

**Oracle® Communications
EAGLE**

Hardware Reference

Release 46.2

E63595 Revision 1

July 2015

Oracle® Communications EAGLE Hardware Reference, Release 46.2

Copyright © 1993, 2015, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, then the following notice is applicable:

U.S. GOVERNMENT END USERS: Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information about content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services unless otherwise set forth in an applicable agreement between you and Oracle. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services, except as set forth in an applicable agreement between you and Oracle.

Table of Contents

Chapter 1: Introduction.....	13
Overview.....	14
Scope and Audience.....	14
Manual Organization and Conventions.....	14
Documentation Admonishments.....	15
My Oracle Support (MOS).....	16
Emergency Response.....	16
Related Publications.....	17
Customer Training.....	17
Locate Product Documentation on the Oracle Help Center Site.....	17
Regulatory Compliance and Certification.....	17
Hardware Repair and Return.....	19
Repair and Return Shipping Instructions.....	20
Returning a Crate.....	22
 Chapter 2: System Overview.....	 23
Introduction.....	24
Oracle Communications EAGLE.....	24
Maintenance and Administration Subsystem.....	25
Communication Subsystem.....	27
Application Subsystem.....	28
Timing Systems.....	34
Multi-Purpose Server (MPS) Systems.....	36
OEM Products.....	36
 Chapter 3: Hardware Descriptions - EAGLE.....	 38
Introduction.....	39
EAGLE.....	39
Multi-Purpose Server (MPS).....	39
Hardware Baselines.....	43
Frames.....	43
Extension Frame.....	46
Miscellaneous Frame.....	51

Control Frame.....	52
Control Shelf.....	52
Control Shelf Backplanes.....	54
Extension Shelf.....	57
Extension Shelf Backplanes.....	60
Locating the EAGLE System Number.....	60
Modules.....	62
High Speed IMT Packet Router 2.....	64
E5 Maintenance and Administration Subsystem Processor (E5-MASP) Card.....	68
E5-MDAL.....	75
Time Slot Counter Synchronization.....	78
Link Interface Modules.....	78
High-Capacity Application Processor-Based LIMs.....	83
Database Communications Module.....	85
Signaling Transport Card.....	85
Measurements Collection and Polling Module.....	86
High-Capacity Multichannel Interface Module.....	86
E5-ATM/E5-ATM-B Module.....	91
E5-E1T1/E5-E1T1-B Module.....	95
E5-ENET/E5-ENET-B Module.....	100
E5-IPSM Module.....	105
E5-MCPM-B Module.....	108
E5-SM4G/E5-SM8G-B Module.....	112
E5-TSM.....	115
Air Management Card.....	117
Fan Tray.....	118
Fuse and Alarm Panels.....	119
Fuses.....	120
Fuse and Alarm Panel (P/N 870-2804-01).....	121
Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx).....	124
Provision Rules for FAP Fuse Locations.....	127
Holdover Clock.....	127

Chapter 4: Hardware Descriptions - OEM-Based Products.....133

OEM-Based Product Descriptions.....	134
Extended Services Platform (ESP) Host Servers.....	134
OEM-Based Networking Elements.....	137
Routers.....	138
Ethernet Switches.....	139
OEM-Based Peripheral Elements.....	140

Breaker Panels.....	141
Eight-Port Connector Box.....	142
Chapter 5: Site Engineering - EAGLE.....	144
Safety and Cautionary Information.....	145
Introduction.....	145
Location.....	145
Space Requirements.....	145
Lighting.....	146
Building Requirements.....	146
Earthquake Resistance.....	146
Environmental Requirements.....	146
Heating Ventilation and Air Condition Requirements.....	147
Floor Loading.....	147
Grounding.....	147
Power Requirements.....	150
Populating the System.....	150
Hardware Power Calculator Tool.....	150
Message Flow Control (MFC).....	151
Database Communications Module (DCM) and Double-Slot Enhanced DCM (EDCM).....	152
Cabling DCM, Double-Slot EDCM, and E5-SM4G/E5-SM8G Cards.....	152
Appendix A: Hardware Baselines.....	155
Baseline Tables.....	156
EAGLE Release 43.0 Through 46.2.....	156
EAGLE Cable Assemblies and Adapters.....	160
Notes.....	162
Glossary.....	164

List of Figures

Figure 1: European Directives CE Mark.....	18
Figure 2: Combined UL Mark for the United States and Canada.....	18
Figure 3: Hazardous Substances.....	19
Figure 4: EAGLE Functional Diagram.....	25
Figure 5: E5-based Maintenance and Administration Subsystem Block Diagram.....	26
Figure 6: Clock Routing.....	35
Figure 7: EPAP MPS Overview.....	40
Figure 8: Layered Design for MPS and Applications.....	41
Figure 9: MPS Hardware Overview.....	42
Figure 10: Frames.....	44
Figure 11: Frame End Panel with Lamp Indicators.....	45
Figure 12: Control Frame CF-00 Numbering Plan.....	46
Figure 13: Extension Frame EF-00 Numbering Plan.....	47
Figure 14: Extension Frame EF-01 Numbering Plan.....	48
Figure 15: Extension Frame EF-02 Numbering Plan.....	49
Figure 16: Extension Frame EF-03 Numbering Plan.....	49
Figure 17: Extension Frame EF-04 Numbering Plan.....	50
Figure 18: Extension Shelf Backplane ID (P/N 850-0356-03).....	50
Figure 19: Extension Shelf Backplane ID (P/N 850-0356-04/06).....	51
Figure 20: Miscellaneous Frame.....	52
Figure 21: Control Shelf Front with Card.....	54
Figure 22: Control Shelf Backplane (P/N 850-0330-03/04).....	56

Figure 23: Control Shelf Backplane (P/N 850-0330-06).....	57
Figure 24: Extension Shelf with LIMs.....	58
Figure 25: Shelves with DCM and LIM Cards in Control Frame.....	59
Figure 26: EAGLE System Number Frame View.....	61
Figure 27: EAGLE System Number Medium View.....	61
Figure 28: EAGLE System Number Close View.....	62
Figure 29: Cam-Out/Lock-In Levers on Cards.....	63
Figure 30: HIPR2 Switch Same Topology.....	65
Figure 31: HIPR2 LEDs.....	67
Figure 32: E5-MASP Card (870-2903-01).....	69
Figure 33: E5-MASP Card (870-2903-02).....	70
Figure 34: E5-MASP LEDs.....	74
Figure 35: E5-MDAL LEDs.....	77
Figure 36: E5-ATM-B Card.....	81
Figure 37: E5-E1T1-B Card.....	81
Figure 38: E5-ENET-B Card.....	82
Figure 39: E5-MCPM-B.....	82
Figure 40: HCAP Main Assembly (P/N 850-0419-xx).....	84
Figure 41: HCMIM Module.....	86
Figure 42: Channelized HCMIM Interfaces.....	88
Figure 43: Channel Bridging Schematic.....	89
Figure 44: E5-ATM.....	94
Figure 45: Channelized E5-E1T1 Interfaces.....	96
Figure 46: Channel Bridging Schematic.....	97
Figure 47: E5-E1T1.....	99

Figure 48: E5-ENET.....	103
Figure 49: E5-IPSM.....	107
Figure 50: E5-MCPM-B.....	111
Figure 51: E5-SM4G/E5-SM8G-B LED Indicators.....	114
Figure 52: E5-TSM LEDs.....	117
Figure 53: Air Management card.....	118
Figure 54: Fan Tray.....	119
Figure 55: Fuse (GMT Brand Shown).....	120
Figure 56: Fuse and Alarm Panel - Front View (P/N 870-2804-xx).....	122
Figure 57: Fuse and Alarm Panel Rear (P/N870-2804-01).....	123
Figure 58: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Front.....	125
Figure 59: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear.....	126
Figure 60: Holdover Clock, Card Location.....	128
Figure 61: Holdover Clock, Frame Connections.....	129
Figure 62: Maintenance Interface System Card Block Diagram.....	130
Figure 63: MCA-5 Card and Output Protection Matrix.....	132
Figure 64: ESP Server Front and Rear Views.....	136
Figure 65: 8-Port Connector.....	137
Figure 66: Front View Routers.....	138
Figure 67: Rear View Isolation Router.....	138
Figure 68: Rear View Dial-in Router.....	138
Figure 69: Ethernet Switch.....	139
Figure 70: Telect Breaker Panel Front View.....	141
Figure 71: Telect Breaker Panel Rear View.....	141
Figure 72: Telect Breaker Panel Alarms.....	142

Figure 73: Eight Port Breakout Box.....	143
Figure 74: Logic Grounding with FAP (P/N 870-0243-08).....	148
Figure 75: Logic Grounding with FAP (P/N 870-1606-xx/870-2320-xx).....	149
Figure 76: Door Grounding.....	149
Figure 77: Database Communications Cabling in System.....	153

List of Tables

Table 1: Admonishments.....	15
Table 2: Basic RMA Types.....	19
Table 3: RMA Reasons for Return.....	20
Table 4: Card Specifications.....	64
Table 5: HIPR2 Technical Specifications.....	68
Table 6: Thermal Alarm Conditions.....	73
Table 7: E5-MASP Technical Specifications.....	75
Table 8: E5-MDAL Technical Specifications.....	78
Table 9: Hardware Requirements-Maximum Number of Links.....	79
Table 10: LIM Card Specifications.....	84
Table 11: Channel Bridging E1/T1 Port Pairing.....	89
Table 12: Channelized HCMIM LEDs.....	90
Table 13: HCMIM Technical Specifications.....	91
Table 14: Thermal Alarm Conditions.....	92
Table 15: T1 and T2 temperature thresholds	93
Table 16: E5-ATM Technical Specifications.....	95
Table 17: Channel Bridging E1/T1 Port Pairing.....	97
Table 18: E5-E1T1 Technical Specifications.....	99
Table 19: E5-ENET Supported Protocols.....	100
Table 20: E5-ENET Capacities.....	101
Table 21: Thermal Alarm Conditions.....	101
Table 22: T1 and T2 temperature thresholds	102

Table 23: Interface Cable/Adapter.....	104
Table 24: E5-ENET Technical Specifications.....	104
Table 25: Thermal Alarm Conditions.....	106
Table 26: E5-IPSM LEDs.....	107
Table 27: E5-IPSM Technical Specifications.....	108
Table 28: Thermal Alarm Conditions.....	109
Table 29: T1 and T2 temperature thresholds	109
Table 30: E5-MCPM-B Technical Specifications.....	112
Table 31: Thermal Alarm Conditions.....	113
Table 32: T1 and T2 temperature thresholds	113
Table 33: E5-SM4G and E5-SM8G-B Technical Specifications.....	115
Table 34: Thermal Alarm Conditions.....	115
Table 35: E5-TSM Technical Specifications.....	116
Table 36: Fuse Color Codes of Alarm Flags.....	120
Table 37: Fuse and Alarm Panel Front Items (P/N 870-2804-xx).....	122
Table 38: Fuse State and LED condition (P/N 870-2804-01).....	122
Table 39: Fuse and Alarm Panel Rear Items (P/N870-2804-01).....	123
Table 40: Fuse and Alarm Panel Specifications (P/N 870-2804-01).....	124
Table 41: Fuse and Alarm Panel Front Items.....	125
Table 42: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear.....	126
Table 43: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Specifications.....	126
Table 44: System Specifications.....	134
Table 45: ESP Server LEDs.....	136
Table 46: Router Front LEDs.....	138
Table 47: Router Rear LEDs.....	139

Table 48: Ethernet Switch LEDs.....	139
Table 49: Breaker Panel LEDs.....	142
Table 50: Power Usage by Component.....	151
Table 51: Hardware Baseline EAGLE Release 43.0 Through 46.2.....	156
Table 52: E1 Cable Assemblies.....	160
Table 53: E5-ATM Adapters.....	160
Table 54: ENET Adapters.....	160
Table 55: Fast Copy Adapters.....	160
Table 56: Terminal/Printer Cables and Adapters.....	161
Table 57: Modem Cables and Adapters.....	161
Table 58: Application Server Site Specific Cables.....	161
Table 59: Application Server Serial Adapters.....	161

Chapter 1

Introduction

Topics:

- *Overview.....14*
- *Scope and Audience.....14*
- *Manual Organization and Conventions.....14*
- *Documentation Admonishments.....15*
- *My Oracle Support (MOS).....16*
- *Emergency Response.....16*
- *Related Publications.....17*
- *Customer Training.....17*
- *Locate Product Documentation on the Oracle Help Center Site.....17*
- *Regulatory Compliance and Certification.....17*
- *Hardware Repair and Return.....19*

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*.

Scope and Audience

This manual describes hardware for informational purposes; it does not describe how to install or replace hardware.

For installation information, refer to *Installation Guide* included in your current documentation suite. For replacement procedures of existing hardware components, refer to *Maintenance Guide*.

For configuration and provisioning, refer to *Database Administration – Features User's Guide* included in your current documentation suite.

This manual is intended for customers, system planners and personnel requiring detailed hardware information.

Manual Organization and Conventions

Hardware Reference is organized into the following chapters:

- [Introduction](#) — Contains general information about manual organization, the scope of this manual, its targeted audience, brief explanations of the various systems, typical content of a Documentation Suite delivered with each system, how to handle hardware repairs and returns, and how to get technical assistance.
- [System Overview](#) — Contains a high-level functional overview of the EAGLE. EAGLE subsystems include Maintenance and Administration, Communication and Application elements. [Hardware Descriptions - OEM-Based Products](#) also describes an overview of OEM-based products.
- [Hardware Descriptions - EAGLE](#) — Describes frames, shelves, and cards that make up an EAGLE.

- [Hardware Descriptions - OEM-Based Products](#) — Describes frames, shelves, and the Original Equipment Manufacturer (OEM) parts that make up a OEM-based product.
- [Site Engineering - EAGLE](#) — Describes installation site requirements, including floor plan requirements, environmental requirements, and power requirements.
- [Hardware Baselines](#) — Lists in cross-index tabular form the hardware components that can be configured for each system software release. The tables are divided into groups of similar systems for easier use. Use these tables to determine if a specific hardware module or OEM element can be configured.





Hardware Reference uses the following conventions:

- Components used only in a specific system are clearly labeled, for example, (EAGLE only).
- Components that are specific to a release are labeled with the system and release number; for example, (EAGLE 44.0 or earlier).

Documentation Admonishments

Admonishments are icons and text throughout this manual that alert the reader to assure personal safety, to minimize possible service interruptions, and to warn of the potential for equipment damage.

Table 1: Admonishments

Icon	Description
 DANGER	Danger: (This icon and text indicate the possibility of <i>personal injury</i> .)
 WARNING	Warning: (This icon and text indicate the possibility of <i>equipment damage</i> .)
 CAUTION	Caution: (This icon and text indicate the possibility of <i>service interruption</i> .)
 TOPPLE	Topple: (This icon and text indicate the possibility of <i>personal injury and equipment damage</i> .)

My Oracle Support (MOS)

MOS (<https://support.oracle.com>) is your initial point of contact for all product support and training needs. A representative at Customer Access Support (CAS) can assist you with MOS registration.

Call the CAS main number at 1-800-223-1711 (toll-free in the US), or call the Oracle Support hotline for your local country from the list at <http://www.oracle.com/us/support/contact/index.html>. When calling, make the selections in the sequence shown below on the Support telephone menu:

1. Select **2** for New Service Request
2. Select **3** for Hardware, Networking and Solaris Operating System Support
3. Select one of the following options:
 - For Technical issues such as creating a new Service Request (SR), Select **1**
 - For Non-technical issues such as registration or assistance with MOS, Select **2**

You will be connected to a live agent who can assist you with MOS registration and opening a support ticket.

MOS is available 24 hours a day, 7 days a week, 365 days a year.

Emergency Response

In the event of a critical service situation, emergency response is offered by the Customer Access Support (CAS) main number at 1-800-223-1711 (toll-free in the US), or by calling the Oracle Support hotline for your local country from the list at <http://www.oracle.com/us/support/contact/index.html>. The emergency response provides immediate coverage, automatic escalation, and other features to ensure that the critical situation is resolved as rapidly as possible.

A critical situation is defined as a problem with the installed equipment that severely affects service, traffic, or maintenance capabilities, and requires immediate corrective action. Critical situations affect service and/or system operation resulting in one or several of these situations:

- A total system failure that results in loss of all transaction processing capability
- Significant reduction in system capacity or traffic handling capability
- Loss of the system's ability to perform automatic system reconfiguration
- Inability to restart a processor or the system
- Corruption of system databases that requires service affecting corrective actions
- Loss of access for maintenance or recovery operations
- Loss of the system ability to provide any required critical or major trouble notification

Any other problem severely affecting service, capacity / traffic, billing, and maintenance capabilities may be defined as critical by prior discussion and agreement with Oracle.

Related Publications

For information about additional publications that are related to this document, refer to the *Related Publications Reference* document, which is published as a separate document on the Oracle Technology Network (OTN) site. See [Locate Product Documentation on the Oracle Help Center Site](#) for more information.

Customer Training

Oracle University offers training for service providers and enterprises. Visit our web site to view, and register for, Oracle Communications training:

<http://education.oracle.com/communication>

To obtain contact phone numbers for countries or regions, visit the Oracle University Education web site:

www.oracle.com/education/contacts

Locate Product Documentation on the Oracle Help Center Site

Oracle Communications customer documentation is available on the web at the Oracle Help Center (OHC) site, <http://docs.oracle.com>. You do not have to register to access these documents. Viewing these files requires Adobe Acrobat Reader, which can be downloaded at <http://www.adobe.com>.

1. Access the Oracle Help Center site at <http://docs.oracle.com>.
2. Click **Industries**.
3. Under the Oracle Communications subheading, click the **Oracle Communications documentation** link.
The Communications Documentation page appears. Most products covered by these documentation sets will appear under the headings "Network Session Delivery and Control Infrastructure" or "Platforms."
4. Click on your Product and then the Release Number.
A list of the entire documentation set for the selected product and release appears.
5. To download a file to your location, right-click the **PDF** link, select **Save target as** (or similar command based on your browser), and save to a local folder.

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: European Directives CE Mark](#) shows the mark used to indicate this compliance.



Figure 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 2: Combined UL Mark for the United States and Canada](#) shows the mark used to indicate this compliance.



Figure 2: Combined UL Mark for the United States and Canada

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

Figure 3: Hazardous Substances

Hardware Repair and Return

Any system components being returned for repair or replacement must be processed through the Tekelec Return Material Authorization (RMA) procedures. A hardware repair is defined as an item returned to Tekelec 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 2: Basic RMA Types](#) lists the basic RMA types.

Table 2: 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

Replacement Type	Description	Turnaround
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 3: RMA Reasons for Return lists the RMA return reasons.

Table 3: 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 Tekelec 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.

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.
 - b) Package the defective component in the box of materials you received with your replacement.
Use proper static handling procedures.
 - c) Label the outside and inside of the box with your RMA number clearly visible.
Place the packing slip from the received replacements on the inside of your box.
 - d) Ship the defective component to the return address listed on the packing slip.
4. If the item is a repair/return, the Technical Services engineer arranges for shipment of the replacement item to the customer.
 - a) Package the defective component in a suitable package for shipping.
Use proper static handling procedures.
 - b) Label the outside and inside of the box with your RMA number clearly visible.
Include a packing slip with all the information from [Step 1](#) along with the RMA number.
 - c) Ship the defective component to the following address:

TEKELEC
Attn: RMA Department
5200 Paramount Parkway
Morrisville, NC 27560
RMA#: <assigned by Tekelec>

- d) Wait for the repaired component to arrive.

Returning a Crate

Use the following procedure to return a shipping crate and dollies to Oracle.

1. Replace the retaining brace.
2. Replace the shipping container front panel using the bolts saved previously and arrange the return shipment by contacting:
Shipping Manager ORACLE
Attn: RMA Department
5200 Paramount Parkway
Morrisville, NC
27560RMA#: <assigned by Oracle>
3. After the frame is positioned and the dollies are removed from the frame, the dollies are returned to the same address as the shipping container listed above.

If the equipment is being immediately installed ship the dollies back to Oracle in the crate after use. After installing the equipment bolt the dollies securely in the crate and return to Oracle.

OR

If the equipment is not being immediately installed ship the dollies back to Oracle in the box supplied with the crate. After unpacking the equipment return the crate to Oracle and retain the box to return the dollies. After installing the equipment remove the dollies and return to Oracle in the supplied box.

Note:

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

Chapter 2

System Overview

Topics:

- *Introduction.....24*
- *Oracle Communications EAGLE.....24*
- *Multi-Purpose Server (MPS) Systems.....36*
- *OEM Products.....36*

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.

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 [Figure 4: EAGLE Functional Diagram](#).

- Maintenance and Administration Subsystem (MAS)
- Communication Subsystem (Gigabit backbone)
- Application Subsystem

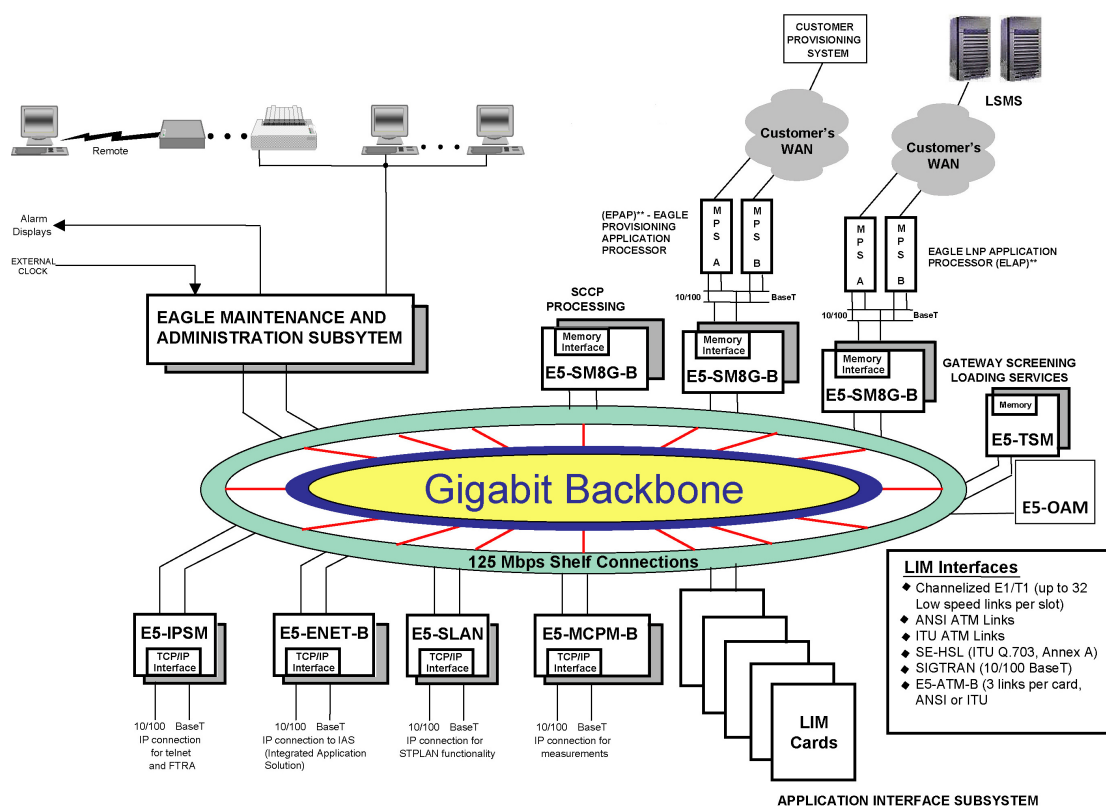


Figure 4: EAGLE Functional Diagram

The EAGLE hardware platform consists of various frame types. Each frame holds shelves or rack mounted equipment. The shelves hold the plug-in application and interface cards. [Hardware Descriptions - EAGLE](#) provides detailed information about component requirements and hardware configuration.

In addition, EAGLE has a clock derived from the Building Integrated Timing System (BITS). This connects to the 64KHz composite BITS signal and distributes clock signals to the rest of the cards in the systems.

Note: See the section [Timing Systems](#) for information about High-Speed Master Timing and Time Slot Counter (TSC) Synchronization features.

Maintenance and Administration Subsystem

The Maintenance and Administration Subsystem (MAS) is the central management point for the EAGLE. The MAS provides user interface, maintenance communication, peripheral services, alarm processing, system disk interface, measurements, and GLS 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 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.

E5-based Control Cards

The E5-based set of EAGLE 5 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

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 5: E5-based Maintenance and Administration Subsystem Block Diagram](#).

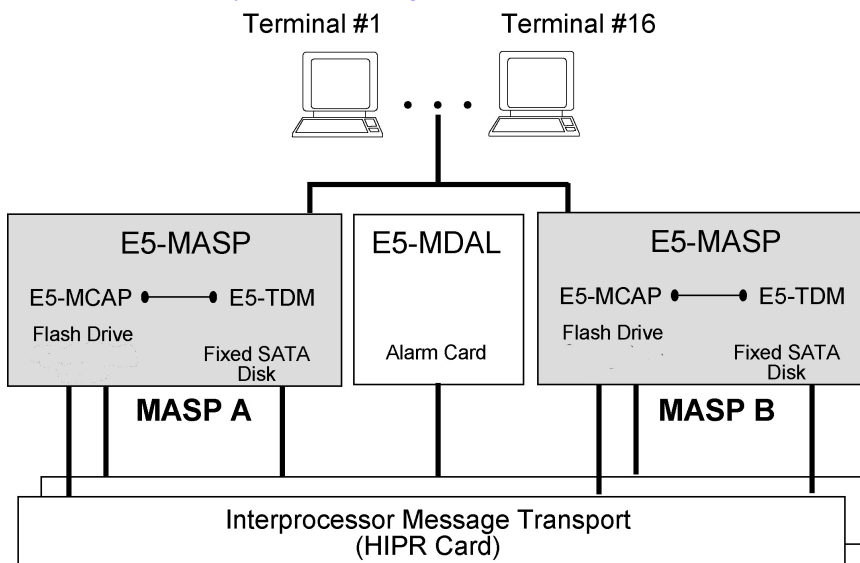


Figure 5: E5-based Maintenance and Administration Subsystem Block Diagram

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

The Maintenance and Administration Subsystem Processor (E5-MASP) (P/N 870-2903-01) and (P/N 870-2903-02) 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.

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 GPSM-II card used for the MCAP function.

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 Master 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).

E5-MDAL

The E5-MDAL card (P/N 870-2900-01) 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.

Communication Subsystem

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

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.

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.

Two HIPR2 modules are required in shelves equipped with high-performance LIMs, such as the High-Capacity MIM, and other E5-class cards. HIPR2 requires all other shelves to be equipped with all HIPR2 cards.

Note: A mixture of cards within a shelf is allowable only during upgrade for a temporary period.

HIPR2 supports a 1.0625 Gbps inter-shelf bus rate. When the high-rate is required, all shelves within an EAGLE node must be equipped with HIPR2.

The HIPR2 card supports one inter-shelf (backbone ring) IMT bit rates:

- 2.5 Gbps that requires:
 - All shelves within EAGLE be equipped with HIPR2
 - A system FAK installed to allow the high-rate channel
 - IMT interface cables upgraded to support new high-speed fiber-channel

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 Generic Loader Services (GLS) and 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:

- Signaling Transport Card (STC), E5-ENET, E5-ENET-B —Transmission Control Protocol/Internet Protocol (TCP/IP) interface over Ethernet for the Signaling Transfer Point Local Area Network (STPLAN) feature.

Note: Beginning with Release 38.0, any type dual-slot DCM card is no longer supported. An E5-ENET/E5-ENET-B card must be used.

- E5-TSM — Supports Gateway Screening, running the GLS GPL.
- Database Service Module (DSM) — EAGLE Application Processor (EPAP), Global System for Mobile Communications (GSM), EAGLE 5 Local Number Portability (ELAP), and interface to Local Service Management System (LSMS).
- E5-SM4G/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.

- E5-ENET, 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 — 8 HDLC channels for E1 or T1 protocols.
- Multi-Port Link Interface Module, E5-ATM, E5-ATM-B — SS7 links. Supports up to 3 links for ATMANSI and ATMITU application.

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.

GPLs can be any of 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

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.

- SLAN—Signaling Transfer Point Local Area Network. This software allows the system to support a TCP/IP interface to any external host with DCMs.
- SS7—This software provides access to remote SS7 network elements.
- GLS—Gateway Loading Service (GLS) software controls download of Gateway Screening (GWS) data to Link Interface Modules (LIMs) and DSM when necessary. This ensures a fast download of gateway screening data when a card re-initializes.

Gateway screening data is downloaded when a card is re-initialized, when Gateway screening is changed by database administration, or when there is manual intervention with commands being entered at a terminal.

- EROUTE—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).

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

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.

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.

E5-SM4G/E5-SM8G-B Module

The E5-SM4G (P/N 870-2860-xx) or the E5-SM8G-B (P/N 870-2990-xx) is a database service module (DSM) designed to operate in the EAGLE shelf. The E5-SM4G is a double-slot card with 4GB of total memory. 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).

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.

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

E5-TSM Module

The E5-TSM card (P/N 870-2943-01) is a single slot card providing the EAGLE system with Gateway Screening Binder/Generic Loading Services. The GLS function provides in-memory storage of Gateway Screening (GWS) data and downloads the data automatically to link cards where the GWS feature is executed.

The E5-TSM is a replacement for the TSM-256 card running GLS.

E5 Interface Module

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

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 types of E5 cards presently available are:

- E5-ATM (P/N 870-1872-xx)
- E5-E1T1 (P/N 870-1873-xx)
- E5-ENET (P/N 870-2212-xx)
- E5-IPSM (P/N 870-2877-xx)

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 EPM card 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)

E5-ATM/E5-ATM-B Module

The E5-ATM card (P/N 870-1872-01) or the E5-ATM-B card (P/N 870-2972-01) is a single slot card providing ATM over E1 and T1 connectivity for EAGLE 5[®] ISS 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 both the E5-ATM (P/N 870-1872-01) and the E5-ATM-B card (P/N 870-2972-01) cards unless specifically noted otherwise.

E5-E1T1/E5-E1T1-B Module

The E5-E1T1 card (P/N 870-1873-xx) or 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 supports up to 32 signaling links of configurable channelized E1 or T1 connectivity OR one SE-HSL signaling link on one of the eight ports and it must be A.

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.

E5-ENET/E5-ENET-B Module

The E5-ENET module (P/N 870-2212-xx) or 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 both the E5-ENET (P/N 870-2212-xx) and the E5-ENET-B (P/N 870-2971-xx) cards unless specifically noted otherwise.

The E5-ENET provides support for the following:

- IPLIM_x
 - SCTP, M2PA
 - Up to 16 SCTP/IP associations per card
 - Up to 250 total E5-ENET cards per node. This total may be made up of cards running any application type (IPLIM, IPGW, IPSG) and any adapter type.
- IPGW_x
 - 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 (IPLIM, IPGW, IPSG) and any adapter type.
- IPSG
 - 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 250 total E5-ENET cards per node. This total may be made up of cards running any application type (IPLIM, IPGW, IPSP) and any adapter type.
- STP Local Area Network (SLAN)
 - TCP/IP
 - Up to 32 cards per node
 - Up to 2 cards per shelf
- 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.

E5-SLAN Module

The SLAN on E5-ENET or on the E5-ENET-B feature increases the transaction processing capacity (TPS) of the SLAN application by implementing the migration of the SLAN application to the E5-ENET assembly introduced in EAGLE Release 35.0. The E5-SLAN feature supports all features currently implemented on the SS-EDCM assembly to support the SLAN application.

The E5-SLAN card connects to an external host using the existing cabling required for the current SSEDCEM assemblies when backplane cable adaptor P/N 830-1103-xx is used. The E5-SLAN card connects to an external host using standard CAT-5 Ethernet cables when backplane adaptor P/N 830-1102-xx is used.

E5-STC Module

The STC on E5-ENET or on the E5-ENET-B feature implements the enhancement of EROUTE application and its migration to E5-ENET assembly. This module provides higher-card capacity with increased TPS support. E5-ENET card supports two Ethernet PMC cards (PMC A and PMC B) each having Ethernet interfaces, one for use and one for maintenance testing. Each interface independently supports 10/100 Mbps data rates, full/half duplex, fixed/auto-negotiate, DIX/802.3 MAC header modes. The E5-STC feature, and corresponding Eagle provisioning capabilities supports up to 32 E5-STC modules per node.

E5-IPSM Module

The E5-IPSM card (P/N 870-2877-01) is a single slot card having two Ethernet interfaces, one for use and one for maintenance testing. The interface supports 10/100 Mbps data rates, full/half duplex traffic flow, fixed/auto-negotiate modes and DIX/802.3 MAC header modes. E5-IPSM can be exchanged with IPSM cards running IPS, without any changes in provisioning information. The E5-IPSM running the IPS GPL supports SEAS Over IP functionality.

The E5-IPSM card connects to an external host using the existing cabling required for the current DCM card assemblies when backplane cable adaptor P/N 830-1103-02 is used. The E5-IPSM card connects to an external host using standard CAT-5 Ethernet cables when backplane adaptor P/N 830-1102-02 is used.

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.

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 Applique (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 6: Clock Routing](#)).

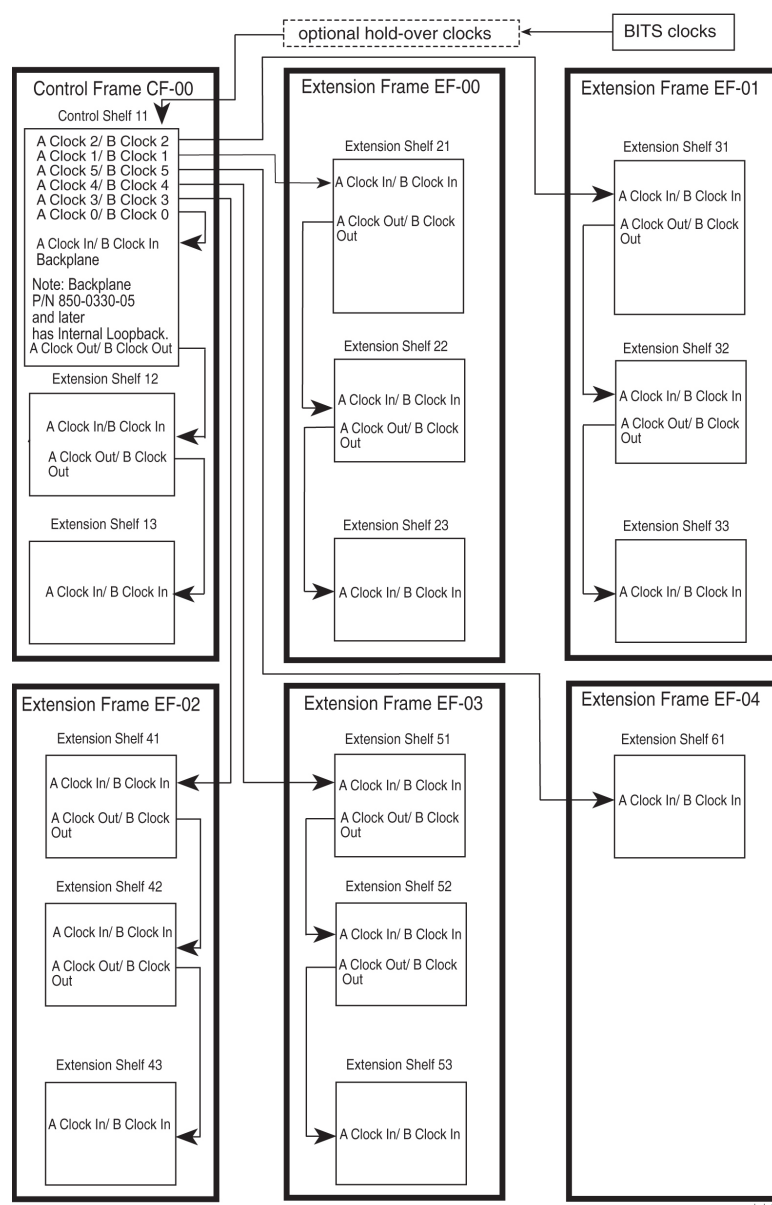


Figure 6: Clock Routing

High-Speed Master Timing

The EAGLE can be configured with high-speed master timing capabilities. High-speed master 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 Master 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.

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*.

OEM Products

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

Hardware

- Workstations
- Terminals
- Switch boxes
- Break-out boxes

System Overview

Chapter 3

Hardware Descriptions - EAGLE

Topics:

- *Introduction.....39*
- *EAGLE.....39*
- *Multi-Purpose Server (MPS).....39*
- *Hardware Baselines.....43*
- *Frames.....43*
- *Modules.....62*
- *Fuse and Alarm Panels.....119*
- *Holdover Clock.....127*

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.

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, DS0-A, OCU, 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 cards (P/N 870-2212-xx) or E5-ENET B cards (P/N 870-2971-xx), and can be configured in any slot (except slots reserved for HIPR2 cards).

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 7: EPAP MPS Overview 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.

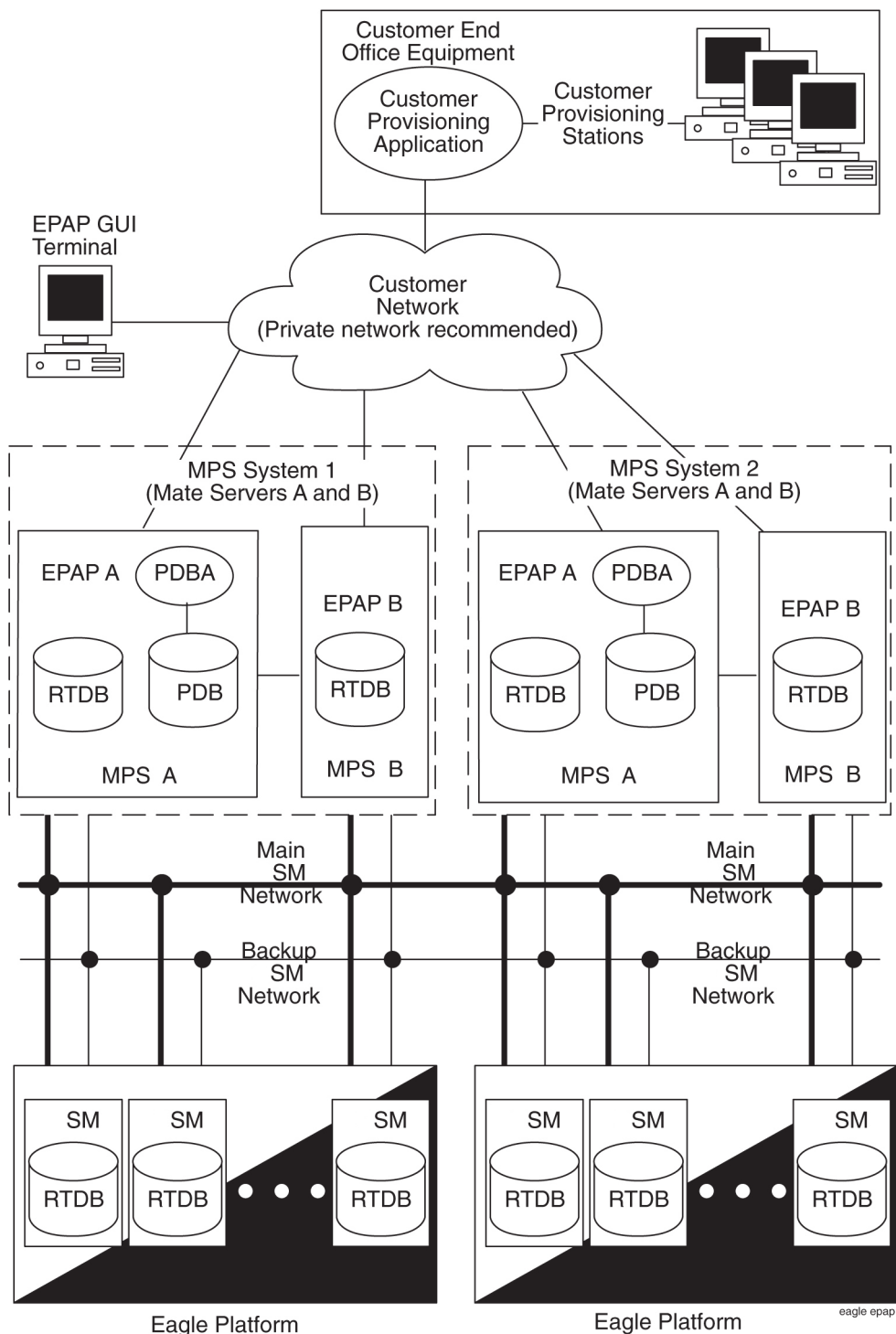


Figure 7: EPAP MPS Overview

Layered Design

MPS is based on the E5-APP-B card and uses a layered design (see [Figure 8: Layered Design for MPS and Applications](#)) 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.

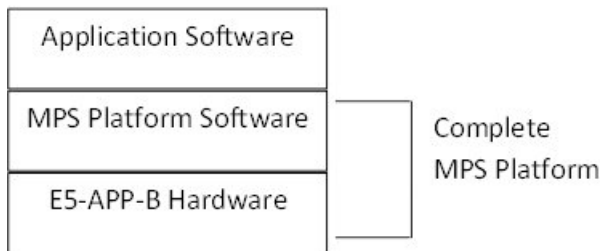


Figure 8: Layered Design for MPS and Applications

Hardware Components

This section includes a description of MPS hardware components and an overview of the disks and file systems. [Figure 9: MPS Hardware Overview](#) illustrates the following equipment.

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

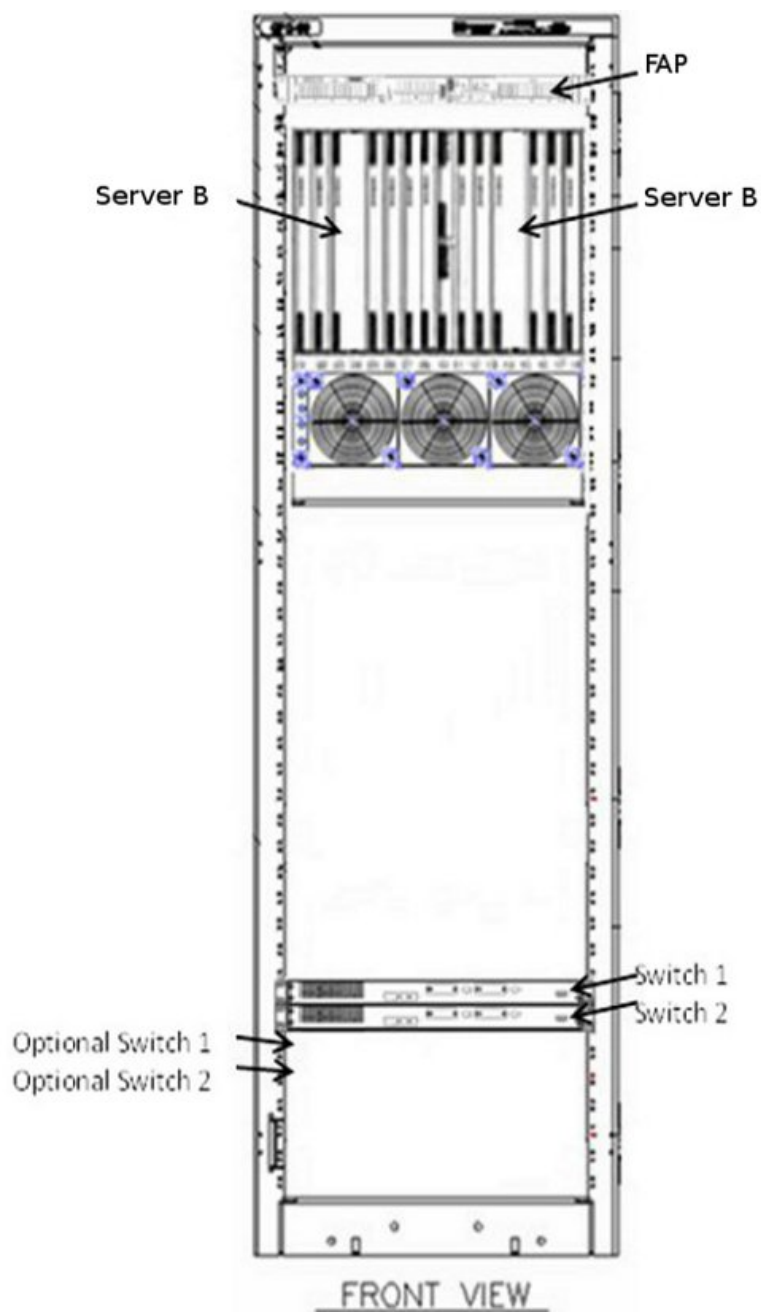


Figure 9: MPS Hardware Overview

Note:

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

**Danger:**

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.

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.

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 from one to four 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.

Cross-connect panels, spare card storage, modems, and holdover clocks are configured in Miscellaneous Frames (MF).

The system can use five types of frames:

- Control Frame (CF)
- Extension Frame (EF)
- Miscellaneous Frame (MF)
- General Purpose Frame (GPF)

Figure 10: Frames shows a system with a Control Frame (CF-00) and two Extension Frames (EF-00 and EF-01).

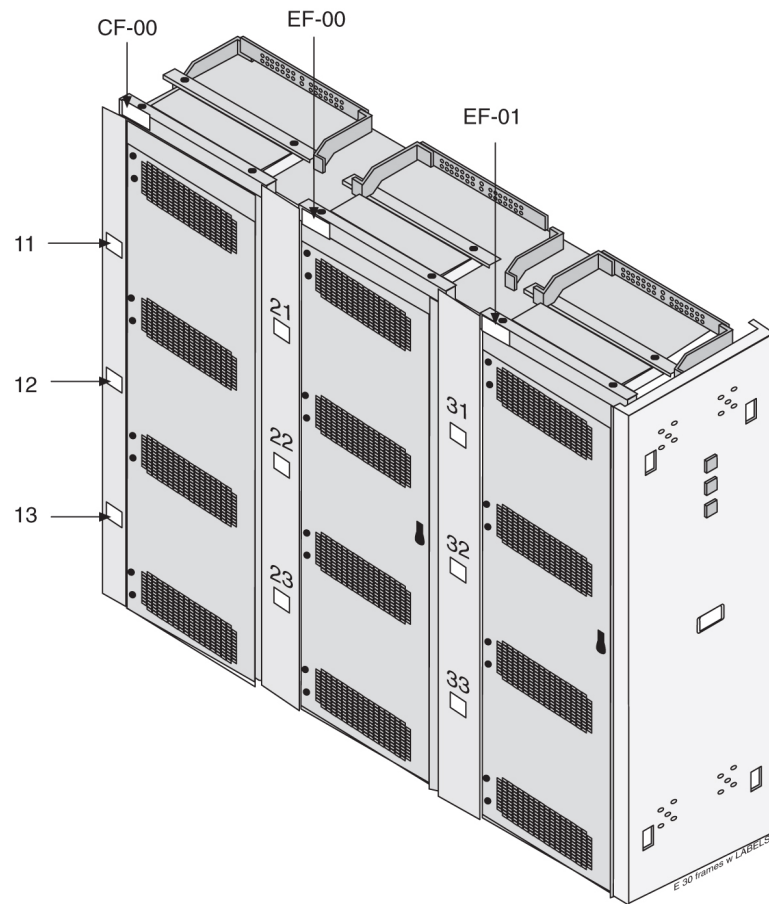


Figure 10: Frames

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 11: Frame End Panel with Lamp Indicators](#)), which show three levels of alarm conditions:

- Critical
- Major
- Minor

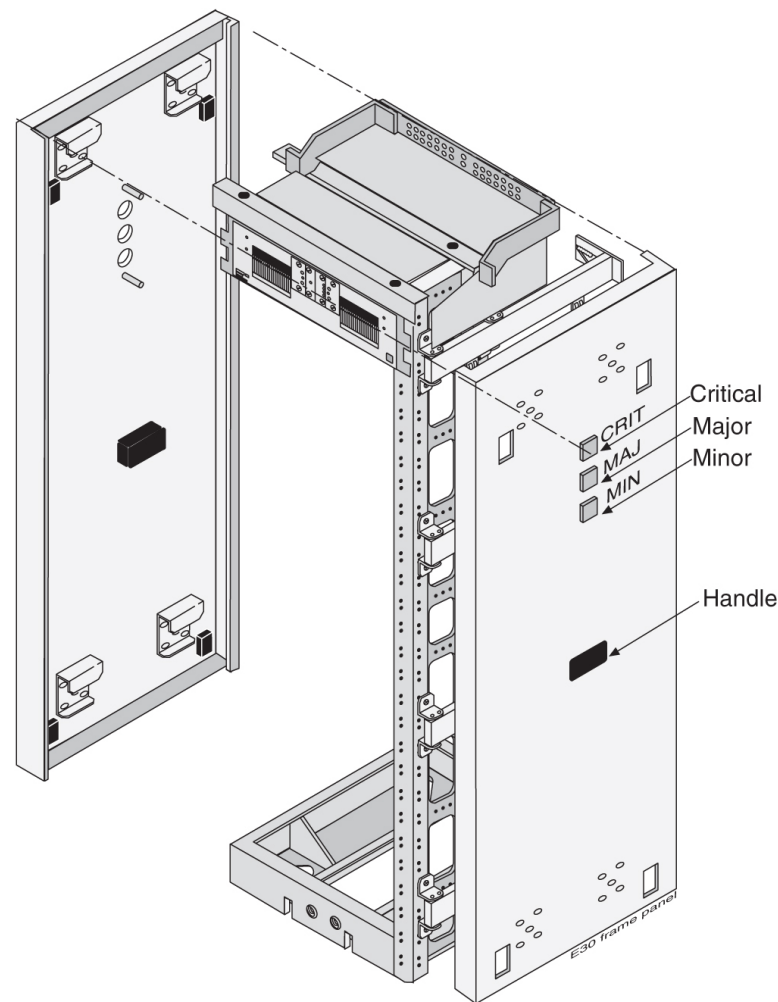


Figure 11: Frame End Panel with Lamp Indicators

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](#)).

Control Shelf 11

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


 These locations are paired entities

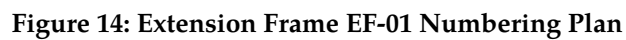
Figure 12: Control Frame CF-00 Numbering Plan

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-SLAN Modules, E5-STC Modules, E5-IPSM 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.

E63595 Revision 1, July 2015

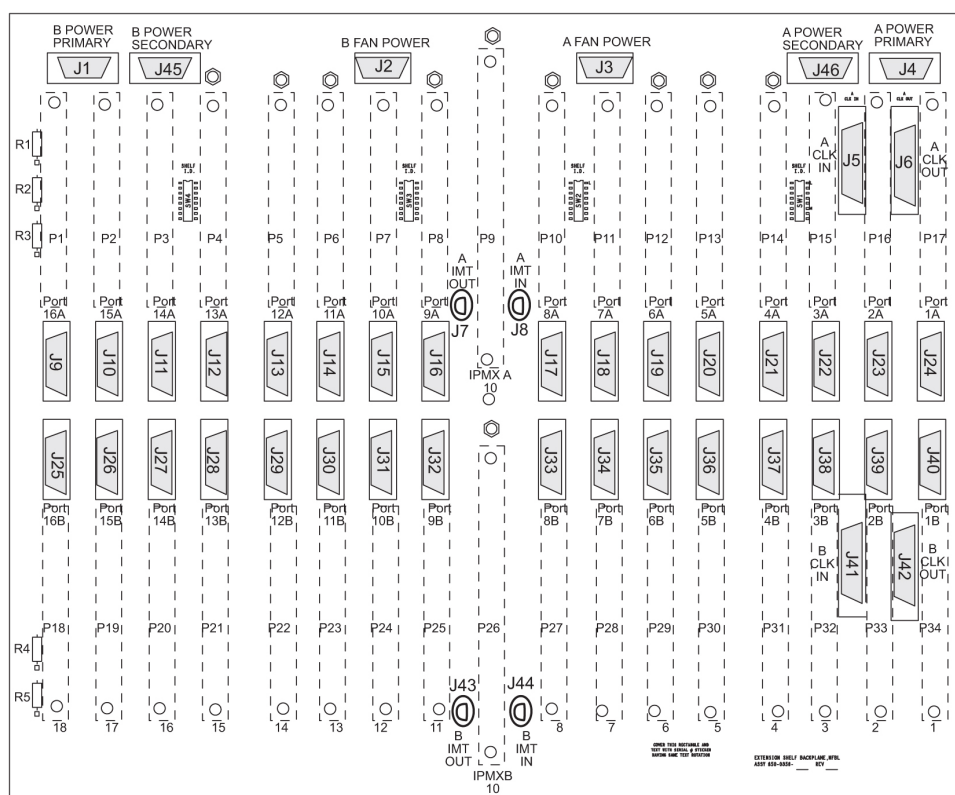
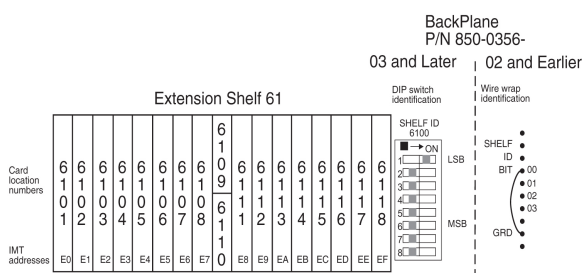
[illegible]

Figure 13: Extension Frame EF-00 Numbering Plan





Note: 6200 and 6300 shelf can be used for Telco switch and E5-APP-B cards.



Warning: ⚠ Conducts -48VDC for the printed circuit board (HOT). Metal points on printed circuit boards conducts -48VDC and can cause shorts, shocks, and damage if not handled properly.

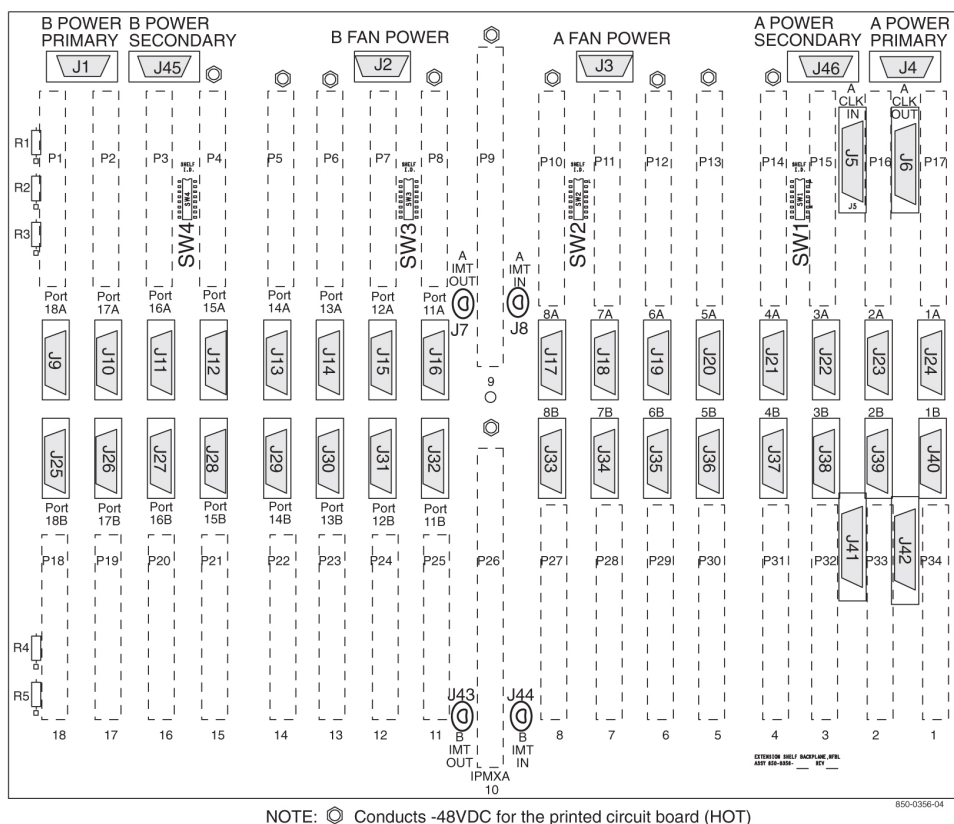


Figure 19: Extension Shelf Backplane ID (P/N 850-0356-04/06)

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 20: Miscellaneous Frame](#).

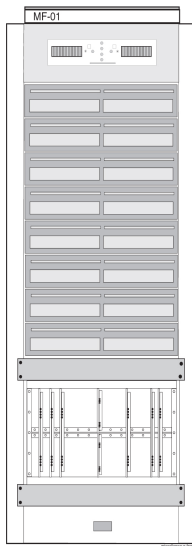


Figure 20: Miscellaneous Frame

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-SLAN Modules, E5-STC Modules, E5-IPSM 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-SLAN Modules, E5-STC Modules, E5-IPSM 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 IP 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.

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-SLAN 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**

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 21: Control Shelf Front with Card](#), 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-SLAN Modules, E5-STC Modules, E5-IPSM 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.

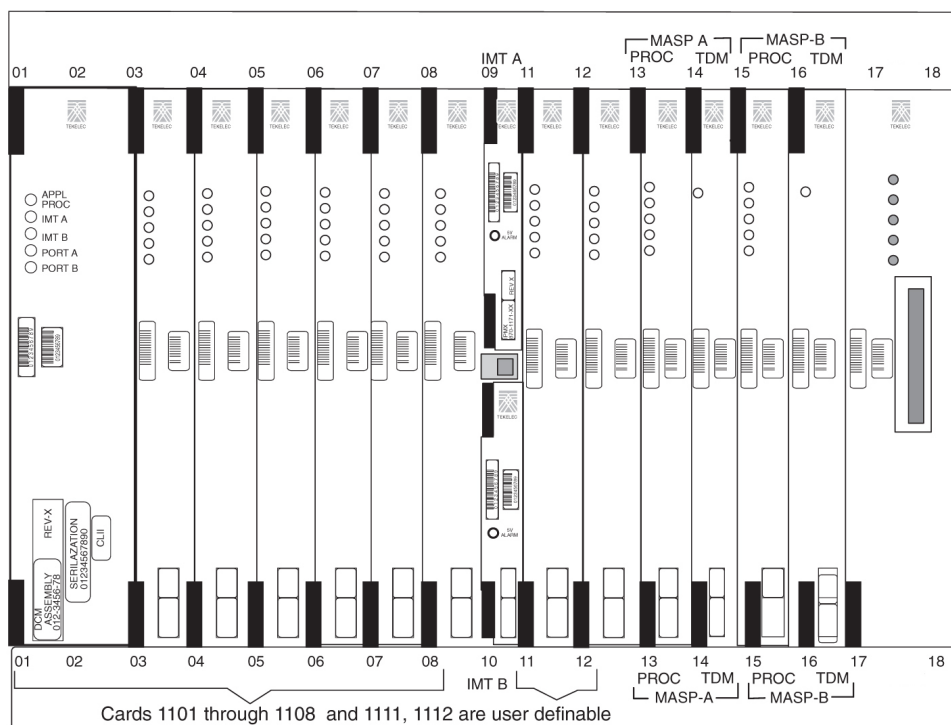


Figure 21: Control Shelf Front with Card

Control Shelf Backplanes

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

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 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, 11, and 13.

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).

**CAUTION**

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) and the control shelf backplane (P/N 850-0330-06).

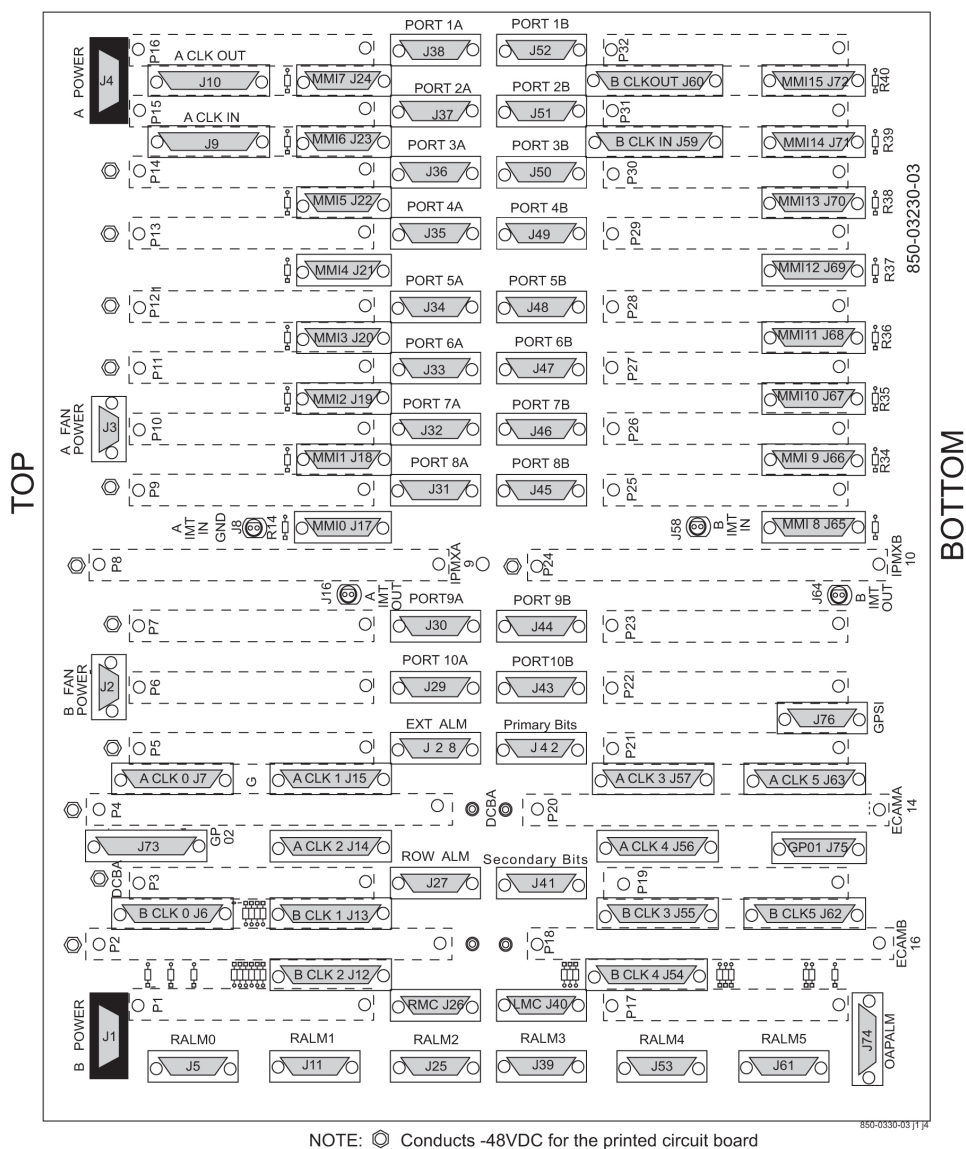


Figure 22: Control Shelf Backplane (P/N 850-0330-03/04)

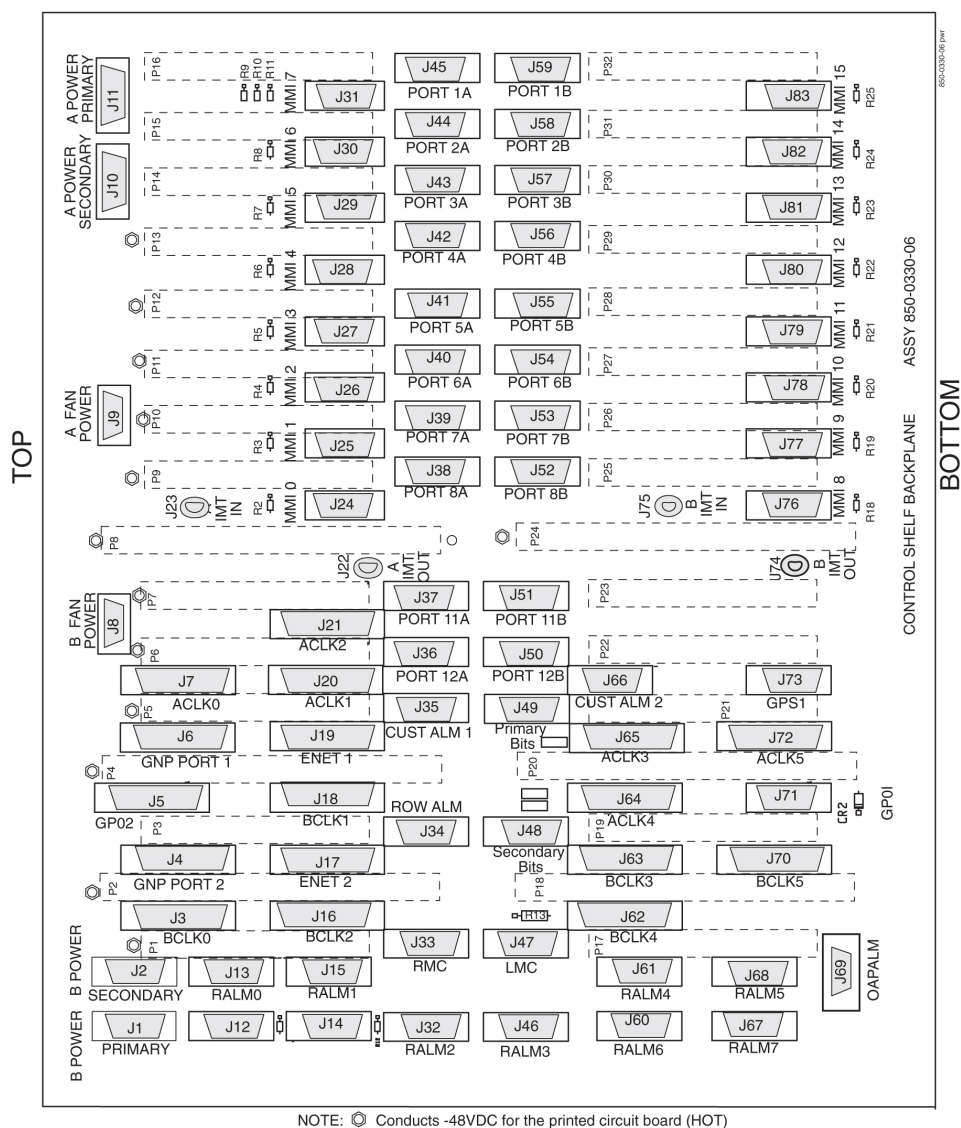


Figure 23: Control Shelf Backplane (P/N 850-0330-06)

Extension Shelf

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

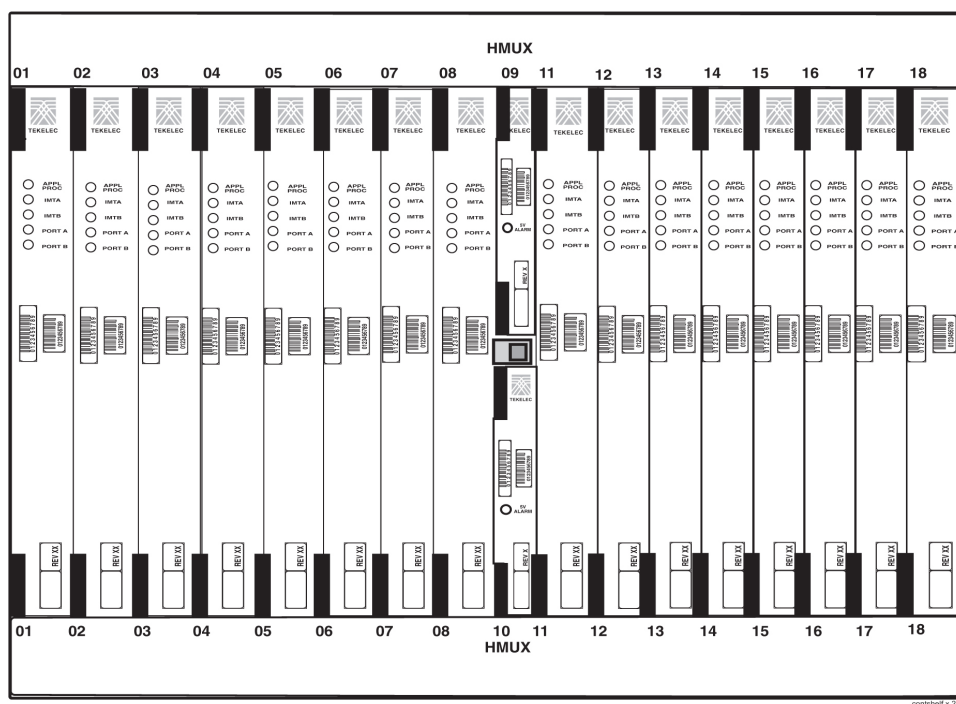


Figure 24: Extension Shelf with LIMs

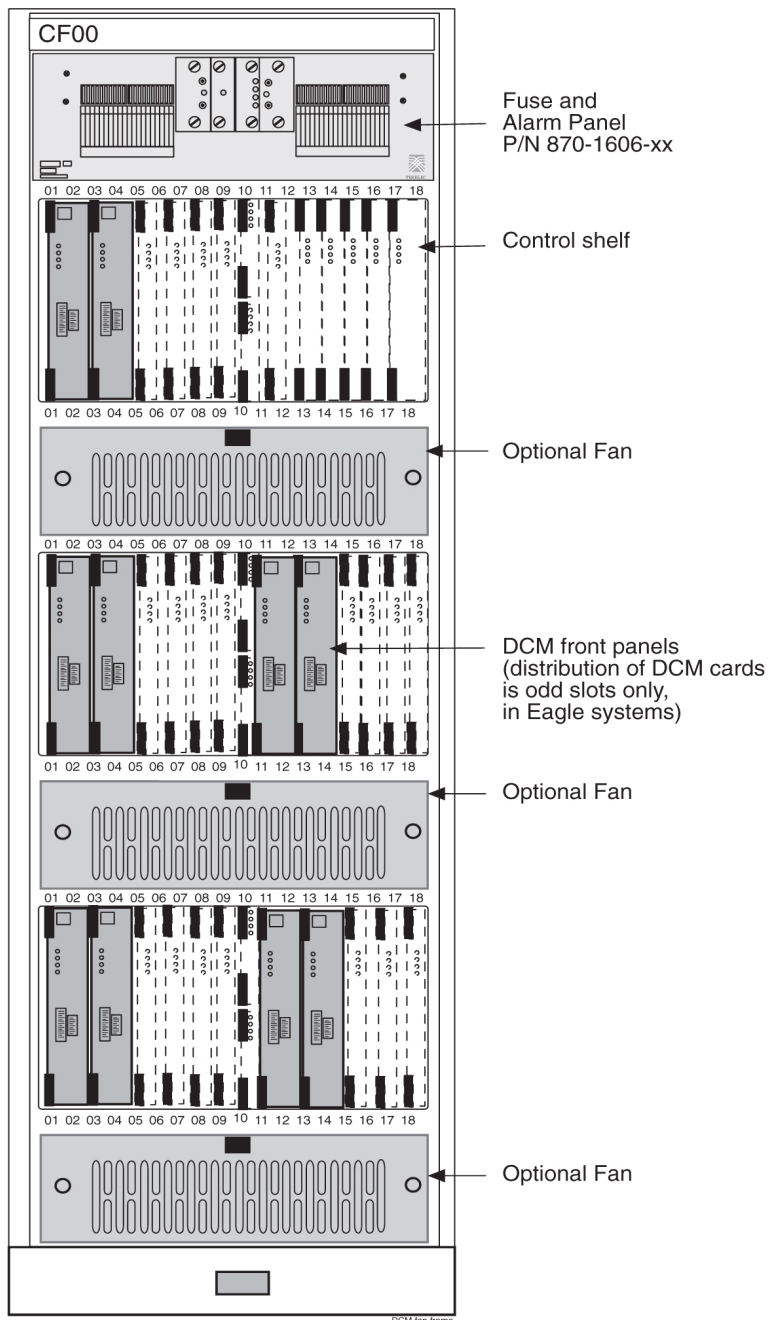


Figure 25: Shelves with DCM and LIM Cards in Control Frame

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.

Extension Shelf Backplanes

This section discusses the technical aspects of the extension shelf backplanes (P/N 850-0356-03/04/06) 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 J1, and the secondary power connection are on backplane (P/N 850-0356-03/04/06) are J45 and J46 secondary.

In *Installation*, 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).

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:

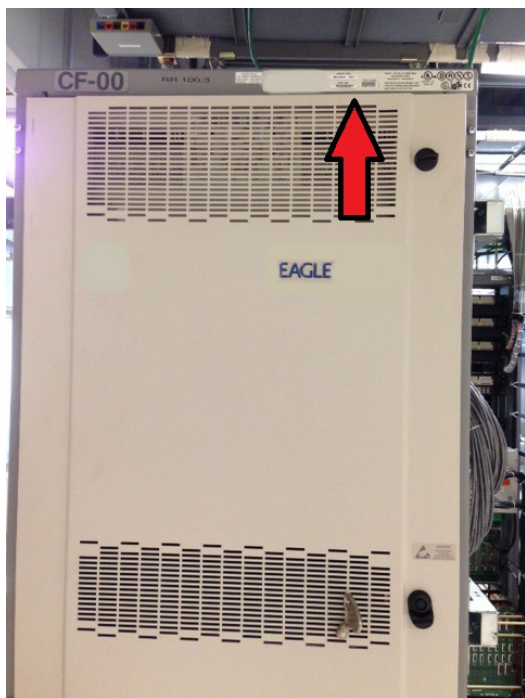


Figure 26: EAGLE System Number Frame View

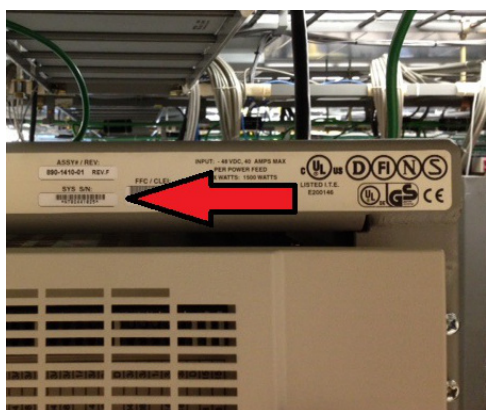


Figure 27: EAGLE System Number Medium View



Figure 28: EAGLE System Number Close View

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.

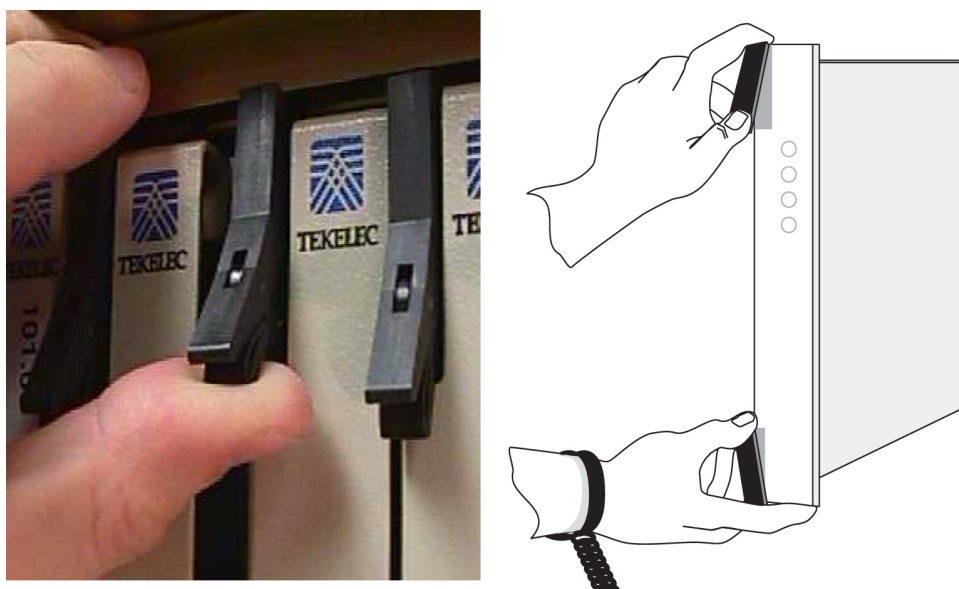


Figure 29: Cam-Out/Lock-In Levers on Cards

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. Customers may also upgrade their existing HMUX- or HIPR-based systems to HIPR2. 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.

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

- *E5 Maintenance and Administration Subsystem Processor (E5-MASP) Card*
- *E5-MDAL*
- *Link Interface Modules (LIM)*
- *Signaling Transport Card*
- *High-Capacity Multichannel Interface Module (HCMIM)*
- *E5-ATM/E5-ATM-B Module*
- *E5-E1T1/E5-E1T1-B Module*
- *E5-ENET/E5-ENET-B Module*
- *E5-IPSM Module*
- *E5-MCPM-B Module*
- *E5-SM4G/E5-SM8G-B Module*
- *E5-TSM*
- *Air Management Card*
- *Fan Tray*

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

Table 4: 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 (Part Number 870-2872-xx) is fully NEBS compliant. However, if ambient temperatures above 40° C are likely, Eagle Fan Trays (Part Number 890-0001-04) are recommended to ensure proper airflow to the upper HIPR2 cards in those shelves.

High Speed IMT Packet Router 2

The High-Speed IMT Packet Router 2 (HIPR2, P/N 870-2872-xx) 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 either 1.0625 Gbps or 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.

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 to be equipped with all HIPR2 cards.

HIPR2 supports a 1 Gbps inter-shelf bus rate and is compatible with the obsolete HIPR when operating at the low-rate. When the high-rate is required, all shelves within an EAGLE node must be equipped with HIPR2.

HIPR2 feature overview:

- EAGLE Release 41.1 or later is required for 870-2872-01 and 870-2872-02.
- Requires control shelf and extension shelf backplanes that support HIPR2 and later IMT components.
- 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, IMT interface cables upgraded to support new high-speed Fibre-channel, and a system FAK installed to allow the high-rate 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 (Part Number 870-2872-xx) is fully NEBS compliant. However, if ambient temperatures above 40° C are likely, Eagle Fan Trays (Part Number 890-0001-04) are recommended to ensure proper airflow to the upper HIPR2 cards in those shelves.

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 either a low rate (1.0625 Gbps) or 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 30: HIPR2 Switch Same Topology](#), in a same topology where all HIPR2 is used in an EAGLE the Fibre channel ring runs at either the low or high speed.

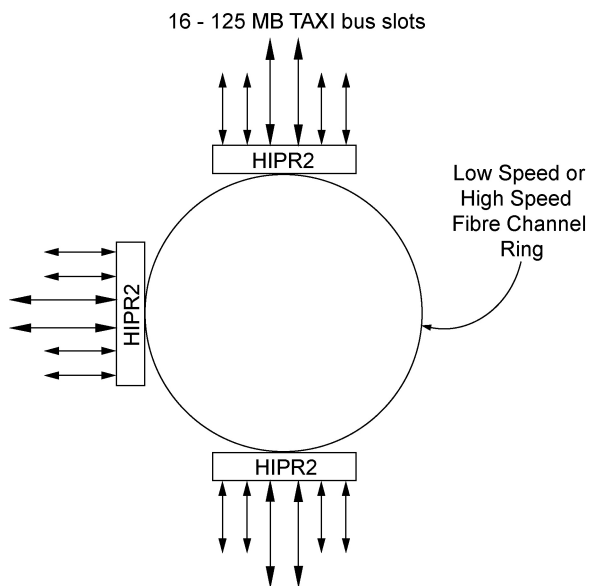


Figure 30: HIPR2 Switch Same Topology

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 than 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

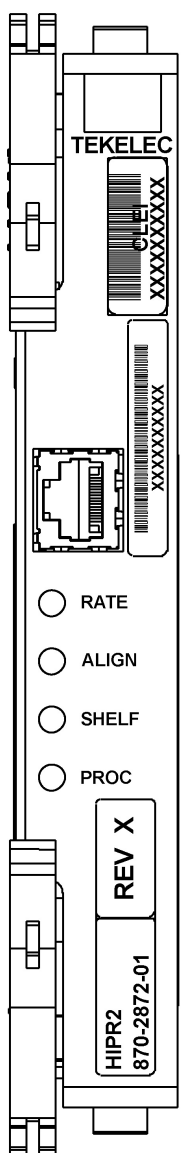
The HIPR2 card is compatible with the obsoleted HIPR card slot and can be fielded with any version of either the control or extension backplanes compatible with the obsoleted HMUX. One bus is taken out of service and upgraded to HIPR2s and then brought back online. This upgrade cycle is repeated on the 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 31: HIPR2 LEDs summarizes the use of the front-panel LEDs.



The diagram shows the HIPR2 card with the following labels: TEKELEC, CLE, XXXXXXXXX, XXXXXXXXX, RATE, ALIGN, SHELF, PROC, REV X, HIPR2 870-2872-01.

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

Figure 31: HIPR2 LEDs

Cabling

If the EAGLE does not have the correct cabling to support the HIPR2 card high rate (2.5 Gbps) operation, the cards will operate at low-rate (1.0625 Gbps) and will not be able to run at the high rate. IMT interface cables must be upgraded to support the new high-speed Fibre-channel. 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.

Technical Specifications

Table 5: 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)

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

The Maintenance and Administration Subsystem Processor (E5-MASP) (P/N 870-2903-01) and (P/N 870-2903-02) 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.

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, or 850-0330-06.
 - 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 32: E5-MASP Card \(870-2903-01\)](#).

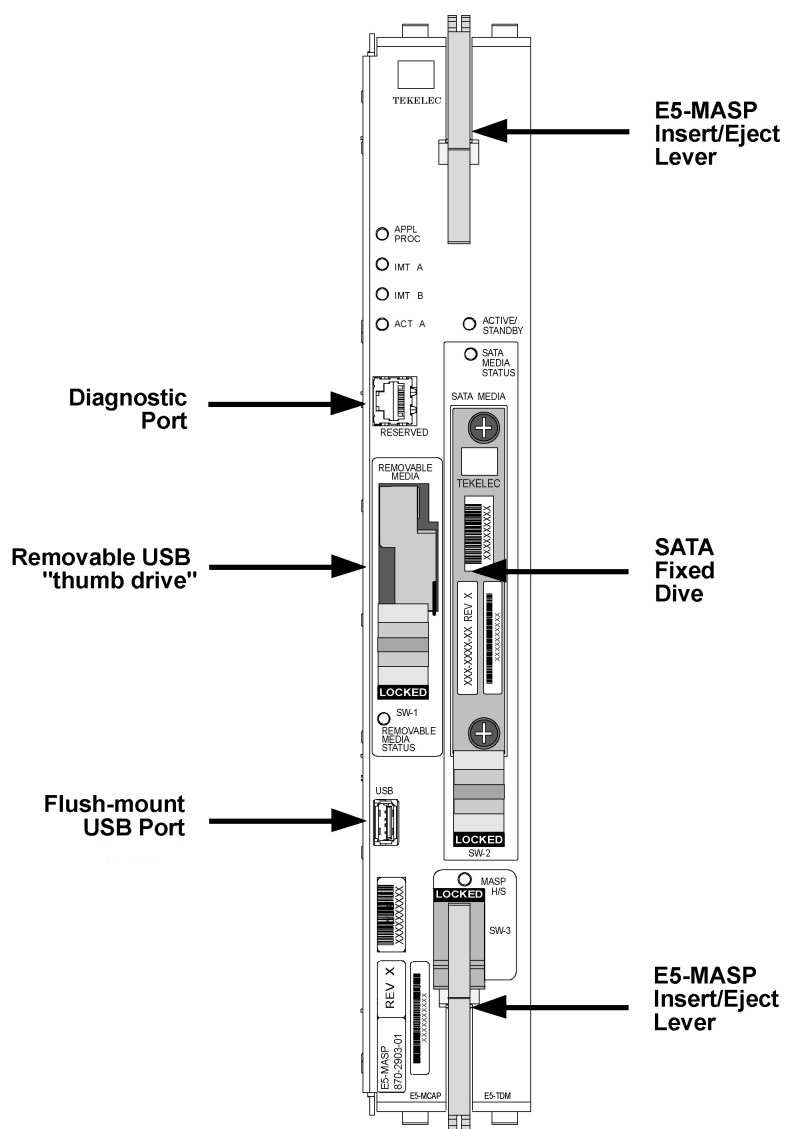


Figure 32: E5-MASP Card (870-2903-01)

The new E5-MASP Card with p/n 870-2903-02 has different hardware than the E5-MASP 870-2903-01.

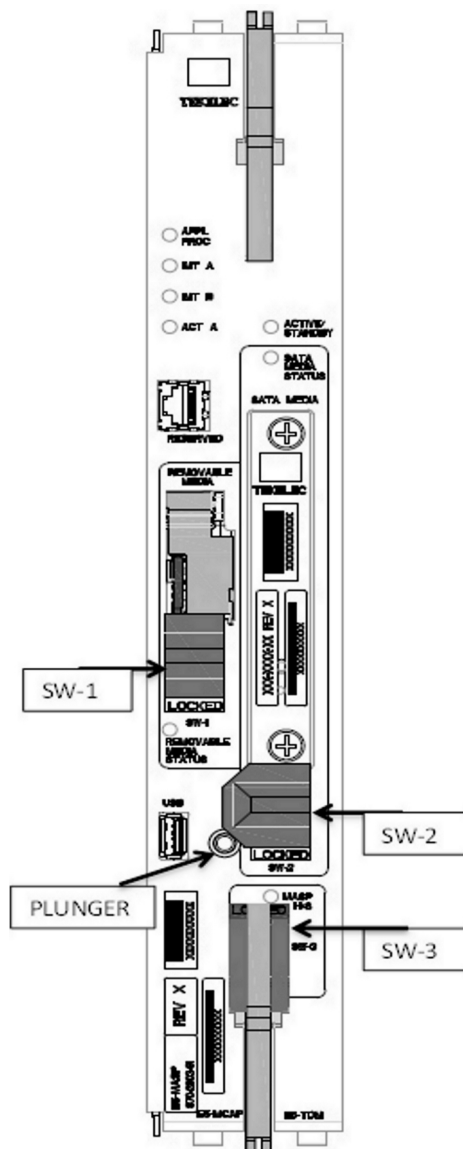


Figure 33: E5-MASP Card (870-2903-02)

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.

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 GPSM-II card used for the MCAP function.

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 Master 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).

E5-TDM Functions

The E5-TDM provides the following functions for the EAGLE 5 ISS.

- *System Clock Interface*
- *Time Slot Counter (TSC) Synchronization*
- *Master/Slave 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, E5-E1T1-B, E5-ENET, E5-ATM

Master/Slave Control

The terminal processor can switch the status of the E5-TDM card from master 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.

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 6: 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 reseated to restore operation once temperature returns to normal operating conditions

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 34: E5-MASP LEDs shows the LED status and description.

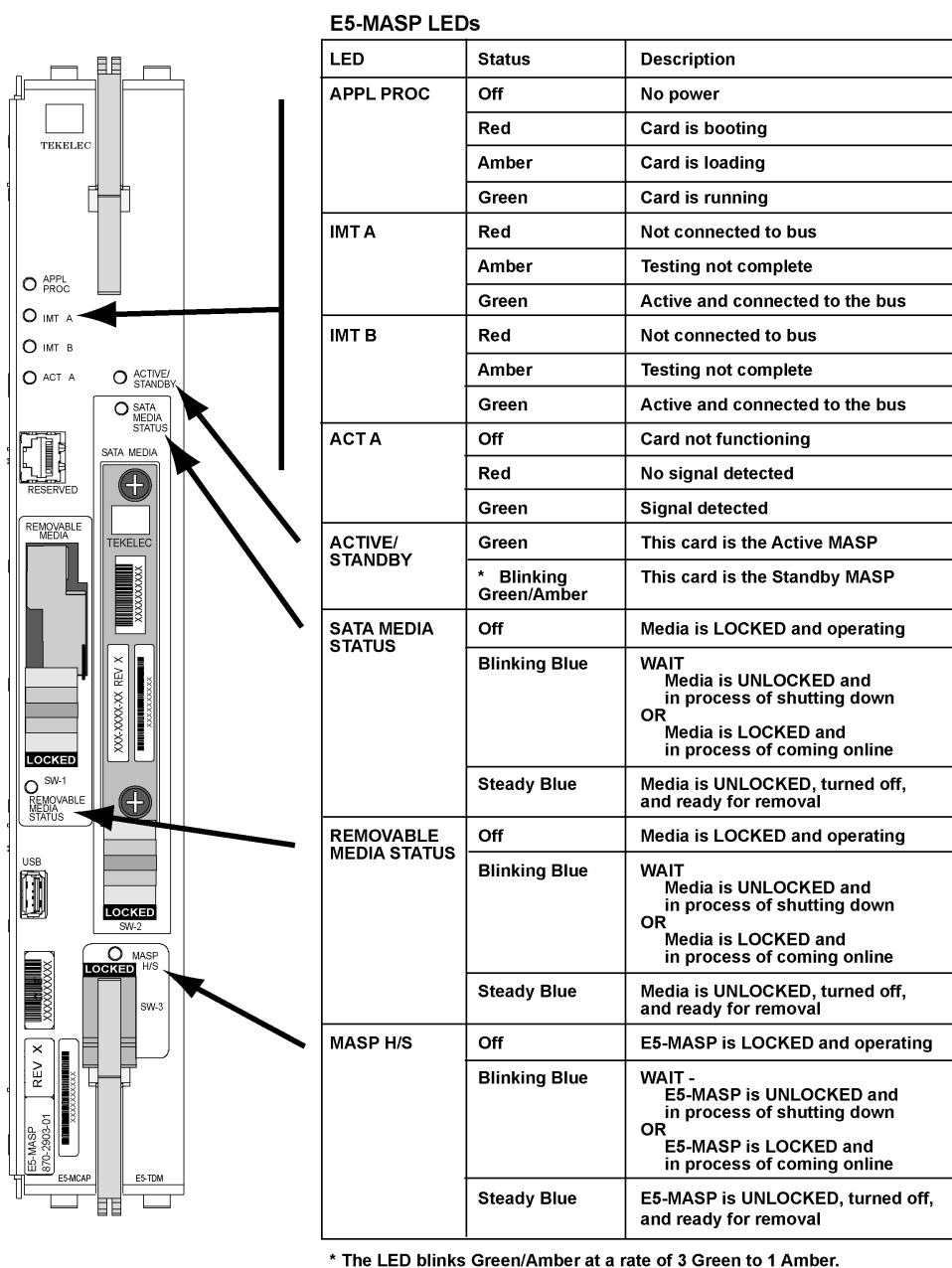


Figure 34: E5-MASP LEDs

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 7: E5-MASP 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)

E5-MDAL

The E5-MDAL card (P/N 870-2900-01) 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.

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 master, 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 master 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.

Fan Control

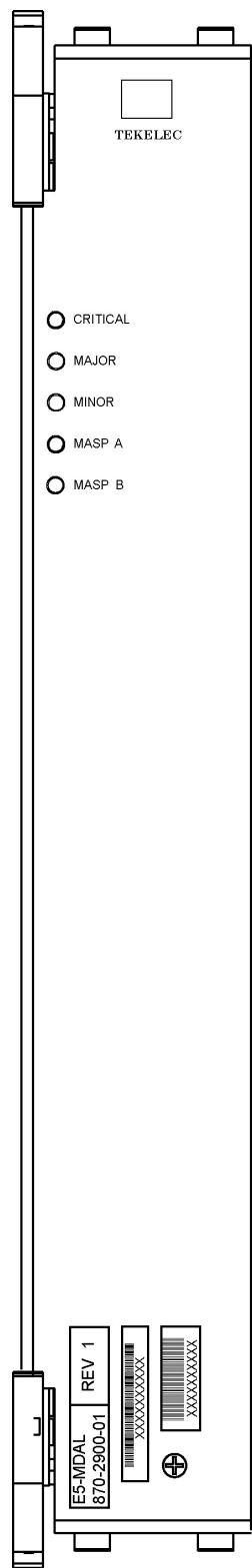
The E5-MDAL card provides control of fans on a per frame basis. The control logic allows for each fan relay to be set individually. There are relays to control fans on a per frame basis. The control logic

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.

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 master. 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 master E5-MASP.



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

Figure 35: E5-MDAL LEDs

Technical Specifications

Table 8: 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)

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:

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

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 (P/N 870-1873-xx) and E5-E1T1-B (P/N 870-2970-xx) cards.
- E5-ATM (P/N 870-1872-xx) and E5-ATM-B (P/N 870-2972-xx) cards.
- HCMIM (P/N 870-2671-xx)

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 9: Hardware Requirements-Maximum Number of Links describes the required hardware for the maximum number of links with different configurations.

Note: *Table 9: Hardware Requirements-Maximum Number of Links* 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 9: Hardware Requirements-Maximum Number of Links

Number of Links	Required Hardware
Up to 500 Links Note: A Maximum of 42 High-speed LIM cards (of which up to 41 can be IPLIMx cards) can be installed	HIPR2 cards on the IMT buses 2-port LIM cards or multi-port LIM cards (MPLs) Installed according to the provisioning rules for a system with up to 500 links in <i>Database Administration - SS7 User's Guide</i> .
From 501-700 Links Note: A Maximum 100 High-speed LIM cards (of which up to 41 can be IPLIMx cards) can be installed	HIPR2 cards on the IMT buses Note: There are only enough slots to support 500 links using just 2-port LIMs. 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 701--1500 Links Note: A Maximum 115 High-speed LIM cards (of which up to 100 can be IPLIMx cards) can be installed	<ul style="list-style-type: none"> • HIPR2 cards on the IMT buses Note: There are only enough slots to support 500 links using just 2-port LIMs. Enough E5-E1T1s to bring the total number of signaling links above 500, up to 700. Installed

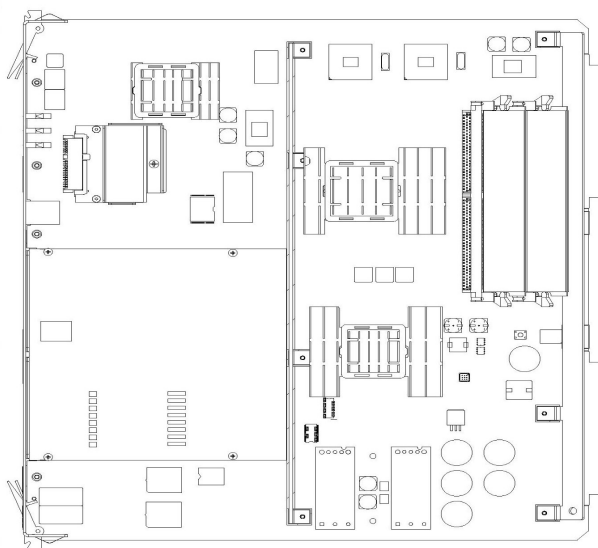
Number of Links	Required Hardware
	according to the provisioning rules for a system with 700 links in <i>Database Administration - SS7 User's Guide</i> .
From 1500 -- 2800 Links Note: A maximum 250 IPLIMx cards can be installed.	<ul style="list-style-type: none"> • HIPR2 cards on the IMT buses • E5-MASP cards installed in 1113 and 1115, to run the active FTP • E5-MDAL cards installed in card locations 1117 and 1118 <p>Note: There are only enough slots to support 500 links using just 2-port LIMs.</p> <p>Enough E5-E1T1 (P/N 870-1873-xx), E5-ATM (P/N 870-1872-xx), E5-ENET (P/N 870-2212-xx), and/or E5-SM4G (P/N 870-2860-xx) cards to bring the total number of signaling links to 2800.</p> <p>Installed according to the provisioning rules for a system with 2800 links in <i>Database Administration - SS7 User's Guide</i>.</p>

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.

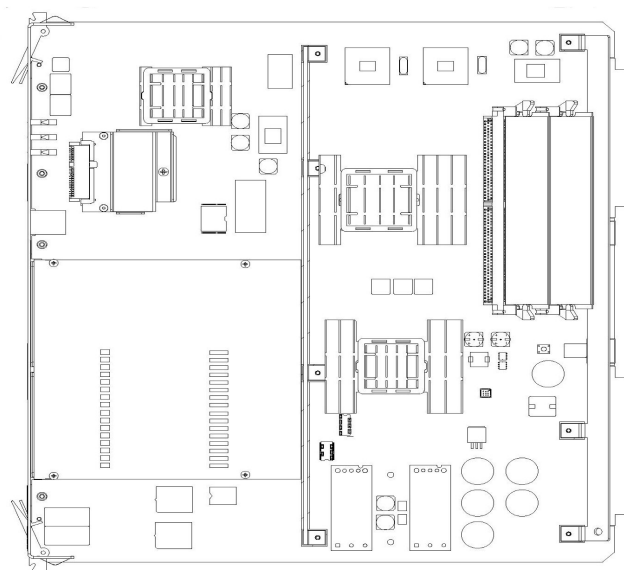
All four PCB assemblies have the same basic functions:

- 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



870-2972-01
E5_ATM-B_CARD_RDHS

Figure 36: E5-ATM-B Card



870-2970-01
E5_E1T1-B_CARD_RDHS

Figure 37: E5-E1T1-B Card

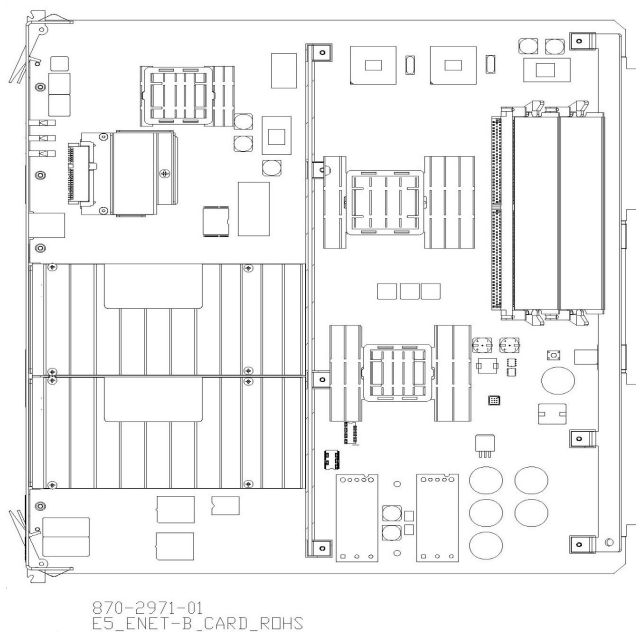


Figure 38: E5-ENET-B Card

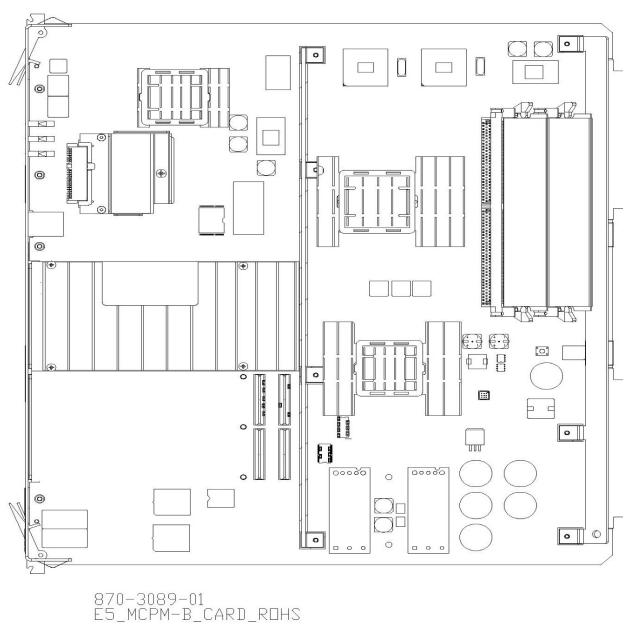


Figure 39: E5-MCPM-B

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.

High-Capacity Application Processor-Based LIMs

The HCAP-T (P/N 850-0615-xx) is an improved version of the HCAP main assembly card (P/N 850-0419-xx) that uses less power and has more on-board memory. The HCAP-T is plug-compatible with existing HCAP cards.

HCAP or HCAP-T Main Assembly

The High-Capacity Application Processor (P/N 850-0419-xx) or HCAP-T (P/N 850-0615-xx) provides the interface between the IMT bus and LIM-ATM or E1-ATM appliques.

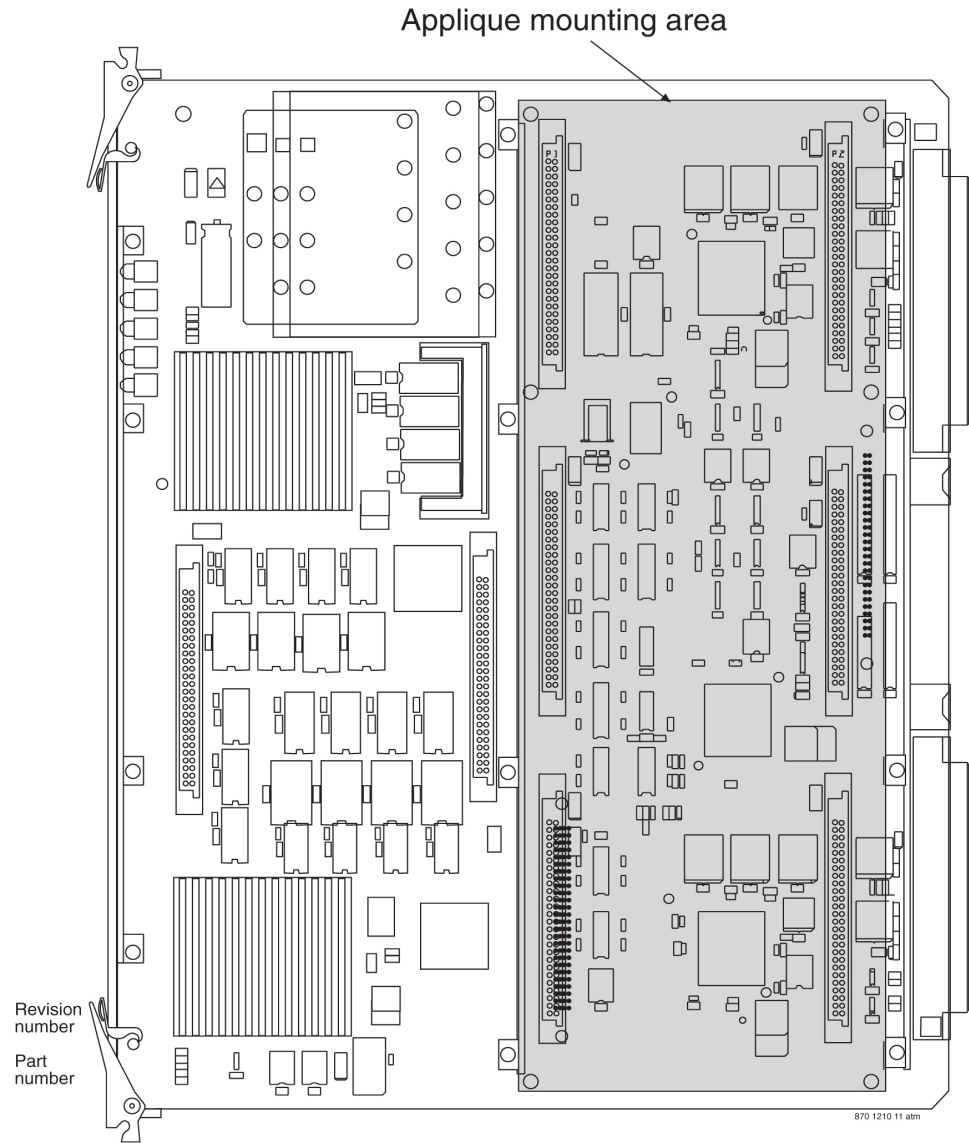


Figure 40: HCAP Main Assembly (P/N 850-0419-xx)

LIM Cards Technical Specifications

The technical specifications of the LIM cards are listed in [Table 10: LIM Card Specifications](#).

Table 10: LIM Card Specifications

Interfaces	
DS0A	64 and 56 kbps

Interfaces	
OCU	64 and 56 kbps
ATM (T1)	1.544 Mbps
E1 ATM	2.048 Mbps
E1	2.048 Mbps
T1	1.544 Mbps
J1	1.544 Mbps
Dimensions	
Height	14.4 in. (36.6 cm)
Length	12.8 in. (32.5 cm)

Database Communications Module

Note: Beginning with Release 46.0, an E5-ENET card must be used.

A Database Communications Module (DCM) provides the following functions for the system:

- Signaling Transfer Point, Local Area Network (SLAN) function
- ISUP protocol data exchange between the IMT and the IP network
- SS7 traffic exchange between B,C,D links and the IP network
- Enhanced bulk download
- When configured as a Sentinel Transport Card (STC) provides TCP/IP interfaces to the Extended Services Platform (ESP).
- When configured as an IPLIMx provides a point to point TCP/IP connection to be used to carry SS7 traffic over B, C and D links. This feature will allow multiple point to point connections and not point to multi-point connections. Point to multi-point connectivity is provided by the SS7IPGWGPL.

The DCM card and DSM card can be mounted in the control shelf, require two slots for mounting, and must be assigned to an odd numbered slots with the next higher-numbered even slot left open. The DCM card and the DSM card are compatible with control shelf backplanes (P/N 850-0330-04/06) and extension backplanes (P/N 850-0356-04/06).

Signaling Transport Card

The Signaling Transport Card (STC) is a DCM card with an “eroute” generic program load (GPL) installed. The STC is based on the single-slot EDCM card. The STC card functions as an IP router between the IMT bus internal to an EAGLE 5 ISS and the ethernet networks used to communicate with an associated Extended Services Platform (ESP).

Note: The STCs provide the IP interface between the LIM cards on the IMT bus and the Extended Services Platform (ESP) subassembly.

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—testing not complete, 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.

High-Capacity Multichannel Interface Module

The High-Capacity Multichannel Interface Module (HCMIM P/N 870-2671-01) is a dual slot card providing eight trunk terminations processing up to 64 signaling links of configurable channelized E1 or T1 connectivity. The eight E1/T1 ports reside on backplane connectors A and B.

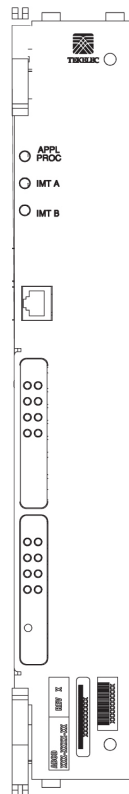


Figure 41: HCMIM Module

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 HCMIMs operating in T1 mode with others operating in E1 mode for gateway node scenarios.

HCMIM has the following requirements and dependencies:

- Any shelf that contains an HCMIM module must also be equipped with the two HIPR2 modules to manage the increased traffic capacity.
- HCMIM modules require a fan tray assembly for thermal management. Be sure to install the fan assembly 890-0001-04 before installing the HCMIM card.
- Any unused slots (that is, empty slots where no cards are populated) in shelves with HCMIMs must have Air Management cards, P/N 870-1824-02, to ensure proper air flow and fan tray efficiency.
- Frames where HCMIMs are to be deployed must be equipped with 60 Amp power circuits. The associated FAP for the frame must accommodate 60 Amp feeds (refer to [Fuse and Alarm Panels](#)).
- The HCMIM is a double-slot module but can only be plugged into odd numbered slots; the module will not power-up if plugged into an even numbered slot.

Total system signaling link capacity depends on other cards within the system and must not exceed the provisioning limit of the EAGLE 5 ISS. Since the HCMIM has the capacity to process a full T1 or E1 on a single card, daisy chaining or channel card operation is not needed. Interoperation with E1/T1MIMs operating in channel mode is not supported.

Channelized Mode

The HCMIM 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 timeslot 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.

The HCMIM card's I/O signals are routed to only the odd backplane slot. 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 42: Channelized HCMIM Interfaces](#).

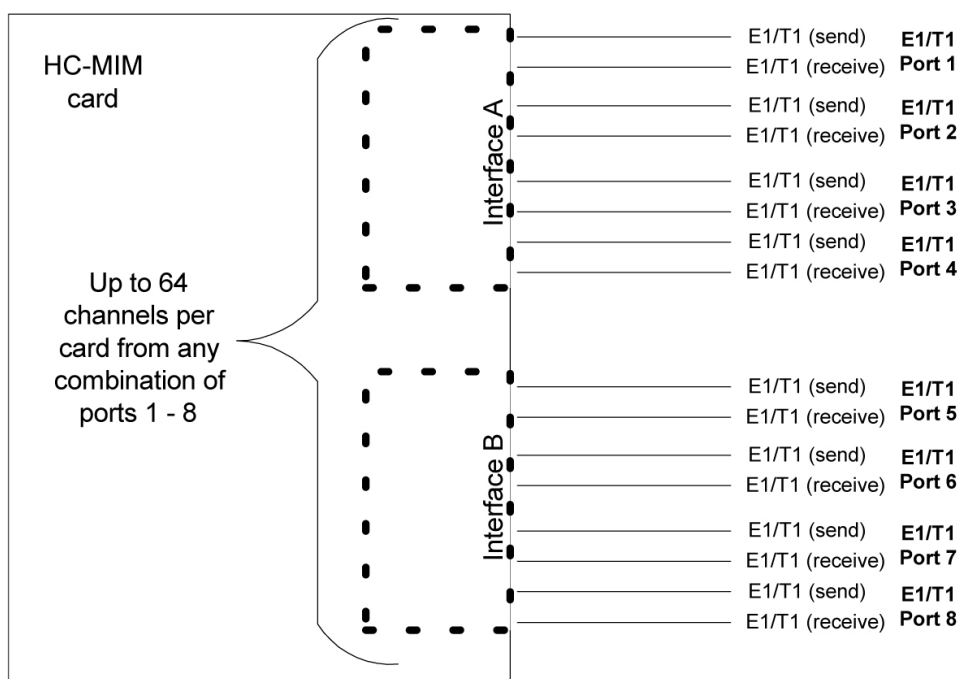


Figure 42: Channelized HCMIM Interfaces

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 Master 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.

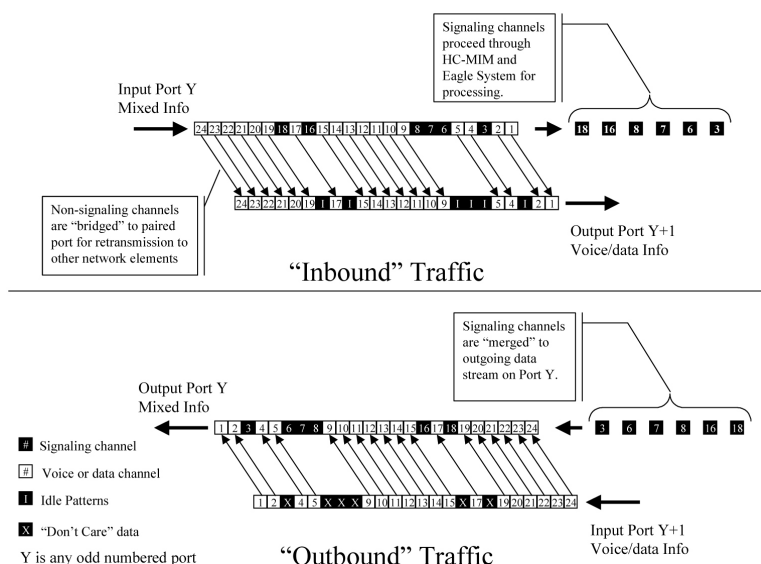


Figure 43: Channel Bridging Schematic

Note: Channel Bridging is unique to the HCMIM card and is not available on other E1 or T1 modules. Software must enable and manage this feature.

Timeslots located on the bridging slave E1/T1 port, (timeslots that have been dropped from the bridging master E1/T1 port), contain idle patterns provided by the EAGLE. All other idle timeslots that are not dropped must contain an idle pattern provided by the remote network elements connected to both E1/T1 ports (bridging master and slave). Without these patterns on the idle timeslots, instability of the E1/T1 may occur.

Note: Provisioning of signaling links on the bridging slave 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 master (odd) E1/T1 port to reach downstream network elements. This is a bi-directional interface so data is also able to enter the bridging slave E1/T1 port and leave through the bridging master E1/T1 port. This feature may be independently selected on E1/T1 ports 1, 3, 5, and/or 7. When selected, the bridging slave (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 HCMIM.

Table 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

Primary E1/T1 Port		Paired E1/T1 Port	
Number	Payload Contents	Number	Payload Contents
7	Signaling Processed	8	Unprocessed

Timing

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

- The bridging master E1/T1 port may use the timing recovered from the bridging slave E1/T1 port or visa versa.
- Both the bridging master and bridging slave E1/T1 ports are using an external clock source (the EAGLE's MASTER 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 slave E1/T1 port; however, standard statistics/measurements are made on the bridging master E1/T1 port. Alarms for the bridging slave E1/T1 port are limited to trunk-level synchronization and framing alarms. Channel alarm LEDs for the bridging slave E1/T1 port are amber to indicate the Channel Bridging mode of operation.

Three LEDs provide conventional EAGLE 5 ISS card indications of APPL Proc operation, and IMT A and IMT B operation. 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.

Table 12: Channelized HCMIM LEDs

Color	Port Status LED	Aggregated Channel Status LED
Green	No alarms, port has acquired timing and framing synchronization	All channels provisioned = ISNR
Amber blinking	Loss of Frame Synchronization	Any channels provisioned = OOS
Amber	Remote alarm condition	Indicates port is the "reflected" port in Channel Bridging mode of operation. Applies only to "even" numbered ports
Red blinking	Loss of signal and remaining errors	All channels provisioned = OOS
Red	Port not provisioned	No channels are provisioned

Technical Specifications

Table 13: HCMIM 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)

HCMIM Cable

The cable designed for the HCMIM card is the T1MIM/LIM P/N 830-0948-XX. When upgrading from an E1/T1MIM to an HCMIM, a cable adapter is not required. However, if you are replacing an MPL with an HCMIM, a port adapter is required.

Note: There will be an 830-0948-XX cable terminated on the odd shelves A and B backplane interfaces. Each cable provides four E1/T1 ports.

E5-ATM/E5-ATM-B Module

The E5-ATM card (P/N 870-1872-01) or the E5-ATM-B card (P/N 870-2972-01) is a single slot card providing ATM over E1 and T1 connectivity for EAGLE 5[®] ISS control and extension shelves.

Note: Throughout this document, the term E5-ATM refers to both the E5-ATM (P/N 870-1872-01) and the E5-ATM-B card (P/N 870-2972-01) cards unless specifically noted otherwise.

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
- STP/LAN (SLAN)
- Integrated Sentinel (e-route)
- Integrated Message Feeder
- 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 p/n 890-0001-04 before installing the E5-ATM-B card.

The E5-ATM has the following requirements and dependencies:

- Requires HIPR2 in the shelf where the E5-ATM resides.
- The E5-ATM is restricted from accessing the IMT bus through hardware control.
- E1 or T1 support, but will not support both physical port types on a single card simultaneously
- Does not require 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 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.

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 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 14: Thermal Alarm Conditions](#) identifies the appropriate responses.

Table 14: Thermal Alarm Conditions

Board Temperature	Actions
Temp1 Exceeded	Major alarm raised; PST/SST of card transitions to IS-ANR/Restrict

Board Temperature	Actions
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

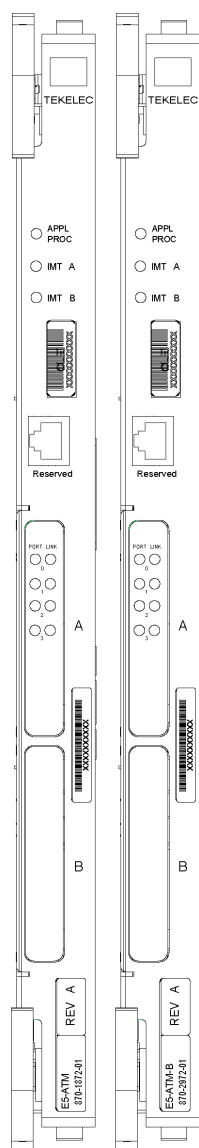
The thermal thresholds (Temperature Level1 and Temperature Level2) are user configurable. The user configurable T1 and T2 values will always be less than or equal to the T1 (max) and T2 (max) defined for a particular board type respectively. See [Table 15: T1 and T2 temperature thresholds](#) and the `chg-th-alm` command for more details on thermal thresholds.

Table 15: 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 44: E5-ATM](#) shows the LEDs and provides a description of indications.



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

Figure 44: E5-ATM

Interface Adapter

The E5-ATM 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 16: E5-ATM 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)

E5-E1T1/E5-E1T1-B Module

The E5-E1T1 card (P/N 870-1873-xx) or 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 supports up to 32 signaling links of configurable channelized E1 or T1 connectivity OR one SE-HSL signaling link on one of the eight ports and it must be A.

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.

The E5-E1T1 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 has these additional requirements:

- 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.

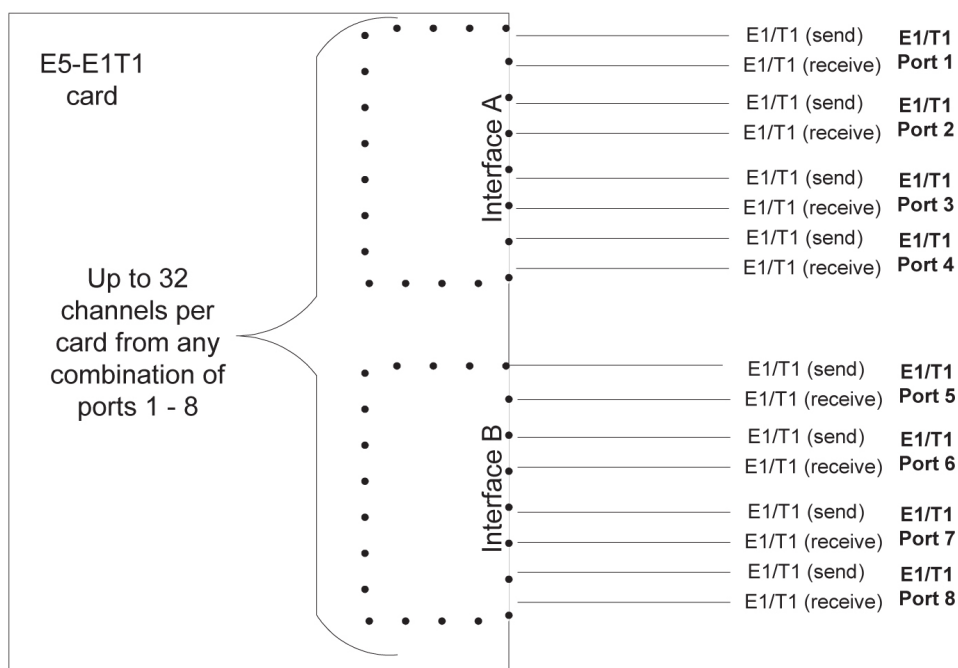
Channelized Mode

Note: The term E5-E1T1 used here refers to both the E5-E1T1 (P/N 870-1873-xx) and the E5-E1T1-B (P/N 870-2970-XX) cards unless specifically noted otherwise.

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 45: Channelized E5-E1T1 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.

Figure 45: Channelized E5-E1T1 Interfaces

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 Master 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 46: Channel Bridging Schematic](#).

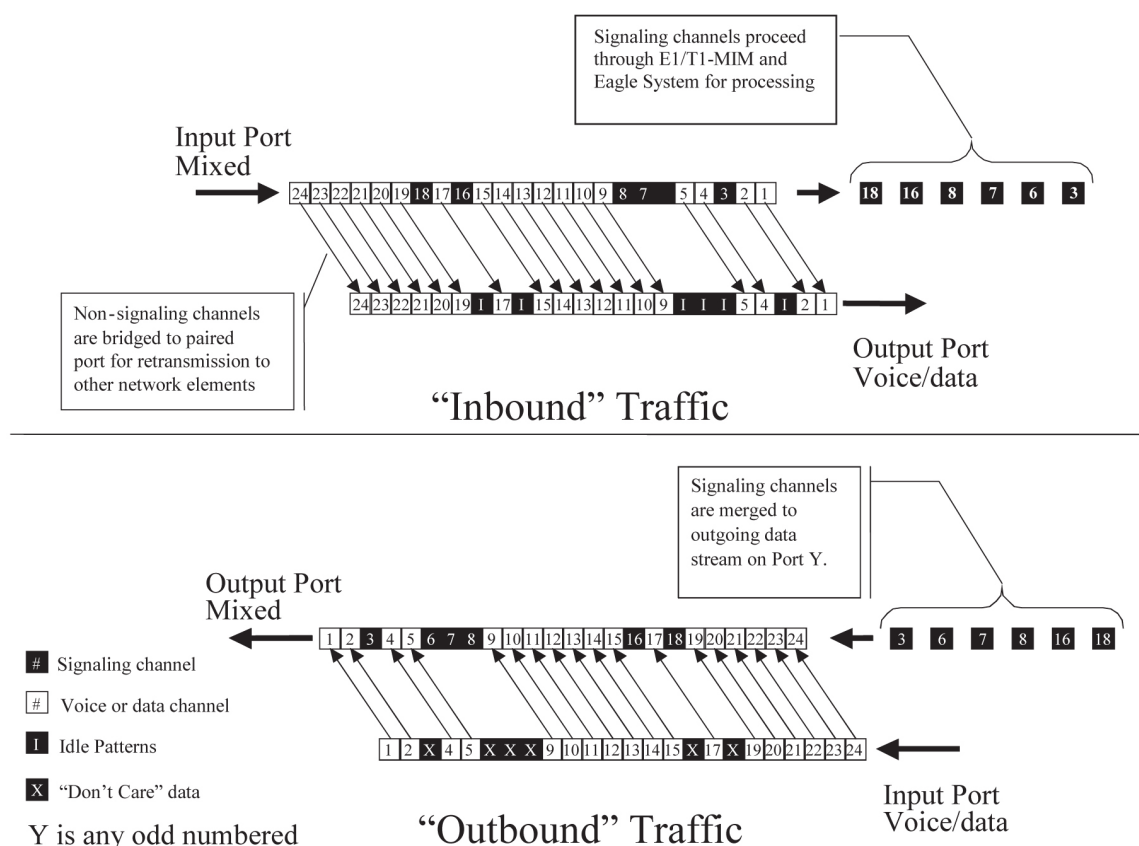


Figure 46: Channel Bridging Schematic

Time slots located on the bridging slave E1/T1 port, (time slots that have been dropped from the bridging master 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 master and slave). Without these patterns on the idle time slots, instability of the E1/T1 may occur.

Note: Provisioning of signaling links on the bridging slave 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 master (odd) E1/T1 port to reach downstream network elements. This is a bi-directional interface so data is also able to enter the bridging slave E1/T1 port and leave through the bridging master E1/T1 port. This feature may be independently selected on E1/T1 ports 1, 3, 5, and/or 7. When selected, the bridging slave (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 17: Channel Bridging E1/T1 Port Pairing

Primary E1/T1 Port		Paired E1/T1 Port	
Number	Payload Contents	Number	Payload Contents

PrimaryE1/T1 Port		PairedE1/T1 Port	
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 master and bridging slave E1/T1 ports must be synchronous; that is, both master and slave must be timed off the same clock source. This synchronization may be accomplished two ways:

- The bridging master E1/T1 port may use the timing recovered from the bridging slave E1/T1 port or visa versa.
- Both the bridging master and bridging slave E1/T1 ports are using an external clock source (the EAGLE's MASTER 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 slave E1/T1 port; however, standard statistics/measurements are made on the bridging master E1/T1 port. Alarms for the bridging slave E1/T1 port are limited to trunk-level synchronization and framing alarms. Channel alarm LEDs for the bridging slave 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 47: E5-E1T1](#).

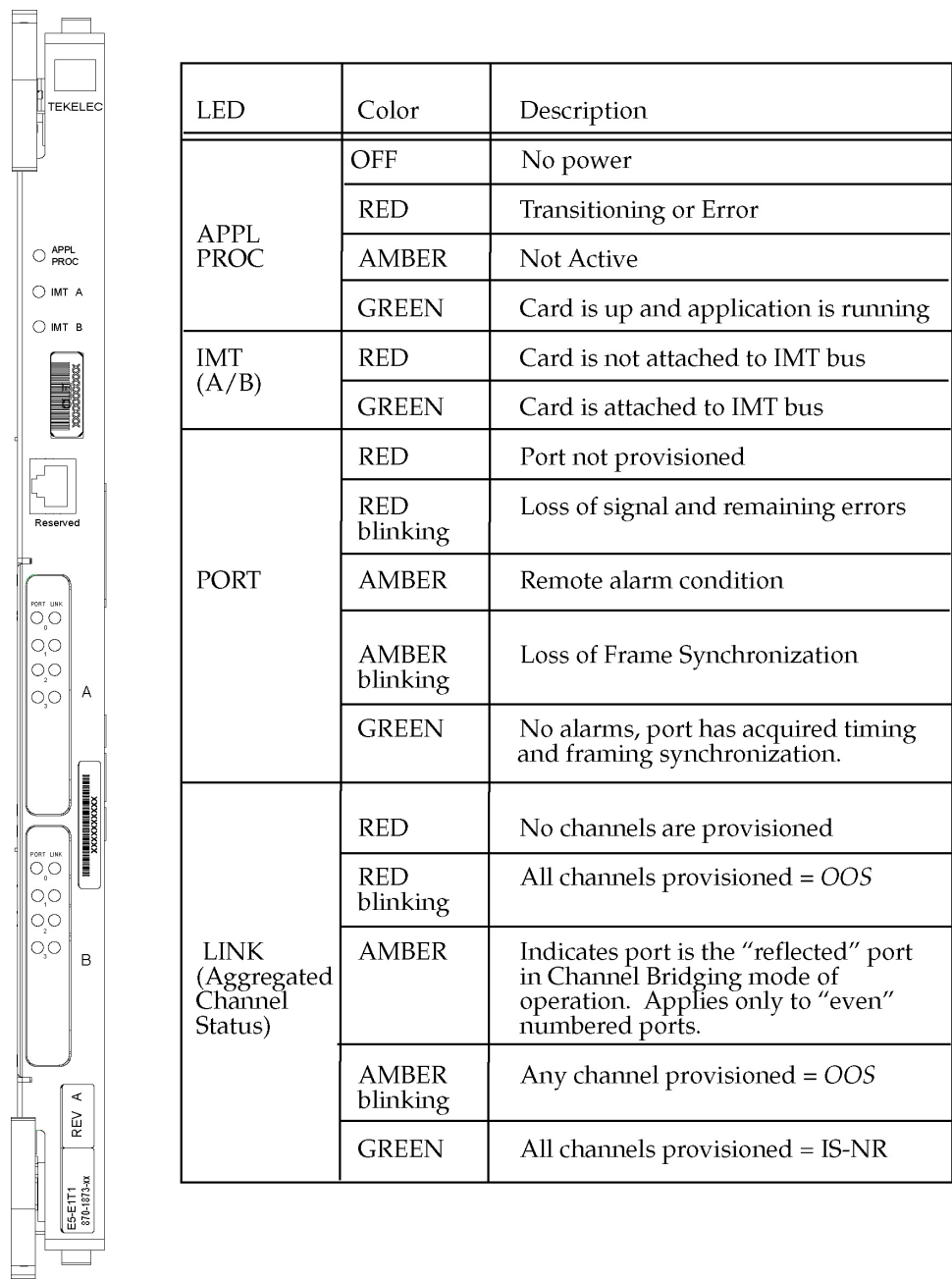


Figure 47: E5-E1T1

Technical Specifications

Table 18: E5-E1T1 Technical Specifications

Physical Characteristics	
Height	14.43 in. (36.65 cm)

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

E5-ENET/E5-ENET-B Module

The E5-ENET module (P/N 870-2212-xx) or 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 both the E5-ENET (P/N 870-2212-xx) and the E5-ENET-B (P/N 870-2971-xx) cards unless specifically noted otherwise.

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 19: E5-ENET Supported Protocols](#):

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.

Note: It is not recommended that customers mix SS-EDCM and DCM cards with E5-ENET cards within a linkset due to differences in performance and N+1 redundancy.

- The E5-ENET does not require a fan tray assembly for thermal management.

The E5-ENET-B has these additional requirements:

- 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 19: E5-ENET Supported Protocols

Feature	Protocols Supported
IPLIM	SCTP,M2PA
IPGWY	SCTP,M3UA,SUA
IPSG	M2PA, M3UA
SLAN	TCP/IP

Feature	Protocols Supported
EROUTE	TCP/IP

Table 20: E5-ENET Capacities

Parameter	IPLIM	IPGWY
E5-ENET cards per node	250	250
SCTP entities perE5-ENET module	16SCTP/IP Associations	50SCTP Connections
The maximum possible EAGLE currently supports 4000 in the link table.		

Thermal Management

The E5-ENET includes thermal management and alarming provisions to protect the card from damage if environmental conditions hinder thermal stability. [Table 21: Thermal Alarm Conditions](#) 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 IPLIMx all links on the card will go out of service.
- 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 21: 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 T1and T2 values will always be less than or equal to the T1 (max) and T2 (max) defined

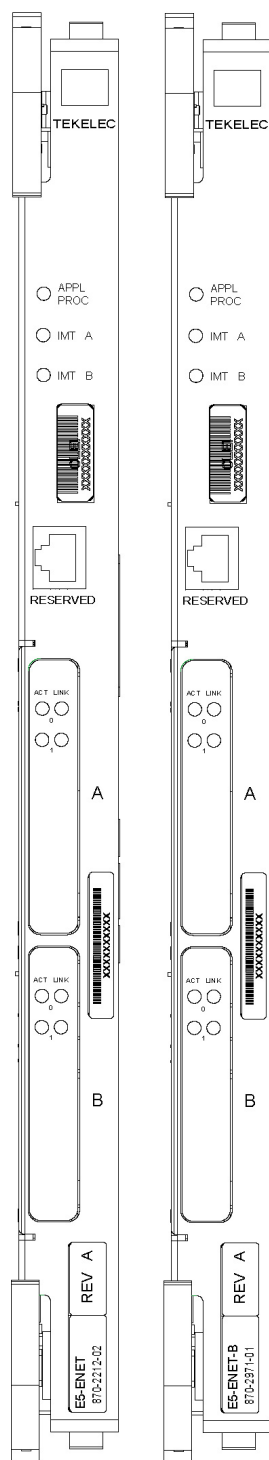
for a particular board type respectively. See [Table 22: T1 and T2 temperature thresholds](#) and the `chg-th-alm` command for more details on thermal thresholds.

Table 22: 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 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).



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	Red
All provisioned links are OOS-MT-DSBLD	Red
No link is OOS-MT and at least one provisioned link is IS-NR or IS-ANR	Green
At least one provisioned link is OOS-MT	Red

ACT Status LED states for IPGWx

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

Figure 48: E5-ENET

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 23: Interface Cable/Adapter](#).

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

- 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 IPSG 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 IPSG 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 23: Interface Cable/Adapter

Protocol	Adapter	Cable
IPLIM, IPGWY	830-1103-xx	830-0978-xx or 830-1204-xx
IPLIM, IPGWY	830-1102-xx	830-0724-xx or 830-1174-xx
IPSG 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 24: E5-ENET 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)

E5-IPSM Module

The E5-IPSM card (P/N 870-2877-01) is a single slot card providing Ethernet interface. The interface supports 10/100 Mbps data rates, full/half duplex traffic flow, fixed/auto-negotiate modes and DIX/802.3 MAC header modes. E5-IPSM can be exchanged with IPSM cards running IPS, without any changes in provisioning information

The E5-IPSM has the following requirements and dependencies:

- The shelf in which the E5-IPSM will reside must include HIPR2 to be active on both IMT A and B buses.
- The E5-IPSM supports one (1) physical Ethernet port.

Note: E5-IPSM assembly includes 2 physical Ethernet ports capable of operating at 10/100 Mbps, however, the second is used for maintenance testing.

- A fan tray assembly for thermal management is not required.
- Back plane cable adaptor P/N 830-1103-02 is needed to use the existing cable currently used for the IPSM based IPS, for connecting to the E5-IPSM card.
- Backplane cable adaptor P/N 830-1102-02 is required when using shielded CAT-5 Ethernet cables for TCP/IP connection to an external host.
- A maximum of three (3) cards either E5-IPSM or IPSM or a combination of both cards is supported for a single EAGLE node, on any shelf or combination of shelves.

Thermal Management

The E5-IPSM 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.

Thermal monitoring detects and provides notification of increasing thermal conditions in order to minimize data loss due to 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 is notified from the OS. The application software auto inhibits all telnet terminals allowed on that card (refer to the table below)
- Once the temperature recedes under the Temperature Level 2 threshold, the application allows all telnet terminals previously allowed on the card and sets their 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 25: Thermal Alarm Conditions

Board Temperature	E5-IPSM Actions
Temp Level 1 Exceeded	Major alarm raised
Temp Level 2 Exceeded	Critical alarm raised; Auto inhibit all telnet terminals allowed by user on that car 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 E5-IPSM 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). 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.

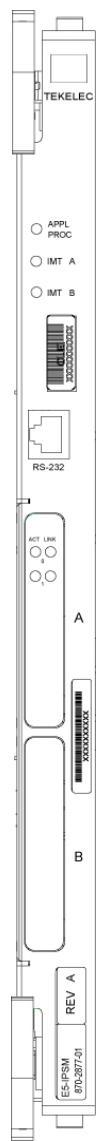


Figure 49: E5-IPSM

Table 26: E5-IPSM LEDs

LED	Color	Descriptions
APPL PROC	Red	Application processor is not running or is failing diagnostics.
	Amber	Card is loading an application or is being polled (may be prevented from loading by maintenance-out-of-service condition).
	Green	Card is running an application.
IMT	Red	Card is off IMT bus.

LED	Color	Descriptions
	Amber	Card is on IMT bus, but testing is not complete.
	Green	Card is on IMT bus.
	Blank	Communication processor is not operating.
ACT	Red	No active connection.
	Green	Active connection.
	Off	Port non-functional.
LINK	Red	Interface inactive.
	Green	Interface active.
	Off	Interface non-functional.

Interface Cable Differences

The Ethernet interface pin outs are different on the E5-IPSM from the IPSM cards.

- Adapter P/N 830-1103-02 is required for each E5-IPSM interface used when using the existing cabling required for DCM-based cards running IPSM. The adapter is connected between the backplane connector and the existing cable for the card.
- Adapter P/N 830-1102-02 is required for installation of the E5-IPSM when the 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 hub, or a patch panel (same place the cable was terminated).

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

Technical Specifications

Table 27: E5-IPSM 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)

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 p/n 890-0001-04 before installing the E5-MCPM-B card

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 28: Thermal Alarm Conditions](#) identifies the appropriate responses.

Table 28: Thermal Alarm Conditions

Board Temperature	Actions
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 29: T1 and T2 temperature thresholds](#) and the `chg-th-alm` command for more details on thermal thresholds.

Table 29: 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-IPSM 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.

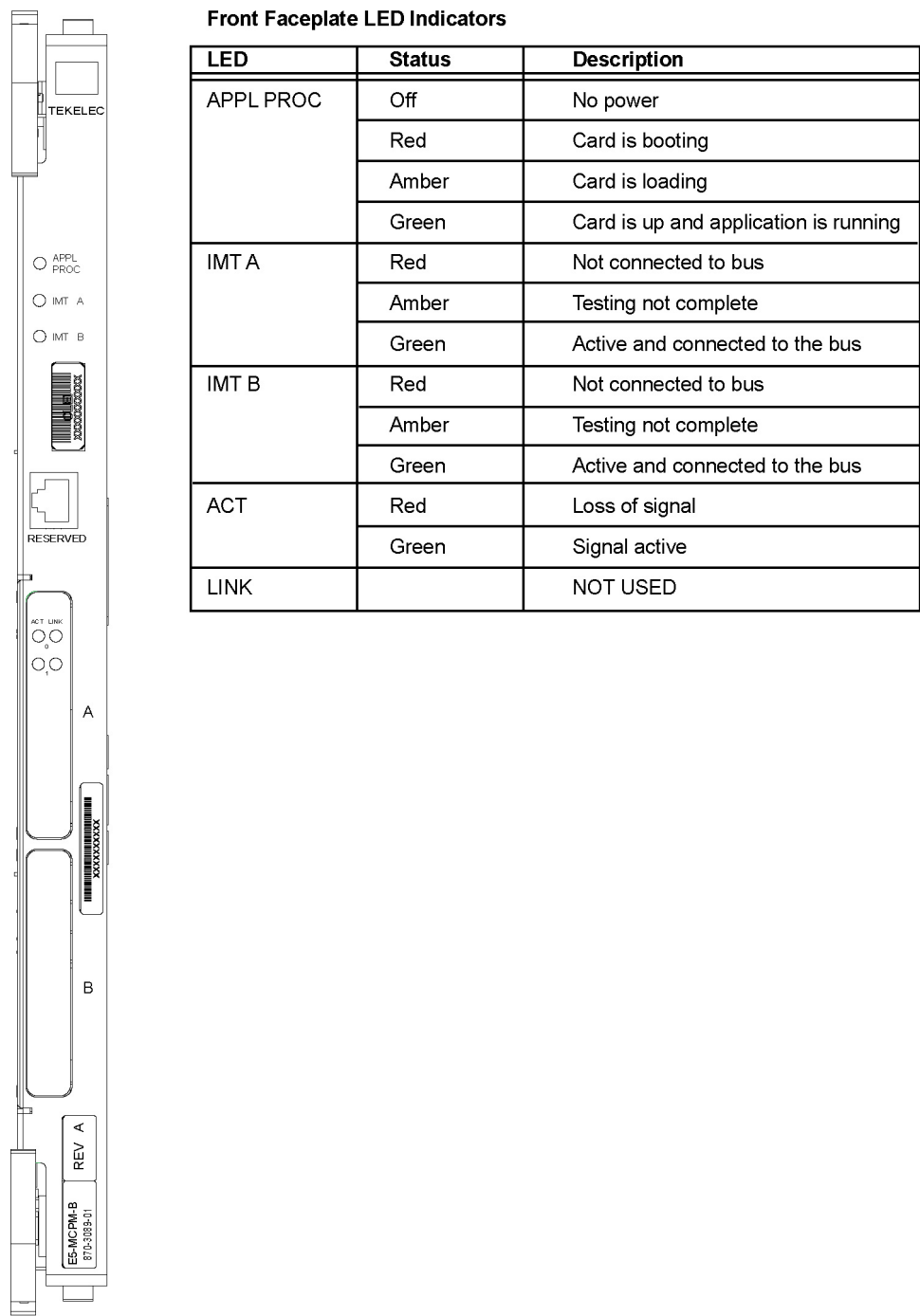


Figure 50: E5-MCPM-B

Technical Specifications

Table 30: E5-MCPM-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)

E5-SM4G/E5-SM8G-B Module

The E5-SM4G (P/N 870-2860-xx) or the E5-SM8G-B (P/N 870-2990-xx) is a database service module (DSM) designed to operate in the EAGLE shelf. The E5-SM4G is a double-slot card with 4GB of total memory. 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).

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.

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

The E5-SM4G 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.

The E5-SM4G has the following requirements and dependencies:

- Requires HIPR2 to be active on both IMT buses in the shelf where the E5-SM4G will reside.
- Does not require a fan tray assembly for thermal management.
- The E5-SM4G 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-SM4G provides two physical 10/100/1000 Mbps Ethernet ports.

Thermal Management

The E5-SM4G provides thermal management and alarming provisions to protect the card from damage due to overheating. The E5 SM4G 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.

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 31: Thermal Alarm Conditions

Board Temperature	E5-SM4G 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 32: T1 and T2 temperature thresholds](#) and the `chg-th-alm` command for more details on thermal thresholds.

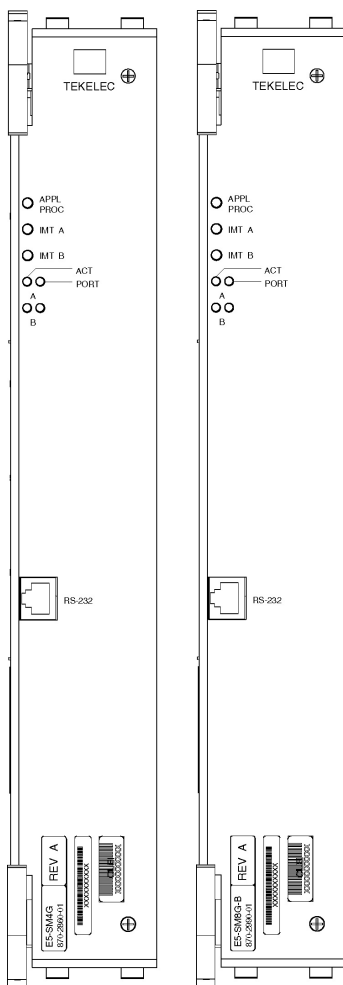
Table 32: T1 and T2 temperature thresholds

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

Cards	T1 Max (in Celsius)	T2 Max (in Celsius)	User Configurable T1 range (in %)	User Configurable T2 range (in %)
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.



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

Figure 51: E5-SM4G/E5-SM8G-B LED Indicators

Interface Cable Adapter

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 33: E5-SM4G and E5-SM8G-B Technical Specifications

	E5-SM4G	E5-SM8G-B
Physical Characteristics		
Height	14.43 in. (36.65 cm)	14.43 in. (36.65 cm)
Width	2.06 in. (5.23 cm)	2.06 in. (5.23 cm)
Depth	12.80 in. (32.51 cm)	12.80 in. (32.51 cm)

E5-TSM

The E5-TSM (Translation Services Module), P/N 870-2943-xx, is a single-slot Embedded Processor Module (EPM) with 512MByte of memory. The E5-TSM card provides the EAGLE system with Gateway Screening Binder/Generic Loading Services. To provide this service, the E5-TSM runs a GPL labeled GLSHC. The GLS function provides in-memory storage of Gateway Screening (GWS) data and downloads the data automatically to link cards where the GWS feature is executed.

The E5-TSM hardware is compatible with pre-existing TSM-256 hardware running GLS. The E5-TSM is a replacement for the TSM-256 card running GLS. This compatibility allows hot-swapping of the card modules after upgrade has completed, provided the card location is in a HIPR2 equipped shelf.

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

- Release 40.0 is required
- Activation of the Gateway Screening feature is required
- A HIPR2 card must be installed in the same shelf as the E5-TSM
- The E5-TSM is fully interoperable and hot-swappable with the TSM-256 for the GLS application

Note: Hot swapping to install an E5-TSM is supported provided the shelf is HIPR2 equipped.

EAGLE nodes may be comprised of one of each type of module for the required redundant configuration. This allows the E5-TSM to serve as a replacement module for the TSM-256 card running GLS.

Thermal Management

The E5-TSM includes thermal management and alarming provisions to protect the card from damage if environmental conditions hinder thermal stability. identifies the appropriate responses.

Table 34: Thermal Alarm Conditions

Board Temperature	Actions
Temp1 Exceeded	Major alarm raised
Temp2 Exceeded	Critical alarm raised, outstanding loading service requests shall be completed, failover initiated,

Board Temperature	Actions
	new loading service requests denied State of card shall transition to IS-ANR / Restricted
Temperature abated	Normal operation restored (Clearing Condition)

Technical Specifications

Table 35: E5-TSM 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)

E5-TSM LEDs

The E5-TSM includes three front panel indicators (LEDs) for APPL Proc operation, IMT A, and IMT B status.

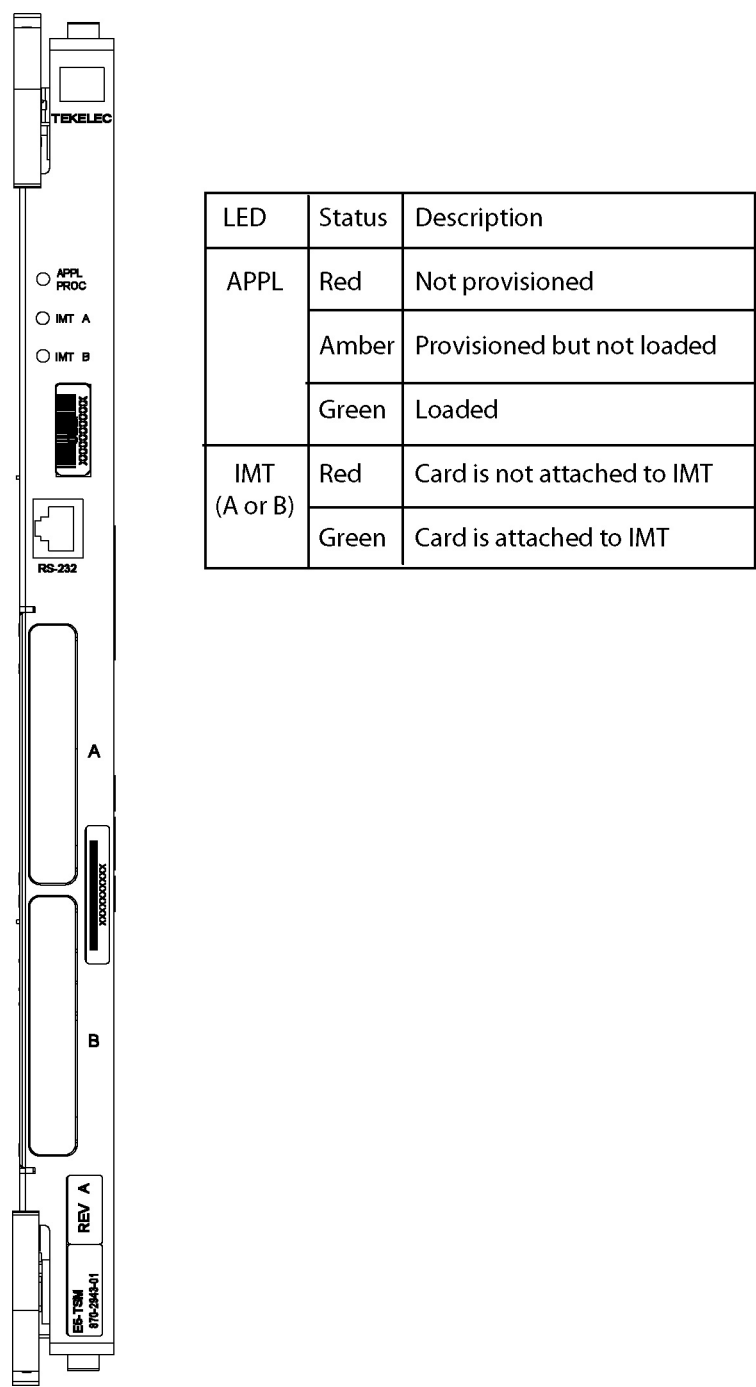


Figure 52: E5-TSM LEDs

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 890-0001-04 fan assembly.

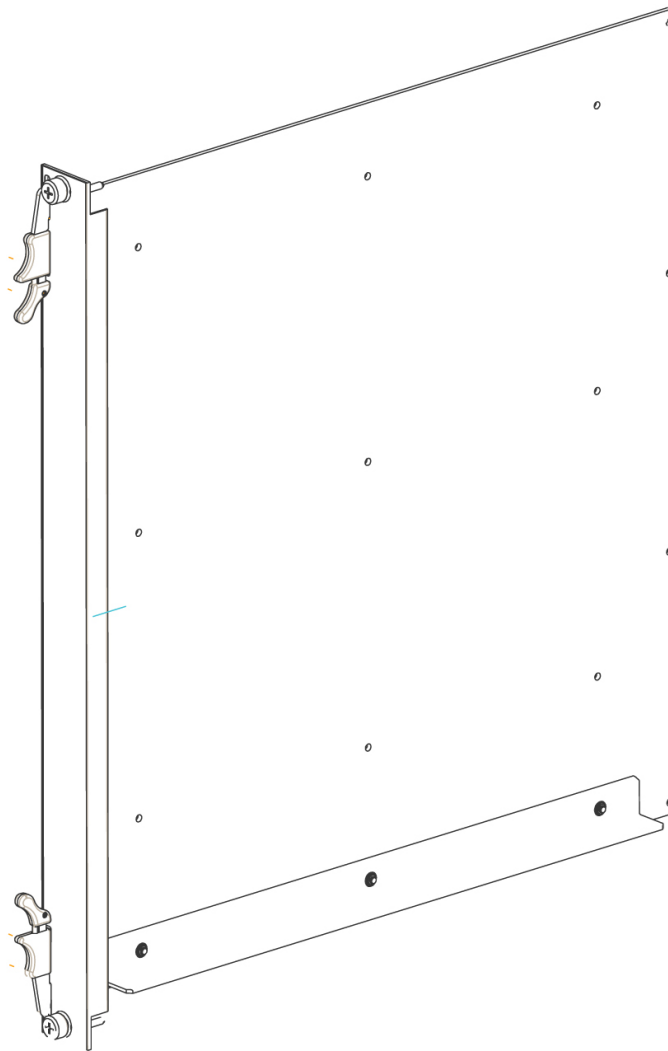


Figure 53: Air Management card

Fan Tray

The EAGLE fan tray P/N 890-0001-04 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, or E5-SM8G-B cards are required to be cooled by fan tray P/N 890-0001-04.

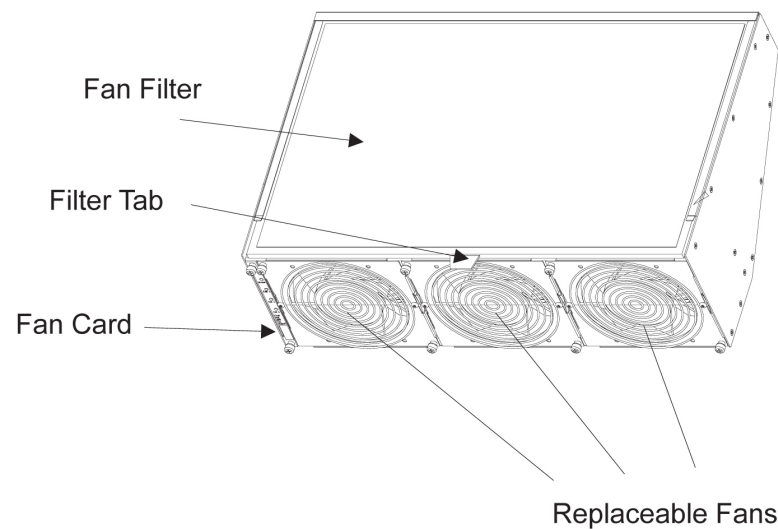


Figure 54: Fan Tray

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.

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.

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 55: Fuse \(GMT Brand Shown\)](#)). 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.

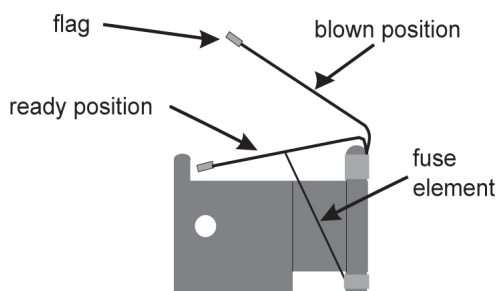


Figure 55: Fuse (GMT Brand Shown)

Table 36: 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

Fuse Amp	Fuse Flag Color		Fuse Amp	Fuse Flag Color
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			

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 56: Fuse and Alarm Panel - Front View (P/N 870-2804-xx) and *Table 37: Fuse and Alarm Panel Front Items (P/N 870-2804-xx)* describes the front panel configuration of the fuse and alarm panel (P/N 870-2804-01).

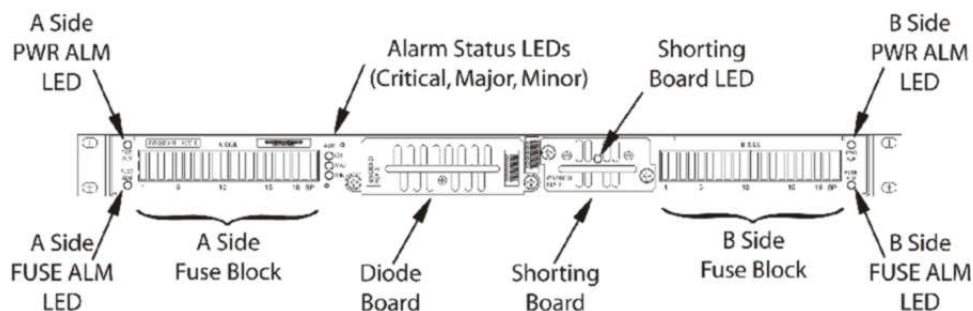


Figure 56: Fuse and Alarm Panel - Front View (P/N 870-2804-xx)

Table 37: 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.
FuseAlarm	LED indicator for fuse fail alarm
PowerAlarm	LED indicator for input power
CriticalAlarm	LED indicator for critical alarm
MajorAlarm	LED indicator for major alarm
MinorAlarm	LED indicator for minor alarm

Table 38: Fuse State and LED condition (P/N 870-2804-01). presents possible alarm LED states and corresponding fuse conditions.

Table 38: 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
Shorting board in normal operational mode, Shorting board		Green	Green

Fuse State A side	Fuse State B side	Fuse LEDs A side	Fuse LEDs B side
LED is off. No fuses blown.			

Figure 57: Fuse and Alarm Panel Rear (P/N870-2804-01). and Table 39: Fuse and Alarm Panel Rear Items (P/N870-2804-01). describes the rear panel configuration. Refer to *Installation* for cabling connection information.

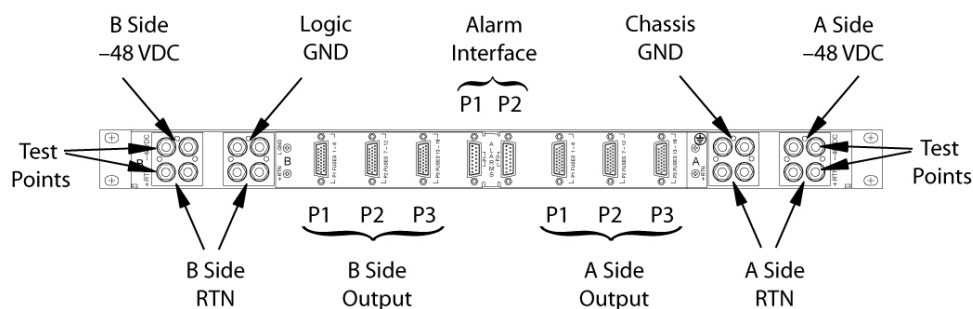


Figure 57: Fuse and Alarm Panel Rear (P/N870-2804-01).

Table 39: 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 40: Fuse and Alarm Panel Specifications (P/N 870-2804-01). presents the power requirements and physical dimensions for the FAP.

Table 40: 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)

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 58: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Front*.

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 58: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Front and *Table 41: Fuse and Alarm Panel Front Items* describes the front panel configuration of the fuse and alarm panel (P/N 870-1606-xx/870-2320-xx).

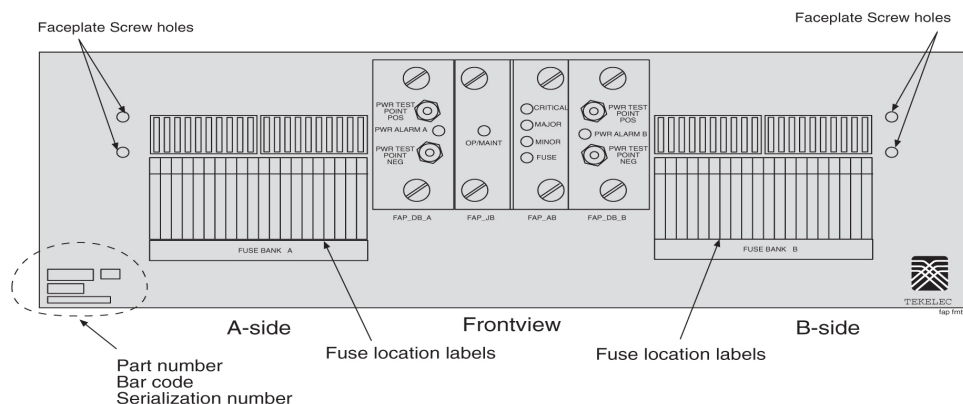


Figure 58: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Front

Table 41: 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 59: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear and *Table 42: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear* describes the rear panel configuration of fuse and alarm panel (P/N 870-1606-xx). Refer to *Installation* for cabling connection information.

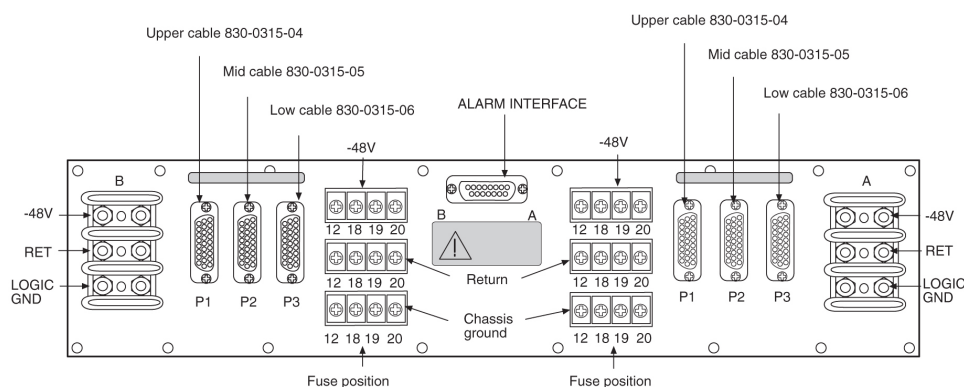


Figure 59: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear

Table 42: 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	<p>–48VDC, Chassis Ground, and RTN for Fuse location 12, 18, 19, and 20 for side A.</p> <p>These are miscellaneous extra capacity fuses refer to Provision Rules for FAP Fuse Locations .</p>
Output Terminal Block B	<p>–48VDC, Chassis Ground, and RTN for Fuse location 12, 18, 19, and 20 for side B.</p> <p>These are miscellaneous extra capacity fuses refer to Provision Rules for FAP Fuse Locations</p>
–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 43: 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)

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 870-2320-03 Rev A through I. Fuse size on boards 60 amp per side for P/N 870-1606-02 Rev C and 870-2320-03 Rev J.
- Fuse and Alarm Panel, Jumper board in maintenance mode must be less than 40 amp per distributed output side.

Holdover Clock

The holdover clock (refer to [Figure 60: Holdover Clock, Card Location](#)) is an optional device that can maintain clock synchronization for system Digital Signal Level-0 Applique (DS0A) links during brief (up to 15 seconds) Building Integrated Timing System (BITS) clock signal outages. This follows Telcordia Technology requirements as specified in GR-1244-CORE.

The holdover clock is connected to the BITS clock source in the system. The BITS clock inputs to the system through the control shelf. The device is located in, and receives –48VDC power from, a miscellaneous frame (refer to [Figure 61: Holdover Clock, Frame Connections](#)).

Connections from the holdover clock to the system control shelf consist of two clock cables and a cable to signal holdover clock alarm conditions to other parts of the system.

The holdover clock contains the following:

- Maintenance Interface System (MIS) (P/N 804-0175-01) card system alarm interface which provides alarms output to the system control shelf.

- Two Critical Status Indicators (CI) (P/N 804-0165-01) cards for clock inputs A and B.
- Two Signal Transfer, Stratum-3 (ST-3) (P/N 804-0173-01) cards for clocks A and B.
- Three Timing Output Composite Clock Automatic (TOCA) (P/N 804-0166-01) cards, clock outputs (TO1 and TO2) for A and B through the system control shelf.

Note: The TOCA cards may be replaced with TOLA cards. For wiring information on TOLA cards see *Installation*.

- One Matrix Controller Automatic-5 (MCA) (P/N 804-0251-01) card controls the output protection switch matrix just above the Data Carrier Detect (DCD) DCD-523 shelf card slots.

The outputs of the TOCA cards are connected to a wire-wrap panel mounted on top of the holdover clock. The clock inputs on the system's control shelf are connected to the holdover clock wire-wrap panel.

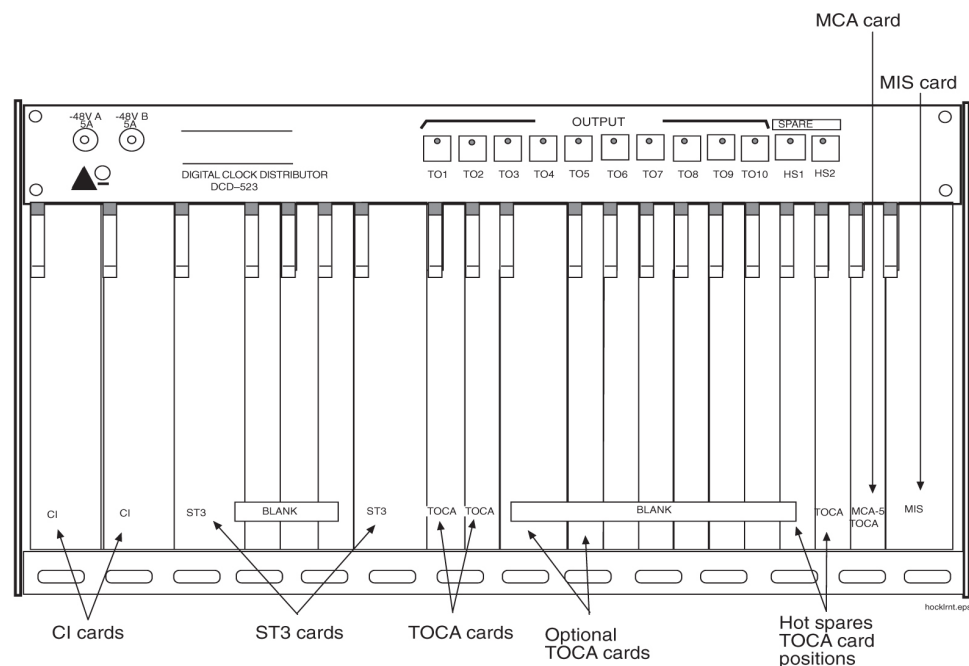


Figure 60: Holdover Clock, Card Location

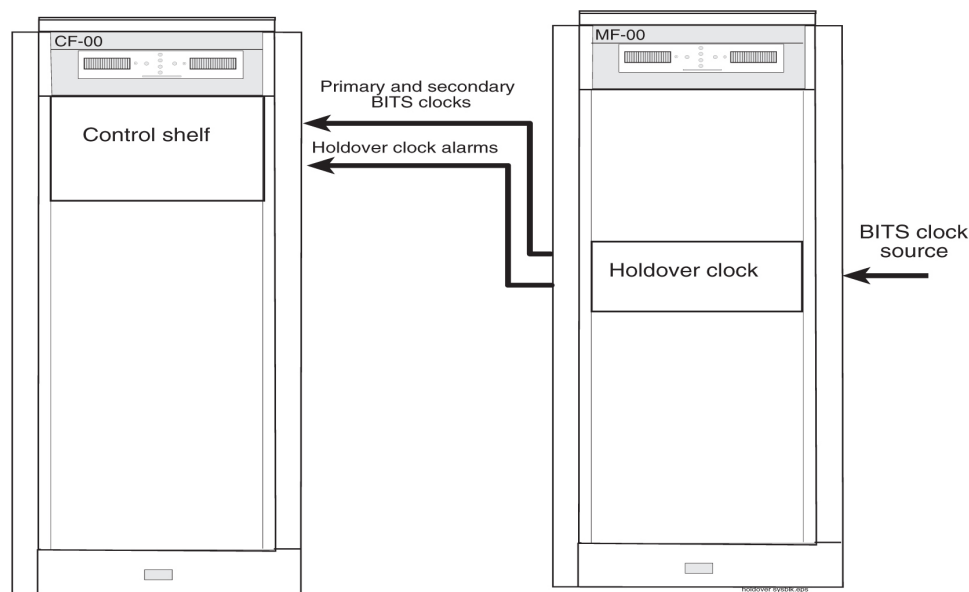


Figure 61: Holdover Clock, Frame Connections

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 62: Maintenance Interface System Card Block Diagram](#) 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 62: Maintenance Interface System Card Block Diagram](#)).

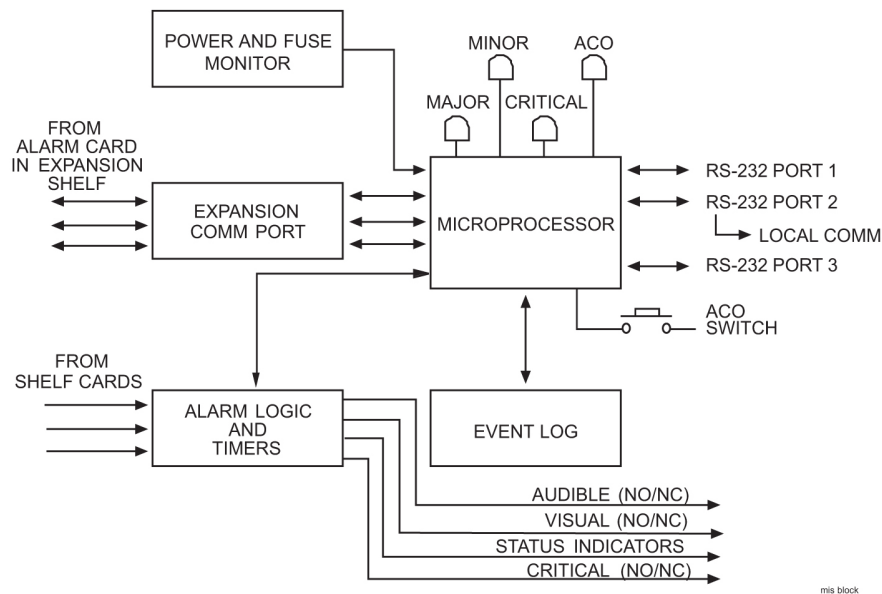


Figure 62: Maintenance Interface System Card Block Diagram

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.

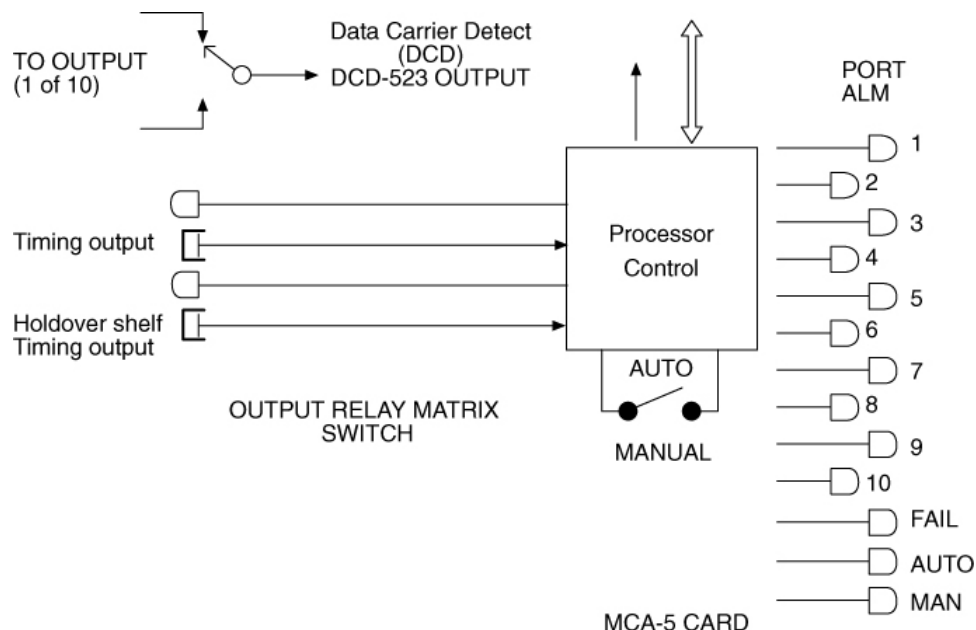


Figure 63: MCA-5 Card and Output Protection Matrix

Chapter 4

Hardware Descriptions - OEM-Based Products

Topics:

- *OEM-Based Product Descriptions.....134*
- *Extended Services Platform (ESP) Host Servers.....134*
- *OEM-Based Networking Elements.....137*
- *OEM-Based Peripheral Elements.....140*

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.

Extended Services Platform (ESP) Host Servers

This section describes the parts of the ESP server nodes. An ESP server can monitor a maximum of 32 SS7 links. ESP server nodes are populated in an N + 1 configuration for redundancy to a maximum of 17 in an ESP subassembly frame. ESP server nodes are rack mounted in heavy-duty frames.

The ESP server node is a one-processor device and has no frame buffer, audio capability, mouse port, or keyboard port. The console ports and Ethernet ports are the primary interfaces of model 120 server.

The server node provides the following:

- High performance processor.
- Modular internal design.
- High performance disk, system, memory and I/O subsystems.
- High performance Peripheral Component Interconnect (PCI)/Serial Asynchronous Interface connection I/O (8 port break-out box).
- Redundant hot swap power supply units.
- Powered by redundant –48VDC supplies.

Server Model 120 Features

The server primary board contains the Central Processing Unit (CPU) module, memory, system control Application-Specific Integrated Circuits (ASICs) and I/O ASICs.

Table 44: System Specifications

Server Node Specifications	
Dimensions and Weight	44.0 mm (1.73 in.)

Server Node Specifications	
Height	437.2 mm (17.21 in.)
Width	487.4 mm (19.19 in.)
Depth	10kg (22 lbs.)
Weight (unpackaged but fully configured)	
CPU	UltraSPARC-II
Processor type	650 MHz
Clock rate	One Processor (NEBS level 3 compliant)
CPU provided	256 Kbyte Internal
Cache on module	
Memory	4GB maximum
Size	PC133 standard Registered DIMMs
Memory type	
Storage (Internal)	66MB/second UltraSCSI
Bus	Two 3.5x1-in. disks (36GB); disk bays are front accessible and support hot-plug
Disks	
CD-ROM	644MB Slim line CD-ROM drive; 24X speed or DVD-ROM
I/O Architecture	See Note:
PCI Interface/Serial Asynchronous Interface connection	Two RS-232C/RS-423 serial ports (RJ45)
Serial ports	Expansion Serial port interface.
I/O ports	Two Ultra-SCSI port
	Two standard 10/100BASE-T ports
Operating System	Solaris 8

Note: ESP server 1A (top server) has an expansion serial board connected by cable to the serial break-out box. ESP server 1B through 1-Q are accessible only through the standard Ethernet ports and serial ports.

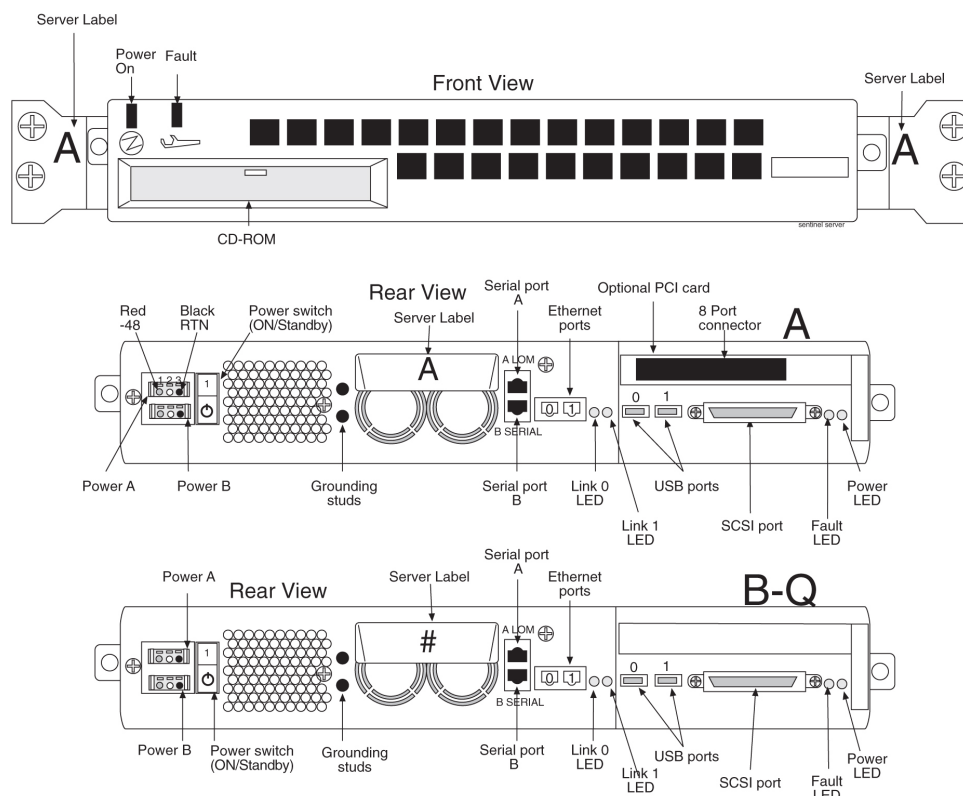


Figure 64: ESP Server Front and Rear Views

ESP Server LEDs

[Table 45: ESP Server LEDs](#) lists the LED indicators of the ESP servers. The LEDs are located on the front and back of the ESP servers.

Table 45: ESP Server LEDs

Location	LED Name	Color	Description
Front and Rear Panel	Power	Green	Power feed available and Standby/on switch ON
Front and Rear Panel	Fault	Yellow	<ul style="list-style-type: none"> ON Operating system stopped OFF No faults detected Blinking — Fault detected
Rear Panel	Link Activity	Green	OneLED for each standardIP interface (two)

SAI/P Card

The Sun SAI/P card (Serial Asynchronous Interface PCI Adapter) is used with the 8-Port Connector Box to provide eight programmable ports for low-speed devices for 50 bps to 115,200 bps transmission for the ESP subsystem. This module is installed in the expansion slot in ESP server 1A only.

8-Port Connector Box

The 8-Port Connector Box segments the output of the Sun SAI/P card into eight ports for the ESP subsystem. This box connects to the Sun SAI/P card with a 78-pin plug on a 40-inch cable in ESP server 1A only. [Figure 65: 8-Port Connector](#) shows the details of the Connector Box.

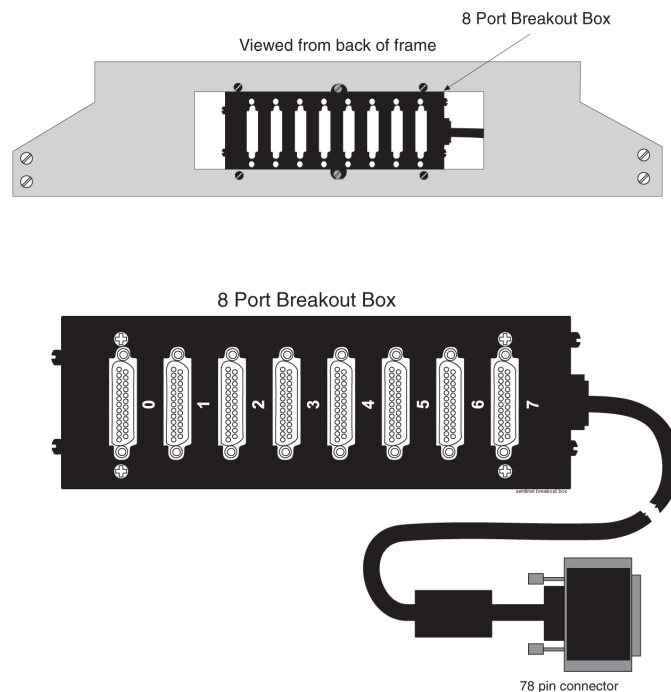


Figure 65: 8-Port Connector

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](#)

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. The dial-in router allows remote dial-up access to the internal ASi 4000 SCP LAN. [Figure 66: Front View Routers](#) shows the front view of the routers and [Table 46: Router Front LEDs](#) describes the LED indicator functions on the front of the router.

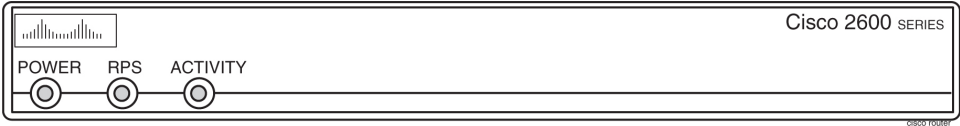


Figure 66: Front View Routers

Table 46: 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 67: Rear View Isolation Router](#) and [Figure 68: Rear View Dial-in Router](#) 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 47: Router Rear LEDs](#) describes the LED indicators on the rear of the routers.

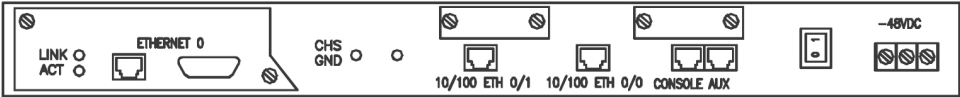


Figure 67: Rear View Isolation Router

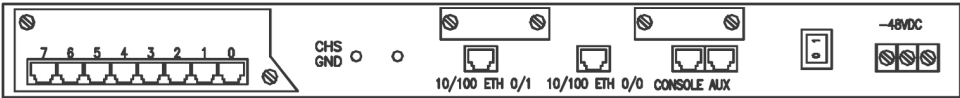


Figure 68: Rear View Dial-in Router

Table 47: Router Rear LEDs

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

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 69: Ethernet Switch illustrates the front and rear of the Ethernet switch.

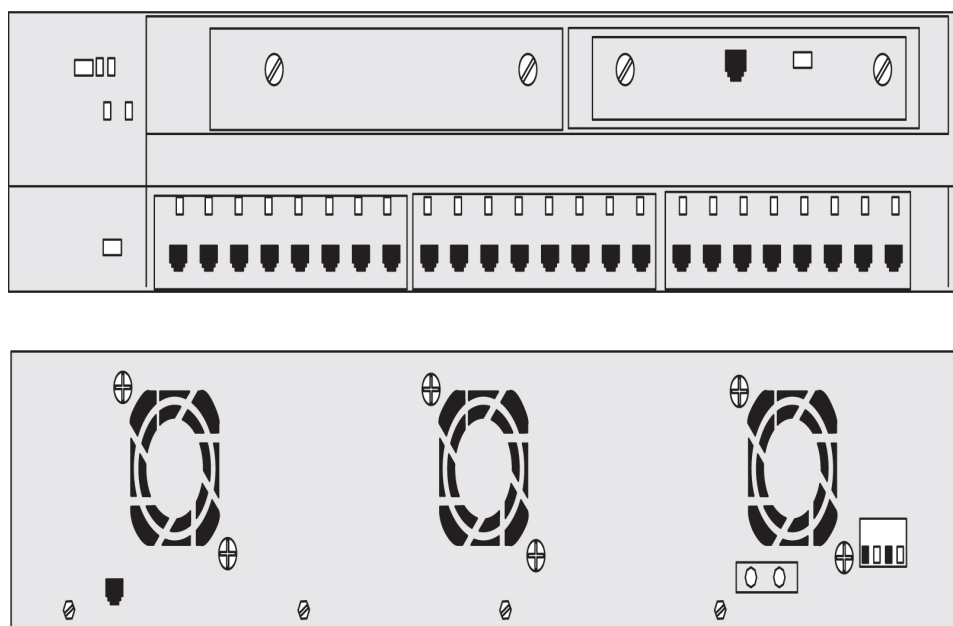


Figure 69: Ethernet Switch

Table 48: Ethernet Switch LEDs describes the LEDs located on the front of the switches.

Table 48: 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)

LED	Description
RPS (Always OFF)	Off when the redundant power supply is not present. Redundant 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). Note: After a port is reconfigured, the port LED can remain amber for up to 30 seconds as STP checks the switch for possible loops.
UTL (utilization)	Green -The LEDs display backplane utilization on a logarithmic scale. If 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.

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](#)
- [Eight-Port Connector Box](#)

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 70: Telect Breaker Panel Front View](#) for the location of the breaker panel drip tray.

[Figure 70: Telect Breaker Panel Front View](#) shows the details of the front view of the breaker panel

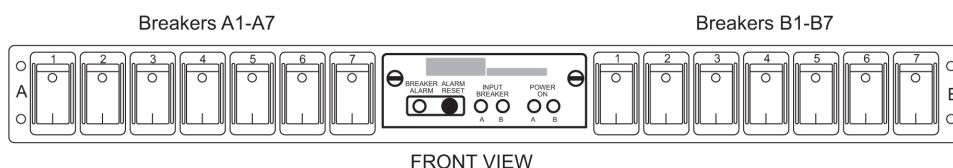


Figure 70: Telect Breaker Panel Front View

[Figure 71: Telect Breaker Panel Rear View](#) shows the rear details of the breaker panel.

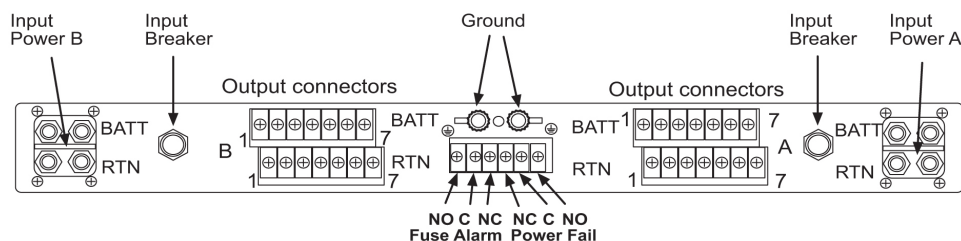


Figure 71: Telect Breaker Panel Rear View

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 72: Telect Breaker Panel Alarms](#) provides details of the alarm panel on the Telect Breaker Panel.

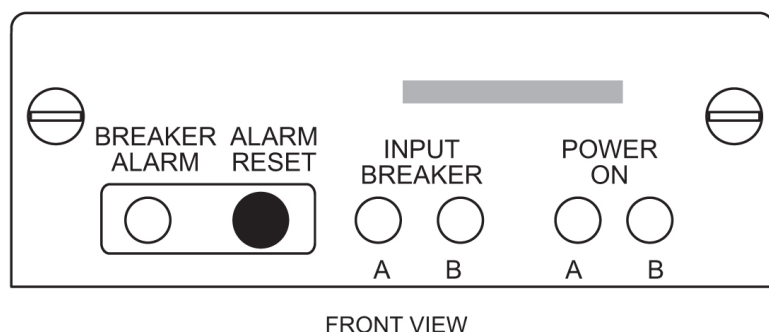


Figure 72: Telect Breaker Panel Alarms

Table 49: Breaker Panel LEDs lists the status LEDs on the Telect Breaker Panel.

Table 49: 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.

Eight-Port Connector Box

This sections shows the Eight-Port Connector Box used in the Sentinel and AXi systems.

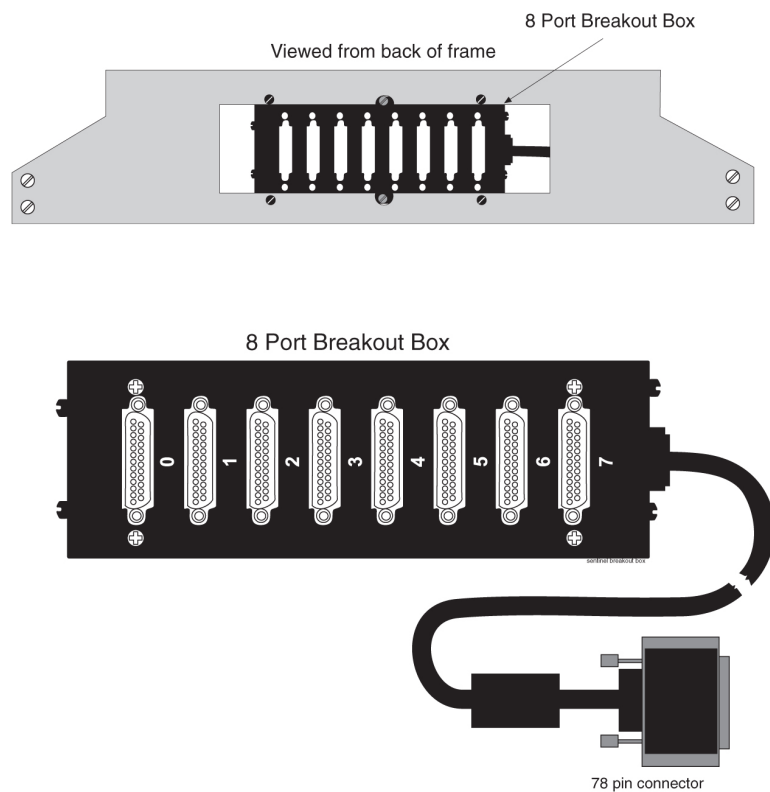


Figure 73: Eight Port Breakout Box

Chapter 5

Site Engineering - EAGLE

Topics:

- *Safety and Cautionary Information.....145*
- *Introduction.....145*
- *Location.....145*
- *Populating the System.....150*

Safety and Cautionary Information



DANGER

Danger:

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



DANGER

Danger:

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

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.

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.

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.

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.

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.

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.

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.

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 (Part Number 870-2872-xx) is fully NEBS compliant. However, if ambient temperatures above 40° C are likely, Eagle Fan Trays (Part Number 890-0001-04) are recommended to ensure proper airflow to the upper HIPR2 cards in those shelves.

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.

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.

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 74: Logic Grounding with FAP \(P/N 870-0243-08\)](#).

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 74: Logic Grounding with FAP \(P/N 870-0243-08\)](#) and [Figure 75: Logic Grounding with FAP \(P/N 870-1606-xx/870-2320-xx\)](#) for wiring information.

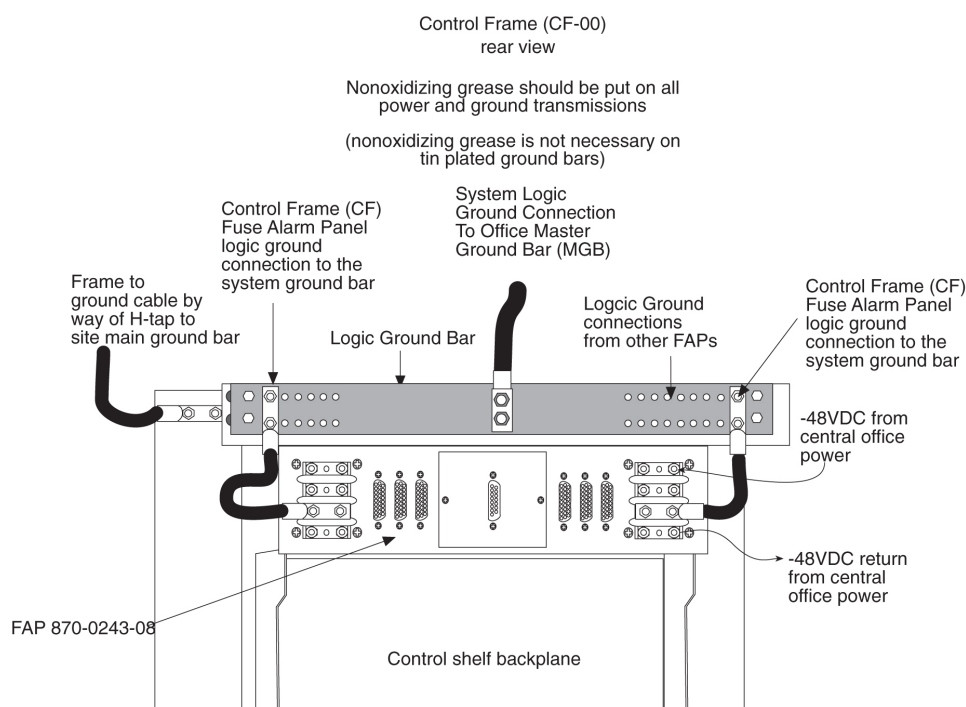


Figure 74: Logic Grounding with FAP (P/N 870-0243-08)

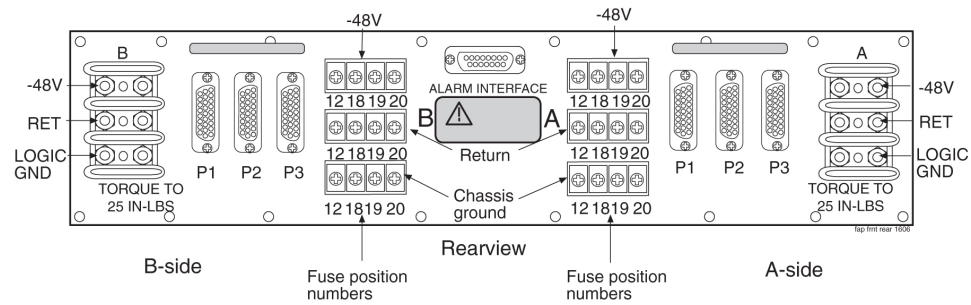


Figure 75: Logic Grounding with FAP (P/N 870-1606-xx/870-2320-xx)

The doors installed are grounded to the frame through a double lug ground wire (see [Figure 76: Door Grounding](#)) and through a screw-down latch.

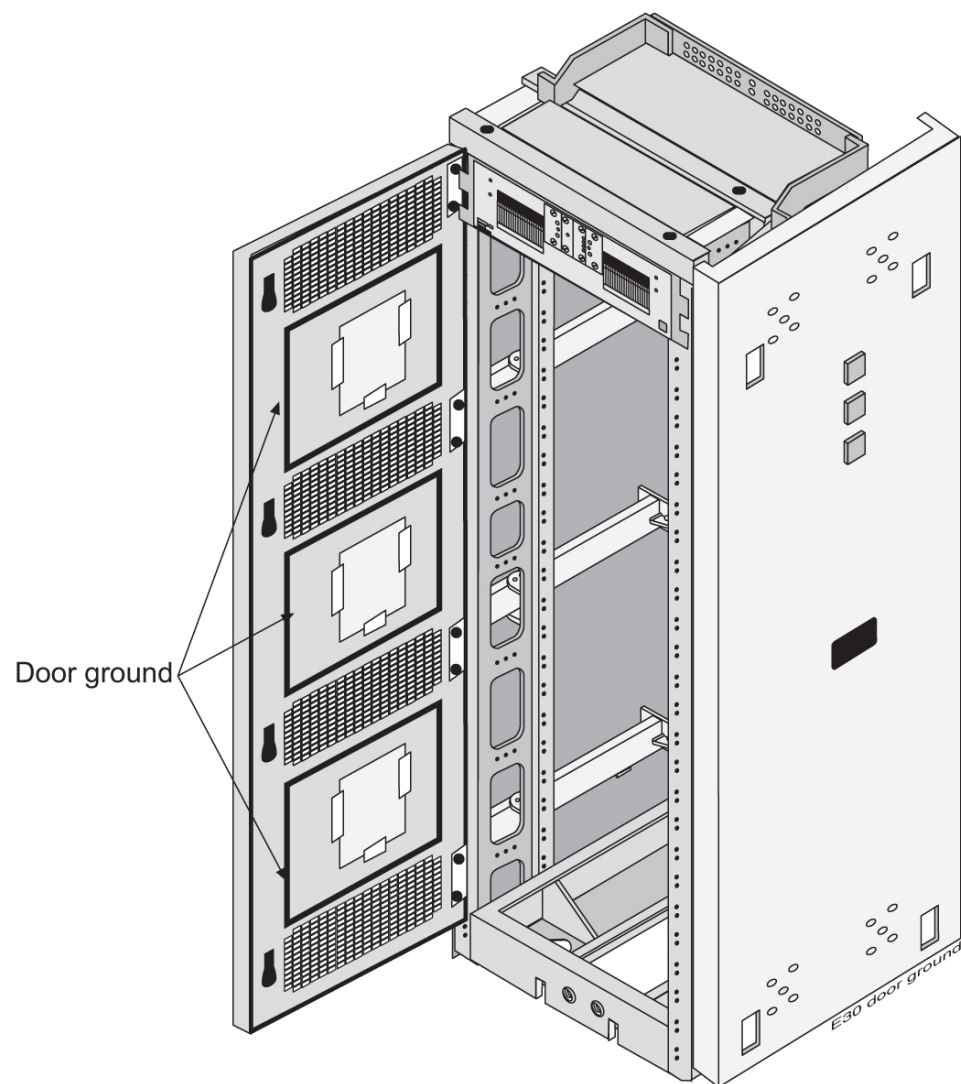


Figure 76: Door Grounding

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.

Populating the System

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

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, or E5-APP-B cards. 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 50: Power Usage by Component

Component	Power (W)	Part Number
E5-APP-B	78	870-3096-XX
E5-ATM	23	870-1872-XX
E5-ATM-B	34	870-2972-XX
E5-E1T1	25	870-1873-XX
E5-E1T1-B	32	870-2970-XX
E5-ENET	27	870-2212-XX
E5-ENET-B	34	870-2971-XX
E5-IPSM	27	870-2877-XX
E5-MASP	58	870-2903-XX
E5-MCPM-B	32	870-3089-XX
E5-MDAL	12	870-2900-XX
E5-SM4G	51	870-2860-XX
E5-SM8G-B	63	870-2990-XX
E5-TSM	26	870-2943-XX
Fan tray	125	890-0001-XX
HC MIM	75	870-2671-XX
HIPR2	18	870-2872-XX
Telco Switch	120	870-2904-01

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 and SLAN to use MFC. Applications that use the MFC framework for message flow control between application cards include:

- MTP3 routing
- INM/SNM routing
- SLAN



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, EROUTE, and SLAN.

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).

Database Communications Module (DCM) and Double-Slot Enhanced DCM (EDCM)

The Database Communications Module (DCM) (P/N 870-1671-xx) can be used in EAGLE or IP⁷ GW systems). The Double Slot EDCM (P/N 870-2197-01) is used in IP7 SG release 4.0 systems and later. Both cards provide the following functions for the systems:

- Signaling Transfer Point, Local Area Network (SLAN) function, port to DCM or Double Slot EDCM
- Enhanced Bulk Download

Note: The DCM card requires two slots for mounting and must be assigned to an odd numbered slot with the next even slot left open on EAGLE systems.

The DCM card is compatible with EAGLE control shelf backplanes P/N 850-0330-03/04/05/06 and extension backplanes P/N 850-0356-01/02/03/04/06. The Double-Slot EDCM is compatible with IP⁷ SG control shelf backplanes P/N 850-0330-03/04/05 and extension shelf backplanes P/N 850-0356-01/02/03. These cards are provisioned in pairs for redundancy with mated pairs mounted in shelves. Size places some restrictions on the placement of DCM or Double-Slot EDCM cards.

The DCM cards require a unique cable interface that is not compatible with current LIM cables on a fully wired but unequipped shelf. The location of the DCM cards must be to odd numbered slots, requiring two slots with the next higher-numbered even slots left open.

Cabling DCM, Double-Slot EDCM, and E5-SM4G/E5-SM8G Cards

The DCM and E5-SM4G/E5-SM8G cards support only Category 5 (100-Ohm) shielded twisted pair cables. In order to meet Electromagnetic Interference (EMI) requirements, the cards may require a

point-to-point connection or a connection to a hub/router. This must be identified to the customer who may be preparing the location. The figure that follows shows the cable types and part numbers.

The maximum cable length has not been determined but will be less than 100 meters.

Three specific DCM cables are required:

- Customer patch panel “straight through” (P/N 830-0788-xx)
- Customer patch panel “crossover” (P/N 830-0789-xx)
- 100-BASET interface to unterminated (P/N 830-0711-xx)

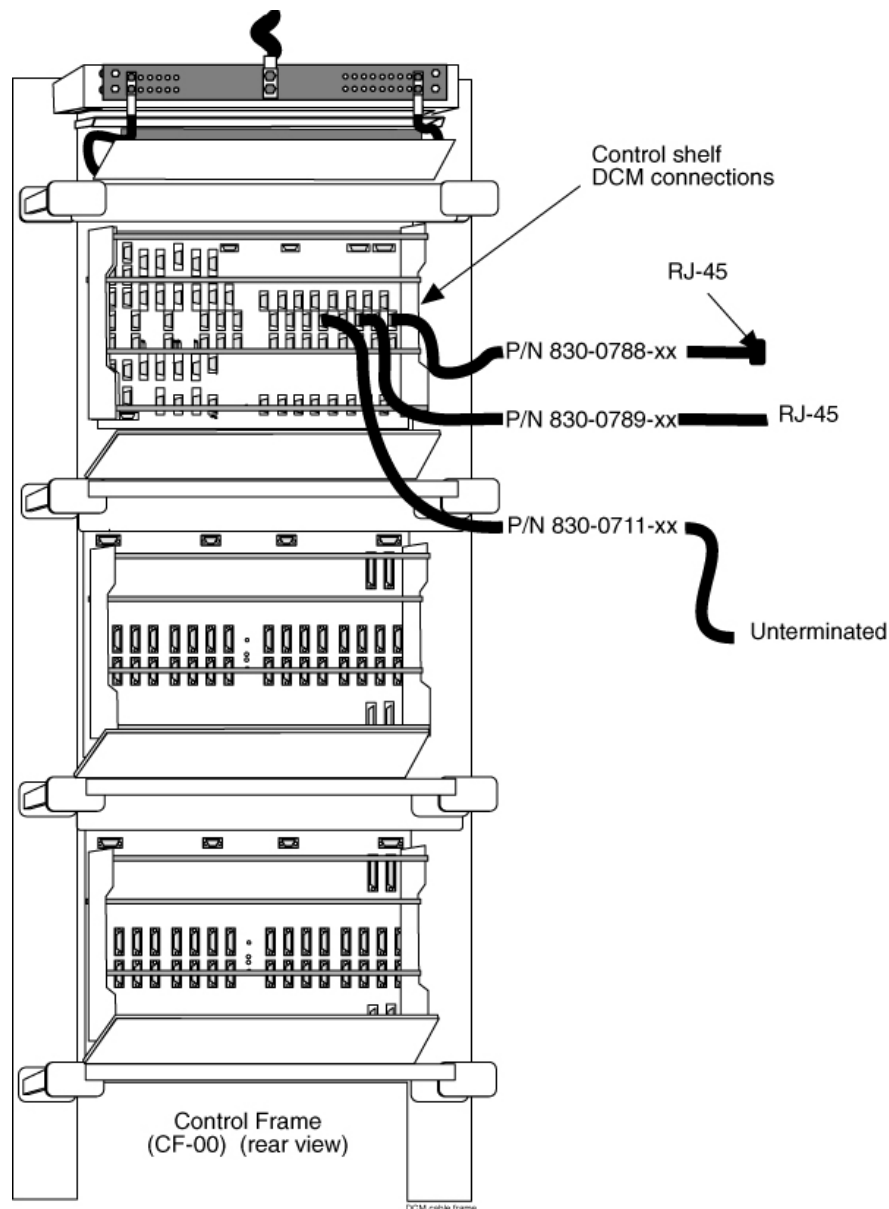


Figure 77: Database Communications Cabling in System

Hardware

The systems support a maximum of six cards for Internet Protocol Link Interface Module (IP LIM) application.

If more than one card is provisioned, each must be powered from different fuse positions and distributed evenly among “A” and “B” power feeds.

Note: In EAGLE systems care must be taken to be sure the DCM card is inserted into the correct odd numbered slots. Cards may be provisioned in any slot where they physically fit except for the MAS dedicated card slots.

Appendix

A

Hardware Baselines

Topics:

- *Baseline Tables.....156*
- *EAGLE Release 43.0 Through 46.2.....156*
- *EAGLE Cable Assemblies and Adapters.....160*
- *Notes.....162*

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 43.0 through 46.2 in [EAGLE Release 43.0 Through 46.2](#)
- EAGLE Cable Assemblies and Adapters:
 - E1 Cable Assemblies in [Table 52: E1 Cable Assemblies](#)
 - E5-ATM Adapters [Table 53: E5-ATM Adapters](#)
 - ENET Adapters [Table 54: ENET Adapters](#)
 - Fast Copy Adapters [Table 55: Fast Copy Adapters](#)
 - Terminal/Printer Cables and Adapters [Table 56: Terminal/Printer Cables and Adapters](#)
 - Modem Cables and Adapters [Table 57: Modem Cables and Adapters](#)
 - Application Server [Table 58: Application Server Site Specific Cables](#)
 - Application Server Serial Adapters [Table 59: Application Server Serial Adapters](#)

Note: Exceptions, additions, and clarifications to the following tables are by superscript numeric notation relating to the listed notes located at the end of each table. The notations are indicated as a numbered step reference (such as [Step 23](#)) which corresponds to the appropriate note which is shown at the end of this section. For example, a table cell with X^{Step 1, Step 2} would indicate that notes 1 and 2 are applicable to that component being configurable in that release.

EAGLE Release 43.0 Through 46.2

Table 51: Hardware Baseline EAGLE Release 43.0 Through 46.2

NAME	PART NUMBER	REV	43.0	44.0	45.0	46.0	46.2
Air ManagementCard	870-1824-01	A	X ^{Step 16}	X ^{Step 16}	X ^{Step 16}	X ^{Step 16}	X ^{Step 16}
Air ManagementCard	870-1824-02	A	X ^{Step 16}	X ^{Step 16}	X ^{Step 16}	X ^{Step 16}	X ^{Step 16}
CTRL SHELF	870-0775-03	E	X ^{Step 11}	X ^{Step 11}	X ^{Step 11}	X ^{Step 11}	X ^{Step 11}
CTRL SHELF	870-2321-02	A	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}
CTRL SHELF	870-2321-04	A	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}

Hardware

Hardware Baselines

NAME	PART NUMBER	REV	43.0	44.0	45.0	46.0	46.2
CTRL SHELF	870-2321-08	A	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}	X ^{Step 2, Step 7}
CTRL SHELF	870-2377-01	A	X ^{Step 3, Step 7}	X ^{Step 3, Step 7}	X ^{Step 3, Step 7}	X ^{Step 3, Step 7}	X ^{Step 3, Step 7}
CTRL SHELF	870-2377-02	A	X ^{Step 3, Step 7}	X ^{Step 3, Step 7}	X ^{Step 3, Step 7}	X ^{Step 3, Step 7}	X ^{Step 3, Step 7}
E5-APP-B	870-3096-xx	A	X	X	X	X	X
E5-ATM	870-1872-01	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-ATM	870-1872-02	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-ATM-B	870-2972-01	D		X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 22, Step 29}
E5-E1T1	870-1873-02	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-E1T1	870-1873-03	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-E1T1	870-1873-04	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-E1T1-B	870-2970-01	D		X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 22, Step 29}
E5-ENET	870-2212-02	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-ENET	870-2212-03	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-ENET	870-2212-04	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-ENET	870-2212-05	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-ENET-B	870-2971-01	E		X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 22, Step 29}
E5-IPSM	870-2877-01	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-IPSM	870-2877-02	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-MASP	870-2903-01	A	X ^{Step 21, Step 26}	X ^{Step 21, Step 26}	X ^{Step 21, Step 26}	X ^{Step 21, Step 26}	X ^{Step 22, Step 26}
E5-MASP	870-2903-02	A	X ^{Step 21, Step 26}	X ^{Step 21, Step 26}	X ^{Step 21, Step 26}	X ^{Step 21, Step 26}	X ^{Step 22, Step 26}
E5-MCPM-B	870-3089-01	A		X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 22, Step 29}

Hardware

Hardware Baselines

NAME	PART NUMBER	REV	43.0	44.0	45.0	46.0	46.2
E5-MDAL	870-2900-01	C	X ^{Step 21, Step 25}	X ^{Step 21, Step 25}	X ^{Step 21, Step 25}	X ^{Step 21, Step 25}	X ^{Step 22, Step 25}
E5-SM4G (Double-slot)	870-2860-01	F	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-SM4G (Double-slot)	870-2860-02	A	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
E5-SM8G-B (Double-slot)	870-2990-01	A		X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 21, Step 29}	X ^{Step 22, Step 29}
E5-TSM	870-2943-03	B	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 21}	X ^{Step 22}
EDCM-2G (MCPM)	870-2372-03	A	X	X	X	X	X
EDCM-2G (MCPM)	870-2372-07	A	X ^{Step 18}	X ^{Step 18}	X ^{Step 18}	X ^{Step 18}	X ^{Step 18}
EDCM-2G (MCPM)	870-2372-09	A	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}
EDCM-2G (MCPM)	870-2372-14	A	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}
EDCM-2G (MCPM)	870-2372-15	A	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}	X ^{Step 18, Step 19}
EXTN SHELF	870-0776-02	C	X ^{Step 27}	X ^{Step 27}	X ^{Step 27}	X ^{Step 27}	X ^{Step 27}
EXTN SHELF	870-0776-03	D	X ^{Step 27}	X ^{Step 27}	X ^{Step 27}	X ^{Step 27}	X ^{Step 27}
EXTN SHELF	870-0776-06	A	X	X	X	X	X
EXTN SHELF	870-0776-07	A	X	X	X	X	X
EXTN SHELF	870-0776-08	A	X	X	X	X	X
EXTN SHELF	870-0776-11	A	X	X	X	X	X
EXTN SHELF	870-2378-01	A	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}
EXTN SHELF	870-2378-02	A	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}
FAP	870-1606-01	A	X	X	X	X	X

Hardware

Hardware Baselines

NAME	PART NUMBER	REV	43.0	44.0	45.0	46.0	46.2
FAP	870-1606-02	A	X ^{Step 4}	X ^{Step 4}	X ^{Step 4}	X ^{Step 4}	X ^{Step 4}
FAP	870-1606-02	C	X ^{Step 13}	X ^{Step 13}	X ^{Step 13}	X ^{Step 13}	X ^{Step 13}
FAP	870-1606-05	A	X ^{Step 13}	X ^{Step 13}	X ^{Step 13}	X ^{Step 13}	X ^{Step 13}
FAP	870-1823-01	B	X	X	X	X	X
FAP	870-2320-01	A	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}
FAP	870-2320-01	J	X ^{Step 12}	X ^{Step 12}	X ^{Step 12}	X ^{Step 12}	X ^{Step 12}
FAP	870-2320-03	A	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}	X ^{Step 5}
FAP-CF/EF	870-0243-08	C	X	X	X	X	X
FAP- MISC	870-0243-09	C	X	X	X	X	X
FAP	870-2804-01	B	X	X	X	X	X
HCMIM	870-2671-01	P	X ^{Step 14}	X ^{Step 14}	X ^{Step 14}	X ^{Step 14}	X ^{Step 15}
HCMIM	870-2671-02	B	X ^{Step 14}	X ^{Step 14}	X ^{Step 14}	X ^{Step 14}	X ^{Step 15}
HCMIM	870-2671-03	A	X ^{Step 14}	X ^{Step 14}	X ^{Step 14}	X ^{Step 14}	X ^{Step 15}
HIPR2	870-2872-01	A	X ^{Step 28}	X ^{Step 28}	X ^{Step 28}	X ^{Step 28}	X ^{Step 28}
HIPR2	870-2872-02	A	X	X	X	X	X
FAN ASSY	890-1038-01	D	X	X	X	X	X
FAN ASSY	890-0001-01	A	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}
FAN ASSY	890-0001-02	A	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}
FAN ASSY	890-0001-04	A	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}	X ^{Step 17}
KIT,E1	890-1037-01	A	X	X	X	X	X
KIT,E1	890-1037-06	A	X	X	X	X	X
KIT, HLDOVRCLKASSY	890-1013-01	A	X	X	X	X	X
MPS in Heavy Duty Frame	890-1801-01	E	X				
MPS in Heavy Duty Frame	890-1801-02	A	X				
MPSDC Frame	890-1843-01	C	X	X	X	X	X
MPSDC Frame	890-1843-02	A	X	X	X	X	X

NAME	PART NUMBER	REV	43.0	44.0	45.0	46.0	46.2
MPS Netra-to- Tekelec 1000 Field Upgrade Kit	870-2735-01	A	X				
MPS Netra-to- Tekelec 1000 Field Upgrade Kit	870-2735-02	A	X				

EAGLE Cable Assemblies and Adapters

Table 52: E1 Cable Assemblies

P/N		Description
non-ROHS	ROHS	
830-0622-xx	830-1233-xx	E1 Dual TX/RX, XX ft., NTW
830-0623-xx	830-1256-xx	E1 Patch, D26M to D26M, 120 OHM, XX ft., NTW

Table 53: E5-ATM Adapters

P/N	Description
830-1342-05	Dual DB-26M to DB-26F / RJ11

Table 54: ENET Adapters

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

Table 55: Fast Copy Adapters

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

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

Table 56: 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 57: 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 58: Application Server Site Specific Cables

P/N		Description
non-ROHS	ROHS	
830-0963-xx	830-1201-xx	Optional DB9F/DB15M Serial w/Flow Control
830-0964-xx	830-1202-xx	DB9/DB25 M/M Site Specific Null Modem Serial Cable
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 59: Application Server Serial Adapters

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

P/N	Description
830-0915-03	RJ45-DB15M Adapter_EAGLE/Cyclades

Notes

1. 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.
2. Control shelf P/N 870-2321-08 with backplane P/N 850-0330-06 can be used with HIPR2 cards in standard frames.
3. Control shelf P/N 870-2377-02 with backplane P/N 850-0330-06 can be used in heavy-duty frames.
4. Required for standard frames. Rev. C required for HCMIM shelves.
5. Required for heavy-duty frames. Rev. J required for HCMIM shelves.
6. Required for Master Timing Feature (T1 clocking).
7. Required for HIPR/HIPR2 cards.
8. Uses HCAP (P/N 850-0419-xx) main assembly board.
9. Uses HCAP-T (P/N 850-0615-xx) main assembly boards.
10. Beginning with EAGLE software release 33.0 through 46.0, all IPMX cards must be replaced by High-Speed IMT Router (HIPR) Cards (P/N 870-2574-02). Software release 46.1 requires HIPR2 cards. HIPR2 cards are installed at the factory or by Technical Support and are not installed by customers.
11. NEBS will support Master Timing with adapter 830-1183-01.
12. 60 Amp FAP required for Heavy-duty frames that contain shelves with HCMIM modules.
13. 60 Amp FAP required for standard frames that contain shelves with HCMIM modules.
14. Requires two HIPR modules for each shelf containing HCMIM, and requires fan tray 890-0001-04.
15. Requires two HIPR2 modules for each shelf containing HCMIM, and requires fan tray 890-0001-04.
16. Required in all empty slots in shelves when using fan tray 890-0001-xx.
17. Required for shelves that contain HCMIM modules.
18. Has K6 II processor.
19. Has COMM processor adapter.
20. Has PQFP processor.
21. Requires HIPR 870-2574-xx or HIPR2 870-2872-xx.
22. Requires HIPR2 870-2872-xx.
23. Has K6 III processor.
24. Set of qualified features may be limited. Confirm feature set compatibility and performance ratings prior to use or upgrade.
25. Requires E5-MASP (P/N 870-2903-xx).
26. Requires E5-MDAL (P/N 870-2900-xx).
27. If any E5 type cards are used in the shelf, HIPR 870-2574-xx or HIPR2 870-2872-02 are required. The HIPR2 870-2872-01 is not supported.
28. Not supported on Extension shelf 870-0776-02 and 870-0776-03.

29. Requires fan tray assembly.

A

AC	Alternating Current Application Context Area Code Authentication Center
ACT	Activate
ALM	Alarm Card
AP	Application Processor
ATM	Asynchronous Transfer Mode A packet-oriented transfer mode that uses an asynchronous time division multiplexing technique to multiplex information flow in fixed blocks, called cells. A high-bandwidth, low-delay switching, and multiplexing technology to support applications that include high-speed data, local area network interconnection, multimedia application and imaging, and residential applications such as video telephony and other information-based services.

B

BITS	Building Integrated Timing System The Building Integrated Timing System (BITS) clocks come directly from the central office BITS clock source or indirectly from an
------	--

B

optional holdover clock installed in the system.

BP

Board Prom

C

CC

Connection Confirmed
Country Code
Composite Clock

CD

Carrier Detect
Compact Disk
Call Deflection

CF

Control Frame

Channel

A single Time-Division-Multiplexed (TDM) timeslot within a channelized E1/T1 port. Generically, channels can be used for transporting signaling, digitized voice, or data information. Unused channels typically are filled with defined idle codes designed to maintain sufficient ones density to ensure frame-level synchronization.

CI

Cell Identity
Clock Interface Card
Critical Status Indicator

CLLI

Common Language Location Identifier
The CLLI uniquely identifies the STP in terms of its physical location. It is usually comprised of a combination of identifiers for the STP's city (or locality), state (or

C

province), building, and traffic unit identity. The format of the CLLI is:

- The first four characters identify the city, town, or locality
- The first character of the CLLI must be an alphabetical character
- The fifth and sixth characters identify state or province
- The seventh and eighth characters identify the building
- The last three characters identify the traffic unit

control cards

Cards that occupy slots 1113 through 1118 of the control shelf on an EAGLE and perform OAM, TDM, and database functions for the EAGLE. The legacy set consists of the single-slot GPSM-II card running the OAM application and EOAM GPL, the single-slot TDM card, and the dual-slot MDAL card. The E5-based set consists of the dual-slot E5-MASP card (the E5-MCAP module and the E5-TDM module) and the dual-slot E5-MDAL card.

Cards that occupy slots 1113 through 1118 of the control shelf control cards on an EAGLE and perform basic OAM. The E5-based set consists of the dual-slot E5-MASP card (the E5-MCAP module and the E5-TDM module) and the dual-slot E5-MDAL card.

Control Shelf

The shelf in the EAGLE that contains the Maintenance and Administration Subsystem. The Maintenance and Administration Subsystem contains 5 cards: 2 CAM cards, 2 TDMs (Terminal Disk Modules), and 1 MDAL

C

(Maintenance Disk and Alarm) card. This shelf is designated as Shelf 1100 and cannot be added or removed from the database.

COTS

Commercial Off-the-Shelf

CP

Call Processing
Communications Processor

CPU

Central Processing Unit

CRC

CAM Redundancy Controller

Cyclic Redundancy Check

A number derived from, and stored or transmitted with, a block of data in order to detect corruption. By recalculating the CRC and comparing it to the value originally transmitted, the receiver can detect some types of transmission errors.

D

Database

All data that can be administered by the user, including cards, destination point codes, gateway screening tables, global title translation tables, links, LNP services, LNP service providers, location routing numbers, routes, shelves, subsystem applications, and 10-digit telephone numbers.

DB

Database
Daughter Board
Documentation Bulletin
Data bus

D

DC	Direct Current Data Collection
DCM	Database Communication Module The DCM provides IP connectivity for applications. Connection to a host is achieved through an ethernet LAN using the TCP/IP protocol.
DMA	Direct Memory Access
DO	Derived Object
DS	Differentiated Service Directory Server Digit String
DS0	Digital Signal Level-0 (64 Kbits/sec or 56 Kbits/sec) A basic digital signaling rate of 64 Kbits/sec corresponding to the capacity of one voice-frequency-equivalent channel.
DS0A	Digital Signal Level-0 The interface used with the LIMDS0 card.
DS1	Digital Signal Level-1 (1.544Mbits/sec) A widely used standard in telecommunications in North America and Japan to transmit voice and data between devices.

D

The data transmitted over a physical T1 line.

DSM

Database Service Module.

The DSM provides large capacity SCCP/database functionality. The DSM is an application card that supports network specific functions such as EAGLE Provisioning Application Processor (EPAP), Global System for Mobile Communications (GSM), EAGLE Local Number Portability (ELAP), and interface to Local Service Management System (LSMS).

DVD

Digital Versatile Disk

E**E1**

The European equivalent of T1 that transmits digital data over a telephone network at 2.048 Mbps.

E1/T1 Port

A trunk-level physical interface on an E1/T1 card. When configured in T1 mode, a port represents a time-division-multiplexed data stream of 24 channels with an aggregate data rate of 1.544 Mbps. When configured in E1 mode, a port represents a time-division-multiplexed data stream of 32 channels with an aggregate data rate of 2.048 Mbps.

E5-APP-B

The E5-APP-B card is a complete application server platform designed to operate within a heavy duty EAGLE shelf. An E5-APP-B card consists of the card, a microprocessor, 8 GB RAM, and two removable drive modules with

E

an operating system and an application, such as EPAP, loaded.

E5-E1T1

EPM-based E1/T1 Multi-Channel Interface Module

An EPM-based card that provides E1 and T1 connectivity. E1T1 is an abbreviation for the ITU E1 and ANSI T1 interfaces. Thus the nomenclature defines the shelves where the card can be used and the physical interface that it provides.

E5-ENET

EPM-based Ethernet card

A high capacity single-slot IP signaling card (EPM card plus Gig Ethernet PMC cards).

EDCM

Enhanced DCM
Enhanced Database
Communication Module

EF

Extension Frame

ELAP

EAGLE Local Number Portability
Application Processor

The EAGLE LNP Application Processor (ELAP) platform provides capacity and performance required to support the ported number database.

EMI

Electro-Magnetic Interference

External Machine Interface

Protocol used to connect to SMSCs, developed by LogicaCMG.

E

ENET	<p>Ethernet</p> <p>Can refer to a generic hardware type that supports one or more Ethernet interfaces.</p>
EPAP	<p>EAGLE Application Processor</p>
EPM	<p>Embedded Platform Module</p> <p>A single-slot card that is similar to the high-capacity blade except that it uses a lower-power CPU and thus does not require external fan trays or extra power.</p> <p>Embedded Processor Module</p> <p>A card that contains an Intel Celeron 1GHz processor, 256MB RAM, and other enhancements, intended as replacement for K6 DCM-class cards.</p>
EROUTE	<p>The application used on the Signaling Transport Card (STC and E5-STC) for the EAGLE.</p>
ESP	<p>Expanded Services Platform</p> <p>The Sentinel system with the hardware and software platform that provides the interface to the Integrated EAGLE and Sentinel monitoring system. The ESP hardware and software platform runs on the model 120 server.</p>

F

FAN	<p>Cooling fan feature. The EAGLE will report on the alarm conditions of the fan assemblies. Once you have turned on the feature, you cannot turn it off. The feature applies to any and all fans installed</p>
-----	---

F

within the system. When replacing a fan assembly, the feature should already be turned on.

FAP

Fuse and Alarm Panel

FTP

File Transfer Protocol

A client-server protocol that allows a user on one computer to transfer files to and from another computer over a TCP/IP network.

Feature Test Plan

G

GB

Gigabyte

1,073,741,824 bytes

G-Flex

GSM Flexible numbering

A feature that allows the operator to flexibly assign individual subscribers across multiple HLRs and route signaling messages, based on subscriber numbering, accordingly.

GLS

Generic Loading Services

An application that is used by the TSM cards for downloading gateway screening to LIM cards.

GMT

Greenwich Mean Time

GPF

General Purpose Frame

GPL

Generic Program Load

G

Software that allows the various features in the system to work. GPLs and applications are not the same software.

G-Port

GSM Mobile Number Portability

A feature that provides mobile subscribers the ability to change the GSM subscription network within a portability cluster, while retaining their original MSISDN(s).

GSM

Global System for Mobile Communications

A second generation digital PCS mobile phone standard used in many parts of the world.

H

HCAP

High-Speed Communications & Applications Processor

HDI

High Density Interconnect

HDLC

High Level Data Link Control

HIPR

High-Speed IMT Packet Router

A card that provides increased system throughput and traffic capacity. HIPR moves EAGLE from an intra-shelf ring topology to an intra-shelf switch topology. HIPR acts as a gateway between the intra-shelf IMT BUS, running at 125Mbps, and the inter-shelf operating at 1.0625Gbps. The HIPR card will seat in the same slot as an HMUX card (slots xx09 & xx10 of each shelf).

H

HIPR2 High-Speed IMT Packet Router 2

A card that provides increased system throughput and traffic capacity on the existing Fibre-Channel ring. A high rate Fibre-Channel option of 2.5 Gbps is available when an EAGLE is provisioned with all HIPR2 cards. In a mixed topology where a HIPR2 is used in an EAGLE along with HMUX and HIPR, the Fibre-Channel ring runs at the lower rate of 1.0625 Gbps.

HS High Speed

I

IMT Inter-Module-Transport

The communication software that operates the inter-module-transport bus on all cards except the LIMATM, DCM, DSM, and HMUX.

INAP Intelligent Network Application Part

A standardized interface for intelligent networks (IN). This interface allows Service Providers to offer their own services.

INP INAP-based Number Portability

Tekelec's INP can be deployed as a stand-alone or an integrated signal transfer point/number portability solution. With Tekelec's stand-alone NP server, no network reconfiguration is required to implement number portability. The NP server delivers a much greater

I

signaling capability than the conventional SCP-based approach.

Intelligent Network (IN) Portability

Internet Protocol

See IP.

IP

Intelligent Peripheral

Internet Protocol - IP specifies the format of packets, also called datagrams, and the addressing scheme. The network layer for the TCP/IP protocol suite widely used on Ethernet networks, defined in STD 5, RFC 791. IP is a connectionless, best-effort packet switching protocol. It provides packet routing, fragmentation and re-assembly through the data link layer.

IPGWx

Point-to-multipoint MTP-User signaling (e.g., ISUP, TCAP) over IP capability. Typically used for A link connectivity which require routing keys. Far End not required to support MTP3. The IPGWx GPLs (IPGWI, SS7IPGW) run on the SSEDCEM/E5-ENET cards.

IPLIM

The application used by the SSEDCEM/E5-ENET card for IP point-to-point connectivity for ANSI point codes.

IPLIMx

Point-to-point MTP3 and MTP3-User signaling over IP capability. Typically used for B-C-D links but can be used for A links but does not have routing key functionality. Far End required to support MTP3. The IPLIMx GPLs

I

(IPLIMI, IPLIM) run on the
SSEDCEM/E5-ENET cards.

IPMX

IMT Power and Multiplexer card

IPS

Internet Protocol Services

An application that is used by the
IPSM card for the IP User Interface
and FTP Retrieve and Replace
features.

IPSM

IP Services Module

A card that provides an IP
connection for the IPUI (Telnet)
and FTP-based Table Retrieve
features. The IPSM is a GPSM-II
card with a one Gigabyte (UD1G)
expansion memory board in a
single-slot assembly running the
IPS application.

ISS

Integrated Signaling System

ISUP

ISDN User Part

The ISDN-specific part of the
transmission with additional
information via a signaling channel
between exchanges.

L

LAN

Local Area Network

A private data network in which
serial transmission is used for
direct data communication among
data stations located in the same
proximate location. LAN uses coax
cable, twisted pair, or multimode
fiber.

See also STP LAN.

L

latched USB port	On the E5-MCAP card, a USB port with a lockable latch. Used with removable media (flash memory "thumb" drives) to install and back up customer data.
LED	<p>Light Emitting Diode</p> <p>An electrical device that glows a particular color when a specified voltage is applied to it.</p>
LIM	<p>Link Interface Module</p> <p>Provides access to remote SS7, IP, and other network elements such as a Signaling Control Point (SCP) through a variety of signaling interfaces (DS0, MPL, E1/T1 MIM, LIM-ATM, E1-ATM, IPLIMx, IPGWx). The LIMs consist of a main assembly and possibly, an interface appliqué board. These appliqué provide level one and some level two functionality on SS7 signaling links.</p>
LIM-ATM	A link interface module (LIM) with the ATM interface.
Link	<p>Signaling Link</p> <p>Carries signaling within a Link Set using a specific Association. A Link can belong to only one Link Set and one Association. There is generally one Link per Association in a Link Set.</p>
LM	Layer Management
LNP	Local Number Portability

L

The ability of subscribers to switch local or wireless carriers and still retain the same phone number.

LSMS

Local Service Management System

An interface between the Number Portability Administration Center (NPAC) and the LNP service databases. The LSMS receives LNP data from the NPAC and downloads that data to the service databases. LNP data can be entered into the LSMS database. The data can then be downloaded to the LNP service databases and to the NPAC.

M**M2PA**

SS7 MTP2-User Peer-to-Peer Adaptation Layer

M3UA

SS7 MTP3-User Adaptation Layer
M3UA enables an MTP3 User Part to be connected to a remote MTP3 via a reliable IP transport.

MAS

Maintenance and Administration Subsystem

A set of cards located in the Control Shelf, used to provide a central management point for the EAGLE. The MAS provides user interface, maintenance communication, peripheral services, alarm processing, system disk interface, and measurements using the following three subassemblies: GPSM-II, TDM, and MDAL.

M

MASP	<p>Maintenance and Administration Subsystem Processor</p> <p>The Maintenance and Administration Subsystem Processor (MASP) function is a logical pairing of the GPSM-II card and the TDM card. The GPSM-II card is connected to the TDM card by means of an Extended Bus Interface (EBI) local bus.</p> <p>The MDAL card contains the removable cartridge drive and alarm logic. There is only one MDAL card in the Maintenance and Administration Subsystem (MAS) and it is shared between the two MASPs.</p>
MB	<p>Megabyte</p> <p>A unit of computer information storage capacity equal to 1,048,576 bytes.</p>
MCA	<p>Matrix Controller Assembly</p>
MCAP	<p>Maintenance Communications and Applications Processor</p>
MCPM	<p>Measurement Collection and Polling Module</p> <p>Provides comma delimited core STP measurement data to a remote server for processing. The MCPM is either an EDSM with 2 GB of memory or an E5-MCPM-B card running the MCP application.</p>
MF	<p>Mediation Function</p> <p>Miscellaneous Frame</p>

M

Multi-Frequency

MHz

Megahertz

MIM

Multi-Channel Interface Module

MODE

A parameter of the `chg-slt` command and a field in the `rtrv-slt` command output showing the mode used when sending signaling link test messages, regular or special.

special - All SLTMs generated by the links in the link set associated with this SLTM record are designated “special” maintenance messages.

regular - All SLTMs generated by the links in the link set associated with this SLTM record are designated “regular” maintenance messages.

MPL

Multi-port LIM

MPS

Multi-Purpose Server

The Multi-Purpose Server provides database/reload functionality and a variety of high capacity/high speed offboard database functions for applications. The MPS resides in the General Purpose Frame.

Messages Per Second

A measure of a message processor’s performance capacity. A message is any Diameter message (Request or Answer) which is received and processed by a message processor.

N

N

NC

Network Cluster
Network Code
Not Compliant
North Carolina

NEBS

Network Equipment Building
Systems

The most common set of safety, spatial and environmental design guidelines applied to telecommunications equipment in the United States. NEBS was developed by Bell Labs in the 1970s to standardize equipment that would be installed in a central office. This document lists the generic requirements for all new telecommunications equipment systems used in central offices and other telephone buildings.

NO

Network OAM&P

A server that manages a collection of SOs and their corresponding MPs. NO servers are deployed in active/standby pairs.

O

OAM

Operations, Administration, and
Maintenance

The application that operates the Maintenance and Administration Subsystem that controls the operation of many products.

OCU

Office Channel Unit

The interface used with the LIMOCU card.

O

OEM	Original Equipment Manufacturer
OOS	Out of Service
OP	Operation
OS	Operating System Operations Systems

P

PCB	Printed Circuit Board
PCI	Peripheral Component Interface Point Code International Protocol Control Information Peripheral Component Interconnect
PIC	Point in Call Programmable Interrupt Controller
PMC	PCI Mezzanine Card

R

RFI	Request for Information
RH	Relative Humidity
RMA	Return Material Authorization
ROM	Read Only Memory
RS	Requirement Specification

R

Redirect Server

S

SCN

Switched Circuit Network

A network that carries traffic within channelized bearers of predefined sizes. Examples include Public Switched Telephone Networks (PSTNs) and Public Land Mobile Networks (PLMNs). Examples of signaling protocols used in SCN include Q.931, SS7 MTP Level 3, and SS7 Application/User parts.

SCP

Secure Copy

Service Control Point

SCPs are network intelligence centers where databases or call processing information is stored. The primary function of SCPs is to respond to queries from other SPs by retrieving the requested information from the appropriate database, and sending it back to the originator of the request.

SCSI

Small Computer System Interface

There are two independent Small Computer System Interface (SCSI) buses, one to the fixed disks on TDM cards and the other to the shared administration SCSI bus that runs on the backplane between TDMs and the MDAL card. Each SCSI bus has a block of memory that allows transfers from memory to occur without delaying the application processor.

S

SCTP

Stream Control Transmission Protocol

An IETF transport layer protocol, similar to TCP, that sends a message in one operation.

The transport layer for all standard IETF-SIGTRAN protocols.

SCTP is a reliable transport protocol that operates on top of a connectionless packet network such as IP and is functionally equivalent to TCP. It establishes a connection between two endpoints (called an association; in TCP, these are sockets) for transmission of user messages.

SE-HSL

Synchronous E1 High Speed Link

Format for E1 high-speed signaling links where time-slot 0 is used for framing and error control. The remainder of bandwidth, equivalent to 31 channels of 64Kbps data, is used as a single data link yielding a total capacity of 1.984 Mbps. Also known as Unchannelized E1.

SI

Service Indicator

SLAN

Signaling Transfer Point Local Area Network

A feature in the EAGLE that copies MSUs selected through the gateway screening process and sends these MSUs over the Ethernet to an external host computer for further processing.

SM

Short Message

S

SS	Subsystem Supplementary Services
SS7	Signaling System #7 A communications protocol that allows signaling points in a network to send messages to each other so that voice and data connections can be set up between these signaling points. These messages are sent over its own network and not over the revenue producing voice and data paths. The EAGLE is an STP, which is a device that routes these messages through the network.
SS7IPGW	SS7 IP Gateway An application used by the DCM/SSEDCM card for IP point-to-multipoint capability within an ANSI network.
SSEDCM	Single Slot Enhanced Data Communications Module
STC	Sentinel Transport Card Signaling Transport Card The Signaling Transport Card (STC) is a member of the DCM card family with an "eroute" generic program load (GPL) installed. The STCs provide the IP interface between the LIM cards on the IMT bus and the Signaling Extended Services Platform (ESP) subassembly. The STC is used for sending MSU data to the ESP/IMF.
STP	Signal Transfer Point

S

The STP is a special high-speed switch for signaling messages in SS7 networks. The STP routes core INAP communication between the Service Switching Point (SSP) and the Service Control Point (SCP) over the network.

Spanning Tree Protocol

STPLAN

Signaling Transfer Point Local Area Network

The application used by the SLAN card and E5-SLAN card to support the STP LAN feature. This application does not support 24-bit ITU-N point codes.

SUA

SCCP User Adaptation Layer

A protocol for the transport of any SCCP-User signaling over IP using the SCTP. The protocol is designed to be modular and symmetric, to allow it to work in diverse architectures.

T

T1

Transmission Level 1

A T1 interface terminates or distributes T1 facility signals for the purpose of processing the SS7 signaling links carried by the E1 carrier.

A leased-line connection capable of carrying data at 1,544,000 bits-per-second.

TCP/IP

Transmission Control Protocol/Internet Protocol

TDM

Terminal Disk Module

T**Time Division Multiplexing**

Data transmissions within individual connections follow a pre-defined multiplex scheme where a fixed time slot is available for each channel.

TO

Timing Output

TOCA

Timing Output Composite Automatic

TSC

Time Slot Counter

TX

Transmit

U

UAM

Unsolicited Alarm Message

A message sent to a user interface whenever there is a fault that is service-affecting or when a previous problem is corrected. Each message has a trouble code and text associated with the trouble condition.

UL

Underwriters Laboratories

V

VSCCP

VxWorks Signaling Connection Control Part

The application used by the Service Module card to support EPAP-related features and LNP features. If an EPAP-related or LNP feature is not turned on, and a Service Module card is present, the

V

VSCCP application processes
normal GTT traffic.