other components from the receiving area to the installation location.
Test equipment: DS-1 test set SS7 protocol tester ISDN protocol tester Call generator	Test installed equipment and modules.

5.1.11 Installation Planning Task Checklist

Table 5.1-U. Installation Planning Task Checklist

ã	Task	Details, see …
_	When equipment is delivered, it is on a pallet. Ensure that a loading dock is available at the ship-to location. If a loading dock is not available, make sure that Lucent's Shipping Department is aware that special requirements will be required.	
_	The shipping carton and pallet must stay intact until the equipment arrives at the actual installation location. Make sure that carts, forklifts, etc. are available to transport the equipment through the building and that aisles, doorways, elevators, etc. are large enough to accommodate them.	
_	Check that the air conditioning at the installation site is sufficient for the estimated BTU/hour of the system. Plan for additional cooling if needed.	Paragraph 5.1.3.4 HVAC Requirements
_	Check that there are adequate AC electrical outlets available for power tools and test equipment.	Paragraph 5.1.3.3 Electrical Outlets
_	Check that precautionary measures have been taken for any equipment that will be installed under roof openings and water pipes.	
_	Check that there are -48V DC power sources for the system with sufficient wattage. Plan for additional power if required.	Paragraph 5.1.7 Power Requirements
_	Ensure that sufficient room is available to allow for the unpacking and maneuvering of the equipment.	
_	Plan for space in a currently installed rack and floor space sufficient to install and service the system. If necessary, plan for space for a new rack.	Paragraph 5.1.5 Planning for Installation

ã	Task	Details, see …
_	Plan for space in a currently installed rack to install DS1 cross-connects, Ethernet hubs and auxiliary equipment. If necessary, plan for space for a new rack.	Paragraph 5.1.5.4 Associated Equipment
_	***Warning:*** Risk of equipment damage. Not all mounting positions are suitable for all styles of racks. To reduce the risk, ensure that the mounting position is appropriate to the rack in which the switch will be installed Determine the mounting position of the chassis.	Paragraph 5.1.5.1 Rack Details
_	***Warning:*** Risk of personal injury and equipment damage. To reduce the risk, never install the chassis in a rack that has not been stabilized by being bolted to the floor and to the ceiling. Check that the rack is ready to support the chassis and all its components; racks must be secured to the floor.	Paragraph 5.1.5.1 Rack Details
_	Check the location and cable length requirements for the direct connection of a local or remote console, if needed.	
_	Check the location and network cable requirements for the network connection of a network management system, if needed.	
_	Plan for building the required power, chassis ground, and I/O cables.	Paragraphs 5.1.6 Planning for Installation 5.1.7 Power Requirements and 5.1.8 System Interfaces
	Warning: Never allow the switch or any of its components to be installed or serviced by anyone except a qualified (trained) service person. Ensure that a second engineer is available to secure the chassis to the rack during installation.	

ã	Task	Details, see …
_	Plan for at least two trained installation engineers who are familiar with lifting techniques for heavy objects to be available to lift and move the chassis and its components to the installation site from the receiving (unpacking) area. To reduce the risk, contact your customer service representative or your trained service personnel for hardware installation and maintenance.	
_	Check that the installation engineers have access to all the tools required for the installation, including a heavy cart to move the chassis and its components.	Paragraph 5.1.10 Tools and Test Equipment
_	Plan the hardware configuration. Make the assignment of system and I/O modules to slots and provide a configuration map for installation engineers.	Paragraph 5.1.12 Planning for Installation
_	Plan the software configuration and system provisioning. Create a list of parameters that must be provisioned for the switch.	

5.1.12 Switch Configuration

Table 5.1-V describes what is included when a base switching system has been ordered. The modules necessary are dependent upon the application and system requirements. Table 5.1-X lists the modules, their part numbers, the number required and a column to fill in for the number required for application. Table 5.1-Y list spares other than modules that may be required and Table 5.1-Z list cables that may be required.

Table 5.1-V. Base Switching System

Part Number	Description	
85-3000-A-0	switch Chassis	
	The following is included with chassis	
	85-3001-A-0	switch Fan Tray Assembly
	85-7003-0-0	Fan Filter
	Box with following:	
	89-0375-n	SW FAB B Rear
		Upper Bezel
		Lower Bezel
	89-0001-1	Accessory Kit with following:
	23-0008-0	2A GMT Fan Fuse
	23-0009-0	Cover for GMT Fan Fuse
	92-0017-6	Hardware Kit with 5 #6 lugs and mounting screws
		Wrist Strap
		Tie Wraps for DS1 modules
	79-6018	Install and TL1 Documentation Set (Shipped in separate carton.)
85-3004-A-0	Switch Chassis with Midplane II. The following is included with chassis.	
	85-3005-A-0	Switch Fan Tray Assembly (High-Speed)
	And all items listed for 85-3000 chassis except Fan Tray Assembly.	
85-3007-A-0	Switch Chassis with Midplane II. The following is included with chassis.	
	85-3005-A-0	Switch Fan Tray Assembly (High-Speed)
	And all items listed for 85-3000 chassis except Fan Tray Assembly.	
Note: Midplane II and III support Octal DS-3/STS-1 modules		

Table 5.1-W. AUXILIARY EQUIPMENT

Part Number	Description	# Required	Order
85-5044-1-0	Air Baffle Assembly	1 per switch	
85-6000-1-0	Power and Alarm Panel	1 per rack	

Table 5.1-X. Switch Module Part Numbers

Part Number	Card/Module	# Required	Order
89-0300-A	Blank Panel	# unused slots	
89-0363-n	SW FAB Front	2 if protected 1 if unprotected	
89-0364-n	SW FAB A Rear	1 if protected 0 if unprotected	
89-0375-n	SW FAB B Rear	Shipped with chassis	
89-0389-n	Dual SP/TMG Front	2 if protected 1 if unprotected	
89-0367-n	SP/TMG Rear	2 if protected 1 if unprotected	
89-0406-n	Dual SP-3 Front	2 if protected 1 if unprotected	
89-0417-n	Dual SP-3 Rear	2 if protected 1 if unprotected	
89-0414-n	DS-1/E1/J1 IOM Front	1- 16 if protected 1-17 if unprotected	
89-0415-n	DS-1/E1/J1 IOM Rear	1- 16 if protected 1-17 if unprotected	
89-0368-n	DS-1 IOM Rear Protection	1 if protected 0 if unprotected	
89-0410-n	Triple DS-3/STS-1 IOM Front	1-15 if protected 1-17 if unprotected	
89-0424-n	Triple DS-3 IOM Front	1-15 if protected 1-17 if unprotected	
89-0411-n	Octal DS-3/STS-1 IOM Front	1-15 if protected 1-17 if unprotected	
89-0425-n	Octal DS-3 IOM Front	1-15 if protected 1-17 if unprotected	
89-0383-n	Octal DS-3 IOM Rear	1-15 if protected 1-17 if unprotected	
89-0386-n	Octal DS-3 IOM Rear Protection	1-2 if protected 0 if unprotected	
89-0384-n or 89-0395-n	Voice Server	1-n =1 if protected 1-n if un protected	
89-0388-n	ATM Network Access	2 if protected 1 if unprotected	
89-0390-A	10/100/1000 Ethernet Network Access Module	1-17	

Part Number	Card/Module	# Required	Order
89-0391-A	Quad 1000 Ethernet Network Access Module	1-17	
89-0399-A	Quad GBIC LX Rear I/O	1-17	
89-0421-A	Quad GBIC SX Rear I/O	1-17	
89-0400-A	Channelized OC-3 IOM	2-8 if protected 1-4 if unprotected	
89-0402-A	Channelized OC-3 IOM Rear	1-17	
Note: The Octal DS3 IOM requires Midplane II/III of the 85-3004 or 85-3007 chassis.			

Table 5.1-Y lists the part numbers and descriptions of spares that may be required for the switch. This table does not list spare modules.

Table 5.1-Y. Switch Spares (Not Modules)

Part Number	Description	Order
23-0008-0-0	2A GMT Fan Fuse	
23-0009-0-0	Cover for GMT Fan Fuse	
85-3001-A-0	Switch Fan Tray Assembly	
85-7003-0-0	Fan Filter, PE-5X 13.19" x 20.21" x .50"	
89-0300-A	Blank Panel	
92-0013-0-0	ESD Wrist Strap, 6-ft. Cord	

Table 5.1-Z. Required Miscellaneous Cables

Part Number	Description	Number Required	Order
45-1xxx-1-0	Ethernet Cable, RJ45 to RJ45	2 for SIG ENET, 2 for OS ENET	
45-2xxx-1-0	Craft Cable, DB9M to DB9F	1 minimum	
45-2xxx-2-0	Craft Modem Cable, DB9M to DB9F	Optional	
45-3xxx-1-0	Bay Alarm Cable, DB9M to DB9M	1, if using Power and Alarm Panel	
45-3xxx-2-0	Alarm Contacts Cable, DB25M to Bare Wire	1, if using Alarm Contacts	
45-4xxx-1-0	#6 AWG Gray Power Cable	4 total, 2 for –48 Vdc and 2 for Return	
45-5xxx-1-0	#6 AWG Green Ground Cable	1	
45-6xxx-1-0	BITS Clock Cable, Shielded Twisted Single Pair	2	
Note: Value of XXX is the length of the cable in feet.			

Table 5.1-AA, Configuration Worksheet, can be used to assist in slot assignments for configurations.

Table 5.1-AA. CONFIGURATION WORKSHEET

Front Card / Part Number	Physical Slot	Slot Notation	Rear Card / Part Number
	1	I/O 1	
	2	I/O 2	
	3	I/O 3	
	4	I/O 4	
	5	I/O 5	
	6	I/O 6	
	7	I/O 7	
	8	I/O 8	
	9	SP/TMG A	
	10	SW FAB A	
	11	I/O 9	
	12	SW FAB B	Switch Fabric B / 89-0375-n-n
	13	SP/TMG B	
	14	I/O 10	
	15	I/O 11	
	16	I/O 12	
	17	I/O 13	
	18	I/O 14	
	19	I/O 15	
	20	I/O 16	
	21	I/O 17	
			T77-AA

5.2 Planning for Provisioning

5.2.1 Introduction

This document contains the information required to plan for provisioning a Lucent switch. The information is for all personnel involved in site planning and preparation for the switch provisioning.

The provisioning information must be provided to create the database within the switch. Provisioning procedures are provided in the *Installation and Operations Manual, Volume 2* and TL1 command details are provided in the *TL1 Commands Reference Guide*.

5.2.2 Switch Overview

The switch is a high-capacity, packet switching system that terminates, switches, and aggregates line- or trunk-side facilities to accommodate today's exploding mix of broadband and narrowband traffic as well as allowing subscribers to connect to a public data network (PDN) over dial-up lines. The switch normalizes a carrier's layer two switching and transport requirements regardless of content or access method. Its integrated signaling and call control feature supports various protocols including SS7, ISDN, and ATM.

The switch is designed for installation and operation in a central office environment and the shelf contains 21 module slots. Four slots are used for active and protect common modules, the SP and SF, with up to 17 modules used for various IOMs, DS-1, and DS-3/STS-1. All of the modules except the SF must be provisioned.

Refer to Figure 5.2-1 for an illustration of a front view of a completely integrated system.

Part number 85-3004 is a chassis with Midplane II and 85-3007 is a new chassis with Midplane III. Midplane II/III supports DS-1 and triple DS-3 IOMs and additionally supports octal DS-3/STS-1 IOMs.

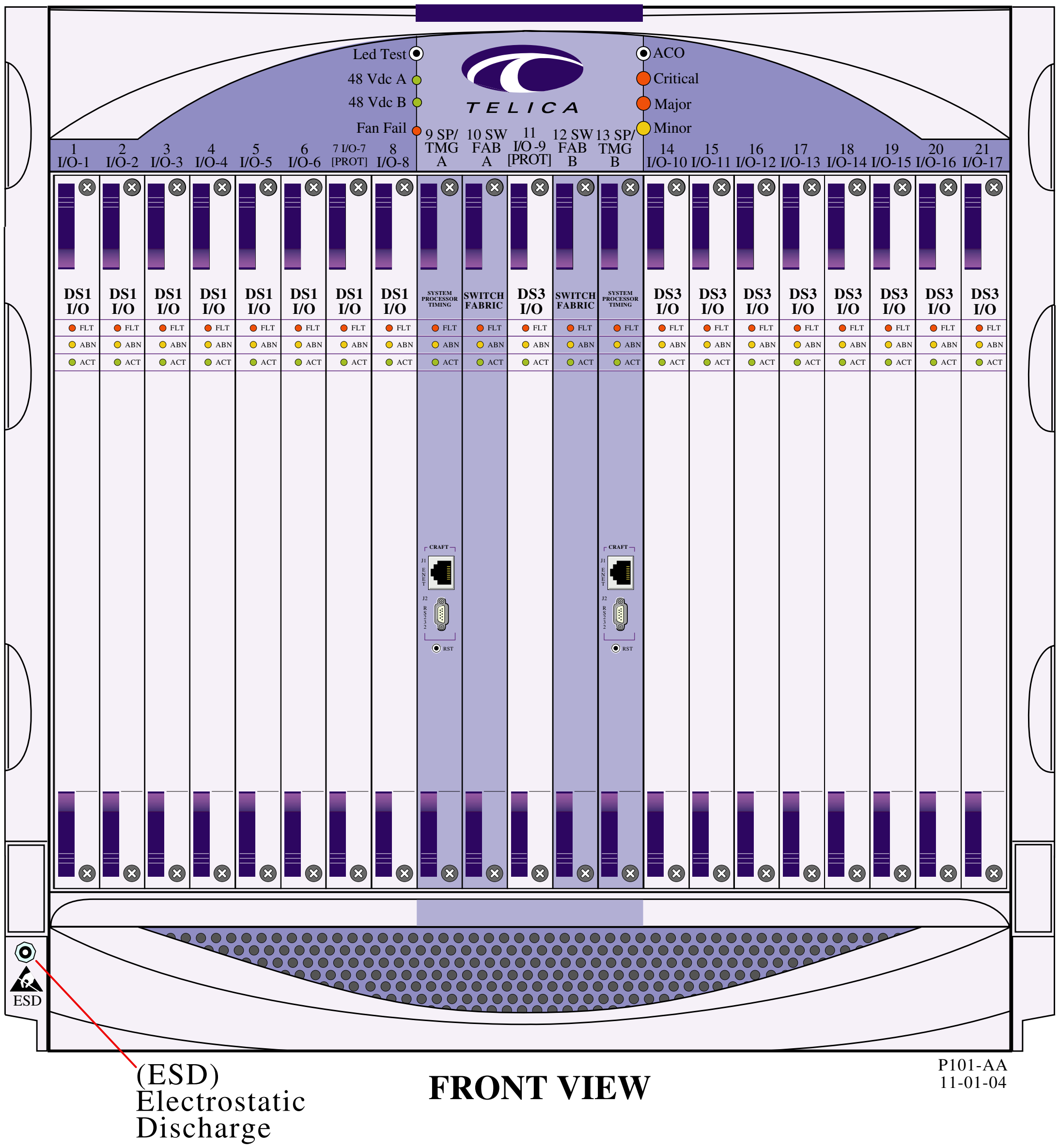


Figure 5.2-1. Switch front view (P101-AA)

5.2.3 Provisioning the Switch

Before the Plexus can be placed in service, it must be provisioned. The first step in provisioning is to configure the IP addresses of both SPs. This must be done using the DB-9 TL1 craft interface and a terminal emulation program such as "HyperTerminal". Once the IP addresses have been set, provisioning can continue using the TL1 craft interface, or a user can telnet into the Ethernet port 2361 and use TL1 commands or use the PlexView Element Management System (EMS). It is recommended that provisioning be done in the order as shown in "Flowchart" in the *Installation and Operation Manual, Volume 2*.

Note: Some procedures and commands may differ depending upon the version of the system software.

5.2.3.1 Ethernet IP Addresses of SPs

Each SP has three Ethernet connectors, which must be provisioned because they do not have a default IP address when shipped. A 10/100Base-T Ethernet connector labeled CRAFT ENET, which was designed as a temporary connection for provisioning and maintenance, is available on the front of each SP. A 100Base-T interface (SIG ENET) required for the signaling LAN and a 10/100Base-T interface (OS ENET) for the OS (operations systems) LAN connections are available on the rear SP module.

In order to Telnet into the craft interface for provisioning and monitoring, the IP addresses and subnet mask must first be provisioned using the DB-9 craft port interface. A system administrator typically assigns IP addresses. Personnel who will provision the switch will need to know the Ethernet addresses and subnet masks to be assigned. Table 5.2-C at the end of this section shows the information that may need to be provisioned.

Once the IP addresses have been provisioned, provisioning of the switch can continue using the DB-9 serial craft interface. It can also now be accessed through a Telnet session and provisioned using the TL1 craft interface or the Element Management System (EMS).

5.2.3.2 Timing Interfaces

The switch can obtain timing inputs from the two external BITS timing inputs or it can recovered Line timing from IOMs in I/O-1 and I/O-2 slots or I/O-8 and I/O-10 slots. The BITS connections are provided on wire wrap pins of the rear SF modules. The BITS cabling is connected during installation and then configured during provisioning of the switch. The BITS or recovered line timing interfaces typically operate with ESF-framed DS-1 all-ones clock signals. Timing provisioning information required is identified in Table 5.2-D at the end of this section.

5.2.3.3 Security

Security must be provisioned using TL1 commands. The default user name and default password are both *telica*. It is recommended that new usernames and passwords be assigned and the defaults be deleted or removed for security. An administrator can add a user’s account, set the user's password, the user's access privilege, the password-aging interval, and the password update grace period. Table 5.2-B describes the access levels. After a new user has logged on, he must change his password.

System security commands allow an administrator to set the maximum allowable number of invalid session setup attempts, the alert condition duration, the time out intervals, the period in which to generate a password expiration alert message, the lower limit for the password aging interval, the heartbeat interval, and whether the TCP connection and trusted hosts are enabled.

Security commands also allow an administrator to create a list of IP addresses representing trusted hosts; that is, hosts that may connect to the switch.
Table 5.2-E at the end of this section lists the parameters that may need to be entered for security.

5.2.3.4 Other Provisioning

Before provisioning is begun information such as point codes, IP addresses, trunk groups, routing, subscribers and so forth must be obtained. Tables at the end of this section provide some of the information that must be acquired. The flowchart found in the *Installation and Operation Manual* lists the Non-Trouble Procedures (NTPs) and their typical order execution when provisioning a switch.

5.2.4 Tables for Provisioning

Table 5.2-A Configuration Worksheet, can be used to assist in slot assignments for configurations. Additional tables provide information that may be required when provisioning the switch.

Notes:

- CAS and ISDN, CAS and MTP-2, CAS and GR-303 can be intermixed on an IOM. ISUP trunks can be configured on an IOM regardless of CAS, MTP2, ISDN, or GR303.
- IDSN D-channels or GR-303 signaling CANNOT be mixed with SS7 MTP2 channels on the same IOM due to a software configuration limitation.
- Call processing capability diminishes as more T1s are configured for CAS.
- If CAS and PRIs co-exist on an IOM there can be a maximum of 140 CAS DS1s and 84 PRIs.
- The table below lists the number of SS7 MTP-2 messages per second that can be supported by various IOMs at different IOM CPU utilization rates, assuming that the IOM is ONLY handling SS7 signaling and IMTs. The table does not indicate the calls per second for SS7 links since these performance numbers are a function of TCAP transactions as well as ISUP (or BICC) usage. The total number of messages per second per chassis is limited to 8,500 messages/sec (85% utilization).

Description	Part Number	MTP-2 Msgs/sec (80%)
3 DS3/STS-1	89-0397	544
8 DS3/STS-1	89-0398	544
3 DS3/STS-1 w digit collect	89-0410	544
8 DS3/STS-1 w digit collect	89-0411	544
28 T1/E1/J1	89-0414	768
3 DS3 w digit collect	89-0424	768
8 DS3 w digit collect	89-0425	768

LIST of TABLES for PROVISIONING

Table 5.2-A. CONFIGURATION WORKSHEET

Front Card / Part Number	Physical Slot	Slot Notation	Rear Card / Part Number
	1	I/O 1	
	2	I/O 2	
	3	I/O 3	
	4	I/O 4	
	5	I/O 5	
	6	I/O 6	
	7	I/O 7	
	8	I/O 8	
	9	SP/TMG A	
	10	SW FAB A	
	11	I/O 9	
	12	SW FAB B	Switch Fabric B / 89-0375-n-n
	13	SP/TMG B	
	14	I/O 10	
	15	I/O 11	
	16	I/O 12	
	17	I/O 13	
	18	I/O 14	
	19	I/O 15	
	20	I/O 16	
	21	I/O 17	

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Table 5.2-B. Plexus 9000 Access Levels

Level	Description
ADMIN	Administrative permits you to perform all TL1 commands including managing user accounts or profiles and downloading new software.
SW	SoftWare permits you to issue COPY-MEM and RTRV commands so the user can download new software.
SA	Service Affecting access level permits you to perform all TL1 commands except security commands (ENT/ED/DLT-USER-SEC).
NSA	Non-Service Affecting permits you to only issue SCHED and RTRV commands to schedule and view the Plexus 9000's status and statistics information.
VIEW	View permits you to only issue RTRV commands to view the Plexus 9000's status and statistics information.
	63-A

Table 5.2-C. Chassis Provisioning

Parameter	Description
Shelfid	
ChassisType	MG, MGC, MGN, SG or BOTH (MG & SG)
CLLI	CLII code
Loc	location
emIPSPA	OS IP of SP-A
craftIPSPA	Craft IP of SP-A
signalingIPSPA	SIG IP of SP-A
emIPSPB	OS IP of SP-B
CraftIPSPB	Craft IP of SP-B
signalingIPSPB	SIG IP of SP-B

Table 5.2-D. Timing Provisioning

Parameter	Description
ds_id	BITS timing (TMG-A and TMG-B) or line timing (IOM-1 and IOM-2 or IOM-8 and IOM-10)
fmt	Line format (SF or ESF)
linecde	Line code (AMI or B8ZS)
tmgreg	Timing Ref. (PRI, SEC or None)
pst	Primary state (IS or OOS)

Table 5.2-E. Security Provisioning

Parameter	Description
iphosts	List of trusted hosts
uid	User ID or login name
pid	User's password
cid	Currently not used
uap	User's access privilege (ADMIN, SW, SA, NSA, VIEW)
page	Password aging interval, in days {0-999}
pcnd	Days password can be used after aged (1-999)
tmout	Time out interval in minutes {0-99}
calea	Enable user to execute commands related to CALEA.
maxInv	Max number of invalid login attempts (0-9}
dural	Duration of lockout {0-99}-{0-59}-{0-59}
tmout	Inactive time before logoff {0-99}
preLoginTimeOut	Inactive time between login and logoff {0-99}
passwdExpAlert	Days after password aging interval has elapsed {0-30}
passwdChgFreq	Days a password can exist {0-99}
heartbeat	Minutes without REPT COND message{0-120}
tcpConnEnabled	TCP connection enabled/disabled (Y|N)
trustedHostEnabled	Trusted host enabled/ disabled (Y|N)
almqPort	Port used for alarm queue sessions
almqTmo	Elapsed time, in minutes, for a user to reconnect to the TL1 agent after a session disconnect
emPort	Port used to connect to the Element Manager
em1Ip	IP address for the primary Element Manager
em2Ip	IP address for the secondary Element Manager
sshEnable	Enables secure shell
eventInterval	Interval between TL1 events or alarms in milliseconds.
defaultGateway	{0- 255}.{0-255}.{0-255}.{0- 255
route1	
destination1	

Table 5.2-F. IOM Provisioning

Parameter	Description
xx_id	oc_id - IOM-8, IOM-8-OC3/12-{1-4}, IOM-8-STM1/4-{1-4}
	ds3_id - IOM-{1-17} or IOM-{1-17}-T3-{1-8}
	sts_id - IOM-{1-17} or IOM-{1-17}-STS-{1-8}
	ds1/e1_id - IOM-{1-17} or IOM-{1-17}-PORT-{1-28}
	enet_id - IOM-{8}-ENET-{1-4}
linecde	OC/STM - Line code - NRZ or RZ
	DS3 – Line format - ASYNC or CBIT
	DS1 - Line format - SF or ESF
	E1 - CRC, CRC MF, DB or, MF
linecde	DS3 - Line code - B3ZS or CCHAN
	DS1 – Line code - AMI or B8ZS
stsmap (sts)	STS-1 - VTLOCK or VTFLOAT
lbo or eqlz	Line build out (cable length to cross-connect)
omode	OOS signal sent - AIS or NORM
mode (enet)	autoneg, halfduplex, fullduplex
format (enet)	ENET_802_3 or ENET_DIX_II
pst	Primary State - IS or OOS

Table 5.2-G. Point Codes and Signaling Provisioning

Parameter	Description
pc	Originating Point Code (ownPc)
	Destination Point Code (rem)
	Adjacent switches (adj)
pcPrflId	Point code profile ID – (1-128)
mtp3PrflId	Layer 2 profile ID - (1-40)
mtp3PrflId	Layer 3 profile ID - (1-20)
lsetId	Link set ID - (1-20)
port	IOM-{1-17} or IOM-{1-17}-T3-{1-8}
	IOM-{1-17} or IOM-{1-17}-STS-{1-8}
	IOM-{1-17} or IOM-{1-17}-PORT-{1-28}
lnkSpeed	Link speed of signaling link (56K or 64K)
routeSs7	Adjacent DPC and connecting link set

Table 5.2-H. Trunk Group Provisioning

Parameter	Description
cicprflid	CIC profile ID – (1-128)
casprflid	CAS profile ID – (1-128)
sigModel	Format for CAS signaling
casTrunk	IOM-{1-17}-PORT-{1-28}-T0-(1-24)
	IOM-{1-17}-T3-{1-8}-PORT-{1-28}-T0-(1-24)
	IOM-{1-17}-STS1-{1-8}-PORT-{1-28}-T0-(1-24)
tgn	Trunk group number – (1-9999)
name	Name of trunk group
sigType	BICC, CAS, SIP or ISUP
dpc	Destination point code for ISUP trunk group
ipAddr	IP address for SIP
trkGrpClass	Access tandem, end office or interexchane carrier
dpc	Destination point code
hunting	CIRCULAR, HIGHESTAVAIL, LOWESTAVAIL or RANDOM

Table 5.2-I. Routing Provisioning

Parameter	Description
rtname	Route name
type	Route type – CAS interface, GR303 subscriber interface, ISDN interface, trunk group number
numPlan	Numbering plans

Table 5.2-J. Numbering and Carrier Provisioning

Parameter	Description
npa	Numbering Plan Area
nxx	Exchange
ratecenter	Rate Center name
lata	Local Access & Transport Area
name	LATA name
carriercode	Carrier code
name	Carrier name
calltype	Type of calls accepted
carrierclass	Carrier class

Table 5.2-K. Subscriber Provisioning

Parameter	Description
subscriberid	Subscriber number
carriers	Intra, inter, and international carriers for subscriber
billingnumber	Billing number for subscriber
	Subscriber features such as caller ID, call forwarding etc.
lcc	Line class code
altdn	Alternate number

NOTES:

6 Interconnect Drawings

6.1 Scope

This section describes the connectors and cables of the switch.

6.2 Overview

The Lucent switch features a midplane design, with IOMs, processing modules, and switching modules installed from the front and all physical facility traffic terminations connected on passive rear IOMs. All electrical interfaces are located on the rear of the unit, while fiber is cabled to the front or rear depending upon the type of IOM.

Each of the front interface modules is paired with a rear module that contains the physical interface, allowing all signal cabling to be installed from the rear of the unit.

At the lower rear of the chassis are -48 Vdc power A and B feeds. The shelf provides independently replaceable line filters for each power input. Chassis grounding is also supplied in this area.

Cable management is built into the top rear of the shelf to facilitate dressing interface cables up and to the sides of the bay. This provides neat and secure dressing for all cable types including 22-gauge twisted pair.

6.3 Power and Ground Cabling

Power and ground cabling is shown in Figure 6-1.

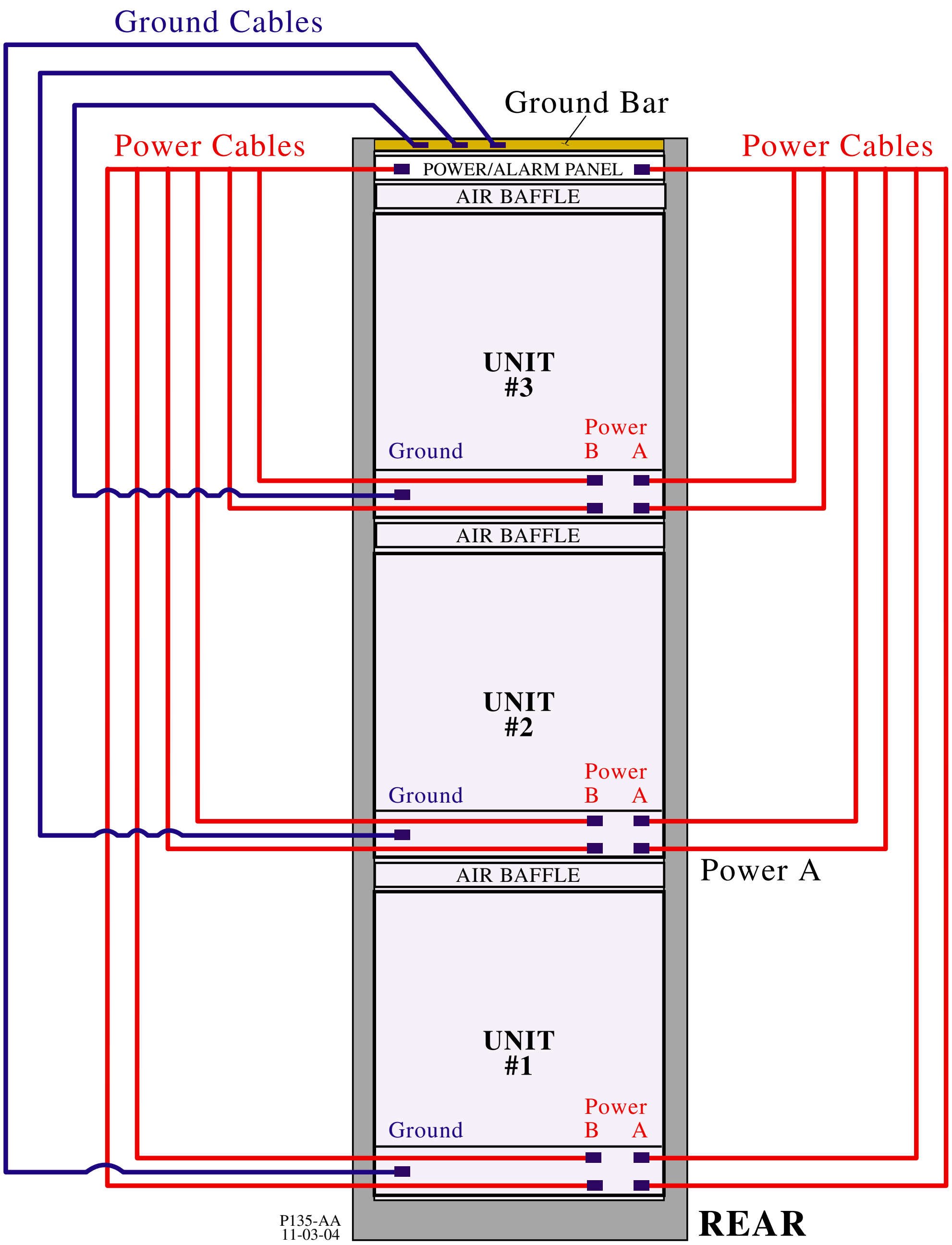


Figure 6-1. Power and Ground Cabling

6.3.1 Power Cabling

Each switch requires that redundant power be provided from two separate (A and B) 50 amp breakers at -48 Vdc. Therefore, each breaker requires wiring sized to handle up to 50 amps at -48 Vdc. Each power connection requires two wires, -48 Vdc and Return.

Power can be provided to the Lucent shelf either directly from customer power distribution (home run) or via a Power and Alarm Panel (PAP) mounted in the equipment bay. A PAP can be purchased from Lucent.

When the power panel is located in the same rack as the switch then 6-AWG wires with double-hole lugs on the switch chassis end can connect the chassis to the breaker panel.

The input power wire sizing at the power panel must support a 150-amp bus rating and thus must have a minimum size of 1-AWG. The primary system breaker must have a minimum rating of 100 amps.

The allowable voltage drop between the Lucent shelf and the power plant is limited to 2.5V.

Table 6-A specifies the maximum allowable distances from the power source to the PAP for the allowable wire sizes. The shaded table areas represent wire sizes too large to directly terminate on the lugs provided on the Lucent power and alarm panel. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.

Table 6-A. Wire Sizes To Power And Alarm Panel

Power and Alarm Panel Feed	
Wire size	Maximum distance to source
1	102
0	127
00	159
000	198
0000	250
Note: Shaded table areas represent wire sizes that cannot be directly terminated on the lugs provided on the Telica shelf and/or breaker panel. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.	
	T2-B

Because the allowable voltage drop between the Lucent shelf and the power plant is limited to 2.5V, the Lucent shelf has a worst-case load of 33 amps; the maximum power load is 1300 Watts. The required wire sizes for a home run are determined using Table 6-B. The distances specified are from the power source to the switch. The shaded table areas represent wire sizes too large to directly terminate on the lugs provided on the switch. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.

Table 6-B. Wire Sizes For Home Run

Home run to shelf (no Power and Alarm Panel)	
Wire size	Maximum distance to source
6	80
4	157
2	251
1	315
0	393

Note: Shaded table areas represent wire sizes that cannot be directly terminated on the lugs provided on the Lucent shelf and/or breaker panel. Crimp-type splices may be used to pigtail to the appropriate wire size as needed.

T3-B

6.3.2 Ground Cabling

The switch is suitable for installation in either the integrated ground plane or isolated ground plane system in a central office environment. A single 6-AWG ground cable connects to the central office ground plane.

The switch power return is isolated from the chassis ground and provides the return path for all the -48 Vdc loads in the switch.

The frame/chassis ground path is a non-current-carrying path under normal (no fault) conditions. It provides a low impedance connection for all metal parts of the switch. Each frame/chassis ground connection within the switch terminates to the main ground bar.

Each switch chassis connects to the earth/frame ground via a 6-AWG wire, with a double-hole lug at the switch chassis end.

6.4 Alarm Cabling

The switch provides connectors for a bay alarm and for alarm contact closures on the rear SF module in slot 10. The Lucent Power and Alarm Panel provides a DB9 female connector interface to connect shelf alarms to the bay alarm indicator on the front of the PAP. Male-to-male DB9 cables connect the bay alarm output on a shelf to the bay alarm input of the unit above or to the PAP. This type of cable is shown in Figure 6-2. The bay alarm input is a female DB9 connector marked “J3 BAY IN”; pinouts are shown in Table 6-C. The bay alarm output is a female DB9 connector marked “J1 BAY OUT”; pinouts are shown in Table 6-D Bay alarm cabling for a full rack is shown in Figure 6-3.

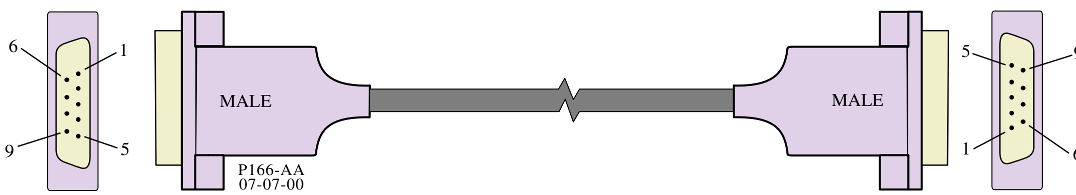


Figure 6-2. Bay Alarm Cable

Table 6-C. BAY ALARM IN CONNECTOR

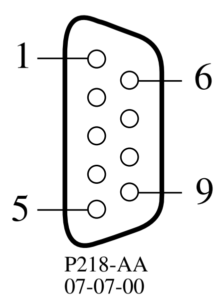
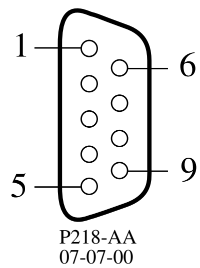
Port	Connector	Pin	Description
J3		1	Common
		2	N/A
		3	N/A
		4	N/A
		5	BAY LAMP-NO
		6	N/A
		7	N/A
		8	N/A
		9	N/A
25			

Table 6-D. Bay Alarm Out Connector

Port	Connector	Pin	Description
J1		1	Common
		2	N/A
		3	N/A
		4	N/A
		5	BAY-LAMP-NO
		6	N/A
		7	N/A
		8	N/A
		9	N/A
			22

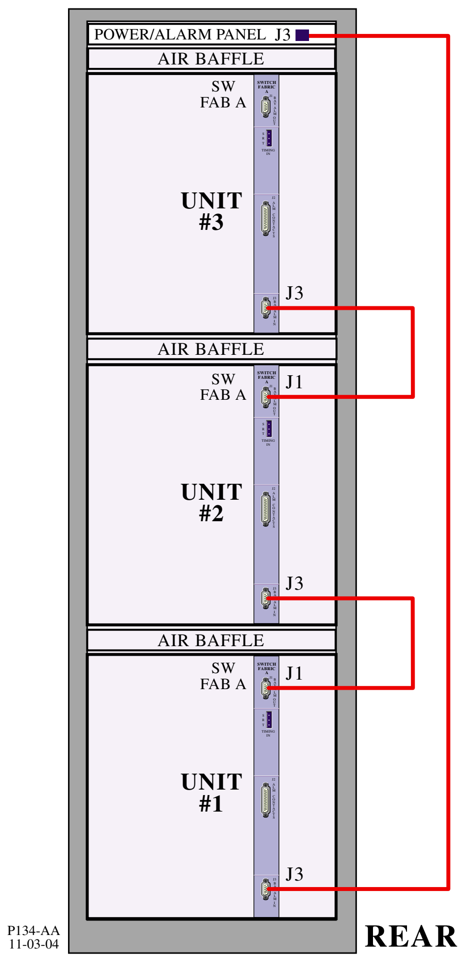


Figure 6-3. Bay Alarm Cabling

The cable for the alarm contacts has a DB25 male connector on the end connecting to the switch, and at least 18 wires to provide both audible and visual alarm contact closures for critical, major, and minor alarms as shown in Figure 6-4. The alarm contact closures connector is a female DB25 connector marked "J2" on the rear SF-A module; pinouts are shown in Table 6-E. Figure 6-5 shows alarm contact closure cabling for a full rack.

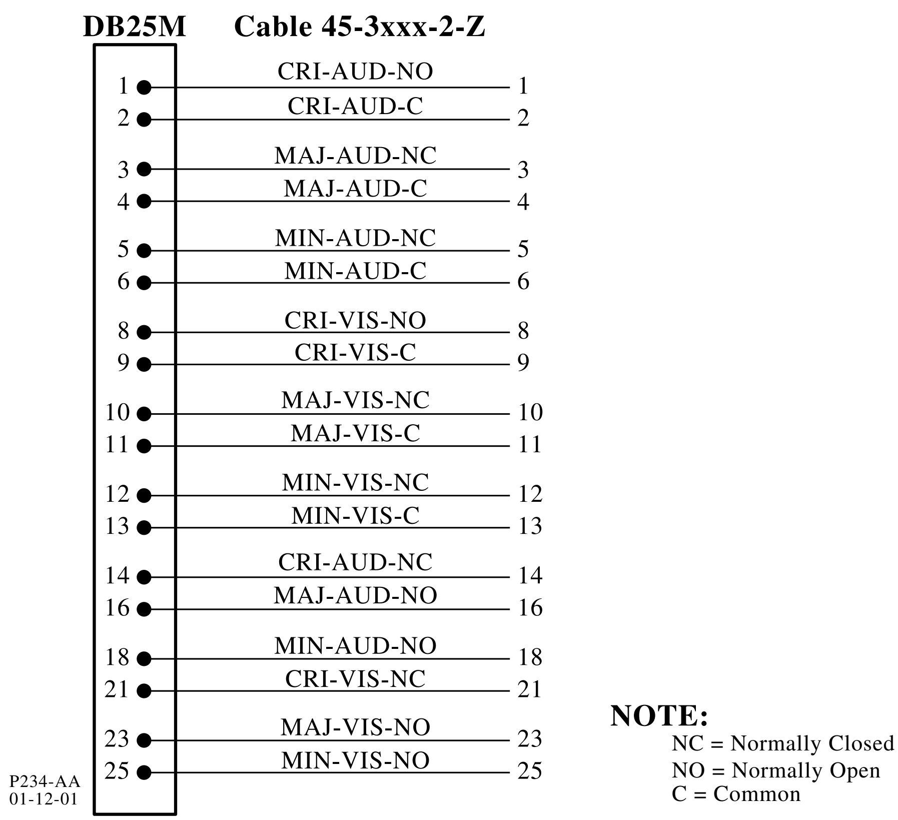
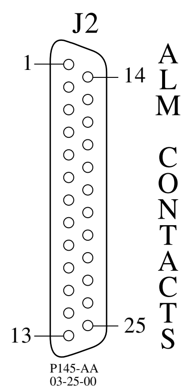


Figure 6-4. Alarm Contacts Cable

Table 6-E. Alarm Contacts Connector

Port	Connector	Pin	Description
J2	ALM CONTACTS 	14	CRI-AUD-NC
		2	CRI-AUD-COMMON
		1	CRI-AUD-NO
		3	MAJ-AUD-NC
		4	MAJ-AUD-COMMON
		16	MAJ-AUD-NO
		5	MIN-AUD-NC
		6	MIN-AUD-COMMON
		18	MIN-AUD-NO
		21	CRI-VIS-NC
		9	CRI-VIS-COMMON
		8	CRI-VIS-NO
		10	MAJ-VIS-NC
		11	MAJ-VIS-COMMON
		23	MAJ-VIS-NO
		12	MIN-VIS-NC
		13	MIN-VIS-COMMON
		25	MIN-VIS-NO
		7	N/A
		15	N/A
		17	N/A
		19	N/A
		20	N/A
		22	N/A
		24	N/A

Note: Audible only alarms can be silenced or cut off (ACOed). It is recommended that visual alarms be used for an external monitoring/management system.

34

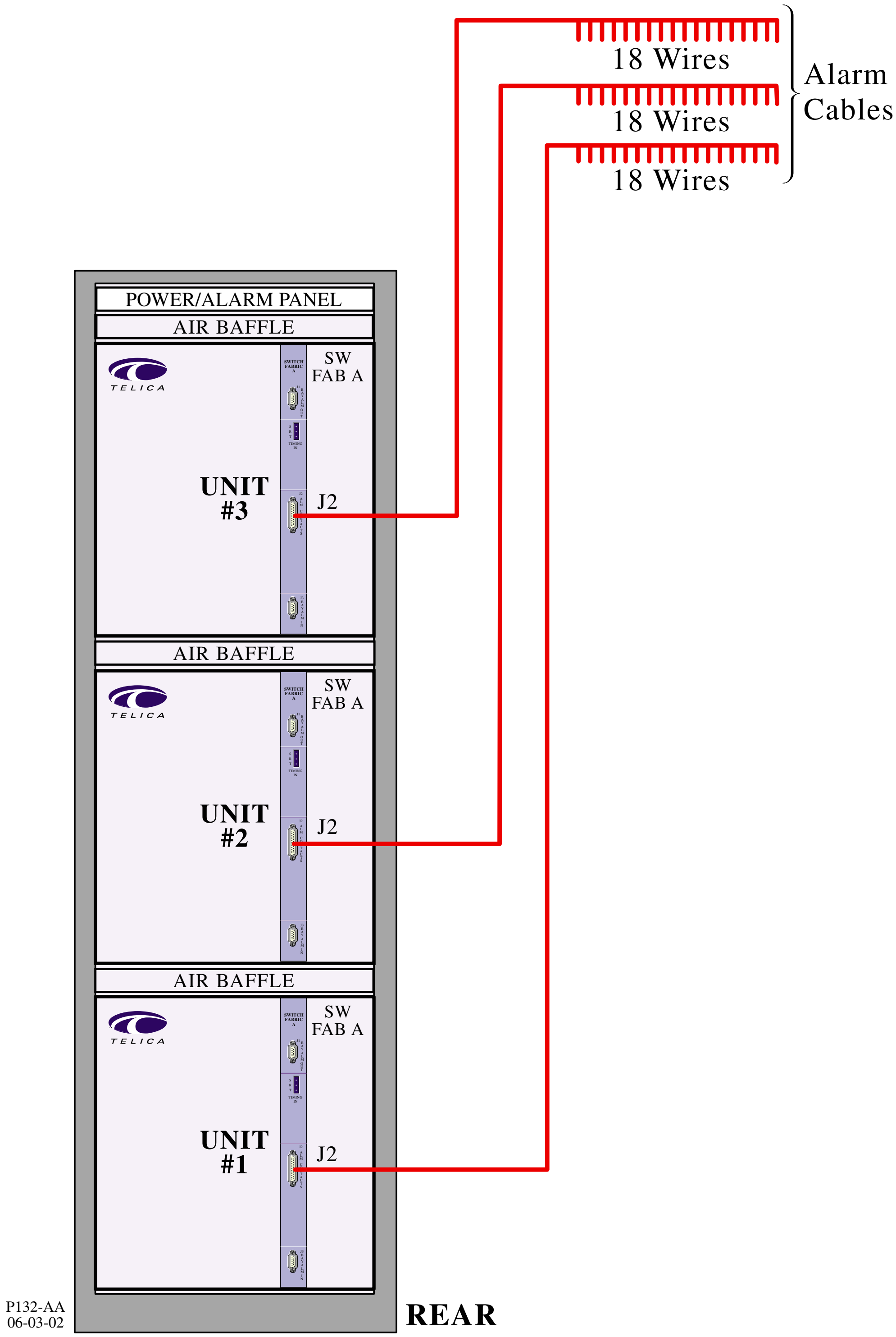
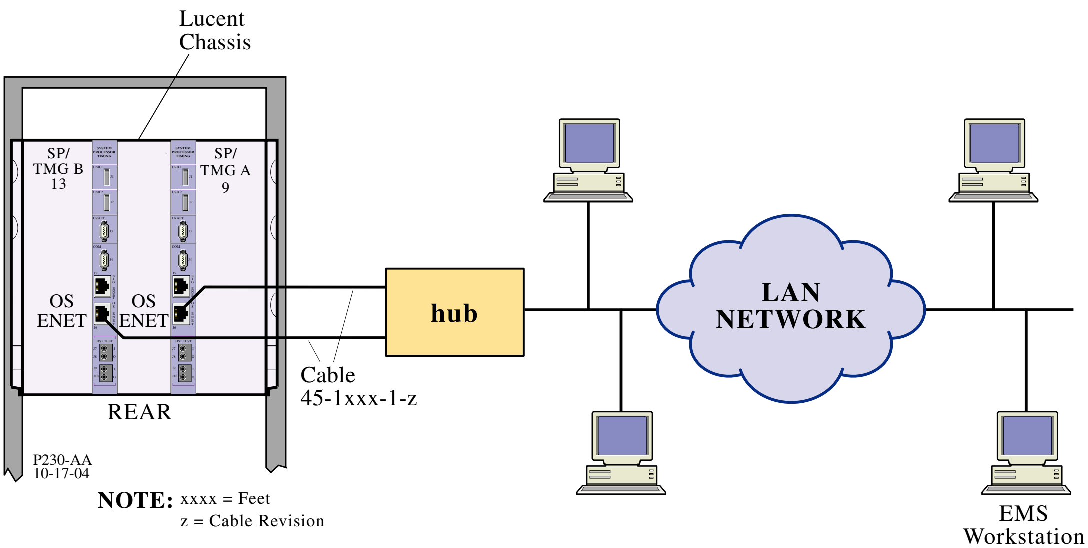


Figure 6-5. Alarm Contact Closure Cabling

6.5 Ethernet Cabling of System Processors

The switch provides two 10/100Base-T management ports for remote operations system (OS) access. These ports connect to a customer-provided Ethernet hub (for the management LAN) via shielded CAT-5 Ethernet cables as shown in Figure 6-6.



NOTE: xxxx = Feet
z = Cable Revision

Figure 6-6. Switch Connected to Hub and LAN Network

When running the cable, the first cable dresses down the left side of the rear of the frame to the OS ENET (J6) connector on the SP/TMG B module in slot 13. The second cable dresses down the right side of the rear of the frame to the OS ENET (J6) connector on the SP/TMG A module in slot 9.

Each rear System Processor has an Ethernet connector labeled SIG ENET (J5). These are used only connecting a switch operating as a Lucent Network Gateway (LNG) to a Lucent Signaling Gateway (LSG). The signaling hub must be dedicated for signaling LAN.

One SP/TMG signaling cable dresses down the left side of the rear of the frame to the SIG ENET (J5) connector on the SP/TMG B module in slot 13. The other SP/TMG signaling cable dresses down the right side of the rear of the frame to the SIG ENET (J5) connector on the SP/TMG A module in slot 9. OS and signaling Ethernet cabling to the rear SP/TMG modules is shown in Figure 6-7.

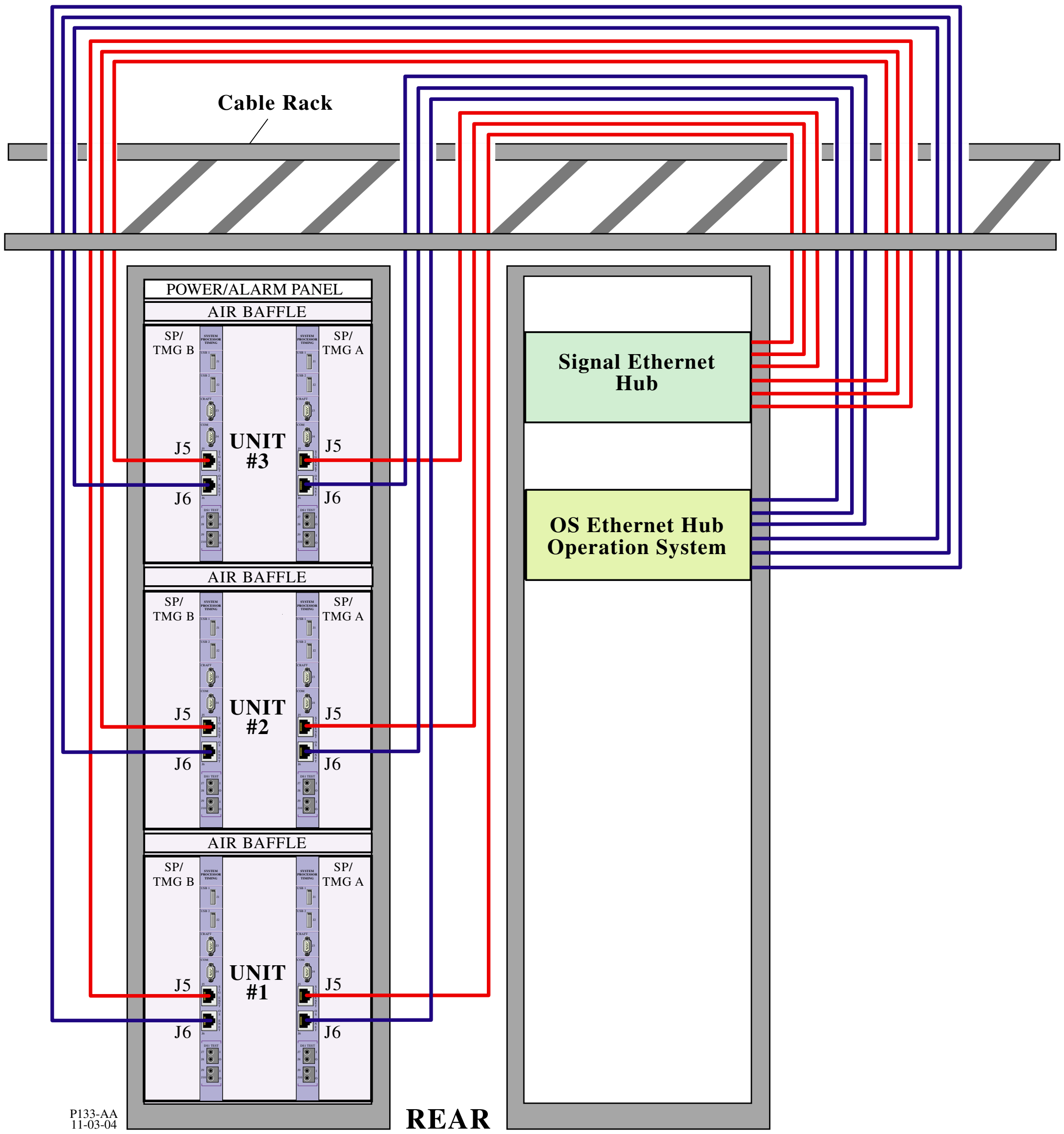
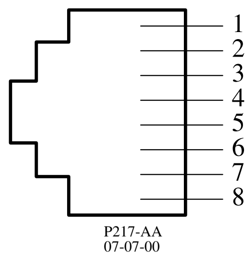


Figure 6-7. Ethernet Cabling for a Rack

Pinouts for the OS ENET (J6) and SIG ENET (J5) connectors on the SP/TMG rear modules are shown in Table 6-F and an illustration of the cable is shown in Figure 6-8.

Table 6-F. Ethernet Connector

Name	Pin	Description
	1	TX+
	2	TX-
	3	RX+
	4	
	5	
	6	RX-
	7	
	8	
		31

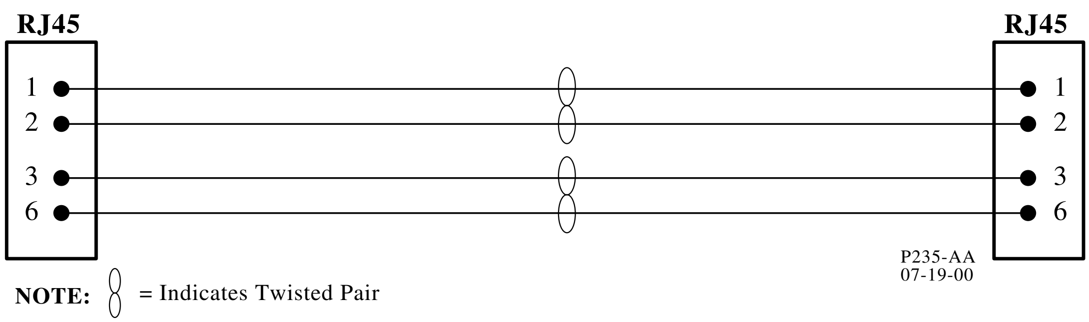


Figure 6-8. Ethernet Cable

6.6 Craft/Modem Cabling

Craft personnel can interface with the system directly via the RS-232 connections or remotely via modems. The craft cable can be connected to the serial port either on the front SP/TMG module as illustrated in Figure 6-9 or on the rear SP/TMG module as shown in Figure 6-10. Because the connectors are electrically the same, only one connector can be used at a time.

The other end of the cable terminates with either a DB-25 male for a modem connection, or a DB-9 female for a direct connection (null modem) to the serial port on the PC or terminal. (A DB-25 female is possible on some older equipment). The modem cable pinouts are shown in Figure 6-17. The pinouts for the DB-9 to DB-9 craft interface cables are shown in Figure 6-12 and for the DB-9 to DB-25 in Figure 6-13.

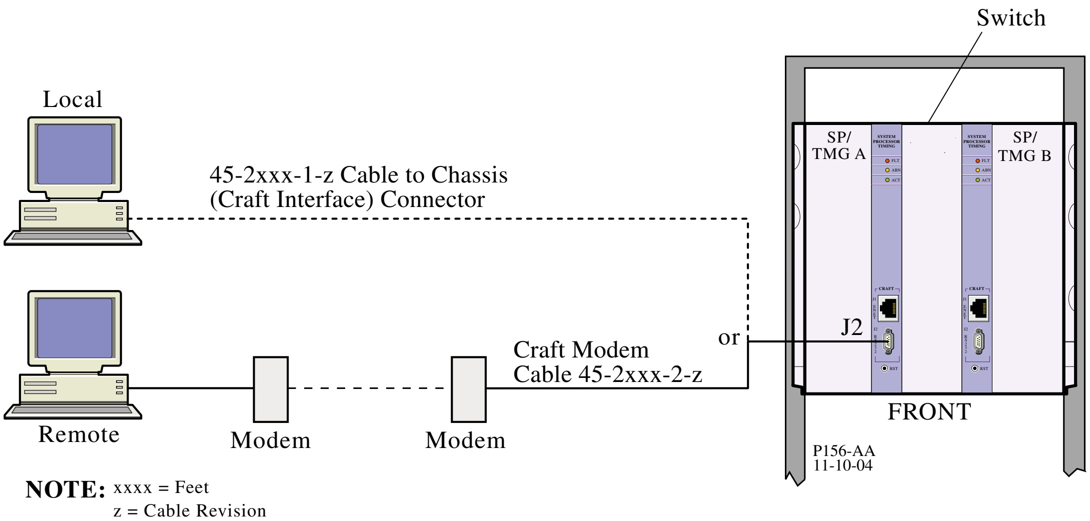


Figure 6-9. Cabling to Craft Port on Front SP/TMG

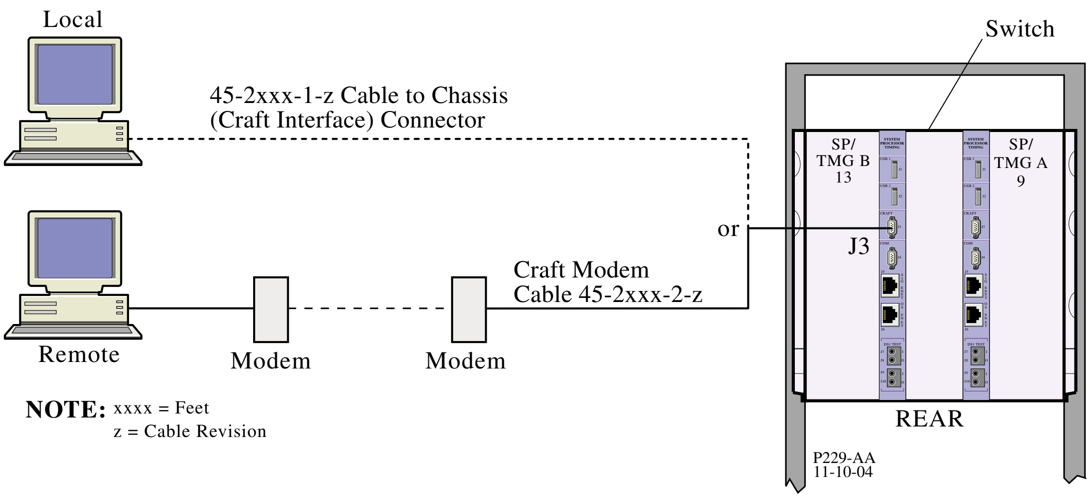


Figure 6-10. Cabling to the Rear Craft Port Connector

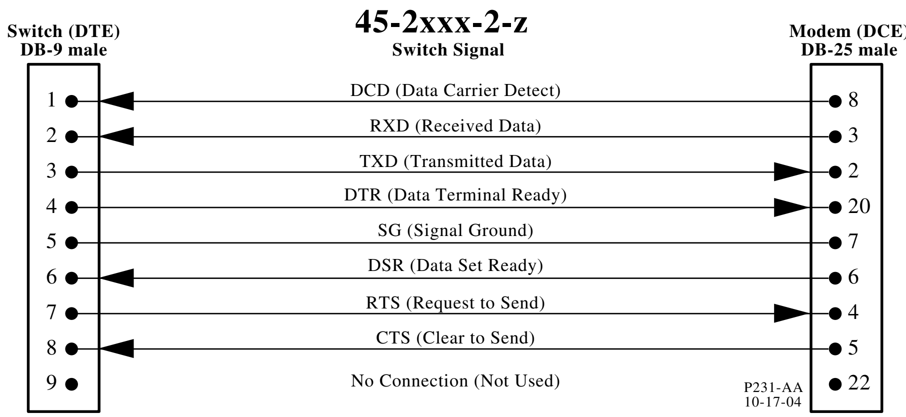


Figure 6-11. DB-9 to DB-25 Craft Modem Cable Pinouts

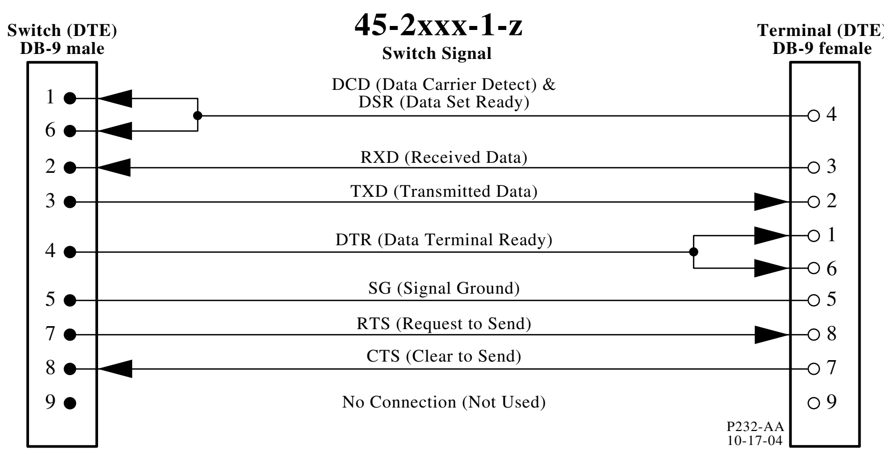


Figure 6-12. DB-9 to DB-9 Craft Terminal (Null Modem) Cable Pinouts

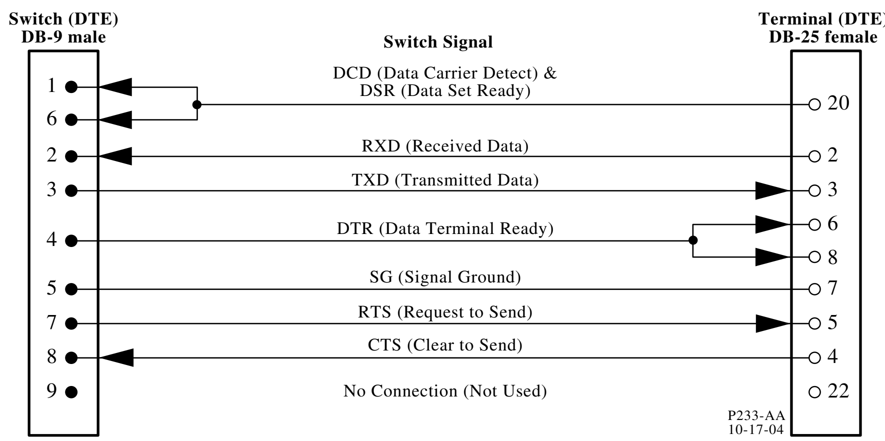


Figure 6-13. DB-9 to DB-25 Craft Terminal (Null Modem) Cable Pinouts

Craft personnel can also interface with the system using a Telnet or EMS over the Ethernet LAN. An Ethernet connector for a permanent LAN connection is provided on each rear SP/TMG module as shown in Figure 6-14. The Ethernet cable is a standard RJ-45 to RJ-45 cable if the connection is through a hub. This cable has been shown in Figure 6-8.

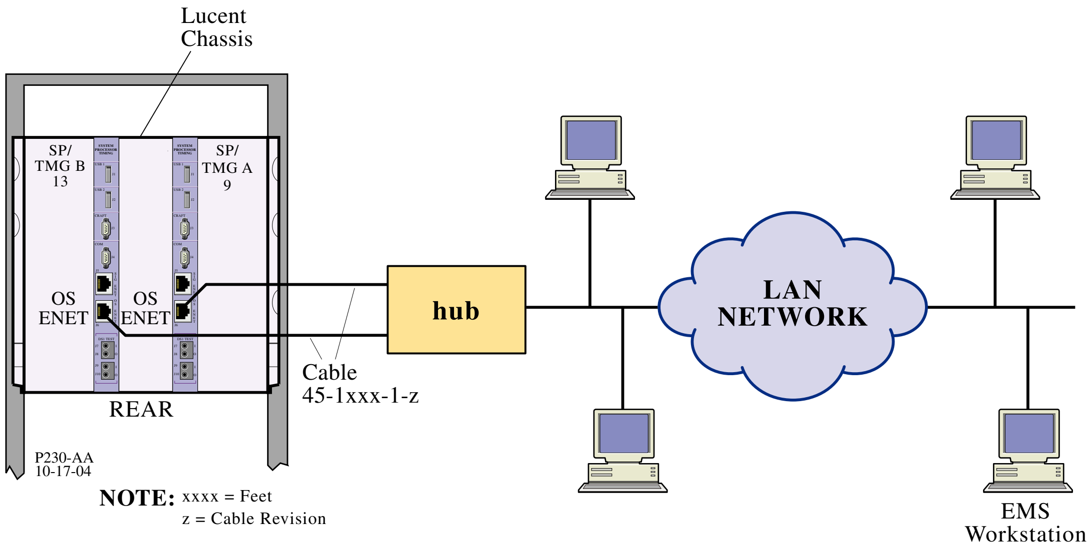


Figure 6-14. Switch Connected to Hub and LAN Network

An Ethernet connector is also available on each front SP/TMG module. This connection was designed for a temporary connection for maintenance. When a connection is made not using an Ethernet hub, a crossover cable is needed to connect directly to a PC. The pinout of this cable is shown in Figure 6-15.

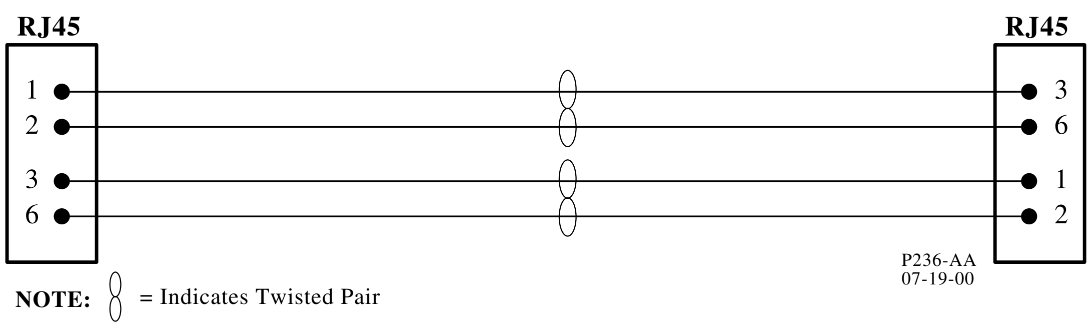


Figure 6-15. Ethernet Crossover Cable

6.7 DS-1 and E1 Cabling

The DS-1 I/O rear interface modules provide the DS-1 terminations. The DS-1/J1/E1 rear IOM provides the DS-1 or E1 terminations. Each DS-1 IOM terminates 28 DS-1 channels via two 64-pin connectors (28 pairs for transmit, 28 pairs for receive). Each E1 IOM terminates 21 E1 channels. The rear IOM connectors are shown in Figure 6-16 and their pinouts are shown in
Table 6-G.

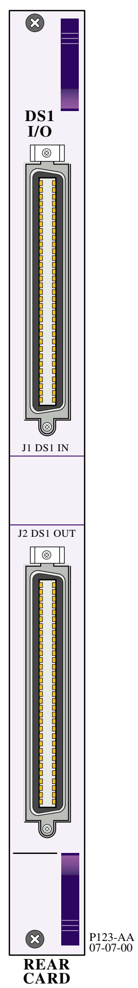
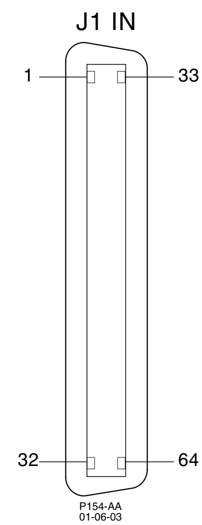
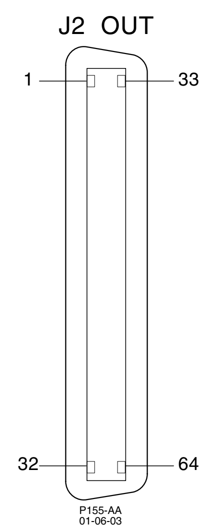


Figure 6-16. Rear DS1/E1 IOM

Table 6-G. Pins and Wires 64-pin In and Out Cables

<table>
<tr><th>Function</th><th>Color Code -</th><th>Pin Number</th><th>Connector</th></tr>
<tr><td>Channel 1 Ring</td><td>BLU/WHT</td><td>1</td><td rowspan="14">
</td></tr>
<tr><td>Channel 1 Tip</td><td>WHT/BLU</td><td>33</td></tr>
<tr><td>Channel 2 Ring</td><td>ORN/WHT</td><td>2</td></tr>
<tr><td>Channel 2 Tip</td><td>WHT/ORN</td><td>34</td></tr>
<tr><td>Channel 3 Ring</td><td>GRN/WHT</td><td>3</td></tr>
<tr><td>Channel 3 Tip</td><td>WHT/GRN</td><td>35</td></tr>
<tr><td>Channel 4 Ring</td><td>BRN/WHT</td><td>4</td></tr>
<tr><td>Channel 4 Tip</td><td>WHT/BRN</td><td>36</td></tr>
<tr><td>Channel 5 Ring</td><td>GRY/WHT</td><td>5</td></tr>
<tr><td>Channel 5 Tip</td><td>WHT/GRY</td><td>37</td></tr>
<tr><td>Channel 6 Ring</td><td>BLU/RED</td><td>6</td></tr>
<tr><td>Channel 6 Tip</td><td>RED/BLU</td><td>38</td></tr>
<tr><td>Channel 7 Ring</td><td>ORN/RED</td><td>7</td></tr>
<tr><td>Channel 7 Tip</td><td>RED/ORN</td><td>39</td></tr>
<tr><td>Channel 8 Ring</td><td>GRN/RED</td><td>8</td><td rowspan="14">
</td></tr>
<tr><td>Channel 8 Tip</td><td>RED/GRN</td><td>40</td></tr>
<tr><td>Channel 9 Ring</td><td>BRN/RED</td><td>9</td></tr>
<tr><td>Channel 9 Tip</td><td>RED/BRN</td><td>41</td></tr>
<tr><td>Channel 10 Ring</td><td>GRY/RED</td><td>10</td></tr>
<tr><td>Channel 10 Tip</td><td>RED/GRY</td><td>42</td></tr>
<tr><td>Channel 11 Ring</td><td>BLU/BLK</td><td>11</td></tr>
<tr><td>Channel 11 Tip</td><td>BLK/BLU</td><td>43</td></tr>
<tr><td>Channel 12 Ring</td><td>ORN/BLK</td><td>12</td></tr>
<tr><td>Channel 12 Tip</td><td>BLK/ORN</td><td>44</td></tr>
<tr><td>Channel 13 Ring</td><td>GRN/BLK</td><td>13</td></tr>
<tr><td>Channel 13 Tip</td><td>BLK/GRN</td><td>45</td></tr>
<tr><td>Channel 14 Ring</td><td>BRN/BLK</td><td>14</td></tr>
<tr><td>Channel 14 Tip</td><td>BLK/BRN</td><td>46</td></tr>
</table>

64-pin In And Out Cables (Table Continued)			
Function	**Color Code -**	**Pin Number**	**Connector**
Channel 15 Ring	GRY/BLK	15	
Channel 15 Tip	BLK/GRY	47	
Channel 16 Ring	BLU/YEL	16	
Channel 16 Tip	YEL/BLU	48	
Channel 17 Ring	ORN/YEL	17	
Channel 17 Tip	YEL/ORN	49	
Channel 18 Ring	GRN/YEL	18	
Channel 18 Tip	YEL/GRN	50	
Channel 19 Ring	BRN/YEL	19	
Channel 19 Tip	YEL/BRN	51	
Channel 20 Ring	GRY/YEL	20	
Channel 20 Tip	YEL/GRY	52	
Channel 21 Ring	BLU/VIO	21	
Channel 21 Tip	VIO/BLU	53	
Channel 22 Ring	ORN/VIO	22	
Channel 22 Tip	VIO/ORN	54	
Channel 23 Ring	GRN/VIO	23	
Channel 23 Tip	VIO/GRN	55	
Channel 24 Ring	BRN/VIO	24	
Channel 24 Tip	VIO/BRN	56	
Channel 25 Ring	GRY/VIO	25	
Channel 25 Tip	VIO/GRY	57	
Channel 26 Ring	BLU/WHT 2	26	
Channel 26 Tip	WHT/BLU 2	58	
Channel 27 Ring	ORN/WHT 2	27	
Channel 27 Tip	WHT/ORN 2	59	
Channel 28 Ring	GRN/WHT 2	28	
Channel 28 Tip	WHT/GRN 2	60	
DRAIN	N/A (bare wire)	64	
			T61-B

The DS-1, J1 or E1 cables typically terminate at a cross-connect, via either wire-wrap, Figure 6-17, or 64-pin connectors, Figure 6-18. Refer to Table 6-G for the channel designation pinout and wire color-coding.

The cable distance to the cross-connect panel cannot be greater than 655 feet when using 22-gauge T1 cable and no greater than 400 feet when using 24-guage T1 cable. DS1/J1/E1 cabling in a rack is shown in Figure 6-19.

The DS-1, J1 or E1 can be Inter-Machine Trunks (IMTs), ISDN Primary Rate Interfaces (PRIs) or SS7 Signaling Links. To provide redundancy for the SS7 links, two IOMs modules are typically used.

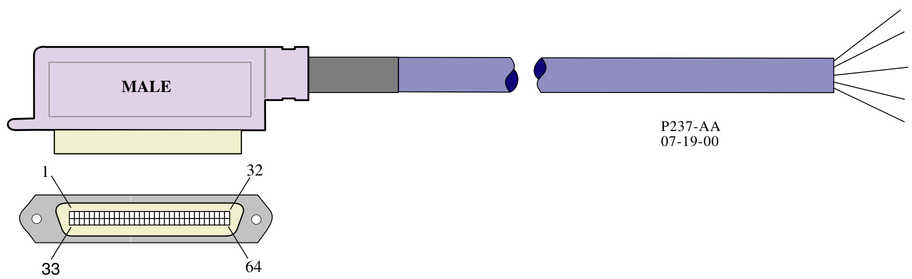


Figure 6-17. 64-pin AMP-style Cable – Connector to Wire-wrap

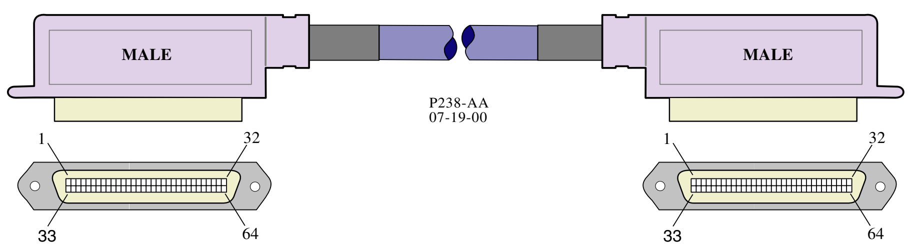


Figure 6-18. 64-pin AMP-style Cable – Connector to Connector

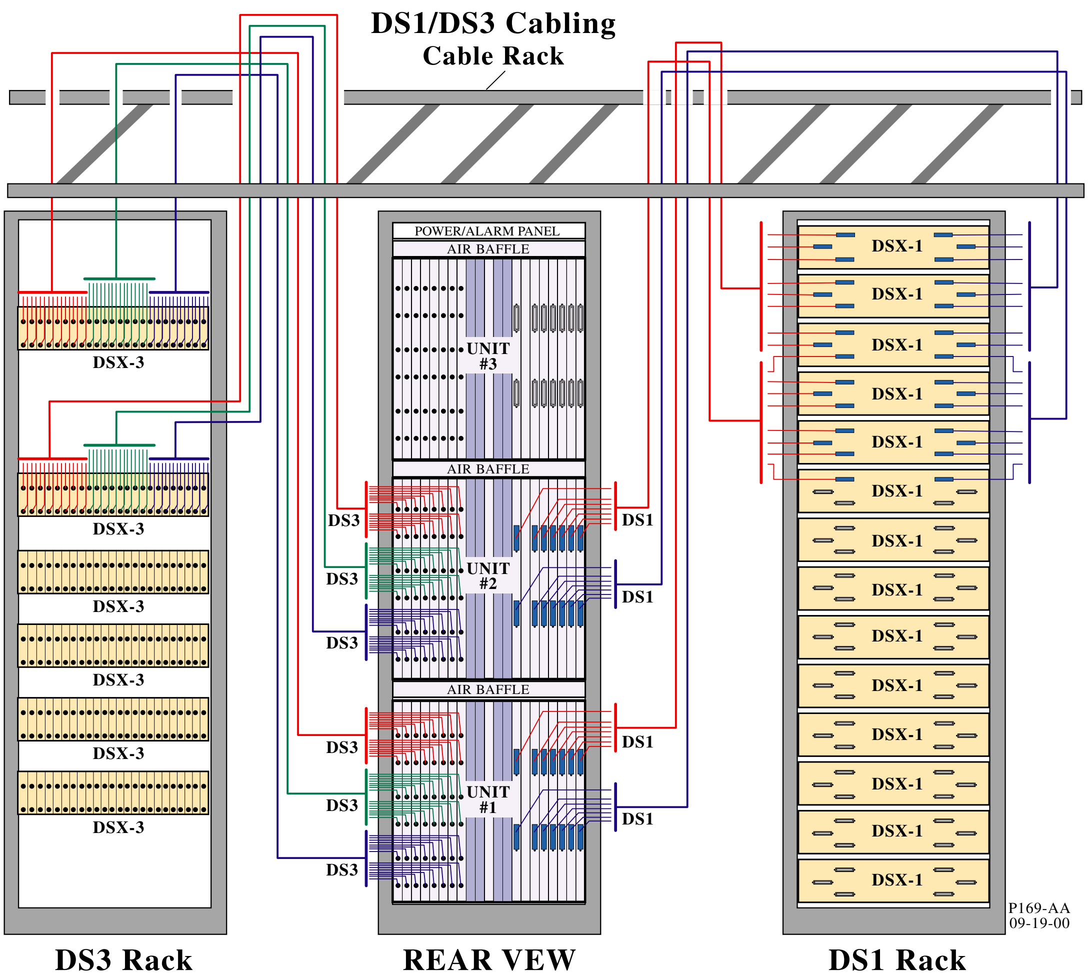


Figure 6-19. Cabling of IOMs

6.8 DIAG Connector

The 89-0402 rear Channelized OC3 IOM has a DB-9 connector labeled DIAG that is used by Lucent technical personnel for diagnostic purposes. It has an Ethernet and two serial ports. Refer to Figure 6-20 for an illustration of the connector.

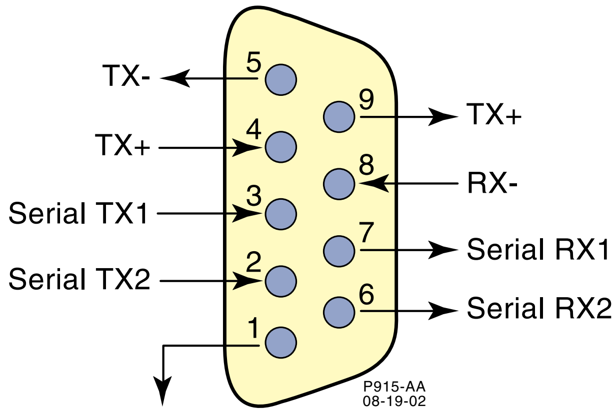


Figure 6-20. DB-9 DIAG connector

6.9 DS-3/STS-1 Cabling

The DS-3 or DS-3/STS-1 I/O rear interface modules provide the terminations for three or eight DS-3 or STS-1 ports. Each module terminates DS-3 or STS-1 ports with an input and output BNC connector for each DS-3. The rear DS-3 (triple) IOM connectors are shown in Figure 6-21 and the Octal DS3/STS-1 IOM connectors are shown in Figure 6-22.

The DS-3 cables typically terminate at a DSX-3 cross-connect and the cable distance to the DSX-3 cross-connect panel cannot be greater than 450 feet. Refer to Figure 6-23 for an illustration of the triple DS-3 cable and to Figure 6-24 for the octal. DS-3 cabling in a rack is shown in Figure 6-19.

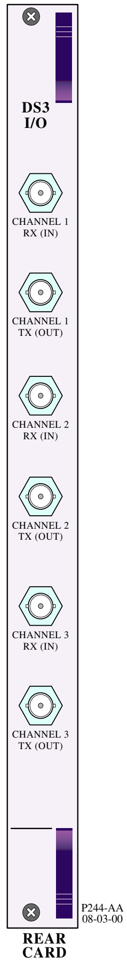


Figure 6-21. Triple DS3 IOM

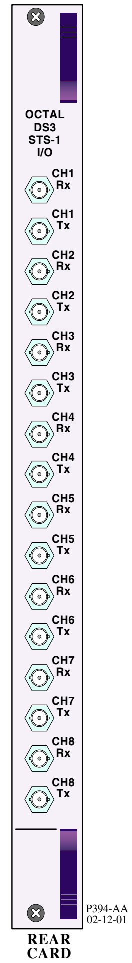


Figure 6-22. Octal DS3/STS-1 IOM

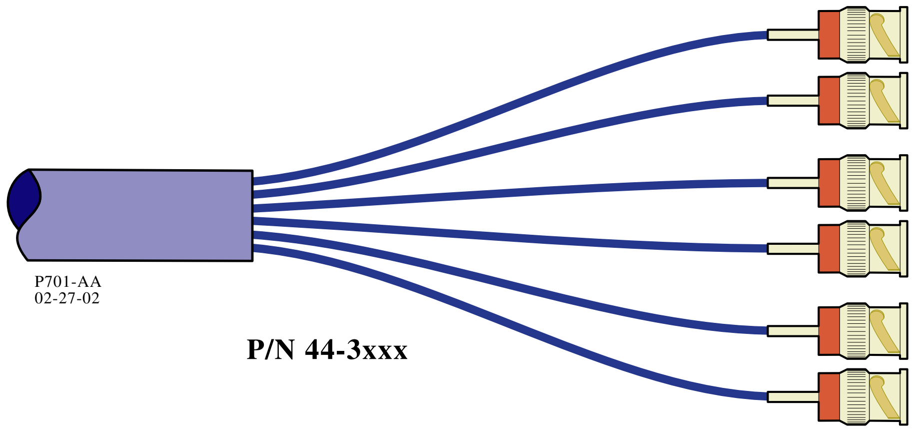


Figure 6-23. Triple DS3 Cable, Part Number 44-3XXX

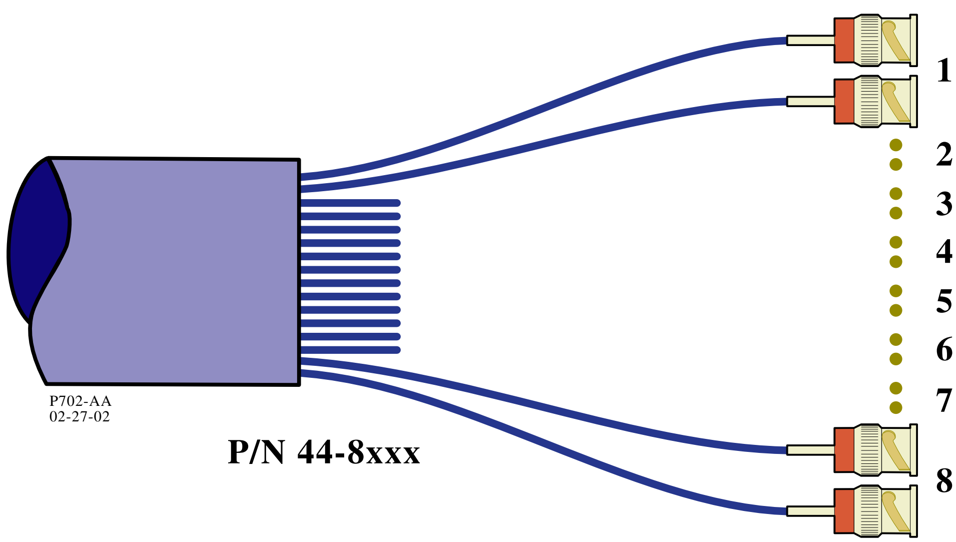
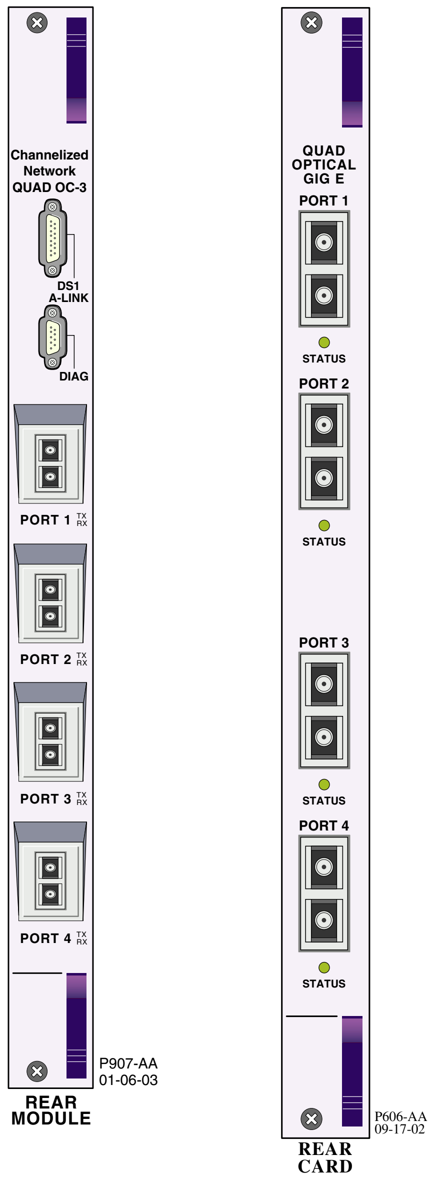


Figure 6-24. Octal DS3 Cable, Part Number 44-8XXX

6.10 OC-3/STM-1 Cabling

The module OC-3/STM-1 connectors with fiber cables attached are shown in Figure 6-25. An illustration of a single mode fiber optic cable with duplex SC connectors is shown in Figure 6-26.



Rear OC-3 CNA **Rear QBIC ENA**

Figure 6-25. Optical Connectors

The Channelized OC-3 Rear IOMs as well as the rear GBIC Ethernet Network Access IOM have single mode optical SC-type connectors for connections to an optical network. These connectors of these IOMs are illustrated in Figure 6-25.

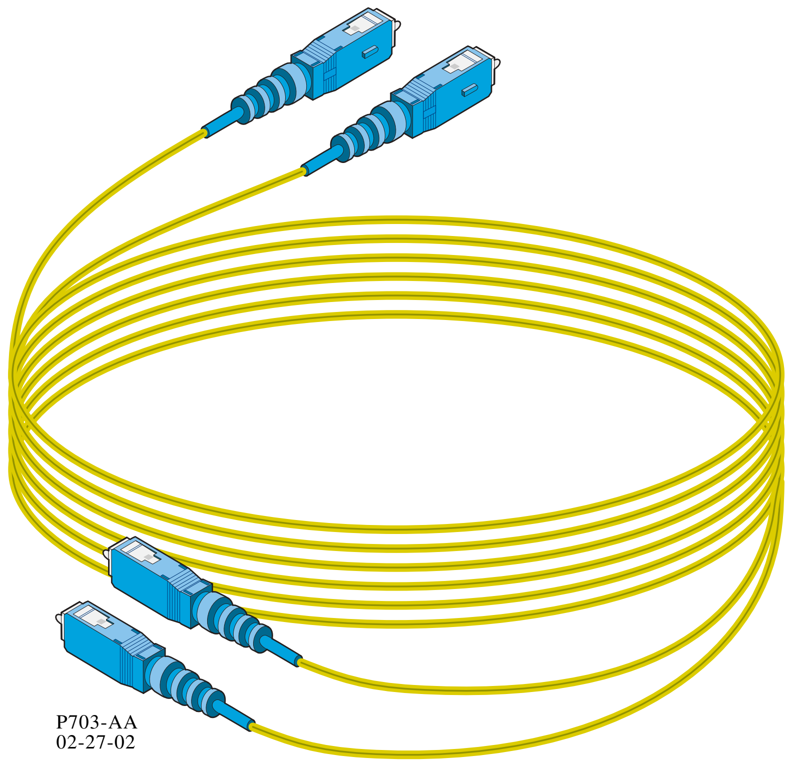


Figure 6-26. Single Mode Fiber Optic Cable with Duplex SC Connectors

6.11 Test Jacks

There are two pairs of bantam jacks, J7, J8 and J9, J10. Refer to Figure 6-27. Typically, these jacks are used to monitor DS-0s of multiple DS-1s, J1s or E1s (e.g., ISDN D channels). Because there are two pairs of jacks, two different DS-1s, J1s or E1s can be monitored. J7, labeled "I", allows the user to input a signal and monitor it using J8, labeled "O". J9 is not used and J10, which is labeled "O", is used as a monitor jack.

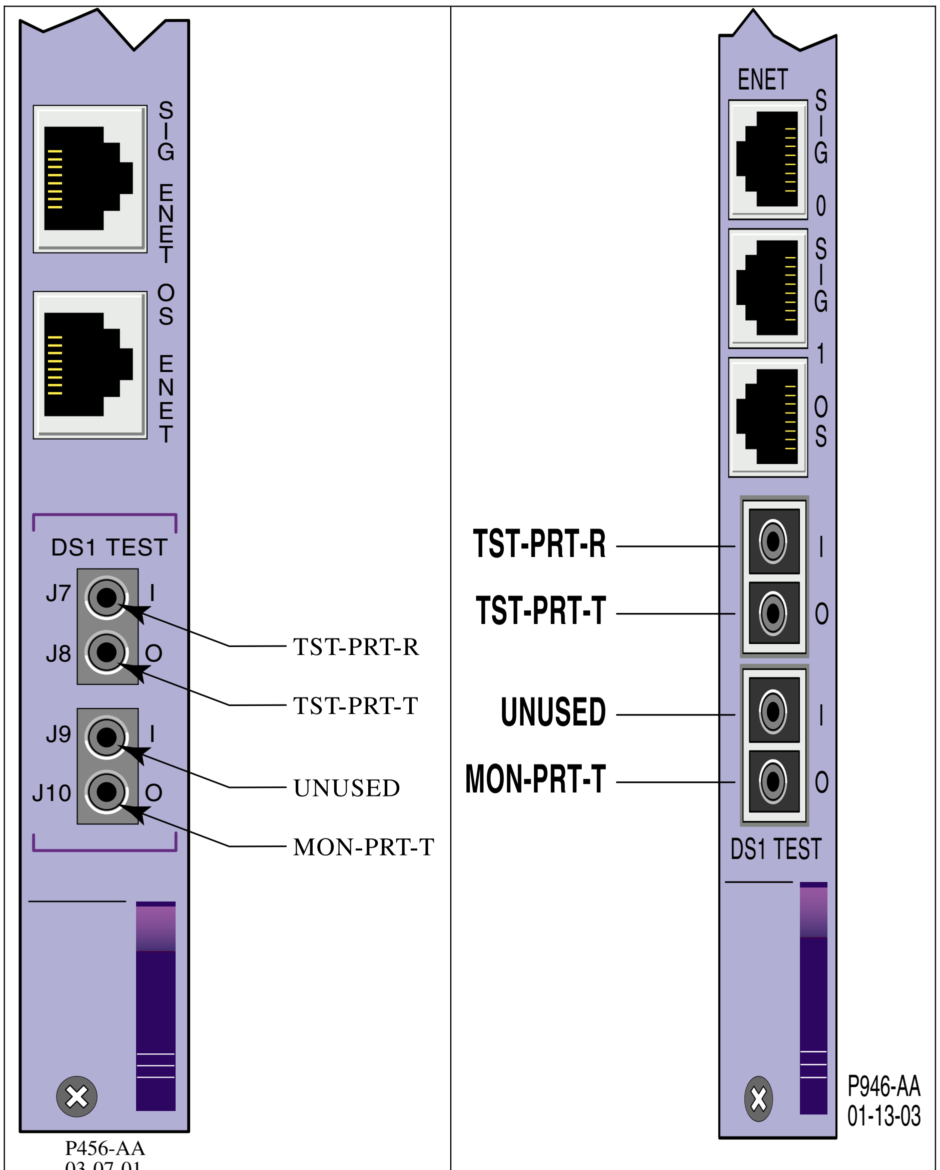


Figure 6-27. Monitor Jacks

These jacks allow the user to monitor a DS-1, J1 or E1 or DS0s of multiple DS-1s, J1s or E1s entering or leaving the Plexus 9000. The DS-0s are typically ISDN D-channels or SS7 signaling channels, although a single DS-1, J1 or E1 could be monitored. However, ISDN D-channels and SS7 signaling channels cannot be monitored on the same DS-1, J1 or E1. The DS-0s to be monitored must be on the same IOM and are selected with TL1 commands. The test jacks are also selected with a TL1 command.

The monitor jacks are connected via the midplane to the framer/LIU of the front System Processor module. Refer to Figure 6-28. The framer/LIU receives the DS-0s from the IOM, multiplexes them into a single DS-1, J1 or E1 and sends it to the rear module and the monitor jacks. Test equipment can now be connected to monitor the signals.

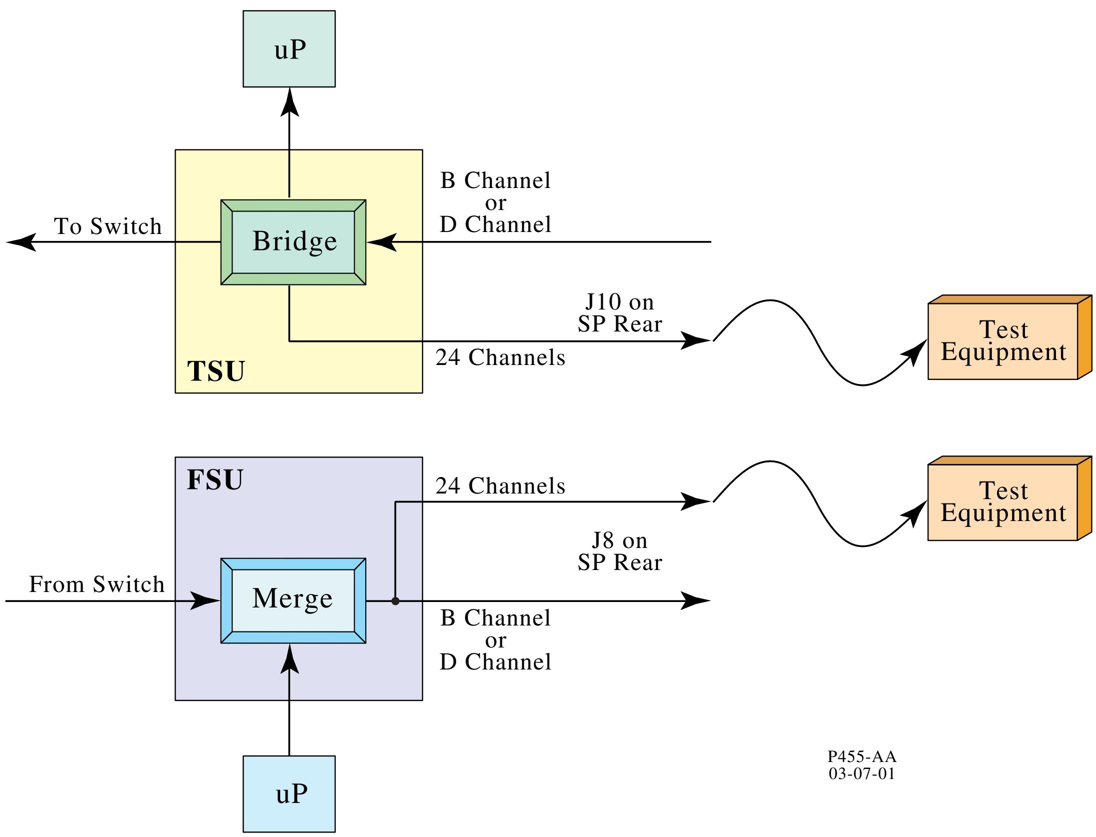


Figure 6-28. Monitor Jacks, System Processor and IOM

NOTES:

7 Part Information

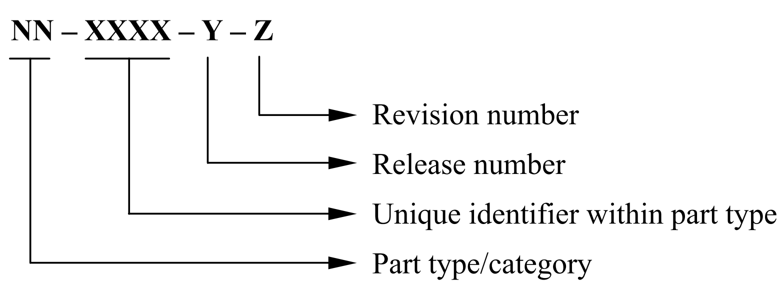
7.1 Scope

This section provides an explanation of part number formats, lists of part numbers, associated Commcodes, descriptions and CLEI codes of the switch modules. Usage of some modules is determined by the version of the system software, the chassis (i.e., 85-3004 or 85-3007), or the application (i.e., VoIP). For information about ordering, contact Order Administration at 508-480-0909.

7.2 Lucent Part Number Formats

7.2.1 System Part Numbers

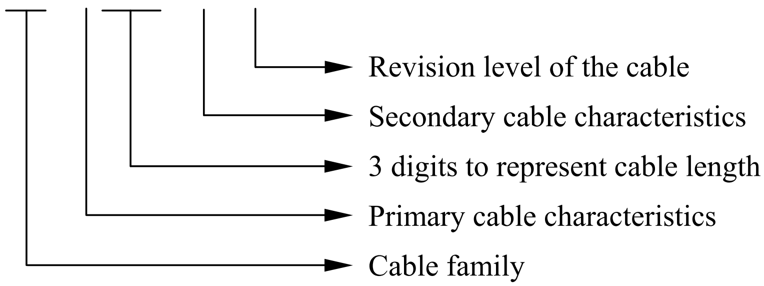
The format of all Lucent-assigned part numbers, with the exception of cable assemblies, is as follows:



7.2.2 Cable Assemblies

The format of all cable assemblies, is as follows:

NN – AXXX – Y – Z



7.2.2.1 NN Field

The cable families represented by the “NN” field are:

43 = DS1/E1/J1 Cables

44 = DS3 Cables

45 = Miscellaneous Cables

46 = Fiber Optic Cables

7.2.2.2 A Field

For 43/44-series cables, the “A” field represents primary cable characteristics, such as wire gauge. For 45-series cables, the “A” field represents the category of cable. Refer to Table 7-A.

7.2.2.3 XXX Field

The “XXX” field is a three-digit representation of the cable length. The units are usually in feet. Certain cables may have lengths that are not exact to the foot (e.g., 20 inches).

7.2.2.4 Y Field

For 43/44-series cables, the “Y” field represents secondary cable characteristics, such as connector. For 45-series cables, the “Y” field represents the sub-category of cable. Refer to Table 7-B for a description of the “Y” field for cables.

7.2.2.5 Z Field

The “Z” field represents the revision level of the cable.

Table 7-A. "A" Field of Cables (RMA Only)

Cable Number	Description
43-Axxx-y-z	DS-1/E1/J1 cable, shielded, 28 pairs terminated with 64-pin connector
43-1	22-gauge solid wire
43-2	24-gauge solid wire
44-Axxx-y	DS-3 coaxial cable, shielded with aluminum-polyester and tinned copper braid
44-1	Single 734 series (solid 26-AWG copper wire) cable
44-2	Single 735 series (solid silver-plated, 26-AWG copper wire) cable
44-3	Six 735 series cables bundled together into one
44-8	Sixteen 735 series cables bundled together into one
45-Axxx-y-z	
45-1	Ethernet Cable
45-2	Craft Cable
45-3	Alarm Cable
45-4	#6 AWG Gray Power Cable
45-5	#6 AWG Green Ground Cable
45-6	BITS Clock Cable, Shielded Twisted Single Pair

Table 7-B. "Y" Field of Cables (RMA Only)

Cable Number	Description
43-axxx-**Y**-z	DS-1/E1/J1 cable
43-axxx-1	Shielded connectors, two male ends, and screw fasteners
43-axxx-2	Unshielded connectors, two male ends, and screw fasteners
43-axxx-3	Shielded connectors, two male ends, one screw fastener and one bail lock fastener
43-axxx-4	One shielded male connector with screw fastener and bare wire at other
44-axxx-**Y**-z	DS-3 cable
44-axxx-1	BNC connector at each end
44-axxx-2	BNC connector at one end and field terminate at other
45- axxx-**Y**-z	Miscellaneous Cables
45-1xxx-1	Ethernet Cable, RJ45 to RJ45
45-2xxx-1	Craft Cable, DB9M to DB9F
45-2xxx-2	Craft Modem Cable, DB9M to DB25M
45-3xxx-1	Bay Alarm Cable, DB9M to DB9M
45-3xxx-2	Alarm Contacts Cable, DB25M to Bare Wire

Cable Number	Description
45-4xxx-1	#6 AWG Gray Power Cable
45-5xxx-1	#6 AWG Green Ground Cable
45-6xxx-1	BITS Clock Cable, Shielded Twisted Single Pair

7.3 Base System

Table 7-C lists what is included when ordering a switch.

Table 7-C. Base System

Part Number	Description	
85-3000-A	Switch Chassis	
	The following is included with the chassis:	
	85-3001-A	Fan Tray Assembly
	85-7003-0	Fan Filter
	Box with following:	
	85-5044-A	Air Baffle
	89-0375-n	SW FAB B Rear
		Upper Bezel
		Lower Bezel
	89-0001-1	Accessory Kit with following:
	23-0012-0	2A GMT Fan Fuse
	23-0009-0	Cover for GMT Fan Fuse
	92-0017-0	Hardware Kit with 5 #6 lugs and mounting screws
		Wrist Strap
		Tie Wraps for DS1 modules
	79-6006	Install and TL1 Documentation Set (Shipped in separate carton.)
85-3004-A	Switch Chassis with Midplane II. The following is included with chassis:	
	85-3005-B See Note.	Fan Tray Assembly (High-Speed)
	And all items listed for 85-3000 chassis except Fan Tray Assembly.	
85-3007-A	Chassis with Midplane III. The following is included with chassis:	
	85-3005-B See Note.	Fan Tray Assembly (High-Speed)
	And all items listed for 85-3000 chassis except Fan Tray Assembly.	

Part Number	Description	
85-3008-A	14 RU Chassis with Midplane III. The following is included with chassis:	
	85-3009-A	Fan Tray Assembly (High-Speed)
	And all items listed for 85-3000 chassis except Air Baffle and Fan Tray Assembly.	
Note: Midplane II and III support Octal DS3/STS-1 modules. 85-3005-B Fan Trays replaced 85-3005-A trays.		

7.4 Parts Numbers

7.4.1 Documentation

Table 7-E and Table 7-E provide a complete list of the system and Plexview documentation that is available.

Table 7-D

Product	Part Number	Product Description
Lucent Gateway Platform Operations Manual	255-400-000	Contains the platform provisioning procedures.
Lucent Gateway Platform Maintenance and Troubleshooting Guide	255-400-001	Contains the procedures for adding and upgrading modules, and maintaining and troubleshooting switch alarms.
Lucent Gateway Platform TL1 Commands Reference Guide	255-400-002	Description of all the TL1 commands needed to provision the platform, functional entities and services.
Lucent Gateway Platform Planning and Engineering Guide	255-400-003	Contains the information necessary for designing an installation site including: hardware specifications; cabling schematics; and cabling, floor plan, environmental and power requirements.
Lucent Gateway Platform Product Overview Guide	255-400-004	Contains descriptions of the base switching platform, functional entities (Network Controller, Signaling Gateway; Network Gateway, Compact Switch) and supported provisioning methods.

Product	Part Number	Product Description
Lucent Gateway Platform System Release Notes	255-400-006	Contains new features and feature enhancements, new and modified TL1 commands, hardware and software limitations and other important release-specific information not available elsewhere.
Lucent Gateway Platform Feature Packages Guide	255-400-012	Contains detailed feature package descriptions.
Lucent Gateway Platform Billing and Traffic Collection (BTC) Guide	255-400-403	Contains installation, upgrade, and applications procedures.
Lucent Gateway Platform BTC Release Notes	255-400-404	Contains software features and release-specific information that is not available elsewhere.
Lucent Gateway Platform System Documentation CD-ROM	255-400-007	Contains all of the manuals and the release notes listed above in Adobe Acrobat PDF format.

Table 7-E. PlexView Documentation

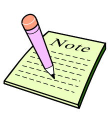
Product Documentation	Part Number	Product Description
Lucent Gateway Platform Element Management System (EMS) User Guide	255-400-400	EMS provisioning reference guide.
Lucent Gateway Platform Element Management System (EMS) Installation Guide	255-400-401	Installing the EMS software on a Sun workstation.
Lucent Gateway Platform EMS Software Release Notes	255-400-402	Contains software features and release-specific information that is not available elsewhere.

Product Documentation	Part Number	Product Description
Lucent Gateway Platform Billing Traffic Collection (BTC) Guide	255-400-403	Contains installation, upgrade, and applications procedures.
Lucent Gateway Platform BTC Release Notes	255-400-404	Contains software features and release-specific information that is not available elsewhere.
Lucent Gateway Platform EMS/BTC Documentation CD-ROM	255-400-406	Contains: EMS User Guide 255-400-400 EMS Installation Guide 255-400-401 EMS Software Release Notes 255-400-402 BTC Guide 255-400-403 BTC Release Notes 255-400-404
Lucent Gateway Platform Advanced Reporting System (ARS) User’s Guide	255-400-200	ARS provisioning reference guide.
Lucent Gateway Platform Advanced Reporting System (ARS) Installation Guide	255-400-201	Installation and upgrade information for the ARS software.
Lucent Gateway Platform Advanced Reporting System (ARS) with Advanced Traffic Collector (ATC) Installation Guide	255-400-202	Provides installation and upgrade information for the ATC and ARS in sequential order.
Lucent Gateway Platform ARS Software Release Notes	255-400-203	ARS software features and release-specific information that is not available elsewhere

Product Documentation	**Part Number**	**Product Description**
Lucent Gateway Platform ARS Documentation CD-ROM	255-400-204	Contains: ARS User Guide 255-400-200 ARS Installation Guide 255-400-201 ARS with ATC Installation Guide 255-400-202 ARS Software Release Notes 255-400-203

7.4.2 Module and System Part Numbers

Table 7-F provides information about the individual module and which software versions support it. As indicated, the individual modules are available for RMA purposes only. Table 7-G lists the customer orderable units and the individual modules that are contained in those units. Table 7-H provides information about the individual module and the chassis that supports it. Table 7-I provides information about functionality of the Switch Fabric when used with the single or dual System Processor and in the chassis with Midplane I, II or III. Table 7-J lists other individual system and ancillary part numbers.



Note: The **i**ndividual part numbers that are shaded in the table below have been "manufacture discontinued." They are, however, still supported by some of the software versions as indicated.

Table 7-F. Software Version and Support of Modules

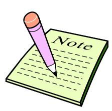
			Software Version									
Module	**Part Number**	**Comm Code**	**3.5.X.X**	**3.6.X.X**	**3.7.X.X**	**3.8.X.X**	**3.9.X.X**	**3.10.X.X**	**3.11.X.X**	**5.0.X.X**	**5.1.X.X**	**6.0.X.X**
Switch Chassis	85-3000-A	300729803	Y	Y	Y	Y	Y	Y	Y	N	N	N
Switch Chassis	85-3003-A	#N/A	Y	Y	Y	Y	Y	Y	Y	N	N	N
Switch Chassis	85-3004-A	300729811	Y	Y	Y	Y	Y	Y	Y	N	N	N

Module	Part Number	Comm Code	Software Version									
			3.5.X X	3.6.X.X	3.7.X.X	3.8.X.X	3.9.X.X	3.10.X.X	3.11.X.X	5.0.X.X	5.1.X.X	6.0.X.X
Switch Chassis	85-3007-A	#N/A	N	N	N	Y 9	Y 9	Y	Y	Y	Y	Y
Switch Chassis	85-3008-A	300723814	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fan Tray (high speed fans)	85-3009-A	300723830	N	N	N	Y 10	Y 10	Y	Y	Y	Y	Y
SP/TMG Front	89-0366-B	300729985	Y	Y	Y	N	N	N	N	N	N	N
Dual SP/TMG Front (SP-2)	89-0389-B	300730116	Y	Y	Y	Y	Y	Y	Y	N	N	N
Dual SP/TMG Front (SP-3) (Note 3)	89-0406-A	300730207	N	N	N	Y 5	Y 5	Y	Y	Y	Y	Y
	89-0406-B	300730280	N	N	N	Y 5	Y 5	Y	Y	Y	Y	Y
	89-0406-C	300783933	N	N	N	Y 5	Y 5	Y	Y	Y	Y	Y
	89-0406-D	300796588	N	N	N	Y 5	Y 5	Y	Y	Y	Y	Y
SP/TMG Rear	89-0367-A	300729993	Y	Y	Y	Y	Y	N	N	N	N	N
	89-0367-B	300730009	Y	Y	Y	Y	Y	N	N	N	N	N
	89-0367-C	300730017	Y	Y	Y	Y	Y	Y	Y	N	N	N
Switch Fabric Front	89-0363-A	300729902	Y	Y	Y	N	N	N	N	N	N	N
	89-0363-B	300729910	Y	Y	Y	N	N	N	N	N	N	N
	89-0363-C	300729928	Y	Y	Y	Y	Y	Y	Y	N	N	N
	89-0363-D	300729936	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SW FAB A Rear	89-0364-A	300729944	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SW FAB B Rear	89-0375-A	300730041	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Front Compute Module	89-0419-B	300763885	-	-	-	-	-	N	N	Y	Y	N
Rear Compute Module	89-0420-A	#N/A	-	-	-	-	-	N	N	Y	Y	N
DS-1 Front	89-0360-A	300729860	Y	Y	Y	Y	Y	Y	Y	N	N	N
DS1/E1/J1 I/O Termination Module	89-0414-A	300746922	-	-	-	-	-	N	N	Y	Y	Y
DS-1 Rear	89-0362-A	300729886	Y	Y	Y	Y	Y	Y	Y	N	N	N
	89-0362-B	300729894	Y	Y	Y	Y	Y	Y	Y	N	N	N
DS1/E1/J1 I/O Rear	89-0415-A	300730231	-	-	-	-	-	N	N	Y	Y	Y
DS-1 Rear Prot.	89-0368-A	300730025	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
DS-3 Front (Note 1)	89-0365-A	300729951	Y	Y	Y	Y	Y	N	N	N	N	N
	89-0365-B	300729969	Y	Y	Y	Y	Y	N	N	N	N	N
	89-0365-C	300729977	Y	Y	Y	Y	Y	N	N	N	N	N

Module	Part Number	Comm Code	Software Version									
			3.5.X X	3.6.X.X	3.7.X.X	3.8.X.X	3.9.X.X	3.10.X.X	3.11.X.X	5.0.X.X	5.1.X.X	6.0.X.X
Triple DS-3/STS-1 Front	89-0397-A	300730165	Y	Y	Y	Y	Y	Y	Y	N	N	N
Triple DS-3/STS-1 Front w/tone detect	89-0410-A	300730215	Y 1	Y 1	Y 1	Y	Y	Y	Y	Y	Y	Y
Triple DS-3 Front w/tone detect	89-0424-A	300730264	-	-	-	Y 5	Y 5	Y	Y	Y	Y	Y
Triple DS-3 Rear	89-361-A	300729878	Y	Y	Y	Y	Y	Y	Y	N	N	N
DS-3 Rear Protection Module	89-369-A	300730033	Y	Y	Y	N	N	N	N	N	N	N
Octal DS-3 Front Module	89-0382-B	300730058	Y	Y	Y	Y	Y	Y	Y	N	N	N
Octal DS-3 Front Module	89-0398-A	300730173	Y	Y	Y	Y	Y	Y	Y	N	N	N
Octal DS-3/STS-1 Front w/tone detect	89-0411-A	300730223	Y 3	Y 3	Y 3	Y	Y	Y	Y	Y	Y	Y
Octal DS-3 Front w/tone detect	89-0425-A	300730272	-	-	-	Y 6	Y 6	Y	Y	Y	Y	Y
Octal DS-3 Rear	89-0383-A	300730066	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Octal DS-3/STS-1 Rear Protection	89-0386-A	300730082	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Voice Server	89-0384-A	300730074	Y	Y	Y	Y	Y	Y	Y	N	N	N
2688 Channel Voice Server	89-0395-A	300723715	Y	Y	Y	Y	Y	Y	Y	N	N	N
	89-0395-B	300730157	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Voice Server-3 89-0413	89-0413-A	300723723	-	-	-	-	-	-	-	-	-	Y
Ethernet Net. Access	89-0390-A	300730124	N	N	Y	Y	Y	Y	Y	Y	Y	N
	89-0390-B	300746906	-	-	-	Y 7	Y 7	Y 7	Y	Y	Y	Y
Ethernet Net. Access	89-0432-A	300783925	-	-	-	-	Y 8	Y 8	Y 8	-	-	Y
1000BASE-T Rear	89-0391-A	300730132	N	N	Y	Y	Y	Y	Y	Y	Y	Y
1000BASE-LX Rear	89-0399-A	300730181	N	N	Y	Y	Y	Y	Y	N	N	N
	89-0399-B	300730199	N	N	Y	Y	Y	Y	Y	Y	Y	Y
1000BASE-SX Rear	89-0421-A	300730256	N	N	Y	Y	Y	Y	Y	Y	Y	Y

Module	Part Number	Comm Code	Software Version									
			3. 5. X X	3. 6. X. X	3. 7. X. X	3. 8. X. X	3. 9. X. X	3. 10. X. X	3. 11. X. X	5. 0. X. X	5. 1. X. X	6. 0. X. X
OC-3 Network Access (ANA)	89-0388-C	300730108	-	-	-	-	-	-	-	-	-	Y
Channelized OC3 Front	89-0400-A	#N/A	-	-	-	-	-	N	N	Y	Y	Y
Channelized OC3 Rear	89-0402-A	#N/A	-	-	-	-	-	N	N	Y	Y	Y

Note 1 (Y1): The 89-0365 does not support CAS or IUA for MGs. Used for SS7 trunks or PRIs.
Note 2 (Y2): Available for 2.7.X.X and 2.9.X.X only.
Note 3 (Y3): Software recognizes but cannot use tone detection.
Note 4 (Y4): Needs an upgrade of lynx.os.
Note 5 (Y5): Only available with releases 3.8.3.3 and 3.9.0.7.
Note 6 (Y6): Only available with releases 3.8.3.3 and 3.9.0.7.SP.3.
Note 7 (Y7): Only available with releases 3.8.3.4, 3.9.0.x and 3.10.1.5.
Note 8 (Y8): *Target* release availability **-** 3.9.0.10, 3.10.1.8, and 3.11.0.2.
Note 9 (Y9): Only available with releases 3.8.3.3 and 3.9.0.8.
Note 10 (Y10): Only available with releases 3.8.3.4 and 3.9.0.9.



Note: The individual part numbers that are shaded in the table below have been "manufacture discontinued." They are, however, still supported by some of the software versions. Please refer to Table 7-F to determine whether the part number is supported by a particular software version.

Table 7-G. Customer Orderable Part Numbers and Comm Codes

Part Number	Commcode	Part Description (Customer Orderable Unit)	Module Part Numbers (RMA only)
87-1002-A	300729688	DS1 IOM KIT	89-0360-A 89-0362-B
87-1003-A	300729696	DS1 IOM KIT PROTECTED	89-0360-A 89-0368-A
87-1007-A	300729738	DS1 INTERFACE SPARES KIT MOD	89-0360-A 89-0362-B 89-0368-A

Part Number	Commcode	Part Description (Customer Orderable Unit)	Module Part Numbers (RMA only)
87-1020-A	300723533	P9000 CHASSIS & COMM EQUIP PROTECT W/SP2	85-3004-A (w/ 85-3005-B) 89-0389-B (2) 89-0367-C (2) 89-0363-D (2) 89-0364-A 89-0375-A
87-1021-A	300723764	QUAD 1000BASE-T (COPPER) IOM	89-0390-B 89-0391-A
87-1023-A	300723772	QUAD 1000BASE-SX (MULTIMODE FIBER) IOM	89-0390-B 89-0421-A
87-1023-B	300723780	QUAD 1000BASE-LX (SINGLE-MODE FIBER) IOM	89-0390-B 89-0399-B
87-1024-A	300723871	COMMON EQUIPMENT SPARE KIT (SP2)	85-3005-B 89-0389-B 89-0367-C 89-0363-D 89-0364-A
87-1025-A	300729761	OCTAL DS3/STS-1 IOM KIT	89-0398-A 89-0383-A
87-1026-A	300729779	OCTAL DS3/STS-1 IOM PROTECT	89-0398-A 89-0386-A
87-1027-A	300729746	TRIPLE DS3/STS-1 IOM KIT	89-0397-A 89-0383-A
87-1028-A	300729753	TRIPLE DS3/STS-1 IOM PROTECT	89-0397-A 89-0386-A
87-1029-A	300723582	3XDS3/STS-1 IOM WITH TONE DETECT	89-0410-A 89-0383-A
87-1030-A	300723640	3XDS3/STS-1 PROTECT IOM, W/ TONE DETECT	89-0410-A 89-0386-A
87-1031-A	300723590	8XDS3/STS-1 IOM WITH TONE DETECT	89-0411-A 89-0383-A
87-1032-A	300723657	8XDS3/STS-1 PROTECT IOM, W/ TONE DETECT	89-0411-A 89-0386-A
87-1035-A	300729787	TRIPLE DS3/STS-1 INTERFACE SPARES KIT	89-0397-A 89-0383-A 89-0386-A
87-1036-A	300729795	OCTAL DS3/STS-1 IOM SPARES KIT	89-0398-A 89-0383-A 89-0386-A

Part Number	Commcode	Part Description (Customer Orderable Unit)	Module Part Numbers (RMA only)
		28XDS1/E1/J1 IOM WITH TONE DETECT SPARES KIT	89-0414-A 89-0415-A 89-0368-A
87-1037-A		3XDS3/STS-1 IOM WITH TONE DETECT SPARES KIT	89-0410-A 89-0383-A 89-0386-A
87-1038-A		8XDS3/STS-1 IOM WITH TONE DETECT SPARES KIT	89-0411-A 89-0383-A 89-0386-A
87-1042-A	300723574	28XDS1/E1/J1 IOM WITH TONE DETECT	89-0414-A 89-0415-A
87-1043-A	300723632	28XDS1/E1/J1 PROTECT IOM	89-0414-A 89-0368-A
87-1052-A	300723608	3XDS3 IOM HIGH PERF, W/TONE DETECT	89-0424-A 89-0383-A
87-1053-A	300723665	3XDS3 PROTECT IOM HIGH PERF, W/ TD	89-0424-A 89-0386-A
87-1056-A	300723616	8XDS3 IOM HIGH PERF, WITH TONE DETECT	89-0425-A 89-0383-A
87-1057-A	300723673	8XDS3 PROTECT DS3 IOM HIGH PERF, W/ TD	89-0425-A 89-0386-A
87-1063-A	300723707	COMPUTE MODULE	89-0419-B 89-0420-A
87-1066-A	300723541	P9000 CHASSIS & COM EQUIP PROTECT W/ SP3	85-3008-A (w/ 85-3009-A) 89-0406-D (2) 89-0417-A (2) 89-0363-D (2) 89-0364-A 89-0375-A
87-1077-A	300723624	3XOC-3 IOM, WITH 5,376 DS0	89-0400-A 89-0402-A
87-1079-A	300741220	PLEXUS COMMON EQUIP SPARES KIT (SP3)	85-3009-A 89-0406-B 89-0417-A 89-0363-D 89-0364-A 89-0375-A
87-1074-A	300746914	SP-3 SPARE MODULE	89-0406-B 89-0417-A
87-1077-A	300723624	3XOC-3 IOM, WITH 5,376 DS0	89-0400-A 89-0402-A

Part Number	Commcode	Part Description (Customer Orderable Unit)	Module Part Numbers (RMA only)
N/A	300723715	VSM-2 SERVER MODULE: FRONT CARD ONLY	89-0395-B
N/A	300723723	VSM-3 SERVER MODULE: FRONT CARD ONLY	89-0413-A
N/A	300789914	VSM-3 SERVER MODULE: FRONT CARD ONLY	89-0413-B
N/A	300723798	QUAD OC-3C ATM NETWORK ADAPTER: FRONT CARD ONLY	89-0388-C

Note: The individual part numbers that are shaded in the table below have been "manufacture discontinued." They are, however, still supported by some of the software versions. Please refer to Table 7-F to determine whether the part number is supported by a particular software version.

Table 7-H. Chassis and Modules

Module	Part Number (RMA only)	85-3000 Midplane 1	85-3004 Midplane 2	85-3007 Midplane 3	85-3008 Midplane 3
SP/TMG Front	89-0366-A	yes	yes	yes	yes
	89-0366-B	yes	yes	yes	yes
Dual SP/TMG Front (SP-2)	89-0389-A	yes, single	yes	yes	yes
	89-0389-B	yes, single	yes	yes	yes
SP/TMG Rear	89-0367-A	yes	yes	yes	yes
	89-0367-B	yes	yes	yes	yes
	89-0367-C	yes	yes	yes	yes
Dual SP/TMG Rear (SP-3)	89-0417-A	no	no	yes	yes
Dual SP/TMG Rear (SP-3)	89-0417-B	no	no	yes	yes
Dual SP/TMG Rear (SP-3)	89-0417-C	no	no	yes	yes
Compute Front	89-0419-B	no	no	no	yes
Compute Rear	89-0429-A	no	no	no	yes
Switch Fabric Front	89-0363-A	yes	yes	yes	no
	89-0363-B	yes	yes	yes	no
	89-0363-C	yes	yes	yes	no
	89-0363-D	yes	yes	yes	yes
Switch Fabric A Rear	89-0364-A	yes	yes	yes	yes
Switch Fabric B Rear	89-0375-A	yes	yes	yes	yes

Module	Part Number (RMA only)	85-3000 Midplane 1	85-3004 Midplane 2	85-3007 Midplane 3	85-3008 Midplane 3
DS-1 Front	89-0360-A	yes	yes	yes	yes
DS-1/E1/J1 Front	89-0414-A	no	yes	yes	yes
DS-1 Rear	89-0362-A	yes	yes	yes	yes
	89-0362-B	yes	yes	yes	yes
DS-1/E1/J1 Rear	89-0415-A	no	yes	yes	yes
DS-1 Rear Prot.	89-0368-A	yes	yes	yes	yes
DS-3 Front	89-0365-A	yes	yes	yes	yes
	89-0365-B	yes	yes	yes	yes
DS-3 Front with STS	89-0365-C	yes	yes	yes	yes
Triple DS-3/STS-1 Front	89-0397-A	no	yes	yes	yes
Triple DS-3/STS-1 with Tone Detect Front	89-0410-A	no	yes	yes	yes
Triple DS-3 with Tone Detect Front	89-0424-A	no	yes	yes	yes
Triple DS-3/STS-1 Rear	89-0361-A	yes	yes	yes	yes
DS-3/STS-1 Rear Prot.	89-0369-A	yes	no, use 89-0386	no, use 89-0386	yes
Octal DS-3/STS-1 Front	89-0382-A	no	yes	yes	yes
	89-0382-B	no	yes	yes	yes
Octal DS-3/STS-1 Front	89-0398-A	no	yes	yes	yes
Octal DS-3/STS-1 with Tone Detect Front	89-0411-A	no	yes	yes	yes
Octal DS-3 with Tone Detect Front	89-0425-A	no	yes	yes	yes
Octal DS-3/STS-1 Rear	89-0383-A	no	yes	yes	yes
Octal DS-3/STS-1 Rear Prot.	89-0386-A	no	yes	yes	yes
Voice Server	89-0384-A	no	yes	yes	yes
2688 Channel Voice Server	89-0395-A	no	yes	yes	yes
	89-0395-B	no	yes	yes	yes
Voice Server-3	89-0413-A	no	no	no	yes
	89-0413-B	no	no	no	yes
Ethernet Network Access	89-0390-A	no	yes	yes	yes
	89-0390-B	no	yes	yes	yes
	89-0432-A	no	no	yes	yes

Module	Part Number (RMA only)	85-3000 Midplane 1	85-3004 Midplane 2	85-3007 Midplane 3	85-3008 Midplane 3
Rear Quad 1000BASE-T ENET Interface Module	89-0391-A	no	yes	yes	yes
Rear Quad 1000BASE-SX SM GBIC ENET Interface	89-0399-A	no	yes	yes	yes
	89-0399-B	no	yes	yes	yes
Rear Quad 1000BASE-SX MM GBIC ENET Interface	89-0421-A	no	yes	yes	yes
OC-3c Network Access (ANA)	89-0388-C	no	no	yes	yes
Channelized OC-3 Module	89-0400-A	no	no	yes	yes
Channelized OC-3 Rear Module	89-0402-A	no	no	yes	yes

Table 7-I. Switch Fabric and System Processor

SF	Midplane	SP	Functions and Limitations
rev. A	I	Single	DS-1 and Triple DS-3 IOMs
	II and III	Single	DS-1 and Triple DS-3 IOMs
rev. B	I	Single	DS-1 and Triple DS-3 IOMs
		Dual	DS-1 and Triple DS-3 IOMs, more processing power but no access to second processor
	II and III	Single	DS-1, Triple and Octal DS-3 IOMs
		Dual	DS-1, Triple and Octal DS-3 IOMs, more processing power but no access to second processor
rev. C	I	Single	DS-1 and Triple DS-3 IOMs
		Dual	DS-1 and Triple DS-3 IOMs, more processing power but no access to second processor
	II and III	Single	DS-1, Triple and Octal DS-3 IOMS
		Dual	DS-1, Triple and Octal DS-3 IOMS, Full access to second processor and memory
rev. D	I	Single	DS-1 and Triple DS-3 IOMs
		Dual	DS-1 and Triple DS-3 IOMs, more processing power but no access to second processor
	II and III	Single	DS-1, Triple and Octal DS-3 IOMS

		Dual	DS-1, Triple and Octal DS-3 IOMS, Full access to second processor and memory
Note 1: Chassis 85-3000 has Midplane I, Chassis 85-3004 has Midplane II and Chassis 85-3007 and 85-3008 have Midplane III. ***Note 2:*** Single and Dual refer to the processors on the SP, not the number of SPs.			

Table 7-J. System and Ancillary Parts Numbers

Part Number	Description
23-0012-0-z	2A GMT Fan Fuse
23-0009-0-z	Cover for GMT Fan Fuse
49-0007-A	RJ45 Loopback Plug
85-3000-A-z	Switch Chassis
85-3001-A-z	Switch Fan Tray Assembly
85-3004-A-z	Switch Chassis – with Midplane II and new hardware supporting Octal DS3/STS-1 IOM
85-3005-B-z	Switch Fan Tray Assembly (See Note.)
85-3007-A-z	Switch Chassis – with Midplane III
85-3008-A-z	14 RU Switch Chassis – with Midplane III
85-3009-A-z	Switch High Speed Fan Tray Assembly
85-5044-1-z	Air Baffle Assembly
85-7003-0-z	Fan Filter, PE-5Y 13.19" x 20.21" x .50"
89-0300-A	Blank Panel
92-0013-0-z	ESD Wrist Strap, 6-ft. Cord
Note: The 85-3005 has high-speed fans, which are required for the 85-3004 and 85-3007 chassis. It is backwards compatible with the 85-3000 Chassis. 85-3005-B Fan Trays replaced 85-3005-A trays.	

Cable Part Numbers

Table 7-K provides a list of DS1, DS3/STS-1 and miscellaneous cable part numbers.

Table 7-K. Cable Part Numbers (RMA Only)

Part Number	Description
43-1YYY-1-z	DS-1 cable, 64-pin connectors, 22-gauge solid wire (28 pairs terminated), shielded connectors, male, male, screw fasteners
43-2YYY-1-z	DS-1 cable, 64-pin connectors, 24-gauge solid wire (28 pairs terminated), shielded connectors, male, male, screw fasteners

Part Number	Description
44-1xxx-2-z	Single DS-3 734-series cable, BNC shielded connector at both ends
44-2xxx-1-z	DS-3 735-series cable, BNC shielded connector
44-3xxx-1-z	DS-3 735-series cable, bundle of three, BNC shielded connectors at one end
44-3xxx-2-z	DS-3 735-series cable, bundle of three, BNC shielded connectors at both ends
44-8xxx-2-z	DS-3 735-series cable, bundle of eight, BNC shielded connectors at both ends
45-1xxx-1-z	Ethernet Cable, RJ45 to RJ45
45-2xxx-1-z	Craft Cable, DB9M to DB9F
45-2xxx-2-z	Craft Modem Cable, DB9M to DB25M
45-3xxx-1-z	Bay Alarm Cable, DB9M to DB9M
45-3xxx-2-z	Alarm Contacts Cable, DB25M to Bare Wire
45-4xxx-1-z	#6 AWG Gray Power Cable
45-5xxx-1-z	#6 AWG Green Ground Cable
45-6xxx-1-z	BITS Clock Cable, Shielded Twisted Single Pair

7.5 CLEI Codes

The Common Language Equipment Identification (CLEI) Code contains intelligent ten-character codes that can identify telecommunications equipment with great precision. Accepted by telecommunications providers as the industry standard, its primary applications include inventory control, investment tracking and provisioning. There is also a 1:1 relationship between a CLEI code and a vendor's Product ID. The latter defines the manufacturer, part number and manufacturing version of that part number. For further information on code types, refer to the Telcordia document GR-485-CORE, "*Generic Requirements for Common Language Equipment Coding Processes and Guidelines*."

Table 7-L provides a list of CLEI codes for the switching system equipment.

Note: The individual part numbers that are shaded in the table below have been "manufacture discontinued." They are, however, still supported by some of the software versions. Please refer to Table 7-E to determine whether the part number is supported by a particular software version.

Table 7-L. CLEI Codes

Part Number	Name	CLEI Code
85-3000-A	Chassis	BAM9LJ0GRA
85-3001-A	Fan Shelf	BAPQADK2AA
85-3003-A	Chassis with Midplane II	BAMBE00ERA
85-3004-A	Chassis with Midplane II	BAMFF00DRA
85-3005-A	Fan Tray (high speed fans)	BAPQADY2AA
85-3005-B		BAPQAG52AA
85-3007-A	Chassis with Midplane III	BAMFJ00DRA
85-3008-A	14-RU chassis with Midplane III	BAMGL00GRA
85-3009-A	Fan Tray (high speed fans)	BAMYAAKDAA
89-0360-A	DS-1 Front Module	BA9IAA0AAA
89-0361-A	DS-3 Rear Module	BA9IB80AAA
89-0362-A	DS-1 Rear I/O Module	BA9IBC0AAA
89-0362-B		BA9IBC0AAB
89-0363-A	Switch Fabric Front Module	BAC7W30JAA
89-0363-B		BAC7W3UJAA
89-0363-C		BAC7W3YJAA
89-0363-D		BAC7W3YJAB
89-0364-A	Switch Fabric Rear A Module	BAC7Z30JAA
89-0365-A	DS-3 Front Module	BA9IY70AAA
89-0365-B		BA9IY70AAB
89-0365-C		BA9IY72AAA
89-0366-A	SP/TMG Front Module	BAC7Y40JAA
89-0366-B		BAC7Y40JAB
89-0367-A	SP/TMG Rear Module	BAC7Y50JAA
89-0367-B		BAC7Y50JAB
89-0367-C		BA1CXZMHAA
89-0368-A	DS-1 Rear I/O Protection Module	BA9IBB0AAA
89-0369-A	DS-3 Rear I/O Protection Module	BA9IB90AAA

Part Number	Name	CLEI Code
89-0375-A	Switch Fabric B Rear Module	BAC7160JAA
89-0382-A	Octal DS-3/STS-1 Front Module Revision B module is supported by software revision 3.1.1.2 or greater.	BAA9UV0GAA
89-0382-B		BAA9UVZGAA
89-0383-A	Octal DS-3/STS-1 Rear Module	BAA9TW0GAA
89-0384-A	Voice Server Module	BAA9Z20GAA
89-0388-C	OC-3 Network Access (ANA)	BAA91Z0GAC
89-0386-A	Octal DS-3/STS-1 Rear Protection Module	BAA9TU0GAA
89-0389-A	Dual SP/TMG Front Module	BAC9CD0AAA
89-0389-B		BAC9CD0AAB
89-0390-A	Ethernet Network Access Module	BA2A30TGAA
89-0390-B		BA1AX60AAA
89-0391-A	Rear Quad 1000BASE-T Ethernet Interface Module	BA2A20SGAA
89-0395-A	2688 Channel Voice Server Module	BA1AY60AAA
89-0395-B		BA1AX60AAB
89-0397-A	Triple DS-3/STS-1 Front Module	BA9IY04AAA
89-0398-A	Octal DS-3/STS-1 Front Module	BAA9UVXGAA
89-0399-A	Rear Quad 1000BASE-SX SM GBIC Ethernet Interface Module	BAA9TZYGAA
89-0399-B		BAA9TZYGAB
89-0400-A	Channelized OC-3 Module	BA4AW60FAA
89-0402-A	Channelized OC-3 Rear Module	BA4A50VFAA
89-0406-A	Dual SP/TMG Front (SP-3)	BA1CUV0HAA
89-0406-B	Dual SP/TMG Front (SP-3)	BA1CUV0HAB
89-0406-C	Dual SP/TMG Front (SP-3)	BA1CUV0HAC
89-0406-D	Dual SP/TMG Front (SP-3)	BAUCAAEAAA
89-0410-A	Triple DS-3/STS-1 Front Module with tone detection	BA4A60ZFAA
89-0411-A	Octal DS-3/STS-1 Front Module with tone detection	BA4A701FAA
89-0413-A	Voice Server-3 Front Module	BAUIAA1EAA
89-0413-B	Voice Server-3 Front Module	BAUIAA1EAB
89-0414-A	DS1/E1/J1 I/O Termination Module	BA7ATP0FAA
89-0415-A	DS1/E1/J1 I/O Rear	BA7A1P0FAA
89-0417-A	Dual SP/TMG Rear (SP-3)	BA1C1W0HAA
89-0419-A	Compute Module Front	BA9ATS0FAA

Part Number	Name	CLEI Code
89-0419-B	Compute Module Front	BA9ATS0FAB
89-0420-A	Compute Module Rear	BA9AUT0FAA
89-0421-A	Rear Quad 1000BASE-SX MM GBIC Ethernet Interface Module	BAA9TZ5GAA
89-0424-A	Triple DS3 I/O Module With Tone Detect	BA9AWX0FAA
89-0425-A	Octal DS3 I/O Module With Tone Detect	BA9AXY0FAA
89-00432-A	Ethernet Network Access Module	BAUIADPEAA

NOTES:

8 Technical Support

8.1 Installation Support

On-site installation support is provided during the installation of the initial release and, if necessary, during an upgrade. A Lucent Worldwide Services (LWS) Engineer will be on site with you to perform the installation on a previously scheduled date.

Note: Most upgrades are done remotely.

If necessary, the LWS Engineer also will arrange for a third-party installation contractor to help with the installation. This is usually necessary when multiple systems are involved.

The LWS Engineer will verify acceptance of the installation with you by obtaining your signature on an acceptance form.

8.2 Technical Support

Lucent Worldwide Services (LWS) provides customer support for the switch 24 hours a day, 7 days a week.

LWS uses an Action Request (AR) system to assign, document, track and report all customer call activity. All calls are assigned an Action Request (AR) number and are fully documented in the system, no matter what the level of severity. Calls usually fall into one of several categories:

- Calls that can be solved on the telephone at the time of the call
- Calls that inquire about returning hardware
- Calls that require escalation
- Complaints

When a call is first received, it must be determined whether the call is a new call or an open call. If it is a new call, an Action Request (AR) number will be assigned immediately, and the information entered into the system. If the call is in reference to an open call, you must know the AR number so that LWS can retrieve the AR information.

8.2.1 Call That Can be Solved Immediately

After determining whether the call is new or open, the LWS Engineer may be able to solve the problem while you are on the telephone. In this case, the LWS Engineer will document the resolution and close the call. Every effort will be made to resolve the issue on the first call.

8.2.2 Calls for Returning Hardware

If you need to return equipment, the LWS Engineer will transfer you to the Return Material Authorization (RMA) Coordinator and re-assign the AR in the Action Request System. Refer to section 3, Hardware Repair and Return, in this document.

8.2.3 Calls That Require Escalation

When a call is received and an action request number is assigned, a level of severity is also determined. Levels of severity are categorized as follows:

Level of Severity	Symptom	Examples
Minor	Problem does not significantly impair function of the system	Request for equipment or system service, request for documentation, request for training, information requests, routine maintenance
Major	Conditions that seriously affect system operation	Short system outages, reduction in measurement function
Critical	Affects service	Total system failure, reduction in capacity or traffic handling capability

If personnel are not immediately available when a call is received, your call will be returned according to the severity assigned. For instance, a minor call is returned within 8 hours, and a major call within 4 hours. If the call is critical, you will be placed on hold until an LWS engineer can be located.

You may, at any time, ask that the issue be escalated to management. The LWS Engineer will then notify the appropriate manager. If required, on-site technical support will be provided within 24 hours of a customer request.

8.2.4 Complaints

Customers have the ability to submit complaints by entering an action request via the Lucent CARES Trouble tracking system http://www.lucent/com/support/. However, if you have an engineering complaint, you must file form EO-143, in accordance with GR-230-CORE. Engineering complaints will also be recorded in the Action Request system, but acknowledgement of form EO-143 will be made by returning an acknowledgement report, form 79-7020-ECCnfrmtn, by the end of the working day following receipt of the complaint.

Regular and engineering complaints will be handled by an assigned department, with the LWS Manager monitoring the engineering complaint until the issue is resolved.

8.2.5 Closing Action Requests

Action Requests will only be closed when all deliverables required to resolve the AR such as information, documentation, and software, are provided to the customer.

8.3 Hardware Repair and Return

Switch components being returned for repair or replacement must be processed through the Lucent RMA procedures. A hardware repair is defined as an item returned to Lucent due to a failure, with the returned item being repaired and returned to you, the customer.

All hardware components and I/O modules are described in the *Planning and Engineering Guide* in the section Hardware Description.

8.3.1 RMA Procedure

The following list provides the steps that must be taken when a module or other item of the switch must be returned for repair:

1. Determine whether the item is under warranty. If the item is not under warranty and an annual purchase order for repair and return is not in effect, the LWS Engineer will request a purchase order from you, the customer.
2. Obtain an RMA number from an LWS Engineer at 866-582-3688 (select prompt 5 to skip all other messages) and verify the shipping and billing addresses, the individual who is to receive the item at the address, and the prime customer contact.
3. Provide a detailed description of the problem and failure symptoms.
4. If the item is a like-for-like replacement, the LWS Engineer will arrange for shipment of the replacement item to you (i.e., advanced exchange). Advanced exchange shipments include a pre-paid return air bill to facilitate the expeditious return of the defective unit.

8.3.2 Repair and Return Shipping Instructions

All returned equipment, assemblies, or subassemblies must be shipped to the Lucent Repair and Return Facility, specified by the LWS Engineer. Returned items must be shipped in the original carton or equivalent container assuring proper static handling procedures and with the freight charges prepaid. The assigned RMA number must be clearly printed on the ATTN: line of the shipping label on the outside of the shipping package. If the RMA number is not placed on the label, the return could be delayed.

Ship to:

Lucent, Inc.
Attn: RMA ####
734 Forest St. Building G, Suite 100
Marlboro, MA 01752

9 Acronyms

A

AAL5	ATM Adaption Layer 5
ACB	Automatic Call Back
ACE	ATM Crossbar Element
ACO	Alarm Cut-Off
ACR	Anonymous Call Rejection
AIS	Alarm Indicator Signal
AIS	Automatic Intercept System
AMA	Automatic Message Accounting
AMADNS	Automatic Message Accounting Data Networking System
AMI	Alternate Mark Inversion
ANA	ATM Network Adapter
ANI	Automatic Number Identification
ANSI	American National Standards Institute
APC	ATM Port Controller
AR	Automatic Recall
ASCII	American Standard Code for Information Inter-exchange
ASN.1	Abstract Syntax Notation One
ASX	ATM Switch Element
AT	Access Tandem
ATM	Asynchronous Transfer Mode
AWG	American Wire Gauge

B

B2BUS	Back-to-Back User Agent
B3ZS	Bipolar with 3-Zero Substitution
B8ZS	Bipolar with 8-Zero Substitution Binary 8-Zero Suppression
BAF	Bellcore AMA Format
B-ISDN	Broadband Integrated Services Digital Network
BICC	Bearer Independent Call Control
BITS	Building Integrated Timing System
BRI	Basic Rate Interface
BTU	British Thermal Unit

C

CAC	Carrier Access Code
CALEA	Communications Assistance for Law Enforcement Act
CAS	Channel Associated Signaling
CBR	Constant Bit Rate
CCITT	Consultative Committee on International Telephone & Telegraph

CCS	Common Channel Signaling
CDR	Call Detail Record
CHAP	Challenge Handshake Authentication Protocol
CIC	Circuit Identification Code
CID	Calling Identity Delivery
CIDCW	Call ID on Call Waiting
CIS	Calling Identity Suppression
CLASS	Custom Local Area Signaling Service
CLEC	Competitive Local Exchange Carrier
CLEI	Common Language Equipment Identifier
CLLI	Common Language Location Identifier
CNAB	Calling Name Delivery Blocking
CNAM	Caller name display
CND	Calling Number Delivery
CNDB	Calling Number Delivery Blocking
CO	Central Office
COT	Continuity Test message
CPE	Customer Premises Equipment
CRDPCL	Screen blocking or Code Restriction/Diversion Prohibited Code List
CSC	Common Signaling Channel
CSS	Control Slip Seconds
CV	Coding Violation
CWC	Call Waiting Cancel
CWT	Call Waiting

D

DA	Directory Assistance
DCE	Data Communication Equipment
DDI	Data Server/DPMS Interface
DLC	Digital Loop Carrier
DPC	Destination Point Code
DPMS	Data Processing and Management System
DSL	Digital Subscriber Line
DS	Digital Signal
DSLAM	Digital Subscriber Line Access Multiplexer
DSP	Digital Signal Processing
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency

E

E1	Electronic 1
EEPROM	Electronically Erasable Programmable Read Only Memory
EIA	Electronics Industries Association
EM	Element Manager

EMS	Element Management System
ENET	Enhanced Network
EO	End Office
EOC	Embedded Operations Channel
EQM	Equipment Manager
ES	Errored Seconds
ESD	ElectroStatic Discharge
ESF	Extended Superframe

F

FAM	Fault Alarm Manager
FCC	Federal Communications Commission
FDL	Facilities Data Link
FPGA	Field-Programmable Gate Array
FSU	From Switch Unit
FTP	File Transfer Protocol

G

Gb/s	Gigabits per second
GCC	Generic Call Control
GDI	Generating system to Data server Interface
GMSC	Gateway Mobile Switching Center
GUI	Graphical User Interface

H

HDB3	High Density Bipolar 3
HDLC	High-level Data Link Control

I

IAD	Integrated Access Device
IAM	Initial Address Message
ICC	Interworking Call Control
ID	Identification
IDE	Integrated Drive Electronics
IDT	Integrated Digital Terminal
ILEC	Incumbent Local Exchange Carrier
ILMI	Interim Local Management Interface
IMT	InterMachine Trunk
IN	Intelligent Network
IN	Intelligent Network Application Protocol
INC	International Carrier
IO	Input/Output
IOM	Input/Output Module
IP	Internet Protocol or Intelligent Peripheral
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
ISUP	Integrated Services Digital Network User Part
IVR	Interactive Voice Response
IXC	Inter-exchange Carrier

J

K

KB	KiloByte
Kb/s	Kilobits per second

L

L2AC	Layer 2 Access Concentrator
L2TP	Layer 2 Tunneling Protocol

LAC	L2TP Access Concentrator
LAN	Local Area Network
LATA	Local Access & Transport Area
LCM	Line Card Module
LCP	Link Control Protocol
LBO	Line Build-Out
LDS	Local Digital Switch
LEC	Local Exchange Carrier
LED	Light Emitting Diode
LNP	Local Number Portability
LNS	L2TP Network Server
LOS	Loss of Signal
LQP	Link Quality Protocol
LT	Local Tandem

M

MAC	Machine Address Code
MB	Megabyte
MBI	Master Base Index
Mb/s	Megabits per second
MCC	MultiChannel Controller
MEGACO	Media Gateway Controller
MG	Media Gateway
MIB	Management Information Base
MLBA	Maintenance Link Bus Adapter
MOU	Minutes of Use
MTBF	Mean Time Between Failures
MTP	Message Transfer Part
MWC	Multi-Way Calling

N

NANP	North American Numbering Plan
NAS	Network Access Server
NAT	Network Address Translation
NC	Normally Closed
NCP	Network Control Protocol
NE	Network Element
NEBS	Network Equipment Building System
NFAS	Network Facility Associated Signaling
NFS	Network File System
NGDLC	Next Generation Digital Loop Carrier
NMS	Network Management System
NO	Normally Open
NPA	Numbering Plan Area

NSA	Non-Service Affecting
NXX	The first three digits of a seven-digit telephone number; indicates the central office exchange number

O

OAM	Operations, Administration, and Maintenance
OAM&P	Operations, Administration, Maintenance, and Provisioning
OC	Optical Carrier
OLI	Originating Line Information
OPC	Originating Point Code
OS	Operating System

P

PAP	Password Authentication Protocol
PAP	Power and Alarm Panel
PCI	Peripheral Component Interconnect
PIC	Primary Inter-exchange Carrier
PIC1	Primary Inter-exchange Carrier 1
PISO	Parallel In, Serial Out
POP	Point Of Presence
POTS	Plain Old Telephone Service
PPP	Point to Point Protocol
PPS	Permanent Presentation Status
PRI	Primary Rate Interface
PSIF	Protocol Specific Interface
PSTN	Public Switched Telephone Network
PVC	Permanent Virtual Connection

Q

QFALC	Quad Framer and Line Interface Component
QOS	Quality of Service
QRSF	Quasi-Random Signal – Framed
QRSU	Quasi-Random Signal – Unframed

R

RADIUS	Remote Authentication Dial In User Service
RAI	Remote Alarm Indication
RAF	Remote Access to Features
RAS	Remote Access Server
RBOC	Regional Bell Operating Company
RDAS	Residence Distinctive Alerting Service
RDT	Remote Digital Terminal
RLT	Release Line Trunk
RM	Resource Manager
RMA	Return Material Authorization
RMS	Root Mean Square

RT	Router
RU	Rack Unit (1RU = 1.75 inch)

S

SA	Service Affecting
SAR	Segmentation and Reassembly
SCA	Selective Call Acceptance
SCC	Specific Call Control
SCCP	Signaling Connection Control Part
SCF	Selective Call Forwarding
SCR	Selective Call Rejection
SDRAM	Synchronous Dynamic Random Access Memory
SEC	Secondary
SES	Severely Errored Seconds
SF	Switch Fabric
SFM	Switch Fabric Manager
SG	Signaling Gateway
SIP	Session Initiated Protocol
SIPO	Serial In, Parallel Out
SIPT	Session Initiated Protocol Trunking
SLUS	Subscriber Line Usage Study
SONET	Synchronous Optical Network
SP	System Processor
SP/TMG	System Processor and timing module
SS7	Signaling System 7
SSN	Sub-service Number
SSP	Service Switching Point
SST	Subsystem Status Test
STM	Synchronous Transmission Module
STP	Signal Transfer Point
SW FAB	Switch Fabric Module
SX	Simplex (unprotected)
SYCOR	System Controller

T

TCA	Traffic Collection Application (formerly called TMM)
TCAP	Transaction Capabilities Applications Part
TDM	Time-Division Multiplexer/Multiplexing
TL1	Transaction Language 1
TMC	Timeslot Management Channel
TMG	Timing
TMM	Traffic Management Module (now called TCA)
TSU	To Switch Unit
TT	Toll Tandem
TWC	Three-Way Calling

U

UBR	Unspecified Bit Rate
USB	Universal Serial Bus
UNI	User to Network Interface

V

VBR	Variable Bit Rate
VCI	Virtual Channel Identifier
Vdc	Volts – direct current
VMS	Voice Mail Service
VoIP	Voice over Internet Protocol

W

X

Y

Z

NOTES: