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Acronyms

The following table provides information about the acronyms and the terminology used in the document.

Table Acronyms

Acronym	Definition
A-Port	ANSI-41 Mobile Number Portability
AINPQ	ANSI-41 INP Query
AAL	ATM Adaptation Layer
AAL5	ATM Adaptation Layer 5
AAL5CP	ATM Adaptation Layer 5 Common Port
AATM	ATM Applique
ACG	Automatic Call Gapping
ACO	Alarm Cut Off
ADJ DPC	Adjacent Destination Point Code
AI	Address Indicator
AIN	Advanced Intelligent Network
AINF	Application Interface Applique
ANSI	American National Standards Institute
AP	Application Processor
APC	Adjacent Point Code
ARP	Address Resolution Protocol
AS	Application Server; a logical entity serving a specific Routing Key
ASIC	Application-Specific Integrated Circuits
ASP	Application Server Process
ATI	Any Time Interrogation
ATM	Asynchronous Transfer Mode
ATMANSI	The application software for the ATM (high-speed) SS7 signaling links
ATM HSL	Asynchronous Transfer Mode High Speed Link
ATMM	ATM Layer Management
AVL	Availability Measurements report
AVLD	Daily Availability measurements report
AVLDTH	Day-to-Hour Availability measurements report
BCSM	Basic Call State Model
BIP	Board Identification PROM
BITS	Building Integrated Timing System
BLM	Bulk Load Module
BP	Breaker Panels
BSD	Berkeley Software Distribution
BSN	Backward Sequence Number
CAS	Channel Associated Signaling

Table (Cont.) Acronyms

Acronym	Definition
CCM	Command Class Management
CCS	Common Channel Signaling
CCS7	Common Channel Signaling System #7
CCS7ITU	The application software for the ITU SS7 signaling links
CDPA	Called Party Address
CDPN	Called Party Number
CGPA	Calling Party Address
CE	Compliance European
CF	Control Frame
CIC	Circuit Identification Code
CLLI	Common Language Location Identifier
CLU	Network Cluster
CM	Cluster Management
CNCF	Calling Name Conversion Facility
CP	Communication Processor
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CRMD	Cluster Routing and Management Diversity
CRP	Circular Route Prevention
CSL	Common Screening List
CSPC	Concerned Signaling Point Code Group
CSU	Channel Service Unit
DB	Database
DCD	Data Carrier Detect
DCM	Database Communications Module
DIP	Dual In-Line Package
DIX	Digital/Intel/Xerox de facto standard for Ethernet Media Access Control Type
DN	Dialed or Directory Number
DPC	Destination Point Code
DRAM	Dynamic Random Access Memory
DSM	Database Services Module
DSU	Data Service Unit
DTA	Database Transport Access
E5IS	EAGLE 5 Integrated Monitoring Support
E5- MASP	E5-based Maintenance and Administration Subsystem Processors
E5-MCAP	E5-based Maintenance Communication Application Processor
E5-MDAL	E5-based Maintenance Disk and Alarm
E5-TDM	E5-based Terminal Disk Module
EBDA	Enhanced Bulk Download and Audit
EDR	Efficient Data Representation

Table (Cont.) Acronyms

Acronym	Definition
EF	Extension Frame
EGTT	Enhanced Global Title Translation
EIA	Electronic Industries Association
EIR	Equipment Identity Register
ELAP	EAGLE LNP Application Processor
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMP	EAGLE Monitoring Protocol
EMSALM	Element Management System Alarm Monitor
ENET	Ethernet
EOAM	Enhanced Operations, Administration, and Maintenance
EOAP	Enhanced OSS Application Process
EPAP	EAGLE Provisioning Application Processor
EPM	Embedded Processor Module
EPROM	Erasable PROM
ESP	Extended Services Platform
FAK	Feature Access Key
FAP	Fuse and Alarm Panel
FAS	Frame Alignment Signal
FISU	Fill In Signal Unit
FPBA	Frame Power Budget Alarm
FPCR	Full Point Code Routing
FPT	Frame Power Threshold
FSN	Forward Sequence Number
FTA	File Transfer Area
FTP	File Transfer Protocol
FTRA	FTP-based Table Retrieve Application
GDB	GSM Real-Time Database
G-Flex	GSM Flexible Numbering
G-Port	GSM Mobile Number Portability
GLS	Generic Loading Service
GMSC	Gateway MSC
GPL	Generic Program Load
GPMS	General Purpose Service Module
GSL	Generic Software Load
GSM	Global System for Mobile Communications
GTA	Global Title Address
GTI	Global Title Indicator
GTT	Global Title Translation
GTWY	Gateway Administration measurements report
GWS	Gateway Screening
GWSA	Gateway Screening Application

Table (Cont.) Acronyms

Acronym	Definition
GWSM	Gateway Screening Messages
HDB3	High Density Bipolar 3 encoding
HIPR	High Speed IMT Packet Router
HLR	Home Location Register
HOMERN	Home Network Routing Number Prefix
HMUX	High-Speed Multiplexer
HRN	Home Routing Number
HSL	High-Speed Links
HVAC	Heating, Ventilation, and Air Conditioning
IAM	Initial Address Message
IC	Integrated Circuit
ICMP	Internet Control Message Protocol
ID	Identity
IDP	Initial Detection Point
IEC	International Escape Code
IETF	Internet Engineering Task Force
IGM	IS41 GSM Migration
IGTTLS	Intermediate Global Title Translation Load Sharing
IL	Incremental loading
ILA	Integrated LIM Applique
IMEI	International Mobile Equipment Identifier
IMF	Integrated Message Feeder
IMSI	International Mobile Station Identifier
IMT	Inter-processor Message Transport
IN	Intelligent Network
INAP	Intelligent Network Application Part
INET	Internet
INH	Inhibit
INP	INAP-based Number Portability
INSL	In-Network Subscriber List
IP	Internet Protocol
IPGWI	An ITU version of SS7IPGW
IPGWx	Point to multi-point IP Transport GPL, referring to SS7IPGW (ANSI) and IPGWI (ITU)
IPLIM	Internet Protocol Link Interface Module
IPLIMI	The application software used by the DCM card for TCP/IP point-to-point connectivity for ITU point codes.
IPLIMx	Point to point IP Transport GPL, referring to IPLIMI (ITU)
IPMX	IMT Power and Multiplexer
IPS	Internet Protocol Services
IS-41	Interim Standard 41, same as and interchangeable with ANSI-41
IS-ANR	In Service - Abnormal

Table (Cont.) Acronyms

Acronym	Definition
ISDN	Integrated Services Digital Network
IS-NR	In Service - Normal
ISUP	ISDN User Part
ITU	International Telecommunications Union
ITUDUPPC	ITU National Duplicate Point Code
JIP	Jurisdiction Indicator Parameter
LAN	Local Area Network
LB	Load Balancing
LBP	Loop Back Point
LC	Logical channel
LED	Light Emitting Diode
LFS	Link Fault Sectionalization
LNP	Local Number Portability
LNPMPR	LNP Message Relay
LNPQS	LNP Query Service
LNP SMS	LNP Short Message Service
LPE	Logical Processing Element
LPO	Link Processor Outage
LRN	Location Routing Number
LS	Link Set
LSA	Link Status Alignment
LSB	Least Significant Bit (bit 1)
LSL	Low-Speed Link
LSMS	Local Service Management System
LSN	Link Set Name
LSO	Link Status out of Service
LSPE	Link Status Proving Emergency
LSPN	Link Status Proving Normal
LSR	Link Status Ready
LSSU	Link Status Signal Unit
M2PA	SS7 MTP2-User Peer-to-Peer Adaptation Layer
M3UA	SS7 MTP3-User Adaptation Layer
MAAL	Management ATM Adaptation Layer
MAP	Mobile Application Part
MAS	Maintenance and Administration Subsystem
MAPSCRN	GSM MAP Screening measurements report
MCAP	MAS Communication Application Processor Card
MCC	Mobile Country Code
MCM	Maintenance Communication Module
MCP	Measurement Collection Processor
MCPM	Measurement Collection and Polling Module
MDAL	Maintenance Disk and Alarm (card)

Table (Cont.) Acronyms

Acronym	Definition
MDN	Mobile Dialed Number
MGT	Mobile Global Title
MGTT	Modified Global Title Translation
MF	Miscellaneous Frame
MFC	Message Flow Control
MIM	Multi-Channel Interface Module
MIN	Mobile Identification Number
MIS	Maintenance Interface System
MLPRST	MTP Low Priority Route Set
MNP	Mobile Number Portability
MNP SMS	Portability Check for Mobile Originated SMS
MNP-SRF	Signaling Relay Function for support of Mobile Number Portability
MOBR	Origin-based MTP Routing feature
MPC	Multiple Point Code feature
MPL	Multi-port LIM
MPS	Multi-Purpose Server
MR	Message Relay
MRN	Mated Relay Node
MRN	Message Reference Number
MS	Mobile Station
MSB	Most Significant Bit
MSC	Mobile Switching Center
MSAR	Memory space accounting reporting
MSISDN	Mobile Station ISDN Number or Mobile Switching ISDN Number
MSRN	Mobile Station Roaming Number
MSU	Message Signal Unit
MTCD	Maintenance Daily measurements report
MTCPTH	Maintenance Day-to-Hour measurements report
MTCH	Maintenance Hourly (marginal) measurements report
MTCS	Maintenance Status (link/link set) measurements report
MTP	Message Transfer Part
MTP2	Message Transfer Part, Level 2
NAI	Nature of Address Indicator
NCAI	Nested Cluster Allowed Indicator
NCR	Nested Cluster Routing
NEBS	Network Equipment Building System
NEC	National Escape Code
NFAS	Non-Frame Alignment Signal
NI	Network Indicator
NIC	Network Information Center

Table (Cont.) Acronyms

Acronym	Definition
NID	Network Identification
NM	Network Management
NP	Number Plan
NPA	Numbering Plan Area
NPAC	Number Portability Administration Center
NPANXX	Numbering Plan Area and Exchange
NRT	Network Routing
NSAP	Network Service Access Point
NSE	Network Security Enhancement
NSFI	Next Screening Function Indicator
NSP	Network Services Part
NSPC	New Secondary Point Code
OAM	Operations, Administration, and Maintenance
OAP	Operation System Support Application Processor
OAMP	Operations, Administration and Maintenance Part
OBSR	Origin-based SCCP Routing feature
OCU	Office Channel Unit
OEM	Original Equipment Manufacturer
OOS-MA	Out of Service - Memory Administration
OOS-MT	Out of Service - Maintenance
OOS-MT-DSBLD	Out of Service - Maintenance Disabled
OPC	Origination Point Code
OPCODE	Operation Code
OPNAME	Operation Name
OSI	Open Systems Interconnection
OSS	Operations Systems Support
PC	Point Code
PCI	Peripheral Component Interconnect
PCR	Preventive Cyclic Retransmission
PCS	Personal Communications Service (North American GSM)
PDBA	Provisioning Database Application
PDBI	Provisioning Database Interface
PDN	Packet Data Network
PDS	Persistent Device States
PLL	Phase Lock Loop
PLNP	PCS 1900 LNP
PLNPQS	LNPQS support provided for PLNP
PPSMS	Prepaid Short Message Service Intercept
PROM	Programmable Read-Only Memory
PSEL	Presentation Selector
PST	Primary State for Maintenance
PSTN	Public Switched Telephone Network

Table (Cont.) Acronyms

Acronym	Definition
PVC	Permanent Virtual Circuit
PVN	Private Virtual Network
Q3	Q.3 Protocol
RAM	Random Access Memory
RBASE	Record Base measurements report
RC	Relative Cost
RI	Routing Indicator
RFC	Request for Comments
RMA	Return Material Authorization
RMC	Remote Maintenance Center
RMTP	Reliable Multicast Transport Protocol
RN	Routing Number
RTDB	DSM Real-time database
RTT	Round Trip Time
SAAL	Signaling ATM Adaptation Layer
SAPC	Secondary Adjacent Point Code
SCCP	Signaling Connection Control Part
SCM	System Configuration Manager
SCMG	SCCP Management
SCP	Service Control Point
SCRSET	Screen Set
SCSI	Small Computer System Interface
SCTP	Stream Control Transmission Protocol
SE-HSL	Synchronous E1 High Speed Link
SEAS	Signaling Engineering and Administration System
SFAPP	Stateful Applications
SI	Status Indicator
SIB	Status Indication "Busy"
SIE	Status Indication "Emergency" Alignment
SIN	Status Indication "Normal Alignment"
SIO	Service Information Octet
SIO	Status Indication "Out of Alignment"
SIOS	Status Indication "Out of Service"
SK	Service Key
SKTS	Service Key/TeleService List
SLIC	Service and Link Interface Card
SLK	Signaling Link
SLS	Signaling Link Selection
SLSCI	Signaling Link Conversion Indicator
SLTA	Signaling Link Test Acknowledgement
SLTM	Signaling Link Test Message
SMS	Short Message Service

Table (Cont.) Acronyms

Acronym	Definition
SMSC	Short Message Service Center
SMSMR	Prepaid Short Message Service
SNAI	Service Nature of Address Indicator
SNM	Signaling Network Management
SNR	Subsystem Normal Routing
SOR	Support for Optimal Routing
SORP	Socket Option Registration Primitive
SPC	Secondary Point Code Signaling Point Code
SRF	Signaling Relay Function
SRI	Send Routing Information
SRVSEL	Service Selector
SS7	Signaling System #7
SS7ANSI	The application software for the ANSI SS7 signaling links
SSA	Subsystem Allowed (An SCCP management message)
SSEL	Session Selector
SSN	SS7 Subsystem Number
SSP	Service Switching Point
SSU	Status Signal Unit
ST	Stop Digit—BCD value 15 (0xF)—used to indicate the end of dialing in some applications
STC	Signaling Transport Card
STP	Signal Transfer Point
STPLAN	The application software for the STPLAN feature
SUA	SS7 SCCP-User Adaptation Layer
SVC	Switched Virtual Circuit
TALI	Transport Adapter Layer Interface
TCP	Transmission Control Protocol
TCAP	Transaction Capabilities Application Part
TCXO	Temperature-Compensated Oscillator
TDM	Terminal Disk Module
TFA	Transfer Allowed
TFC	Transfer Congested (traffic)
TFP	Transfer Prohibited
TFR	Transfer Restricted
TLNP	Triggerless LNP
TOCA	Timing Output Composite Clock Automatic
TOS	Type of Service
TPS	Transactions Per Second
TRA	Traffic Restarting Allowed
TRBL	Trouble
TRW	Traffic Restarting Waiting
TSC	Time Slot Counter Synchronization

Table (Cont.) Acronyms

Acronym	Definition
TSM	Translation Services Module
TT	Translation Type
TUP	Telephone User Part
TV	Ticket Voucher
UA	IETF User Adaptation Layers
UAM	Unsolicited Alarm Message
UART	Universal Asynchronous Receiver - Transmit
UDP	User Datagram Protocol
UDTS	Unit Data Transfer Service
UI	User Interface
UID	User ID
UIM	Unsolicited Informational Message
UPD	Update
VGTT	Variable Length GTT
VLR	Visitor Location Register
VMSC	Voice Mail Service Center Visited Mobile Switching Center
VSCCP	VxWorks Signaling Connection Control Part
WNP	Wireless Number Portability
WNPQS	Wireless Number Portability Query Service
X.25 DE	X.25 Destination Entity
XGTT	Expanded GTT (GTT Table Expansion)
XMAP	Expanded MAP TablePreviousNext

What's New in This Guide

This section introduces the documentation updates for Release 47.0 in Oracle Communications EAGLE Hardware Reference Guide.

Release 47.0 -F41408-04, January 2024

Updated the [EAGLE Card Overview](#) table.

Release 47.0 -F41408-03, August 2023

- Updated [Link Interface Modules](#) section by removing the mentions of "E1/T1 MIM" and "LIM-ATM" modules.
- Added [EAGLE Card Overview](#) in [Hardware Descriptions - EAGLE](#) section.
- Removed the following sub-sections:
 - "E5-STC Module" from [Application Subsystem](#) section.
 - "Database Communications Module" and "Signalling Transport Card" from [Modules](#) section.
 - "Eight-Port Connector Box" from [OEM-Based Peripheral Elements](#) section.
 - "Database Communications Module (DCM) and Double-Slot Enhanced DCM (EDCM)" and "Cabling DCM, Double-Slot EDCM, and E5-SM8G Cards" from [Populating the System](#) section.
- Updated [Holdover Clock](#) section.
- Removed the entry of "HC MIM" from [Table 5-1](#) in [Hardware Power Calculator Tool](#) section.
- Updated [Table 3-7](#) in [Link Interface Modules](#) section.
- Updated the hardware baseline details for EAGLE release 47.0 in [EAGLE Release 46.7 Through 47.0](#) and removed hardware baseline details for EAGLE release 46.6.
- Removed the non-ROHS details from [EAGLE Cable Assemblies and Adapters](#)

1

Introduction

This chapter contains an overview of the available information for HLR alarms and events. The contents include sections on the scope and audience of the documentation, as well as how to receive customer support assistance.

1.1 Overview

This manual provides hardware descriptions for Oracle Communications signaling systems or components based on the **EAGLE** for releases 45.0 and later. For hardware descriptions of earlier releases, contact your sales representative.

This manual provides an overview of each system and its subsystems including details of standard and optional hardware components. In addition, this manual describes basic site engineering for signaling products.

Systems included in this manual are:

- EAGLE Signal Transfer Point (**STP**)
- Multi-Purpose Server(**MPS**)

For information on Oracle Communications EAGLE Application Processor Provisioning (**EPAP**) using the Oracle Communications EAGLE Application B Card (E5-APP-B) Platform, see *Application B Card Hardware and Installation Guide*.

1.2 Scope and Audience

The scope of this manual includes Oracle Communications EAGLE system information. This manual also contains details on Multi-Purpose Server (MPS), Frames, Modules, and Alarm Panels.

1.3 References

For more information, refer to the following documents:

- *Application B Card Hardware and Installation Guide*
- *Installation Guide*
- *Database Administration - SS7 User's Guide*.

1.4 Regulatory Compliance and Certification

Oracle Communications products are tested to meet the following regulatory standards:

- Network Equipment Building System (NEBS) level 3 as listed in Telcordia SR-3580.
- Applicable Telcordia Electromagnetic Compatibility and Electrical Safety requirements in GR-1089-CORE.

- Applicable Physical Protection requirements in GR-63-CORE.
- Relevant directives and harmonized standards in support of the products Compliance European (CE) mark required in Europe. [Figure 1-1](#) shows the mark used to indicate this compliance.

Figure 1-1 European Directives CE Mark



- Relevant standards in ElectroMagnetic Compatibility (EMC) directive 2004/108/EC.
- Relevant standards in Safety directive 2006/95/EC, supported by Certified Body (CB) Test Certificates issued by the National Certification Body as tested to IEC 60950 with national differences for participating countries .
- Underwriters Laboratories (UL) listed under UL File E200146 for USA and c-UL for Canada. [Figure 1-2](#) shows the mark used to indicate this compliance.

Figure 1-2 Combined UL Mark for the United States and Canada



- Relevant standards in SJ/T 11363-2006 for limits of certain hazardous substances.

Figure 1-3 Hazardous Substances

部件名称 (Parts)	有毒有害物质或元素 (Hazardous Substance)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr ⁶⁺)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属部件 (Metal Parts)	○	○	○	○	○	○
电路模块 (Circuit Modules)	×	○	○	○	○	○
电缆及电缆组件 (Cables & Cable Assemblies)	×	○	○	○	○	○
塑料和聚合物部件 (Plastic and Polymeric parts)	○	○	○	○	○	○

○: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/Txxxx-xxxx标准规定的限量要求以下。
Indicates that the concentration of the hazardous substance in all homogeneous materials in the parts is below the relevant threshold of the SJ/T 11363-2006 standard.

×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/Txxxx-xxxx标准规定的限量要求。
Indicates that the concentration of the hazardous substance of at least one of all homogeneous materials in the parts is above the relevant threshold of the SJ/T 11363-2006 standard.

台灣標準文件 CNS 15663

Taiwan Standard CNS 15663

Eagle 通訊機架

Eagle Communication Rack

表格文件號碼：

Table part number: 7360209

產品中所含有毒或限用物質含有情況的名稱和含量

Names and Contents of Toxic or Hazardous Materials Contained in the Product

設備名稱：Eagle 通訊機架 Equipment Name: Eagle Communication Rack						
單元 Unit	限用物質及其化學符號					
	鉛 (Pb)	汞 (Hg)	鎘 (Cd)	六價鉻 (Cr ⁺⁶)	多溴聯苯 (PBB)	多溴二苯醚 (PBDE)
主機板 Main Boards	—	○	○	○	○	○
磁碟 Disk Drive	—	○	○	○	○	○
擴充卡/板 Expansion cards/boards	—	○	○	○	○	○
電纜 Cables	—	○	○	○	○	○
電源 Power Supply	—	○	○	○	○	○
機架機殼 Rack and Enclosure	—	○	○	○	○	○
風扇 Fan	—	○	○	○	○	○
電子，發光二極管 Electronics, LEDs	—	○	○	○	○	○
備考 1. “超出 0.1 wt%” 及 “超出 0.01 wt%” 係指限用物質百分比含量超出百分比含量基準值。 Note 1: “Exceeding 0.1 wt%” and “exceeding 0.01 wt%” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition. 備考 2. “○” 係指該項限用物質之百分比含量未超出百分比含量基準值。 Note 2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence. 備考 3. “—” 係指該項限用物質為排除項目。 Note 3: The “—” indicates that the restricted substance corresponds to the exemption.						

中国标准文件 SJ/T 11364

China Standard SJ/T 11364

Eagle 通信机架

Eagle Communication Rack

表文件号：

Table part number:

7360209

产品中所含有毒有害物质或元素的名称及含量

Names and Contents of Toxic or Hazardous Materials Contained in the Product

部件名称 Part Name	有毒或有害物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr ⁶⁺)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
主板 Main Boards	×	○	○	○	○	○
磁盘驱动器 Disk Drive	×	○	○	○	○	○
扩展卡/板 Expansion cards/boards	×	○	○	○	○	○
电缆 Cables	×	○	○	○	○	○
电源 Power Supply	×	○	○	○	○	○
机架机壳 Rack and Enclosure	×	○	○	○	○	○
风扇 Fan	×	○	○	○	○	○
电子, 发光二极管 Electronics, LEDs	×	○	○	○	○	○

该表依据 SJ/T 11364 所制。 This table is prepared according to SJ/T 11364.
 ○: 表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572 标准规定的限量要求以下。
 ○: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.
 ×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572 标准规定的限量要求。
 ×: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572.

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1.5 Hardware Repair and Return

Any system components being returned for repair or replacement must be processed through the Oracle Return Material Authorization (**RMA**) procedures. A hardware repair is defined as an item returned to Oracle due to a failure, with the returned item being repaired and returned to the customer. It is essential that serial numbers are recorded correctly. **RMAs** cannot be created without a valid serial number. All repair and quality information is tracked by serial number. [Table 1-1](#) lists the basic **RMA** types.

Table 1-1 Basic RMA Types

Replacement Type	Description	Turnaround
Priority Advance Replacement	Customer requests the URGENT replacement of a damaged product	Same Day Shipment
Advance Replacement	Customer request the replacement of a damaged product	Shipment Within 3 Business Days
Repair / Return	Customer will return a damaged product for repair	Shipment Within 5 Days After Receipt
Expendable	A damaged part, such as a cable, is replaced, but the Customer does not return the damaged product	Depends on Urgency - Shipment Within 3 Business Days

[Table 1-2](#) lists the **RMA** return reasons.

Table 1-2 RMA Reasons for Return

Reason for Return	Description
Damaged by Environment	Product damaged by environmental phenomena such as water damage or earthquake
Damaged in Shipment	Damaged between shipment from Oracle and receipt at the Customer's installation site.
DOA – Dead on Arrival	Product is not functional when it is first installed at the Customer's location.
Lab Return	Products returned from lab sites.
Product Capture	Defect to be captured by Quality or Engineering (not Product Recall).
Product Deficiency	Anything wrong with the part that doesn't fall into another category.
Product Recall	Products recalled by divisions for the repair of a defect or replacement of defective products.
Return – No Product Deficiency	Anything returned without the product being defective.

1.5.1 Repair and Return Shipping Instructions

All returned equipment, assemblies, or subassemblies must be shipped to the Repair and Return Facility specified by the Technical Services engineer. The item being returned must be

shipped in the original carton or in an equivalent container assuring proper static handling procedures and with the freight charges prepaid.

The assigned **RMA** number must be clearly printed on the “**RMA#:**” 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.

1. Obtain and confirm the following information before contacting the [My Oracle Support \(MOS\)](#):
 - a. Your name
 - b. Company name
 - c. Call-back number
 - d. Email address
 - e. Which product you are calling about?
 - f. Site location
 - g. **CLLI** number
 - h. System serial number (**NT, CE, LM, DS**, etc.)
 - i. Complete software release (e.g., 28.0.1-41.53.0)
 - j. Upgrade forms
 - **WI005153**
 - **WI005154**
 - **WI005218**
 - **WI005219**
 - **WI005220**
 - k. Card type: (e.g., **E5-MPL, DSM**, etc.)
 - l. Card part number (870-#####-##)
 - m. Associated serial number (102#####)
 - n. Reason for return or replacement (isolated from system)
 - o. Full name of person the replacement card is being shipped to
 - p. Shipping address

 **Note:**

If possible, include associated alarms (**UAMs**) and a copy of the associated output (capture file).

2. Contact the Customer Contact Center and request a Return of Material Authorization (**RMA**).
Reference: [My Oracle Support \(MOS\)](#).
3. If the item is a like-for-like advance replacement, the Technical Services engineer arranges for shipment of the replacement item to the customer.
 - a. Wait for the replacement component to arrive.

 **Note:**

It is the site supervisor's responsibility to assure the crate and dollies are returned to Oracle.

2

System Overview

2.1 Introduction

This chapter introduces the hardware in Oracle Communication's signaling products. The hardware components to support its processor and feature applications include the following:

- **EAGLE**
- Multi-purpose Server (**MPS**)

[Hardware Baselines](#) in this guide lists specific hardware (required or configurable components) by part number for each system type and release.



Note:

Products are described generally in this chapter and in detail in [Hardware Descriptions - EAGLE](#).

In this document, modules or components that are used only in specific systems or releases are noted in the following syntax.

- Components used only in EAGLE systems are labeled (**EAGLE** only).
- Components that are specific to a system and release are labeled with the system name and release number. For example, (Sentinel 8.0 and later).



Note:

The term “module” refers to a hardware card provisioned with software. In some cases, EAGLE cards are referred to by the name of the module in which they function, rather than the card name that appears on the label of the card. For ordering or service purposes, customers should use the card name and part number printed on the card itself.

2.2 Oracle Communications EAGLE

The EAGLE is a large capacity, multi-functional, fully scalable **Signaling Transfer Point (STP)**. High capacity and scalability allow the EAGLE to grow from a single-shelf, 80-link STP to a multi-frame, 2800-link STP. EAGLE also supports a variety of interface cards to support connectivity to a wide range of network elements. The EAGLE utilizes a modular design to provide ease of maintenance and expansion. Application and interface cards provide plug-and-play functionality. High reliability and redundancy maximize system availability.

The EAGLE consists of the following functional subsystems. Each subsystem is responsible for a specific task. These subsystems are depicted in the diagram below.

and SNMP feature support. The EAGLE architecture provides Inter-processor Message Transport (IMT) connectivity directly to the maintenance and administration subsystem. The MAS includes redundancy ensuring continuous management control for the EAGLE. Management and redundancy is provided by use of two separate subsystem processors.

The MAS consists of two separate E5 Maintenance and Administration Subsystem Processor (E5-MASP) cards and a E5 Maintenance Disk and Alarm (E5-MDAL) card Maintenance and Administration Subsystem Processor (MASP) cards and a Maintenance Disk and Alarm card (collectively referred to as control cards). The control cards are located in slots 1113 through 1118 of the EAGLE Control Shelf.

**Note:**

If FTRA is in use and E5-OAM cards are installed, EAGLE Release 41.0 and FTRA 4.2 are required.

2.2.1.1 E5-based Control Cards

The E5-based set of EAGLE **control cards** consist of the following cards:

- One E5-based **Maintenance Disk and Alarm (E5-MDAL)** card.
- Two E5-based **Maintenance and Administration Subsystem Processors (E5-MASP)** cards. The E5-MASP card is a dual-slot physical assembly made up of the following two cards:
 - E5-based **Maintenance Communication Application Processor (E5-MCAP)** card
 - E5-based Terminal Disk Module (**E5-TDM**) card

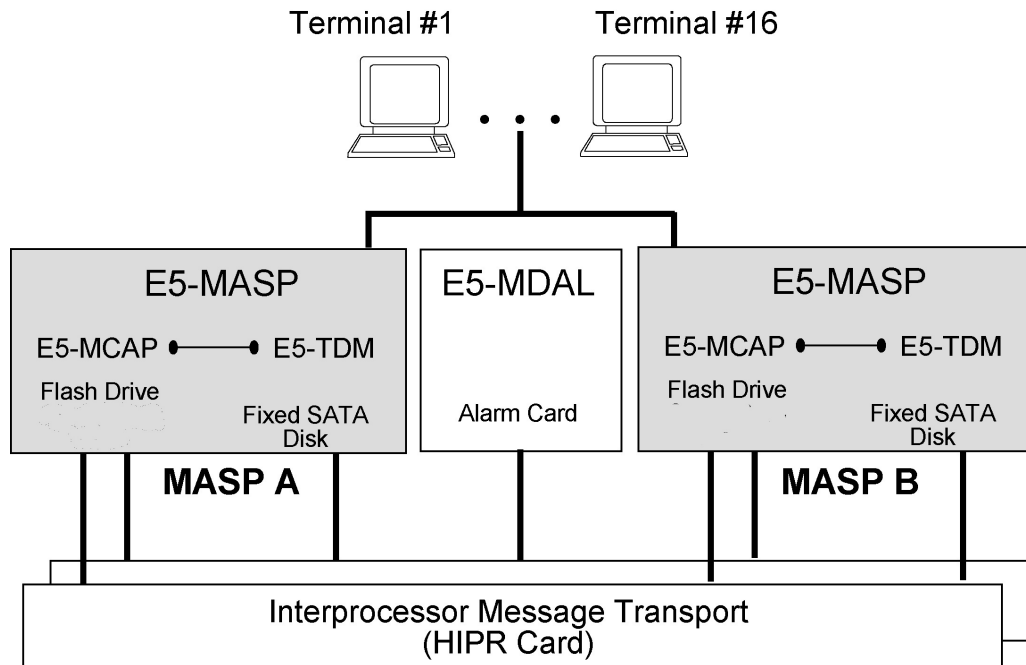
**Note:**

See "Hardware Baseline Table" in *Release Notes* for compatible card part numbers.

The E5-MASP is a dual-card/dual-slot assembly occupying slots 1113/1114 or 1115/1116 of the control shelf. The E5-MDAL is a dual-slot card occupying slots 1117/1118 of the control shelf.

The relationship between the control cards is depicted in [Figure 2-2](#).

Figure 2-2 E5-based Maintenance and Administration Subsystem Block Diagram



2.2.1.1.1 E5 Maintenance and Administration Subsystem Processor (E5-MASP) Card

The **Maintenance and Administration Subsystem Processor (E5-MASP)** cards contain all of the necessary logic to perform both application and communication processing of the data streams provided by the EAGLE. The cards provide connections to the IMT bus through the backplane and all of the necessary logic to perform both application and communication processing of the data streams through the EAGLE. The E5-MASP cards contains one fixed drive and USB connectors for two removable drives. The USB storage media in the flush-mounted USB port of the MASP card can be used for backups.

2.2.1.1.1.1 E5-MCAP

The E5-MCAP card is equipped with 4 GB of physical application processor memory. The primary data interface to the E5-MCAP is RS-232 interfaces (i.e.: terminals) through the E5-TDM.

The E5-MCAP card contains one **latched USB port** for use with removable flash media (“thumb drive”), and one flush-mounted USB port for use with a plug-in flash drive. The removable media drive is used to install and back up customer data. The flush-mounted USB port is used for upgrade and could be used for disaster recovery. The removable flash media is used as a replacement for the legacy Magneto-Optic (MO) Drive. The E5-MCAP card is a replacement for the obsoleted legacy GPSPM-II card used for the **MCAP** function.

2.2.1.1.1.2 E5-TDM

The **E5-TDM** card contains four major subsystems: the Terminal Processor Subsystem, the System Clock/Control Subsystem, the SATA Subsystem, and a Power

Subsystem. These subsystems provide the EAGLE 5 with 16 user-accessible terminals, distributes Composite Clocks and High Speed Source clocks throughout the EAGLE 5, distributes Shelf ID to the EAGLE 5, and disk storage for an E5-MCAP card. The E5-TDM card provides an interface to the E5-MDAL card for system alarms.

The E5-TDM card contains one fixed solid-state SATA drive that is removable and used to store primary and backup system databases, measurements, and Generic Program Loads (GPLs).

2.2.1.1.2 E5-MDAL

The **E5-MDAL** card processes alarm requests, provides general purpose relays, and provides fan control. There is only one **E5-MDAL** card in a control card set and it is shared between two **E5-MASP** cards. The E5-MDAL card is located in slots 1117 and 1118 of the control shelf.

Critical, major and minor system alarms are provided for up to 6 individual racks. In addition to the 3 system alarms, the E5-MDAL card provides the system audible alarm. All alarms are software controlled.

The E5-MDAL card provides control of fans on a per frame basis. The control logic allows for each fan relay to be set individually.

The **E5-MDAL** card does not contain a disk drive.

2.2.2 Communication Subsystem

The communication subsystem consists of the Inter-processor Message Transport (IMT) bus:

2.2.2.1 Inter-processor Message Transport

The Inter-processor Message Transport (IMT) bus is the main communications artery for all subsystems in the system. The IMT bus uses load sharing, so messages from the various subsystems are divided evenly across both buses. If one bus should fail, the other immediately assumes control of all messages.

IMT buses can function as a private **LAN** assigning internal **IP** addresses to **LIM** cards. By addressing cards on an internal **LAN**, the **EAGLE** and the Integrated Monitoring feature allows monitoring of **SS7** links without external connections. **SS7** link information from the **EAGLELIM** cards is collected by the Signaling Transport Cards (**STCs**) and is transferred to Expanded Service Platform (**ESP**) subassemblies. After processing in the **ESP**, the link information is forwarded to a monitoring server.

2.2.2.2 High-Speed IMT Packet Router 2

The High-Speed IMT Packet Router 2 (HIPR2) provides enhanced capabilities in existing EAGLE shelves by increasing system throughput. The HIPR2 enhances the IMT bus with the capability to operate the IMT inter-shelf bus at a rate of 2.5 Gbps. HIPR2 implements the HIPR scheme of transmitting data between shelves only when it is necessary.

Traffic between EAGLE cards on the same shelf will be switched directly to the destination slot and will not transit any other cards in the shelf. Traffic between shelves is not required to pass onto an intra-shelf IMT channel if it is not necessary.

As of Release 46.4, only the High-speed Fibre-channel cable (P/N 830-1344-XX) operating at a 2.5 Gbps inter-shelf bus rate is supported.

2.5 Gbps requires:

- All shelves within EAGLE be equipped with HIPR2
- High-speed Fibre-channel cables

2.2.3 Application Subsystem

The application subsystem consists of application cards. Application cards are capable of communicating with other cards through the redundant IMT buses. A Communications Processor (**CP**) on each application board provides control of communications from the cards to the IMT buses.

Software is downloaded to application cards on initial power-up from the **Maintenance and Administration Subsystem Processors (MASP)**. Once EAGLE is loaded, software is downloaded to cards by the Operation Administration and Maintenance (**OAM**).

An Application Processor (**AP**) receives the software load on the application card. The type of software the **AP** receives depends on the function of the application board which is determined by the provisioning of the board. Presently, there are several types of application cards that support network specific functions:

- **Database Service Module (DSM)** — **EAGLE** Application Processor(**EPAP**), Global System for Mobile Communications (**GSM**), **EAGLE Local Number Portability (ELAP)**, and interface to **Local Service Management System (LSMS)**.
- **E5-SM8G-B Database Service Module** — **EAGLE** Application Processor (**EPAP**), Global System for Mobile Communications (**GSM**), **EAGLE LNP Application Processor (ELAP)**, and interface to Oracle Communications LSMS (**Local Service Management System**). Supports 150K TPS GTT and 75K TPS G-Port features. The E5-SM8G-B module is capable of providing up to 13.6K TPS per card.

 **Note:**

The E5-SM8G-B does not support ELAP with databases greater than 192M or EPAP with databases greater than 84M.

- **E5-ENET-B** — Has 4 physical 10/100 Mbps Ethernet ports. The PMC ports A0 and B0 are utilized as IP signaling link ports while PMC ports A1 and B1 support the Fast Copy feature when enabled. Each interface is independent of the others.
 - 2 physical 10/100 Mbps Ethernet ports.
 - Supports STP Local Area Network function, and 10/100 Base-T ethernet links to the STP.
- **E5-MCPM-B** - Requirement for the **FTP** measurements feature. The **FTP** measurements feature uses the **MCPM** card ethernet ports to transfer measurements information directly to a **FTP** server. Is used for nodes with link capacity of 2,400 (1,200 if 15 Minute Measurements is enabled) or greater.
- **Multi-Channel Interface Module, E5-E1T1-B** — 8 **HDLC** channels for **E1** or **T1** protocols.
- **Multi-Port Link Interface Module, E5-ATM-B** — **SS7** links. Supports up to 3 links for ATMANSI and ATMITU application.

2.2.3.1 Generic Program Loads

Application software is downloaded to individual application cards by means of Generic Program Loads (GPLs). Hardware is defined to EAGLE by means of a series of administration commands. Software is then loaded from the fixed disk over the IMT bus directly to the cards. The type of the **GPL** loaded depends on the card that is chosen.

Example GPLs include the following:

- **VSCCP**—Signaling Connection Control Part. This software allows the Database Service Module (DSM) to be used as a memory board for Global Title Translation (GTT). Inbound SCCP messages from Link Interface Modules (LIMs) are sent to the DSM assigned to the LIM by system software. VSCCP software on the DSM performs the translation, and sends messages through the IMT back to the appropriate LIM, which routes messages to the destination. The VSCCP application can run on the DSM cards.

Caution:

It is recommended that cards running the VSCCP application be uniformly distributed in the EAGLE to provide a more even VSCCP load distribution. During normal operation unevenly distributed VSCCP cards in an EAGLE would not have any network or system impacts. However, should a particular VSCCP card database(s) become corrupted, inconsistent, or at a different level, depending on the amount of service provided by that card and the extent of the database issue, network impacts can occur.

- **SS7**—This software provides access to remote SS7 network elements.
- **ERROUTE**—Ethernet Routing transfers link information messaging from the EAGLE LIM cards to the Integrated Sentinel using TCP/IP and EAGLE Monitor Protocol (EMP). Implemented in Signaling Transport Cards (STC).

Note:

For a full and current list of GPLs, see "Generic Program Loads" in *Release Notes*.

2.2.3.2 Link Interface Module

The application subsystem provides external services, relying on the Link Interface Module (**LIM**) as an interface. Each LIM provides one or more line interfaces (Ethernet, E1/T1/J1, ATM) that can support 1 or more **SS7** links (depending on configuration). A LIM consists of an application card equipped with a main assembly and an applique. This assembly provides level one and some level two functions on SS7 signaling links/line protocols.

The types of interfaces presently available through a LIM are:

- T1-**ATM** at 1.544 Mbps
- E1-ATM at 2.048 Mbps
- E1 at 2.048 Mbps
- T1 at 1.544 Mbps

- Channelized E1 at 64Kbps per TS
- Channelized T1 at 56Kbps per TS
- Channelized **J1** at 64Kbps per TS
- **IP/Ethernet** at 10/100 Mbps

2.2.3.3 Measurements Collection and Polling Module

The Measurements Collection and polling Module (**MCPM**) is an **E5-MCPM-B** card running MCPHC GPL.

 **Note:**


The Measurements Platform IP Security feature requires an MCPM card.

 **Note:**

The MCPM card is a requirement for the FTP measurements feature. The FTP measurements feature utilizes the MCPM card ethernet ports to transfer measurements information directly to a FTP server.

2.2.3.4 E5-MCPM-B Module

The E5-MCPM-B (P/N 870-3089-xx), Measurements Collection and polling Module (**MCPM**), is a requirement for the FTP measurements feature. The FTP measurements feature utilizes the E5-MCPM-B card ethernet ports to transfer measurements information directly to a FTP server.

 **Note:**

The Measurements Platform IP Security feature requires E5-MCPM-B or EDSM-2G MCPM cards.

2.2.3.5 E5-SM8G-B Module

The E5-SM8G-B (P/N 870-2990-xx) is a database service module (**DSM**) designed to operate in the EAGLE shelf. The E5-SM8G-B is a double-slot card with 8GB of total memory. It provides global title functions required for Local Number Portability (LNP), all Signaling Connection Control Part (SCCP), which is part of Global Title Translation (GTT), and Generic Load Services (GLS) which is part of Gateway Screening.

 **Note:**

All E5-based cards require **HIPR2**. For more information, see [High-Speed IMT Packet Router 2](#).

2.2.3.6 E5-B Interface Module

The E5-B interface module is a link interface card that utilizes an **Embedded Processor Module (EPM-B)** with an appliqué card. The E5-B card provides the EAGLE system a high performance general purpose-processing platform in a single-slot footprint. The E5-B card is used on existing EAGLE control and extension shelves.

 **Note:**

As of Release 46.6, all cards and references to E5 and EPM cards refer to E5-B and EPM-B cards.

The **EPM** appliqué cards provide **LIM** functionality such as **E1/T1** or **IP**. The EPM accepts up to two single-width or one double width **PCI Mezzanine** appliqué card(s). The EPM assembly contains all of the necessary logic to perform both application and communication processing of the data streams provided by the appliqué cards such as E1/T1 or IP. All EAGLE System interfacing to the EPM occurs through the EAGLE backplane signals and connects to the appliqué cards through the **PCI Mezzanine Card (PMC)** interface.

The EPM-B is a dual core base board with an appliqué interface to support the line interface cards. The **EPM-B** appliqué cards provide the same functionality as the obsoleted EPM cards, providing increased throughput and capacities.

 **Note:**

The EPM-B cards may take up to 30 seconds after they are plugged in before any LED activity is observed.

The types of E5-B cards presently available are:

- **E5-E1T1-B** (P/N 870-2970-xx)
- **E5-ENET-B** (P/N 870-2971-xx)
- **E5-ATM-B** (P/N 870-2972-xx)
- **E5-MCPM-B** (P/N 870-3089-xx)

2.2.3.6.1 E5-ATM-B Module

The **E5-ATM-B** card (P/N 870-2972-01) is a single slot card providing ATM over E1 and T1 connectivity for EAGLE control and extension shelves.

The card supports up to 3 links for ATMANSI and ATMITU application. The E5-ATM provides connectivity for two E1/T1 ports on the Port A backplane connector, allowing up to three links that may be provisioned. Both E1/T1 ports can be accessed with a 2-port or 4-port cable. An interface adapter (P/N 830-1342-05) allows the two ports to be physically split to two different cables/patch panels. If it is desired to move the second E1/T1 port to the Port B backplane connector, then an adapter and another cable (1-, 2-, or 4-port) must be used.

 **Note:**

Throughout this document, the term E5-ATM refers to the E5-ATM-B card (P/N 870-2972-01).

2.2.3.6.2 E5-E1T1-B Module

The E5-E1T1-B card (P/N 870-2970-xx) is a single slot card providing eight trunk terminations. The eight E1/T1 ports reside on backplane connectors A and B. The E5-E1T1-B supports up to 64 signaling links of configurable channelized E1 or T1 connectivity OR two SE-HSL/ST-HSL signaling links.

All ports on a single board operate in the same trunk format, E1 or T1. However, it is possible to have a mixture of trunk formats in a node with some E5-E1T1s operating in T1 mode with others operating in E1 mode for gateway node scenarios.

 **Note:**

Throughout this document, the term E5-E1T1 refers to the E5-E1T1-B card (P/N 870-2970-xx).

2.2.3.6.3 E5-ENET-B Module

The E5-ENET-B module (P/N 870-2971-xx) is a single slot card that has one or more Ethernet interfaces and provides increased transactions per second (TPS).

 **Note:**

Throughout this document, the term E5-ENET refers to the E5-ENET-B (P/N 870-2971-xx) card.

The E5-ENET provides support for the following:

- IPGWx
 - **SCTP, M3UA, SUA**
 - Up to 50 SCTP connections per card
 - Up to 250 total E5-ENET cards per node. This total may be made up of cards running any application type (IPGW, IPSP) and any adapter type.
- IPSP
 - **M2PA, M3UA**
 - Up to 32 M2PA or M3UA links per IPSP E5-ENET card
 - Up to 32 M2PA or M3UA associations per IPSP E5-ENET card
 - Up to 128 SCTP associations per SLIC card
 - Up to 250 total E5-ENET cards per node. This total may be made up of cards running any application type (IPGW, IPSP) and any adapter type.

- EROUTE (STC)
 - TCP/IP
 - Up to 32 cards per node

 **Note:**

The E5-ENET is provisionable for these functions, but does not support multiple functions on a single card simultaneously.

 **Note:**

The E5-ENET-B module (P/N 870-2971-xx) can run the IPS GPL to perform all functions as the E5-IPSM card. E5-ENET-B with IPS GPL can be exchanged with IPSM cards running IPS, without any changes in provisioning information. The E5-ENET-B running the IPS GPL supports SEAS Over IP functionality.

The E5-ENET module has 4 physical 10/100 Mbps Ethernet ports. The PMC ports A0 and B0 are utilized as IP signaling link ports while PMC ports A1 and B1 support the Fast Copy feature when enabled. Each interface is independent of the others. The E5-ENET card and other DCM-class cards have backplane cable pinout differences requiring an adapter for the E5-ENET card.

2.2.4 Timing Systems

EAGLE uses synchronized timing systems to provide accurate reference standards to all cards on the IMT buses.

System Clock

EAGLE connects to the 64KHz composite Building Integrated Time System (**BITS**) clocks through two **DB-15** style connectors on the backplane of the control shelf. The two clocks are labeled primary and secondary and are sent to both **MASPs**. Each **MASP** selects between two **BITS** clock signals to provide a system clock to the rest of the EAGLE. The system clock is used by **Link Interface Modules (LIMs)** and **Signaling System #7 (SS7)** Digital Service level-0 Appliance (**DS0A**) signaling links, with each **LIM** selecting either clock A or clock B for its own use.

EAGLE also distributes system clocks to all frames. All shelves, both extension shelves and control shelves, provide “clock in” and “clock out” connections. Clock cables from the control shelf connect to the “clock in” connector on the top shelf of each frame. From the “clock out” connector on the top shelf of each frame, the clock signals are connected to the “clock in” connector of the middle shelf of the frame and from that shelf to the bottom shelf.

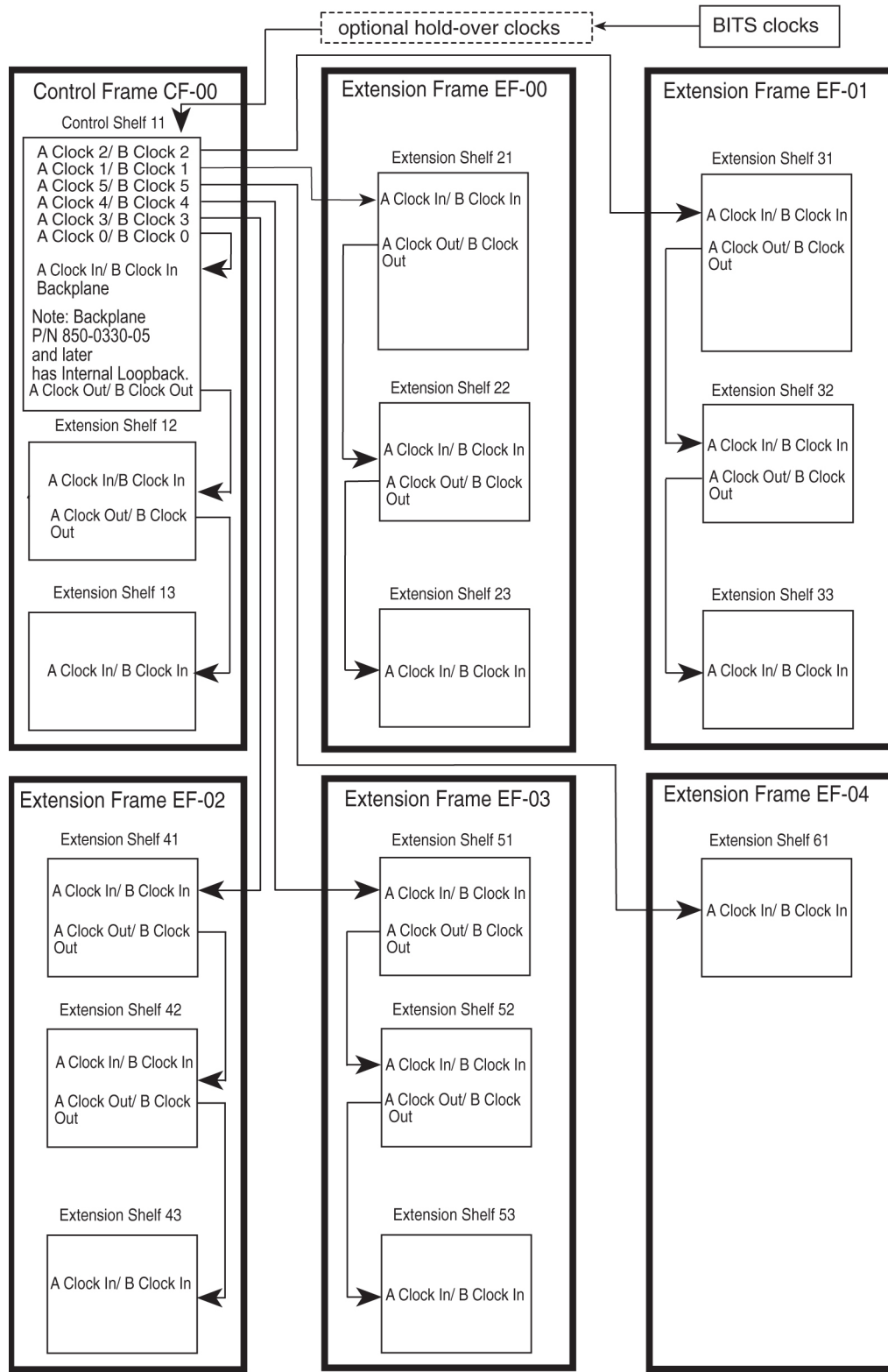
Holdover Clock

An optional holdover clock can maintain clock synchronization for EAGLE **DS0A** links during brief interruptions of the **Building Integrated Timing System (BITS)** clock signals. In accordance with Telcordia Technologies **GR-1244-CORE**, **BITS** clock outages of up to 15 seconds can be tolerated.

BITS Clock Routing

BITS clock signals A and B are routed through the holdover clock and then to the system, allowing the holdover clock to continue Stratum 3 clock signals to the EAGLE (see [Figure 2-3](#)).

Figure 2-3 Clock Routing



clock_21

High-Speed Source Timing

The EAGLE can be configured with high-speed source timing capabilities. High-speed source timing allows synchronization of **LIM** cards at **E1** or **T1** rates. For more information about installing or upgrading to high-speed timing see the section on Source Timing in *Installation Guide*.

Time Slot Counter Synchronization

Time Slot Counter Synchronization (**TSC**) Synchronization allows all cards in the system that contain a Time Slot Counter (**TSC**) to synchronize with one another. The ability to have synchronized timing between cards is used in applications such as system wide message time stamping.

2.3 Multi-Purpose Server (MPS) Systems

The **MPS** system can be configured as an Oracle Communications **EAGLE** LNP Application Processor (**ELAP**) or **EAGLE** Application Processor (**EPAP**) server.

The **MPS** provides an interface between the customer provisioning network and the EAGLE **SM** cards. As the customer's data is updated, the **MPS** stores the data and updates the **SM** cards. An **MPS** is usually co-located with an EAGLE. If you need to install an **MPS** at a distance from the **EAGLE**, contact the [My Oracle Support \(MOS\)](#) for assistance.

MPS running the **EPAP** software supports the **GSM** Flexible Numbering (**G-Flex**), **GSM** Mobile Number Portability (**G-Port**), **INAP**-based Number Portability (**INP**), and other features.

These features allow a subscriber to change location, service provider, or service while keeping the same directory number and ensures that subscribers receive the same freedom of choice for local service as they do with long-distance service providers.

MPS running the (ELAP) software supports the North American **LNP** feature.

The **MPS** uses the **E5-APP-B** card. For more information on this card, see *Application B Card Hardware and Installation*.

2.4 OEM Products

OEM-Based Servers

OEM-based products use Commercial Off-The-**Shelf (COTS)** servers, network elements, and peripheral components. Server hosts provide processing power and database storage capacity to deliver a scalable range of application specific services. Components can be configured redundantly to provide a high level of reliability in processing applications. One such **OEM**-based Product server currently being used is the Sun Netra **T1DC200** server (used as Extended Services Platform (**ESP**) servers in the **Integrated Sentinel** systems).

OEM-based product capabilities are defined by specific application requirements. Optional processing components that provide application specific services can be integrated into **OEM**-based systems.

OEM-Based Network Elements

OEM-based products are configured as frame-mounted Local Area Networks (**LAN**) using Commercial Off-The-**Shelf (COTS)** routers, hubs, and switches. Typically **OEM**-based products are configured in redundant **LANs** with isolation and dial-up access **IP** links to customers networks.



Note:

Telco switches are provisioned in Eagle.

Network components are typically configured in redundant pairs with dual power supply systems for reliability. Network components can include:

- Routers
- Hubs
- Ethernet Switches
- Application Servers
- Optional components

OEM-Based Peripheral Components

OEM-based products use **COTS** peripheral components to support the server and network elements. Peripheral components can include:

- Breaker panels
- Workstations
- Terminals
- Switch boxes
- Break-out boxes

3

Hardware Descriptions - EAGLE

3.1 Introduction

This chapter provides detailed descriptions of the various hardware associated with the EAGLE including **MPS** systems. This chapter is designed to aid personnel in configuration, planning, and replacing components in the systems.

This chapter contains detailed descriptions of the frames, shelves, modules, and power distribution in the systems.

3.2 EAGLE

EAGLE is a large-capacity, multi-functional, fully scalable Signaling Transfer Point (**STP**). The EAGLE is **NEBS**-compliant (**GR-63-CORE**, Network Equipment-Building Systems). High capacity and scalability allow the EAGLE to grow from a single-shelf, 80-link **STP** to a multi-frame, 2800-link **STP**.

Due to the distributed processor design, EAGLE does not have a separate central processing unit to bottleneck traffic throughput. Application and interface cards are designed to provide plug and play type functionality that facilitates future growth. EAGLE application and interface cards generally do not have specific shelf or frame limitations, allowing you to fully customize and define how your **STP** is configured. EAGLE also supports a variety of interface cards to support connectivity to a wide range of network elements. EAGLE provides connectivity interfaces for **IP**, **ATM**, **T1**, and **E1** protocols.

IP Connectivity

The **EAGLE** provides connectivity between **SS7** and **IP** networks. It receives and sends switched circuit network (**SCN**) native signaling at the edge of the **IP** network. The signaling gateway function may relay, translate, or terminate **SS7** signaling in an **SS7**-Internet gateway. The signaling gateway function may also be co-resident with the media gateway function to process **SCN** signaling associated with line or trunk terminations controlled by the media gateway.

Monitoring

In EAGLE STP, Signaling Transport Cards (STC) monitor the activity of Link Interface Modules (LIM) and transfer information to an Integrated Data Acquisition system such as the Extended Services Platform (ESP) subassembly.

Note:

STC cards are based on E5-ENET B cards (P/N 870-2971-xx) or SLIC cards (P/N 7094646), and can be configured in any slot (except slots reserved for HIPR2 cards).

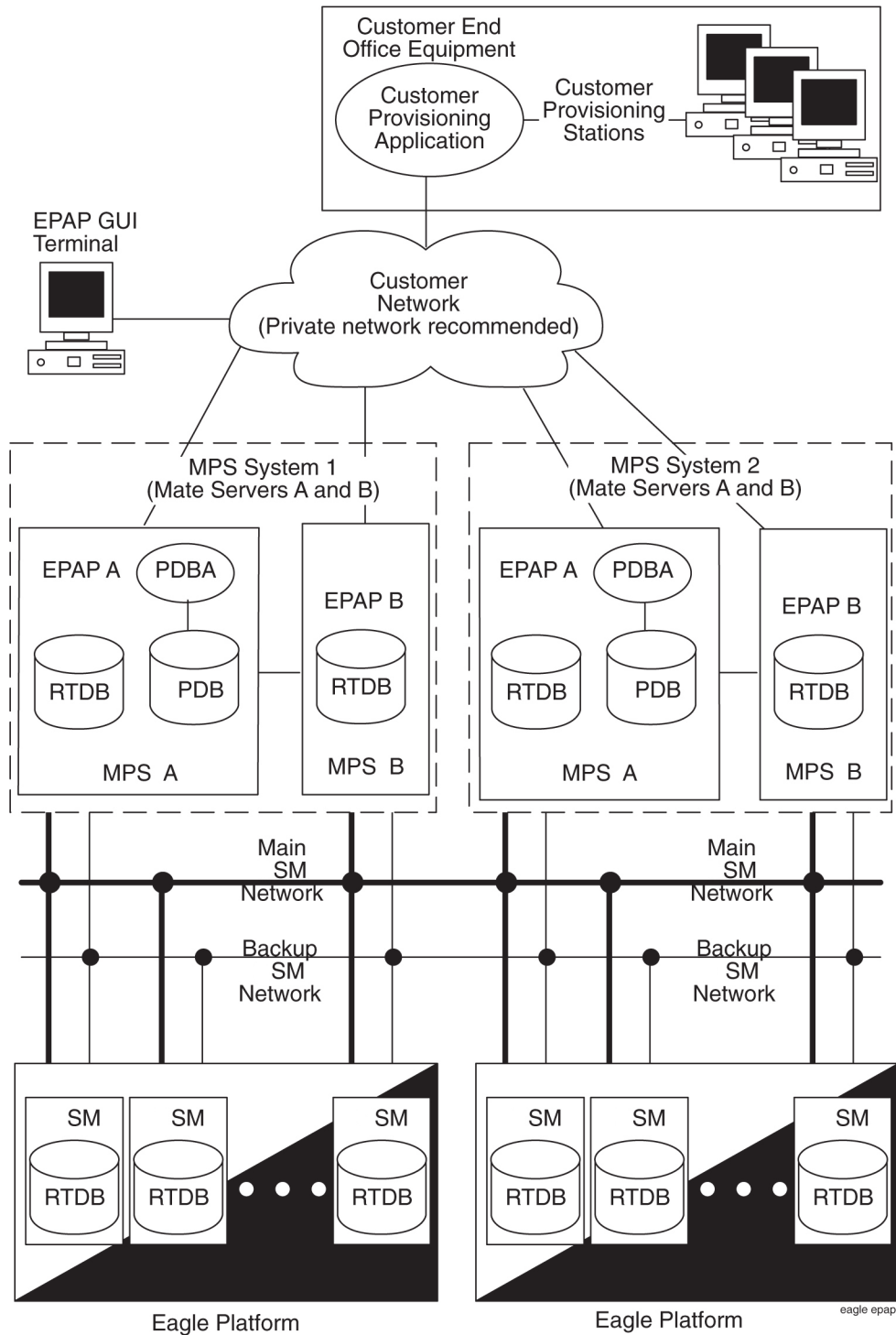
3.3 Multi-Purpose Server (MPS)

Oracle Communications' Multi-purpose Server (**MPS**) is a hardware and software platform that can be configured to support ELAP or EPAP.

[Figure 3-1](#) shows an overview of how the **EPAP MPS** is used with the **EAGLE**.

The **MPS** provides an interface between the customer provisioning network and the EAGLE **SM** cards. As the customer's data is updated, the **MPS** stores the data and updates the **SM** cards. An **MPS** is usually co-located with an EAGLE.

Figure 3-1 EPAP MPS Overview

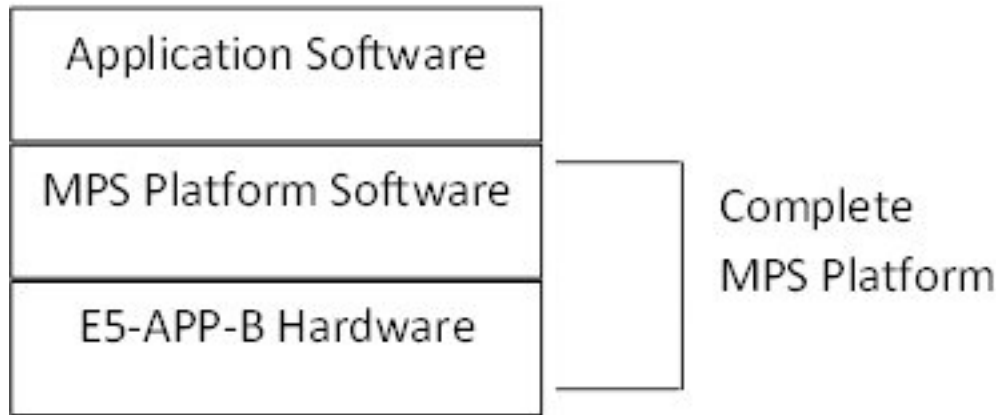


Layered Design

MPS is based on the **E5-APP-B** card and uses a layered design (see [Figure 3-2](#)) with defined interfaces to enable application and platform changes to be made independently. This design

provides an environment in which changes made to platform components need not cause changes in application.

Figure 3-2 Layered Design for MPS and Applications

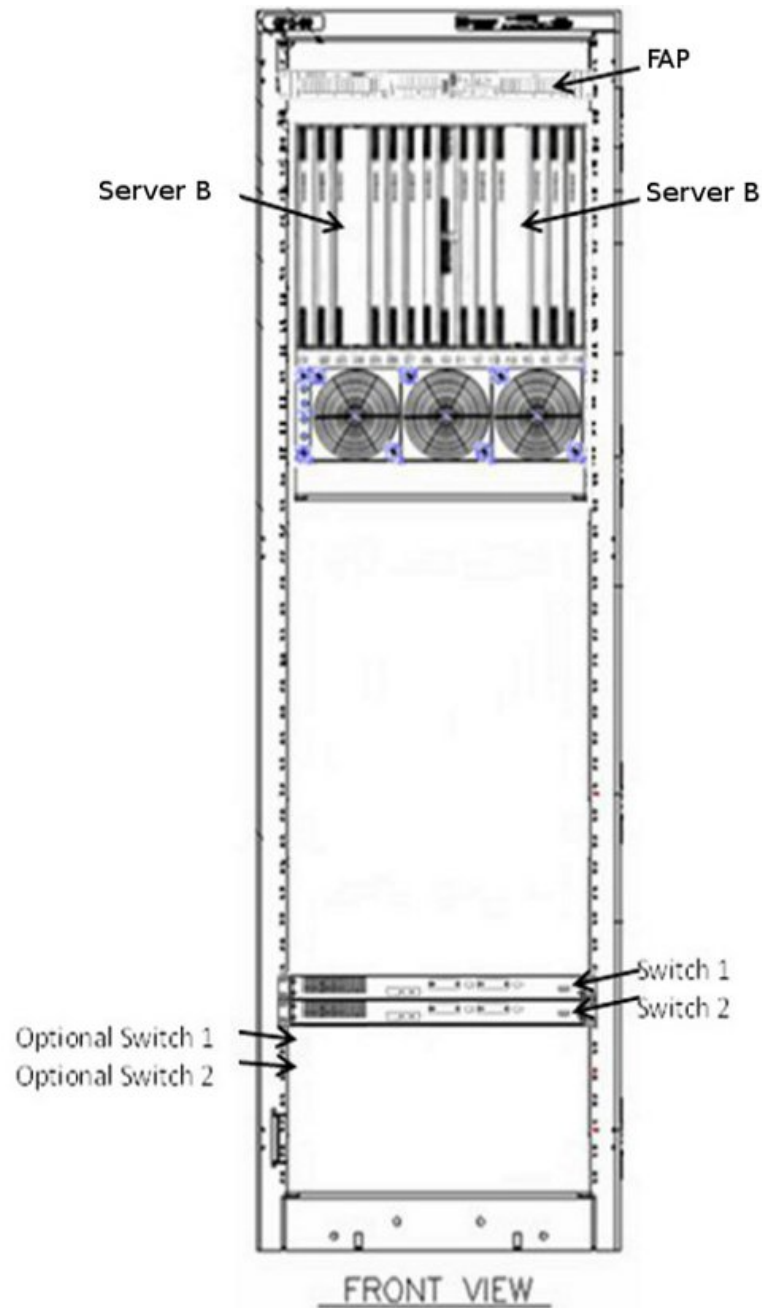


Hardware Components

This section includes a description of **MPS** hardware components and an overview of the disks and file systems. [Figure 3-3](#) illustrates the following equipment.

- One EAGLE **FAP**
- One Fan tray
- Two to four Switches
- Two **MPS** Servers
- One General Purpose Frame

Figure 3-3 MPS Hardware Overview



 **Note:**

If the Dual ExAP Configuration feature is used, the MPS Frame would instead contain four to six switches and four MPS server.

NOT_SUPPORTED:

DO NOT install **AC** powered equipment in the **MPS** frame. No commercially powered **AC** equipment should be used or placed within 7 feet of -48VDC equipment. Doing so can create a shock hazard to personnel and equipment.

3.4 EAGLE Card Overview

The EAGLE Card Overview table is a resource table that provides an overview of information for cards that can be provisioned in EAGLE. For a detailed description of supported hardware, see Table below.

This table lists the following card information:

- GPLs and applications that can run on the card
- Provisioned card type
- Name of the card as shown on the card label
- Card part number
- Number of shelf slots that the card occupies (1 or 2)
- Number of physical ports on the card
- Maximum number of links that can be assigned to the card

Table 3-1 EAGLE Card Overview Table

Card Applications	Card GPLs	Provisioned Card Type	Card Name as shown on the card label	Card Part Number	Slots per Card	Ports per Card	Links per Card
atmansi	atmhc69	limatm	E5-ATM-B	870-2972-01	1	4 (3 used)	2
atmitu	bldc32	lime1atm					
ccs7itu	ss7hc69	lime1	E5-E1T1-B	870-2970-01	1	8	64
	bldc32		SLIC	70946467352578	1	4	96
ccs7itu	ss7hc69	lime1 (for SE-HSL)	E5-E1T1-B	870-2970-01	1	8	2
	bldc32		SLIC	70946467352578	1	2	3
enumhc	enum64	dsm	E5-SM8G-B	870-2990-01	2	2 Ethernet	1 Ethernet for MPS link
							1 Ethernet for Signaling (16 TCP; 1 UDP)

Table 3-1 (Cont.) EAGLE Card Overview Table

Card Applications	Card GPLs	Provisioned Card Type	Card Name as shown on the card label	Card Part Number	Slots per Card	Ports per Card	Links per Card
	enum64 blslc64		SLIC	7094646 7352578	1	4 Ethernet	2 Ethernet for MPS links 2 Ethernet for Signaling links (2 UDP)
eroute	erthc69 bldc32	stc	E5-ENET-B	870-2971-01	1	2	2 Ethernet
	erthc69 blsl932		SLIC	7094646 7352578			
hipr2	hipr2	N/A	HIPR2	7333484	1	N/A	N/A
				870-2872-01Foot 2			
				870-2872-02Foot 2			
ips	ipshc69 bldc32	ipsm	E5-ENET-B	870-2971-01	1	2 (use only A)	1 ipshc service
	ipshc69 blsl932		SLIC	7094646 7352578	1	1	1 Ethernet
ipsg	ipsg69 bldc32	enet enetb	E5-ENET-B	870-2971-01	1	4	32
	ipsg69 blsl932	enetb	SLIC	7094646 7352578	1	4 Ethernet	2 Ethernet for Signaling links (32 SCTP) 2 Ethernet for Fast Copy
	ipsg69 blsl932	slic	SLIC	7094646 7352578	1	4 Ethernet	2 Ethernet for Signaling links (128 SCTP) 2 Ethernet for Fast Copy

Table 3-1 (Cont.) EAGLE Card Overview Table

Card Applications	Card GPLs	Provisioned Card Type	Card Name as shown on the card label	Card Part Number	Slots per Card	Ports per Card	Links per Card
ipsg + GTT	ipsg932 blsl932	slic	SLIC	7094646 7352578	1	4 Ethernet	2 Ethernet for Signaling links (32 SCTP) 2 Ethernet for Fast Copy
mcp	mcphc69 bldc32	mcpm	E5-MCPM-B	870-3089-01	1	2 (use only A)	1 Ethernet
	mcphc69 blsl932		SLIC	7094646 7352578	1	1	1 Ethernet
oam	oamhc69 bldc32	N/A	E5-MASP	7346924	2	2	N/A
				870-2903-01Foot 2			
				870-2903-02Foot 2			
				870-2903-03Foot 2			
sfapp	sfapp blslc64	slic	SLIC	7094646 7352578	1	1 Ethernet	1 Ethernet for Visualization links (8 TCP)
siphc	sip64 bldc64	dsm	E5-SM8G-B	870-2990-01	2	2 Ethernet	1 Ethernet for MPS link 1 Ethernet for Signaling (16 TCP; 1 UDP)
	sip64 blslc64			SLIC	7094646 7352578	1	4 Ethernet
ss7ansi	ss7hc69 bldc32	limt1	E5-E1T1-B	870-2970-01	1	8	64
	ss7hc69 blsl932		SLIC	7094646 7352578	1	4	96

Table 3-1 (Cont.) EAGLE Card Overview Table

Card Applications	Card GPLs	Provisioned Card Type	Card Name as shown on the card label	Card Part Number	Slots per Card	Ports per Card	Links per Card
ss7ansi	ss7hc69 bldc32	limt1 (for ST-HSL- A)	E5-E1T1- B	870-2970- 01	1	8	2
	ss7hc69 blsl932		SLIC	7094646 7352578	1	2	3
vsccp	sccp64 bldc64	dsm	E5- SM8G-B	870-2990- 01	2	2 Ethernet	2 Ethernet for MPS links
	sccp64 blslc64		SLIC	7094646 7352578	1	3 Ethernet	2 Ethernet for MPS links 1 Ethernet for Visualizati on links (8 TCP)
		slic		7094646 7352578	1	3 Ethernet	2 Ethernet for MPS links 1 Ethernet for Visualizati on links (8 TCP)
N/A	N/A	N/A	E5-MDAL	7346923 870-2900- 01Foot 2	2	N/A	N/A
elap epap lsms nas imf	N/A	e5appb	E5-APP-B	870-3096- xx	2	4	N/A

3.5 Hardware Baselines

[Hardware Baselines](#) contains a complete listing of the hardware available for each software release. The appendix lists configurable modules arranged in alphabetical order indexed to system software releases. For example, all hardware available will have a bold X where the hardware module row crosses the release column.

3.6 Frames

The system uses standard 7-foot high, 23-inch wide frames (inside dimension). These floor mounted frames are constructed from channel steel and painted with electrostatic powder.

Depending on the configuration, the system uses two frames to accommodate a maximum of 2800 **SS7** signaling links.

 **Note:**

A heavy-duty frame with the capability to support the greater weight of **COTS** equipment is shipped with all new systems. The generic frame is no longer being shipped but is supported in the documentation.

 **Note:**

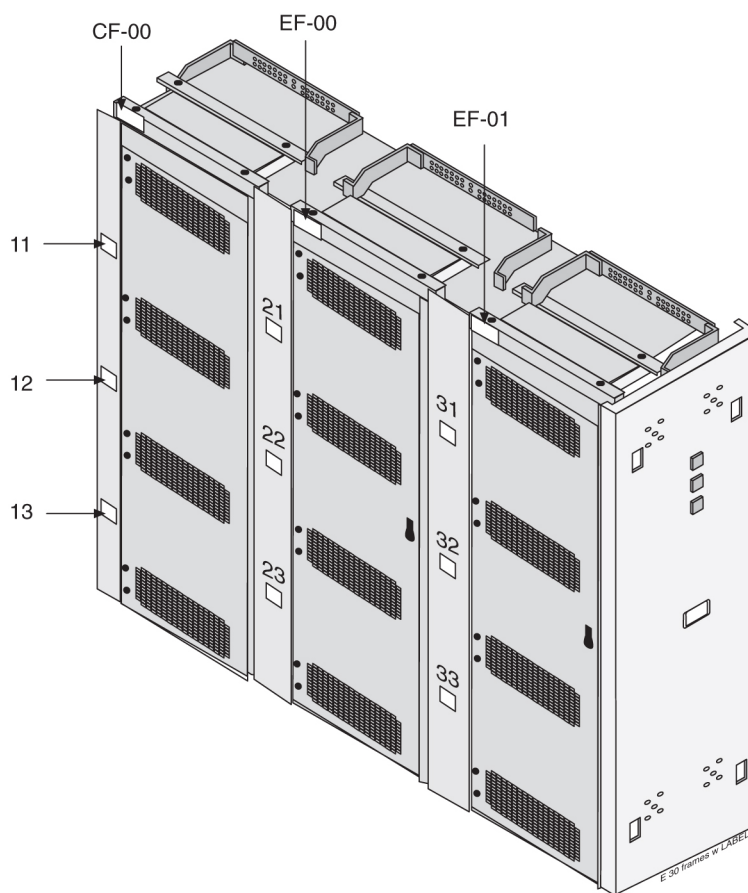
With the large system feature, depending on configuration, the system can accommodate up to 2800 links. The large system feature applies to the EAGLE systems only.

The system can use two types of frames:

- Control Frame (**CF**)
- Extension Frame (**EF**)

Figure 3-4 shows a system with a Control Frame (CF-00) and two Extension Frames (EF-00 and EF-01).

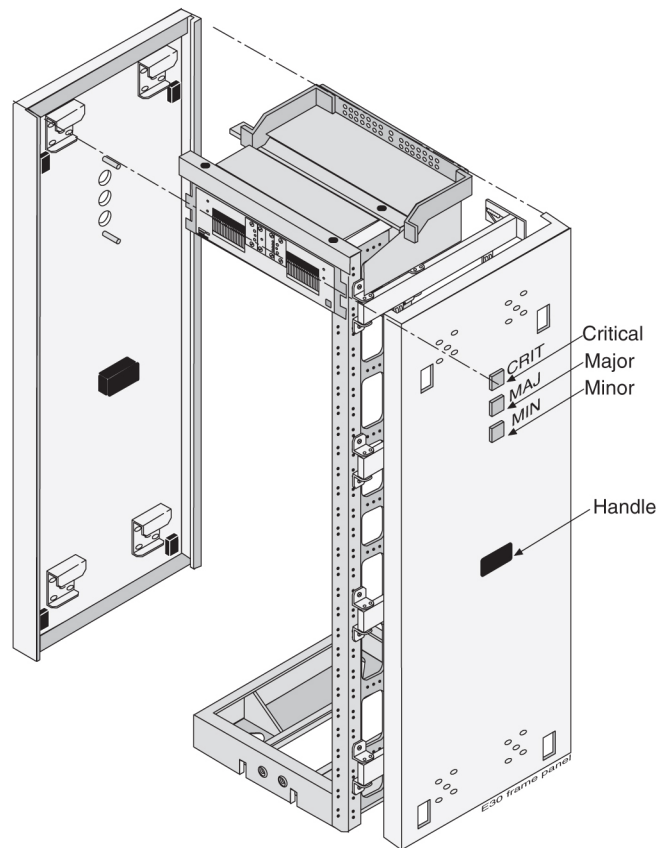
Figure 3-4 Frames



Lamp indicators (P/N 525-0067-R01) can be mounted on either side of the row of frames on the end panels (as shown in [Figure 3-5](#)), which show three levels of alarm conditions:

- Critical
- Major
- Minor

Figure 3-5 Frame End Panel with Lamp Indicators



The doors on the front of each frame provide electromagnetic interference shielding and lock in place with a screw lock. Mounted on the inside of the doors are card locators, used to record the location of each card in a shelf and important data regarding the application that each card provides. The shelf backplanes are protected at the rear of the frame by removable transparent Plexiglas panels.

The following lists the part numbers for the panels for the frames:

- P/N 840-0064-01 End row panel, full depth, standard frame, **NTW**.
- P/N 840-0089-01 End row panel, full depth, heavy-duty **NTW**.
- P/N 870-2238-02 Extended panel, alarm side, **NEBS NTW**.
- P/N 870-2278-02 Full depth alarm side panel, heavy-duty frame, **NTW**.

A Fuse and **Alarm Panel (FAP)**, located at the top of each frame, distributes -48VDC to all the shelves in the frame. Fuses are located on the front of the fuse and alarm panel. For more information on the fuse and alarm panel (refer to [Fuse and Alarm Panels](#)).

The numbering of the shelves, with the shelf identification backplane wiring, circuit card location, and with the Inter-processor Message Transport (IMT) address in small print at the bottom of the faceplates is shown in [Figure 3-6](#). The HIPR2 card provides Inter-processor Message Transport (IMT) bus continuity for all cards connected to the IMT bus.

Figure 3-6 Control Frame CF-00 Numbering Plan

Control Shelf 11

									1			MCAP A	TDM A	MCAP B	TDM B	MDAL	MDAL
Card location numbers	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1	1	9	1	1	1	1	1	1	1	1
	0	0	0	0	0	0	0	0		1	1	1	1	1	1	1	1
	1	2	3	4	5	6	7	8	1	1	2	3	4	5	6	7	8
IMT addresses	F0	F1	F2	F3	F4	F5	F6	F7	0	F8	F9	FA		FB			

☐ These locations are paired entities

Extension Shelf 12

									1								
Card location numbers	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2	9	2	2	2	2	2	2	2	2
	0	0	0	0	0	0	0	0		1	1	1	1	1	1	1	1
	1	2	3	4	5	6	7	8	1	1	2	3	4	5	6	7	8
IMT addresses	00	01	02	03	04	05	06	07	0	08	09	0A	0B	0C	0D	0E	0F

Extension Shelf 13

									1								
Card location numbers	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
	3	3	3	3	3	3	3	3	9	3	3	3	3	3	3	3	3
	0	0	0	0	0	0	0	0		1	1	1	1	1	1	1	1
	1	2	3	4	5	6	7	8	1	1	2	3	4	5	6	7	8
IMT addresses	10	11	12	13	14	15	16	17	0	18	19	1A	1B	1C	1D	1E	1F

11-2-3

3.6.1 Extension Frame

The Extension Frame (EF) accommodates up to three extension shelves, each shelf is capable of supporting up to 16 Link Interface Modules (LIMs), E5 Interface Modules, E5-TSM Modules, E5-STC Modules or E5-MCPM-B Modules in any combination. E5-SM (E5-SMxG/E5-SMxG-B) cards must be inserted into odd numbered slots in eagle systems.

The system can have up to five Extension Frames, EF-00 to EF-04. EF-04 supports only one extension shelf. The numbering of the shelves is shown, with the shelf identification

Figure 3-8 Extension Frame EF-01 Numbering Plan

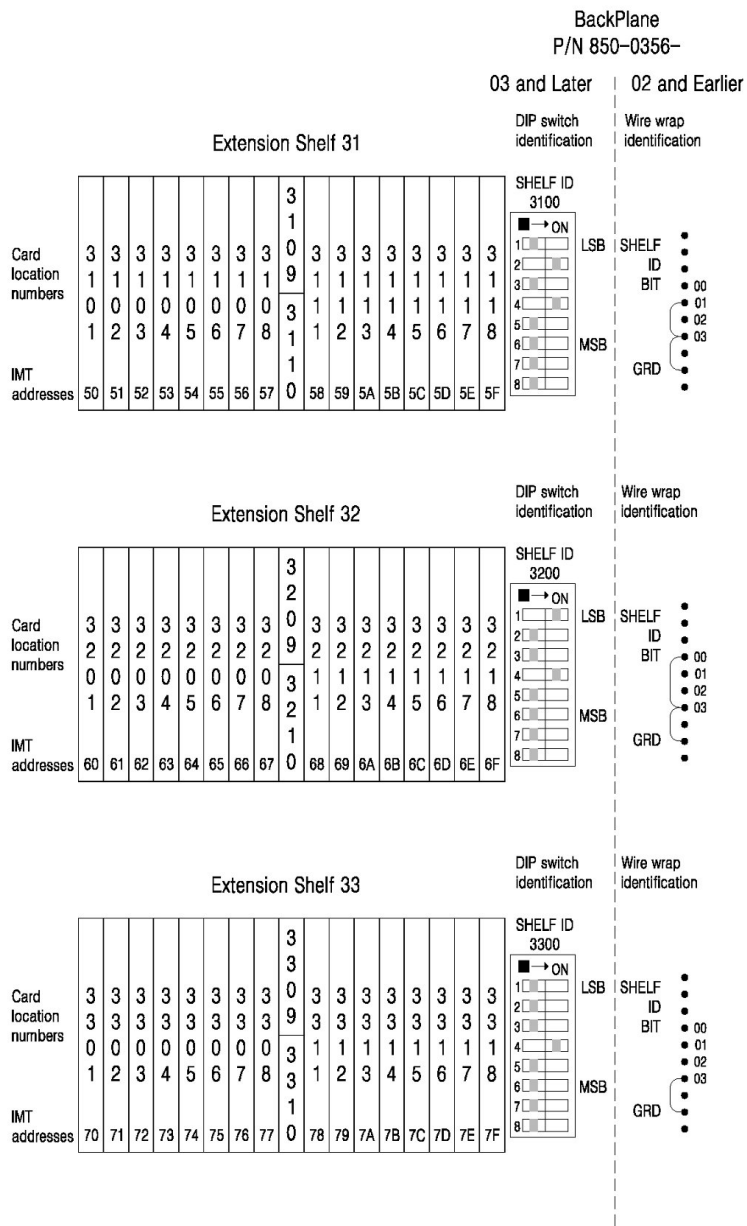
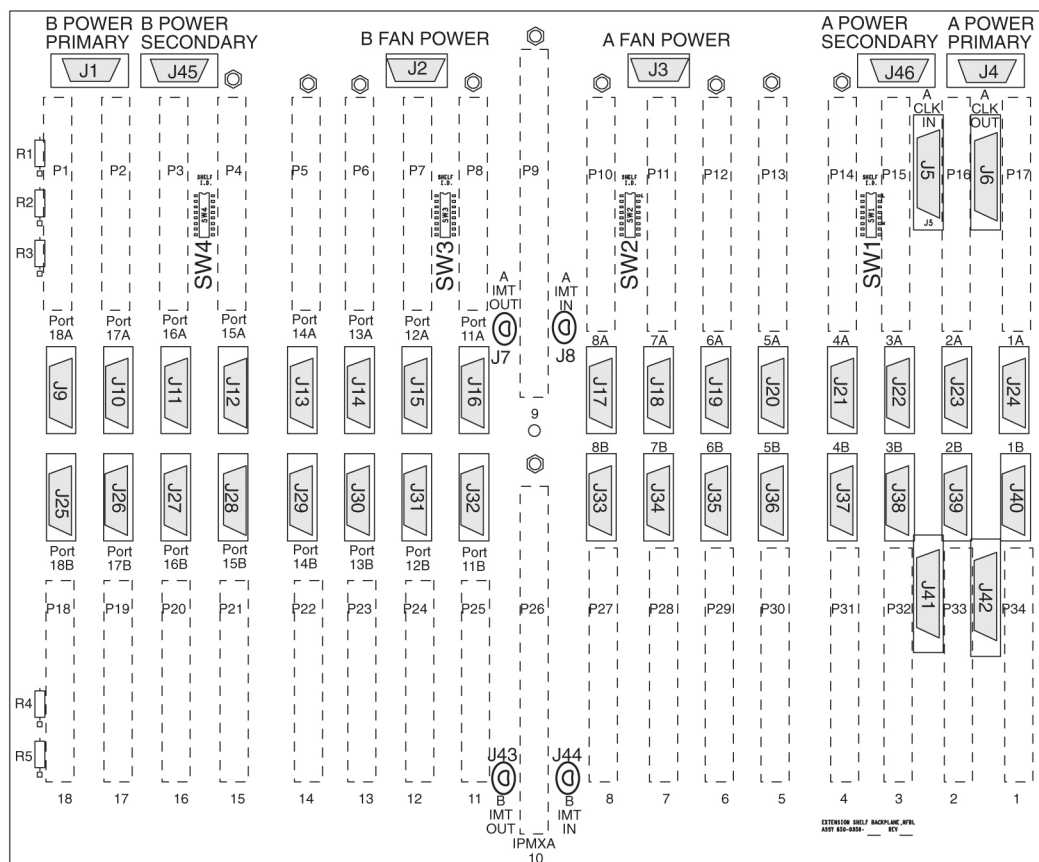


Figure 3-13 Extension Shelf Backplane ID (P/N 850-0356-04/06/7333417)



NOTE: ⦿ Conducts -48VDC for the printed circuit board (HOT)

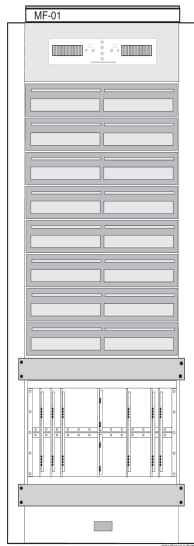
850-0356-04
7333417

3.6.2 Miscellaneous Frame

The Miscellaneous Frame (**MF**) is an optional frame that can be used to mount holdover clocks, test equipment, jack panels, spare cards, and other customer-specified accessories or equipment. The optional spare card storage shelf is equipped with card guides and doors for safe storage of all system cards.

The Miscellaneous Frame (**MF**) is equipped with a Fuse and **Alarm Panel (FAP)** that can provide fused -48VDC to equipment mounted in the frame.

An example of a miscellaneous frame is shown in [Figure 3-14](#).

Figure 3-14 Miscellaneous Frame

3.6.3 Control Frame

The Control Frame (**CF**) is the principle frame for the system. The top shelf is the control shelf, containing all the components of the Maintenance and Administration Subsystem (**MAS**), and up to ten additional **Link Interface Modules (LIMs)**, **E5 Interface Modules**, **E5-TSM Modules**, **E5-STC Modules** or **E5-MCPM-B Modules** in any combination. **E5-SM (E5-SMxG/E5-SMxG-B) Modules** (**E5-SM** modules require two card slots).

The control frame can also contain up to two extension shelves. Each extension shelf can accommodate up to 16:

- **Link Interface Modules (LIMs)**, **E5 Interface Modules**, **E5-TSM Modules**, **E5-STC Modules** or **E5-MCPM-B**

Or each extension shelf can accommodate up to eight:

- **E5-SM (E5-SMxG/E5-SMxG-B) Modules** (**E5-SM (E5-SMxG/E5-SMxG-B) Modules** (**E5-SM** modules require two card slots).

All cards can be inserted in any slot except for those locations dedicated to the **HIPR2** and **MASP** cards. In **EAGLE** systems and **IP⁷** 4.0 and earlier systems, **E5-SM (E5-SMxG/E5-SMxG-B) modules** must be placed into odd-numbered slots, and due to their width the adjoining even-numbered slot will be taken as well.

3.6.4 Control Shelf

The control shelf is divided into two parts. One part is used by the **Maintenance and Administration Subsystem (MAS)** and contains the following hardware:

- Two **E5-based Maintenance and Administration Subsystem Processors (E5-MASP)** cards.
- One **E5-based Maintenance Disk and Alarm (E5-MDAL)** card

Two HIPR2 cards provide Inter-processor Message Transport (**IMT**) bus continuity for all cards connected to the IMT bus.

 **Note:**

HIPR2 cards are installed at the factory or by Technical Support and are not installed by customers.

The remainder of the control shelf can be occupied by up to ten of the following cards, in any combination and in any location not dedicated to an **MASP** pair or **HIPR2** card:

- Link Interface Module (**LIM**)
- E5 Interface Modules
- E5-TSM Modules
- E5-STC Modules
- E5-IPSM Modules
- E5-MCPM-B Modules

E5-SM (E5-SMxG/E5-SMxG-B) cards must be inserted into odd numbered slots in EAGLE systems.

 **Caution:**

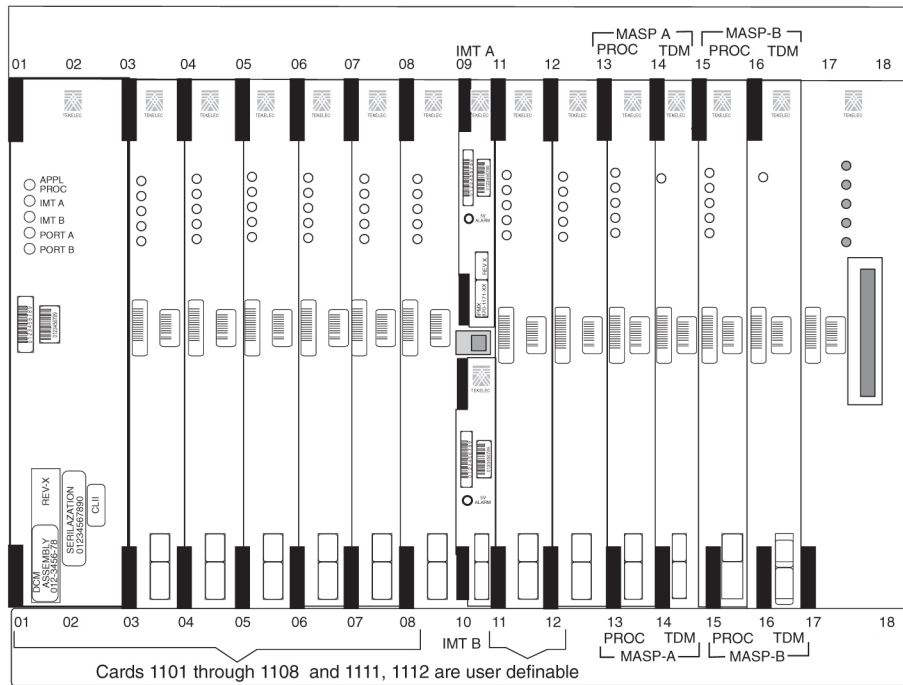
After the frame has been shipped or moved, prior to applying power, remove all cards. Reset all cards carefully to avoid possible faulty connections. All cards are hot swappable.

The control shelf, shown in [Figure 3-15](#), consists of top and bottom assemblies with die-formed channel slots to accept the top and bottom edges of the cards. The assemblies are anchored to the sheet steel side panels which are equipped with integral flanges for attaching the shelf to a 23-inch rack. The shelf backplane consists of an epoxy-glass printed circuit board and associated connectors. The section [Control Shelf Backplanes](#) describes the control shelf backplane.

The control frame can also contain up to two extension shelves. Each extension shelf can accommodate up to 16 Link Interface Modules (**LIMs**) or E5 Interface Modules, E5-TSM Modules, E5-STC Modules or E5-MCPM-B Modules in any combination; except for those locations dedicated to the HIPR2 and **MAS** cards. All cards can be inserted in any card location.

E5-SM (E5-SMxG/E5-SMxG-B) cards are only configured in available odd numbered slots, and require two card slots.

Figure 3-15 Control Shelf Front with Card



3.6.5 Control Shelf Backplanes

This section describes the control shelf backplanes (P/N 850-0330-03/04/06/07 and 7333412), all can be used in EAGLE systems.

Note:

Control Shelf Backplane can be used with the HIPR2 in the EAGLE system with minor modifications and the addition of adapter cable (P/N 830-1185-01). See "Hardware Baseline Table" in *Release Notes* for compatible control shelf and extension backplane part numbers. The adapter cable is not necessary for customers not wanting high speed links.

Note:

The clocking and fan control signals used to support extension frames 6 and 7 are eliminated in the 850-0330-06 version and later of the **Control Shelf** Backplane because those frames are no longer supported in the EAGLE system.

The control shelf backplane provides connectors for the system circuit cards. These connectors are four column High Density Interconnect (**HDI**) male headers with shrouds of varying pin quantities, depending on card position.

- **LIM**, **E5-ENET**, and **E5-E1T1** cards can be used in slots 1, 2, 3, 4, 5, 6, 7, 8, 11, and 12.
- **HIPR2** cards are connected in slots 9 and 10.

 **Note:**

HIPR2 cards are installed at the factory or by Technical Support and are not installed by customers.

- The **HCMIM** and **E5-SM4G** cards, used in **EAGLE** systems, are mounted only in available odd numbered slots 1, 3, 5, 7, and 11.

 **Note:**

The **E5-SM4G** may also be mounted in available odd numbered slots 1, 3, 5, 7, 11, 13, 15, and 17 in the extension shelf.

 **Note:**

Throughout this document, the term **E5-SM4G** refers to both the **E5-SM4G** (P/N 870-2860-xx) and the **E5-SM8G-B** (P/N 870-2990-xx) cards unless specifically noted otherwise.

The control shelf backplane provides –48VDC power and ground to all card positions. The power is distributed into two parts, A and B. Power is brought to the shelf from the Fuse and **Alarm Panel (FAP)** using two cables. The connectors on the control shelf backplane are **DB-26** high density connectors. The power is distributed over two separate pins per power connection to handle the current load. The current capacity of the connector pins is 1.5A per pin for a total of 3A per pair. *Installation Guide* tables list the shelf location, card type, and fuse location in the fuse and alarm panel for the control shelf backplane.

 **Note:**

Cards that are provisioned in redundant pairs must be on separate power buses. This provides backup processing capabilities with the loss of either the A or B power buses. All **MASP** and **HIPR2** cards are provisioned in pairs and are redundantly powered from separate power buses.

The control shelf power connectors are designated as:

- J1 (B Power) and J4 (A Power) on control shelf backplane (P/N 850-0330-04)
- J1 (B Power Primary) and J2 (B Power secondary) J11 (A Power primary) and J10 (A Power Secondary) on control shelf backplane (P/N 850-0330-06/07 and 7333412).

 **Caution:**

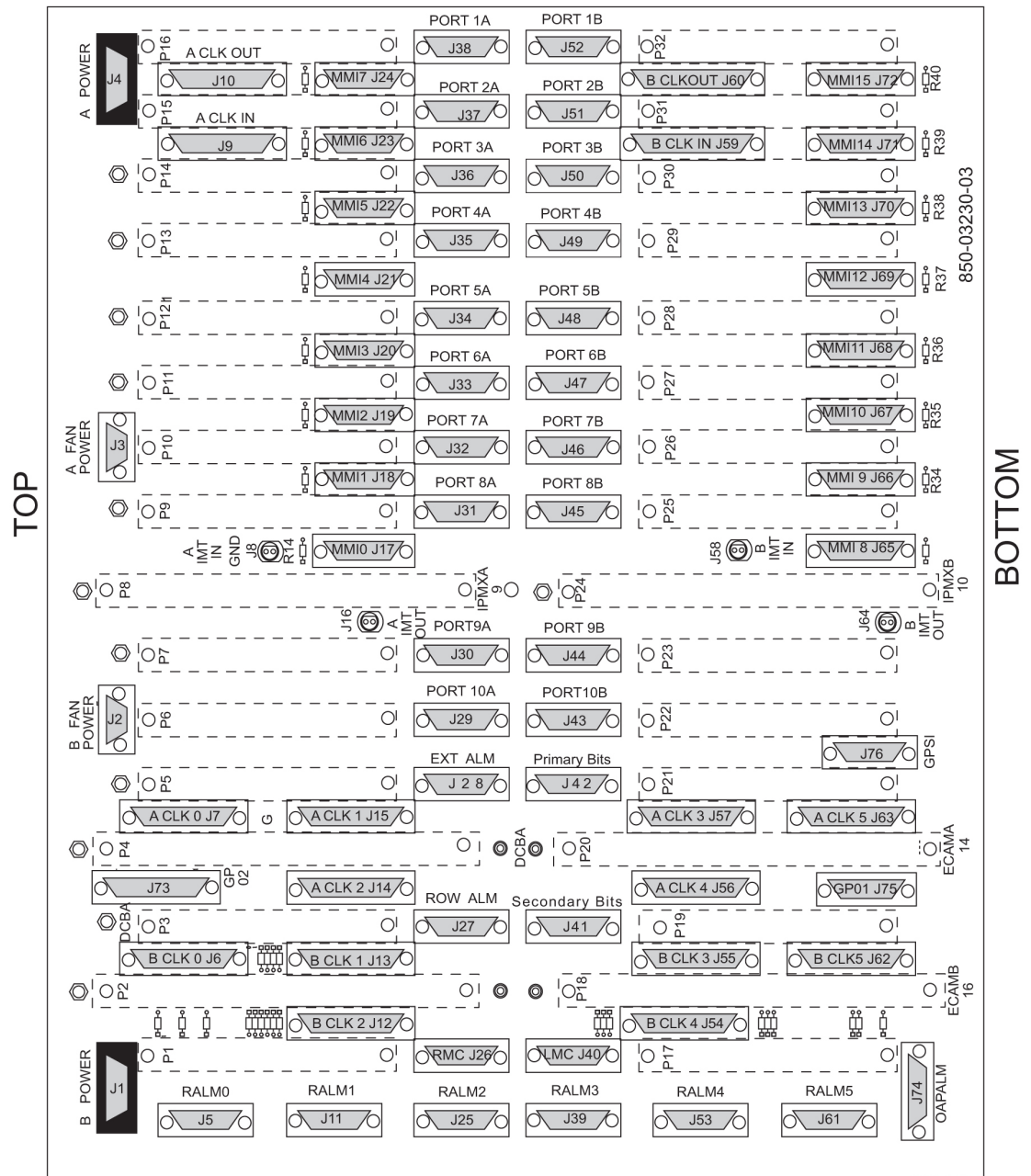
Disconnect both Input and supply sources when repairs require removal of power. This will take the system down.

 **Note:**

Control Shelf Backplane (P/N 850-0330-03/04) can be used with the HIPR2 in the EAGLE system with minor modifications and the addition of adapter cable (P/N 830-1185-01).

The following figures depict the rear connector view of control shelf backplane (P/N 850-0330-03/04/06/07 or 7333412).

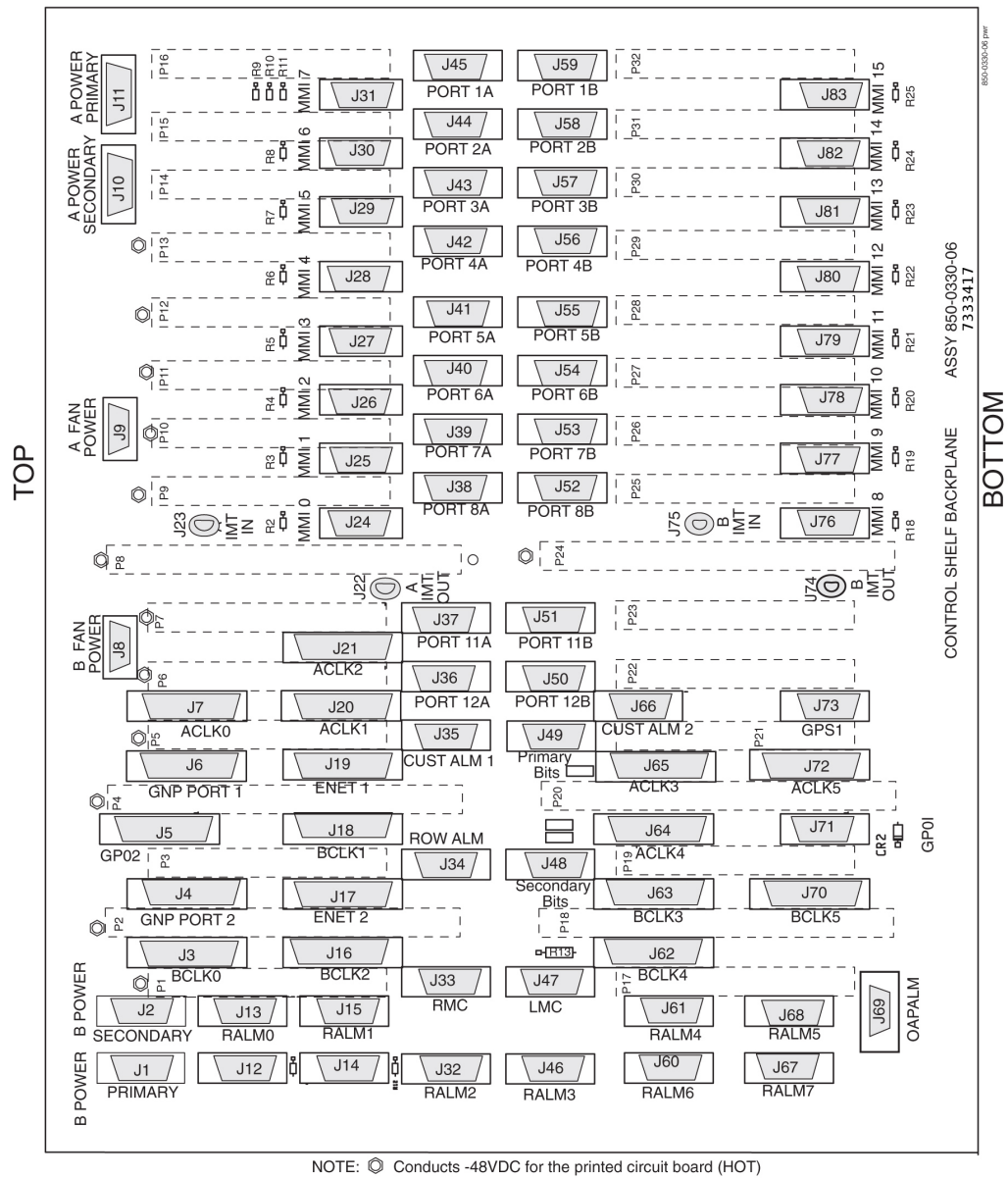
Figure 3-16 Control Shelf Backplane (P/N 850-0330-03/04)



NOTE: Ⓞ Conducts -48VDC for the printed circuit board

850-0330-03/114

Figure 3-17 Control Shelf Backplane (P/N 850-0330-06/07 or 7333412)

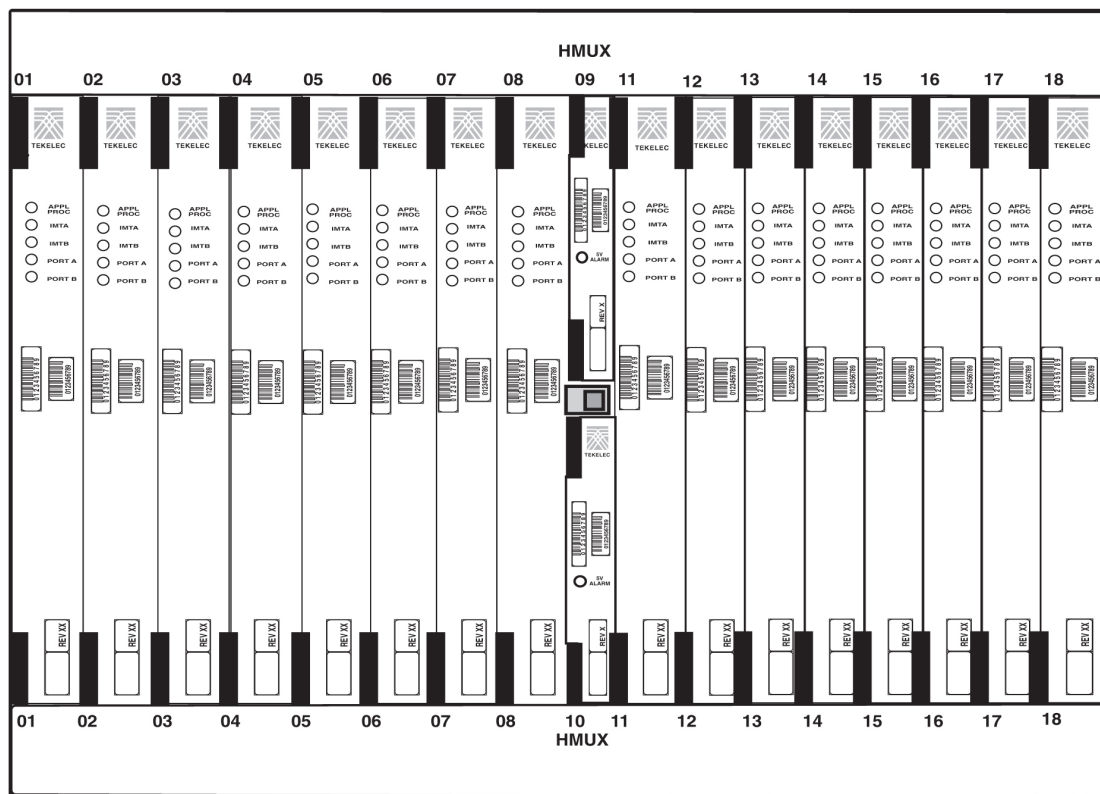


3.6.6 Extension Shelf

The extension shelf provides the mounting space for up to 16 **Link** Interface Modules (**LIMs**), E5 Interface Modules, E5-TSM Modules, E5-STC Modules or E5-MCPM-B Modules and E5-SM (E5-SMxG/E5-SMxG-B) cards (mounted in odd numbered slots, requiring two slots).

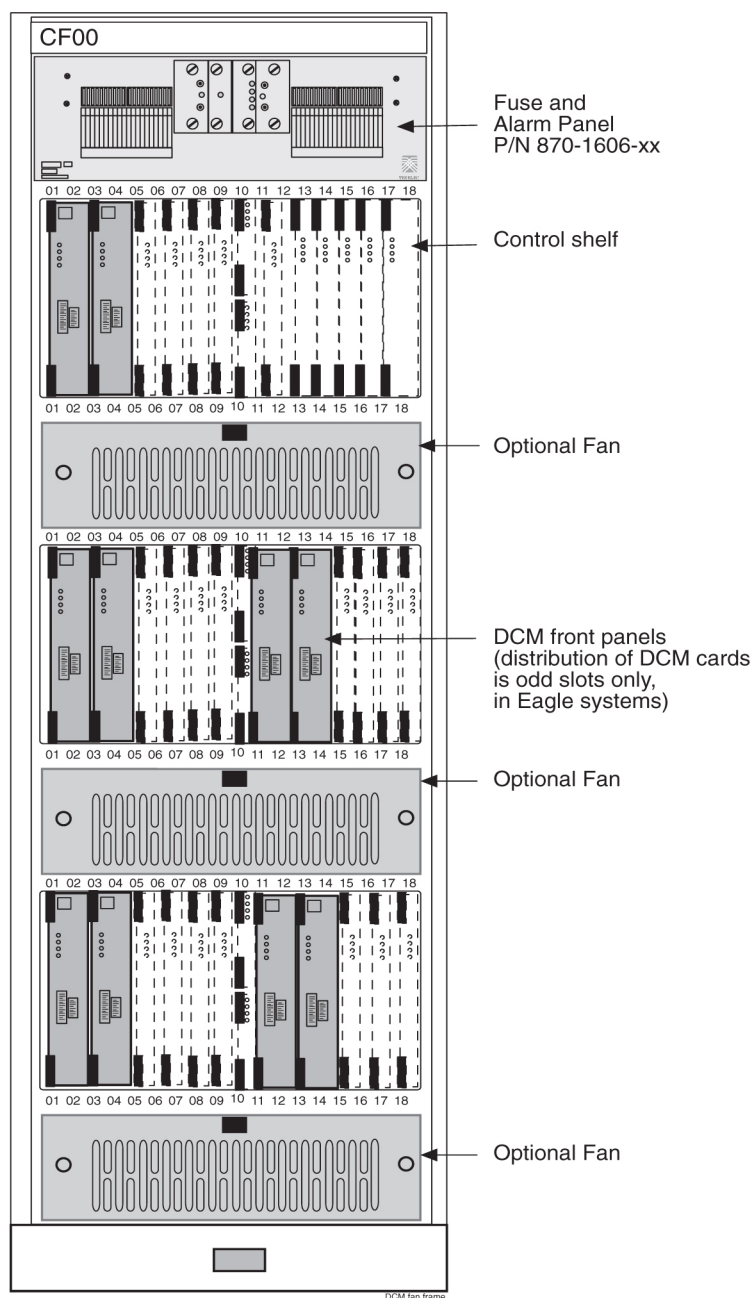
Note:
HIPR2 and **HIPR** cards are installed at the factory or by Technical Support and are not installed by customers.

Figure 3-18 Extension Shelf with LIMs



contshelf x 22

Figure 3-19 Shelves with DCM and LIM Cards in Control Frame



The extension shelf consists of die-formed top and bottom assemblies with die-formed channel slots to accept the top and bottom edges of the cards. The assemblies are anchored to the side panels which are equipped with integral flanges for attaching the shelf to a 23-inch rack in a 26-inch frame. The shelf backplane consists of an epoxy-glass printed circuit board and associated connectors.

The extension shelf backplane is shown in the figure for the [Extension Shelf Backplanes](#). Each card is equipped with a power converter that takes the -48VDC input from the backplane and converts it to +5VDC and/or +3VDC.

3.6.7 Extension Shelf Backplanes

This section discusses the technical aspects of the extension shelf backplanes (P/N 850-0356-03/04/06 and 7333417) and the extension shelf backplanes (P/N 850-0356-01/02) used in the system.

The extension shelf backplane provides connectors for 18 circuit cards. These connectors are four column High Density Interconnect (**HDI**) male headers with shrouds of varying pin quantities depending on card position. The reverse or component side of the backplane contains **DB** style connectors for interfacing to the rest of the system. The extension shelf backplane provides shielding on all of the interface connectors to prevent Radio Frequency Interference (**RFI**).

Power Distribution

Caution:

This is a redundant system to allow service during normal maintenance. When repairs require a total power disconnect both input supply sources must be disconnected. This will cause service interruption and take down the system.

The extension shelf backplane provides –48VDC power and return to all card positions. The power is divided into parts A and B and brought to the shelf from the Fuse and **Alarm Panel (FAP)** using two cables (P/N 830-0315-xx). The power connectors on the extension shelf backplane are **DB-26** high density connectors with two pins per power connection to handle the current load. The current capacity of the connector pins is 1.5A per pin for a total of 3A per pair. The extension shelf primary power connectors are designated as J4 and J11, and the secondary power connection are on backplane (P/N 850-0356-03/04/06 and 7333417) are J45 and J46 secondary.

In *Installation Guide*, tables list the shelf location, card type, and fuse location in the fuse and alarm panel for the extension shelf backplane.

Note:

Cards that are provisioned in redundant pairs must be on separate power buses. This provides backup processing capabilities with the loss of either A or B buses.

Interface Connectors

Behind each slot on the extension shelf backplane are two **DB-26** connectors. These provide connection to the outside world in the form of **TCP/IP** networks, **SS7** links, or X.25 networks. The interface connectors are designated as J9 through J40.

System Clock Connectors

Each extension shelf receives and passes along Clock signals A (J5 and J6) and B (J41 and J42).

3.6.8 Locating the EAGLE System Number

The Oracle Communications EAGLE System number is printed on a label affixed to the outside of an EAGLE frame. The number begins with either an NT or TA number.

The following figures provide examples of the label placement:

Figure 3-20 EAGLE System Number Frame View

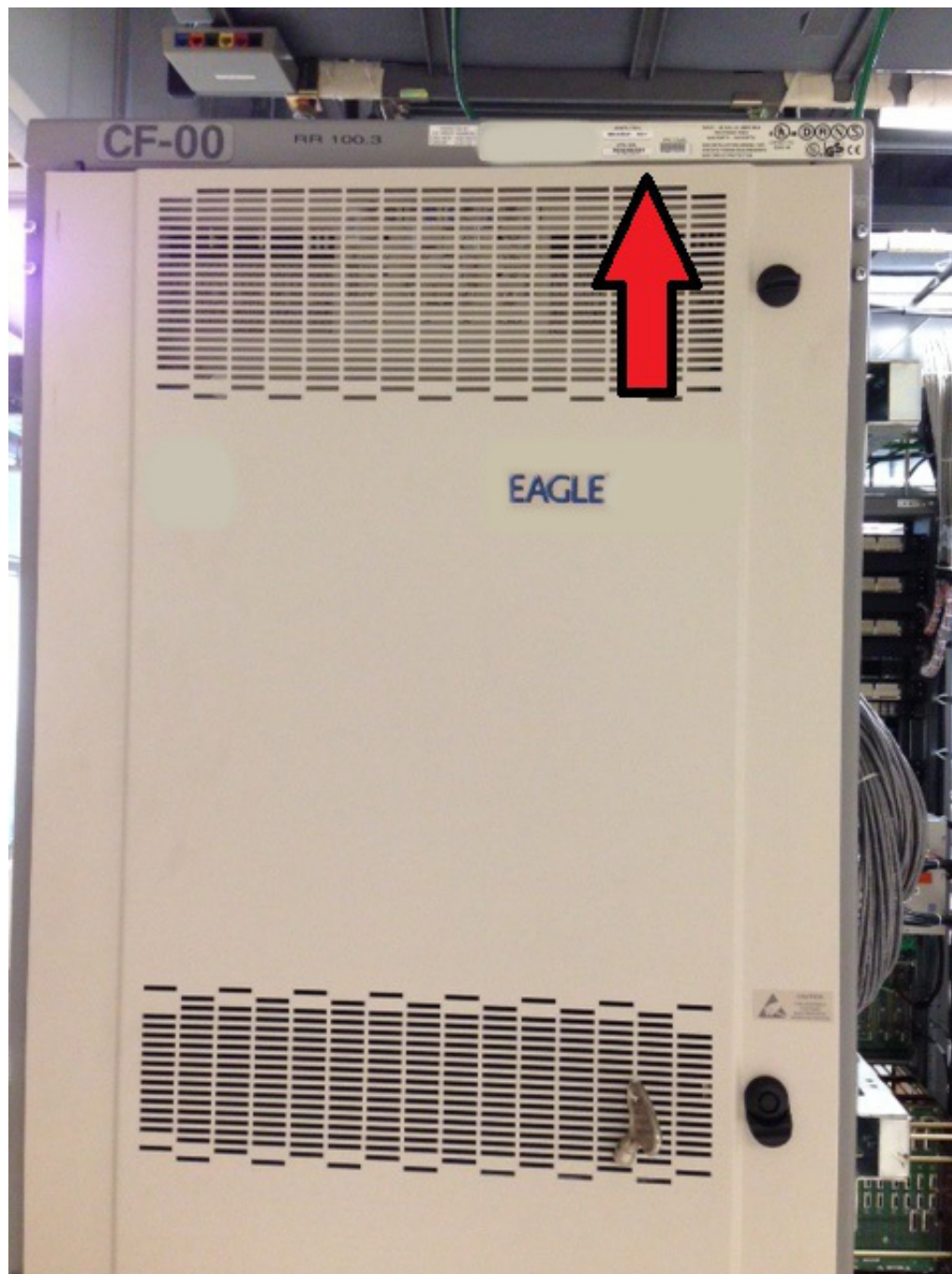
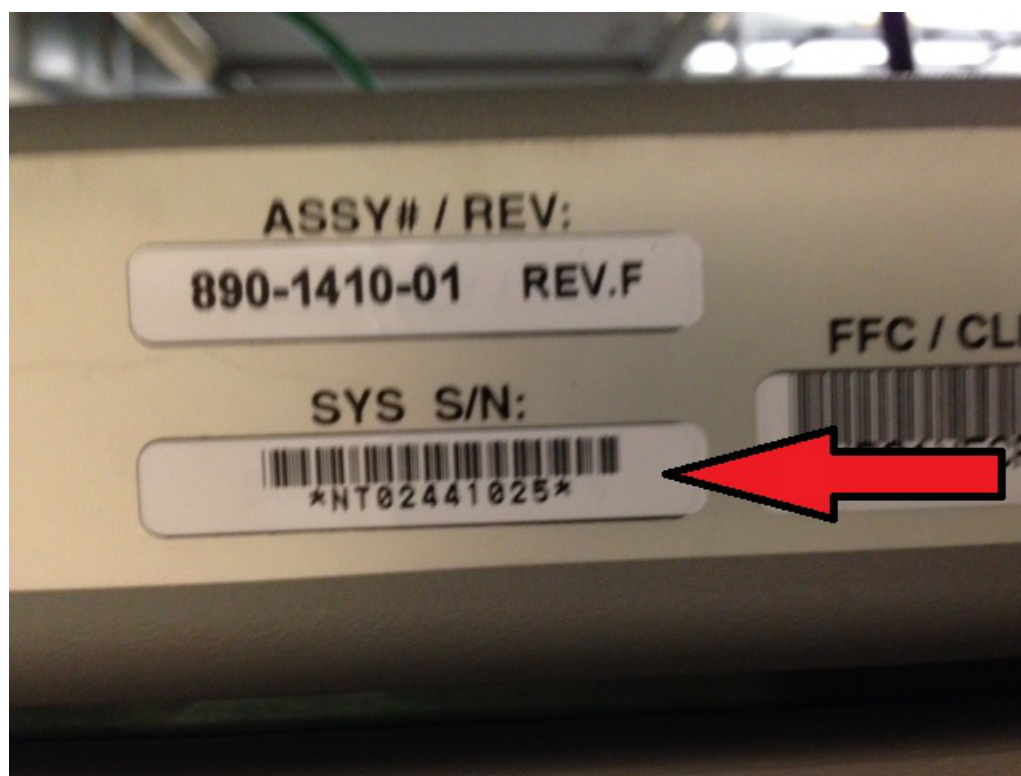


Figure 3-22 EAGLE System Number Close View



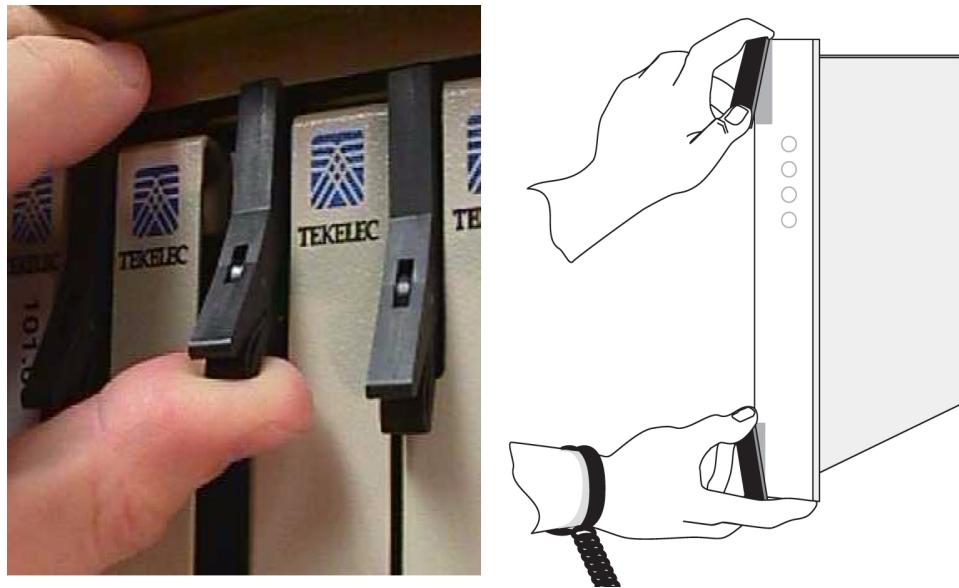
3.7 Modules

The EAGLE frames are configured with card modules (also known as “cards”) that provide specific functions and services. Cards are connected to the shelf backplane through connectors located on the rear of the card. See *Installation Guide, Cable and Adapter Use* for additional information about individual card adapters and cabling requirements.

Cam-out/lock-in levers, mounted on the front edge of the card, assist in insertion and removal of the card. Part numbers, LEDs, and tables are also located on the front of the cards.

Note:

To remove a card use both hands to toggle the levers out from the face of the card. To insert a card, align the card in the slot, push slowly in until the connectors engage and press both levers in until they lock the card in place. To ensure proper seating, the toggle levers must be held in the release position until the locking tabs can engage the upper and lower flange on the shelf. Once the locking tabs on the levers engage the shelf plane, the levers are pressed in toward the card faceplate, and must be flush with the faceplate when the card is completely seated.

Figure 3-23 Cam-Out/Lock-In Levers on Cards

The modules used in the system are:

- [High Speed IMT Packet Router 2 \(HIPR2\)](#)

 **Note:**

The HIPR2 card is installed by the factory for initial frame shipments or subsequent extension frame shipments. The HIPR2 card is a customer replaceable unit. If the IMT interface cables need to be replaced to support the higher 2.5 Gbps rate, contact Oracle Service to arrange for IMT cable replacement.

- [E5 Maintenance and Administration Subsystem Processor \(E5-MASP\) Card](#)
- [E5-MDAL](#)
- [Link Interface Modules \(LIM\)](#)
- [E5-ATM-B Module](#)
- [E5-E1T1-B Module](#)
- [E5-ENET-B Module](#)
- [SLIC](#)
- [E5-MCPM-B Module](#)
- [E5-SM8G-B Module](#)
- [Air Management Card](#)
- [Fan Tray](#)

**Note:**

See "Hardware Baseline Table" in *Release Notes* for compatible card part numbers.

The following table summarizes the environmental specifications common to all EAGLE cards. Other technical specifications are listed with the individual card types.

Table 3-2 Card Specifications

Operating Environment	
Operating temperature	+ 41° F to + 104° F + 5° C to + 40° C
Relative Humidity	5% to 85%
Altitude	–200 ft. to +13,000 ft. (–61 m to +3962 m)

**Note:**

For ambient temperatures above 95° Fahrenheit, relative humidity must be less than 80 percent. At the short-term emergency condition of 120° Fahrenheit, the relative humidity must be below 20 percent.

**Note:**

HIPR2 is fully NEBS compliant. However, if ambient temperatures above 40° C are likely, EAGLE Fan Trays are recommended to ensure proper airflow to the upper HIPR2 cards in those shelves.

3.7.1 High Speed IMT Packet Router 2

The High-Speed IMT Packet Router 2 provides enhanced capabilities by changes in bus architecture and increased packet processing (routing) capabilities, HIPR2 interfaces and operates with the high speed Fibre channel ring to provide the EAGLE system with increased inter-shelf bus (FC) bandwidth operating at 2.5 Gbps.

Traffic between EAGLE cards on the same shelf will be switched directly to the destination slot and will not transit any other cards in the shelf. Traffic between shelves is not required to pass onto an intra-shelf IMT channel if it is not necessary.

All shelves within an EAGLE node must be equipped with HIPR2.

HIPR2 feature overview:

- Requires control shelf and extension shelf backplanes that support HIPR2 and later IMT components.
- Two (2) HIPR2 cards are required in a shelf with up to a total of 32 for the system.
- Switched architecture.

- The ability to BIP the HIPR2 card reporting within the HIPR2 card.
- One IMT bit rate possible:
 - 2.5 Gbps requires that all shelves within EAGLE be equipped with HIPR2 and IMT interface cables upgraded to support new high-speed Fibre-channel.
- Re-programmable and ungradable in the field via software release.
- Fault Tolerance - Errors occurring on a switched slot do not bring down the inter-shelf IMT ring nor affect any other switched slot on its shelf.
- Does not require a fan tray assembly for thermal management.

 **Note:**

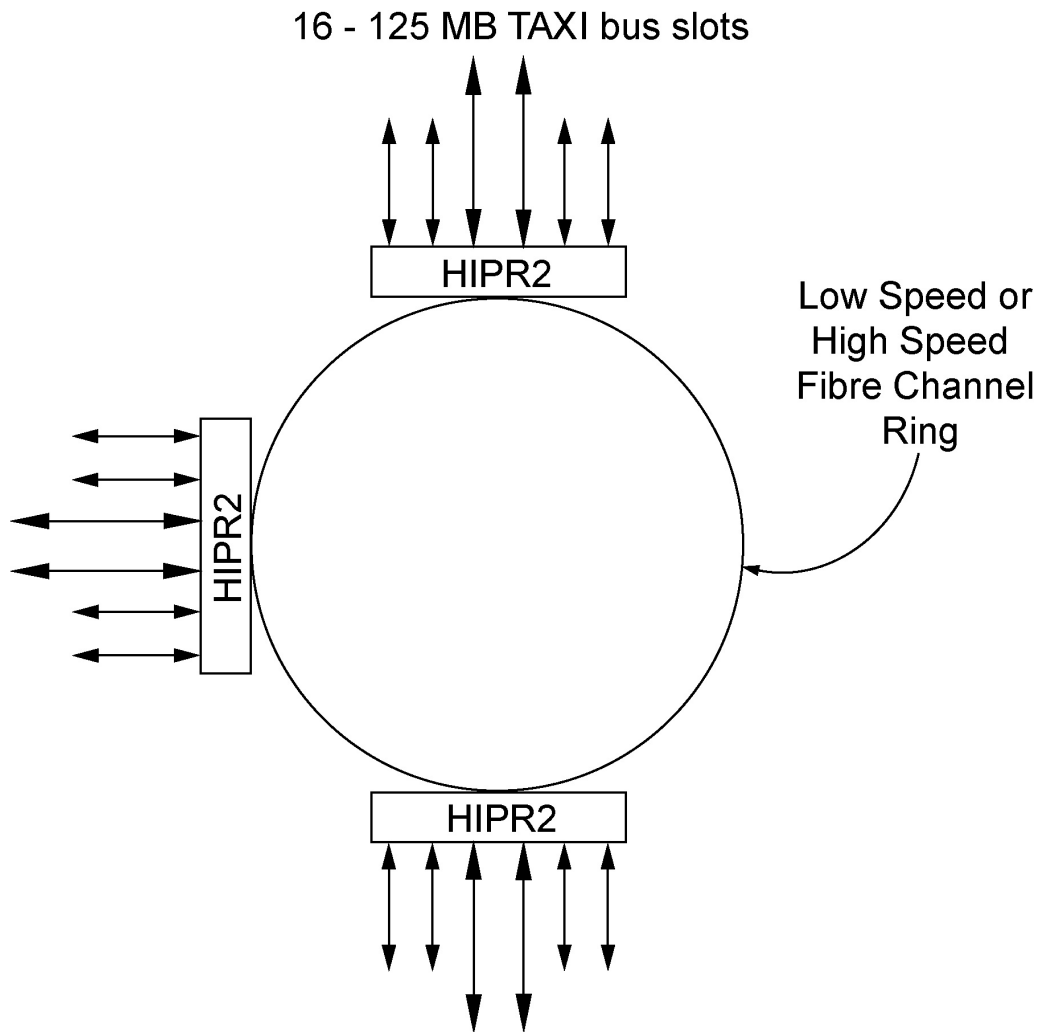
HIPR2 is fully NEBS compliant. However, if ambient temperatures above 40° C are likely, EAGLE Fan Trays are recommended to ensure proper airflow to the upper HIPR2 cards in those shelves. See "Hardware Baseline Table" in *Release Notes* for compatible card and fan tray part numbers.

Switched Architecture

The inter-shelf ring connects the shelves together and HIPR2 acts as a gateway between the intra-shelf IMT bus, running at 125 Mbps, and the inter-shelf Fibre channel ring operating at a high rate (2.5 Gbps). HIPR2 retains the high speed 1Gb Fibre Channel ring as a way to ensure interoperability with other HIPR2 equipped shelves. After HIPR2 recognizes that data from the high speed ring is destined for its shelf address, the data is immediately switched to the correct card within the shelf rather than traversing the intra-shelf IMT bus, running at 125 Mbps. The HIPR2 allows more bandwidth than in the HMUX-based ring architecture.

As shown in [Figure 3-24](#), in a same topology where all HIPR2 is used in an EAGLE the Fibre channel ring runs at either the low or high speed.

Figure 3-24 HIPR2 Switch Same Topology



The switched interface to each card is at 125 Mbps, the same speed as the intra-shelf IMT bus. This switched architecture has an inherent reliability advantage of point to point connections within the shelf. A ring can be broken, potentially causing all cards on the ring to be affected. However, a switched architecture automatically isolates a problem to a specific data path which immediately determines which card is experiencing problems. Trouble shooting and debugging are greatly enhanced. For example, corrupted packets can be isolated quickly because there is only a single path per card rather the multiple paths possible in a ring.

All routing decisions are controlled by the network processor on the HIPR2 card. A core processor performs the switching function. This allows future upgrades without changes to the hardware.

Upgrade Considerations

The HIPR2 card is compatible with the obsoleted HIPR card slot and can be fielded with any version of either the control or extension backplanes compatible with the obsoleted HMUX. One bus is taken out of service and upgraded to HIPR2s and then brought back online. This upgrade cycle is repeated on the second bus to get both

busses upgraded. HIPR2 interfaces and operates with all the same cards that HIPR had been used with.

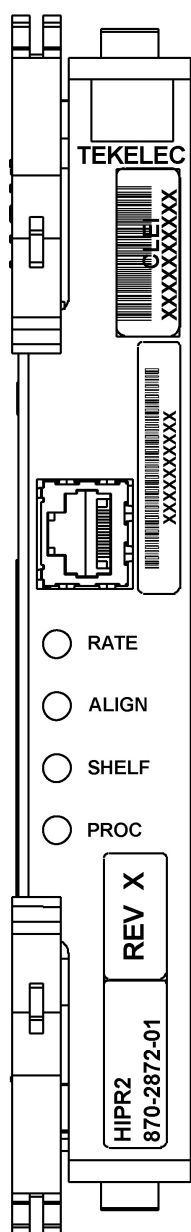
Two HIPR2 modules are required in shelves equipped with high-performance LIMs, such as the High-Capacity MIM, and for interfacing to application servers (such as the Tekelec 1x00 series of Application Servers) through IMT Bridge and IMT PCI modules. HIPR2 requires all other shelves be equipped with either all HIPR2 cards. High-rate (2.5 Gbps) operation requires that all shelves within EAGLE be equipped with HIPR2, IMT interface cables upgraded to support new high-speed Fibre-channel, and a system FAK installed to allow the high-rate channel.

LEDs

On the front edge of the HIPR2 card, there are four Light Emitting Diodes (LED) that provide status. Each LED has a red, green, or amber illumination state. The RATE LED indicates the IMT bus condition. The ALIGN LED indicates code initialization and programming status. The SHELF LED indicates HIPR2 running and shelf ID address condition. The PROC LED indicates state of the HIPR2 processor.

[Figure 3-25](#) summarizes the use of the front-panel LEDs.

Figure 3-25 HIPR2 LEDs



HIPR2 State	LED			
	RATE	ALIGN	SHELF	PROC
No power	Off	Off	Off	Off
Power on (cold start)	Off	Off	Off	RED
Reset (warm start)	Off	Off	AMBER	RED
Programming (cold start)	Off	Off	Off	AMBER
Programming (warm start)	Off	Off	AMBER	AMBER
Programming Complete	---	AMBER	AMBER	GREEN
Shelf Address Capture:				
Timer Started	---	AMBER	AMBER	GREEN
Successful	---	GREEN	AMBER	GREEN
Unsuccessful	---	RED	AMBER	GREEN
Code Running	---	GREEN	Note 2	GREEN
IMT is operational at:				
low-rate (1 Gbps)	GREEN			
high-rate (2.5 Gbps)	GREEN			
	Blinking			
IMT is rate negotiating or in proving period	AMBER			
IMT is not operational	RED			

Notes:

1. ALIGN and SHELF LEDs are not accessible to software until the FPGA has been programmed. So for the same point in the HIPR bootstrap sequence, the state of these two LEDs can be different depending on whether a warm or cold start is in progress.
2. State depends on the address received from OAM and written to Assigned Shelf Address Register and compared to the value previously read from the Assigned Shelf Address Register.
 - RED - Does Not Match
 - GREEN - Matches

Cabling

As of Release 46.4, the EAGLE will only operate at the HIPR2 card high rate (2.5 Gbps). High-speed Fibre-channel cables (P/N 830-1344-XX, length dependent upon site requirements) must replace existing cables (P/N 830-1141-xx/830-0221-xx) in order for HIPR2 high-rate operation and Release 46.4 compatibility.

Technical Specifications

Table 3-3 HIPR2 Technical Specifications

Physical Characteristics	
Height	7.7 in. (18.3 cm)
Width	1.8 in. (2 cm)
Depth	12.8 in. (32.5 cm)

3.7.2 E5 Maintenance and Administration Subsystem Processor (E5-MASP) Card

The **Maintenance and Administration Subsystem Processor (E5-MASP)** cards contain all of the necessary logic to perform both application and communication processing of the data streams provided by the EAGLE. The cards provide connections to the IMT bus through the backplane and all of the necessary logic to perform both application and communication processing of the data streams through the EAGLE. The E5-MASP cards contains one fixed drive and USB connectors for two removable drives. The USB storage media in the flush-mounted USB port of the MASP card can be used for backups.

3.7.2.1 Requirements and Dependencies

The E5-MASP has the following requirements and dependencies:

- Requires an E5-MDAL in the control shelf.
- Requires HIPR2 to be active on both IMT buses in the control shelf.

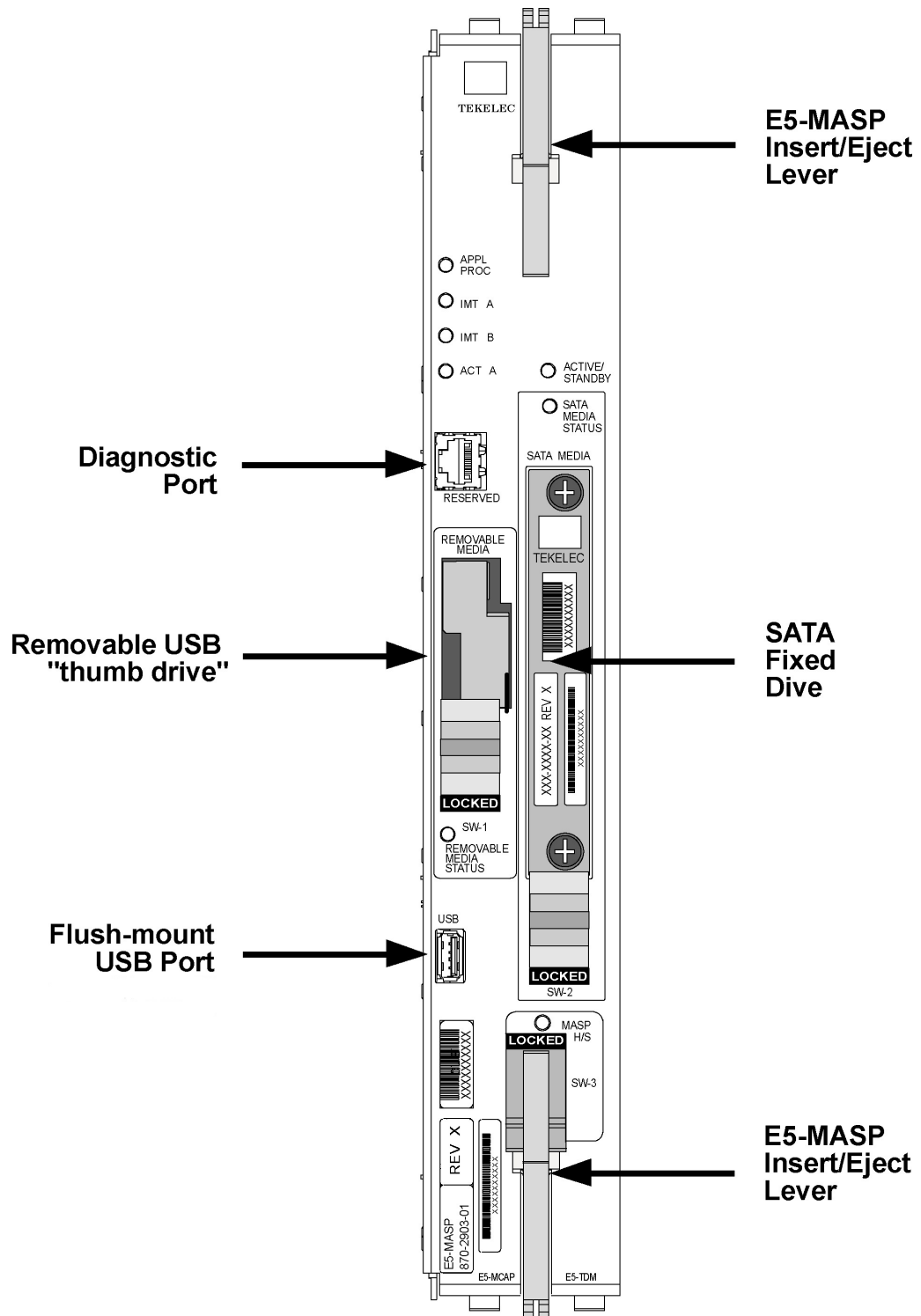
 **Note:**

HIPR2 requires all other shelves to be equipped with all HIPR2 cards.

- The E5-MASP operates in backplanes 850-0330-03, 850-0330-04, 050-0330-06, 850-0330-07, or 7333412. See "Hardware Baseline Table" in *Release Notes* for compatible backplane part numbers.
- Does not require a fan tray assembly for thermal management.

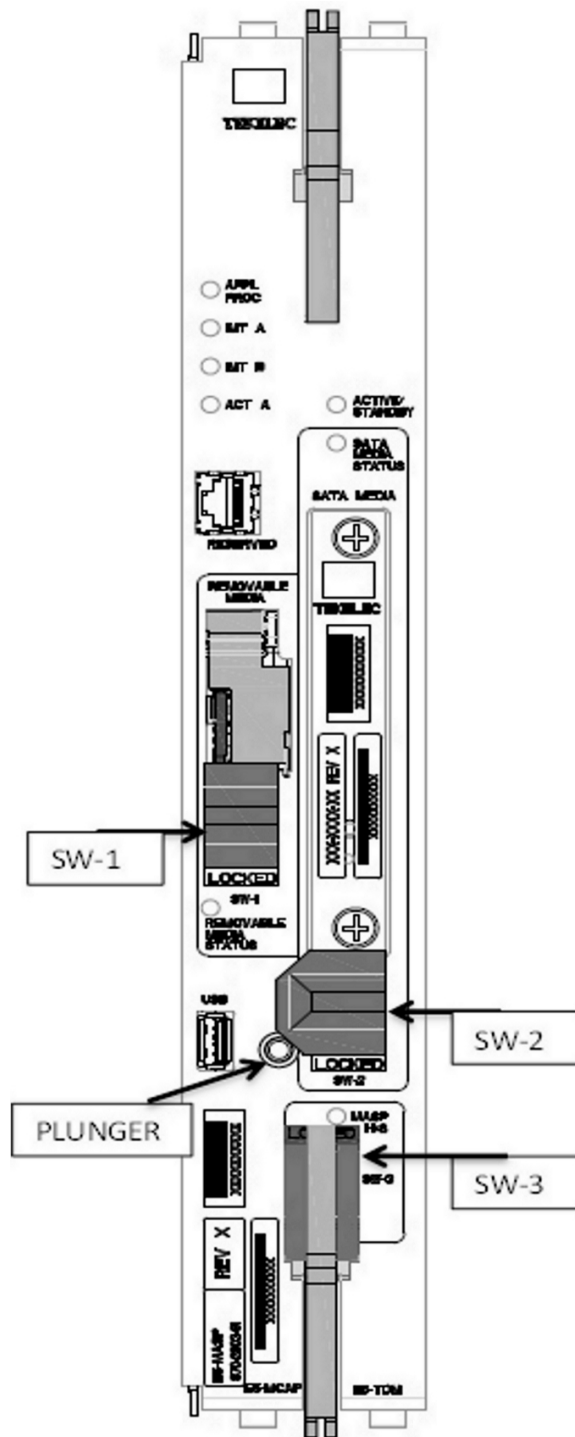
The E5-MASP card is a single dual-card assembly of the E5-MCAP card mated to an E5-TDM card. The E5-MASP is a dual-slot card that occupies slots 1113/1114 and 1115/1116 in an EAGLE Control Shelf. The E5-MASP card must be used with the E5-MDAL card. See [Figure 3-26](#).

Figure 3-26 E5-MASP Card -01



The -02 E5-MASP card has different hardware than the E5-MASP -01 card.

Figure 3-27 E5-MASP Card -02



SW-1: Used to activate or de-activate Removable USB "thumb drive." The locked position activates the switch.

SW-2: Used to activate or de-activate hard drive. The locked position activated hard drive. The plunger must be depressed before the switch can be unlocked, which de-activates hard drive.

SW-3: Used to activate or de-activate the card and lock or unlock the lower E5-MASP Insert/Eject lever. The locked position activates the card and locks the lever.

3.7.2.2 E5-MCAP

The E5-MCAP card is equipped with 4 GB of physical application processor memory. The primary data interface to the E5-MCAP is RS-232 interfaces (i.e.: terminals) through the E5-TDM.

The E5-MCAP card contains one **latched USB port** for use with removable flash media (“thumb drive”), and one flush-mounted USB port for use with a plug-in flash drive. The removable media drive is used to install and back up customer data. The flush-mounted USB port is used for upgrade and could be used for disaster recovery. The removable flash media is used as a replacement for the legacy Magneto-Optic (MO) Drive. The E5-MCAP card is a replacement for the obsoleted legacy GPSPM-II card used for the **MCAP** function.

3.7.2.3 E5-TDM

The **E5-TDM** card contains four major subsystems: the Terminal Processor Subsystem, the System Clock/Control Subsystem, the SATA Subsystem, and a Power Subsystem. These subsystems provide the EAGLE 5 with 16 user-accessible terminals, distributes Composite Clocks and High Speed Source clocks throughout the EAGLE 5, distributes Shelf ID to the EAGLE 5, and disk storage for an E5-MCAP card. The E5-TDM card provides an interface to the E5-MDAL card for system alarms.

The E5-TDM card contains one fixed solid-state SATA drive that is removable and used to store primary and backup system databases, measurements, and Generic Program Loads (GPLs).

3.7.2.4 E5-TDM Functions

The E5-TDM provides the following functions for the EAGLE.

- [System Clock Interface](#)
- [Time Slot Counter \(TSC\) Synchronization](#)
- [Source/Follower Control](#)
- [Alarm Interface](#)
- [Shelf ID UART Interface](#)

System Clock Interface

The primary purpose of the Clock LCA is to derive and/or distribute the system clocks for the EAGLE. There are two system clock outputs: the TEKCC clock and high-speed E1/T1 clock. The external clock sources are a BITS or composite clock input, a high-speed E1/T1 clock input, and a derivation of an E1/T1 clock generated on the E5-TDM. The terminal processor on the E5-TDM selects which source clock is used to derive and/or distribute the system clocks. Each external source has a primary and secondary that is received, verified and validated. The E5-TDM automatically switches the clock source between the primary and the secondary if the current source fails validation.

The BITS or composite clock is used to generate the TEKCC clock output. The high-speed clock input is distributed via the high-speed clock output. The terminal

processor can force a switch of the system clock source between the primary and secondary clocks, or select the local oscillator as the system clock source. The local oscillator only generates a TEKCC output. It cannot generate a high-speed E1/T1 clock output. Therefore, if the terminal processor selects the local clock and there is no high-speed clock input present, there will be no high-speed clock output.

The terminal processor can also select to derive the system clocks internally on the E5-TDM. This is known as the Global Timing Interface. A customer needs only to have an E1/T1 data stream as input to the E5-TDM. The E5-TDM will generate and distribute the TEKCC and high-speed E1/T1 clocks to the system.

Time Slot Counter (TSC) Synchronization

The Time Slot Counter (TSC) Synchronization feature is an advanced function enabled in all LIMs. The TSC Synchronization feature does not require any physical hardware changes to any of the boards in the EAGLE. TSC Synchronization is an optional feature for the EAGLE that will allow all cards in the system, which contain a Time Slot Counter, to synchronize with one another. The ability to have synchronized timing between cards is used in applications such as system wide message time stamping.

The TEKCC output includes Time Slot Synchronization information. In the EAGLE system, it is possible for the occurrence of the TSC Sync pulse to differ in time between the Active and the Standby E5-TDM. This difference is known as TSC skew. This skew must be detected and eliminated so that cards can switch between the two clocks and stay synchronized to the rest of the system. In the E5-TDM, the elimination of TSC skew is accomplished in hardware, a LIM card does not detect TSC skew. If skew occurs, hardware detects and corrects this and alerts the system that this condition has occurred.

TSC Sync affects all EAGLE cards that contain a Time Slot Counter. This includes:

- HCMIM, E5-E1T1-B, E5-ENET, E5-ATM-B

Source/Follower Control

The terminal processor can switch the status of the E5-TDM card from source to standby modes. The terminal processor can determine the state of the E5-TDM (active or standby) and can also force a switchover from active to standby.

Alarm Interface

The Alarm Interface gives the terminal processor visibility to E5-MDAL Alarms, External Alarms, and Customer Alarms. The interface is split into two parts: the terminal processor interface and the physical interface. The terminal processor interface contains registers to update E5-MDAL alarms and status registers to read E5-MDAL alarms. It also contains external and customer alarm registers.

The physical interface is made up of a bidirectional I2C interface to the E5-MDAL and direct connection to opto-isolator outputs for external and customer alarms. The physical interface provides input data to the registers which the terminal processor can read. The physical interface also provides a way for the E5-MDAL alarm update data to be sent to the E5-MDAL.

Shelf ID UART Interface

The Clock LCA implements a 9-bit UART, which is used to transmit Shelf ID information to each EAGLE shelf. The terminal processor selects which shelf to transmit the information.

3.7.2.5 Thermal Management

The E5-MASP provides thermal management and alarming provisions to protect the card from damage due to overheating. The E5-MASP contains a thermal monitor with software selectable thresholds for temperature abnormal levels. Threshold crossings generate alarms and impair card operations. These alarms require the mitigation of the temperature rise to resume normal card operations interrupted by the threshold crossings. The E5-MASP is designed to operate in the EAGLE shelf with natural convection cooling and does not require a fan tray for cooling.

Table 3-4 Thermal Alarm Conditions

Board Temperature	E5-MASP Actions
Temp Level 1 Exceeded	Major alarm raised
Temp Level 2 Exceeded	Critical alarm raised; the application software responds to the notification by either preventing database updates or failing over to the standby
Temperature abated	Application re-allows database updates; Normal operation restored
Thermtrip - shutdown temperature exceeded	CPU shuts down automatically. Card must be resealed to restore operation once temperature returns to normal operating conditions

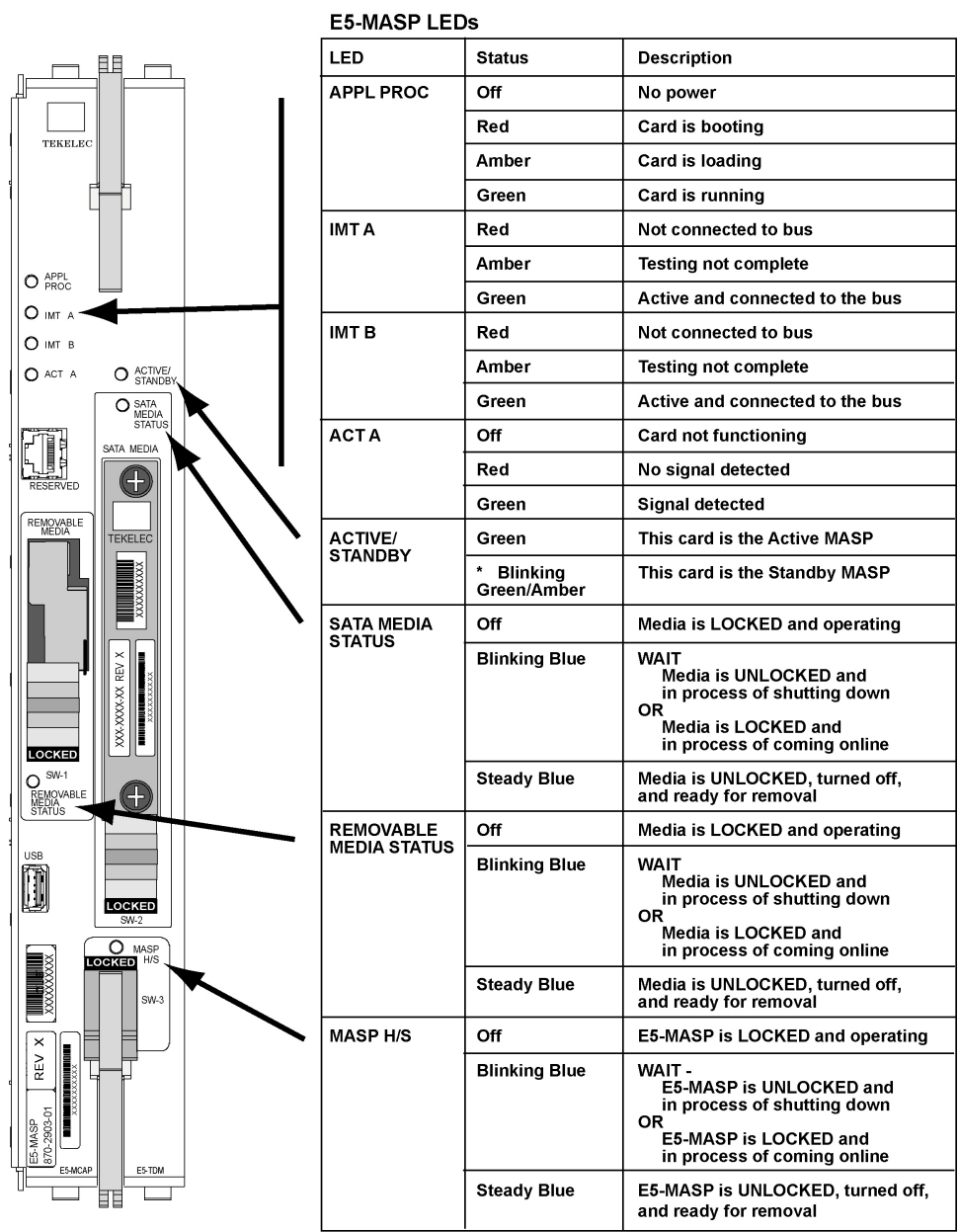
3.7.2.6 Switches and LEDs

The E5-MASP card provides faceplate switch interfaces for the removable drive (SW1), the fixed SATA drive (SW2), and the card (SW3). Each switch is used to notify software that the corresponding item is about to be unplugged or is plugged in and ready for use. Software may use this signal to gracefully shut down the card. An associated LED for each corresponding item indicates when it is safe to remove the item.

The E5-MASP card has six LEDs visible on the front of the card.

[Figure 3-28](#) shows the LED status and description.

Figure 3-28 E5-MASP LEDs



* The LED blinks Green/Amber at a rate of 3 Green to 1 Amber.

3.7.2.7 Cabling and Technical Specifications

The E5-MASP card utilizes an RS-232 cable for manufacturing and customer service installation diagnostics. The cable part number is 830-1327-XX.

Table 3-5 E5-MASP Technical Specifications

Physical Characteristics	
Height	14.43 in. (36.65 cm)

Table 3-5 (Cont.) E5-MASP Technical Specifications

Physical Characteristics	
Width	2.06 in. (5.23 cm)
Depth	12.80 in. (32.51 cm)

3.7.3 E5-MDAL

The **E5-MDAL** card processes alarm requests, provides general purpose relays, and provides fan control. There is only one **E5-MDAL** card in a control card set and it is shared between two **E5-MASP** cards. The E5-MDAL card is located in slots 1117 and 1118 of the control shelf.

Critical, major and minor system alarms are provided for up to 6 individual racks. In addition to the 3 system alarms, the E5-MDAL card provides the system audible alarm. All alarms are software controlled.

The E5-MDAL card provides control of fans on a per frame basis. The control logic allows for each fan relay to be set individually.

The **E5-MDAL** card does not contain a disk drive.

3.7.3.1 Alarms

Alarms are grouped into four categories: Rack, Remote Maintenance Center (RMC), Local Maintenance Center (LMC), and the Row End Panel. Critical, major and minor system alarms are provided for up to 6 individual racks. In addition to the 3 system alarms, the E5-MDAL card provides the system audible alarm. All alarms are software controlled.

Relays on the E5-MDAL provide switching for all of the alarm circuits. Regardless of which E5-MASP is primary, the current state of the relays is read by both TDM_A and TDM_B alarm buses on the E5-MDAL. General Purpose Relays reset signals have not been carried over from the obsoleted legacy MDAL to the E5-MDAL. Critical relays are wired such that they are in the alarming state when the E5-MDAL is not powered.

Alarm indicator lights are provided in the Row End Panel, Fuse Panels, and E5-MDAL Card panel. The major and minor alarms are only active if there is a request from the E5-MASP and the E5-MDAL indicates that at least one of the E5-MASPs is sane. A critical alarm is generated if there is a request from the E5-MASP or the E5-MDAL card indicates that both E5-MASPs are insane or the E5-MDAL card loses power. The RMC signals are gated by the AlarmTransfer signals from the primary E5-MASP. When the AlarmTransfer signal is active, the RMC signals are set to the output relays. When the AlarmTransfer signal is inactive, the RMC alarm signals are blocked. Optocouplers on the RMC alarms sense current when the alarms are active. If the alarm is active and there is no current sensed then it is assumed that the bulb/led on the row end panel is either burned out or missing.

3.7.3.2 Fan Control

The E5-MDAL card provides control of fans on a per frame basis. The control logic allows for each fan relay to be set individually. There are relays to control fans on a per frame basis. The control logic allows for each fan relay to be set individually. On the

legacy fan tray an open circuit turns the fans on. A control signal from the controller must be present to turn the fans off on the legacy fan tray. Fan control and alarm signals are routed through the Clock B cables to each shelf. Signals are then available on each backplane at the DB15 pin connector labeled A Fan Power and B Fan Power. Optocouplers have been added to detect fan alarms on a per frame basis.

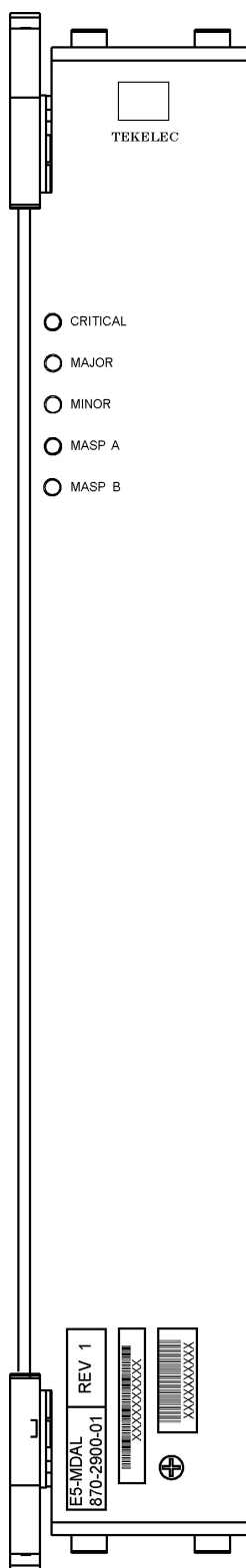
**Note:**

The control logic allows the each optocoupler to be read individually.

3.7.3.3 LEDs

There are 5 bicolor LEDs on the E5-MDAL that are controlled by the software in the E5-MASP. The critical, major and minor system alarm LEDs have four states per LED, which can be set by the E5-MASP. They are not tied to the alarm logic and are completely under control of the E5-MASP software. The MASP A and MASP B LEDs indicate which E5-MASP is primary. Located on the E5-MDAL is a Sonalert electronic audible device. The buzzer is activated if both E5-MASPs are insane or if there is sanity and a request is made by the primary E5-MASP.

Figure 3-29 E5-MDAL LEDs



E5-MDAL LEDs

LED	Status	Description
CRITICAL	Red	A critical system alarm has been detected
	Green	No Alarm
MAJOR	Red	A major system alarm has been detected
	Green	No Alarm
MINOR	Amber	A minor system alarm has been detected
	Green	No Alarm
MASP A	Green	This is the master MASP
	Off	This is the standby MASP
MASP B	Green	This is the master MASP
	Off	This is the standby MASP

3.7.3.4 Technical Specifications

Table 3-6 E5-MDAL Technical Specifications

Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	2.06 in. (5.23 cm)
Depth	12.80 in. (32.51 cm)

3.7.4 Time Slot Counter Synchronization

The Time Slot Counter (**TSC**) Synchronization feature is an advanced function enabled in all **LIMs**. The **TSC** Synchronization feature does not require any physical hardware changes to any of the boards in the **EAGLE**. **TSC** Synchronization is an optional feature for the **EAGLE** that will allow all cards in the system, which contain a Time Slot Counter, to synchronize with one another. The ability to have synchronized timing between cards is used in applications such as system wide message time stamping.

The **TSC** Synchronization feature uses **E5-OAM** cards. The **EAGLE** must use an external **BITS** clock so that the system A and B clocks remain synchronous to each other. If either of the **TDMs** provides its internal clock to the system instead of the **BITS** clock, the A and B clocks may drift apart and introduce skew into the system.

After the **TSC** Sync feature is enabled there may be skew between the A clock and B clock **TSC** Reset Events. This skew must be detected and eliminated so that cards can switch between the two clocks and stay synchronized to the rest of the system. All cards with a **TSC** have a Skew Interrupt and the Skew Count register.

TSC Sync affects all **EAGLE** cards that contain a Time Slot Counter. This includes:

- **E5-E1T1-B, E5-ENET-B, SLIC**
- **E5-ATM-B**

3.7.5 Link Interface Modules

▲ Caution:

After the frame has been shipped or moved, prior to applying power, remove all cards.

▲ Caution:

Reset all cards carefully to avoid possible faulty connections. All cards are hot swappable

The **Link** Interface Module (**LIM**) provides access to remote **SS7**, **IP** and other network elements, such as a Signaling Control Point (**SCP**). The **LIMs** consist of a main assembly and

possibly, an interface applique board. These appliques provide level one and some level two functionality on **SS7** signaling links. The types of LIMs presently available are:

- E5-E1T1-B (P/N 870-2970-xx) cards.
- E5-ATM-B (P/N 870-2972-xx) cards.

Maximum Numbers of Links

A maximum of 2800 links can be configured in the EAGLE depending on the hardware, software release level, and features that are installed. A mixture of high-speed and low-speed signaling links is supported.

Note:

If the addition of either a low-speed signaling link or a high-speed signaling link exceeds the total number of low-speed and high-speed signaling links allowed in the system, the ent-slk command is rejected. The addition of a high-speed signaling link decreases the number of low-speed signaling links that can be supported by the system.

Table 3-7 describes the required hardware for the maximum number of links with different configurations.


Note:

Table 3-7 lists EAGLE base hardware requirements only. For complete provisioning rules and requirements, including tables listing all link types see *Database Administration - SS7 User's Guide*.

LIM Main Assembly

Table 3-7 Hardware Requirements-Maximum Number of Links

Number of Links	Required Hardware
Up to 500 Links	<p>HIPR2 cards on the IMT buses</p> <p>2-port LIM cards or multi-port LIM cards (MPLs)</p> <p>Installed according to the provisioning rules for a system with up to 500 links in <i>Database Administration - SS7 User's Guide</i>.</p>

 **Note:**

A Maximum of 42 High-speed LIM cards (of which up to 41 can be **IPLIMx** cards) can be installed

Table 3-7 (Cont.) Hardware Requirements-Maximum Number of Links

Number of Links	Required Hardware
From 501-700 Links	HIPR2 cards on the IMT buses Enough E5-E1T1-Bs to bring the total number of signaling links above 500, up to 700. Installed according to the provisioning rules for a system with 700 links in <i>Database Administration - SS7 User's Guide</i> .
From 701--1500 Links	<ul style="list-style-type: none"> HIPR2 cards on the IMT buses Enough E5-E1T1s to bring the total number of signaling links above 500, up to 700. Installed according to the provisioning rules for a system with 700 links in <i>Database Administration - SS7 User's Guide</i> .
From 1500 -- 2800 Links	<ul style="list-style-type: none"> HIPR2 cards on the IMT buses E5-MASP cards installed in 1113 and 1115, to run the active FTP E5-MDAL cards installed in card locations 1117 and 1118 Enough E5-B cards to bring the total number of signaling links to 2800. Installed according to the provisioning rules for a system with 2800 links in <i>Database Administration - SS7 User's Guide</i> .

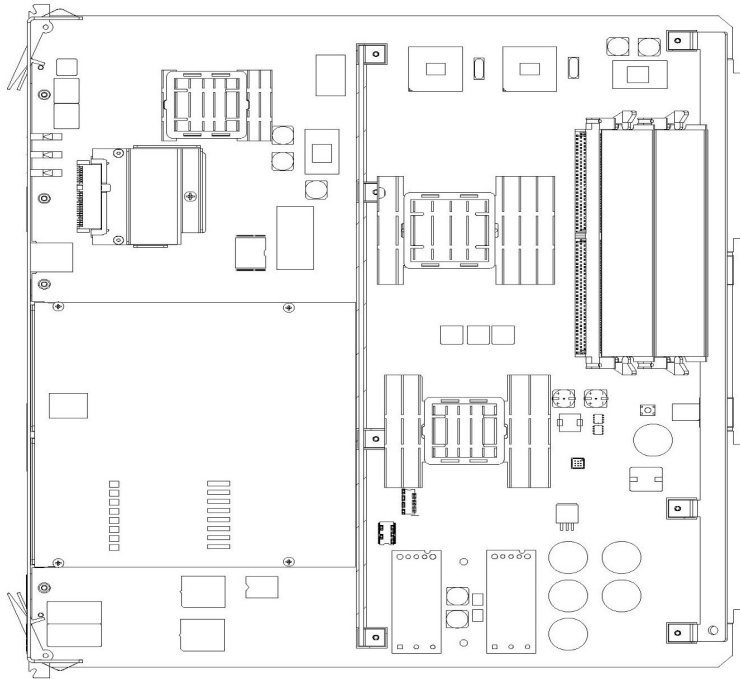
Cam-out/lock-in levers, mounted on the front edge of LIM cards, (the exception being E1) assist in the insertion and the removal of the card from the shelf.

The figures below show the E5-B based LIM cards.

All four PCB assemblies have the same basic functions:

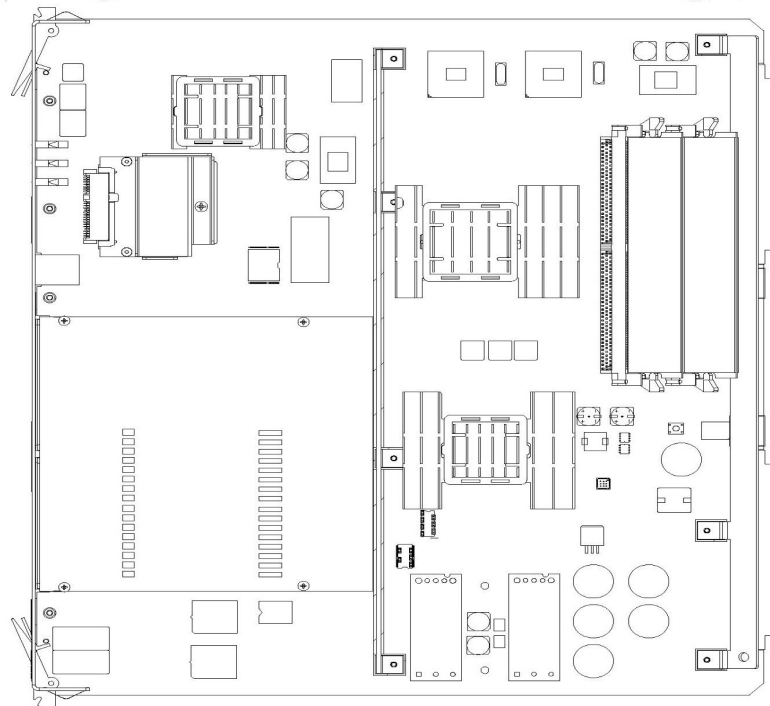
- Intel Dual Core processor: one core is used as the applications processor and the other core is used as the communications processor
- An Inter-processor Message Transport (IMT) interface that provides two 125 Mbps communications links that provide communications between modules
- 48VDC/+5VDC and –48VDC/+3.3VDC DC to DC power converter units

Figure 3-30 E5-ATM-B Card



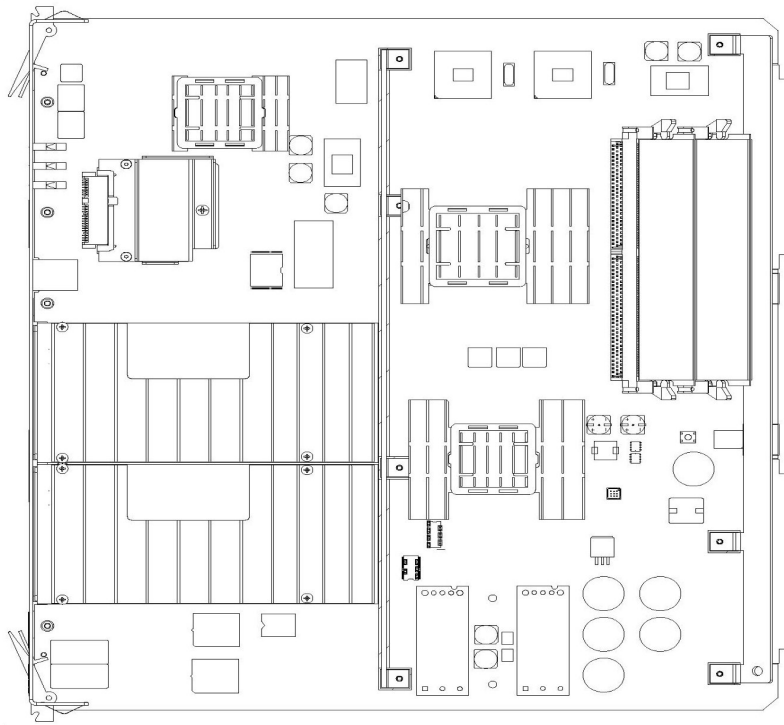
870-2972-01
E5_ATM-B_CARD_RDHS

Figure 3-31 E5-E1T1-B Card



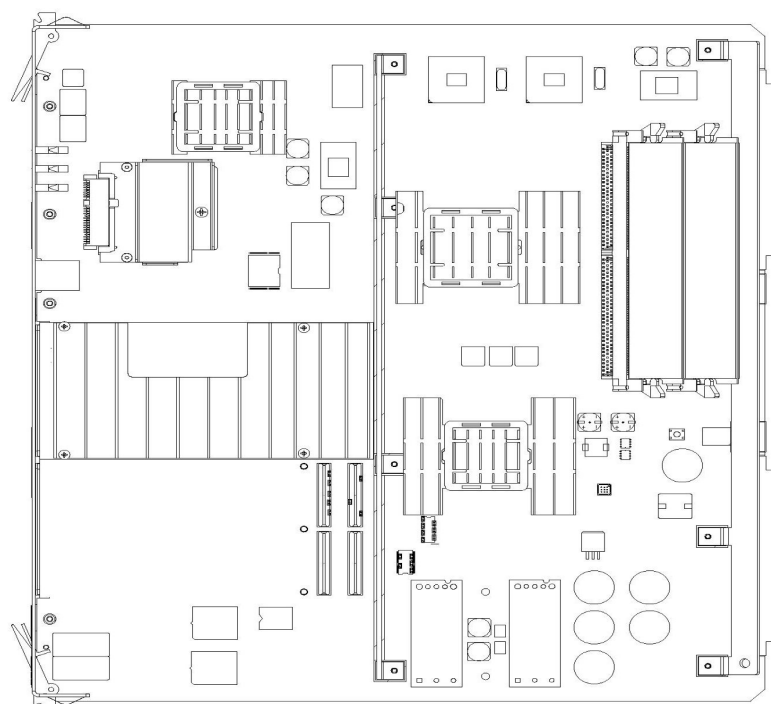
870-2970-01
E5_E1T1-B_CARD_ROHS

Figure 3-32 E5-ENET-B Card



870-2971-01
E5_ENET-B_CARD_ROHS

Figure 3-33 E5-MCPM-B



870-3089-01
E5_MCPM-B_CARD_ROHS

Applications Processor

The Application Processor (**AP**) section of the LIM interfaces and controls the operation of the interface applique. The AP's operations are controlled by one core of the Intel Dual Core processor and peripherals.

Communications Processor

The Communications Processor (**CP**) is made up of one core of the Intel Dual Core Duo processor and peripherals. The CP section of the LIM controls the flow of transmit/receive data to and from the Inter-processor Message Transport (IMT) buses.

In the receive direction, the CP writes a receive initialization command to the IMT bus. The data packet is checked for the destination. If its destination is this LIM, the format is checked and a **Cyclic Redundancy Check (CRC)** is performed. The packet is then transferred to the CP memory by Direct Memory Access (**DMA**).

In the transmit direction, the CP forwards a packet along with 2 CRC bytes, calculated by the IMT circuitry, to the HIPR2 cards for transmission.

The CP also controls the selection of the IMT buses, A or B. In the other direction, the CP forwards data received from the IMT buses through the AP to the interface port (DB15) connector on the shelf backplane.

The CP is interrupt driven. Eight levels of the interrupts initiated by the IMT, the AP, and the **MAS**, are administered by a Programmable Interrupt Controller (**PIC**).

Inter-processor Message Transport

Each LIM unit has two Inter-processor Message Transport (IMT) interface circuits, IMT A and IMT B. The redundant IMT buses are used to transport:

- Generic Program Loads (GPLs) to various circuit cards
- All SS7 and traffic between circuit cards
- Maintenance traffic within the system

In the receive direction, a data packet is checked to see if it is destined for this particular LIM. If it is, the packet is checked for format and a cyclic redundancy check is performed. The packet is then transferred to the CP memory by Direct Memory Access (DMA). If the packet is not destined for this LIM, it is sent back onto the IMT bus towards the next module.

In the transmit direction, the Cyclic Redundancy Check (CRC) is calculated for a packet and the packet is transmitted through the HIPR2 cards to the IMT bus.

Power Converter Unit

LIM power is provided by two DC to DC converters that convert the –48VDC supplied to the system to +5VDC and +3VDC needed to power the LIM components.

Test and Maintenance Features

Colored **LEDs** are mounted on the front edge of the printed circuit board as LIM status and alarm indicators.

3.7.6 Measurements Collection and Polling Module

The **MCPM** is an E5-MCPM-B card running MCPHC GPL.

Note:

The E5-MCPM-B card is a requirement for the **FTP** measurements feature. The **FTP** measurements feature uses the **E5-MCPM-B** ethernet ports to transfer measurements information directly to a **FTP** server.

On the front edge of the **MCPM** card, there are five Light Emitting Diodes (**LED**) that provide status. The **MCPM LEDs** have four illumination states: red, amber, green, or off. The Application processor **LED** is off if -48VDC is not supplied. The Application Processor **LED** is red while booting, amber while loading, and green when the application is running. The IMT A and B **LEDs** indicate whether the **MCPM** is active on the A or B buses. IMT **LED** red—the card is off the bus, IMT **LED** amber—MUX card on the same shelf is seated and not inhibited; bus not available, IMT **LED** green—the card is active on the bus. The **PORT A** and **PORT B LEDs** are illuminated green when the A or B port is active.

3.7.7 E5-ATM-B Module

The **E5-ATM-B** card (P/N 870-2972-01) is a single slot card providing ATM over E1 and T1 connectivity for EAGLE control and extension shelves.

 **Note:**

Throughout this document, the term E5-ATM refers to the E5-ATM-B card (P/N 870-2972-01) card.

 **Note:**

All E5-based cards require **HIPR2**. For more information, see [High-Speed IMT Packet Router 2](#).

The E5-ATM assembly is comprised of the Embedded Processor Module (EPM) and an ATM/E1-T1 PCI Mezzanine Card (PMC). The E5-ATM provides:

- SS7 Link, ATM over T1 (ANSI)
- SS7 Link, ATM over E1 (ITU)
- TVG or MFC based load sharing
- Integrated Sentinel (e-route)
- Integrated Message Feeder
- Higher throughput than current HCAP-based LIMATM and LIME1ATM cards
- Automatic on/off CRC4 detection for E1 framing (default is on)
- Three ATM signaling links operating at 1 Erlang
- BICC support
- Thermal protection

The E5-ATM-B has the following requirements and dependencies:

- Requires HIPR2 in the shelf where the E5-ATM-B resides.
- E1 or T1 support, but will not support both physical port types on a single card simultaneously
- The E5-ATM-B requires a fan tray assembly for thermal management.
- Can interoperate with E1-ATM
- Is a hot-swap compatible replacement for the HCAP-based LIMATM and LIME1ATM cards

 **Note:**

Hot-swap is limited to one interface, but the second and third link can be provisioned once E5-ATM-B is installed. The Port B connector on the backplane may be used for link connectivity. To utilize the Port B connector on the backplane, a cable adapter (P/N 830-1342-05) and an additional cable are required.

- The E5-ATM-B requires Message Flow Control (MFC) feature
- The E5-ATM-B does not support TVG

- E5-ATM-B modules require a fan tray assembly for thermal management. Be sure to install the fan assembly before installing the E5-ATM-B card. See "Hardware Baseline Table" in *Release Notes* for compatible fan assembly part numbers.

Thermal Management

The **E5-ATM** includes thermal management and alarming provisions to protect the card from damage if environmental conditions hinder thermal stability.

When the CPU temperature rises above nominal range and exceeds a thermal threshold (Temperature Level1) a major alarm is raised against the card. When the temperature returns to its nominal range (below Temperature Level1) the alarm is automatically cleared.

If the temperature continues to increase and exceeds a second thermal threshold (Temperature Level2) a critical alarm is raised against the card. When this second thermal event occurs, the result is a local processor outage (LPO) and traffic is redirected to other cards (changeover), if possible. For ATM links, an LPO will take the links out-of-service. If the temperature recedes under the Temperature Level2 threshold, the LPO condition is cleared and the links can begin operation again.

If the CPU temperature goes above operating limits (approximately 99°C), the CPU will halt and the card will shut itself down to prevent permanent, catastrophic damage. In the event of thermal shutdown all processor activity will cease. If thermal shutdown occurs, the E5-ATM must then be reseated and allowed to load in order to clear the alarm and resume operation.

If the CPU temperature goes above operating limits (approximately 95°C for E5-ATM or 90°C for E5-ATM-B), the CPU will halt and the card will shut itself down to prevent permanent, catastrophic damage. In the event of thermal shutdown all processor activity will cease. If thermal shutdown occurs, the E5-ATM must then be reseated and allowed to load in order to clear the alarm and resume operation.

[Table 3-8](#) identifies the appropriate responses.

Table 3-8 Thermal Alarm Conditions

Board Temperature	Actions
Temp1 Exceeded	Major alarm raised
Temp1 Exceeded	Major alarm raised; PST/SST of card transitions to IS-ANR/Restrict
Temp2 Exceeded	Critical alarm raised; failover initiated, traffic rerouted
Temp2 Exceeded	Critical alarm raised; failover initiated, traffic rerouted; PST/SST of card remains in IS-ANR/Restrict
Temperature abated	Normal operation restored
Thermtrip - shutdown temperature exceeded	CPU shuts down automatically. Card must be reseated to restore operation once temperature returns to normal operating conditions

The thermal thresholds (Temperature Level1 and Temperature Level2) are user configurable. The user configurable T1 and T2 values will always be less than or equal to the T1 (max) and T2 (max) defined for a particular board type respectively. See [Table 3-9](#) and the `chg-th-alm` command for more details on thermal thresholds.

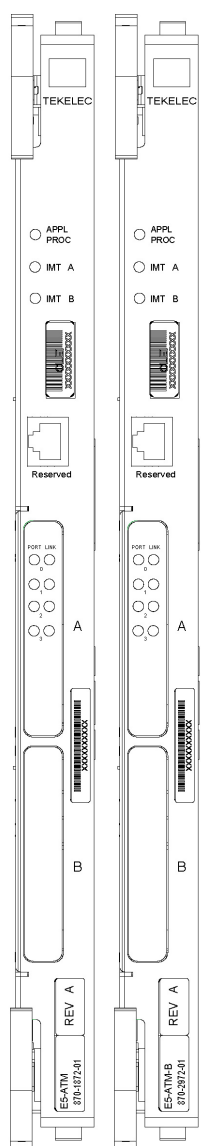
Table 3-9 T1 and T2 temperature thresholds

Cards	T1 Max (in Celsius)	T2 Max (in Celsius)	User Configurable T1 range (in %)	User Configurable T2 range (in %)
E5-ATM	92	95	(73-92)% of T2 max	(74-100)% of T2 max
E5-ATM-B	83	90	(73-92)% of T2 max	(74-100)% of T2 max

LED Indicators

The **E5-ATM** includes three front panel indicators (**LEDs**) for **APPL Proc** operation, **IMT A**, and **IMT B** status. In addition, four front panel **LED Link/Activity** indicators (two for each **IP** port used). [Figure 3-34](#) shows the LEDs and provides a description of indications.

Figure 3-34 E5-ATM-B



LED	Color	Description
APPL PROC	OFF	No power
	RED	Transitioning or Error
	AMBER	Not Active
	GREEN	Card is up and application is running
IMT (A/B)	RED	Card is not attached to IMT bus
	GREEN	Card is attached to IMT bus
PORT (0/1/2)	RED	Port not provisioned
	RED blinking	Loss of signal
	AMBER	Remote alarm condition or loss of cell delineation
	AMBER blinking	Loss of Frame Synchronization
	GREEN	E1/T1 framing is established
LINK (0/1/2)	RED	Signaling Link is not provisioned
	RED blinking	Signaling Link Out Of Service
	AMBER	Signaling Link is ready to start alignment
	AMBER blinking	Signaling Link alignment in progress
	GREEN blinking	Signaling Link alignment successful, awaiting far end INSV
	GREEN	Signaling Link is aligned
PORT (3)	OFF	Not used
LINK (3)	OFF	Not used

Interface Adapter

The E5-ATM-B provides connectivity for two E1/T1 ports on the Port A backplane connector, allowing up to two links that may be provisioned. Both E1/T1 ports can be accessed with a 2-port or 4-port cable. An interface adapter (P/N 830-1342-05) allows the two ports to be physically split to two different cables/patch panels. If it is desired to move the second E1/T1 port to the Port B backplane connector, then an adapter and another cable (1-, 2-, or 4-port) must be used.

The following are existing interface cables that may be attached to the backplane connectors:

- 1-port connectivity (P/N 830-0849-XX or P/N 830-1184-XX)
- 2-port connectivity (P/N 830-0622-XX or P/N 830-1233-XX)
- 4-port connectivity (P/N 830-0932-XX, P/N 830-1196-XX, P/N 830-0948-XX, or 830-1197-XX)

Technical Specifications

Table 3-10 E5-ATM-B Technical Specifications

Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	1.013 in. (2.57 cm)
Depth	12.80 in. (32.51 cm)

3.7.8 E5-E1T1-B Module

The E5-E1T1-B card (P/N 870-2970-xx) is a single slot card providing eight trunk terminations. The eight E1/T1 ports reside on backplane connectors A and B. The E5-E1T1-B supports up to 64 signaling links of configurable channelized E1 or T1 connectivity OR two SE-HSL/ST-HSL signaling links.



Note:

The term E5-E1T1 used here refers to the E5-E1T1-B (P/N 870-2970-XX) card.

All ports on a single board operate in the same trunk format, **E1** or **T1**. However, it is possible to have a mixture of trunk formats in a node with some E5-E1T1-Bs operating in **T1** mode with others operating in **E1** mode for gateway node scenarios.

The **E5-E1T1-B** has the following requirements and dependencies:

- Requires **HIPR2** to be active on both IMT buses in the shelf where the **E5-E1T1** will reside.
- The **E5-E1T1** will not support channel cards as it uses all connections on the backplane.
- E5 modules do not require a fan tray assembly for thermal management.

- The **E5-E1T1** is a single-slot module that can be used in any slot that a **LIM** can be configured.
- The E5-E1T1-B requires the Message Flow Control (MFC) feature to be active.
- The E5-E1T1-B does not support TVG.
- The E5-E1T1-B requires a fan tray assembly for thermal management.

Total system signaling link capacity depends on other cards within the system and must not exceed the provisioning limit of the **EAGLE** system. Since the **E5-E1T1** has the capacity to process a full **T1** or **E1** on a single card, daisy chaining or channel card operation is not needed.

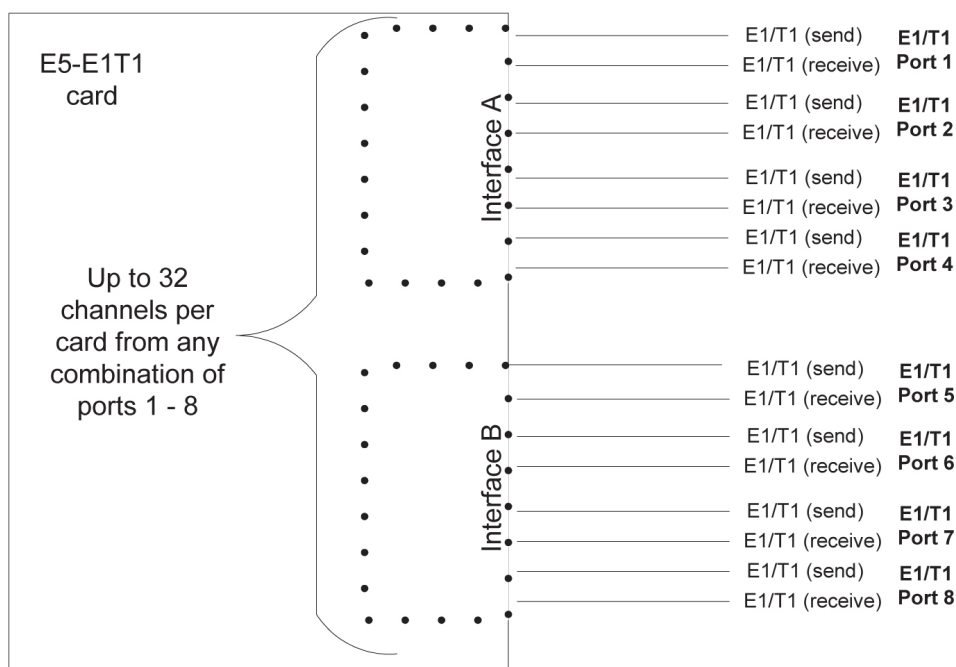
The maximum provisionable links for the **E5-E1T1** will be 32 links. If the **E5-E1T1** has more than 32 links provisioned, it will auto-inhibit. The fan feature is ignored for the **E5-E1T1**.

Channelized Mode

The **E5-E1T1** provides access to eight **E1/T1** ports residing on backplane connectors A and B. Each data stream consists of 24 **T1** or 31 **E1 DS0** signaling links assigned in a time-division multiplex (TDM) manner. Each channel occupies a unique time slot in the data stream and can be selected as a local signaling link on the interface card. Each card can select up to a total of 64 signaling links. The default configuration is 16 signaling links.

External interfaces (the **E1/T1** trunks) use both backplane interfaces of the single backplane slot used, each terminating four **E1/T1** ports (trunks). These two backplane interfaces will be referred to in this section as interfaces A and B. Interface A terminates **E1/T1** ports 1-4, while Interface B terminates **E1/T1** ports 5-8. Refer to [Figure 3-35](#).

Figure 3-35 Channelized E5-E1T1-B Interfaces



Note:

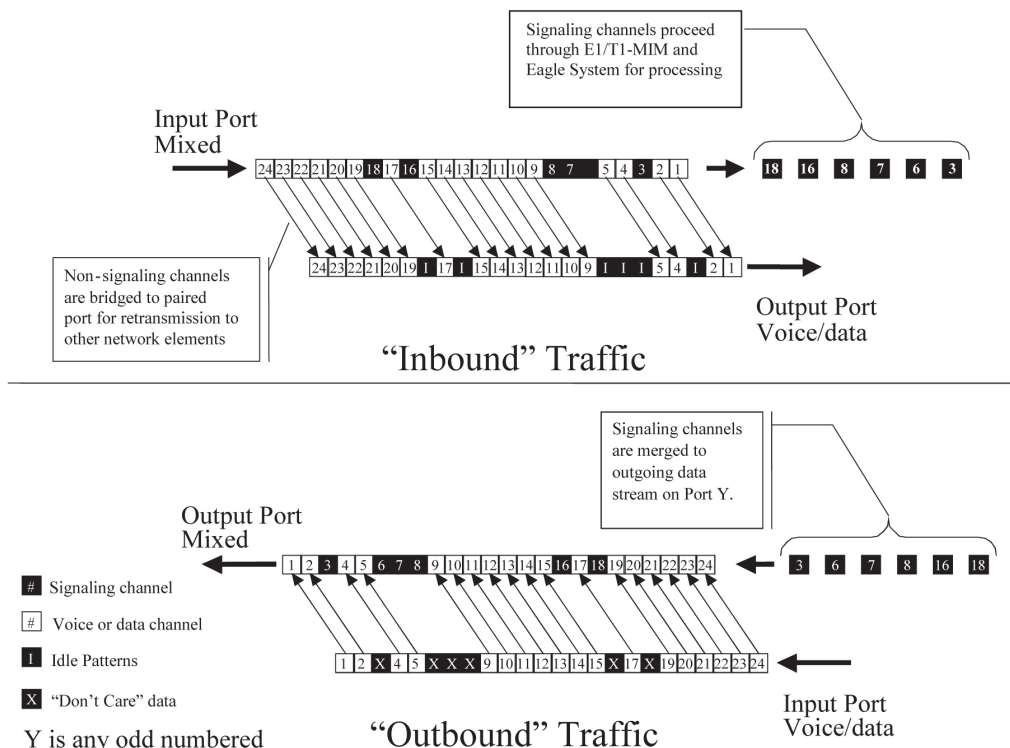
All ports on a single board must operate in the same trunk format, **E1** or **T1**, and that the total number of channels utilized as signaling links must not exceed the maximum allowable number in accordance with a **Feature Access Key** defining total channel capacity.

Channel Bridging

Channel Bridging is the processing of signaling channels that are intermixed on trunks with voice or data channels. The **HCMIM** provides **Channel** Bridging which allows for better utilization of bandwidth without dedicating entire trunks to signaling. Non-signaling channels are bridged to an adjacent **E1/T1** port for transport to other network devices. Likewise, signaling channels are merged to non-signaling data for transmission back to the mixed network.

In this configuration, the High-speed source Timing option can only apply to one trunk format since only one high-speed clock rate can be provided. **Channel** bridging is available only in the channelized mode. Refer to [Figure 3-36](#).

Figure 3-36 Channel Bridging Schematic



Time slots located on the bridging follower **E1/T1** port, (time slots that have been dropped from the bridging source **E1/T1** port), contain idle patterns provided by the **EAGLE**. All other idle time slots that are not dropped must contain an idle pattern provided by the remote network elements connected to both **E1/T1** ports (bridging

source and follower). Without these patterns on the idle time slots, instability of the **E1/T1** may occur.

 **Note:**

Provisioning of signaling links on the bridging follower **E1/T1** port is not allowed while channel bridging is activated.

Channel Bridging is implemented by pairing **E1/T1** ports; this pairing limits provisioning to odd **E1/T1** ports only (1,3,5,7) when channel bridging is enabled. The adjacent even numbered **E1/T1** ports (2, 4, 6, 8) are used to allow the original non-signaling data received on the bridging source (odd) **E1/T1** port to reach downstream network elements. This is a bi-directional interface so data is also able to enter the bridging follower **E1/T1** port and leave through the bridging source **E1/T1** port. This feature may be independently selected on **E1/T1** ports 1, 3, 5, and/or 7. When selected, the bridging follower (even) **E1/T1** port would be provisioned as the pass-through **E1/T1** port. On ports operating in **Channel Bridging** mode, all time-slots not provisioned for signaling are handled as active data and not overwritten by the **E5-E1T1**.

Table 3-11 Channel Bridging E1/T1 Port Pairing

Primary E1/T1 Port		Paired E1/T1 Port	
Number	Payload Contents	Number	Payload Contents
1	Signaling Processed	2	Unprocessed
3	Signaling Processed	4	Unprocessed
5	Signaling Processed	6	Unprocessed
7	Signaling Processed	8	Unprocessed

Timing

In order to use channel bridging without facility errors, both bridging source and bridging follower **E1/T1** ports must be synchronous; that is, both source and follower must be timed off the same clock source. This synchronization may be accomplished two ways:

- The bridging source **E1/T1** port may use the timing recovered from the bridging follower **E1/T1** port or visa versa.
- Both the bridging source and bridging follower **E1/T1** ports are using an external clock source (the EAGLE's source option for the **E1/T1** port provisioning).

Any other methods used for timing could cause problems on the **E1/T1** trunk and are not supported.

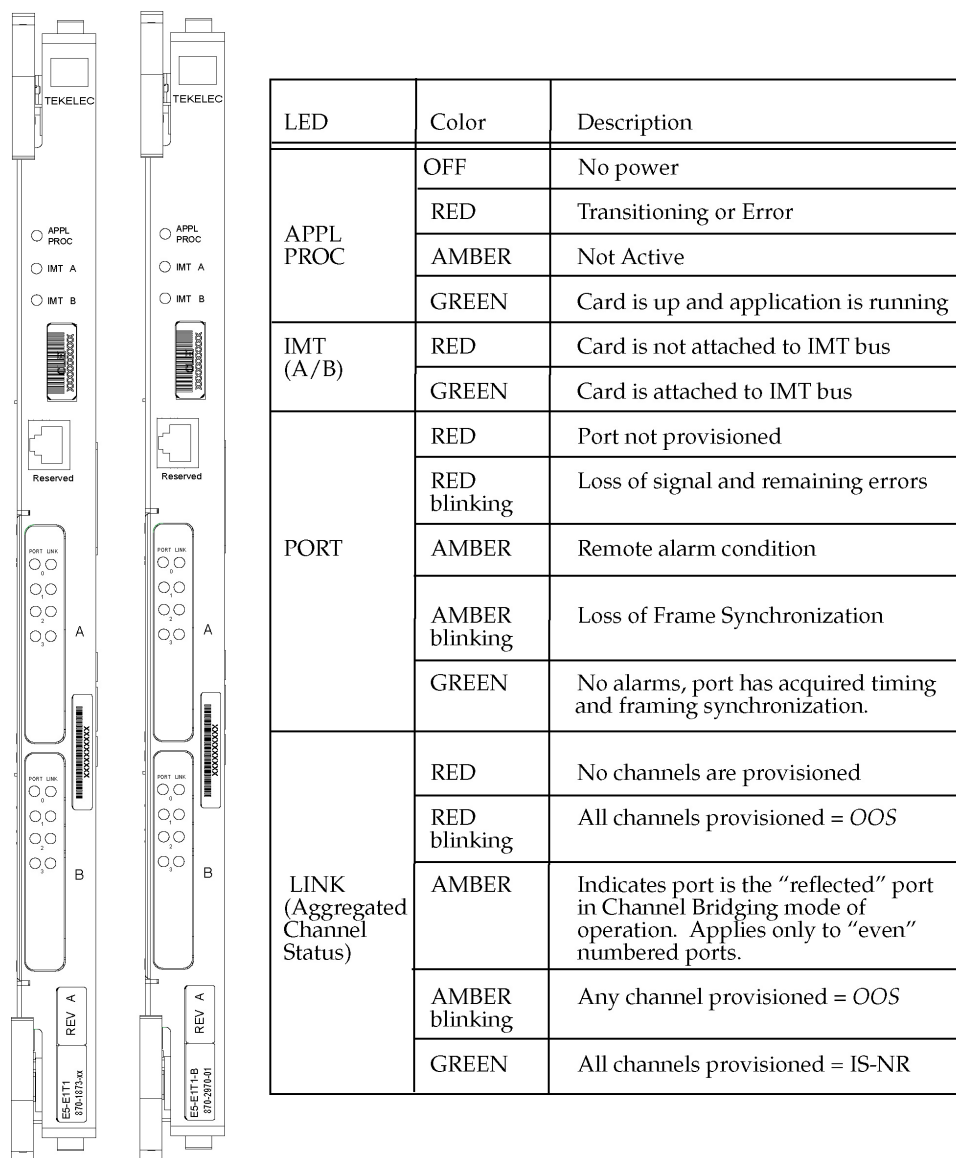
Alarms and LEDs

The channel bridging functionality requires no additional statistics collection for the bridging follower **E1/T1** port; however, standard statistics/measurements are made on the bridging source **E1/T1** port. Alarms for the bridging follower **E1/T1** port are limited to trunk-level synchronization and framing alarms. **Channel** alarm LEDs for the bridging follower **E1/T1** port are amber to indicate the **Channel Bridging** mode of operation.

Three LEDs provide conventional EAGLE card indications of APPL Proc operation, and IMT A and IMT B operation. Up to sixteen (16) LEDs, two for each **E1/T1** port, are used to

indicate port and channel (signaling link) status. One **LED** per **E1/T1** port indicates **E1/T1** port Status and one **LED** per **E1/T1** port indicates aggregated channel status. See [Figure 3-37](#).

Figure 3-37 E5-E1T1-B



Technical Specifications

Table 3-12 E5-E1T1-B Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	0.67A
Power	32W

Table 3-12 (Cont.) E5-E1T1-B Technical Specifications

Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	1.013 in. (2.57 cm)
Depth	12.80 in. (32.51 cm)

3.7.9 E5-ENET-B Module

The E5-ENET-B module (P/N 870-2971-xx) is a single slot card that has one or more Ethernet interfaces and provides increased transactions per second (TPS).



Note:

Throughout this document, the term E5-ENET refers to the E5-ENET-B (P/N 870-2971-xx) card.

The E5-ENET card has the following requirements and dependencies:

- The **E5-ENET** has 2 physical 10/100 Mbps Ethernet ports.
- The E5-ENET supports STP Local Area Network function, and 10/100Base-T ethernet links to the STP.
- The **E5-ENET** supports protocols as identified in [Table 3-13](#):



Note:

The **E5-ENET** is provisionable for **IPLIMx** or **IPGWx**, but does not support both functions on a single card simultaneously.

- Requires **HIPR2** to be active on both IMT buses in the shelf where the **E5-ENET** will reside.
- An adapter cable per Ethernet port. See [Interface Cable Differences](#).
- Maximum number of cards per shelf is 10 for the control shelf and 16 for the extension shelf.
- Mix of **E5-ENET/HCMIM** on a shelf can be any up to shelf and power capacity.
- The E5-ENET does not require a fan tray assembly for thermal management.
- The E5-ENET-B requires the Message Flow Control (MFC) feature to be active.
- The E5-ENET-B does not support TVG.
- The E5-ENET-B requires a fan tray assembly for thermal management.

Table 3-13 E5-ENET-B Supported Protocols

Feature	Protocols Supported
IPSG	M2PA, M3UA
EROUTE	TCP/IP

Table 3-14 E5-ENET-B Capacities

Parameter	IPGWY
E5-ENET-B cards per node	250
SCTP entities per E5-ENET-B module	50 SCTP Connections
The maximum possible EAGLE currently supports 4000 in the link table.	

Thermal Management

The **E5-ENET-B** includes thermal management and alarming provisions to protect the card from damage if environmental conditions hinder thermal stability. [Table 3-15](#) identifies the appropriate responses.

When the CPU temperature rises above nominal range and exceeds a thermal threshold (Temperature Level1) a major alarm is raised against the card. When the temperature returns to its nominal range (below Temperature Level1) the alarm is automatically cleared.

If the temperature continues to increase and exceeds a second thermal threshold (Temperature Level2) a critical alarm is raised against the card. The application software will treat the notification as a local processor outage (LPO) and begin redirecting traffic to other cards (changeover), if possible.

- For IPGWx the link will be taken out of service and the far end will be notified that the connections will no longer accept traffic.

If the CPU temperature goes above operating limits (approximately 125°C), the CPU will halt and the card will shut itself down to prevent permanent, catastrophic damage. In the event of thermal shutdown all processor activity will cease. If thermal shutdown occurs, the E5-ENET must then be reseated and allowed to load in order to clear the alarm and resume operation.

Table 3-15 Thermal Alarm Conditions

Board Temperature	Actions
Temp1 Exceeded	Major alarm raised
Temp2 Exceeded	Critical alarm raised; failover initiated, traffic rerouted
Temperature abated	Normal operation restored
Thermtrip - shutdown temperature exceeded	CPU shuts down automatically. Card must be reseated to restore operation once temperature returns to normal operating conditions

The thermal thresholds (Temperature Level1 and Temperature Level2) are user configurable. The user configurable T1 and T2 values will always be less than or equal

to the T1 (max) and T2 (max) defined for a particular board type respectively. See [Table 3-16](#) and the `chg-th-alm` command for more details on thermal thresholds.

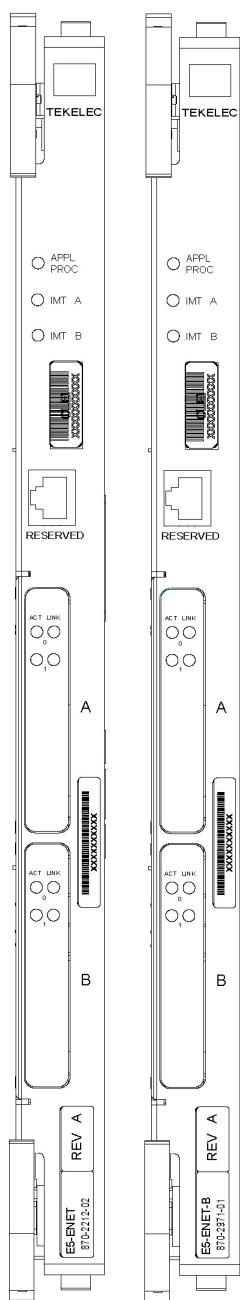
Table 3-16 T1 and T2 temperature thresholds

Cards	T1 Max (in Celsius)	T2 Max (in Celsius)	User Configurable T1 range (in %)	User Configurable T2 range (in %)
E5-ENET	92	95	(73-92)% of T2 max	(74-100)% of T2 max
E5-ENET-B	83	90	(73-92)% of T2 max	(74-100)% of T2 max

LED Indicators

The **E5-ENET-B** includes three front panel indicators (**LEDs**) for **APPL** Proc operation, IMT A, and IMT B status. In addition, eight front panel **LED Link/Activity** indicators (two for each **IP** port used).

Figure 3-38 E5-ENET-B



Front Faceplate LED Indicators

LED	Status	Description
APPL PROC	Off	No power
	Red	Card is booting
	Amber	Card is loading
	Green	Card is up and application is running
IMT A	Red	Not connected to bus
	Amber	Testing not complete
	Green	Active and connected to the bus
IMT B	Red	Not connected to bus
	Amber	Testing not complete
	Green	Active and connected to the bus

EROUTE/SLAN

LED	ACT	LINK
Red	Signaling links inactive, or 1 or more active links are out-of-service	N/A
Green	All active links are in-service	Ethernet signal detected
Off	Card nonfunctional	No Ethernet signal detected

ACT Status LED states for IPLIMx/IPSG

SLK States (Port A or Port B)	ACT Status LED
No links configured	Off
All provisioned links are OOS-MT-DSBLD	Red
Sync	Green

ACT Status LED states for IPGWx

IPGWx SLK PST	ACT Status LED	
	A0	B0
None configured (card must be inhibited)	Off	Off
OOS-MT-DSBLD	Red	Red
IS-NR or IS-ANR	Green	Green

Interface Cable Differences

The PMC ports A0 and B0 are utilized as IP signaling link ports while PMC ports A1 and B1 support the Fast Copy feature when enabled. Each interface is independent of the others. The E5-ENET card and other DCM-class cards have backplane cable pinout differences requiring an adapter for the E5-ENET card. See [Table 3-17](#).

The PMC ports A0 and B0 are utilized as IP signaling link ports while PMC ports A1 and B1 support the Fast Copy feature when enabled. Each interface is independent of

the others. The E5-ENET card and other DCM-class cards have backplane cable pinout differences requiring an adapter for the E5-ENET card. See [Table 3-18](#).

The Ethernet cable pinouts differ between the card and the **DCM/SSEDCM** cards.

- Adapter P/N 830-1103-02 is required for each **E5-ENET** interface used when using the existing **DCM** cable (P/N 830-0978-xx). The adapter is connected between the backplane connector and the existing **DCM** cable for the card.
- Adapter P/N 830-1102-02 is required for installation of the **E5-ENET** when the **DCM** cable is replaced with an **RJ-45 CAT-5E** cable (P/N 830-0724-xx). The adapter is connected to the backplane and the **RJ-45 CAT-5E** cable is connected from the other side of the adapter to a switch, or a hubcopy feature, or a patch panel (same place the **DCM** cable was terminated). This adapter configuration can be used for IPSP with the FAST COPY feature. When the adapter is connected (P1 to the backplane), the upper jack (P2) is for FAST COPY and the lower jack (P3) is the ethernet interface.
- Adapter P/N 830-1103-xx is required for each **E5-ENET** interface used when using the existing **DCM** cable (P/N 830-0978-xx). The adapter is connected between the backplane connector and the existing **DCM** cable for the card.
- Adapter P/N 830-1102-xx is required for installation of the **E5-ENET** when the **DCM** cable is replaced with an **RJ-45 CAT-5E** cable (P/N 830-0724-xx). The adapter is connected to the backplane and the **RJ-45 CAT-5E** cable is connected from the other side of the adapter to a switch, or a hubcopy feature, or a patch panel (same place the **DCM** cable was terminated). This adapter configuration can be used for IPSP with the FAST COPY feature. When the adapter is connected (P1 to the backplane), the upper jack (P2) is for FAST COPY and the lower jack (P3) is the ethernet interface.
- For IPSP with the FAST COPY feature, adapter P/N 830-1343-xx is required when using existing cables (P/N 830-1204-xx) and additional CAT-5 shielded cables P/N 830-1174-xx for the monitoring ports are also required. When the adapter is connected (P1 to the backplane), jack P2 is for FAST COPY and jack P3 is the ethernet interface.

Table 3-17 Interface Cable/Adapter

Protocol	Adapter	Cable
IPSP with FAST COPY	830-1102-02	830-0724-xx or 830-1174-xx
	830-1343-01 (port A0, A1)	830-0978-xx or 830-1204-xx (backplane connector A)
	830-1343-02 (port B0, B1)	830-0978-xx or 830-1204-xx (backplane connector B)

Table 3-18 Interface Cable/Adapter

Protocol	Adapter	Cable
IPSP with FAST COPY	830-1102-xx	830-0724-xx or 830-1174-xx
	830-1343-01 (port A0, A1)	830-0978-xx or 830-1204-xx (backplane connector A)
	830-1343-02 (port B0, B1)	830-0978-xx or 830-1204-xx (backplane connector B)

If the card inserted into the slot does not match the backplane connector, the interface will not function.

Technical Specifications

Table 3-19 E5-ENET-B Technical Specifications

Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	1.013 in. (2.57 cm)
Depth	12.80 in. (32.51 cm)

3.7.10 SLIC

The Oracle Communications EAGLE Service and Link Interface Card (**SLIC**) is a single-slot, multi-use card that runs multiple applications. See "EAGLE Card Overview" in *Release Notes* for current GPL and Application compatibility. When provisioning the SLIC card, the card type will be SLIC when plugged in.

Thermal Management

The SLIC includes thermal management and alarming provisions to protect the card from damage if environmental conditions hinder thermal stability. In the event of thermal shutdown all processors activity ceases.

The SLIC requires a fan tray assembly for thermal management. Be sure to install the fan assembly before installing the SLIC card.

Thermal monitoring detects and provides notification of increasing card temperature, and disables the card when needed to prevent it from overheating.

- When the CPU temperature rises above nominal range and exceeds a thermal threshold (Temperature Level 1) a major alarm is raised against the card.
- If the temperature continues to increase and exceeds a second thermal threshold (Temperature Level 2), a critical alarm is raised against the card. When this second thermal event occurs, the application software auto-inhibits the card (refer to the table below).
- Once the temperature recedes under the Temperature Level 2 threshold, the application re-allows operation and sets its state to IS-NR/Idle. The raised critical alarm is cleared and the corresponding major alarm is raised.
- When the temperature returns to its nominal range (below Temperature Level 1) the raised major alarm is cleared.

 **Note:**

These thermal thresholds (Temperature Level 1 and Temperature Level 2) are user configurable. For more information refer to the `chg-th-alm` command in *Commands User's Guide*.

Table 3-20 Thermal Alarm Conditions

Board Temperature	SLIC Actions
Temp Level 1 Exceeded	Major alarm raised
Temp Level 2 Exceeded	Critical alarm raised; Auto-inhibit is allowed by the user on that card and set their status to OOS-MT-DSBLD/MEA. Set card state to out-of-service, maintenance fault.
Temperature abated	When temperature drops below Temperature Level 2, Temperature Level 1 action/state restored. When the temperature drops below Temperature Level 1, normal operation restored.
Thermtrip - shutdown temperature exceeded	CPU shuts down automatically. Card must be reseated to restore operation once temperature returns to normal operating conditions

Alarms and LEDs

The SLIC has 21 LEDs visible on the faceplate. The LEDs are visible with the aid of a light pipe, which directs the light from the LED to the front panel.

Figure 3-39 SLIC

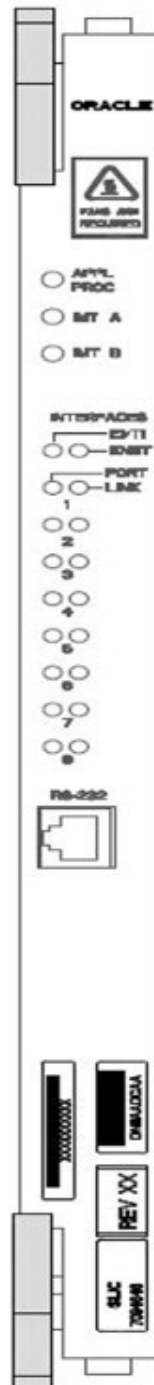


Table 3-21 SLIC Front Panel LEDs

LED Name	Control	Colors	Definition
APPL	FPGA / Application Software	Off / Red / Green	Off - No power Red - Card is booting Green - Card is running Application
IMTA	LIIC FPGA / Communication Software	Red / Green	Red -Not connected to BUS Green - Active and Connected to Bus Amber - MUX card on the same shelf is seated and not inhibited; bus not available
IMTB	LIIC FPGA / Communication Software	Red / Green	Red - Not connected to BUS Green - Active and Connected to Bus Amber - MUX card on the same shelf is seated and not inhibited; bus not available
INTERFACE S E1/T1	FPGA / Application Software	Green / Off	Green - Enabled Off - Disabled
INTERFACE S ENET	FPGA / Application Software	Green / Off	Green - Enabled Off - Disabled
PORT1-PORT8	PHY / Application Software	Off / Red / Green	Off - Not configured Red - Cable removed and/or not synced Green - 10/100Mb link speed
LINK1-LINK8	FPGA / Application Software	Off / Red / Green	Off - No SLKS configured Red - All Configured SLKS OOS Green - All SLKS aligned

3.7.11 E5-MCPM-B Module

The single-slot E5-MCPM-B (P/N 870-3089-xx) card can be used for nodes larger than 1200 (if 15 Measurements is enabled). E5-OAM Integrated Measurements can still be used for smaller nodes.

E5-MCPM-B modules require a fan tray assembly for thermal management. Be sure to install the fan assembly before installing the E5-MCPM-B card. See "Hardware Baseline Table" in *Release Notes* for compatible fan assembly part numbers.

 **Note:**

The E5-MCPM-B card is a requirement for the **FTP** measurements feature. The **FTP** measurements feature uses the **E5-MCPM-B** ethernet ports to transfer measurements information directly to a **FTP** server.

Thermal Management

The E5-MCPM-B includes thermal management and alarming provisions to protect the card from damage if environmental conditions hinder thermal stability.

When the CPU temperature rises above nominal range and exceeds a thermal threshold (Temperature Level1) a major alarm is raised against the card. When the temperature returns to its nominal range (below Temperature Level1) the alarm is automatically cleared.

If the temperature continues to increase and exceeds a second thermal threshold (Temperature Level2) a critical alarm is raised against the card. When this second thermal event occurs, the result is a local processor outage (LPO) and critical thermal alarm on the primary MCP will initiate a role change arbitration with the secondary MCP, which may or may not result in a role change. The state of card will transition to 'in-service abnormal' state. If the temperature recedes under the Temperature Level2 threshold, the LPO condition is cleared and the card can begin operation again.

If the CPU temperature goes above operating limits (approximately 99°C), the CPU will halt and the card will shut itself down to prevent permanent, catastrophic damage. In the event of thermal shutdown all processor activity will cease. If thermal shutdown occurs, the E5-MCPM-B must then be reseated and allowed to load in order to clear the alarm and resume operation.

[Table 3-22](#) identifies the appropriate responses.

Table 3-22 Thermal Alarm Conditions

Board Temperature	Actions
Temp1 Exceeded	Major alarm raised
Temp2 Exceeded	Critical alarm raised; If the card is the primary MCP, a role change will be initiated. Card state transitions to IS-ANR.
Temperature abated	Normal operation restored
Thermtrip - shutdown temperature exceeded	CPU shuts down automatically. Card must be reseated to restore operation once temperature returns to normal operating conditions

The thermal thresholds (Temperature Level1 and Temperature Level2) are user configurable. The user configurable T1 and T2 values will always be less than or equal to the T1 (max) and T2 (max) defined for a particular board type respectively. See [Table 3-23](#) and the `chg-th-alm` command for more details on thermal thresholds.

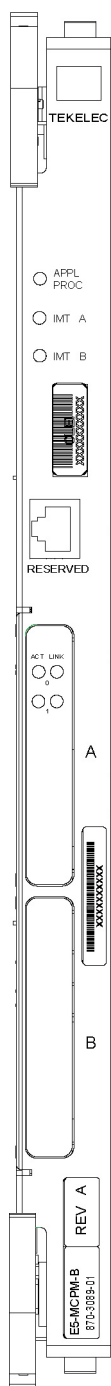
Table 3-23 T1 and T2 temperature thresholds

Cards	T1 Max (in Celsius)	T2 Max (in Celsius)	User Configurable T1 range (in %)	User Configurable T2 range (in %)
E5-MCPM-B	83	90	(73-92)% of T2 max	(74-100)% of T2 max

Alarms and LEDs

The E5-MCPM-B includes three front panel indicators (LEDs) for **APPL** Proc operation, IMT A, and IMT B status. In addition, four front panel LED Act/Link indicators (two for each IP port used). The Link indicator will illuminate Green when the interface is connected to an active Ethernet device and is Off when not connected. The Activity indicator will be Green when the IP signaling links are active and synchronized and RED otherwise.

Figure 3-40 E5-MCPM-B



Front Faceplate LED Indicators

LED	Status	Description
APPL PROC	Off	No power
	Red	Card is booting
	Amber	Card is loading
	Green	Card is up and application is running
IMT A	Red	Not connected to bus
	Amber	Testing not complete
	Green	Active and connected to the bus
IMT B	Red	Not connected to bus
	Amber	Testing not complete
	Green	Active and connected to the bus
ACT	Red	Loss of signal
	Green	Signal active
LINK		NOT USED

Technical Specifications

Table 3-24 E5-MCPM-B Technical Specifications

Physical Characteristics	
Height	14.43 in. (36.65 cm)

Table 3-24 (Cont.) E5-MCPM-B Technical Specifications

Physical Characteristics	
Width	1.013 in. (2.57 cm)
Depth	12.80 in. (32.51 cm)

3.7.12 E5-SM8G-B Module

The E5-SM8G-B (P/N 870-2990-xx) is a database service module (**DSM**) designed to operate in the EAGLE shelf. The E5-SM8G-B is a double-slot card with 8GB of total memory. It provides global title functions required for Local Number Portability (LNP), all Signaling Connection Control Part (SCCP), which is part of Global Title Translation (GTT), and Generic Load Services (GLS) which is part of Gateway Screening.



Note:

All E5-based cards require **HIPR2**. For more information, see [High-Speed IMT Packet Router 2](#).

The **E5-SM8G** (P/N 870-2990-xx) is a database service module (**DSM**) designed to operate in the EAGLE shelf. The E5-SM8G provides the following for the EAGLE system:

- Support for the VSCCP features
- SS7 traffic exchange between B,C,D links and the IP network
- Support for the 150K TPS GTT and 75K TPS G-Port features
- Enhanced bulk download

The E5-SM8G-B has the following requirements and dependencies:

- Requires HIPR2 to be active on both IMT buses in the shelf where the E5-SM8G-B will reside.
- Requires the Message Flow Control (MFC) feature to be active.
- Requires a fan tray assembly for thermal management.
- The E5-SM8G-B is restricted from accessing the IMT bus through hardware control.
- Can replace a DSM in the control or extension frame without requiring additional provisioning.
- Can interoperate with DSMs at an operating capacity of 850, 1100, or 1700 transactions per second (TPS).
- Can also interoperate with two channel LIM cards per node. The E5-SM8G-B provides two physical 10/100/1000 Mbps Ethernet ports.

Thermal Management

The E5-SM8G provides thermal management and alarming provisions to protect the card from damage due to overheating. The E5 SM8G contains a thermal monitor with software selectable thresholds for temperature abnormal levels. Threshold crossings generate alarms

accompanied by application processor interrupts. These interrupts require the mitigation of the temperature rise to resume normal card operations interrupted by the threshold crossings. The E5-SM8G is designed to operate in the EAGLE shelf with natural convection cooling and does not require a fan tray for cooling.

When the CPU temperature rises above nominal range and exceeds a thermal threshold, a major alarm is raised against the card. When the temperature returns to its nominal range the alarm is automatically cleared.

If the temperature continues to increase and exceeds a second thermal threshold, a critical alarm is raised against the card. When this second thermal event occurs, the result is a local processor outage (LPO) and outstanding grant requests shall be completed but no new grant requests shall be accepted, an LPO will take the card out-of-service. If the temperature recedes under the threshold, the LPO condition is cleared and the card can begin operation again.

If the CPU temperature goes above operating limits (approximately 125°C), the CPU will halt and the card will shut itself down to prevent permanent, catastrophic damage. In the event of thermal shutdown all processor activity will cease. If thermal shutdown occurs, the E5-SM4G must then be reseated and allowed to load in order to clear the alarm and resume operation.

Table 3-25 Thermal Alarm Conditions

Board Temperature	E5-SM8G Actions
Temp Level 1 Exceeded	Major alarm raised
Temp Level 2 Exceeded	Critical alarm raised; outstanding grant requests shall be completed but no new grant requests shall be accepted; card state set to out-of-service, maintenance fault.
Temperature abated	Normal operation restored.
Thermtrip - shutdown temperature exceeded	CPU shuts down automatically. Card must be reseated to restore operation once temperature returns to normal operating conditions

The thermal thresholds (Temperature Level1 and Temperature Level2) are user configurable. The user configurable T1 and T2 values will always be less than or equal to the T1 (max) and T2 (max) defined for a particular board type respectively. See [Table 3-26](#) and the `chg-th-alm` command for more details on thermal thresholds.

Table 3-26 T1 and T2 temperature thresholds

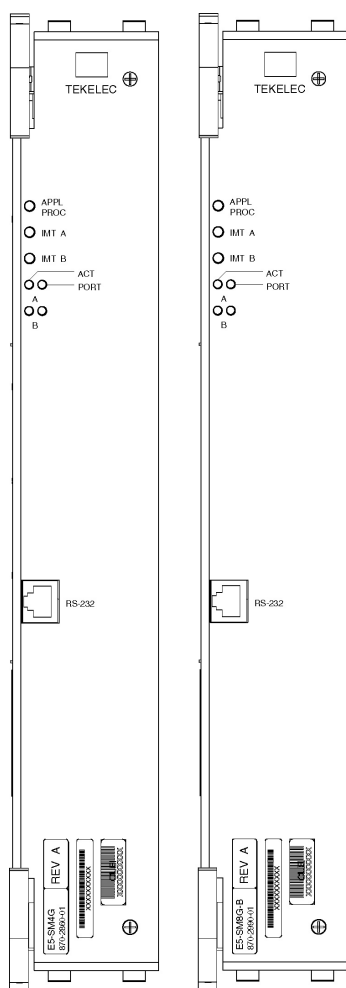
Cards	T1 Max (in Celsius)	T2 Max (in Celsius)	User Configurable T1 range (in %)	User Configurable T2 range (in %)
E5-SM4G	92	95	(73-92)% of T2 max	(74-100)% of T2 max
E5-SM8G-B	83	90	(73-92)% of T2 max	(74-100)% of T2 max

Alarms and LEDs

Three LEDs provide conventional EAGLE card indications of APPL Proc operation, and IMT A and IMT B operation. Four (4) LEDs, two for each port, are used to indicate port and signaling link status.

Table 3-27 Front Faceplate LED Indicators

LED	PORT	ACT
RED		No signal detected
GREEN	Data link active operating at 10/100 Mbps	Signal detected
AMBER	Data link active operating at 1 Gbps	
OFF	Card non-functional	Card non-functional

Figure 3-41 E5-SM8G-B LED Indicators**Front Faceplate LED Indicators**

LED	Status	Description
APPL PROC	Off	No power
	Red	Card is booting
	Amber	Card is loading
	Green	Card is up and application is running
IMT A	Red	Not connected to bus
	Amber	Testing not complete
	Green	Active and connected to the bus
IMT B	Red	Not connected to bus
	Amber	Testing not complete
	Green	Active and connected to the bus
ACT	Off	Card non-functional
	Red	No signal detected
	Green	Signal detected
PORT	Off	Card non-functional
	Amber	Data link active operating at 1 Gbps
	Green	Data link active operating at 10/100 Mbps

Interface Cable Adapter

An adapter, P/N 830-1104-03, and a CAT 5E cable may be used in place of the existing DCM cable. The adapter is connected to the backplane and the RJ-45 CAT 5E cable is connected from the other side of the adapter to a switch, or a hub, or a patch panel (same place the DCM cable was terminated).

An adapter, P/N 830-1104-xx, and a CAT 5E cable may be used in place of the existing DCM cable. The adapter is connected to the backplane and the RJ-45 CAT 5E cable is connected from the other side of the adapter to a switch, or a hub, or a patch panel (same place the DCM cable was terminated).

Technical Specifications

Table 3-28 E5-SM8G-B Technical Specifications

Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	2.06 in. (5.23 cm)
Depth	12.80 in. (32.51 cm)

3.7.13 Air Management Card

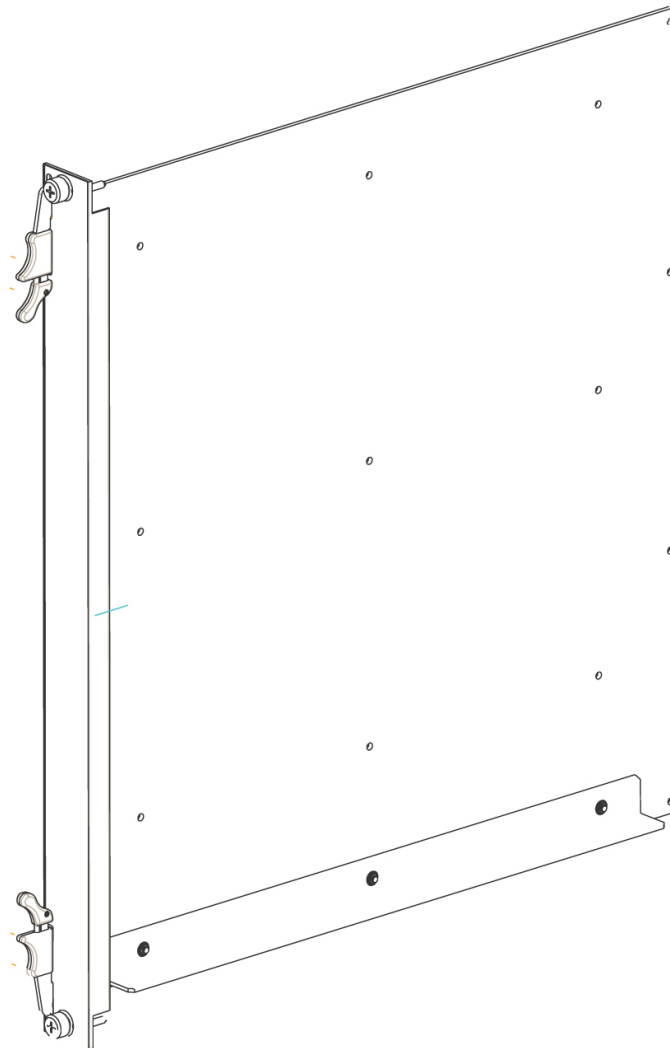
The Air Management (P/N 870-1824-02) card is an unpowered filler card used to ensure efficient air flow in shelves equipped with fans. Air Management cards are required in all empty slots in the shelf immediately above the fan assembly.



Note:

See "Hardware Baseline Table" in *Release Notes* for compatible fan assembly part numbers.

Figure 3-42 Air Management card



3.7.14 Fan Tray

The **EAGLE** fan tray contains three -48V fans that provide a redundant airflow for thermal management of the shelf. The **EAGLE** fan tray is powered by -48 VDC, at a fused rating of 3A. It has redundant power inputs (A and B). Each input is provided by a **DB-9**, keyed, positive locking connector. The contacts have 30 micro-inches of gold plating.

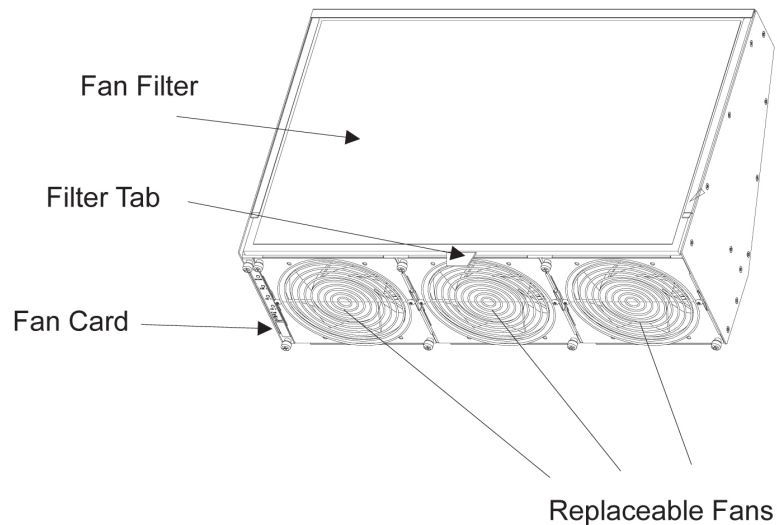
 **Note:**

Shelves with **HCMIM**, **E5-ENET-B**, **E5-ATM-B**, **E5-MCPM-B**, **E5-SM8G-B** or **SLIC** cards are required to be cooled by a fan tray.

 **Note:**

See "Hardware Baseline Table" in *Release Notes* for compatible fan tray part numbers.

Figure 3-43 Fan Tray



Failover is governed by a fan controller card on the fan tray. The fan tray will provide adequate airflow if there is a single fan failure or during replacement of one of the three fans while the **EAGLE** fan tray is operational. The control card bracket provides mounting for the control **PCB** (P/N 850-0703-01). The control **PCB** inserts into the front face of the fan tray on card guides mounted to the left side wall, and is intended to be a field replaceable item.

The **EAGLE** fan tray is designed to be field installable, with mounting brackets, in both a Heavy Duty frame and a standard frame. There is one disposable air filter in the assembly (P/N 551-0032-01). The filters should be changed once a month.

The **EAGLE** fan tray is designed to be compliant to Bellcore Standards **GR-63-CORE**, **GR-78-CORE**, and **GR-1089-CORE** when mounted in a Heavy Duty Frame or standard frame. The **EAGLE** fan tray is also designed to be **UL** and **CE** compliant. The **EAGLE** fan tray is designed to operate in a Central Office environment with continuous operation at -5C to 50C and 5% to 90% **RH** in compliance with **GR-63-CORE**.

3.8 Fuse and Alarm Panels

The Fuse and Alarm Panel (**FAP**) provides protected distribution of -48VDC power to the shelves in the frame. The site voltage input to each frame should be between -40VDC and -57.5VDC. Allowing for the full population of a frame and for the failure of one primary supply, new installations of Control and Extension frames require two 60A feeds. See the "Hardware Power Calculator Tool" section in *Hardware* for more information.

The **FAP** is installed at the top of the frame and uses two cables to bring A and B power to the frame. The **FAP** contains two separate circuits, A and B. Current flows

from the input terminals to the fuse bus. Protection is provided by fuses placed in fuse holders on the front panel. When a fuse is installed in a fuse holder, the circuit is completed to the output connector.

 **Warning:**

Existing frames that are fused at 40 amps may be upgraded to support 60 amps with a FAP upgrade kit. Frames that contain HC-MIMs must be upgraded to support 60 amps. Customers do not perform a FAP upgrade; these upgrades are performed by Oracle Communications personnel.

 **Warning:**

The FAP P/N 870-1606-02 Revs A-B can be upgraded to FAP P/N 870-1606-02 Rev C with FAP upgrade kit P/N 840-0139-01. The FAP P/N 870-2320-01 Revs A-I can be upgraded to FAP P/N 870-2320-01 Rev J with FAP upgrade kit P/N 870-0139-02.

 **Caution:**

All personnel associated with the installation of this system must adhere to all safety precautions and protection equipment required to avoid the possibility of injury to personnel, service degradation, and/or service interruption.

 **Caution:**

This is a redundant system to allow service during normal maintenance. When repairs require a total power disconnect, both input supply sources must be disconnected. This will cause service interruption and take down the system.

3.8.1 Fuses

The fuse and alarm panel uses **GMT**-type fuses of different amperage ratings for individual circuit protection. If a frame circuit fuse is blown the alarm is indicated by an **LED** on the front panel and a small colored flag on the fuse shows the fuse that has failed (refer to [Figure 3-44](#)). Refer to *Maintenance* for procedures on replacing fuses and the **FAP** assembly.

 **Caution:**

Always use a fuse of the same type and amperage rating when replacing a failed fuse.

Figure 3-44 Fuse (GMT Brand Shown)

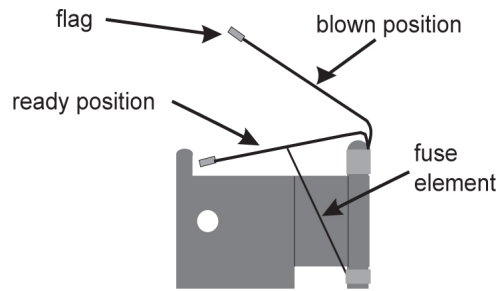


Table 3-29 Fuse Color Codes of Alarm Flags

Fuse Amp	Fuse Flag Color	Fuse Amp	Fuse Flag Color
0.18A	Orange-Red	2A	Orange
0.2A	Black-Red	2.5A	White-Orange
0.25A	Violet	3A	Blue
0.33A	Yellow-Green	3.5A	White-Blue
0.375A	White-Green	4A	White -Brown
0.5A	Red	5A	Green
0.65A	Black	7.5A	Black-White
0.75A	Brown	10A	Red-White
1A	Gray	12A	Yellow-Green
1.33A	White	15A	Red-Blue
1.5A	White-Yellow		

3.8.2 Fuse and Alarm Panel (P/N 870-2804-01)

The FAP (P/N 870-2804-01) is a low-profile (1U) unit that can be installed in the Control Frame (CF) and the Extension Frame (EF).

The Power Alarm LED indicates the input power state to the FAP. The LED is green when input power is applied to that bus of the FAP and is red when there is no input power to that bus of the FAP. An unlit Power Alarm LED indicates a failed LED or no input power to either bus of the FAP.

Alarm LEDs to indicate Critical, Major, and Minor alarms are located to the left of the diode board. The LEDs indicate alarms generated by the system that are applicable to that frame which the FAP is installed.

The FAP contains a Diode board and a Shorting board. These boards are located at the front center of the FAP. The FAP also contains two fuse blocks, one to the left (A-side) and one to the right (B-side) of diode and shorting boards, consisting of 20 fuse positions each. The Fuse Alarm LED indicates the failure of a fuse.

The diode board in the FAP contains power diodes and circuitry which allow one bus to pick up the entire load when there is a loss of input power on the other bus.

The Shorting board allows the removal of the diode board without taking down the system. This permits periodic maintenance of the diodes without having to power

down or remove the unit from the shelf. For maintenance operation, the Shorting board has to be removed, flipped over, and reinstalled. In the bypass position, both A and B power is connected to the fuse blocks so the diode board can be safely removed. The Shorting board has an LED which is off when the board is in normal operational mode and is green when in the bypass mode of operation. With the Shorting board in the bypass mode, the OR'ing function is not available. Refer to *Maintenance* for additional information to place the FAP into Maintenance Mode of operation.

Figure 3-45 and Table 3-30 describes the front panel configuration of the fuse and alarm panel (P/N 870-2804-01).

Figure 3-45 Fuse and Alarm Panel - Front View (P/N 870-2804-xx)

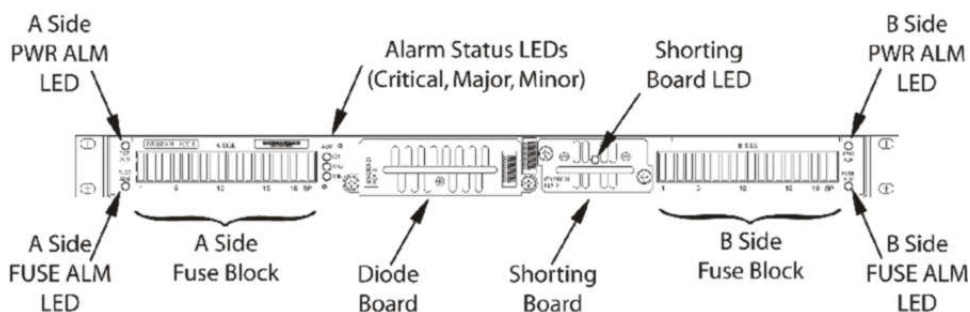


Table 3-30 Fuse and Alarm Panel Front Items (P/N 870-2804-xx)

Fuse Panel Item	Description
Fuse Positions	Two groups of 20 GMT fuses
Shorting Board LED	LED indicator for shorting board.
Fuse Alarm	LED indicator for fuse fail alarm
Power Alarm	LED indicator for input power
Critical Alarm	LED indicator for critical alarm
Major Alarm	LED indicator for major alarm
Minor Alarm	LED indicator for minor alarm

Table 3-31 presents possible alarm LED states and corresponding fuse conditions.

Table 3-31 Fuse State and LED condition (P/N 870-2804-01).

Fuse State A side	Fuse State B side	Fuse LEDs A side	Fuse LEDs B side
No fuses blown	No fuses blown	Green	Green
No fuses blown	At least 1 fuse blown	Green	Red
At least 1 fuse blown	No fuses blown	Red	Green
At least 1 fuse blown	At least 1 fuse blown	Red	Red
Shorting board enabled (in bypass mode), Shorting board LED is green.		Red	Red

Table 3-31 (Cont.) Fuse State and LED condition (P/N 870-2804-01).

Fuse State A side	Fuse State B side	Fuse LEDs A side	Fuse LEDs B side
Shorting board in normal operational mode, Shorting board LED is off. No fuses blown.		Green	Green

Figure 3-46 and Table 3-32 describes the rear panel configuration. Refer to *Installation* for cabling connection information.

Figure 3-46 Fuse and Alarm Panel Rear (P/N870-2804-01).

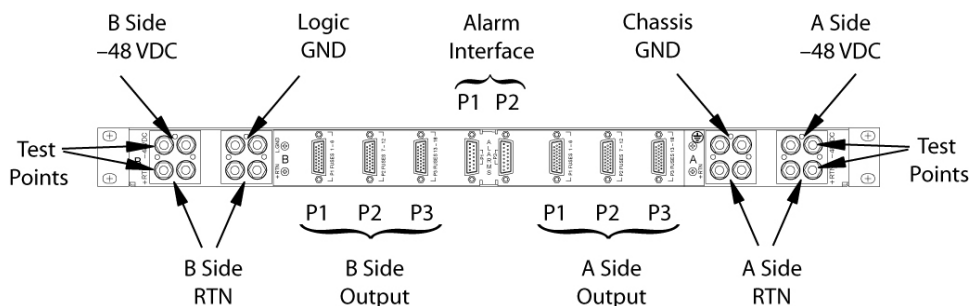


Table 3-32 Fuse and Alarm Panel Rear Items (P/N870-2804-01).

Fuse Panel Item	Description
Input Terminal Block A	Input and Return for power source A and FAP Chassis Ground
Input Terminal Block B	Input and Return for power source B and FAP Logic Ground
-48VDC Outputs A	26-pin "D" connectors for A-side outputs: <ul style="list-style-type: none"> • P1 - Fuses 1 through 6 • P2 - Fuses 7 through 12 • P3 - Fuses 13 through 18
-48VDC Outputs B	26-pin "D" connectors for B-side outputs: <ul style="list-style-type: none"> • P1 - Fuses 1 through 6 • P2 - Fuses 7 through 12 • P3 - Fuses 13 through 18
Alarm Interface	15-pin "D" connectors: <ul style="list-style-type: none"> • P1 to the EAGLE • P2 to a power distribution breaker panel

Table 3-33 presents the power requirements and physical dimensions for the FAP.

Table 3-33 Fuse and Alarm Panel Specifications (P/N 870-2804-01).

Dimensions	
Height	1.75 inches (4.4 cm)
Width	21.5 inches (53.8 cm)
Depth	10 inches (25 cm)

3.8.3 Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx)

The **FAP** P/N 870-1606-xx can be installed in standard frames. The FAP P/N 870-2320-xx can be installed in heavy duty frames.

The FAP contains an alarm board, two diode boards, and a jumper board. These boards are located at the front center of the FAP. The fuse holders are to the left and right of these boards as shown in [Figure 3-47](#).

The alarm board contains a FUSELED to indicate a failed fuse (for either bus A or B) and LEDs to indicate Critical, Major, and Minor alarms generated by the system that are applicable to that frame which the FAP is installed.

There are two diode boards in the FAP, one for bus A and one for bus B. Each diode board contains power diodes and circuitry which allow one bus to pick up the entire load when there is a loss of input power on the other bus. An LED indicates the input power state to the FAP. The LED is green when input power is applied to that bus of the FAP and is red when there is no input power to that bus of the FAP.

The Maintenance (Jumper) board allows the removal of one or both diode boards without taking down the system. The Jumper board has two connectors and a connector plug. During normal operation, the connector plug is seated on the first connector. For maintenance operation, the jumper board has to be removed and the connector plug moved to the second connector. In the maintenance position, the connector plug connects both A and B power feeds to the fuse panels so one or both diode boards can be safely removed. The OP/MAINTLED is green when the Jumper board is in normal operational mode and is red when in the maintenance mode of operation. Refer to *Maintenance*.

[Figure 3-47](#) and [Table 3-34](#) describes the front panel configuration of the fuse and alarm panel (P/N 870-1606-xx/870-2320-xx).

Figure 3-47 Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Front

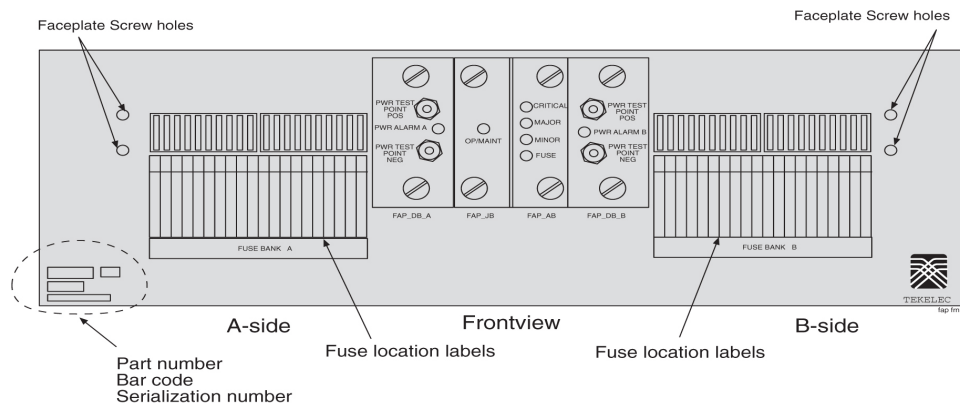


Table 3-34 Fuse and Alarm Panel Front Items

Fuse Panel Item	Description
Fuse Positions	Two groups of 20 GMT fuses
PWR ALARM	LED indicator for A or B diode board input power <ul style="list-style-type: none"> Green - input power applied Red - no input power to board
OP/MAINT	LED indicator for mode of operation <ul style="list-style-type: none"> Green - normal Red - maintenance
FUSE	LED indicator for fuse fail alarm <ul style="list-style-type: none"> Green - normal Red - blown fuse
CRITICAL	LED indicator for frame critical alarm
MAJOR	LED indicator for frame major alarm
MINOR	LED indicator for frame minor alarm

Figure 3-48 and Table 3-35 describes the rear panel configuration of fuse and alarm panel (P/N 870-1606-xx). Refer to *Installation* for cabling connection information.

Figure 3-48 Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear

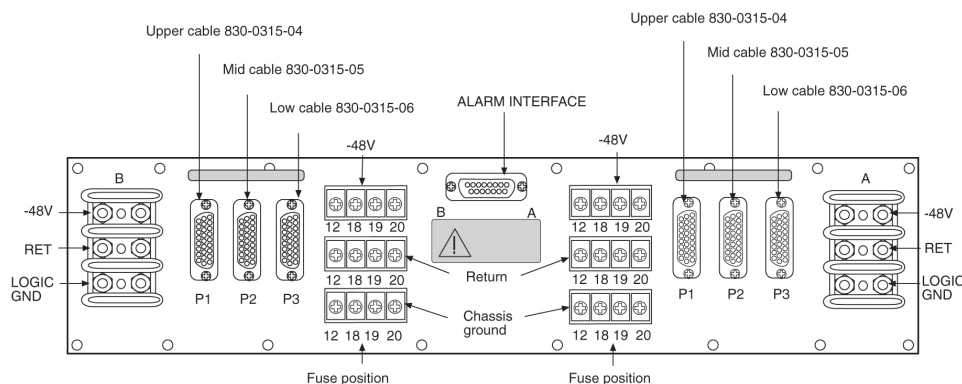


Table 3-35 Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear

Fuse Panel Item	Description
Input Terminal Block A	Logic Ground, Return, and Input for power source A
Input Terminal Block B	Logic Ground, Return, and Input for power source B
Output Terminal Block A	-48VDC, Chassis Ground, and RTN for Fuse location 12, 18, 19, and 20 for side A. These are miscellaneous extra capacity fuses refer to Provision Rules for FAP Fuse Locations .

Table 3-35 (Cont.) Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear

Fuse Panel Item	Description
Output Terminal Block B	–48VDC, Chassis Ground, and RTN for Fuse location 12, 18, 19, and 20 for side B. These are miscellaneous extra capacity fuses refer to Provision Rules for FAP Fuse Locations
–48VDC, Chassis Ground, and RTN Outputs A	26-pin “D” connectors, P1, P2, and P3 for A-side outputs.
–48VDC, Chassis Ground, and RTN Outputs B	26-pin “D” connectors, P1, P2, and P3 for B-side outputs.

Table 3-36 Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Specifications

	Dimensions
Height	3 inches (7.6 cm)
Width	17 inches (43.2 cm)
Depth	10.25 inches (26 cm)

3.8.4 Provision Rules for FAP Fuse Locations

The following are provisioning rules for fuse placement apply to FAP P/N870-2804-xx:

- Maximum fuse size 3 amp.
- Fuse positions 19 and 20 not used.
- Power feed must originate from the same power source.
- Fuse and Alarm Panel Shorting board in bypass mode must be less than 40 amp per distributed output side.

These provisioning rules for fuse placement apply to **FAPs** P/N 870-1606-xx and P/N 870-2320-xx.

- Maximum fuse size 3 amp for Fuse one through Fuse 18 when P1, P2, or P3 are used for power output
- P2 cannot be used if the Terminal Strip (output) position 12 is used.
- P3 cannot be used if the Terminal Strip (output) position 18 is used.
- Fuse maximum of 15 amp for fuse positions 12, 18, 19, and 20, all other fuse positions are 3 amp.

 **Note:**

For fuse locations 12, 18, 19, and 20, the fuse maximum is 10 amp when adjacent locations are used.

- Power feed must originate from the same power source.
- Fuse and **Alarm** Panel, Jumper Board (P/N 870-1641-01) fuse size on boards 40 amp per side for P/N 870-1606-02 Rev A and B, and for P/N 870-2320-01 Rev A through I.

Fuse size on boards 60 amp per side for P/N 870-1606-02 Rev C and 870-2320-01 Rev J.

- Fuse and **Alarm** Panel, Jumper board in maintenance mode must be less than 40 amp per distributed output side.

3.9 Holdover Clock

Figure 3-49 Holdover Clock, Card Location

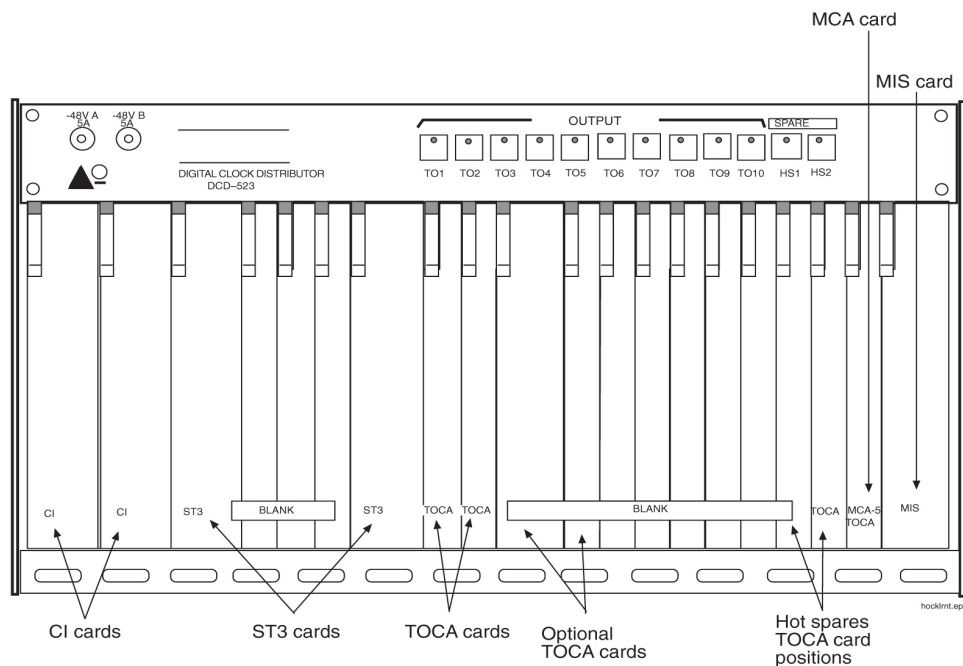
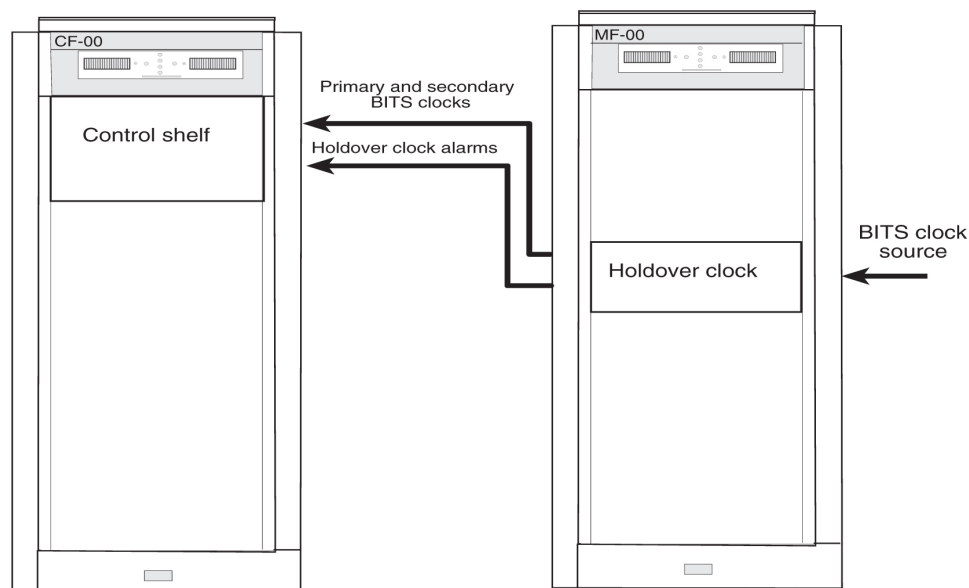


Figure 3-50 Holdover Clock, Frame Connections



Maintenance Interface System Card

The Maintenance Interface System (**MIS**)(P/N 804-0175-01) card provides local and remote command and control for the holdover clock. The **MIS** card is installed in the far right slot of the holdover clock shelf (refer to [Figure 3-51](#) for an **MIS** card block diagram).

The **MIS** provides Data Carrier Detect (**DCD**) alarm summary with office and remote alarm relay closures and status indicators, as well as remote **RS-232** communication.

Output alarms from the Timing Output Composite Clock Automatic (**TOCA**) cards, input reference alarms from the clock inputs, and failure alarms from any card in the shelf are sent to the **MIS** card. Status indications including clock loss and port alarms are also monitored by the **MIS** card.

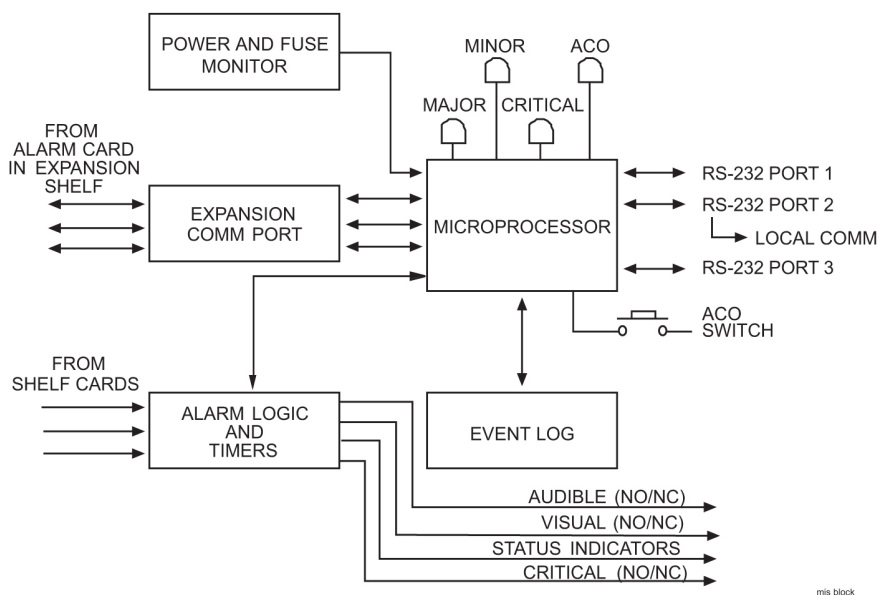
Depending on which alarms are received, the **MIS** activates audible and visual alarm and Status Indicator (**SI**) outputs. An additional set of status leads on the back enables either a major, minor, or critical alarm in the event of the failure of a battery or blown fuse.

 **Note:**

Major, minor, and critical alarm leads have both Normally Open (**NO**) and Normally Closed (**NC**) dry relay contacts. Major, minor, and critical status indicators have **NO** relay contacts only. All other Status Indicators are open-collector outputs between the **SI** lead and battery return.

Alarm battery supply is not required for the system. When **DC** power is lost to the shelf, the normally open relays close, initiating an office alarm (refer to [Figure 3-51](#)).

Figure 3-51 Maintenance Interface System Card Block Diagram



A front-panel **Alarm Cut Off (ACO)** push button, when pressed, silences the audible alarm and lights the **ACO** lamp. The **ACO** push buttons on all shelves in the system have the same effect. An external lead on the shelf backplane is provided for remote **ACO** operation.

The status of the shelf is available at the front panel lamps. A Major, Minor, or Critical lamp lights to indicate that one of those alarms exists on the shelf. The Fail lamp lights to indicate the **MIS** card has failed. The **Alarm Cut Off (ACO)** lamp lights when the **ACO** push button, is pressed to silence an audible alarm, before the alarm is cleared.

Critical Status Indicators Card

Two **Card Indicator (CI)**(P/N 804-0165-01) cards, provide input signal redundancy. Each **CI** card uses one Common **Channel (CC)** or one Digital Signal Level 1 (**DS1**) input as its timing reference. A switch on the **CI** card selects the type of input and the framing format, if **DS1**, of the input timing signal. Front panel lamps (**CC** and **DS1**) show which type of input is present.

Under normal operating conditions, **CI A** drives clock card A, and **CI B** drives clock card B. Both input reference signals are simultaneously monitored, and if an input fails, the clock card automatically switches to the other **CI** card, which then supplies both clock cards until the failed reference is restored. The **SOURCEACTIVE** lamp on the front panel indicates which **CI** card is on-line.

The **CI** card contains a source control circuit that causes the card to switch to the redundant **CI** card if the primary card, defined as the card currently in operation, fails.

Transfer between **CI** cards can be manually initiated by pressing the front-panel **XFR** switch on either **CI** card.

Switching activity between **CI A** and **CI B** will not cause the timing outputs to transmit phase hits, as the phase information of the active signal is transferred to the redundant **CI** card before switching. A Phase Locked Crystal Oscillator (**PLXO**) keeps the **CI** output stable while the transfer takes place. The **PLXO** also removes any phase jitter from the incoming signal before it passes the reference to the Timing Output Composite Clock Automatic (**TOCA**) cards.

If both **CI** cards fail, the clock cards go into holdover mode, and the system automatically uses the active clock card.

Stratum-3 Card

The Signal Transfer, Stratum-3 (**ST-3**) (P/N 804-0173-01) clock card provides timing signals at Stratum-3 accuracy to the **TOCA** cards. Select logic on each **TOCA** card automatically chooses the input timing signal of the highest priority.

The **ST-3** card is based on Phase Lock Loop (**PLL**) filtering and **VXCO** technology. The **ST-3** is a relatively wide-bandwidth, fast-tracking clock that provides the necessary jitter attenuations and holdover stability. The **PLL** output is compared to a Temperature-Compensated Oscillator (**TCXO**), and an offset is generated to phase lock to the clock input, A or B.

If an input source is unavailable or has failed, the circuit goes into clock holdover mode at the frequency of the last valid input. If the holdover clock is started without an input reference, the **ST-3** maintains accuracy at a predetermined rate.

If both **ST-3** cards fail, a major system alarm is issued and the **TOCA** cards use the output of the clock input cards.

A phase build out circuit between the two clock input cards, A and B, and each **ST-3** clock prevents transients from being transmitted to the Timing Output (**TOCA**) cards when there is a transfer between the two **ST-3** cards.

TOCA and TOLA Cards

A Timing Output Composite Clock Automatic (**TOCA**)(P/N 804-0166-01) card, provides 10 composite clock timing outputs. There is a third **TOCA** card in the hot spare slot.

A source select circuit obtains the timing signal from either **ST-3** clock card A or B. If no input timing signals are present, the **TOCA** card turns off both its **ST-3** and **INPUT** lamps, lights the **FAIL** lamp, and mutes the outputs.

A Phase Lock Loop (**PLL**) circuit reconstitutes the internal timing signal. The reconstituted Computer and Communications (**CC**) timing signal is then applied to each port driver and sent through an impedance matching transformer.

The outputs are fed to the interface panel.

If the **TOCA** card fails or the output monitor determines that one to five output drivers have failed or are shorted, the front panel **PORTALM** lamp lights, and a minor alarm is generated.

Whenever manual or automatic protection switching takes place, the **TOCA** cards automatically transfer option switch settings to the hot spare, **TOCA** card.

Note:

An **OEM** purchased Timing Output Logic Automatic (**TOLA**) can be used as a composite clock source. The output cable connections are different from the **TOCA** card pin outs. See *Installation* for instructions about cabling both the **TOCA** and **TOLA** clock outputs.

MCA Card

The Matrix Controller Automatic-5 card (**MCA**)(P/N 804-0251-01) controls the output protection switch matrix just above the holdover shelf and card slots on the hold over clock. It monitors the protection matrix push-button for activation. The **MCA** card requires the presence of at least one Hot Spare (**HS**) **TOCA** card in the slots provided immediately to the left of the **MCA**. Each holdover clock shelf contains slots for two hot spare **TOCA** cards.

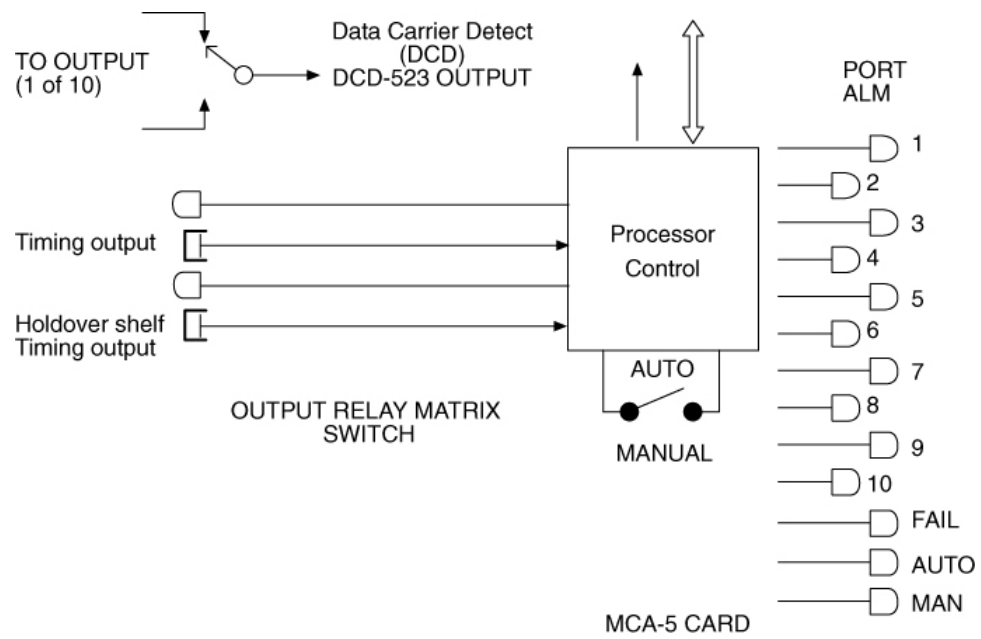
The **MCA** card monitors the protection matrix for activation and the **TO** cards for port and fail alarms. When an active **TO** card indicates a failure or is removed, the **MCA** activates the relays and lamps in the protection matrix and switches in the appropriate hot spare **TOCA** card, if installed.

To ensure that a hot spare **TOCA** card cannot be accidentally placed in service or accidentally taken out of service, activating the hot spare **TOCA** card requires that the **MCA** detect a timing output failure or the front panel be pressed in the correct sequence. In addition, no switch occurs if the **MCA** card is physically removed from the shelf.

Note:

The **MCA-5** can only switch from one **TOCA** to a hot spare **TOCA** at a time. There are six different **TOCA** card types and two hot spare **TOCA** slots per shelf.

Figure 3-52 MCA-5 Card and Output Protection Matrix



4

Hardware Descriptions - OEM-Based Products

4.1 OEM-Based Product Descriptions

Original Equipment Manufacturer (**OEM**)-based products use Common Off-The-**Shelf** (**COTS**) components configured in a standard or heavy-duty frame. Systems are configured at an Oracle Communications site for **NEBS** compliance and typically have redundant components for reliability and maintainability. **OEM**-based products support application specific services that interact with the **SS7** and **IP** networks.



Note:

Elements used in **OEM**-based products have components configured by Oracle Communications to conform to **Network Equipment-Building System (NEBS)** generic equipment requirements.



topple:

Systems with slide shelf mounted equipment must also be anchored to the overhead cable racks. Before beginning installation, ensure the frame is properly secured to the floor and overhead cable racks to prevent the frame from tipping over when the server slide shelves are extended.

4.2 OEM-Based Networking Elements

This section describes the common networking elements that can be used in **OEM**-based products. Networking elements of **OEM**-based products provide the connections and communications links for interworking between the **SS7** networks, local customer networks, and the Internet.



Note:

Some **OEM**-based products do not use all of the networking components, for example, the **MPS** systems. Use [Baseline Tables](#) to determine the specific components that can be configured in system releases.

Common networking components described in this section include:

- [Routers](#)

- [Ethernet Switches](#)
- [OEM-Based Peripheral Elements](#)

4.2.1 Routers

The routers used in **OEM**-based products are configured by Oracle Communications for **NEBS** compliancy. Two types can be configured; isolation routers and dial-in routers.



Note:

Some **OEM**-based products do not use routers, for example, the **MPS** systems. Use [Baseline Tables](#) to determine the specific components that can be configured in system releases.

The isolation routers provide 10/100Mbps communications between the customer **LAN** or dedicated network and the IP7 Front End, hubs, and host servers. [Figure 4-1](#) shows the front view of the routers and [Table 4-1](#) describes the **LED** indicator functions on the front of the router.

Figure 4-1 Front View Routers

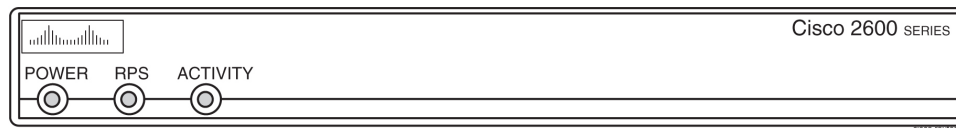


Table 4-1 Router Front LEDs

LED	Description
PWR	Indicates when power is present to the router and the power switch is in the ON position.
RPS (Always OFF)	Off when the redundant power supply is not present. On redundant power supply is present and functional.
Activity	Off-No network activity Blink-Network activity

[Figure 4-2](#) and [Figure 4-3](#) show rear views of the Isolation and Dial-In routers. **Link (LNK)** and activity (**ACT**) **LEDs** are located near each ethernet port at the rear of the routers. [Table 4-2](#) describes the **LED** indicators on the rear of the routers.

Figure 4-2 Rear View Isolation Router

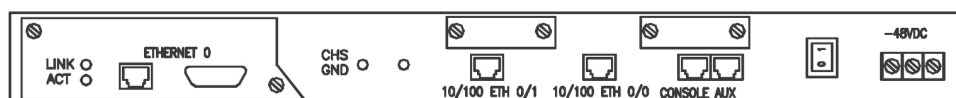


Figure 4-3 Rear View Dial-in Router

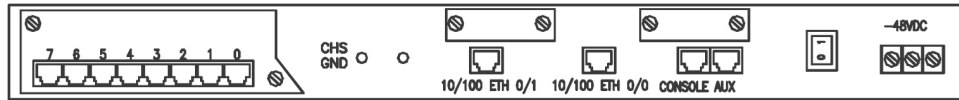


Table 4-2 Router Rear LEDs

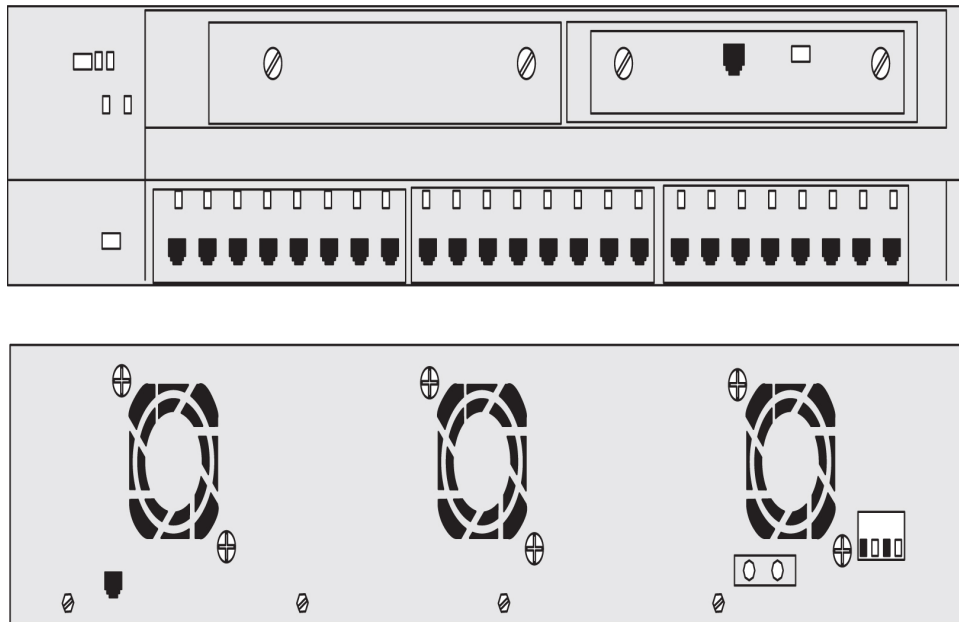
LED	Description
LNK	Indicates link is established to far end connection.
ACT	Blink-indicates data activity on the link.

4.2.2 Ethernet Switches

The following section provides an overview of the Ethernet **LAN** switches used in some **OEM** products. The ethernet switches cross-connect the components in the frames functioning as an internal **Local Area Network (LAN)**. The switches support 24 auto-sensing 10/100Mbps ports each.


[Figure 4-4](#) illustrates the front and rear of the Ethernet switch.

Figure 4-4 Ethernet Switch



[Table 4-3](#) describes the **LEDs** located on the front of the switches.

Table 4-3 Ethernet Switch LEDs

LED	Description
System	Green -Indicates when power is present to the switch and the power switch is in the ON position. Amber -Indicates power is present but system is not functioning properly
1 and 2	Indicates expansion boards WS-X2932-XL are installed and functioning LED 1 (Left board) LED 2 (Right board)
RPS (Always OFF)	Off when the redundant power supply is not present. Redudant power supply is not configured
Pressing the MODE switch on the front of the WS-C2924-XL-EN changes the per-port LED indications to the following.	
STAT (port status) Default	Off -No link. Solid green - Link present. Flashing green -Activity. Port is transmitting or receiving data. Alternating green/amber - Link fault. Error frames can affect connectivity, and errors such as excessive collisions, CRC errors, and alignment and jabber errors are monitored for a link-fault indication. Solid amber -Port is not forwarding. Port was disabled by management or an address violation or was blocked by Spanning Tree Protocol (STP).
<div style="border: 1px solid #0070C0; padding: 10px; background-color: #E6F2FF;"> <p> Note:</p> <p>After a port is reconfigured, the port LED can remain amber for up to 30 seconds as STP checks the switch for possible loops.</p> </div>	
UTL (utilization)	Green -The LEDs display backplane utilization on a logarithmic scuffle all port LEDs are green, the switch is using 50 percent or more of its total bandwidth capacity. If the right-most LED is amber, the switch is using less than 50 percent of its total bandwidth. If the LED to the left of the right-most LED is amber, the switch is using less than 25 percent of its total capacity, and so on.
FDUP (port full-duplex)	Off -Port is operating in half duplex. Green -Port is operating in full duplex.
100 (port speed)	Off -Port is operating at 10 Mbps. Green -Port is operating at 100 Mbps.

4.3 OEM-Based Peripheral Elements

Peripheral elements used in the **OEM**-based products are common components required to provide service functionality. Peripheral components described in this section are:

- [Breaker Panels](#)

4.3.1 Breaker Panels

The following section describes the components of the Telect Breaker Panels (**BP**) used in **OEM**-based products. The **BPs** provide the following features:

- Dual-feed power inputs (Input A and Input B) to each breaker panel, totalling four breakers for the system. (30-amp domestic or 32-amp international)
- Maximum of fourteen breakers each breaker panel
- Breaker panels accept circuit breakers up to 20 ampere rating
- Visual A and B input power alarms with single remote dry contact indicator
- Replaceable alarm card

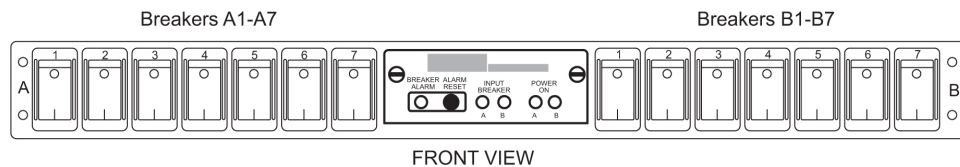


Note:

The drip tray, located under the breaker panels, is designed to assure compliance with **NEBS**, **UL**, and **CE** safety requirements, aiding damage control in the event of a fire. See [Figure 4-5](#) for the location of the breaker panel drip tray.

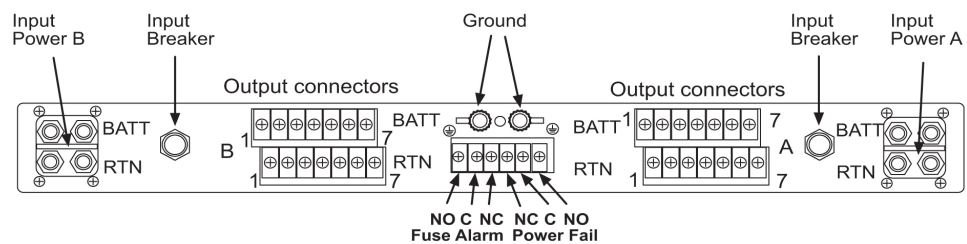
[Figure 4-5](#) shows the details of the front view of the breaker panel

Figure 4-5 Telect Breaker Panel Front View



[Figure 4-6](#) shows the rear details of the breaker panel.

Figure 4-6 Telect Breaker Panel Rear View



Note:

When breakers trip to the half-way position as a result of an overload they must be switched completely **OFF** then **ON** to reset.

Figure 4-7 provides details of the alarm panel on the Telect Breaker Panel.

Figure 4-7 Telect Breaker Panel Alarms

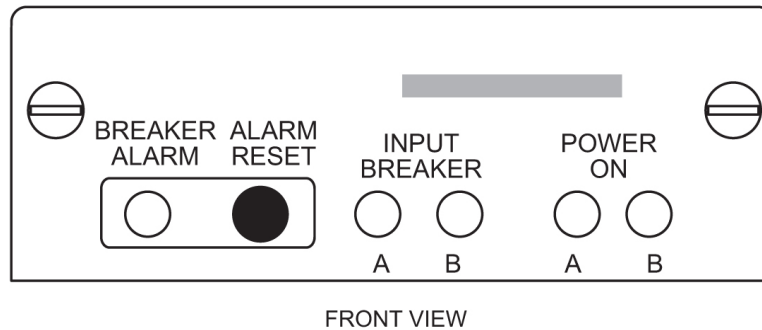


Table 4-4 lists the status LEDs on the Telect Breaker Panel.

Table 4-4 Breaker Panel LEDs

LED	Color	Description
Power On A	Green	Lights whenever Side A is receiving input power (LED will remain lit even if the input breaker has tripped)
Power On B	Green	Lights whenever Side B is receiving input power (LED will remain lit even if the input breaker has tripped)
Breaker Alarm	Red	Lights whenever an output circuit breaker has tripped or turned off
Input Breaker A/B	Green	Lights whenever Side A/B is receiving input power (Not lit if input breaker is tripped)

 **Note:**

If all breakers are not turned on, the alarm LED will light. To turn off the alarm LED, press **RESET** and the alarm LED will reset and turn off.

5

Site Engineering - EAGLE

5.1 Safety and Cautionary Information

NOT_SUPPORTED:

At least two people are required to safely move and position the frames.

NOT_SUPPORTED:

No commercially **AC** powered equipment may be used or placed within 7 ft. of – 48VDC equipment. This may create a shock or current loop that can be severely hazardous to personnel and equipment.



topple:

Frames with sliding shelves must be securely anchored to the floor and overhead frame racks. Extending a shelf without correctly anchoring the frame can cause it to topple, endangering personnel and damaging equipment.

5.2 Introduction

This chapter contains procedures for preparing the site for the installation of signaling products and is intended for use by personnel involved in planning and executing an installation. This chapter also provides power, environmental, and floor plan requirements relating to that installation.

This chapter covers only those areas unique to Oracle Communications systems and does not cover common telecommunications installation requirements.

5.3 Location

The system is designed to be installed and operated in a central office environment.

Local fire protection codes must be satisfied in the equipment room where the system is to be located.

5.3.1 Space Requirements

This system equipment is housed in 7 foot high, 23 inch wide, floor supported, unequal flange upright frames. Separator panels, and end panels add to the width of multiple frame systems.

The floor area taken up by this system is:

- 1 frame = 30 inches wide by 22 inches deep = 660 square inches (4.6 square feet)
- 2 frames = 62 inches wide by 22 inches deep = 1364 square inches (9.5 square feet)
- 3 frames = 94 inches wide by 22 inches deep = 2068 square inches (14.4 square feet)
- 4 frames = 126 inches wide by 22 inches deep = 2772 square inches (19.3 square feet)
- 5 frames = 158 inches wide by 22 inches deep = 3476 square inches (24.1 square feet)
- 6 frames = 190 inches wide by 22 inches deep = 4180 square inches (29 square feet)

The number of frames required for an installation is described in the Initial Sales Order for that site. The number of frames is determined by the space required by the module population of the system and optional items such as holdover clocks. See the *Planning Guide, STP, LNP, and LSMS* for information on populating the system.

When planning the installation, be sure to take into account spare module storage, modems, terminals, printers, cross connect panels, and all other items that might require space in a system.

5.3.2 Lighting

Adequate lighting should be provided in the room where the equipment is to be located. Lighting fixtures must be far enough from the equipment and cables to prevent heat damage and to allow safe access to equipment and cables.

5.3.3 Building Requirements

The building requirements for this system are standard telephony industry requirements for equipment installation.

The building must provide a clear, uncluttered route between the loading/receiving dock and the planned system location. In order to move the equipment to the proper location, recommended hall clearance is at least 4.5 feet (1.4 meters) wide by 8 feet (2.4 meters) tall.

Four foot, (1.2 meter) side aisles should be used to allow maneuvering frames into place and provide ample work space around the equipment.

The room selected for system installation should be large enough so the system frames can be at least 2.5 feet (76 cm) from the walls for front and rear access and at least 12 inches (31 cm) for side access.

5.3.4 Earthquake Resistance

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

5.3.5 Environmental Requirements

The environmental conditions for the system must be maintained to the following ambient temperature and humidity specifications:

- Normal operating temperature — +41° F to +104° F, (+5° C to +40° C)
- Maximum rate of temperature change — 15° F, (8° C)/hour
- Normal operating relative humidity — 5% to 85%
- Short-term relative humidity — 5% to 90% (not to exceed 0.024 kg of water per kg of dry air)
- Altitude — 200 feet (60 meters) below to 13,000 feet (3,900 meters) above sea level

 **Note:**

Short-term is a period of not more than 96 consecutive hours and a total of not more than 15 days in one year.

 **Note:**

Ambient is to conditions at a location 1.5 m (59 in) above the floor and 400 mm (15.8 in) in front of equipment.

 **Note:**

HIPR2 is fully NEBS compliant. However, if ambient temperatures above 40° C are likely, Eagle Fan Trays are recommended to ensure proper airflow to the upper HIPR2 cards in those shelves. See "Hardware Baseline Table" in *Release Notes* for compatible fan tray part numbers.

5.3.6 Heating Ventilation and Air Condition Requirements

To maintain the required temperature range, Heating, Ventilation, and Air Conditioning (**HVAC**) equipment should have the capacity to compensate for up to 1230 **BTUs/hr** for each installed system shelf.

The required **HVAC** capacity to compensate for a miscellaneous frame varies depending on the customer previously installed equipment. To calculate needed **HVAC** capacity, determine the wattage of the installed equipment and use the following formula: watts x 3.413 = **BTUs/hr**.

5.3.7 Floor Loading

It is recommended the floor or raised sub-flooring have a distributed load capacity of no less than 100 pounds per square foot (453 kg/m²). The floor loading is determined by using the following equation:

Total equipment weight/floor area = distributed floor capacity.

Following are the maximum weights of frames:

- Maximum weight of **EAGLE** Control or Extension frames: 850 lbs (386 kg).
- Maximum weight of a four E5-APP-B card frame with six Telco Switches: 500 lbs (226 kg).

See [Space Requirements](#) for the floor area of the combined system.

5.3.8 Grounding

The system operates as a digital isolated ground plane system in a central office environment and requires a single connection to the central office ground window. The system's ground bars and ground cables must provide the sole grounding connection between the entire system and the central office grounding.

The system uses three types of grounding paths:

- Battery return
- Frame/chassis ground
- Logic ground

Non-oxidizing grease will be applied to all lugs terminated on a copper system ground bar. Refer to [Figure 5-1](#).

The power return grounding path is the return path for all –48VDC loads in the system. This path is isolated from other system grounds and connects to the rest of the central office through the –48VDC return connections located on the Fuse and **Alarm Panel (FAP)** of each frame.

The frame/chassis ground path provides a low impedance connection for all metal parts of the entire system, including the frame, doors, card cages, and end panels. Each frame/chassis connection within the system lineup terminates to the frame and connects to the main ground bar by way of Htaps, #6 American Wire Gauge (**AWG**) to 1/0 cable.

The logic ground path provides a common voltage reference point between all circuit boards of an system. Each connection terminates to the system ground bar on the control frame.

The frame/chassis and logic ground paths are both noncurrent carrying paths.

warning:

The power (-48 **VDC**) and return connections of **FAP** (P/N 870-0243-08) and (P/N 870-1606-xx) are physically reversed at the input terminal. See [Figure 5-1](#) and [Figure 5-2](#) for wiring information.

Figure 5-1 Logic Grounding with FAP (P/N 870-0243-08)

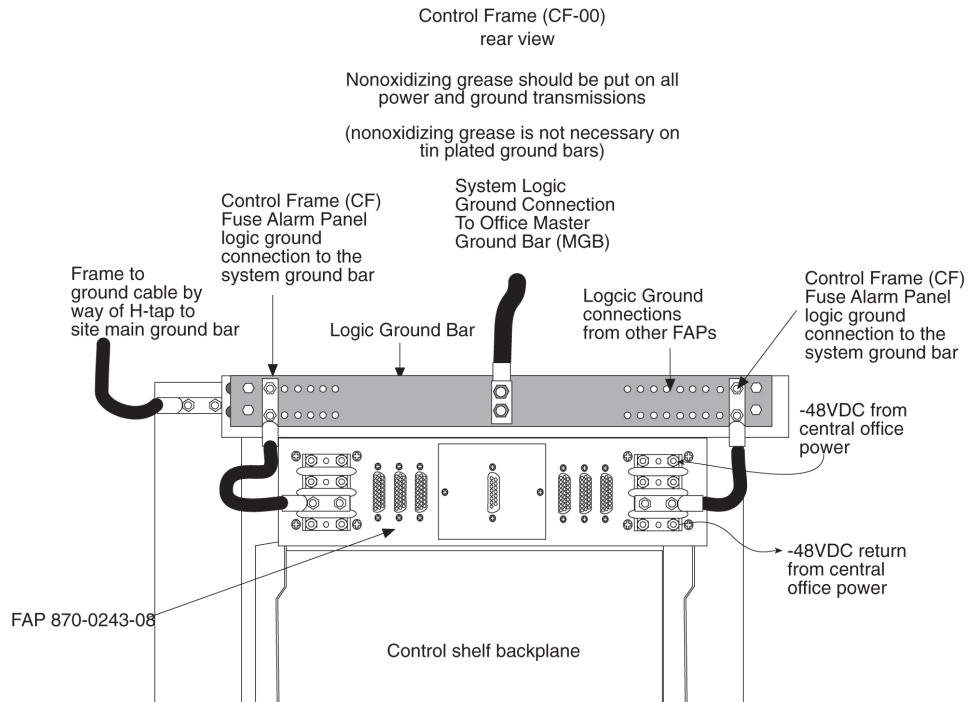
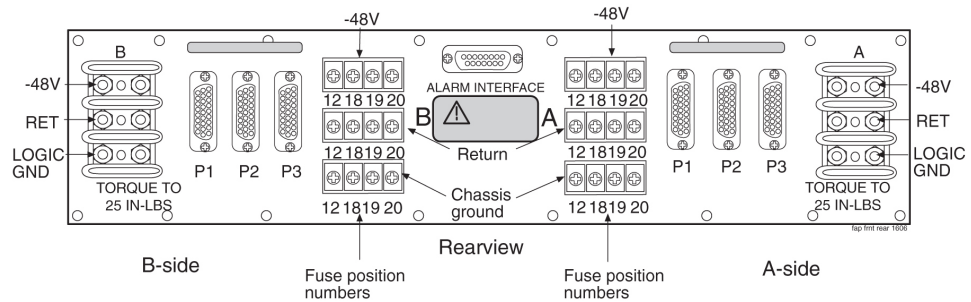
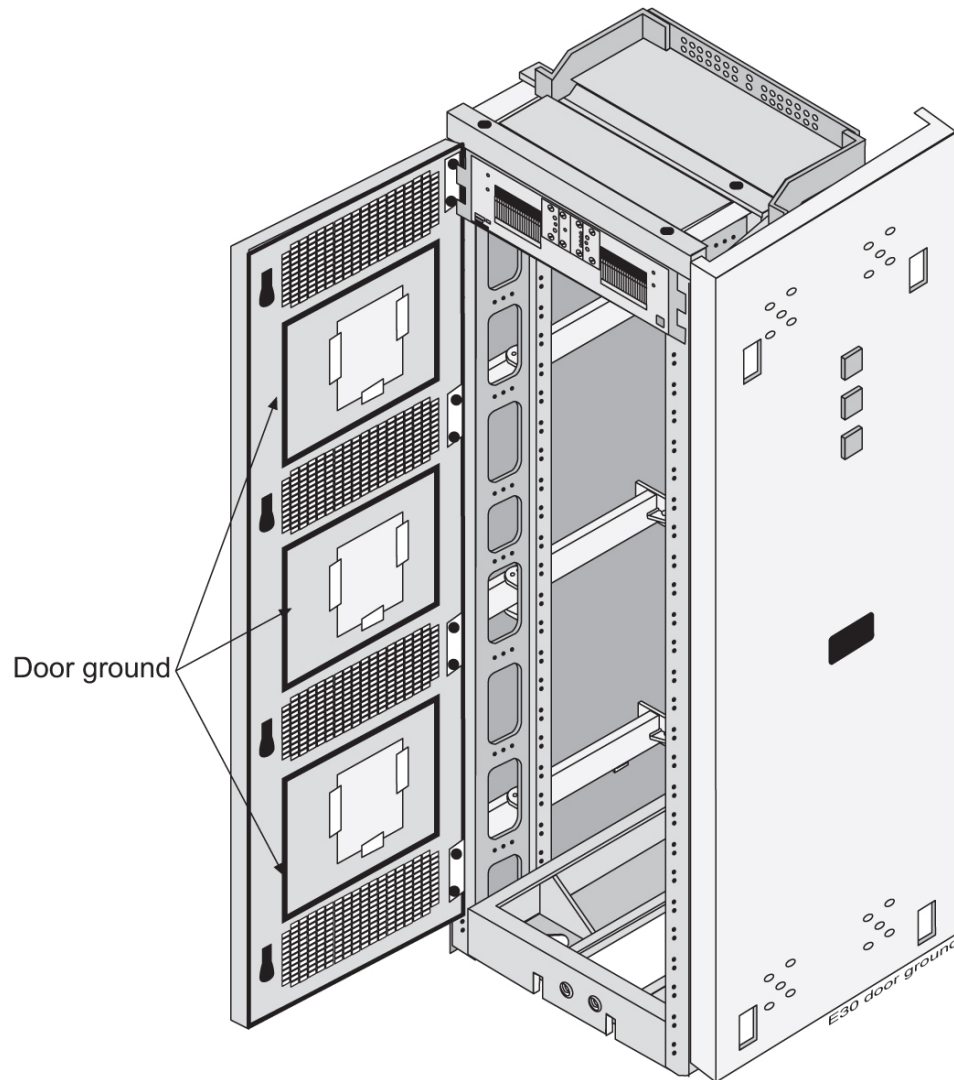


Figure 5-2 Logic Grounding with FAP (P/N 870-1606-xx/870-2320-xx)



The doors installed are grounded to the frame through a double lug ground wire (see [Figure 5-3](#)) and through a screw-down latch.

Figure 5-3 Door Grounding



5.3.9 Power Requirements

Each frame requires that power be provided from two fuses/breakers at -48VDC . Additional peripherals that require alternating current (for example but not limited to, terminals, printers, and modems) must be compatible with the system and have a separate ground from the frames.

Each frame is divided into A and B power buses. In the event of loss of power on one of the buses, the other bus must be able to supply current for the entire frame. Therefore, each bus requires wiring sized to handle up to the maximum amps at -48VDC , with a maximum voltage drop of 0.5 volts. To meet this specification you must:

- For new installations of Control and Extension Frames (as of Release 34.0) use 60 amp breakers (see note), the **ELAP** frames use 30 amp and 60 amp breakers, and the **EPAP** frames use 30 amp breakers. Local Alarms for the Frame's Power Distribution System are provided at each frame.

 **Note:**

Existing frames that are fused at 40 amps can be upgraded to support 60 amps with a **FAP** upgrade kit. 60 amps is required for frames that contain **HC-MIMs**.

- Use #6, two-hole, #10 Bolt, 5/8" on center lug with windows (P/N 502-0085-01) for fuse and alarm panel connectors.

 **Note:**

If breakers are tripped by an overload, they must be switched completely **OFF** and then **ON** to reset.

5.4 Populating the System

The number of frames, shelves, and modules needed to populate the system can be determined using the following procedures.

5.4.1 Hardware Power Calculator Tool

Fans are required for all shelves that contain E5-ENET-B, E5-ATM-B, E5-E1/T1-B, E5-MCPM-B, E5-SM8G-B, HCMIM, E5-APP-B cards or SLIC. Due to higher power B cards, dual 60 Ampere power feeds to a frame may be required depending on frame configuration.

The Frame Power Budget Alarm feature (R35) provides an alarm if the power consumption of cards in a frame nears the frame-level power capacity. The current capacity value can be provisioned in the Frame Power Threshold (FPT) table or a default value of 30 Amperes can be used (30 A through 60 A are values that can be used). The feature identifies the type of cards in a frame, calculates potential current consumption based on the frame-level population of cards, compares calculated current consumption to the frame-level current capacity figure, and raises alarms based on provisioned thresholds (90%, 95%, and 98%).

A Power Calculator Tool (SS005963) can be used to analyze current power requirements and to plan power requirements for future configurations.

This table summarizes the power usage of each component that can be installed in the EAGLE frame.

Table 5-1 Power Usage by Component

Component	Power (W)	Part Number
E5-APP-B	78	870-3096-XX
E5-ATM-B	34	870-2972-XX
E5-E1T1-B	32	870-2970-XX
E5-ENET-B	34	870-2971-XX
E5-MASP	58	7346924 870-2903-XX
E5-MCPM-B	32	870-3089-XX

Table 5-1 (Cont.) Power Usage by Component

E5-MDAL	12	7346923 870-2900-XX
E5-SM8G-B	63	870-2990-XX
Fan tray	125	890-0001-XX
HIPR2	18	7333484 870-2872-XX
SLIC	34	7094646
Telco Switch	120	870-2904-01

5.4.2 Message Flow Control (MFC)

With Message Flow Control (MFC), an EAGLE card can inform all EAGLE cards that it has reached the allotted capacity of a particular advertised service. MFC contains the concept of system and card groups, and the groups can go into flow control independently based on the flow of messages through MFC. MFC controls all traffic across the IMT bus.

MFC is a framework that allows features such as MTP3 to use MFC. Applications that use the MFC framework for message flow control between application cards include:

- MTP3 routing
- INM/SNM routing

Caution:

MFC can be used only with E5-based cards; however, it is required for E5-B type cards. Release 46.2 and later does not support TVG.

When a card determines that the rated capacity for a service is reached, it notifies all cards that the specified service is no longer available for the remainder of the time slice and specifies the time interval that defines the remainder of the time slice. When the time slice expires the service is automatically made available again on all cards. The tasks that use MFC are INM, SNM, Linkset Reroute, SCCP, and EROUTE.

There are two general types of MFC services:

- **Card Service Flow**
Control Card services are provided by a card and the capacity stated by that card only affects the usage of that card. If the capacity of a card service is exhausted, only the services on that card are affected. The client card can look to another card to provide the service. A card service is used when supporting a feature with an "N+1" configuration.
- **System Service Flow**
Control System services are provided by the system as a whole. The capacity of the system service is rated as the capacity of the system. Several cards may provide the same system service, and it is possible that each card will have a different rated capacity. When a service request is sent to a system service, it is sent to all cards that provide the service. The capacity of the system service is

limited to the rate of the lowest capacity card. If the capacity is exhausted on one card, the service for the whole system group is 'in flow control.' A system service is used when the available pool of resources must be limited by the weakest link (the card with the lowest rated capacity).

A

Hardware Baselines

A.1 Baseline Tables

The following tables list the configurable hardware components for each release. A bold X in a table cell indicates the component listed on the left is valid for the release indicated at the top of the column. To obtain configuration information about hardware and release compatibility for each release use:

- EAGLE Release 46.7 through 46.9 in [EAGLE Release 46.7 Through 47.0](#)
- EAGLE Cable Assemblies and Adapters:
 - E1 Cable Assemblies in [Table A-2](#)
 - T1 MIM LIM Cable Assemblies [Table A-3](#)
 - E5-ATM Adapters [s](#)
 - ENET Adapters [Table A-4](#)
 - Fast Copy Adapters [Table A-6](#)
 - Terminal/Printer Cables and Adapters [Table A-7](#)
 - Modem Cables and Adapters [Table A-8](#)
 - Application Server [Table A-9](#)
 - Application Server Serial Adapters [Table A-10](#)

 **Note:**

Exceptions, additions, and clarifications to the following tables are mentioned in table footnotes.

A.2 EAGLE Release 46.7 Through 47.0

Table A-1 Hardware Baseline EAGLE Release 46.7 through 47.0

NAME	PART NUMBER	REV	46.7	46.8	46.9	47.0
Air Management Card	870-1824-01	A	X ¹	X ¹	X ¹	X ¹
Air Management Card	870-1824-02	A	X ¹	X ¹	X ¹	X ¹
CTRL SHELF	870-0775-03 ²	E	X ³	X ³	X ³	X ³

Table A-1 (Cont.) Hardware Baseline EAGLE Release 46.7 through 47.0

NAME	PART NUMBER	REV	46.7	46.8	46.9	47.0
CTRL SHELF	870-2321-02	A	X ⁴	X ⁴	X ⁴	X ⁴
CTRL SHELF	870-2321-04	A	X ⁴	X ⁴	X ⁴	X ⁴
CTRL SHELF	870-2321-08 ⁴	A	X ⁴	X ⁴	X ⁴	X ⁴
CTRL SHELF	870-2377-01	A	X ⁵	X ⁵	X ⁵	X ⁵
CTRL SHELF	870-2377-02 ⁵	A	X ⁵	X ⁵	X ⁵	X ⁵
CTRL SHELF	7335031	N/A	X ⁵	X ⁵	X ⁵	X ⁵
E5-APP-B	870-3096-xx	A	X	X	X	X
E5-ATM-B	870-2972-01	D	X ⁶	X ⁶	X ⁶	X ⁶
E5-E1T1-B	870-2970-01	D	X ⁶	X ⁶	X ⁶	X ⁶
E5-ENET-B	870-2971-01	E	X ⁶	X ⁶	X ⁶	X ⁶
E5-MASP	870-2903-01	A	X ⁷	X ⁷	X ⁷	X ⁷
E5-MASP	870-2903-02	A	X ⁷	X ⁷	X ⁷	X ⁷
E5-MASP	7346924	N/A	X ⁷	X ⁷	X ⁷	X ⁷
E5-MCPM-B	870-3089-01	A	X ⁶	X ⁶	X ⁶	X ⁶
E5-MDAL	870-2900-01	C	X ⁸	X ⁸	X ⁸	X ⁸
E5-MDAL	7346923	N/A	X ⁸	X ⁸	X ⁸	X ⁸
E5-SM8G-B (Double-slot)	870-2990-01	A	X ⁶	X ⁶	X ⁶	X ⁶
EXTN SHELF	870-0776-02	C	X ⁹	X ⁹	X ⁹	X ⁹
EXTN SHELF	870-0776-03	D	X ⁹	X ⁹	X ⁹	X ⁹
EXTN SHELF	870-0776-06	A	X	X	X	X
EXTN SHELF	870-0776-07	A	X	X	X	X
EXTN SHELF	870-0776-08	A	X	X		
EXTN SHELF	870-0776-11	A	X	X	X	X
EXTN SHELF	870-2378-01	A	X ¹⁰	X ¹⁰	X ¹⁰	X ¹⁰
EXTN SHELF	870-2378-02	A	X ¹⁰	X ¹⁰	X ¹⁰	X ¹⁰
EXTN SHELF	7335033	N/A	X ¹⁰	X ¹⁰	X ¹⁰	X ¹⁰
FAP	870-1606-01	A	X	X	X	X
FAP	870-1606-02	A	X ¹¹	X ¹¹	X ¹¹	X ¹¹
FAP	870-1606-02	C	X ¹²	X ¹²	X ¹²	X ¹²
FAP	870-1606-05	A	X ¹²	X ¹²	X ¹²	X ¹²
FAP	870-1823-01	B	X	X	X	X
FAP	870-2320-01	A	X ¹⁰	X ¹⁰	X ¹⁰	X ¹⁰
FAP	870-2320-01	J	X ¹³	X ¹³	X ¹³	X ¹³
FAP	870-2320-03	A	X ¹⁰	X ¹⁰	X ¹⁰	X ¹⁰
FAP-CF/EF	870-0243-08	C	X	X	X	X

Table A-1 (Cont.) Hardware Baseline EAGLE Release 46.7 through 47.0

NAME	PART NUMBER	REV	46.7	46.8	46.9	47.0
FAP- MISC	870-0243-09	C	X	X	X	X
FAP	870-2804-01	B	X	X	X	X
HIGH-SPEED FIBER CHANNEL CABLE	830-1344-xx		X	X	X	X
HIGH-SPEED FIBER CHANNEL CABLE	830-1141-xx					
HIGH-SPEED FIBER CHANNEL CABLE	830-0221-xx					
HIPR2	870-2872-01	A	X ¹⁴	X ¹⁴	X ¹⁴	X ¹⁴
HIPR2	870-2872-02	A	X	X	X	X
HIPR2	870-2872-03	A	X	X	X	X
HIPR2	7333484	X	X	X	X	X
FAN ASSY	890-1038-01	D	X	X	X	X
FAN ASSY	890-0001-01	A	X ²	X ²	X ²	X ²
FAN ASSY	890-0001-02	A	X ²	X ²	X ²	X ²
FAN ASSY	890-0001-04	A	X ²	X ²	X ²	X ²
FAN ASSY	7315823	N/A	X ²	X ²	X ²	X ²
KIT,E1	890-1037-01	A	X	X	X	X
KIT,E1	890-1037-06	A	X	X	X	X
KIT, HLDVRCCLK ASSY	890-1013-01	A	X	X	X	X
MPS DC Frame	890-1843-01	C	X	X	X	X
MPSDC Frame	890-1843-02	A	X	X	X	X
SLIC	7094646	N/A	X ⁶	X ⁶	X ⁶	X ⁶
SLIC	7352578	N/A	X ⁶	X ⁶	X ⁶	X ⁶
Telco 24 port switch for ExAP-SM interconnectivity	870-2904-01	N/A	X	X	X	X

- 1 Required in all empty slots in shelves when using fan tray 890-0001-xx.
- 2 Control shelf P/N 870-0775-03 with backplane P/N 850-0330-04 can be used with minor modifications and addition of adapter cable P/N 830-1185-01.
- 3 NEBS will support Source Timing with adapter 830-1183-01.
- 4 Control shelf P/N 870-2321-08 with backplane P/N 850-0330-06/07 and 7333412 can be used together in standard frames.

- 5 Control shelf P/N 870-2377-02 with backplane P/N 850-0330-06/07 and 7333412 can be used in heavy-duty frames.
- 6 Requires fan tray assembly.
- 7 Requires E5-MDAL.
- 8 Requires E5-MASP.
- 9 If any E5 type cards are used in the shelf, **HIPR2** 870-2872-02, -03, or 7333484 are required. The HIPR2 870-2872-01 is not supported.
- 1 Required for heavy-duty frames. Rev. J required for **HCMIM** shelves.
- 0
- 1 Required for standard frames. Rev. C required for **HCMIM** shelves.
- 1
- 1 60 Amp **FAP** required for standard frames that contain shelves with **HCMIM** modules.
- 2
- 1 60 Amp **FAP** required for Heavy-duty frames that contain shelves with **HCMIM** modules.
- 3
- 1 Not supported on Extension shelf 870-0776-02 and -03.
- 4

A.3 EAGLE Cable Assemblies and Adapters

Table A-2 E1 Cable Assemblies

P/N	Description
ROHS	
830-1233-xx	E1 Dual TX/RX, XX ft., NTW

Table A-3 T1 MIM LIM Cable Assemblies

P/N	Description
ROHS	
830-1197-xx	T1 MIM Lim XX ft. Unterminated

Table A-4 ENET Adapters

P/N	Description
830-1102-03	DB-26M to Dual RJ45 10/100/1000
830-1103-02	DB-26M to DB-26F 10/100
830-1104-04	DB-26M to RJ45 10/100
830-1104-04	DB-26M to RJ45 10/100/1000

Table A-5 SLIC Adapter

P/N	Description
830-1102-03	DB-26M to Dual RJ45 10/100/1000

Table A-6 Fast Copy Adapters

P/N	Description
830-1343-01	CABLE ASSY_ADAPTER_PRE-MOLD_UPPER_EAGLE FAST COPY_DUAL DB26_RJ45 (E5_ENET)
830-1343-02	CABLE ASSY_ADAPTER_PRE-MOLD_LOWER_EAGLE FAST COPY_DUAL DB26_RJ45 (E5-ENET)

Table A-7 Terminal/Printer Cables and Adapters

Cable P/N	Necessary Adapter
830-0394-xx	830-0531-02
830-0535-xx	None
830-1154-xx (ROHS)	None

Table A-8 Modem Cables and Adapters

Cable P/N	Necessary Adapter
830-0394-xx	830-0531-03
830-0535-xx	830-0531-04
830-1154-xx (ROHS)	830-1153-04 (ROHS)
830-0680-01	None
830-1165-01 (ROHS)	None

Table A-9 Application Server Site Specific Cables

P/N	Description
non-ROHS	ROHS
830-0963-xx	830-1201-xx Optional DB9F/DB15M Serial w/Flow Control
830-0978-xx	830-1204-xx DB26-RJ45 Site Specific Straight Through Cable - Non Shielded
830-0979-xx	830-1205-xx DB26-RJ45 Site Specific Crossover Cable - Non Shielded

Table A-10 Application Server Serial Adapters

P/N	Description
830-0915-01	RJ45-DB15M Adapter_NTW
830-0915-02	RJ45-DB15M Adapter_MRV
830-0915-03	RJ45-DB15M Adapter_EAGLE/Cyclades