Tekelec EAGLE® 5

Hardware

910-5891-001 Revision A
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Chapter 1

Introduction

Topics:

Overview

This manual provides hardware descriptions for Tekelec signaling systems or components based on the EAGLE 5 Integrated Signaling System (ISS) for releases 42.0 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 5 ISS Signal Transfer Point (STP)
- Multi-Purpose Server(MPS)

For additional information on MPS components that use the Tekelec 1000 Application Server, see the *Tekelec 1000* Application Server *Hardware Manual.* For information on ELAP application using the Tekelec 1100 Application Server, see the *Tekelec 1100* Application Server *Hardware Manual.*

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

For configuration and provisioning, refer to the Database *Administration Manual – Features* included in your current documentation suite.

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

Manual Organization and Conventions

This *Hardware Manual* is organized into the following chapters:

- *Introduction* — Containsgeneral 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 5 ISS. EAGLE 5 ISS subsystems include Maintenance and Administration, Communicationand Application elements. *Hardware Descriptions - OEM-Based Products*also describes an overview of OEM-based products.

- *Hardware Descriptions - EAGLE 5 ISS* — Describes frames, shelves, and cards that make up an EAGLE 5 ISS.
- *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 5 ISS* — 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.

The *Hardware Manual* uses the following conventions:

- Components used only in a specific system are clearly labeled, for example, (EAGLE 5 ISS only).
- Components that are specific to a release are labeled with the system and release number; for example, (EAGLE 5 ISS 37.0 or earlier).

Related Publications

For information about additional publications that are related to this document, refer to the *Related Publications* document. The *Related Publications* document is published as a part of the *Release Documentation* and is also published as a separate document on the Tekelec Customer Support Site.

Documentation Availability, Packaging, and Updates

Tekelec provides documentation with each system and in accordance with contractual agreements. For General Availability (GA) releases, Tekelec publishes a complete EAGLE 5 ISS documentation set. For Limited Availability (LA) releases, Tekelec may publish a documentation subset tailored to specific feature content or hardware requirements. Documentation Bulletins announce a new or updated release.

The Tekelec EAGLE 5 ISS documentation set is released on an optical disc. This format allows for easy searches through all parts of the documentation set.

The electronic file of each manual is also available from the *Tekelec Customer Support* site. This site allows for 24-hour access to the most up-to-date documentation, including the latest versions of Feature Notices.

Printed documentation is available for GA releases on request only and with a lead time of six weeks. The printed documentation set includes pocket guides for commands and alarms. Pocket guides may also be ordered separately. Exceptions to printed documentation are:

- Hardware or Installation manuals are printed without the linked attachments found in the electronic version of the manuals.
- The Release Notice is available only on the Customer Support site.

Note: Customers may print a reasonable number of each manual for their own use.

Documentation is updated when significant changes are made that affect system operation. Updates resulting from Severity 1 and 2 Problem Reports (PRs) are made to existing manuals. Other changes are included in the documentation for the next scheduled release. Updates are made by re-issuing an electronic file to the customer support site. Customers with printed documentation should contact their Sales Representative for an addendum. Occasionally, changes are communicated first with a Documentation Bulletin to provide customers with an advanced notice of the issue until officially released in the documentation. Documentation Bulletins are posted on the Customer Support site and can be viewed per product and release.

Locate Product Documentation on the Customer Support Site

Access to Tekelec's Customer Support site is restricted to current Tekelec customers only. This section describes how to log into the Tekelec Customer Support site and locate a document. Viewing the document requires Adobe Acrobat Reader, which can be downloaded at www.adobe.com.

1. Log into the *Tekelec Customer Support* site.

   Note: If you have not registered for this new site, click the **Register Here** link. Have your customer number available. The response time for registration requests is 24 to 48 hours.

2. Click the **Product Support** tab.
3. Use the Search field to locate a document by its part number, release number, document name, or document type. The Search field accepts both full and partial entries.
4. Click a subject folder to browse through a list of related files.
5. To download a file to your location, right-click the file name and select **Save Target As**.

Regulatory Compliance and Certification

Tekelec 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 89/336/EEC.

- Relevant standards in Safety directive 73/23/EEC, supported by Certified Body (CB) Test Certificates US/5923/UL or US/5451/UL issued by the National Certification Body as tested to IEC 60950 with national differences for European 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

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

Figure 3: Hazardous Substances

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

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

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

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

	**DANGER**: (This icon and text indicate the possibility of *personal injury*.)
	**WARNING**: (This icon and text indicate the possibility of *equipment damage*.)
	**CAUTION**: (This icon and text indicate the possibility of *service interruption*.)

Customer Care Center

The Tekelec Customer Care Center is your initial point of contact for all product support needs. A representative takes your call or email, creates a Customer Service Request (CSR) and directs your requests to the Tekelec Technical Assistance Center (TAC). Each CSR includes an individual tracking number. Together with TAC Engineers, the representative will help you resolve your request.

The Customer Care Center is available 24 hours a day, 7 days a week, 365 days a year, and is linked to TAC Engineers around the globe.

Tekelec TAC Engineers are available to provide solutions to your technical questions and issues 7 days a week, 24 hours a day. After a CSR is issued, the TAC Engineer determines the classification of the trouble. If a critical problem exists, emergency procedures are initiated. If the problem is not critical, normal support procedures apply. A primary Technical Engineer is assigned to work on the CSR and provide a solution to the problem. The CSR is closed when the problem is resolved.

Tekelec Technical Assistance Centers are located around the globe in the following locations:

Tekelec - Global

Email (All Regions): support@tekelec.com

- **USA and Canada**

  Phone:

  1-888-FOR-TKLC or 1-888-367-8552 (toll-free, within continental USA and Canada)

  1-919-460-2150 (outside continental USA and Canada)

  TAC Regional Support Office Hours:

  8:00 a.m. through 5:00 p.m. (GMT minus 5 hours), Monday through Friday, excluding holidays

- **Central and Latin America (CALA)**

  Phone:

  USA access code +1-800-658-5454, then 1-888-FOR-TKLC or 1-888-367-8552 (toll-free)

TAC Regional Support Office Hours (except Brazil):

10:00 a.m. through 7:00 p.m. (GMT minus 6 hours), Monday through Friday, excluding holidays

- **Argentina**

  Phone:

  0-800-555-5246 (toll-free)

- **Brazil**

  Phone:

  0-800-891-4341 (toll-free)

  TAC Regional Support Office Hours:

  8:30 a.m. through 6:30 p.m. (GMT minus 3 hours), Monday through Friday, excluding holidays

- **Chile**

  Phone:

  1230-020-555-5468

- **Colombia**

  Phone:

  01-800-912-0537

- **Dominican Republic**

  Phone:

  1-888-367-8552

- **Mexico**

  Phone:

  001-888-367-8552

- **Peru**

  Phone:

  0800-53-087

- **Puerto Rico**

  Phone:

  1-888-367-8552 (1-888-FOR-TKLC)

- **Venezuela**

  Phone:

  0800-176-6497

- **Europe, Middle East, and Africa**

  Regional Office Hours:

  8:30 a.m. through 5:00 p.m. (GMT), Monday through Friday, excluding holidays

  - **Signaling**

Phone:

+44 1784 467 804 (within UK)

- **Software Solutions**

  Phone:

  +33 3 89 33 54 00

- **Asia**
  - **India**

    Phone:

    +91 124 436 8552 or +91 124 436 8553

    TAC Regional Support Office Hours:

    10:00 a.m. through 7:00 p.m. (GMT plus 5 1/2 hours), Monday through Saturday, excluding holidays
  - **Singapore**

    Phone:

    +65 6796 2288

    TAC Regional Support Office Hours:

    9:00 a.m. through 6:00 p.m. (GMT plus 8 hours), Monday through Friday, excluding holidays

Problem Report (PR)

The assigned Technical Support engineer opens a problem report (PR) using problem criteria as defined in "TL-9000 Quality System Metrics (Book Two, Release 3.0" and the following sections.

Critical

Critical problems severely affect service, capacity/traffic, billing, and maintenance capabilities and requires immediate corrective action, regardless of time of day or day of the week, as viewed by a customer upon discussion with the supplier. For example:

- A loss of service that is comparable to the total loss of effective functional capacity of an entire switching or transport system.
- A reduction in capacity or traffic handling capacity such that expected loads cannot be handled.
- Any loss of safety or emergency capability (for example, 911 calls).

Major

Major problems cause conditions that seriously affect system operations, maintenance, and administration, etc., and require immediate attention as viewed by the customer upon discussion with the supplier. The urgency is less than in a critical situations because of a lesser immediate or impending effect on system performance, customer, and the customer's operation and review. For example:

- Reduction in any capacity/traffic measurement function

- Any loss of functional visibility and/or diagnostic capability
- Short outage equivalent to system or subsystem outages, with accumulated duration of greater than two minutes in any 24-hour period, or that continue to repeat during longer periods
- Repeated degradation of DS1 or higher rate spans or connections
- Prevention of access for routine administrative activity
- Degradation of access for maintenance or recovery operations
- Degradation of the system's ability to provide any required critical or major trouble notification
- Any significant increase in product related customer trouble reports
- Billing error rates that exceed specifications
- Corruption of system or billing databases

Minor

Other problems that a customer does not view as critical or major are considered minor. Minor problems do not significantly impair the functioning of the system and do not significantly affect service to customers. These problems are tolerable during system use.

Engineering complaints are classified as minor unless otherwise negotiated between the customer and supplier.

Emergency Response

In the event of a critical service situation, emergency response is offered by the Tekelec Customer Care Center 24 hours a day, 7 days a week. 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 an EAGLE 5 ISS that severely affects service, traffic, or maintenance capabilities, and requires immediate corrective action. Critical problems affect service and/or system operation resulting in:

- 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 the Tekelec Customer Care Center.

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
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.

Reason for Return	Description
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 Tekelec 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 Tekelec *Customer Care Center* :
   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) Tekelec card type: (e.g., ILA, MPL, DSM, etc.)
   l) Tekelec 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: *Customer Care Center*.
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 Tekelec.

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 TEKELECAttn: RMA Department5200 Paramount ParkwayMorrisville, NC 27560RMA#: <assigned by Tekelec>
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 Tekelec in the crate after use. After installing the equipment bolt the dollies securely in the crate and return to Tekelec.

   OR

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

Note:

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

Chapter 2

System Overview

Topics:

Introduction

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

- EAGLE 5 Integrated Signaling System (ISS)
- Multi-purpose Server (MPS)
- Tekelec 1000 Application Server (T1000 AS)
- Tekelec 1100 Application Server (T1100 AS)

Hardware Baselines in this manual 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 5 ISS*.

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 5 ISS systems are labeled (EAGLE 5 ISS 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 5 ISS 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.

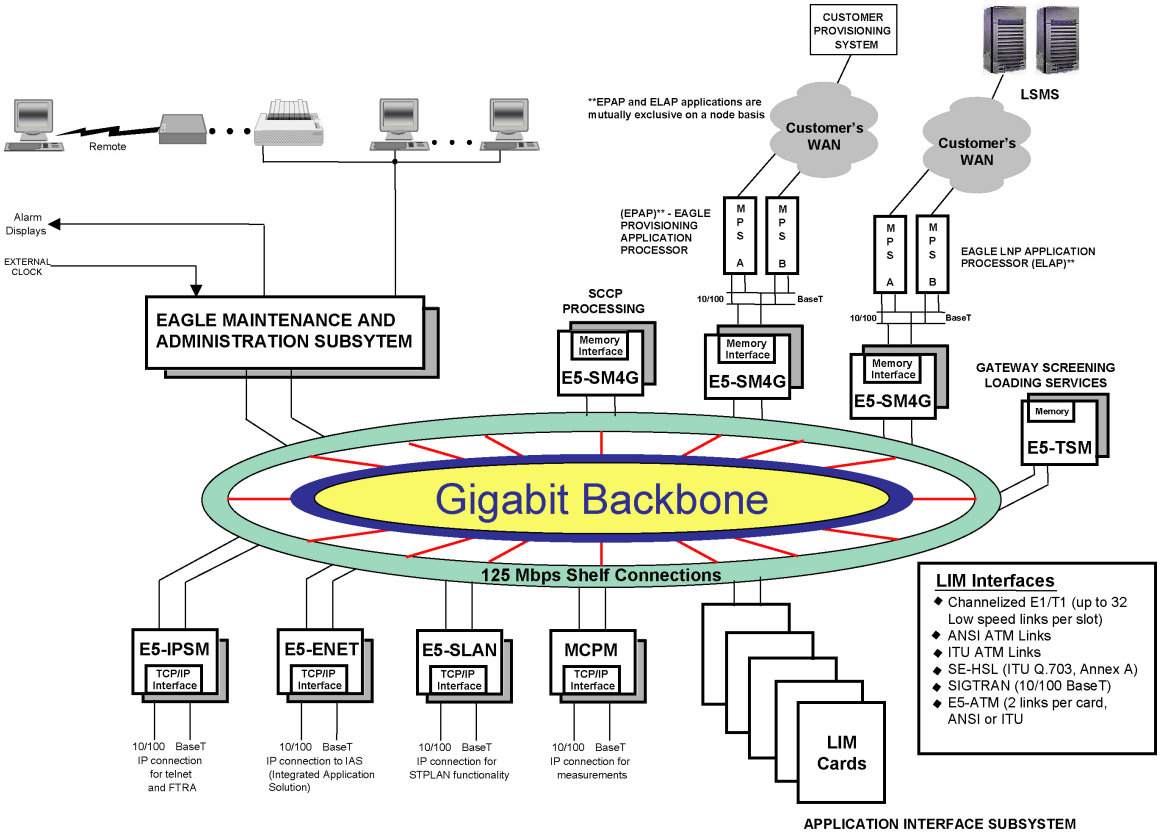
EAGLE 5 ISS

The EAGLE 5 ISS is a large capacity, multi-functional, fully scalable Signaling Transfer Point (STP). High capacity and scalability allow the EAGLE 5 ISS to grow from a single-shelf, 80-link STP to a multi-frame, 2800-link STP. EAGLE 5 ISS also supports a variety of interface cards to support connectivity to a wide range of network elements. The EAGLE 5 ISS 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 5 ISS consists of the following functional subsystems. Each subsystem is responsible for a specific task. These subsystems are depicted in *Figure 4: EAGLE 5 ISS Functional Diagram* .

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

Figure 4: EAGLE 5 ISS Functional Diagram



The EAGLE 5 ISS 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 5 ISS* provides detailed information about component requirements and hardware conffiguration.

In addition, EAGLE 5 ISS 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 5. The MAS provides user interface, maintenance communication, peripheral services, alarm processing, system disk interface, and measurements. The EAGLE 5 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 5. 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 5 ISS Control Shelf. The control cards may be either E5-based cards or legacy cards.

Note: E5-based control cards are those cards for the EAGLE 5 available for use as of Release 40.1.

Note: Legacy control cards are those cards for the EAGLE 5 that are based on the GPSM-II, TDM, and MDAL cards.

Note: During normal operation, the E5-based control cards and legacy control cards cannot be mixed in one EAGLE 5 Control Shelf. During an upgrade to the E5-based control cards, mixing legacy and E5-based cards are managed.

E5-based Control Cards

The E5-based set of EAGLE 5 control cards consist of the following cards:

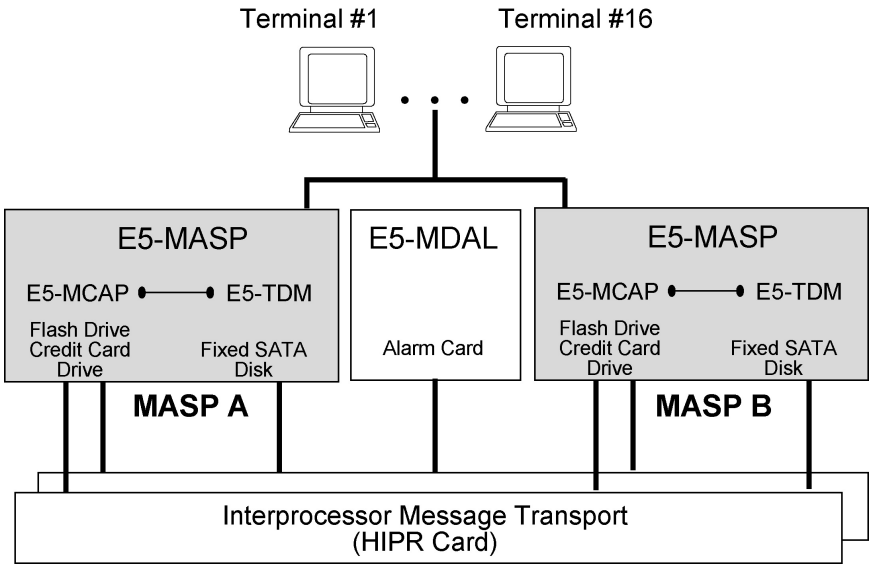
- One E5-based Maintenance Disk and Alarm (E5-MDAL) card.
- Two E5-based Maintenance and Administration Subsystem Processors (E5-MASP) cards. The E5-MASP card is a single dual-slot physical assembly made up of the following two cards.
  - E5-based Maintenance Communication Application Processor (E5-MCAP)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

  Note: An E5 control card is not compatible with a legacy control 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 or 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) card (P/N 870-2903-01) contains all of the necessary logic to perform both application and communication processing of the data streams provided by the EAGLE 5. The card provides 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 5. The E5-MASP card contains one fixed drive and USB connectors for two removable drives.

E5-MCAP

The E5-MCAP card provides increased processor and memory performance over the legacy GPSM-II card. 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 "credit card" flash drive. The removable media drive is used to install and back up customer data. The credit card drive 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 existing legacy GPSM-II card used for the MCAP function.

Note: The E5-MCAP card can not be used for the other functions for which the GPSM-II class (e.g.: MCP, IPS, DCM) card is used.

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.

Note: The E5-MDAL card is not compatible with a legacy MASP. It is designed to work with the E5-MASP card.

Legacy Control Cards

The set of EAGLE 5 ISS control cards consist of the following cards:

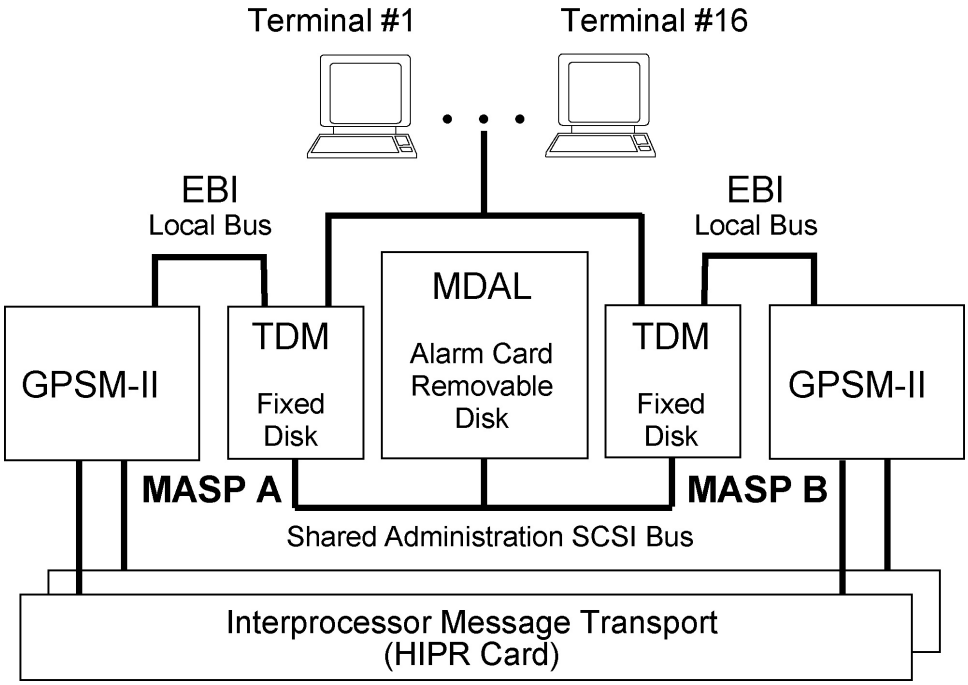
- One legacy Maintenance Disk and Alarm (MDAL) card.
- Two legacy Maintenance and Administration Subsystem Processors (MASP) card sets. The MASP card set is made up of the following two cards.
  - General Purpose Service Module II (GPSM-II) card
  - legacy Terminal Disk Module (TDM) card

Note: An E5 control card is not compatible with a legacy control card.

The GPSM-II card and legacy TDM card are single-slot cards. The GPSM-II control card occupies slots 1113 and 1115 of the control shelf. The legacy TDM card occupies slots 1114 and 1116 of the control shelf. The legacy MDAL card is a dual-slot card occupying slots 1117 and 1118 of the control shelf.

The relationshi[p between the control cards is depicted in *Figure 6: Legacy Maintenance and Administration Subsystem Block Diagram* .

Figure 6: Legacy Maintenance and Administration Subsystem Block Diagram



GPSM-II

The GPSM-II card contains the Communications and Applications Processors and provides connections to the IMT bus. The GPSM-II card controls the maintenance and database administration activity.

The GPSM-II card is a single-slot card occupying slots 1113 and 1115 of the control shelf.

TDM

The legacy TDM card provides the Terminal Processor for the 16 I/O ports, and interfaces to the Maintenance Disk and Alarm (MDAL) card. The fixed disk drive is used as a permanent, temporary, or transient medium for data storage. The data stored on the disk can be used immediately or backed up and stored as permanent archives files. The TDM card also distributes Composite Clocks and High Speed Master clocks throughout the EAGLE 5 ISS.

The legacy TDM card is a single-slot card occupying slots 1114 and 1116 of the control shelf.

MDAL

The legacy MDAL card provides alarm processing from the currently active MASP, and an audible alarm. The MDAL card contains a removable cartridge drive. The cartridge is used for installing new software, backing up the system software, the application software, and the database; and for downloading data for off-line processing.

The legacy MDAL card is a dual-slot card occupying slots 1117 and 1118 of the control shelf.

Communication Subsystem

The communication subsystem consists of two separate sets of buses:

- Small Computer System Interface (SCSI) buses
- Inter-processor Message Transport (IMT) buses

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Small Computer System Interface Buses

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.

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 5 ISS and the Integrated Monitoring feature allows monitoring of SS7 links without external connections. SS7 link information from the EAGLE 5 ISS LIM 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 Sentinel server.

High-Speed IMT Packet Router

The High-Speed IMT Packet Router (HIPR) Module provides increased IMT bus bandwidth and individual high-speed card/server links by introducing switched 125 Mbps interfaces to each slot within a shelf. HIPR acts as a gateway between the intra-shelf IMTBUS, running at 125 Mbps, and the inter-shelf ring operating at 1.0625 Gbps. HIPR implements the HMUX scheme of transmitting data between shelves only when necessary. The HIPR plugs into the same slot as an HMUX.

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

Two HIPR modules are required in shelves equipped with high-performance LIMs, such as the High-Capacity MIM, and for interfacing to Tekelec 1000 Application Server through IMT Bridge and IMTPCI modules. HIPR requires all other shelves to be equipped with either all HMUX cards or all HIPR cards (shelves cannot contain a mix of HMUX and HIPR).

The HIPR programmable logic is upgradeable and reprogrammable via the IMT inter-shelf interface. Updated images can be downloaded from the OAM to the HIPR and stored in FLASH memory on the HIPR.

With the improved bandwidth from the switched architecture, the HIPR card enables customers to use other higher performance cards from Tekelec such as the High Capacity MIM.

High-Speed Multiplexer

High-Speed Multiplexer (HMUX) cards support requirements for up to 1500 links, allowing communication on IMT buses between cards, shelves and frames. HMUX cards interface to 16 serial links, creating a ring from a series of point to point links. Each HMUX card provides a bypass multiplexer to maintain the ring's integrity as cards are removed and inserted into an operational shelf.

Note: To maintain integrity of the IMT bus, each extension shelf must contain at least one Translation Service Module (TSM) or Database Communications Module (DCM), or Link Interface Module (LIM). If such cards are present for the purpose of maintaining IMT bus integrity, they do not have to be entered into the system database .

Note: Control Shelf Backplane (P/N 850-0330-03/04) can be used with the HMUX and HIPR in the EAGLE 5 ISS system with minor modifications and the addition of adapter cable (P/N 830-0857-01). The adapter cable is not necessary for customers not wanting high speed links.

High-Speed Multiplexer (HMUX) card replaces the IPMX card. A mixture of HMUX and HIPR cards within one IMT ring is possible, provided HIPR is installed on both IMT A and IMT B on a given shelf. HMUX and HIPR cards are installed at the factory or by Tekelec Technical Support and are not installed by customers.

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The communication subsystem consists of two separate sets of buses:

- Small Computer System Interface (SCSI) buses
- Inter-processor Message Transport (IMT) buses

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

Two HIPR modules are required in shelves equipped with high-performance LIMs, such as the High-Capacity MIM, and for interfacing to Tekelec 1000 Application Server through IMT Bridge and IMTPCI modules. HIPR requires all other shelves to be equipped with either all HMUX cards or all HIPR cards (shelves cannot contain a mix of HMUX and HIPR).

The HIPR programmable logic is upgradeable and reprogrammable via the IMT inter-shelf interface. Updated images can be downloaded from the OAM to the HIPR and stored in FLASH memory on the HIPR.

With the improved bandwidth from the switched architecture, the HIPR card enables customers to use other higher performance cards from Tekelec such as the High Capacity MIM.

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Note: To maintain integrity of the IMT bus, each extension shelf must contain at least one Translation Service Module (TSM) or Database Communications Module (DCM), or Link Interface Module (LIM). If such cards are present for the purpose of maintaining IMT bus integrity, they do not have to be entered into the system database .

Note: Control Shelf Backplane (P/N 850-0330-03/04) can be used with the HMUX and HIPR in the EAGLE 5 ISS system with minor modifications and the addition of adapter cable (P/N 830-0857-01). The adapter cable is not necessary for customers not wanting high speed links.

High-Speed Multiplexer (HMUX) card replaces the IPMX card. A mixture of HMUX and HIPR cards within one IMT ring is possible, provided HIPR is installed on both IMT A and IMT B on a given shelf. HMUX and HIPR cards are installed at the factory or by Tekelec Technical Support and are not installed by customers.

High-Speed IMT Packet Router 2

The High-Speed IMT Packet Router 2 (HIPR2) provides enhanced capabilities in existing EAGLE 5 ISS 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 5 ISS 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 (or two HIPR) 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 either all HMUX cards, or all HIPR cards, or all HIPR2 cards (shelves cannot contain a mix of either HMUX/HIPR, and HIPR2).

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 and is compatible with the existing HIPR when operating at the low-rate. When the high-rate is required, all shelves within an EAGLE 5 ISS node must be equipped with HIPR2.

Note: In a system with a mixture of cards on a given bus (ie, any combination of HMUX, HIPR, HIPR2), only the low-rate will be achievable.

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

- Low-rate, defined as the current 1.0625 Gbps rate compatible with HMUX and HIPR
- High-rate, defined as 2.5 Gbps that requires
  - All shelves within EAGLE 5 ISS 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

High-Speed IMT Packet Router

The High-Speed IMTPacket Router (HIPR) Module provides increased IMTbus bandwidth and individual high-speed card/server links by introducing switched 125 Mbps interfaces to each slot within a shelf. HIPR acts as a gateway between the intra-shelf IMTBUS, running at 125 Mbps, and the inter-shelf ring operating at 1.0625 Gbps. HIPR implements the HMUX scheme of transmitting data between shelves only when necessary. The HIPR plugs into the same slot as an HMUX.

Traffic between cards on the same shelf will be switched directly to the destination slot and is not transmitted to any other cards in the shelf. Traffic between shelves is not required to pass onto an intra-shelf IMTchannel.

Two HIPR modules are required in shelves equipped with high-performance LIMs, such as the High-Capacity MIM, and for interfacing to Tekelec 1000 Application Server through IMTBridge and IMTPCI modules. HIPR requires all other shelves to be equipped with either all HMUX cards or all HIPR cards (shelves cannot contain a mix of HMUX and HIPR).

The HIPR programmable logic is upgradeable and reprogrammable via the IMTinter-shelf interface. Updated images can be downloaded from the OAM to the HIPR and stored in FLASH memory on the HIPR.

With the improved bandwidth from the switched architecture, the HIPR card enables customers to use other higher performance cards from Tekelec such as the High Capacity MIM.

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Note: To maintain integrity of the IMT bus, each extension shelf must contain at least one Translation Service Module (TSM) or Database Communications Module (DCM), or Link Interface Module (LIM). If such cards are present for the purpose of maintaining IMT bus integrity, they do not have to be entered into the system database .

Note: Control Shelf Backplane (P/N 850-0330-03/04) can be used with the HMUX and HIPR in the EAGLE 5 ISS system with minor modifications and the addition of adapter cable (P/N 830-0857-01). The adapter cable is not necessary for customers not wanting high speed links.

High-Speed Multiplexer (HMUX) card replaces the IPMX card. A mixture of HMUX and HIPR cards within one IMT ring is possible, provided HIPR is installed on both IMT A and IMT B on a given shelf. HMUX and HIPR cards are installed at the factory or by Tekelec Technical Support and are not installed by customers.

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 5 ISS 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:

- Link Interface Module (LIM)—SS7 links and X.25 links.
- Database Communications Module (DCM), Enhanced DCM (EDCM and EDCM-A), Signaling Transport Card (STC)—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. A single-slot EDCM (SSEDCM) card or an E5-ENET card must be used.
- Translation Service Module (TSM)—Local Number Portability (LNP)/SCCP (GTT) only.
- Database Service Module (DSM)—EAGLE 5 ISS Provisioning Application Processor (EPAP), Global System for Mobile Communications (GSM), EAGLE 5 ISS Local Number Portability (ELAP), and interface to Local Service Management System (LSMS).

  DSM-1G cards based on the GPSM-II card running the IPS GPL function as card type IPSM.
- E5-SM4G Database Service Module—EAGLE 5 ISS Provisioning Application Processor (EPAP), Global System for Mobile Communications (GSM), EAGLE 5 ISS Local Number Portability (ELAP), and interface to Local Service Management System (LSMS). Supports 150K TPS GTT and 75K TPS G-Port features.

  Note: The E5-SM4G does not support ELAP with databases greater than 192M or EPAP with databases greater than 84M.

- General Purpose Service Module II (GPSM-II)— The GPSM-II provides two 10/100Base-T Ethernet ports for LAN connections. The GPSM-II does not require additional memory modules when provisioned as a single slot EDCM. The GPSM-II card replaces the MCAP card.

  Note: GPSM-II cards are installed at the factory or by Tekelec Technical Support and are not installed by customers.

  When the GPSM-II is combined with one or more Gigabytes of expansion memory (UD1G P/N 850-0527-xx) it becomes the primary board for the following card types. GPSM-II card functionality is primarily determined by the GPL provisioned.

  - When combined with a one Gigabyte (UD1G) expansion memory board in a single-slot assembly and provisioned with IPS GPL, the GPSM-II functions as card type IP Services Module (IPSM).
  - The Measurements Collection and polling Module (MCPM) is derived from EDSM-2G cards with 32 MB FSRAM and 2 GB RAM.

  Note: The EDSM-2G card in the MCPM module is a 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.

- Multi-Channel Interface Module—8 HDLC channels for E1 or T1 protocols.
- Multi-Port Link Interface Module—SS7 links.

Generic Program Loads

Application software is downloaded to individual application cards by means of Generic Program Loads (GPLs). Hardware is defined to EAGLE 5 ISS 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:

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

  CAUTION: Tekelec recommends that cards running the SCCP application be uniformly distributed in the EAGLE 5 ISS to provide a more even SCCP load distribution. During normal operation unevenly distributed SCCP cards in an EAGLE 5 ISS would not have any network or system impacts. However, should a particular SCCP 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.
- GX25—This software allows the system to send and receive traffic to and from an X.25 network, and convert the packet to an Signaling System #7 Message Signaling Unit (SS7 MSU).

- GLS—Gateway Loading Service (GLS) software controls download of Gateway Screening (GWS) data to Link Interface Modules (LIMs) and TSM 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 5 ISS LIM cards to the Integrated Sentinel using TCP/IP and EAGLE 5 ISS Monitor Protocol (EMP). Implemented in Signaling Transport Cards (STC).
- EOAM—Enhanced Operation Administration and Maintenance GPL for GPSM-II cards.

Link Interface Module

The application subsystem provides external services, relying on the Link Interface Module (LIM) as an interface. Each LIM provides one or two SS7 links (depending on configuration) or IP links. 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.

The types of interfaces presently available through a LIM are:

- DS0A at 56 kbps
- OCU at 56 kbps
- T1-ATM at 1.544 Mbps
- E1-ATM at 2.048 Mbps
- E1 at 2.048 Mbps
- T1 at 1.544 Mbps
- TCP/IP at 10/100 MHz
- FTP at 10/100 MHz

Database Communications Module

The Database Communications Module (DCM) requires two slots for mounting and must be assigned to an odd numbered slot in EAGLE 5 ISS.

Note: DCMs cannot be configured in any slot reserved for MASP, MDAL, HMUX, and HIPR cards. This applies to all application cards

DCM cards provide STP Local Area Network function, and 10/100 Base-T ethernet links to the STP. DCM cards are compatible with control shelf backplanes (P/N 850-0330-03/04/05/06) and extension shelf backplanes (P/N 850-0356-01/02/03/04/06). DCM cards are provisioned in pairs for redundancy.

Note: Unique cabling needs restrict placement of DCM cards in EAGLE 5 ISS systems. The DCM requires a unique cable interface that is not compatible with current LIM cables on fully wired but unequipped shelves.

Note: Beginning with Release 38.0, any type dual-slot DCM card is no longer supported. A single-slot EDCM (SSEDCM) card or an E5-ENET card must be used.

Single-slot Enhanced Database Communications Module

The single-slot EDCM (P/N 870-2372-01) and EDCM-A (P/N 870-2359-03) require one slot for mounting and can be assigned to any slot. Single-slot EDCM cards are plug compatible with DCM and Double-slot

EDCM cards. Single-slot EDCM cards are compatible with control shelf backplanes (P/N 850-0330-02/03/04) and extension backplanes (P/N 850-0356-01/02/03). Single-slot EDCM and EDCM-A cards can be configured in any slot except those reserved for MASP, TDM, MDAL, HMUX, and HIPR cards.

General Purpose Service Module

The General Purpose Service Module (GPSM-II) (P/N 870-2360-01) has one UD1G expansion memory module. GPSM-II cards are compatible with control shelf backplanes (P/N 850-0330-02/03/04/05) and extension backplanes (P/N 850-0356-01/02/03). The GPSM-II is a required replacement for the MCAP cards to support the large system feature (up to 1500 links) in the EAGLE 5 ISS or to support the Time Slot Counter (TSC) Synchronization and Integrated Sentinel Monitoring features.

Note: HMUX, HIPR, and GPSM-II cards are installed at the factory or by Tekelec Technical Support and are not installed by customers.

Measurments Collection and Polling Module

The Measurements Collection and polling Module (MCPM) is an EDSM-2G card with 32 MB FSRAM and 2 GB RAM.

Note: The Measurements Platform IP Security feature requires EDSM-2G MCPM cards.

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.

Signaling Transport Card

The Signaling Transport Card (STC) is the DCM card (P/N 870-1945-xx) with the generic program load (GPL) called EROUTE. For more information about DCM cards see the section *Database Communications Module* of this manual. The STC functions as an IP router between the IMT bus internal to the EAGLE 5 ISS and the ethernet networks used to communicate with the ESP servers. Refer to the *Database Administration Manual – Features* for information about provisiong rules for the STC.

Database Services Module

The Database Communications Module (DCM) requires two slots for mounting and must be assigned to an odd numbered slot. The DCM card is used as a primary board for the Database Service Module (DSM) cards.

Its primary application, however, is in performing global title functions required for Local Number Portability (LNP), all Signaling Connection Control Part (SCCP), which is part of Global Title Translation (GTT), and Generic Load Services (GLS) which is part of Gateway Screening.

Note: Beginning with Release 38.0, any type dual-slot DCM card is no longer supported. A single-slot EDCM (SSEDCM) card or an E5-ENET card must be used.

E5-SM4G

The E5-SM4G (P/N 870-2860-xx) is a double-slot card with 4GB of total memory. It provides global title functions required for Local Number Portability (LNP), all Signaling Connection Control Part (SCCP), which is part of Global Title Translation (GTT), and Generic Load Services (GLS) which is part of Gateway Screening.

Translation Services Module

The Translation Services Module (TSM) (P/N 870-1289-xx) can perform global title operations for both Local Number Portability (LNP) and standard non-LNP functions.

The Translation Services subsystem consists of cards of up to one GByte capacity. Card capacity is increased by addition of 256 MByte appliques. TSM cards in EAGLE 5 ISS systems are:

- TSM-256 with one 256 MByte applique is P/N 870-1289-xx
- TSM-512 with two 256 MByte appliques is P/N 870-1290-xx
- TSM-768 with three 256 MByte appliques is P/N 870-1291-xx
- TSM-1024 with four 256 MByte appliques is P/N 870-1292-xx

E5-TSM Module

The E5-TSM card (P/N 870-2943-01) is a single slot card providing the EAGLE 5 ISS 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 5 ISS system a high performance general purpose-processing platform in a single-slot footprint. The E5 card is used on existing EAGLE 5 ISS control and extension shelves.

The EPM appliqué cards provide LIM functionality such as E1/T1 or IP. The EPM accepts up 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 5 ISS 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)

E5-ATM Module

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

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/T1ports 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.

E5-E1T1 Module

The E5-E1T1 card (P/N 870-1873-xx) is a single slot card providing eight trunk terminations processing up to 32 signaling links of configurable channelized E1 or T1 connectivity. The eight E1/T1 ports reside on backplane connectors A and B. The E5-E1T1 supports only one SE-HSL signaling link on one of the eight ports and it must be A.

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 Module

The E5-ENET module (P/N 870-2212-xx) is a single slot card that provides increased transactions per second (TPS). The E5-ENET provides support for the following:

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

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 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 5 ISS 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 SSEDCM assemblies when backplane cable adaptor P/N 830-1103-02 is used. The E5-SLAN card connects to an external host using standard CAT-5 Ethernet cables when backplane adaptor P/N 830-1102-02 is used.

E5-STC Module

The STC on E5-ENET 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.

Timing Systems

EAGLE 5 ISS uses synchronized timing systems to provide accurate reference standards to all cards on the IMT buses.

System Clock

EAGLE 5 ISS 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 5 ISS. 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 5 ISS 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.

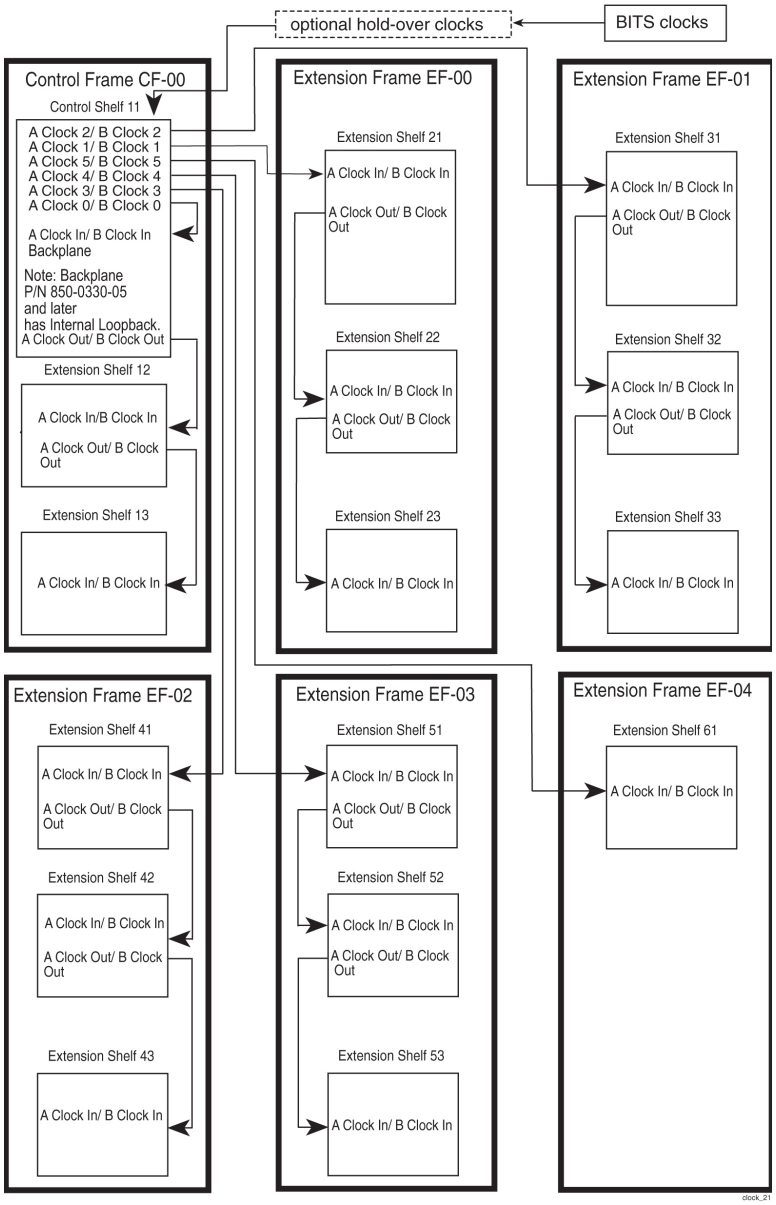
Holdover Clock

An optional holdover clock can maintain clock synchronization for EAGLE 5 ISS 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 5 ISS (see *Figure 7: Clock Routing*).

Figure 7: Clock Routing



High-Speed Master Timing

The EAGLE 5 ISS 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 the *"Installation Manual"*.

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-Platform Server (MPS) Systems

The MPS system can be configured as an EAGLE 5 ISS Local Number Portability (LNP) Application Processor (ELAP) or EAGLE5 ISS Provisioning Application Processor (EPAP) server.

The MPS provides an interface between the customer provisioning network and the EAGLE 5 ISSDSM cards. As the customer's data is updated, the MPS stores the data and updates the DSM cards. An MPS is usually co-located with an EAGLE 5 ISS. If you need to install an MPS at a distance from the EAGLE 5 ISS, contact the *Customer Care Center* for assistance.

MPS running the EAGLE 5 ISS Provisioning Application Processor (EPAP) software supports the GSM Flexible Numbering (G-Flex), GSM Mobile Number Portability (G-Port), and INAP-based Number Portability (INP) 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 EAGLE 5 ISS LNP Application Processor (ELAP) software supports the LNP 228 Million Numbers Feature. The Local Number Portability (LNP) 228 Million Numbers feature increases the number of provisionable telephone numbers (TNs) from 18 million to 228 million. The LNP 228 Million Numbers feature also relocates the LNP database from the OAM (Operation Administration and Maintenance) to the MPS.

MPS on the Tekelec 1000 Application Server (T1000 AS) supports the EPAP. The EPAP application includes the INP, G-Flex, and G-Port® . In addition to the software application, additional third-party software may be required to support the application. For hardware information, see the *Tekelec 1000* Application Server *Hardware Manual*.

MPS on the Tekelec 1100 Applcation Server (T1100 AS) supports the ELAP. The ELAP application includes support for the Local Number Portability (LNP) 228 Million Numbers feature. For hardware information, see the *Tekelec 1100* Application Server *Hardware Manual*.

OEM Products

OEM-Based Servers

OEM-based products use Commercial Off-The-Shelf (COTS) servers, network elements, and peripheral components. Server hosts provide processing power and database storage capacity to deliver a scalable range of application specific services. Components can be configured redundantly to provide a high level of reliability in processing applications. One such OEM-based Product server currently being used is the Sun Netra T1 DC200 server (used as Extended Services Platform (ESP) servers in the Integrated Sentinel systems).

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

OEM-Based Network Elements

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

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

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

OEM-Based Peripheral Components

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

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

Chapter 3

Hardware Descriptions - EAGLE 5 ISS

Topics:

Introduction

This chapter provides detailed descriptions of the various hardware associated with the EAGLE 5 ISS 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 5 ISS

EAGLE 5 ISS is a large-capacity, multi-functional, fully scalable Signaling Transfer Point (STP). The EAGLE 5 ISS is NEBS-compliant (GR-63-CORE, Network Equipment-Building Systems). High capacity and scalability allow the EAGLE 5 ISS to grow from a single-shelf, 80-link STP to a multi-frame, 2800-link STP.

Due to the distributed processor design, EAGLE 5 ISS 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 5 ISS 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 5 ISS also supports a variety of interface cards to support connectivity to a wide range of network elements. EAGLE 5 ISS provides connectivity interfaces for IP, ATM, DS0-A, OCU, T1, and E1 protocols.

IP Connectivity

The EAGLE 5 ISS 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 5 ISS STP, Signaling Transport Cards (STC) monitor the activity of Link Interface Modules (LIM) and transfer information to an Integrated Data Aquisition system such as the Extended Services Platform (ESP) subassembly.

Note: STC cards are based on single-slot EDCM-A cards (P/N 870-2508-02) or E5-ENET cards (P/N 870-2212-xx) and can be configured in any slot (except slots reserved for GPSM-II, TDM, MDAL, HMUX, and HIPR cards).

Multi-purpose Server (MPS)

Tekelec's Multi-purpose Server (MPS) is a hardware and software platform that can be configured to support Eagle STPLocal Number Portability Application Processor (ELAP) or Eagle STP Provisioning Application Processor (EPAP).

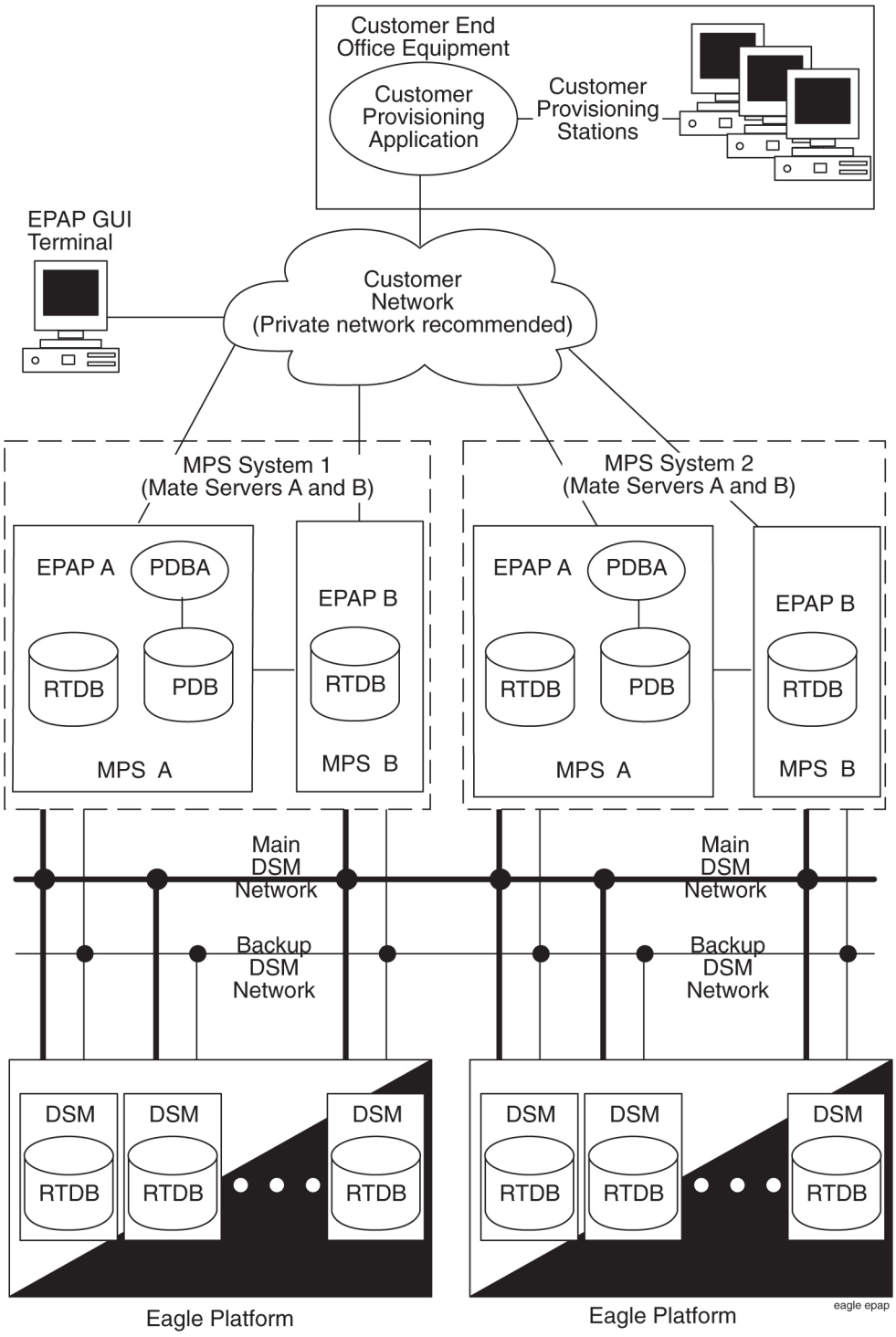
MPS on the Tekelec 1000 Application Server (T1000 AS) supports the EPAP. The EPAP application includes the INP, G-Flex, and G-Port® . In addition to the software application, additional third-party software may be required to support the application. For hardware information, see the *Tekelec 1000* Application Server *Hardware Manual*.

MPS on the Tekelec 1100 Applcation Server (T1100 AS) supports the ELAP. The ELAP application includes support for the Local Number Portability (LNP) 228 Million Numbers feature. For hardware information, see the *Tekelec 1100* Application Server *Hardware Manual*.

Figure 8: MPS on T1000 AS/EAGLE 5 ISS Overview shows an overview of how the MPS on the T1000 AS is used with the EAGLE 5 ISS.

The MPS provides an interface between the customer provisioning network and the EAGLE 5 ISSDSM cards. As the customer's data is updated, the MPS stores the data and updates the DSM cards. An MPS is usually co-located with an EAGLE 5 ISS.

Figure 8: MPS on T1000 AS/EAGLE 5 ISS Overview

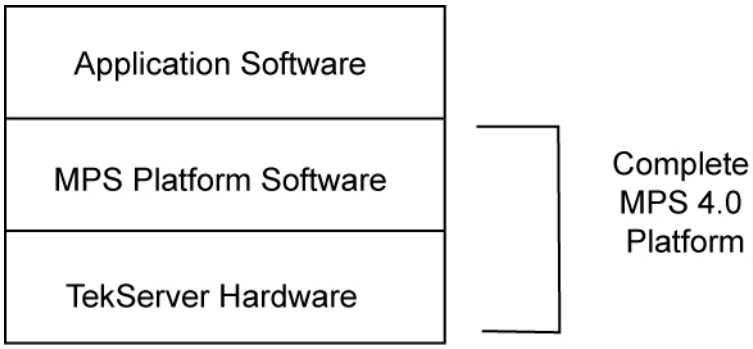


Layered Design

MPS is based on the T1000 AS and uses a layered design (see *Figure 9: 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 9: Layered Design for MPS and Applications

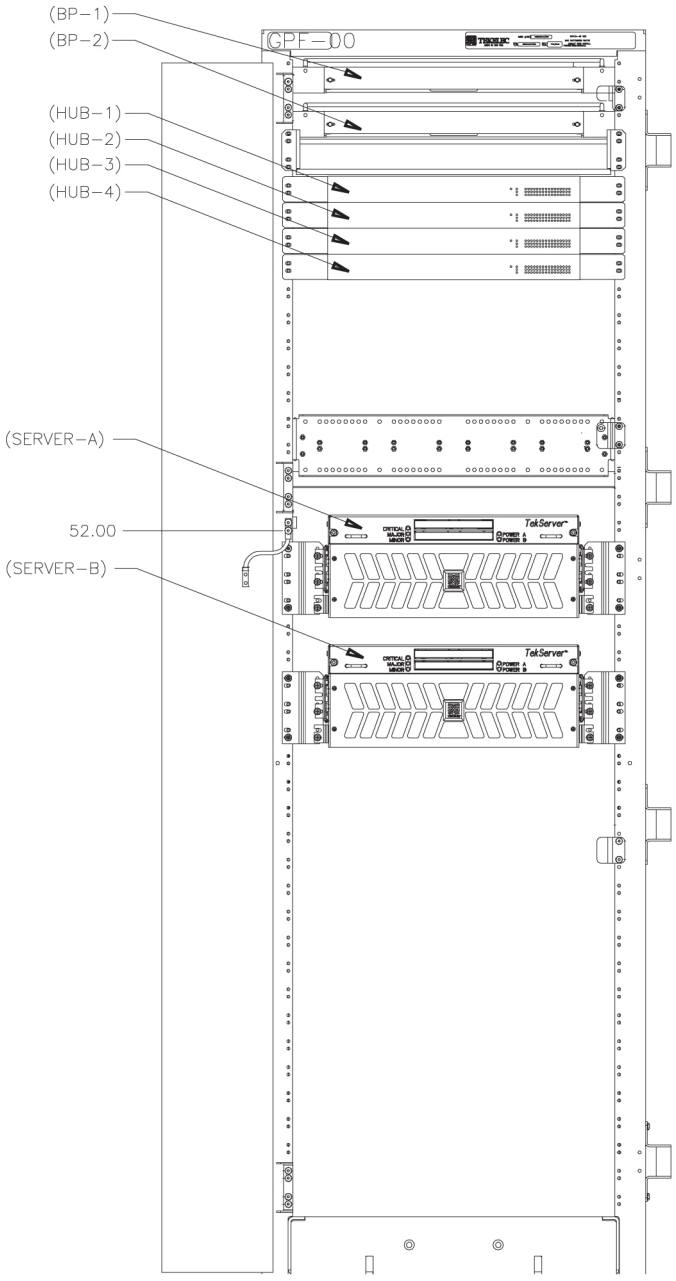


Hardware Components

This section includes a description of MPS hardware components and an overview of the disks and file systems. *Figure 10: MPS Hardware Overview* illustrates the following equipment.

- Two Breaker Panels
- One Drip Tray
- Four Hubs
- Two MPS Servers
- One 8-Port Connector Box (connects by a 40-inch cable the to Sun SAI/P card)
- One General Purpose Frame

Figure 10: MPS Hardware Overview



DANGER

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 2000 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 1024 links. The large system feature applies to the EAGLE 5 ISS systems only.

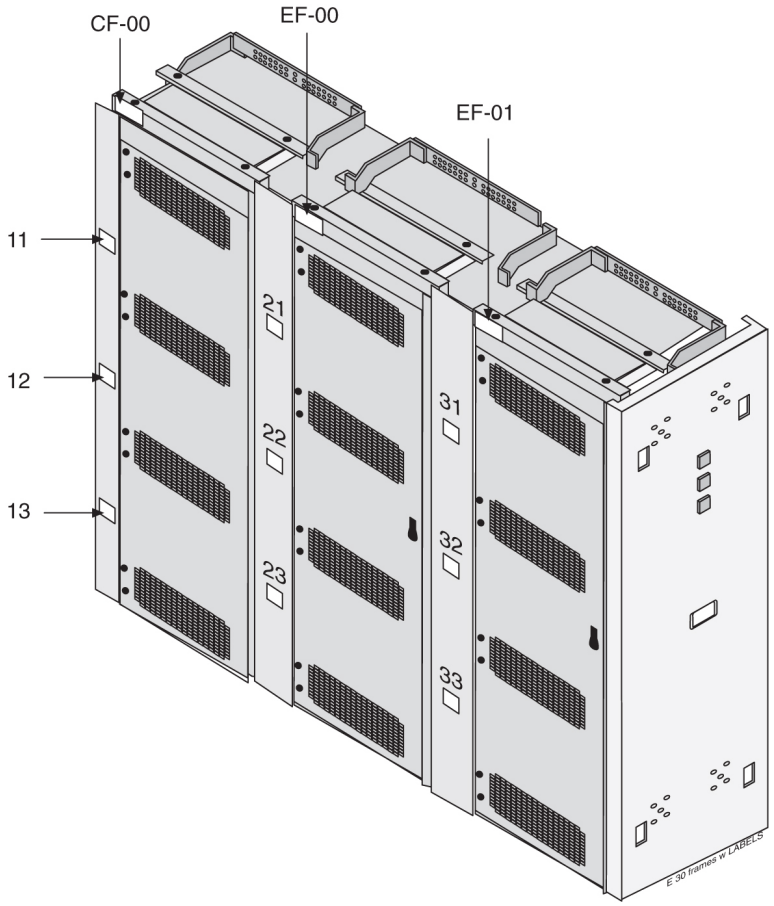
Cross-connect panels, spare card storage, modems, and holdover clocks are configured in Miscellaneous Frames (MF).

The system can use five types of frames:

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

Figure 11: Frames shows a system with a Control Frame (CF-00) and two Extension Frames (EF-00 and EF-01).

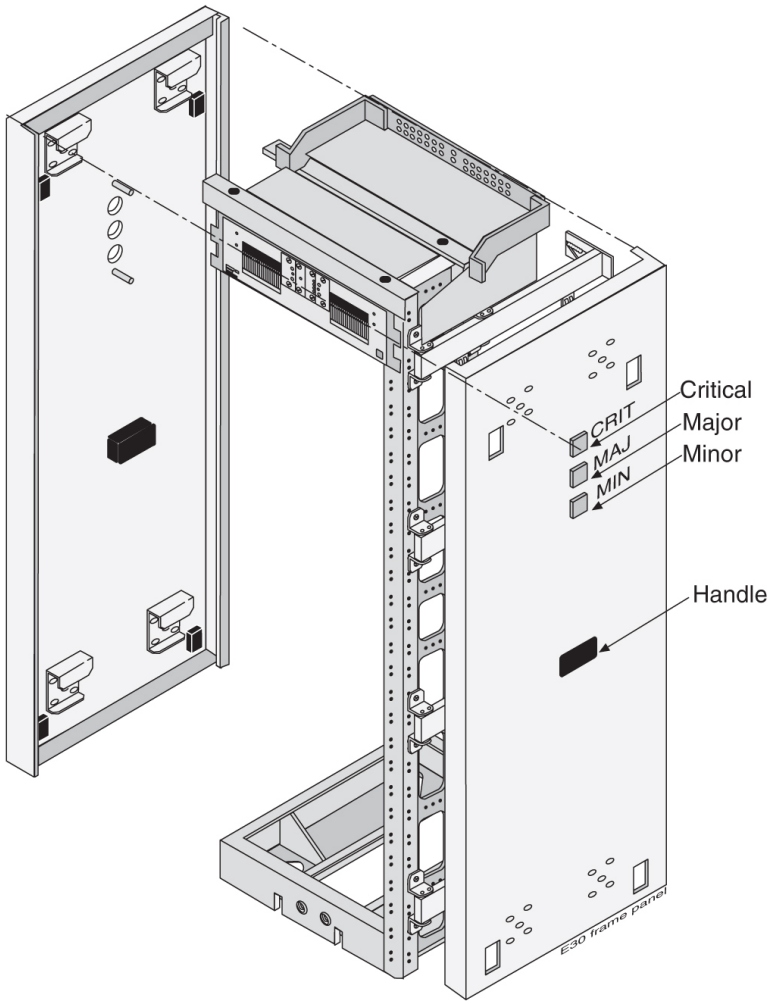
Figure 11: Frames



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 12: Frame End Panel with Lamp Indicators*), which show three levels of alarm conditions:

- Critical
- Major
- Minor

Figure 12: Frame End Panel with Lamp Indicators



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

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

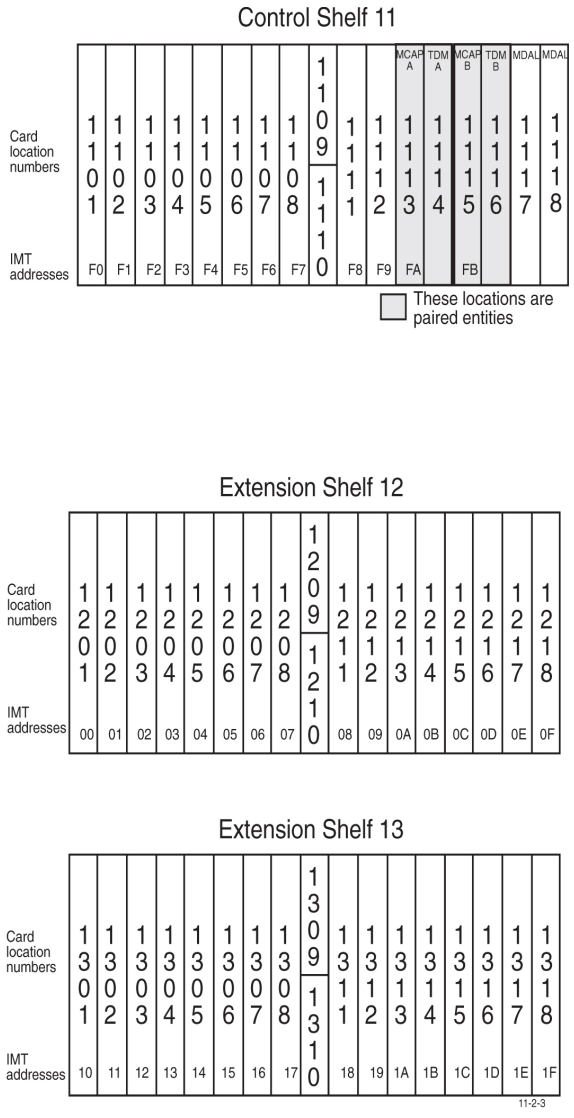
- P/N 840-0064-01 End row panel, full depth, standard frame, NTW.
- P/N 840-0089-01 End row panel, full depth, heavy-duty NTW.
- P/N 870-2238-02 Extended panel, alarm side, NEBS NTW.
- P/N 870-2278-02 Full depth alarm side panel, heavy-duty frame, NTW.

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

The numbering of the shelves, with the shelf identification backplane wiring, circuit card location, and with the Inter-processor Message Transport (IMT) address in small print at the bottom of the faceplates is shown in *Figure 13: Control Frame CF-00 Numbering Plan*. The HMUX or HIPR or HIPR2

card provides Inter-processor Message Transport (IMT) bus continuity for all cards connected to the IMT bus.

Figure 13: Control Frame CF-00 Numbering Plan



Extension Frame

The Extension Frame (EF) accommodates up to three extension shelves, each shelf is capable of supporting up to 16 Link Interface Modules (LIMs), Multi-Port LIMs (MPLs), E1/T1 MIMs, Translation Service Modules (TSMs), or Single-slot Enhanced Database Communications Modules, in any combination.

The EAGLE 5 ISS systems are delivered with customer-specific locations for the Database Communications Module (DCM) cards and DCMX cards. DCM and DCMX cards must be inserted into odd numbered slots in EAGLE 5 ISS systems. DCM, double-slot EDCM, single-slot EDCM and EDCM-A cards can be configured in EAGLE 5 ISS systems.

The system can have up to five Extension Frames, EF-00 to EF-04. EF-04 supports only one extension shelf. The numbering of the shelves is shown, with the shelf identification backplane wiring, circuit card location, and the Inter-processor Message Transport (IMT) address in small print at the bottom of the faceplate. The numbering of the card locations on the extension frames and the IMT address is shown in the following figures.

Figure 14: Extension Frame EF-00 Numbering Plan

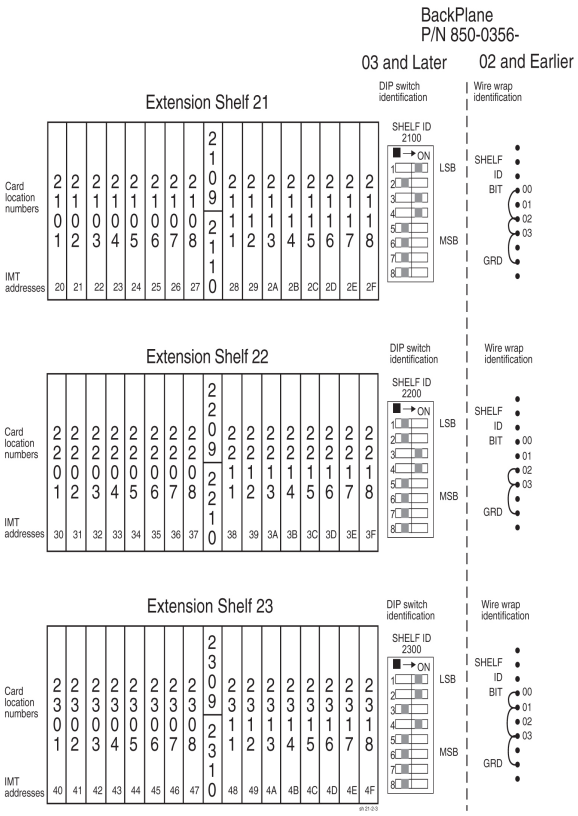


Figure 15: Extension Frame EF-02 Numbering Plan

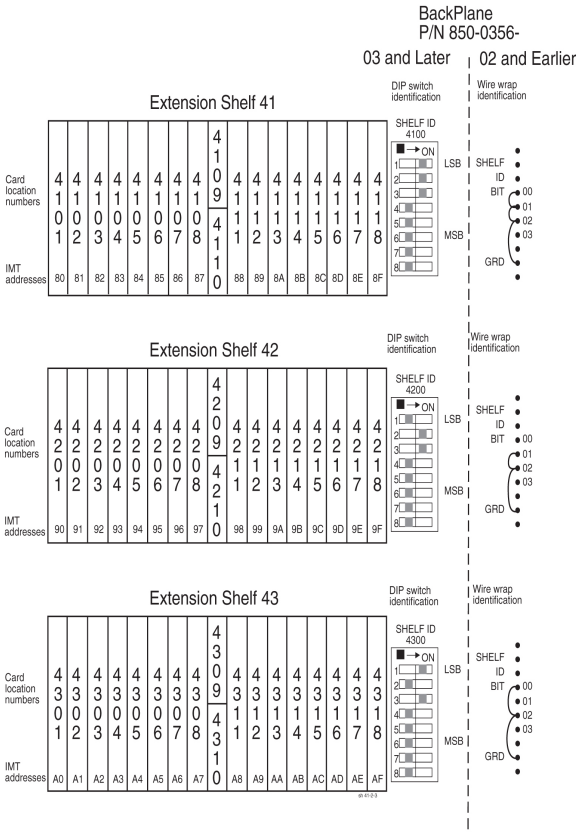


Figure 16: Extension Frame EF-03 Numbering Plan

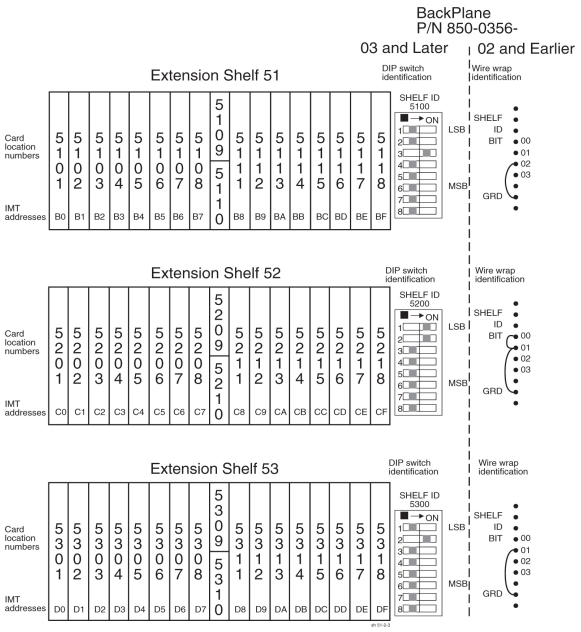


Figure 17: Extension Frame EF-04 Numbering Plan

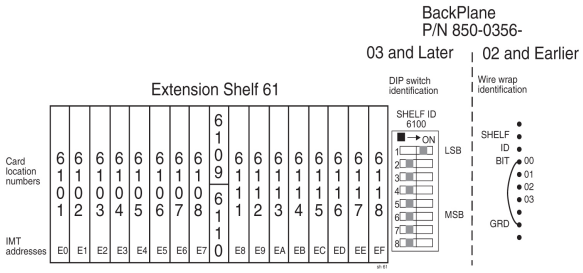
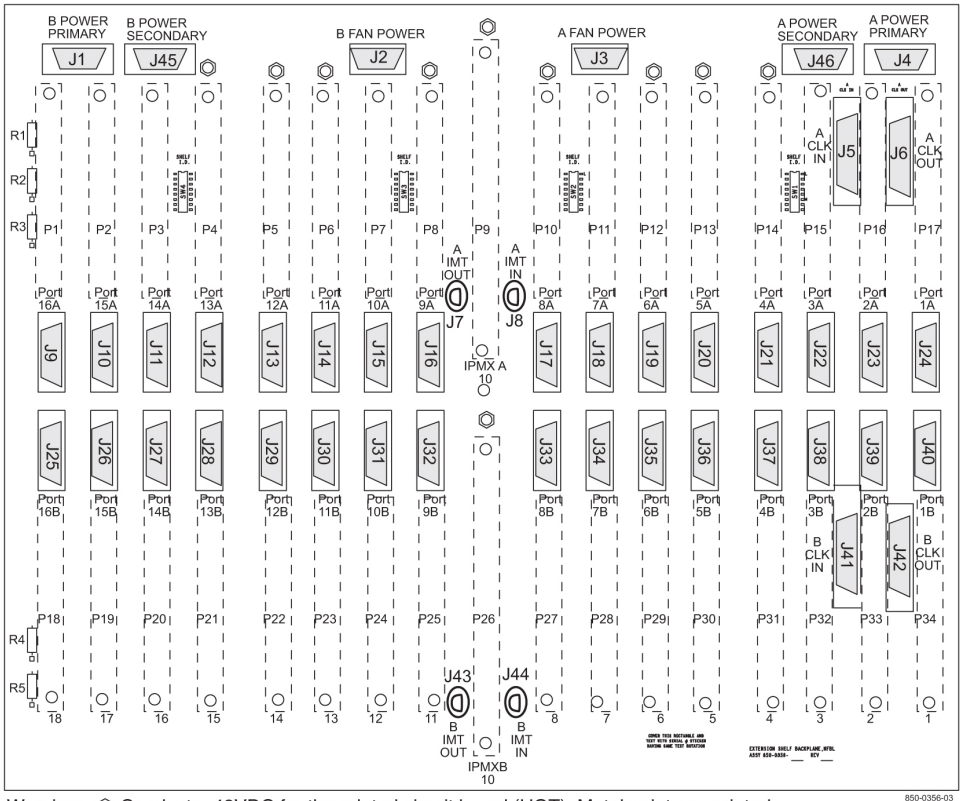
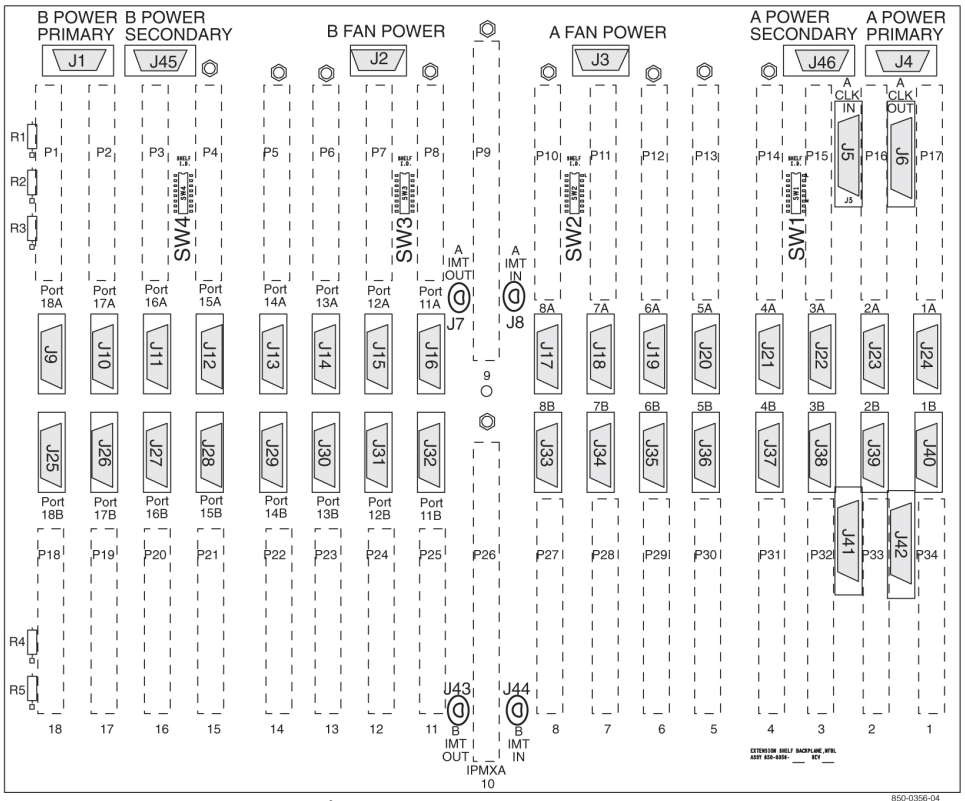


Figure 18: Extension Shelf Backplane ID (P/N 850-0356-03)



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)



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

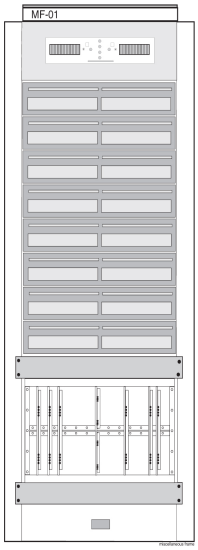
Miscellaneous Frame

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), Multi-Port LIMs (MPLs), E1/T1 MIMs, Integrated LIM AINF (ILAs), Translation Service Modules (TSMs), Database Communications Modules (DCMs) or Database Service Modules (DSM) (Both DCMs and DSMs require two card slots).

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

- LIMs or Integrated LIM Applique Interface (ILA) cards
- Single-slot Enhanced Database Communications Modules (EDCM or EDCM-A)
- E5-E1T1
- E5-ENET

Or each extension shelf can accommodate up to eight:

- Database Communications Modules (DCMs) or Database Service Modules (DSM) (Both DCMs and DSMs require two card slots)
- Double-slot Enhanced Database Communications Modules (EDCM) (requires two card slots)

With the exception of DCMs and double-slot EDCMs, all cards can be inserted in any slot except for those locations dedicated to the HIPR2, HMUX, HIPR, MASP, and MDAL cards. In EAGLE5 ISS systems and IP7 4.0 and earlier systems, DCMs and double-slot EDCMs 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 Terminal Disk Modules (TDMs)

- Two GPSM-II cards
- One Maintenance Disk and Alarm card (MDAL)

Each TDM/GPSM-II pair makes up a Maintenance and Administration Subsystem Processor (MASP).

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

Note: HIPR2, HMUX and HIPR cards are installed at the factory or by Tekelec 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 HIPR card:

- Integrated LIM AINF (ILA) or Enhanced Integrated LIM AINF
- Link Interface Module (LIM)
- Multi-Port Link Interface Module (MPL)
- E1/T1 Multi-Channel Interface Module (MIM)
- Translation Service Module (TSM)
- Single-slot Enhanced Database Communications Module (EDCM and EDCM-A)

Database Communications Module (DCM) and Database Service Module (DSM) are only configured in available odd numbered slots, and requires two card slots.

Double-Slot Enhanced DCMs can be configured in any slot where they can physically fit. Double-Slot EDCMs require two card slots.

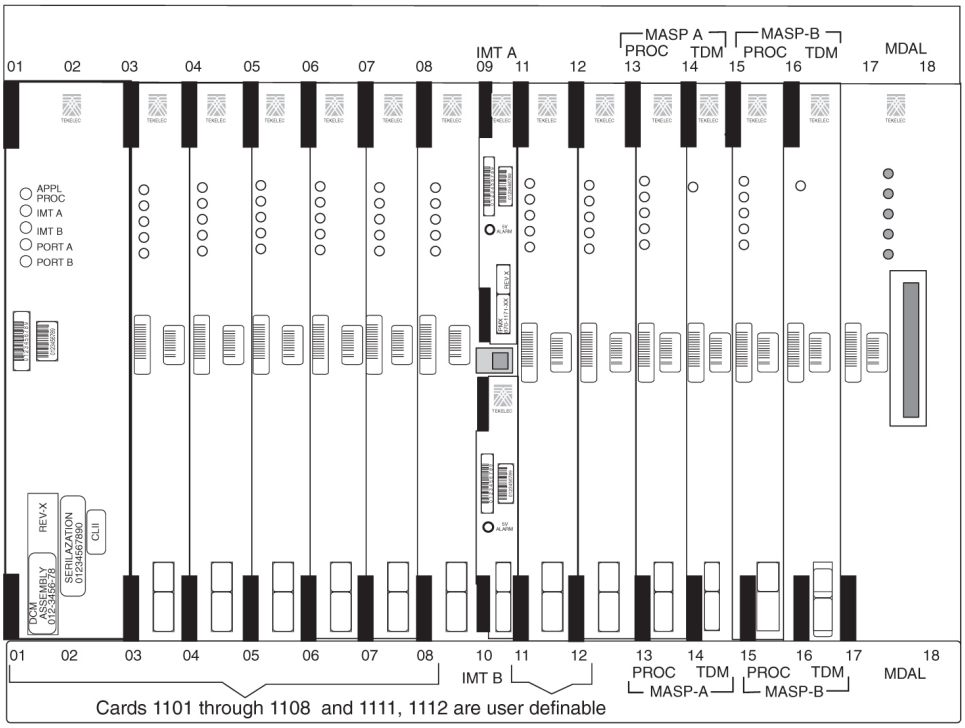
CAUTION: After the frame has been shipped or moved, prior to applying power, remove all cards. Reset all cards carefully to avoid possible faulty connections. All cards are hot swappable

The control shelf, shown in *Figure 21: Control Shelf Front, with DCM 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 ILAs) or Translation Service Modules (TSMs), in any combination; except for those locations dedicated to the HMUX, HIPR, HIPR2 and MAS cards. All cards can be inserted in any card location.

Database Communications Modules (DCM) are only configured in available odd numbered slots, and require two card slots. Double-slot EDCMs can be configured in any available slot where space allows.

Figure 21: Control Shelf Front, with DCM Card



Control Shelf Backplanes

This section describes the control shelf backplanes (P/N 850-0330-03/04/06), all can be used in EAGLE 5 ISS systems.

Note: Control Shelf Backplane (P/N 850-0330-03/04) can be used with the HMUX and HIPR and HIPR2 in the EAGLE 5 ISS 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 5 ISS 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.

- ILA, LIM, MPL, E1/T1 MIM, TSM, E5-ENET, E5-E1T1, and single-slot EDCM and EDCM-A cards can be used in slots 1, 2, 3, 4, 5, 6, 7, 8, 11, and 12.
- HMUX and HIPR and HIPR2 cards are connected in slots 9 and 10.

  Note: HIPR2, HMUX, HIPR, and GPSM-II cards are installed at the factory or by Tekelec Technical Support and are not installed by customers.
- TDMs and TDM-GTIs are connected in slots 14 and 16.
- GPSM-II cards are connected in slots 13 and 15.
- The MDAL card is connected in slot 17 and 18.
- The HCMIM, DCM, DSM, and E5-SM4G cards, used in EAGLE 5 ISS systems, are mounted only in available odd numbered slots 1, 3, 5, 7, and 11.

Note: Double-slot DCMs also require two slots but are not restricted to odd slots.

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.

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. In the *"Installation manual"* 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, HIPR2, HMUX, and HIPR 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: 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 HMUX , HIPR, and HIPR2 in the EAGLE 5 ISS 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)

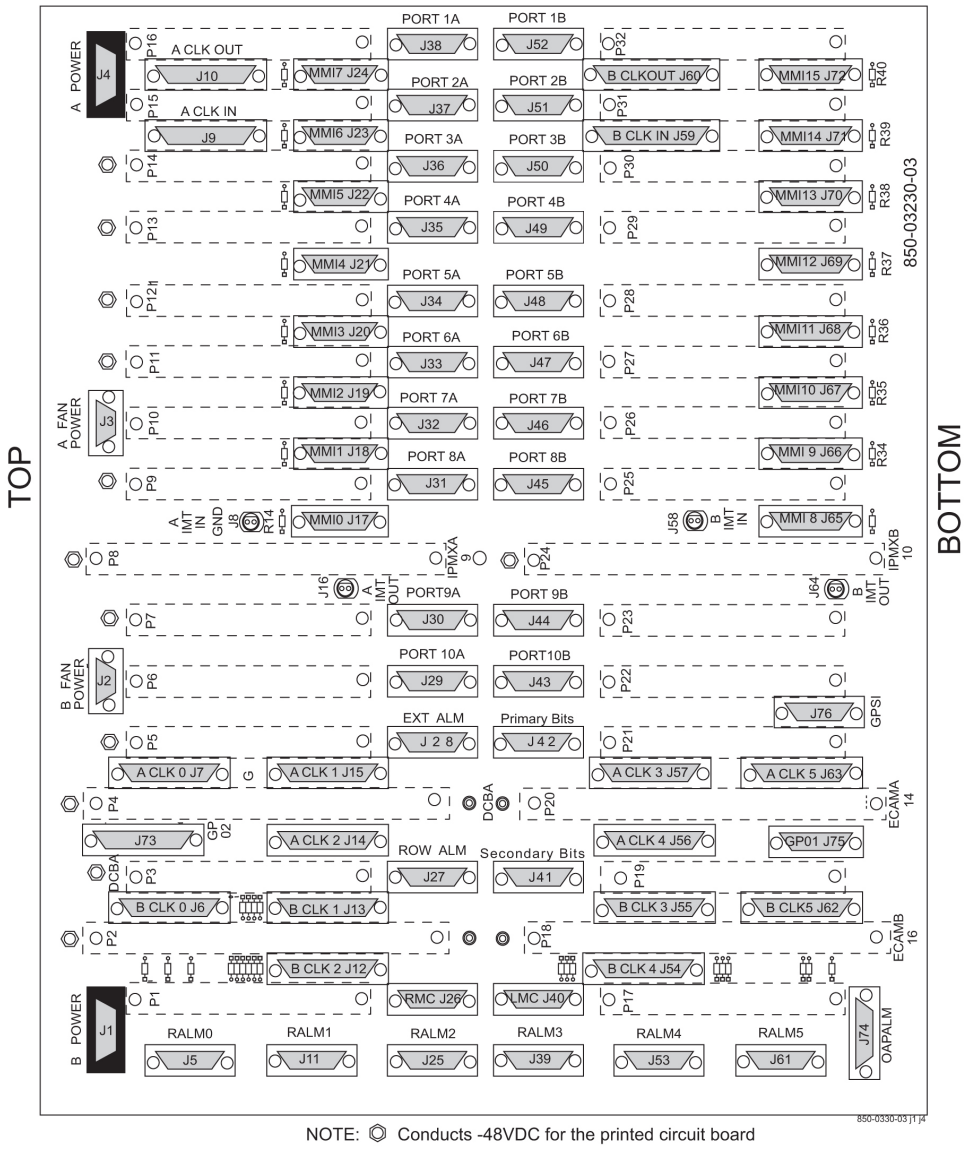
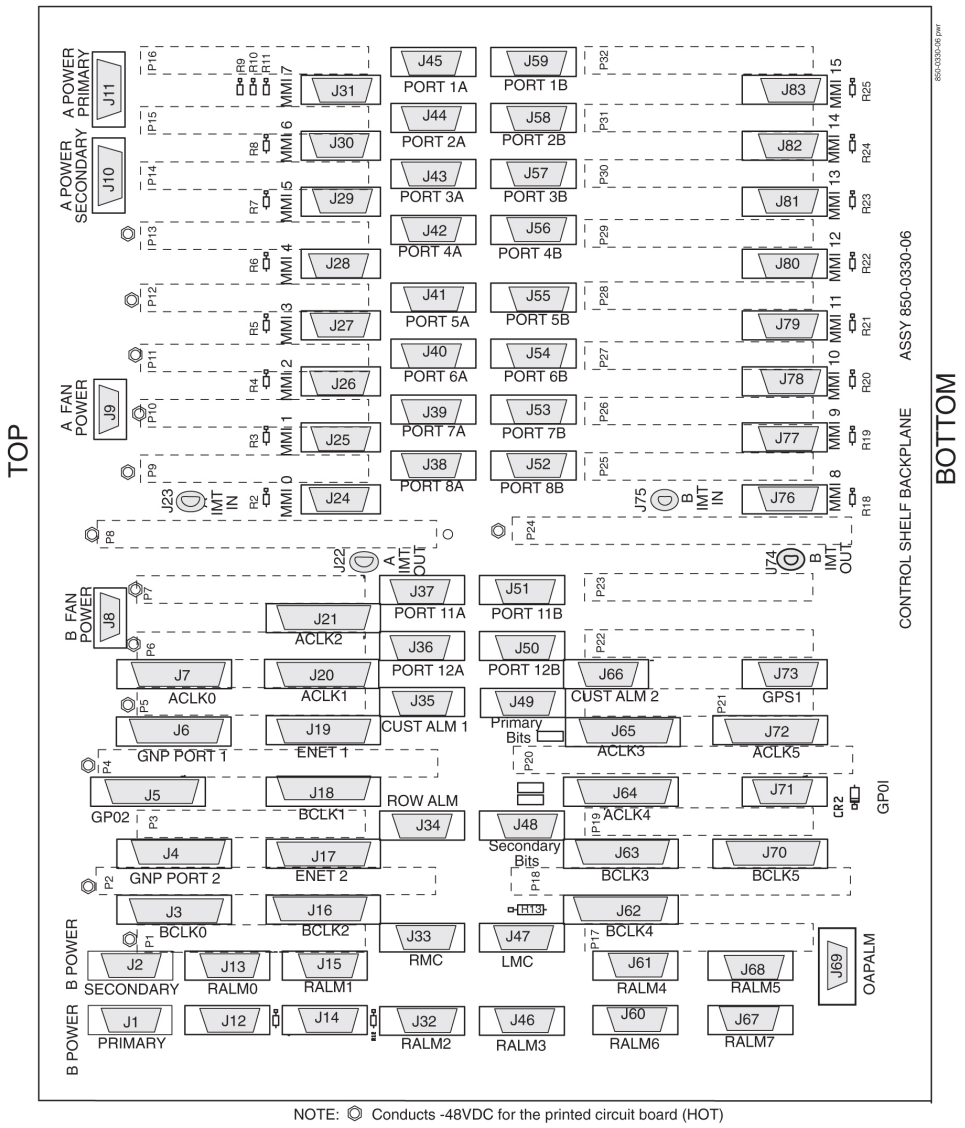


Figure 23: Control Shelf Backplane (P/N 850-0330-06)



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

Extension Shelf

The extension shelf provides the mounting space for up to 16 Link Interface Modules (LIMs), Multi-Port LIMs (MPLs), E1/T1 MIMs, Translation Service Modules (TSMs), Database Communications Modules (DCMs) and Database Service Modules (DSMs) (mounted in odd numbered slots, requiring two slots). The shelf also contains two HMUX (EAGLE 5 ISS) cards, in card locations 9 and 10 (refer to the figures below).

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

Figure 24: Extension Shelf with LIMs

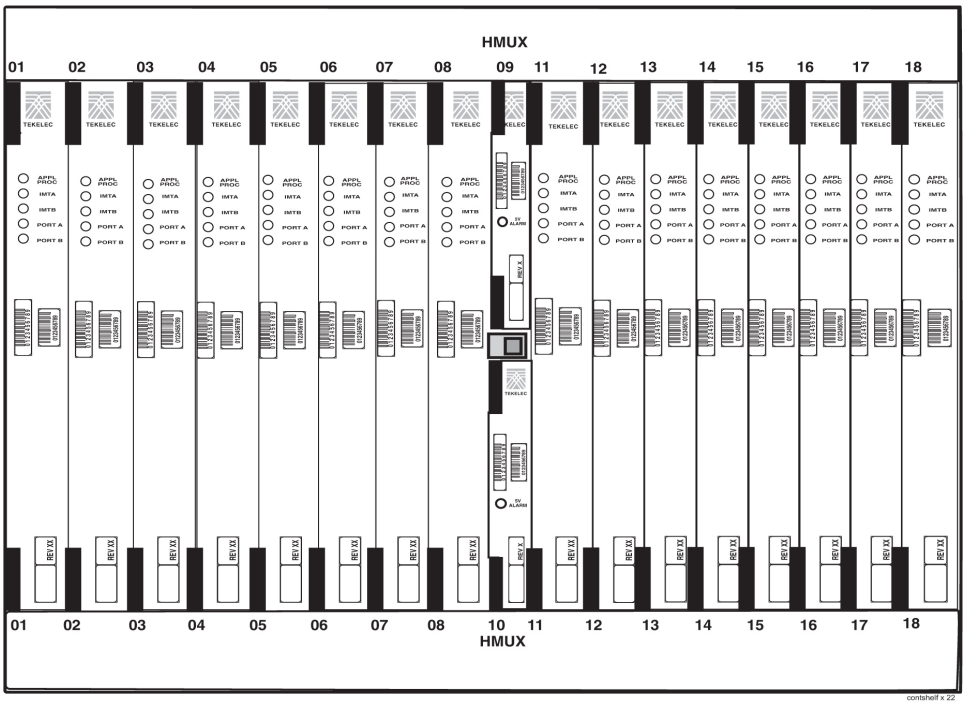
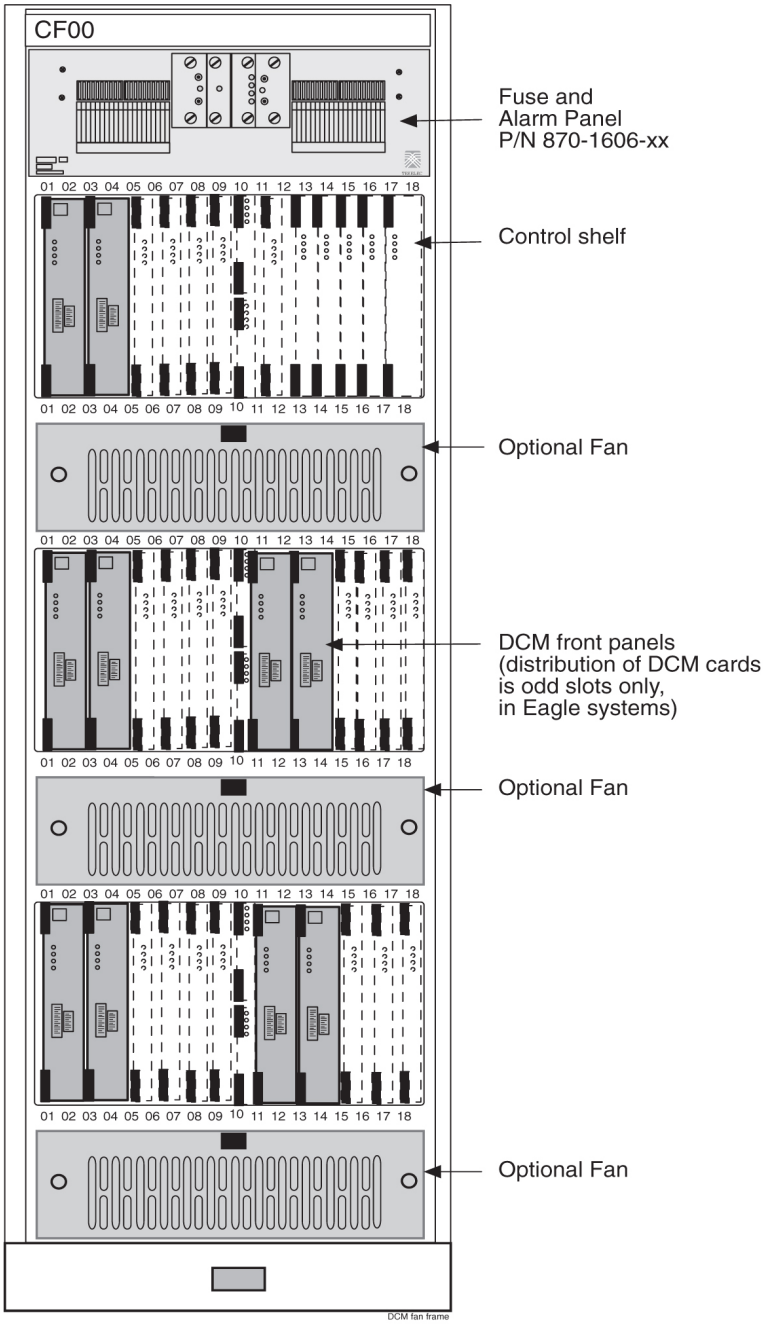


Figure 25: Shelves with DCM and LIM Cards in Control Frame



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 the *"Installation manual"* 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 (J41and J42).

Modules

The EAGLE 5 ISS 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 the *Installation* manual, *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 26: 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 or by Tekelec Technical Support, not by the customer.

  Note: HIPR2 requires all other shelves to be equipped with either all HMUX cards, or all HIPR cards, or all HIPR2 cards (shelves cannot contain a mix of either HMUX/HIPR/HIPR2).

- *High Speed IMT Packet Router* (HIPR)

  Note: The HIPR card is installed by the factory or by Tekelec Technical Support, not by the customer.

  Note: Shelves must contain either HMUX or HIPR cards. A mixture of HMUX and HIPR cards within one IMT ring is possible, provided HIPR is installed on both IMT A and IMT B on a given shelf. HIPR requires all other shelves be equipped with either all HMUX cards or all HIPR cards (shelves cannot contain a mix of HMUX and HIPR).

- *High-Speed Multiplexer Card* (HMUX)

  Note: The HMUX card is installed by the factory or by Tekelec Technical Support, not by the customer.

- *Maintenance Disk and Alarm Card* (MDAL)
- *Terminal Disk Module* (TDM)
- *General Purpose Service Module* (GPSM-II)

Note: GPSM-II cards are required for the Integrated Sentinel and Time Slot Counter (TSC) synchronization features.

Note: TheGPSM-II card is installed by the factory or by Tekelec Technical Support, not by the customer.

- *Database Communications Module* (DCM) and Database Service Module (DSM) can only be located in odd numbered slots and requires two slots.
- *Translation Service Module* (TSM)
- *Link Interface Modules* (LIM)
  - Integrated LIM Applique Interface (ILA)
  - Multi-Port Link Interface Module (MPL) (EAGLE 5 ISS)
  - E1/T1 Multi-Channel Interface Module (MIM) (EAGLE 5 ISS)
- *High-Capacity Multichannel Interface Module* (HCMIM)
- *E5-E1T1 Module*
- *E5-ENET Module*
- *E5-SM4G Module*
- *E5-IPSM Module*

The following table summarizes the environmental specifications common to all EAGLE 5 ISS 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 870-2872-01) 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 870-2872-01) 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 5 ISS 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 (or two HIPR) 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 either all HMUX cards, or all HIPR cards, or all HIPR2 cards (shelves cannot contain a mix of either HMUX/HIPR/HIPR2).

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

HIPR2 supports a 1 Gbps inter-shelf bus rate and is compatible with the existing HIPR when operating at the low-rate. When the high-rate is required, all shelves within an EAGLE 5 ISS node must be equipped with HIPR2.

HIPR2 feature overview:

- EAGLE Release 41.1 is required.
- Requires control shelf and extension shelf backplanes that support HMUX and later IMT components.
- HIPR2 is compatible with HIPR and/or HMUX within a system
- 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.
- Two IMT bit rates possible:
  - Low-rate, defined as the current 1.0625 Gbps rate compatible with HMUX and HIPR, with a mixture of cards on a given bus (ie, any combination of HMUX, HIPR, HIPR2), only the low-rate is achievable.
  - High-rate, defined as 2.5 Gbps, requires that all shelves within EAGLE 5 ISS 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.

  Note: In a system with a mixture of cards on a given bus (ie, any combination of HMUX, HIPR, HIPR2), only the Low-rate will be achievable.
- Reprogrammable and upgradeable 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.

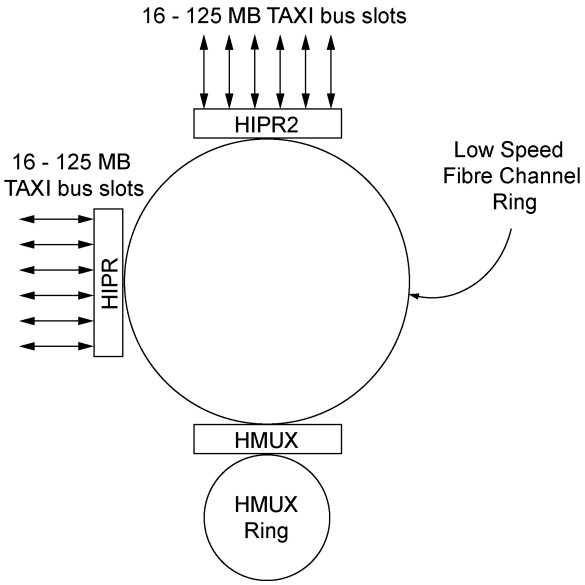
  Note: HIPR2 (Part Number 870-2872-01) is fully NEBS compliant. However, if ambient temperatures above 40° C are likely, Eagle Fan Trays (Part Number 890-0001-04) are recommended to ensure proper airflow to the upper HIPR2 cards in those shelves.

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 HMUX/HIPR 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.

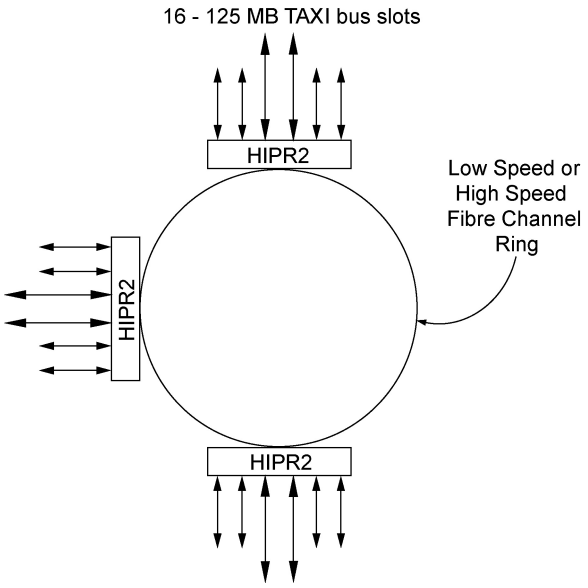
As shown in *Figure 27: HIPR2 Switch Mixed Topology.*, in a mixed topology where a HIPR2 is used in an EAGLE 5 ISS along with HMUX and HIPR, the Fibre channel ring runs at the low speed.

Figure 27: HIPR2 Switch Mixed Topology.



As shown in *Figure 28: HIPR2 Switch Same Topology.*, in a same topology where all HIPR2 is used in an EAGLE 5 ISS the Fibre channel ring runs at either the low or high speed.

Figure 28: HIPR2 Switch Same Topology.



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

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

Upgrade Considerations

The HIPR2 card is compatible with the existing HMUX/ HIPR card slot and can be fielded with any version of either the control or extension backplanes compatible with the HMUX. The HIPR2 card is interoperable with an HMUX/HIPR in the same shelf when performing upgrades. 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 HMUX/ HIPR is used with.

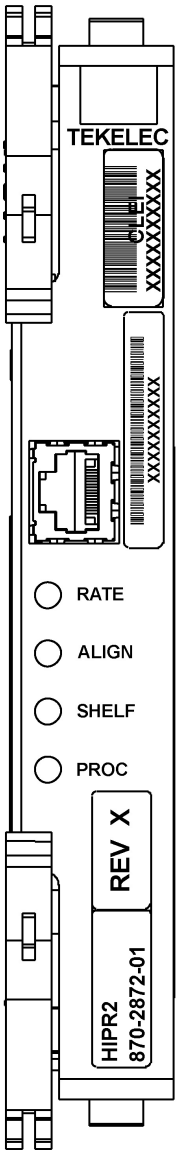
Two HIPR2 (or two HIPR) modules are required in shelves equipped with high-performance LIMs, such as the High-Capacity MIM, and for interfacing to application servers (such as the Tekelec 1x00 series of Application Servers) through IMT Bridge and IMT PCI modules. HIPR2 requires all other shelves be equipped with either all HIPR2 cards or HMUX/HIPR cards (each shelf cannot contain a mix of HMUX/HIPR and HIPR2). High-rate (2.5 Gbps) operation requires that all shelves within EAGLE 5 ISS 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 29: HIPR2 LEDs summarizes the use of the front-panel LEDs.

Figure 29: HIPR2 LEDs



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

Notes:

1. ALIGN and SHELF LEDs are not accessible to software until the FPGA has been programmed. So for the same point in the HIPR bootstrap sequence, the state of these two LEDs can be different depending on whether a warm or cold start is in progress.

2. State depends on the address received from OAM and written to Assigned Shelf Address Register and compared to the value previously read from the Assigned Shelf Address Register.
   - RED - Does Not Match
   - GREEN - Matches

Cabling

If the EAGLE 5 ISS 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

Power Requirements	
Voltage	-48VDC
Current	313 mA
Power	15W typical, 22W max.
Physical Characteristics	
Height	7.7 in. (18.3 cm)
Width	1.8 in. (2 cm)
Depth	12.8 in. (32.5 cm)

High Speed IMT Packet Router

The High Speed IMT Packet Router (HIPR, P/N 870-2574-02) interfaces and operates with the high speed fiber channel ring and all EAGLE 5 ISS cards. The HIPR card features a key architectural improvement over existing shelf level switch cards such as HMUX by replacing the legacy low speed shelf ring with a switched design. This move from an intra-shelf ring topology to an inter-shelf switch topology gives a 16 to 1 transmission speed advantage in that a single low speed ring circuit is being replaced with 16 individual switched circuits. The inter-shelf ring connects the shelves together and HIPR acts as a gateway between the intra-shelf IMTBUS, running at 125 Mbps, and the inter-shelf fibre channel ring operating at 1.0625 Gbps.

HIPR feature overview:

- Switched architecture.
- Serial data transmission rate of 1.0625 Gbps for shelf to shelf communications, and 125Mbps on each of 16 switched slots.
- Reprogrammable and upgradeable 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.
- Provides easy upgrade path from HMUX ring architecture.

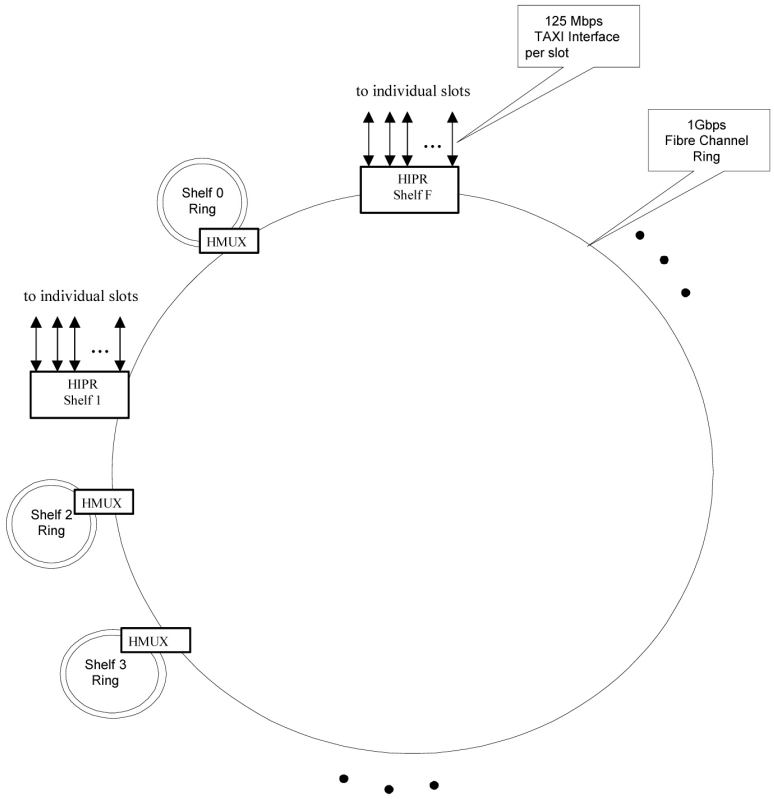
Switched Architecture

The inter-shelf ring connects the shelves together and HIPR acts as a gateway between the intra-shelf IMTBUS, running at 125 Mbps, and the inter-shelf fibre channel ring operating at 1.0625 Gbps. HIPR retains the high speed 1Gb Fibre Channel ring as a way to ensure interoperability with HMUX equipped

shelves. After HIPR 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 a 125MB ring.

As shown in *Figure 30: HIPR Switch Topology, Single IMT Bus.*, each HMUX-based intra-shelf ring in an EAGLE 5 ISS is replaced with one HIPR switch, which connects directly to each card in the shelf. This change allows 16 times more bandwidth than in the HMUX-based ring architecture. The fibre-channel inter-shelf ring is the same as for HMUX. In a fully populated EAGLE 5 ISS with HIPR, there are two independent IMT buses.

Figure 30: HIPR Switch Topology, Single IMT Bus.



The switched interface to each card is at 125MB, the same speed that the intra-shelf IMT bus runs at. Using this same speed for a switched interface precludes any changes to the existing line cards. Thus, HIPR provides both a speed improvement by switching instead of using a ring, while also minimizes card changes for customers. This switched architecture has an inherent reliability advantage of point to point connections within the shelf. A ring can be broken, potentially causing all cards on the ring to be affected. However, a switched architecture automatically isolates a problem to a specific data path which immediately determines which card is experiencing problems. Trouble shooting and debugging are greatly enhanced. For example, corrupted packets can be isolated quickly because there is only a single path per card rather the multiple paths possible in a ring.

All routing decisions are controlled by the network processor on the HIPR card. A core processor with 6 micro-engines performs the switching function. This software based approach will allow future upgrades without changes to the hardware.

Upgrade Considerations

Upgrading a system to use the HIPR card is easy and straight forward. The HIPR card is compatible with the existing HMUX card slot and can be fielded with any version of either the control or extension backplanes compatible with the HMUX. The HIPR card is interoperable with an HMUX in the same shelf when performing upgrades. One bus is taken out of service and upgraded to HIPRs and then brought back online. This upgrade cycle is repeated on the second bus to get both busses upgraded. HIPR interfaces and operates with all the same cards that HMUX is used with.

HIPR is required in shelves equipped with high-performance LIMs, such as the High-Capacity MIM (HCMIM), and for interfacing to Tekelec 1000 Application Servers through IMT Bridge and IMTPCI modules. HIPR requires all other shelves be equipped with either all HMUX cards or all HIPR cards (shelves cannot contain a mix of HMUX and HIPR).

LEDs

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

Figure 31: HIPR LEDs summarizes the use of the front-panel LEDs.

Figure 31: HIPR LEDs

Technical Specifications

Table 6: HIPR Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	310mA
Power	15W typical, 22W max.
Physical Characteristics	
Height	7.7 in. (18.3 cm)
Width	1.8 in. (2 cm)
Depth	12.8 in. (32.5 cm)

High-Speed Multiplexer Card

The High-Speed Multiplexer (HMUX) (P/N 870-1965-xx) card, used in EAGLE 5 ISS systems only, supports requirements for more than 1500 links. The HMUX card requires the 850-0330-06 control shelf backplane.

Note: The HMUX card can be used with Control Shelf Backplane (P/N 850-0330-04) in the EAGLE 5 ISS system with minor modifications and the addition of adapter cable (P/N 830-1185-01).

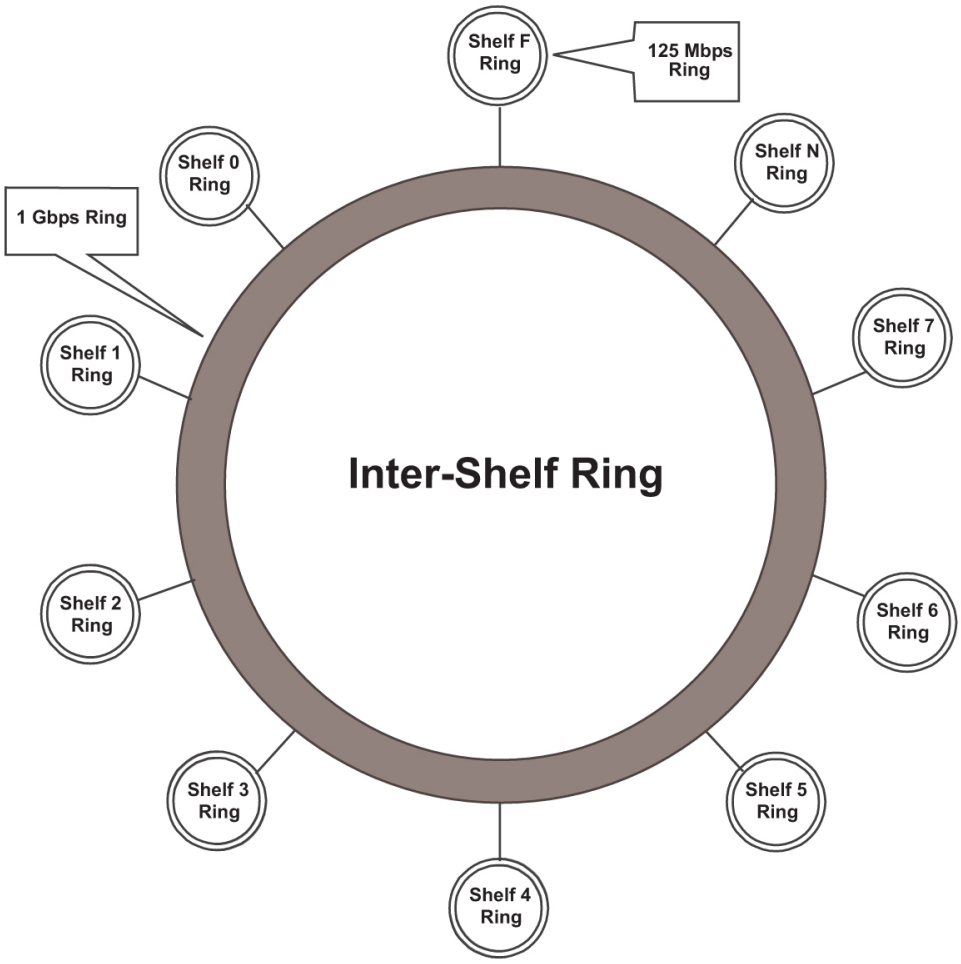
Note: HMUX cards are required to support the Integrated EAGLE 5 ISS/Sentinel monitoring feature.

Note: HMUX or HIPR cards are installed at the factory or by Tekelec Technical Support, not by the customer.

With HMUX cards, the IPMX ring topology is broken into separate ring sections, allowing fault tolerance and higher data throughput rates. Each shelf is a separate secondary IMT ring.

The HMUX Card acts as a gateway between the shelf's IMT ring and the inter-shelf ring. Using the HMUX card transforms the EAGLE 5 ISS from a single 125 Mbps ring to a centralized intra-shelf ring running at 1.0625 Gbps, connecting a maximum of sixteen secondary, 125 Mbps shelf rings. *Figure 32: HMUX Ring Topology* displays the HMUX ring topology.

Figure 32: HMUX Ring Topology



Most messages from one slot to another on the same shelf remain on that shelf's ring. This reduces traffic loading on the high-speed inter-shelf ring. The inter-shelf links form a separate ring used only for inter-shelf communications. The topology changes affect both IMT rings: IMTA and IMTB.

HMUX Addressing

In order to communicate with the GPSM-II card, each HMUX now has its own address in the IMT network. The active OAM selectively sends a physical address shelf ID to each pair (A-bus, B-bus) of HMUX cards on a per-shelf basis. The A-bus and B-bus HMUX cards for a given shelf share the same physical address.

Physical Layout

The HMUX (EAGLE 5 ISS) is designed to plug into the existing shelf backplane, using the same slots the IPMX cards have occupied. *Figure 33: HMUX Side View HMUX* shows a side view of the HMUX card. *Table 7: HMUX Technical Specifications* summarizes the technical specifications of the HMUX card.

On the front edge of the HMUX card, there are three Light Emitting Diodes (LED) that provides status. Each HMUX LED has a red, green, or amber illumination state. The HMUX Alignment LED illuminates green when complete code initialization is achieved, amber when programming is complete, and red when failed. The HMUX Shelf identification LED illuminates green when running and ID address

matches stored address, amber when complete code initialization is achieved and programming is complete, and red when ID addresses do not match. The Processor health LED illuminates red when power on reset, amber while programming, and green when programming completes, code initialization completes, and code is running.

On the front edge of the HMUX card, there are three Light Emitting Diodes (LED) that provide status. The HMUX LEDs have three illumination states: red, green, or off. The LED illuminates green when the –48VDC is supplied to the card and +5VDC available. If –48VDC is supplied to the card and +5VDC is not available, the LED illuminates red. If –48VDC is not supplied to the card, the LED is off.

Figure 33: HMUX Side View HMUX

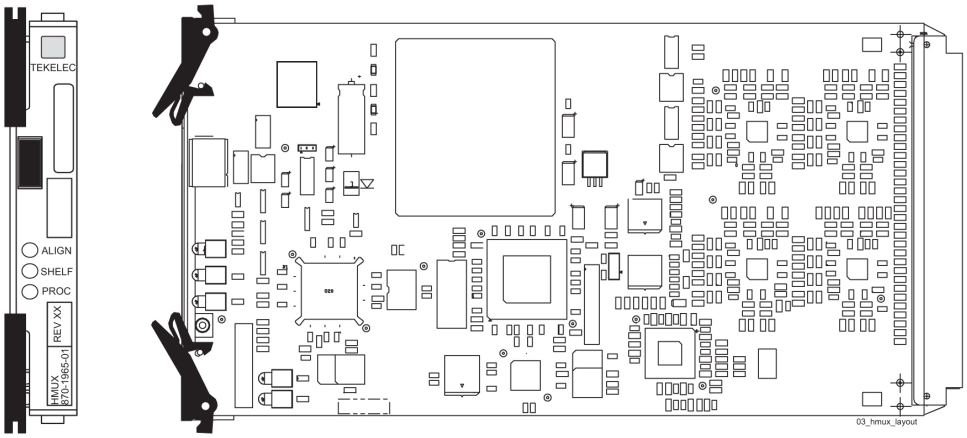


Table 7: HMUX Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	327 mA
Power	13.4W
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) card (P/N 870-2903-01) contains all of the necessary logic to perform both application and communication processing of the data streams

provided by the EAGLE 5. The card provides 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 5. The E5-MASP card 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.

  Note: The E5-MASP card does not function with the legacy MDAL. During an upgrade, the E5-MASP card does not interfere with a legacy MASP and legacy MDAL.

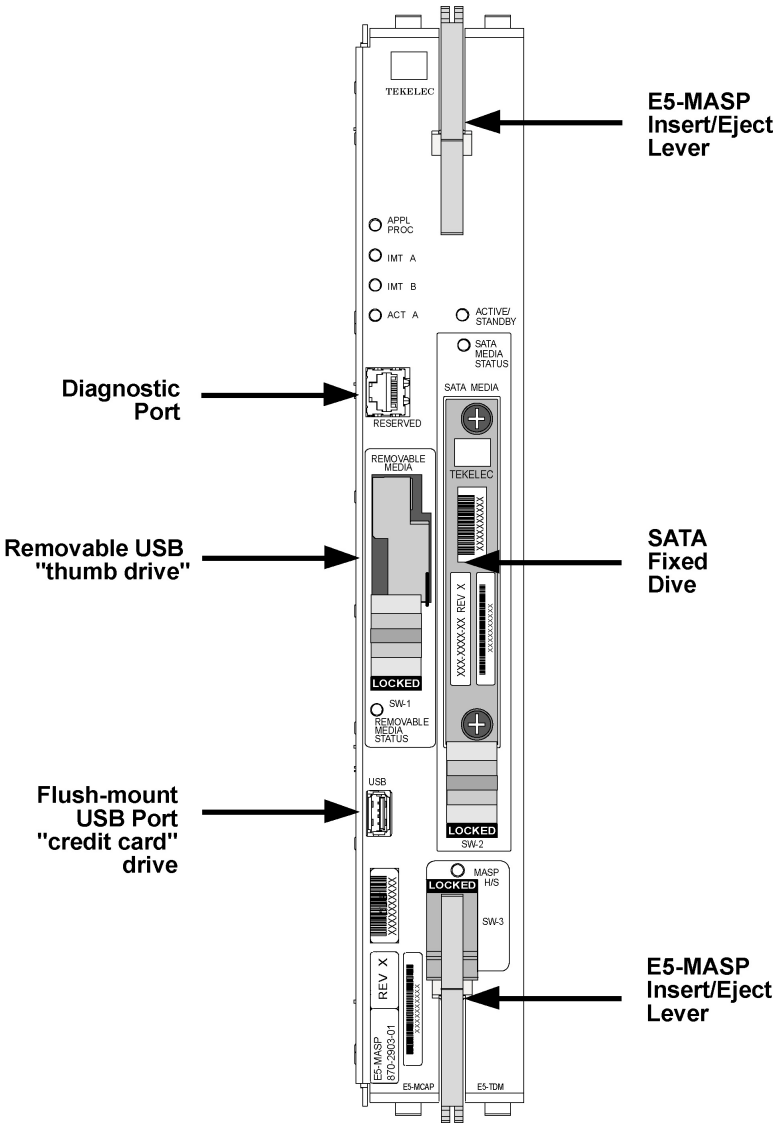
- Requires HIPR or HIPR2 to be active on both IMT buses in the control shelf.

  Note: HIPR2 requires all other shelves to be equipped with either all HMUX cards, or all HIPR cards, or all HIPR2 cards (shelves cannot contain a mix of either HMUX/HIPR/HIPR2) If a shelf contains an HMUX and a HIPR, the card will only attach to the HIPR. Using an HMUX and HIPR on the same shelf is normally only used during upgrade

- 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 5 ISS Control Shelf. The E5-MASP card must be used with the E5-MDAL card. See *Figure 34: E5-MASP Card*.

Figure 34: E5-MASP Card



E5-MCAP

The E5-MCAP card provides increased processor and memory performance over the legacy GPSM-II card. 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 “credit card” flash drive. The removable media drive is used to install and back up customer data. The credit card drive 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 existing legacy GPSM-II card used for the MCAP function.

Note: The E5-MCAP card can not be used for the other functions for which the GPSM-II class (e.g.: MCP, IPS, DCM) card is used.

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 5 ISS. 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 5 ISS. TSC Synchronization is an optional feature for the EAGLE 5 ISS 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 5 ISS 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 5 ISS cards that contain a Time Slot Counter. This includes:

- E486-based and E586-based cards (ILA, ILE1, MCAP-256, TSM, E586-T)
- HCAP or HCAP-T
- DCM, DCMX, EDCM and EDCM-A, and GPSM-II (single-slot EDCM)
- MPL, MPL-T, and E1/T1MIM
- HCMIM, E5-E1T1, 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 5 ISS shelf with natural convection cooling and does not require a fan tray for cooling.

Table 8: 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 stanby
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

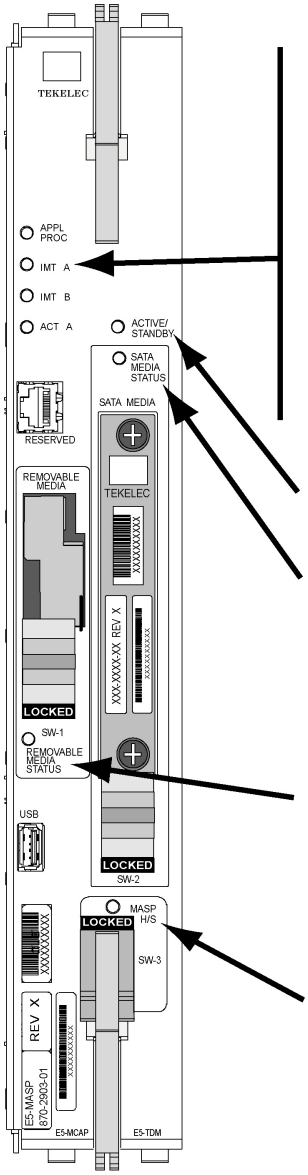
Switches and LEDs

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

Figure 35: E5-MASP LEDs



E5-MASP LEDs

LED	Status	Description
APPL PROC	Off	No power
	Red	Card is booting
	Amber	Card is loading
	Green	Card 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 A	Off	Card not functioning
	Red	No signal detected
	Green	Signal detected
ACTIVE/ STANDBY	Green	This card is the Active MASP
	* Blinking Green/Amber	This card is the Standby MASP
SATA MEDIA STATUS	Off	Media is LOCKED and operating
	Blinking Blue	WAIT Media is UNLOCKED and in process of shutting down OR Media is LOCKED and in process of coming online
	Steady Blue	Media is UNLOCKED, turned off, and ready for removal
REMOVABLE MEDIA STATUS	Off	Media is LOCKED and operating
	Blinking Blue	WAIT Media is UNLOCKED and in process of shutting down OR Media is LOCKED and in process of coming online
	Steady Blue	Media is UNLOCKED, turned off, and ready for removal
MASP H/S	Off	E5-MASP is LOCKED and operating
	Blinking Blue	WAIT - E5-MASP is UNLOCKED and in process of shutting down OR E5-MASP is LOCKED and in process of coming online
	Steady Blue	E5-MASP is UNLOCKED, turned off, and ready for removal

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

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 9: E5-MASP Technical Specifications

Power Requirements	
Voltage	-48 VDC

Power Requirements	
Current	1.17 A - 1.29 A
Power	48 - 53 W
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.

Note: The E5-MDAL card is not compatible with a legacy MASP. It is designed to work with the E5-MASP card.

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 and OAP reset signals have not been carried over from the 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

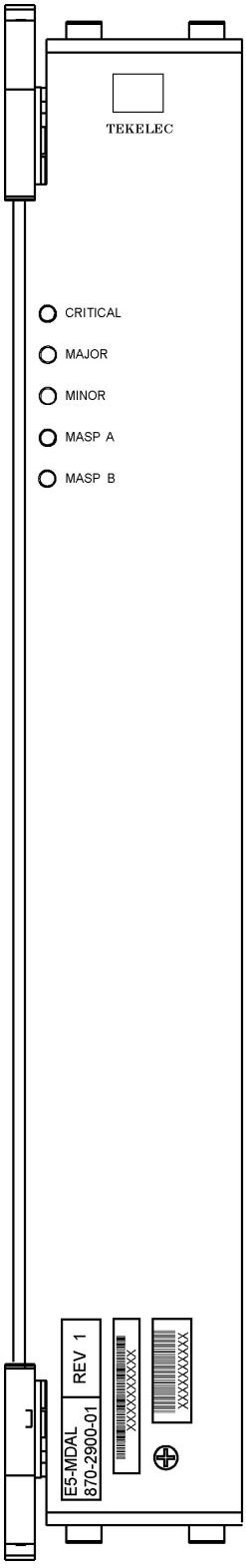
The E5-MDAL card provides control of fans on a per frame basis. The control logic allows for each fan relay to be set individually. There are relays to control fans on a per frame basis. The control logic allows for each fan relay to be set individually, but it also has an option to set all of them together to be backward compatible with the legacy MDAL. On the legacy fan tray an open circuit turns the fans on. A control signal form 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, but it also has the option to read the combined result to be compatible with the legacy MDAL.

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.

Figure 36: E5-MDAL LEDs



E5-MDAL LEDs

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

Technical Specifications

Table 10: E5-MDAL Technical Specifications

Power Requirements	
Voltage	-48 VDC
Current	0.336 mA
Power	13.8 W typical, 16.8 W max
Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	2.06 in. (5.23 cm)
Depth	12.80 in. (32.51 cm)

Maintenance Disk and Alarm Card

The Maintenance Disk and Alarm (MDAL) card (P/N 870-0773-xx) is a multi-layered circuit card that provides the system with removable cartridge data storage, alarm processing from the currently active MASP, and an audible alarm. A drawing of the MDAL is shown in *Figure 37: Maintenance Disk and Alarm Card*.

Note: Fan trays are recommended for control shelves on systems implementing large LNP database applications (large means above 1 Gbyte) to prevent overheating of the MDAL card during long backup or restore procedures.

The LEDs on the front faceplate indicate critical, major, and minor alarms and card activity.

Alarm Circuits

The MDAL processes alarms generated from the active MASP and passed to the MDAL on the alarm data bus. The alarm signals are sent as follows.

Critical, major, and minor alarms:

- The fuse and alarm panel of each control or extension rack
- End panel with alarm lamps
- Local Maintenance Center (LMC)
- Remote Maintenance Center (RMC)
- Maintenance Disk and Alarm (MDAL) card

Audible alarm is sent to:

- Local Maintenance Center (LMC)
- Remote Maintenance Center (RMC)
- Maintenance Disk and Alarm (MDAL) card

Removable Media Cartridge

The removable media cartridge is a magneto-optical (MO) disk cartridge used in the MDAL to install and back up customer data.

Table 11: Supported MO Cartridges presents supported MO cartridges that can be used.

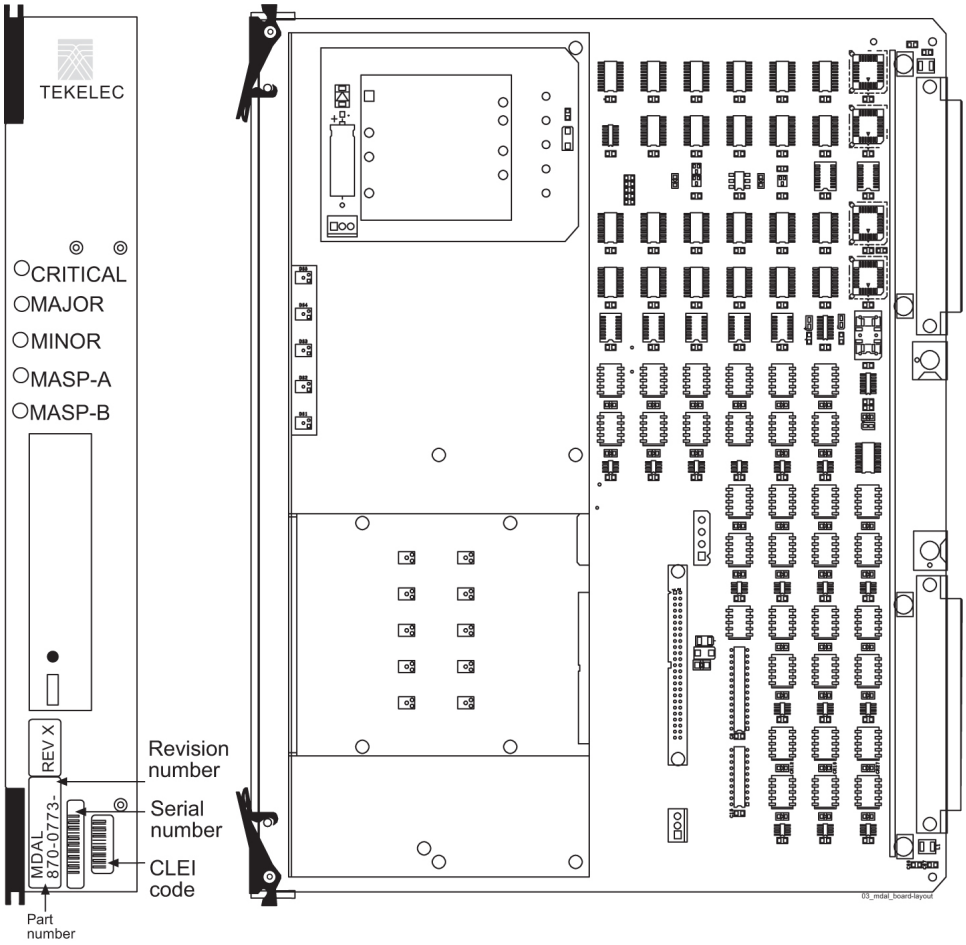
Table 11: Supported MO Cartridges

MDAL		Supported MO Cartridge			
Part Number	**Revision**	**2.3Gb**	**4.1Gb**	**5.2Gb**	**9.1Gb**
870-0773-04	A, B	X			
870-0773-04	C or later	X	X		
870-0773-05	A through F	X			
870-0773-05	G or later	X	X		
870-0773-06	A, B, C	X	X		
870-0773-06	D or later	X	X	X	
870-0773-08	All	X	X	x	X
870-0773-09	All	X	X	X	X
870-0773-10	All	X	X	X	X

Power Converter Unit

MDAL power is provided by a DC to DC converter that converts the –48VDC supplied to the system to the +5VDC needed to power the MDAL components.

Figure 37: Maintenance Disk and Alarm Card



Terminal Disk Module

The Terminal Disk Module (TDM) (P/N 870-0774-xx) provides the following functions for the EAGLE 5 ISS:

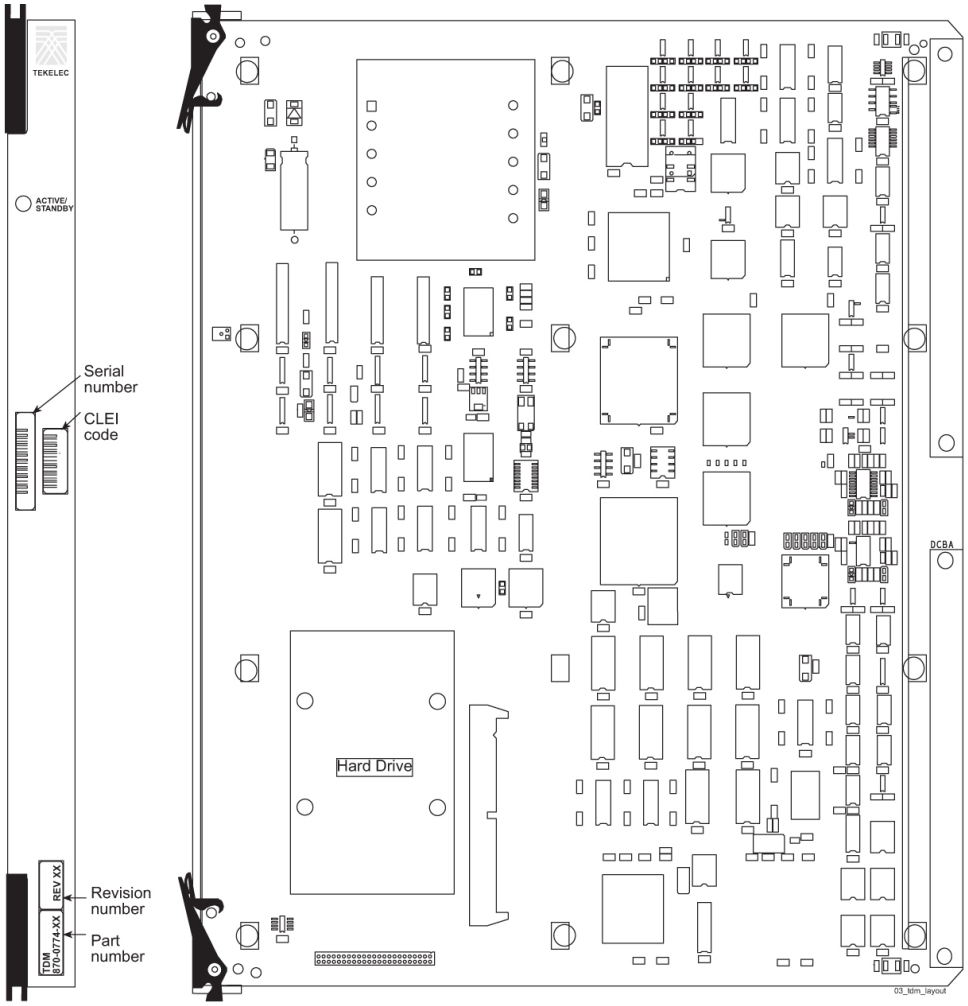
- *Building Integrated Timing System Interfaces*
- *Fuse Alarm Interface*
- *External/Customer Alarm Interface*
- *Maintenance Disk and Alarm Interface*
- *Small Computer System Interface*
- *Terminal Processor*
- *Extended Bus Interface*
- *Global Timing Interface*
- *Hard Drive*
- *Power Converter Unit*

Note: The Time Slot Counter (TSC) synchronization capability in the TDM, which is required for the Integrated Sentinel feature, is implemented in TDM board (P/N 870-0774-10 and later).

Note: The EAGLE 5 ISS internal composite clock sourced from the high speed clock feature of the TDM-GTI (P/N 870-0774-18) is not available to systems with DS0 cards. Customers with DS0 links can use BITS clocks as the TSC synchronization clock source.

The TDM is shown in *Figure 38: Terminal Disk Module*.

Figure 38: Terminal Disk Module



Building Integrated Timing System Interfaces

The TDM provides the system's primary and secondary interfaces to Building Integrated Timing System (BITS) composite clocks. The interface is designed to receive composite clock signals that meet the TA-TSY-000378 and TA-TSY-001244 specifications. The positive and negative pulse signals from these interfaces are recovered and used to generate 56 Khz and 8 Khz system clock signals that are driven to the rest of the system. Frequency, pulse width, and bipolar violations are verified for each clock interface and used to determine which composite clock (primary or secondary) is used as the clock source for the 56 Khz and 8 Khz system clocks. Switch-over from the primary to secondary clock and conversely, the switch from secondary to primary clock happens automatically when a verification failure occurs.

Fuse Alarm Interface

The TDM receives fuse alarm signals from the fuse and alarm panels of each frame. Each fuse alarm has two connections, RxFA- and RxFA+. No alarm is indicated with an open circuit between the connections, and an alarm is indicated by a short circuit between the two connections.

External/Customer Alarm Interface

The TDM provides interfacing for up to 10 external/customer alarms. Each alarm has an individual connection along with common contacts through the power ground provided by the control shelf backplane.

Maintenance Disk and Alarm Interface

The interface to the Maintenance Disk and Alarm Interface (MDAL) card consists of an 8-bit bidirectional data bus, five alarm register enable signals, and an alarm clock. The clock Logic Cell Array (LCA) is used to implement the logic for the MDAL card interface.

Small Computer System Interface

The TDM contains two separate Small Computer System Interface (SCSI) buses. Each bus uses an NCR 53C720 SCSI I/O processor as the SCSI bus controller. SCSI Processor A controls the SCSI bus to the fixed disk, which is installed on the TDM. SCSI Processor B controls the SCSI bus connected to the removable disk, which is part of the MDAL card. Both the MASP-A TDM and the MASP-B TDM use this SCSI bus to communicate with the removable drive. The removable drive SCSI bus is always terminated on the MDAL card.

Terminal Processor

The TDM terminal processor interfaces 16 RS-232 terminals to the TDMs associated General Purpose Service Module II (GPSM-II) cards. The core of the TDM terminal processor is an 80C386XL microprocessor. Two 2698 Octal Universal Asynchronous Receiver Transmitter (OCTART) devices are used to interface the 80C386XL microprocessor to the 16 serial terminal ports. The 80C386XL microprocessor receives data from the GPSM-II and transmits it to the terminals.

Extended Bus Interface

The Extended Bus Interface (EBI) links the TDM to its associated General Purpose Service Module II (GPSM-II), in the same Maintenance and Administration Subsystem Processor (MASP), through the EBI host processor bus. The purpose of the TDM is to provide additional logic, memory, and interfacing for the GPSM-II card. The EBI bus interfaces with every function on the TDM, either directly or indirectly.

Global Timing Interface

The EAGLE 5 ISS internal composite clock sourced from the high speed clock feature of the TDM-GTI is not available to systems with DS0 cards. Customers with DS0 links can use the BITS clocks as the TSC clock source.

The TDM Global Timing Interface (TDM-GTI) (P/N 870-0774-18) has enhancements that generate high speed master clocks from a recovered E1/T1 clock and the optional ability to reload the clock's Logic Cell Array (LCA) bitfile when the mated GPSM-II is initialized.

Requirements:

1. The type of external clock introduced into the EAGLE 5 ISS must be compatible with the EAGLE 5 ISS.
2. The location where the external clock is introduced must be recognized by the EAGLE 5 ISS.
3. The external clock must be provisioned to communicate with the EAGLE 5 ISS.

The TDM-GTI has an additional clock feature related to TSC synchronization. The TDM-GTI allows the TSC synchronization feature to be sourced from the high speed clock and to be the master high speed clocking with the following interfaces. The cards use this clock signal to generate a time stamp that is synchronized across the system. This time stamp is required when using the Sentinel monitoring system.

1. New Interfaces:
   a. T1 framed clocking per American Standards National Institute (ANSI)T1.101, Synchronization Interface Standards-1999 .
   b. T1 unframed clocking per section 5 of ITU, Standard G.703. The hardware supports this clock and the FE005011 will be updated to include this clock.
   c. E1 framed clocking per Section 9 of (translation from French, ITU) Consultative Committee on International Telegraphy and Telephone, standard G.703.
   d. E1 unframed clocking per Section 13 of ITU, Standard G.703.
2. Existing Interfaces:
   a. 64/8 Kilo Hertz (KHz) Return To Zero (RTZ) Composite Clock Interface
   b. E1 (2048 KHz) RS-422 Clock Interface
   c. T1 (1544 KHz) RS-422 Clock Interface

Hard Drive

The hard drive on the TDM is used to store primary and backup system databases, measurements, and Generic Program Loads (GPLs). The hard drive capacities are:

- 9GB (TDM 870-0774-10)
- 18GB (TDM 870-0774-11)
- 36GB (TDM-GTI 870-0774-18)

Power Converter Unit

The TDM is powered by an on-board DC to DC converter. The converter accepts –48VDC and supplies +5VDC and +12VDC to the TDM.

Table 12: TDM Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	0.46A

Power Requirements	
Power	22W
Physical Characteristics	
Height	15.0 in. (38.1 cm)
Width	1.8 in. (2 cm)
Depth	12.8 in. (32.5 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 5 ISS. TSC Synchronization is an optional feature for the EAGLE 5 ISS 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 requires the MCAP cards in slots 1113 and 1115 of the control shelf be replaced with GPSM-II cards. The TSC sync feature also requires the associated TDM cards be updated to (P/N 870-0774-10 or later). A typical EAGLE 5 ISS will have two TDMs installed to distribute both the A and B system clocks. The TSC Sync feature has to be enabled on both TDMs. The EAGLE 5 ISS 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, but the GPSM-II card is unique in that it can communicate with the TDM and adjust the skew.

TSC Sync affects the TDM (P/N 870-0774-10 or later) and all EAGLE 5 ISS cards that contain a Time Slot Counter. This includes:

- E486-based and E586-based cards (ILA, ILE1, MCAP-256, TSM, E586-T)
- HCAP or HCAP-T
- DCM, DCMX, EDCM and EDCM-A, and GPSM-II (single-slot EDCM)
- MPL, MPL-T, and E1/T1 MIM
- HCMIM, E5-E1T1, E5-ENET

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:

- The Multi-Port LIM (MPL) (P/N 870-2061-xx), used in EAGLE 5 ISS systems only, provides eight DS0 ports transporting SS7 traffic in a single EAGLE 5 ISS card slot. Ports A and B are backward compatible with the existing two-port LIM card. Additional ports A1, A2, A3, B1, B2, B3 are DS0 interfaces only. In EAGLE 5 ISS release 28.0 an enhanced version of the MPL board (MPL-T) is available.

  The MPL card improves the functionality of SS7 routing within the EAGLE 5 ISS by increasing the number of SS7 links the EAGLE 5 ISS can handle for each LIM card. This allows the EAGLE 5 ISS to interact in larger SS7 networks as well as decreasing the size of an EAGLE 5 ISS (for example, previously 250 cards would be required to support 500 links, now only 63 cards are required).

  Note: Link Fault Sectionalization (LFS) logic on the MPL provides diagnostic capabilities though network interfaces on ports A and B. LFS tests sequentially exercise all eight ports.

- The E1/T1 Multi-Channel Interface Module (MIM) (P/N 870-2198-02 and P/N 870-2198-01), provides a dual-port (A and B), framed, channelized connection to a customer's network. The interface to each port is mapped to the DS0 time-slots in the fractional E1 or T1 data streams. Each E1/T1MIM supports a maximum of eight High-Level Data Link Control (HDLC) channels that can be provisioned as using either E1 or T1 protocols and assigned to any unused time-slot.

  Note: E1/T1MIM cards do not support internal clocking. E1/T1MIM cards must be provided with either a composite BITS clock or the High-Speed Master Timing clocks to function properly.

  An extension port is provided to connect other boards in the EAGLE 5 ISS shelf to the E1/T1 data stream such that all channels can be mapped (E1 = 32 channels, T1 = 24 channels). This would require four E1/T1MIMs to map an entire E1 link or three E1/T1MIMs to map a T1 link. The two ports (1 and 2) can also be put into an ADD/DROP configuration. The E1/T1MIM would use a fractional part of the data channel connected to port 1 and forward the remaining channel data through port 2.

  The E1/T1 MIM card requires a new cable T1MIMLIM (P/N 830-0894-xx) for T1 interface connections. If replacing existing MPL cards with E1/T1MIM cards the existing T1 interface cables (P/N 830-0772-xx) must be connected to T1LIM to MPL adapter cables (P/N 830-0895-xx) or replaced with the new cable (P/N 830-0894-xx).

  The existing E1 interface cables (P/N 830-0622-xx) can continue to be used with the new E1/T1MIM card for E1 applications.

The E1/T1MIM will implement the ANSIT1 standard for 1.544 MHz data transmission and the European (ITU) E1 standard for 2.048 MHz data transmission.

Note: Each E1/T1MIM port will be capable of operation for E1 or T1 line rates but the interfaces will never be mixed on a single circuit card (for example, one port operating at E1 rates and the other port at T1 rates). The E1/T1MIM does not support clear-channel (no channels) operation.

- LIM-ATM is a specialized LIM that provides one Asynchronous Transfer Mode over T1 Interface at 1.544 Mbps, (P/N 870-1293-xx). This module uses an Asynchronous Transfer Mode Applique (AATM) installed on a High Capacity Application Processor (HCAP or HCAP-T) main assembly.
- E1-ATM LIM provides one Asynchronous Transfer Mode over E1 Interface at 2.048 Mbps, (P/N 870-2455-01). This module uses an E1Asynchronous Transfer Mode Applique (E1-ATM) installed on a High Capacity Application Processor (HCAP or HCAP-T) main assembly.

  Note: The LIM-ATM and E1-ATM LIM appliques are not mounted on the 486 based main assembly. See the section *High-Capacity Application Processor-Based LIMs* for more information.

Maximum Numbers of Links

A maximum of links can be configured in the EAGLE 5 ISS 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 13: Hardware Requirements-Maximum Number of Links describes the required hardware for the maximum number of links with different configurations.

Note: *Table 13: Hardware Requirements-Maximum Number of Links* lists EAGLE 5 ISS base hardware requirements only. For complete provisioning rules and requirements, including tables listing all link types see the ***Database Administration - SS7 Manual*** .

LIM Main Assembly

Table 13: 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	HMUX 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 the ***Database Administration - SS7 Manual*** .
From 501-700 Links	HMUX cards on the IMT buses GPSM-II cards installed in card locations 1113 and 1115

Number of Links	Required Hardware
Note: A Maximum 100 High-speed LIM cards (of which up to 41 can be IPLIMx cards) can be installed	TDM cards in locations 1114 and 1116 **Note:** There are only enough slots to support 500 links using just 2-port LIMs. Enough multi-port LIMs (MPLs), P/N 870-2061-XX, 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 the ***Database Administration - SS7 Manual*** .
From 701--1500 Links **Note:** A Maximum 115 High-speed LIM cards (of which up to 100 can be IPLIMx cards) can be installed	• HMUX cards on the IMT buses • GPSM-II, P/N 850-0622-XX cards, installed in card locations 1113 and 1115, to run the active OAM • TDM cards installed in card locations 1114 and 1116 **Note:** There are only enough slots to support 500 links using just 2-port LIMs. Enough Multi-Port LIMs (MPLs), P/N 870-2061-XX, and/or E1/T1MIMs, P/N 870-2198-XX, to bring the total number of signaling links to 1500. Installed according to the provisioning rules for a system with 1500 links in the ***Database Administration - SS7 Manual*** .
From 1500 -- 2800 Links **Note:** A maximum 250 IPLIMx cards can be installed.	• HIPR/HIP2 cards on the IMT buses • E5-MASP cards installed in 1113 and 1115, to run the active OAM • E5-MDAL cards installed in card locations 1117 and 1118 **Note:** There are only enough slots to support 500 links using just 2-port LIMs. 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. Installed according to the provisioning rules for a system with 2800 links in the ***Database Administration - SS7 Manual*** .

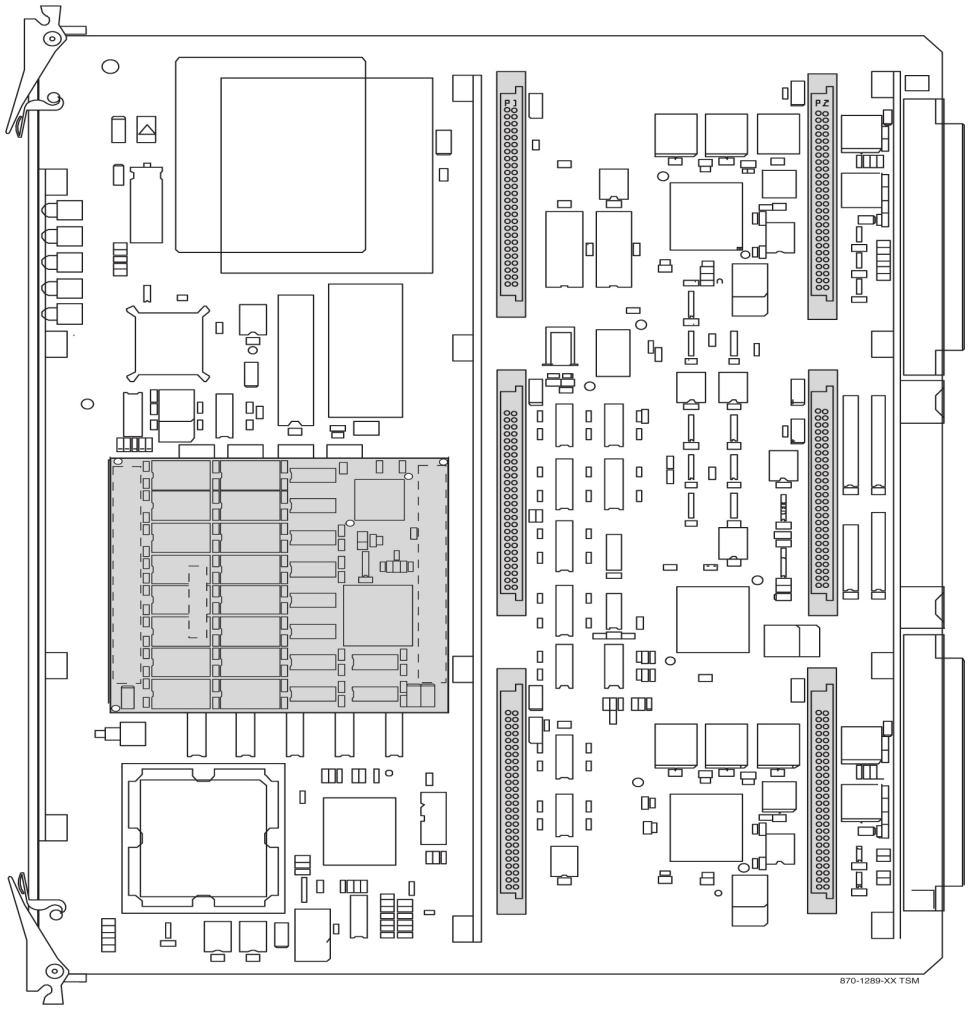
Cam-out/lock-in levers, mounted on the front edge of LIM cards, (the exception being E1) assist in the insertion and the removal of the card from the shelf.

Figure 39: Link Interface Module (LIM) Main Assembly shows the LIM Main Assembly card.

The main assembly portion of the LIM contains the following:

- An 80486 applications processor
- An 80386/80486 communications processor that provides a data transmit/receive interface
- An Inter-processor Message Transport (IMT) interface that provides two 125 Mbps communications links that provide communications between modules
- –48VDC/+5VDC and –48VDC/+3VDC DC to DC power converter units

Figure 39: Link Interface Module (LIM) Main Assembly



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 an 80486 processor and peripherals.

Communications Processor

The Communications Processor (CP) is made up of an 80386/80486 microprocessors 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 HMUX/HIPR/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 HIPR/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. LIM-ATM appliques function the same with either card.

LIM-ATM

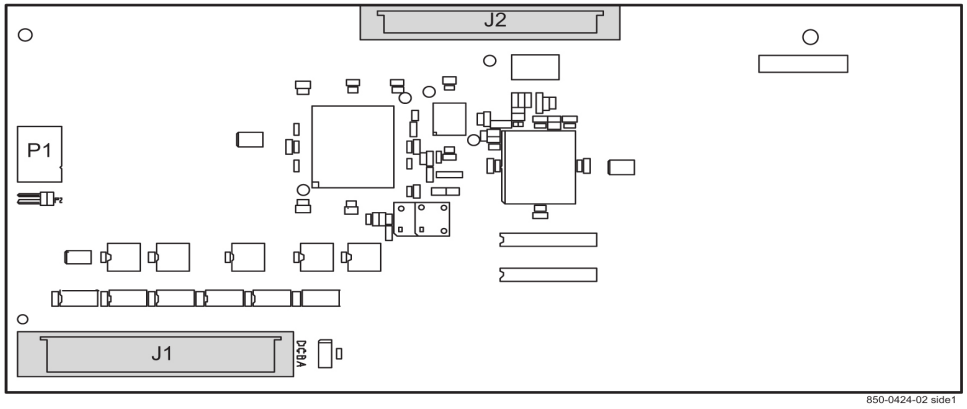
LIM-ATM is a specialized LIM that provides one Asynchronous Transfer Mode over T1 Interface at 1.544 Mbps. This module uses an Asynchronous Transfer Mode Applique (AATM) installed on a High Capacity Application Processor or HCAP-T main assembly. See *HCAP or HCAP-T Main Assembly*.

The AATM applique is shown in the following figure and provides one interface for SS7 links.

The main components of the AATM are:

- One Transmission 1.544 MB (T1) Framer Transceiver
- ATM User network Interface
- AATM LCA (Asynchronous Transfer Mode Applique Logic Cell Array)
- One Transmission 1.544 MB (T1) Interface

Figure 40: AATM Applique (T1)



E1-ATM

E1-ATM LIM provides one Asynchronous Transfer Mode over E1 Interface at 2.048 Mbps. This module uses an E1 Asynchronous Transfer Mode Applique (E1-ATM) installed on a High Capacity Application Processor (HCAP or HCAP-T) main assembly. The E1-ATM applique provides a new communications capability on the EAGLE 5 ISS, a High Speed Link (HSL) using ATM over E1.

The E1-ATM capability supports a single ATM Virtual Channel Connection (VCC) at a line speed of 2.048 Mbps. To the GLS, LSL LIM, SLAN and SCCP cards, the E1-ATM card looks and operates similar to any other LIM but has increased data throughput. The E1-ATM can perform gateway screening, copy and redirect, conversion and any of the other EAGLE 5 ISS features that an ANSI LIM can perform with the exception of Link Fault Sectionalization (LFS) which is not a requirement for E1 links.

The E1-ATM applique is based upon the ATMANSI feature, which provided ATM communications over T1 links. The E1-ATM supports (2.048 Mbps) link speed instead of T1 link speed (1.544 Mbps), and ITU protocol support instead of ANSI protocols. See *Figure 41: E1-ATM Applique* and *Figure 42: HCAP Main Assembly (P/N 850-0419-xx)*.

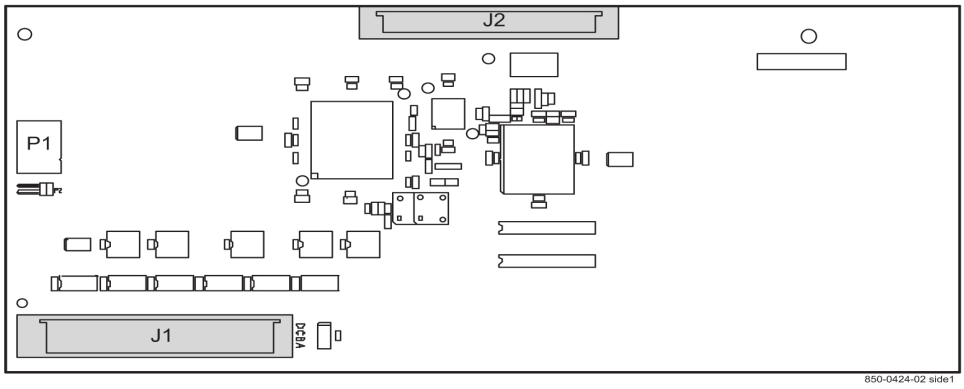
The E1-ATM applique provides one interface for SS7 links.

The main components of the E1-ATM are:

- One Transmission 2.048 MBps (E1) Framer Transceiver
- ATM User network Interface

- One Transmission 2.048 MBps (E1) Interface

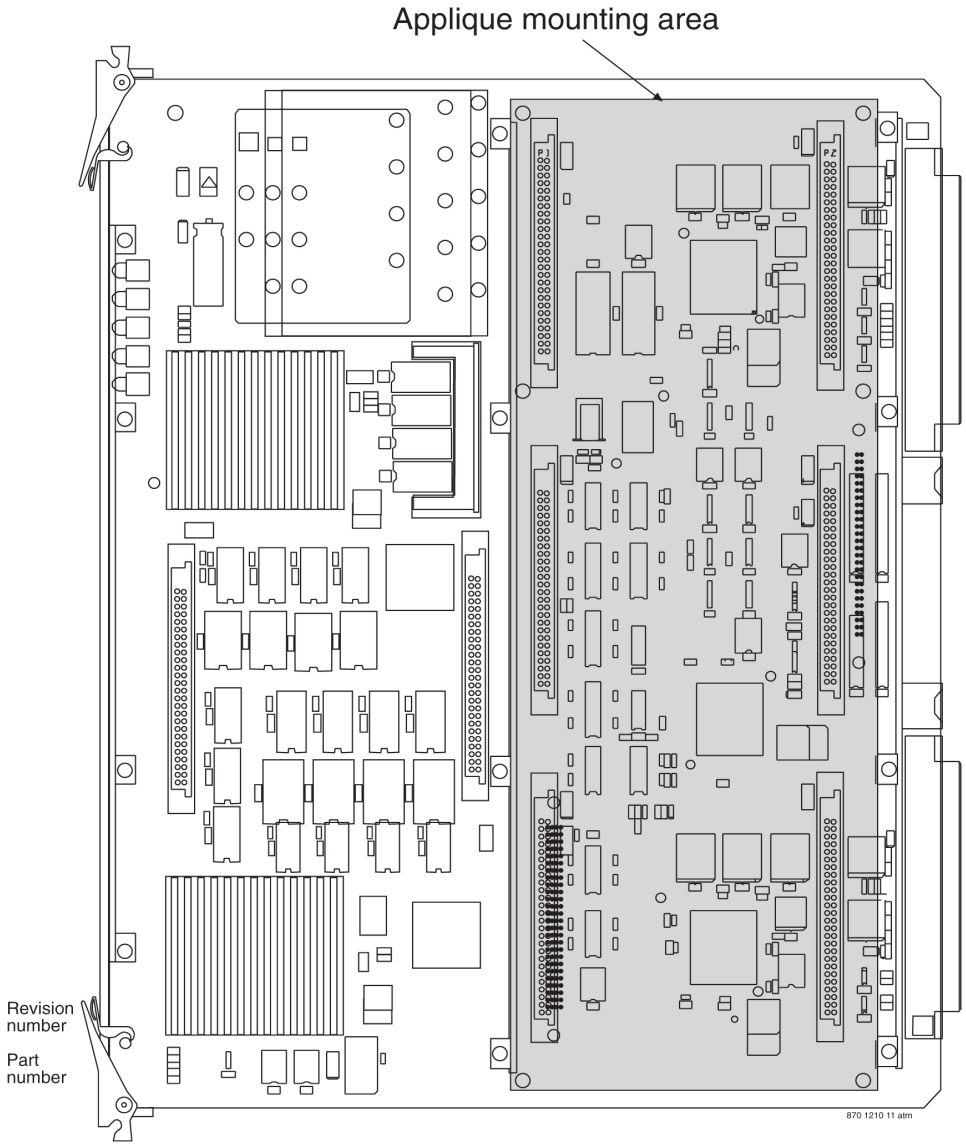
Figure 41: E1-ATM Applique



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



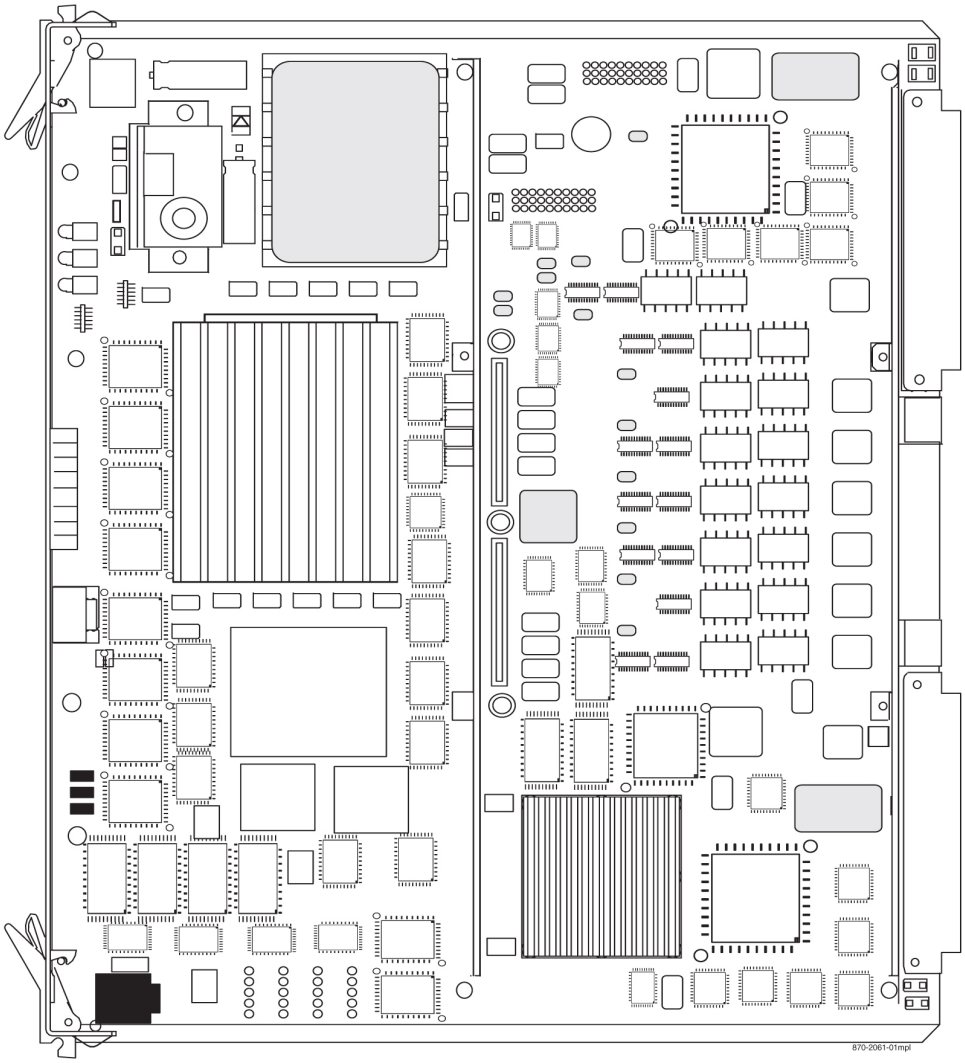
Multi-Port Link Interface Module (MPL)

The MPL card (P/N 870-2061-01) provides eight-port DS0 functionality in a single card slot. The existing two-port (A and B) LIM capabilities are supported with six additional DS0 only ports (A1, A2, A3, B1, B2, B3).

Note: The MPL is backward compatible with existing two-port DS0 LIMs. Attempts to provision the MPL ports as any type other than a DS0 interface will be rejected. The MPL card is used in EAGLE 5 ISS systems only.

Note: The MPL card can be replaced with the enhanced performance MPL-T card (P/N 870-2061-02). The MPL-T card is plug compatible with existing MPL cards.

Figure 43: Multi-Port Link Interface Module (MPL) (P/N 870-2061-01)



LIM Cards Technical Specifications

The technical specifications of the LIM cards are listed in *Table 14: LIM Card Specifications*.

Table 14: LIM Card Specifications

Power Requirements	
Voltage	-48VDC
Current	0.6A
Power	E1/T1 LIM (P/N 870-2198-01) –20 watts ATM (T1) (P/N870-1293-xx) –14 watts MPL, MPL-T(P/N870-2061-xx) –20 watts

Power Requirements	
Interfaces	
DS0A	64 and 56 kbps
OCU	64 and 56 kbps
ATM (T1)	1.544 Mbps
E1 ATM	2.048 Mbps
E1	2.048 Mbps
T1	1.544 Mbps
HMUX	125 Mbps and 1 Gbps
HIPR	125 Mbps and 1 Gbps
Dimensions	
Height	14.4 in. (36.6 cm)
Length	12.8 in. (32.5 cm)

Database Communications Module

The 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 SS7IPGW GPL.

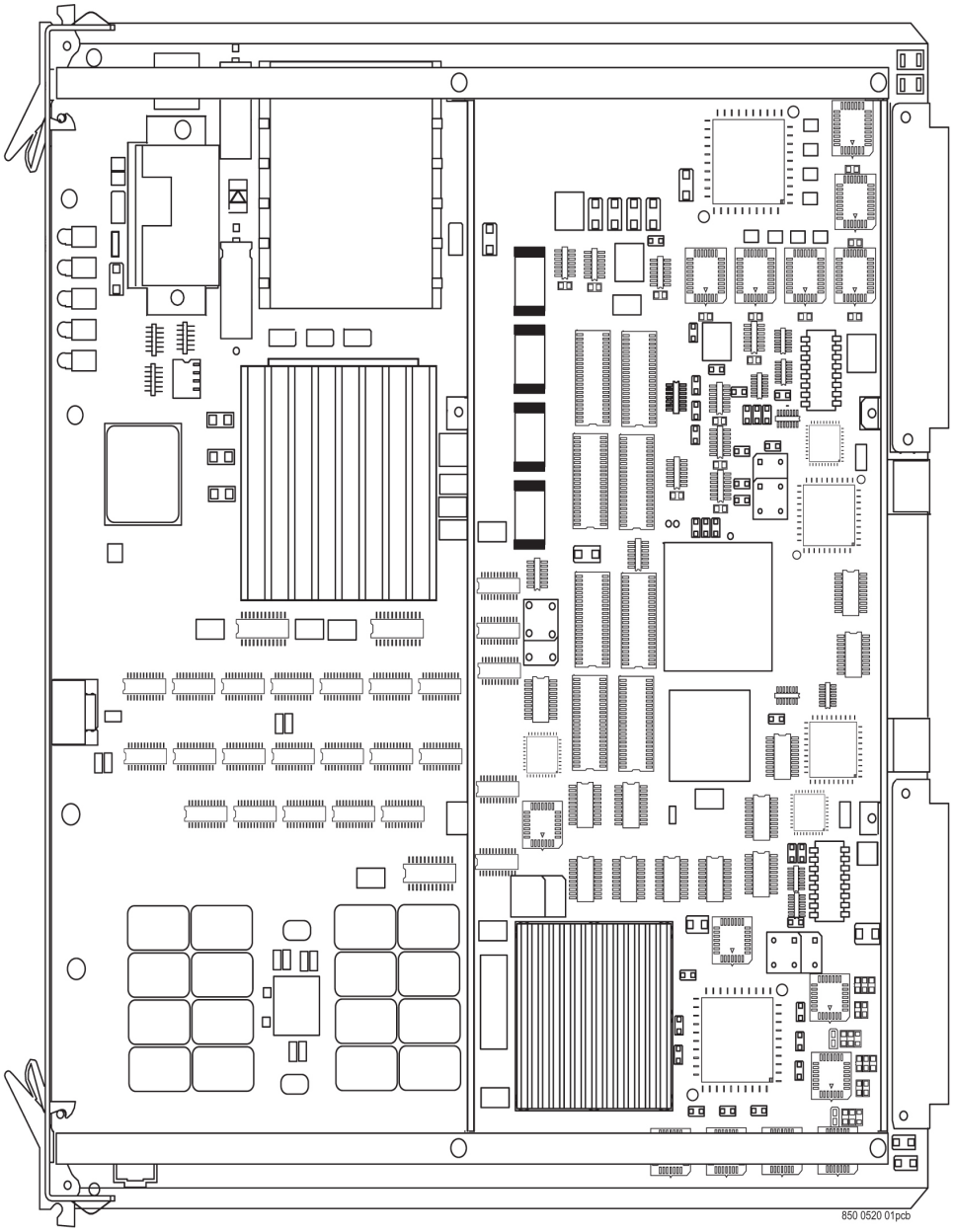
Note: Beginning with Release 38.0, any type dual-slot DCM card is no longer supported. A single-slot EDCM (SSEDCM) card or an E5-ENET card must be used.

The DCM card (P/N 870-1984-01) supports one to four plug-in memory cards. The primary board DCM with the addition of memory boards and software creates the Database Service Modules (DSMs).

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).

A DCM card is shown in *Figure 44: Database Communications Module* .

Figure 44: Database Communications Module



Database Service Module

In the EAGLE 5 ISS system primary board DCMX (P/N 870-1984-01) plus memory boards equal Database Service Modules (DSMs). Memory Boards are stacked as indicated in *Figure 45: DSMs with Memory Boards*.

- P/N 870-1984-02 DSM-1G
- P/N 870-1984-03 DSM-2G
- P/N 870-1984-04 DSM-3G
- P/ N 870-1984-05 DSM-4G

Figure 45: DSMs with Memory Boards

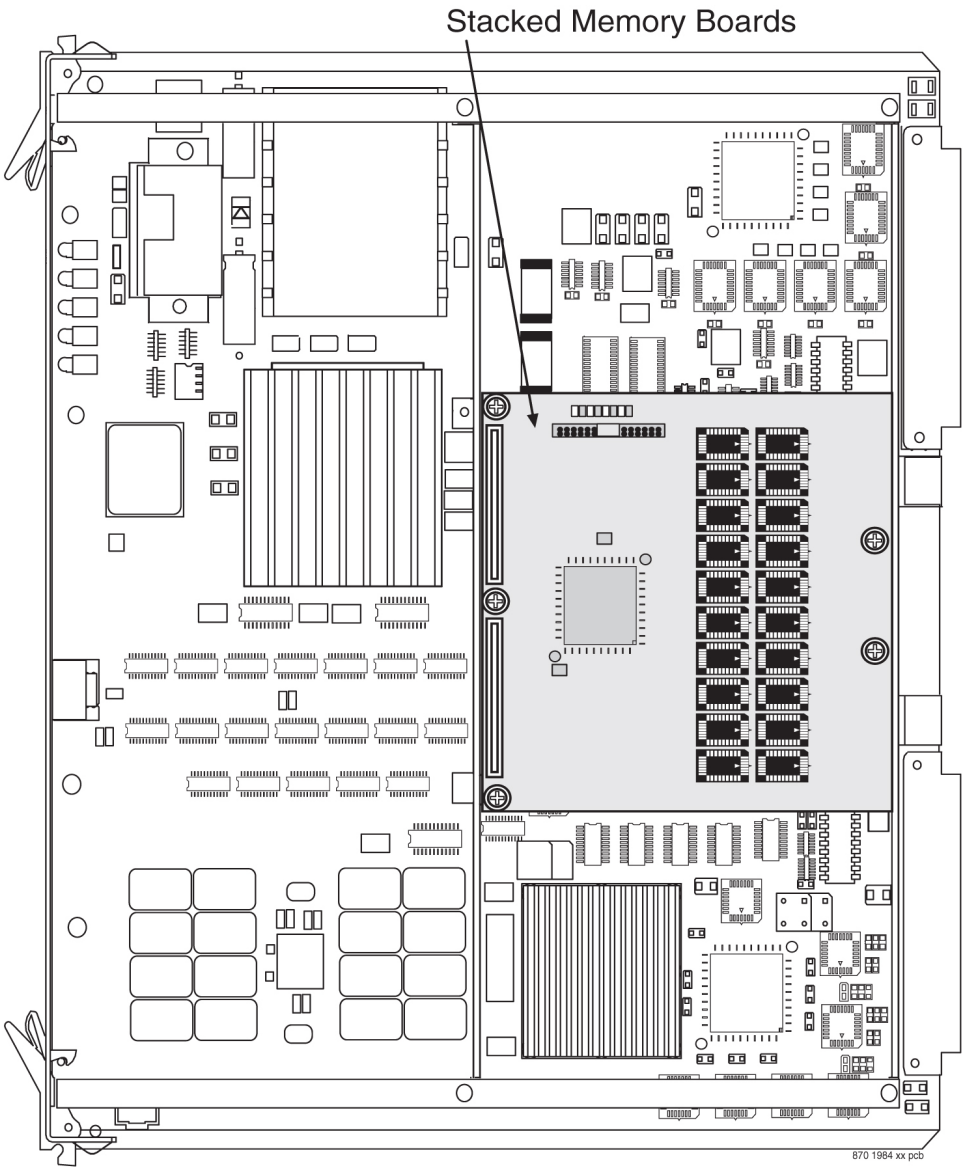


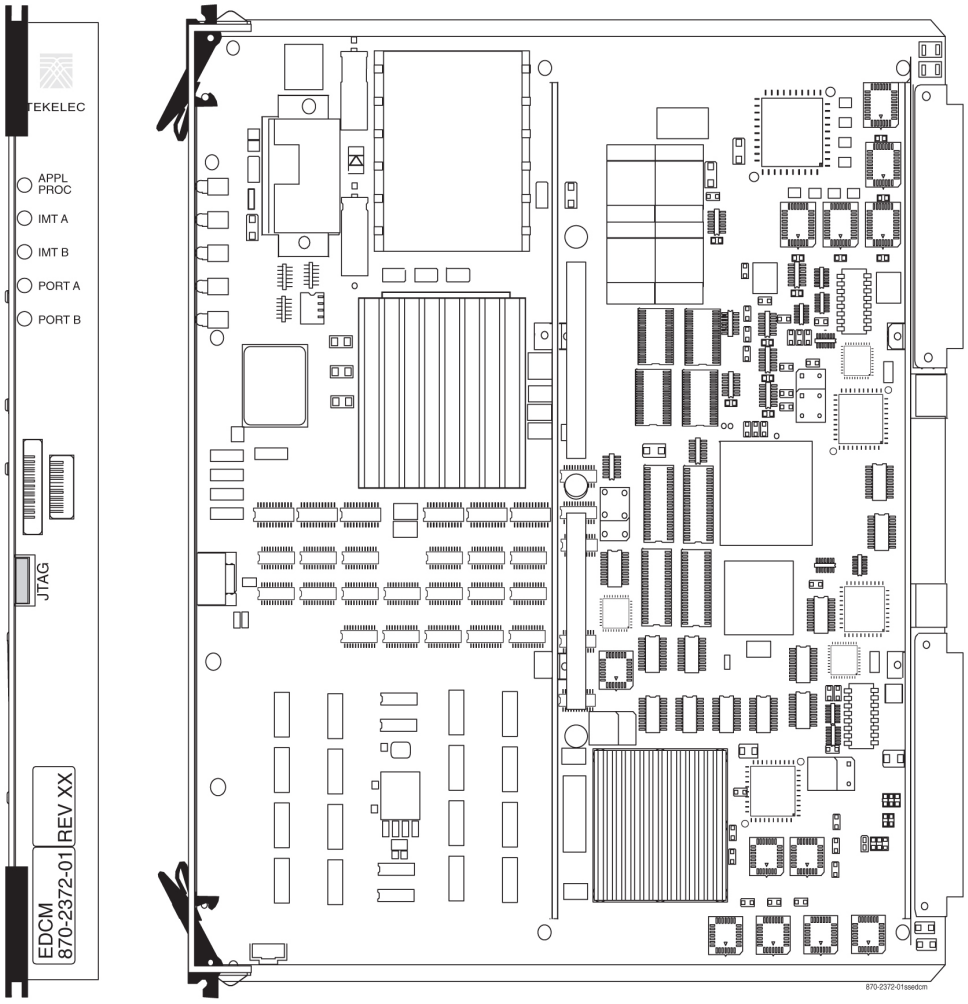
Table 15: DCM and DSM Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	0.32A
Power	21 watts
Dimensions	
Height	14.4 in. (36.6 cm)
Width	1.8 in. (2 cm)
Depth	12.8 in. (32.5 cm)

Single-Slot EDCM and EDCM-A

The single-slot EDCM (P/N 870-2372-01) is a version of the EDCM which requires only a single frame slot. It can be placed in any slot, odd or even, which has been provisioned for DCM.

Figure 46: Single-Slot Enhanced Database Communications Module



The single-slot EDCM is the base for the following card types:

- Signaling transport card (STC)
- General Purpose Service Module (GPSM-II)
- Measurements Collection and Polling Module (MCPM)
- IPLIMx feature with eight point capabilities
- IPGW

EDCM-A Replacement Cards

Any EDCM cards that needs to be replaced will be replaced with EDCM-A cards (P/N 870-2508-02). The front of the card and LEDs are the same as the EDCM card. The following performance parameters are applicable for the EDCM-A:

- STC - No change from EDCM (870-2372-01)
- STPLAN - No change from the EDCM (870-2372-01)
- IPLIMx:

IPLIMx M2PA performance on the EDCM-A (870-2508-02) card can only be guaranteed under the following conditions:

- 2,000 Transactions/Second (TPS)
- Up to 4 Associations
- Average MSU size of 140 Bytes or less.

  If the number of associations or average MSU size is increased above these limits, then performance may fall below 2,000 TPS.

- IPGWx:

  IPGWx performance on the EDCM-A (870-2508-02) card can only be guaranteed under the following conditions:

  - M3UA only (SUA protocol is not supported)
  - 1,700 TPS
  - Up to 8 Connections
  - Average MSU size of 140 Bytes or less.

    If the number of connections or average MSU size is increased above these limits, then performance may fall below 1,700 TPS.

    To maximize throughput per IPGWx card, Tekelec recommends deployment of the same type of DCM cards within a single linkset. For example, EDCM-A cards in a linkset with only EDCM-A cards, and EDCM (870-2372-01/08) cards in a linkset with only EDCM cards. EDCM-As can be deployed within the same linkset with EDCMs; however, if EDCMs and EDCM-As are mixed in a linkset all IPGWx cards within the linkset should be assumed to have a maximum of 1,700 TPS.

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.

General Purpose Service Module

On the front edge of the GPSM-II card, there are five Light Emitting Diodes (LED) that provide status. The GPSM-II 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 GPSM-II 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 not used in the GPSM-II.

Note: GPSM-IIs are required replacements for the MCAP cards. The installation is done at the factory or by Tekelec Technical Support, not by the customer.

Measurements Collection and Polling Module

The MCPM is an EDSM-2G card with 32 MB FSRAM and 2 GB RAM.

Note: The MCPM card is a requirement for the FTP measurements feature. The FTP measurements feature uses the MCPM 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.

Translation Service Module

The Translation Service Module (TSM) provides translation capability and Global Title Translation (GTT) implementation for the Local Number Portability (LNP) function by means of one or more identically configured cards per STP node. If more than one TSM is provided in each shelf, they must be powered from different fuse positions and power feeds.

The E586 and E586-T primary boards provide all logic required to support the TSM MCAP-256 functions. The E586 functions will include:

- An Applications Processor for MCAP applications in the EAGLE 5 ISS.
- A Communication Processor for the high speed bus interface (IMT bus).
- Four Expansion Memory Interfaces to allow additional memory for applications.
- It communicates with the MCAP (GPSM II) in the MASP by the IMT bus.
- The TSM can plug into any LIM slot.
- A dual port memory to allow information to be passed between the Application and Communications Processors.
- A boot EPROM for initialization software of both the Application and Communications Processors.

TSMs can have one to four M256 memory modules provisioned. Part numbers for the TSMs are:

- TSM with one M256 (P/N 870-1289-xx)
- TSM with two M256 (P/N 870-1290-xx)
- TSM with three M256 (P/N 870-1991-xx)
- TSM with four M256 (P/N 870-1292-xx)

For an illustration of the TSM with one M256 installed refer to *Figure 47: Translation Service Module (P/N 870-1289-xx)*. For an illustration of a TSM with four M256s installed refer to *Figure 48: Translation Service Module (P/N 870-1292-xx)*.

The main assembly portion of the TSM consists of:

- An 80486DX5 applications processor
- An 80386 communications processor

- An Inter-processor Message Transport (IMT) interface that provides two 125 Mbps communications links providing communications between modules

CAUTION: It is Tekelec's recommendation that cards running the SCCP application be uniformly distributed in the EAGLE 5 ISS to provide a more even SCCP load distribution. During normal operation unevenly distributed SCCP cards in an EAGLE 5 ISS would not have any network or system impacts. However, should a particular SCCP 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.

Figure 47: Translation Service Module (P/N 870-1289-xx)

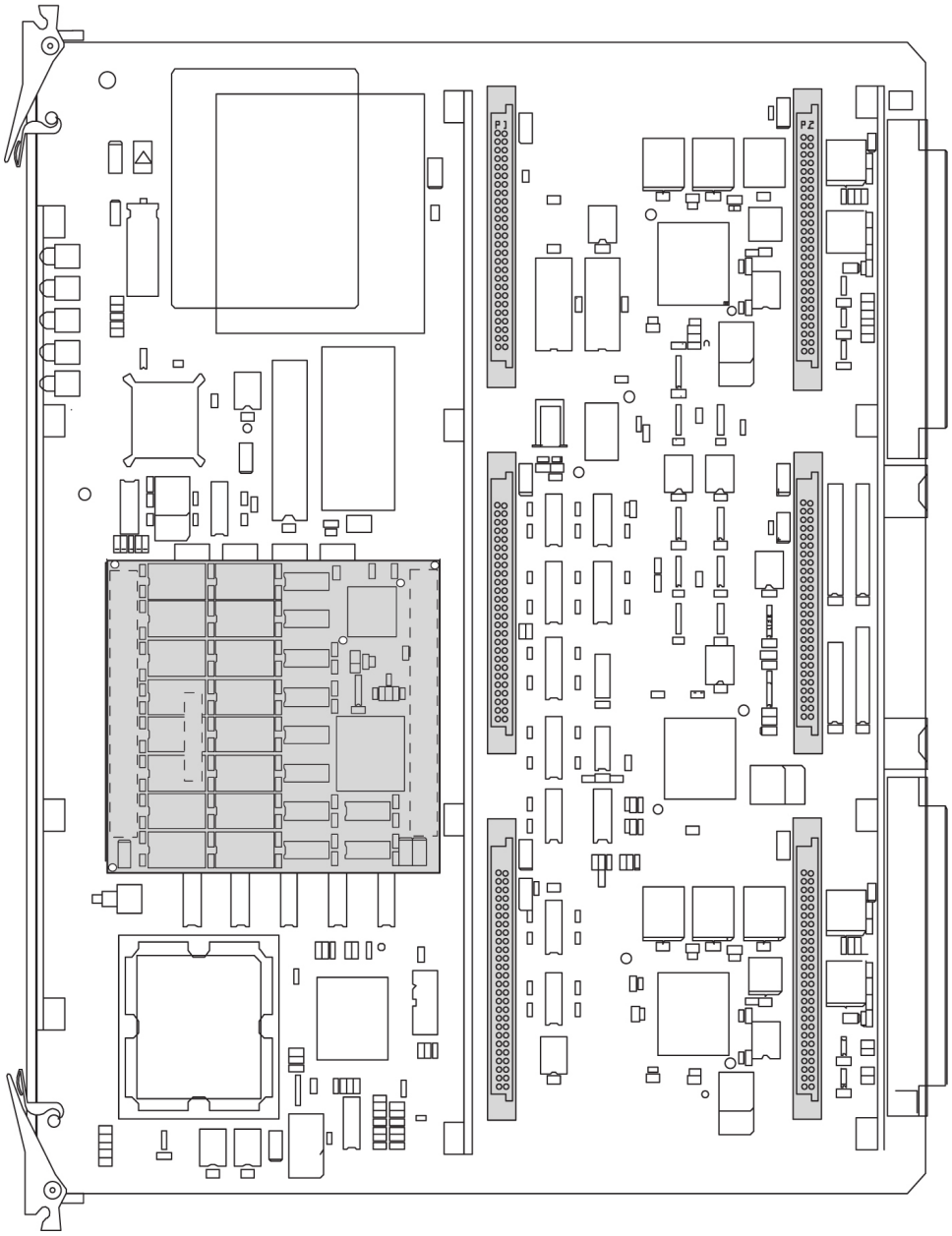
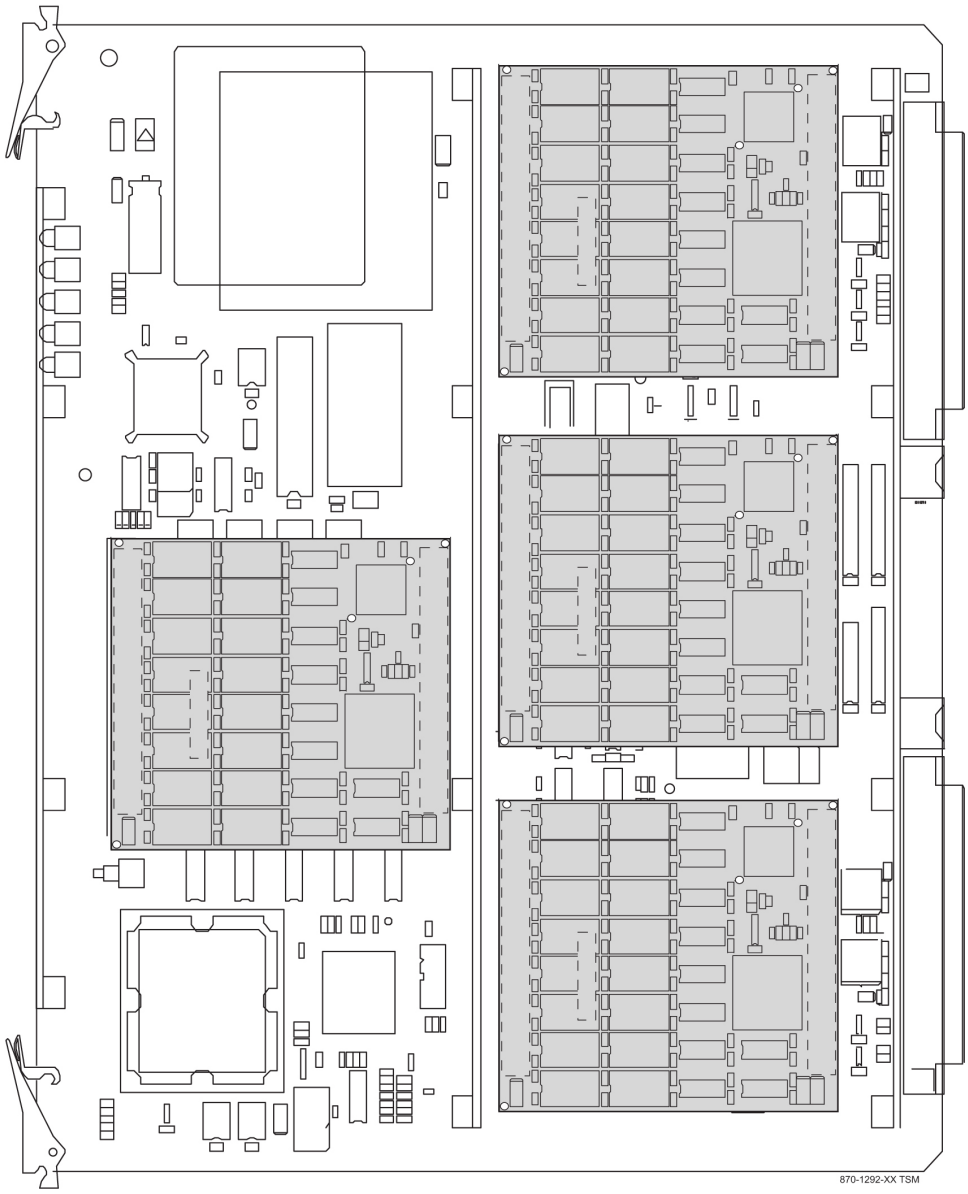


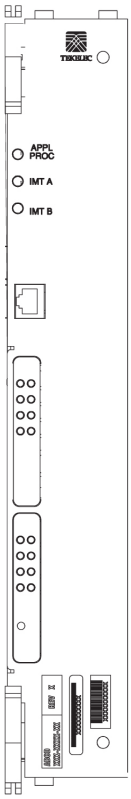
Figure 48: Translation Service Module (P/N 870-1292-xx)



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 49: 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 HIPR 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.

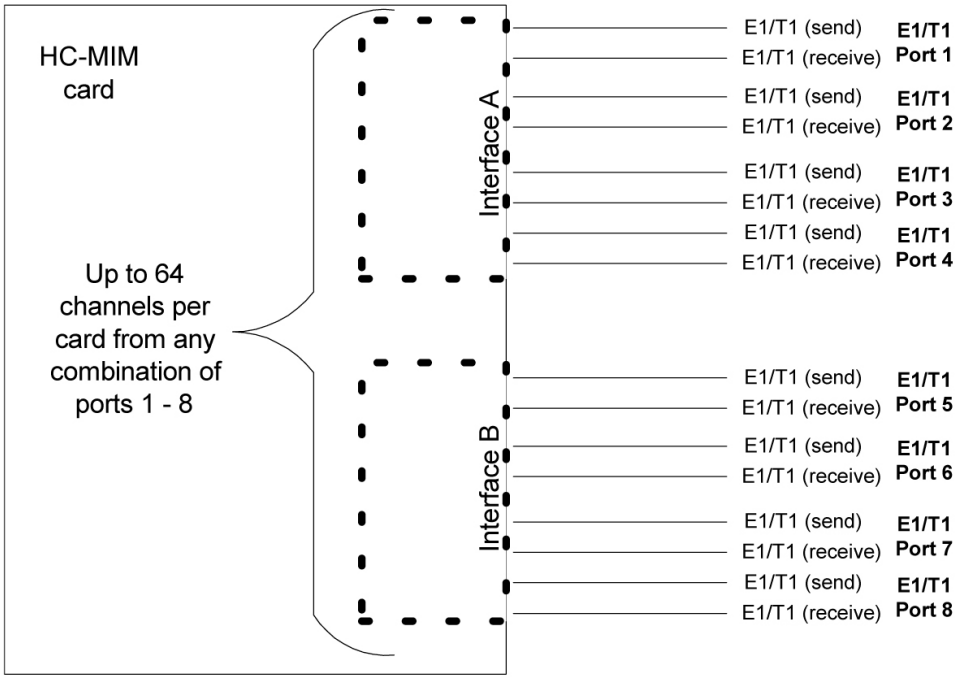
Channelized Mode

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 50: Channelized HCMIM Interfaces*.

Figure 50: Channelized HCMIM Interfaces

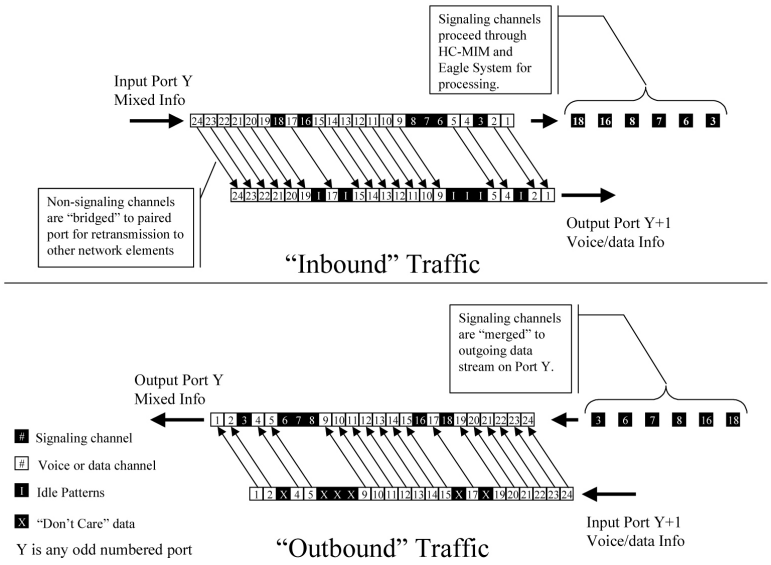


Note: All ports on a single board must operate in the same trunk format, E1 or T1, and that the total number of channels utilized as signaling links must not exceed the maximum allowable number in accordance with a Feature Access Key defining total channel capacity.

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 51: 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 5 ISS. 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 16: 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 5 ISS'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 17: 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

Color	Port Status LED	Aggregated Channel Status LED
Red blinking	Loss of signal and remaining errors	All channels provisioned = OOS
Red	Port not provisioned	No channels are provisioned

Technical Specifications

Table 18: HCMIM Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	1.3A-1.55A
Power	65W typical, 70W max.
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 T1 MIM /LIM P/N 830-0948-XX. When upgrading from an E1/T1 MIM 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 Module

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

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 based load sharing
- STP/LAN (SLAN)
- Integrated Sentinel (e-route)
- Integrated Message Feeder
- Higher throughput than current HCAP-based LIMATM and LIME1ATM cards
- Automatic on/off CRC4 detection for E1 framing (default is on)
- Two ATM signaling links operating at 1 Erlang
- BICC support
- Thermal protection

The E5-ATM has the following requirements and dependencies:

- Requires HIPR in the shelf where the E5-ATM resides.

  Note: If a shelf contains an HMUX and a HIPR, the card will only attach to the HIPR. Using an HMUX and HIPR on the same shelf is normally only used during upgrade

- Can be inserted into HMUX-equipped shelves. However, 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 and LIM-ATM (both card types can be present in a node)
- 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 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 (chg-th-alm:thrmallvl1, a user configurable percentage based on the operating limit), a major alarm is raised against the card. When the temperature returns to its nominal range (below Temperature Level 1) the alarm is automatically cleared.

If the temperature continues to increase and exceeds a second thermal threshold (chg-th-alm:thermallv2, a user configurable percentage based on the operating limit), 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 Level 2 threshold, the LPO condition is cleared and the links can begin operation again.

If the CPU temperature goes above operating limits (approximately 99ºC), 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 19: Thermal Alarm Conditions identifies the appropriate responses.

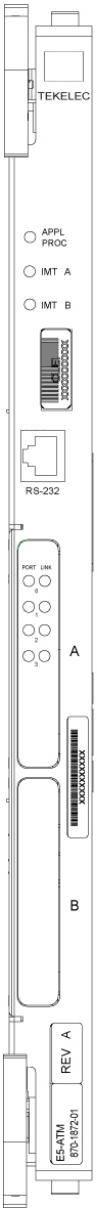
Table 19: Thermal Alarm Conditions

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

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 52: E5-ATM* shows the LEDs and provides a description of indications.

Figure 52: E5-ATM



LED	Color	Description
APPL PROC	RED	Transitioning or Error
	AMBER	Not Active
	GREEN	Active
IMT (A/B)	RED	Card is not attached to IMT bus
	GREEN	Card is attatched to IMT bus
PORT (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 (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 (3/4)	OFF	Not used
LINK (3/4)	OFF	Not used

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/T1ports 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 20: E5-ATM Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	712mA - 736mA
Power	29.2W typical, 30.2W max.
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 Module

The E5-E1T1 card (P/N 870-1873-02) is a single slot card providing eight trunk terminations processing up to 32 signaling links of configurable channelized E1 or T1 connectivity. The eight E1/T1 ports reside on backplane connectors A and B. The E5-E1T1 supports only one SE-HSL signaling link on one of the eight ports and it must be A.

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 HIPR to be active on both IMT buses in the shelf where the E5-E1T1 will reside.

  Note: HIPR card in one bus and HMUX card in the other bus can be used simultaneously in the same shelf only in the case of an upgrade from HMUX card to HIPR card.

- 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.

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. Interoperation with E1/T1 MIMs operating in channel mode is not supported.

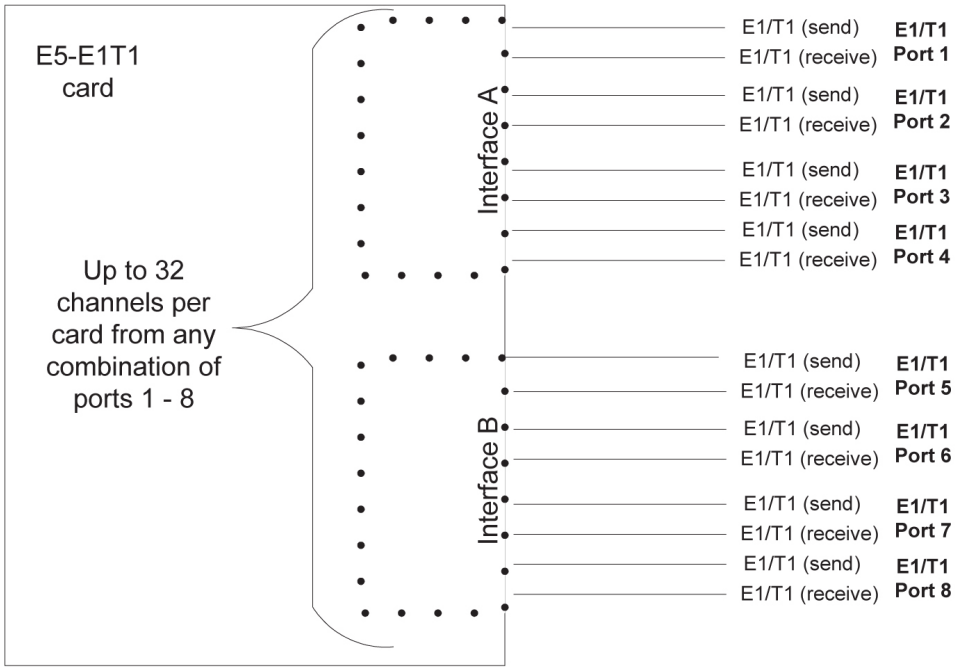
The maximum provisionable links for the E5-E1T1 will be 32 links. If the E5-E1T1 has more than 32 links provisioned, it will auto-inhibit. The fan feature is ignored for the E5-E1T1.

Channelized Mode

The E5-E1T1 provides access to eight E1/T1 ports residing on backplane connectors A and B. Each data stream consists of 24 T1 or 31 E1 DS0 signaling links assigned in a time-division multiplex (TDM) manner. Each channel occupies a unique 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.

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 53: Channelized E5-E1T1 Interfaces*.

Figure 53: Channelized E5-E1T1 Interfaces



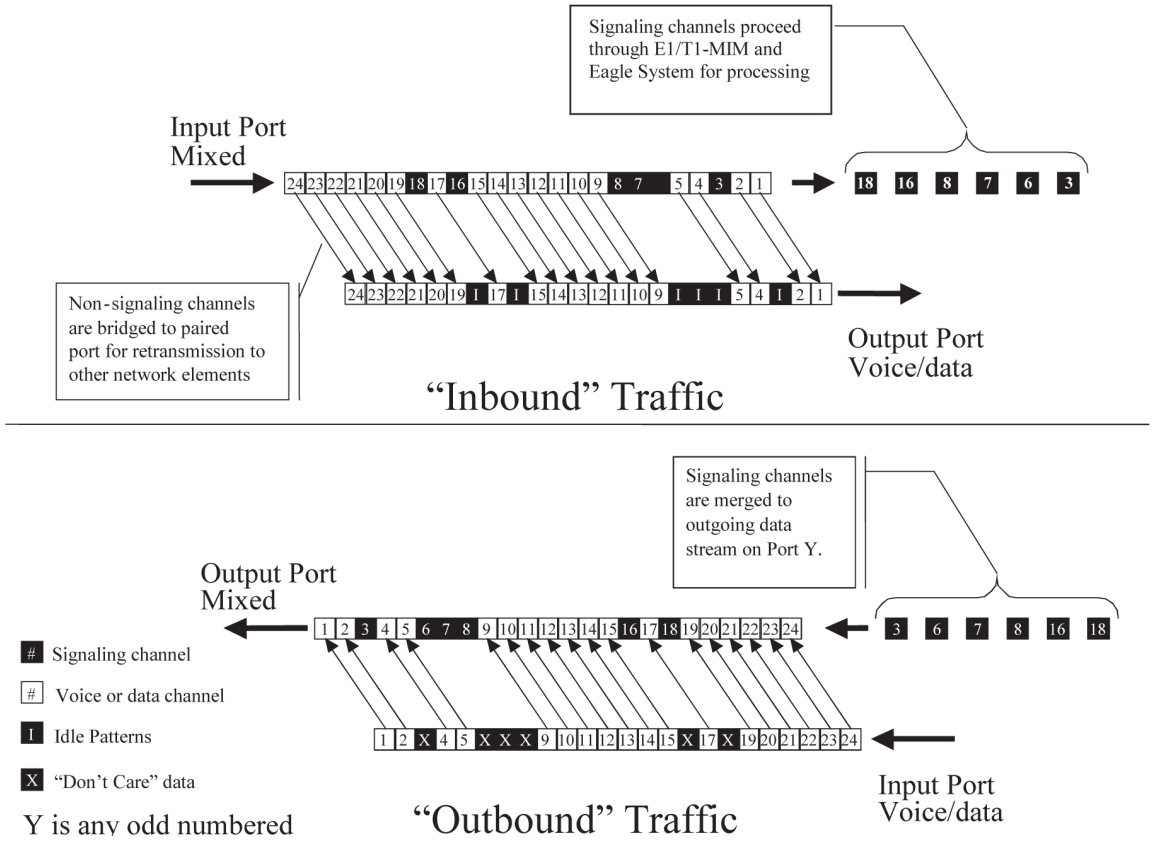
Note: All ports on a single board must operate in the same trunk format, E1 or T1, and that the total number of channels utilized as signaling links must not exceed the maximum allowable number in accordance with a Feature Access Key defining total channel capacity.

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 54: Channel Bridging Schematic*.

Figure 54: Channel Bridging Schematic



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 E5-E1T1.

Table 21: Channel Bridging E1/T1 Port Pairing

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

Primary E1/T1 Port		Paired E1/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 55: E5-E1T1*.

Figure 55: E5-E1T1

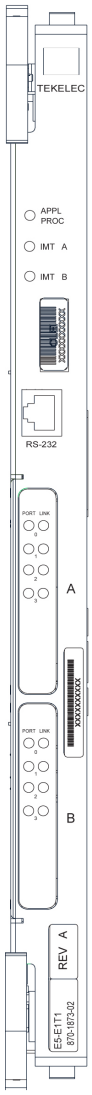


Table 22: E5-E1T1 LEDs

Color	Port Status LED	Aggregated Channel Status LED
Green	No alarms, port has acquired timing and framing synchronization	All channels provisioned =IS-NR
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

Color	Port Status LED	Aggregated Channel Status LED
Red	Port not provisioned	No channels are provisioned

Technical Specifications

Table 23: E5-E1T1 Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	646mA
Power	26W
Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	2.06 in. (5.23 cm)
Depth	12.80 in. (32.51 cm)

E5-ENET Module

The E5-ENET card (P/N 870-2212-02) is a single slot card providing one or more Ethernet interfaces. 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 24: 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.

Table 24: E5-ENET Supported Protocols

Feature	Protocols Supported
IPLIM	SCTP, M2PA
IPGWY	SCTP, M3UA, SUA

Feature	Protocols Supported
IPSG	M2PA, M3UA
SLAN	TCP/IP
EROUTE	TCP/IP

Table 25: E5-ENET Capacities

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

- Requires HIPR to be active on both IMT buses in the shelf where the E5-ENET will reside.

  Note: HIPR in one bus and HMUX in the other bus for that shelf is not a supported configuration and will be treated as no HIPR cards being present in the shelf.
- 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.

Thermal Management

The E5-ENET includes thermal management and alarming provisions to protect the card from damage if environmental conditions hinder thermal stability. *Table 26: Thermal Alarm Conditions* identifies the appropriate responses.

Table 26: Thermal Alarm Conditions

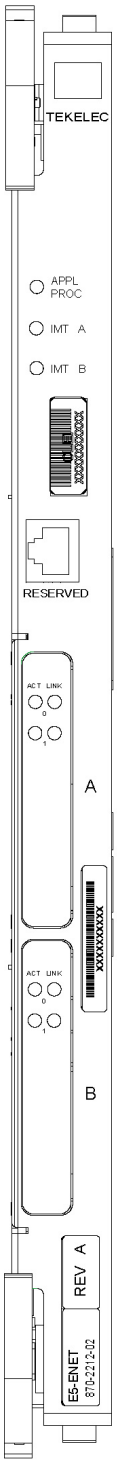
Board Temperature	Actions
Temp1 Exceeded	Major alarm raised
Temp2 Exceeded	Critical alarm raised; failover initiated, traffic rerouted
Temperature abated	Normal operation restored

Board Temperature	Actions
Thermtrip - shutdown temperature exceeded	CPU shuts down automatically. Card must be reseated to restore operation once temperature returns to normal operating conditions

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).

Figure 56: E5-ENET



Front Faceplate LED Indicators

LED	Status	Description
APPL PROC	Off	No power
	Red	Card is booting
	Amber	Card is loading
	Green	Card 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
None configured	Red
All are OOS-MT-DSBLD	Red
None are OOS-MT and at least one is IS-NR or IS-ANR	Green
At least 1 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

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 27: Interface Cable/Adapter* .

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

- Adapter P/N 830-1103-02 is required for each E5-ENET interface used when using the existing DCM cable (P/N 830-0978-xx). The adapter is connected between the backplane connector and the existing DCM cable for the card.
- Adapter P/N 830-1102-02 is required for installation of the E5-ENET when the DCM cable is replaced with an RJ-45 CAT-5E cable (P/N 830-0724-xx). The adapter is connected to the backplane and the RJ-45 CAT-5E cable is connected from the other side of the adapter to a switch, or a hubcopy feature, or a patch panel (same place the DCM cable was terminated). This adapter configuration can be used for 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 27: Interface Cable/Adapter

Protocol	Adapter	Cable
IPLIM, IPGWY	830-1103-02	830-0978-xx or 830-1204-xx
IPLIM, IPGWY	830-1102-02	830-0724-xx or 830-1174-xx
IPSG with FAST COPY	830-1102-02	830-0724-xx or 830-1174-xx
	830-1343-01 (port A0, A1)	830-0978-xx or 830-1204-xx (backplane connector A)
	830-1343-02 (port B0, B1)	830-0978-xx or 830-1204-xx (backplane connector B)

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

Technical Specifications

Table 28: E5-ENET Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	712mA - 736mA

Power Requirements	
Power	29.2W typical, 30.2W max.
Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	2.06 in. (5.23 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 resided must include HIPR 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 5 ISS 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 the Commands Manual.

Table 29: 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 57: E5-IPSM

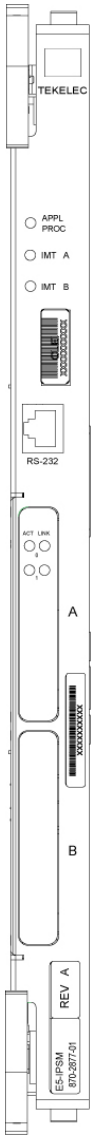


Table 30: E5-IPSM LEDs

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	Actuive 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 31: E5-IPSM Technical Specifications

Power Requirements	
Voltage	-48 VDC
Current	730 mA
Power	30 W

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

E5-SM4G Module

The E5-SM4G (P/N 870-2860-02) is a database service module (DSM) designed to operate in the EAGLE 5 ISS shelf. The E5-SM4G is a double-slot card that provides 3.1 GB of application processor memory. The E5-SM4G provides the following for the EAGLE 5 ISS 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-SM4G has the following requirements and dependencies:

- Requires HIPR to be active on both IMT buses in the shelf where the E5-SM4G will reside.

  Note: If a shelf contains an HMUX and a HIPR, the card will only attach to the HIPR. Using an HMUX and HIPR on the same shelf is normally only used during upgrade

- Does not require a fan tray assembly for thermal management.
- Can be inserted into HMUX-equipped shelves. However, 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.

  Note: The E5-SM4G does not support ELAP with databases greater than 192M or EPAP with databases greater than 84M.

- 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 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. The E5-SM4G is designed to operate in the EAGLE 5 ISS shelf with natural convection cooling and does not require a fan tray for cooling.

Table 32: 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.
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

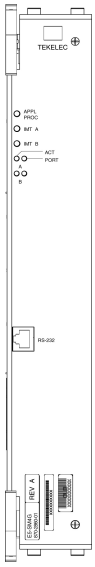
Alarms and LEDs

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

Table 33: Front Faceplate LED Indicators

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

Figure 58: E5-SM4G



Interface Cable Adapter

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

Technical Specifications

Table 34: E5-SM4G Technical Specifications

Power Requirements	
Voltage	-48 VDC
Current	1.17 A - 1.29 A
Power	48 - 53 W
Physical Characteristics	
Height	14.43 in. (36.65 cm)
Width	2.06 in. (5.23 cm)
Depth	12.80 in. (32.51 cm)

E5-TSM (Translation Services Module)

The E5-TSM (P/N 870-2943-xx) is a single-slot Embedded Processor Module (EPM) with 512MByte of memory. The E5-TSM card provides the EAGLE 5 ISS 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 HIPR 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 HIPR 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 HIPR equipped.

EAGLE 5 ISS 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 35: 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, new loading service requests denied State of card shall transition to IS-ANR / Restricted
Temperature abated	Normal operation restored (Clearing Condition)

Technical Specifications

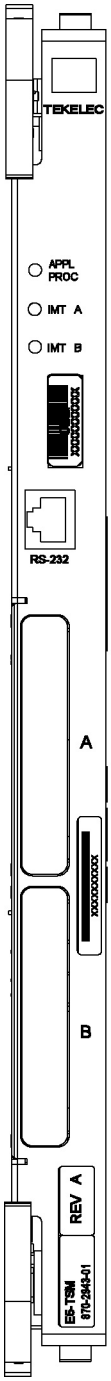
Table 36: E5-TSM Technical Specifications

Power Requirements	
Voltage	-48VDC
Current	624mA
Power	25.6W
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 59: E5-TSM LEDs

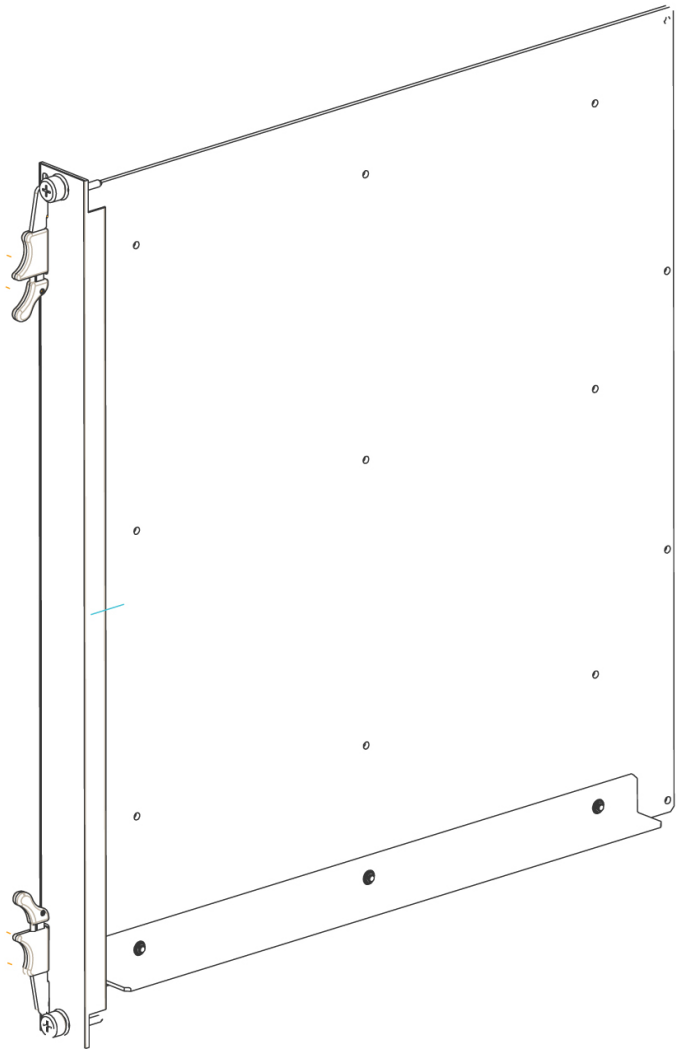


LED	Status	Description
APPL	Red	Not provisioned
	Amber	Provisioned but not loaded
	Green	Loaded
IMT (A or B)	Red	Card is not attached to IMT
	Green	Card is attached to IMT

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 above the 890-0001-04 fan assembly used with HCMIM cards.

Figure 60: Air Management card

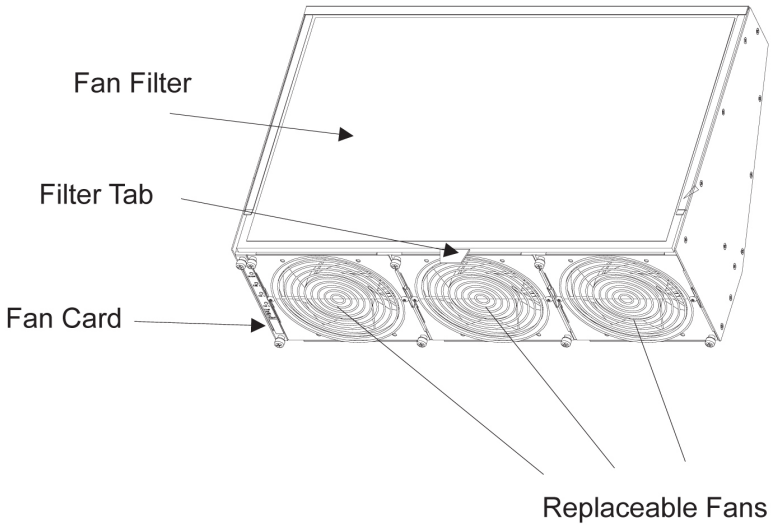


Fan Tray

The EAGLE 5 ISS fan tray P/N 890-0001-04 contains three -48V fans that provide a redundant airflow for thermal management of the shelf. The EAGLE 5 ISS 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 cards are required to be cooled by fan tray P/N 890-0001-04.

Figure 61: 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 5 ISS 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 5 ISS fan tray is designed to be field installable, with mounting brackets, in both a Tekelec 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 5 ISS fan tray is designed to be compliant to Bellcore Standards GR-63-CORE, GR-78-CORE, and GR-1089-CORE when mounted in a Tekelec Heavy Duty Frame or standard frame. The EAGLE 5 ISS fan tray is also designed to be UL and CE compliant. The EAGLE 5 ISS 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.

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 Tekelec personnel.

WARNING

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 870-1831-01. 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 870-1831-02.

CAUTION

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

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 62: Fuse (GMT Brand Shown)*. Refer to the *Maintenance Manual* for procedures on replacing fuses and the FAP assembly.

CAUTION

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

Figure 62: Fuse (GMT Brand Shown)

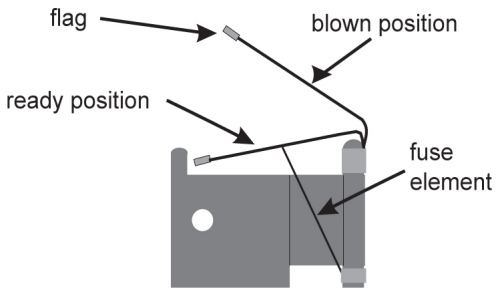


Table 37: Fuse Color Codes of Alarm Flags

Fuse Amp	Fuse Flag Color		Fuse Amp	Fuse Flag Color
0.18A	Orange-Red		2A	Orange
0.2A	Black-Red		2.5A	White-Orange
0.25A	Violet		3A	Blue
0.33A	Yellow-Green		3.5A	White-Blue

Fuse Amp	Fuse Flag Color		Fuse Amp	Fuse Flag Color
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 functon is not available. Refer to the Maintenance Manual for additional information to place the FAP into Maintenance Mode of operation.

Figure 63: Fuse and Alarm Panel - Front View (P/N 870-2804-xx) and *Table 38: 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 63: Fuse and Alarm Panel - Front View (P/N 870-2804-xx)

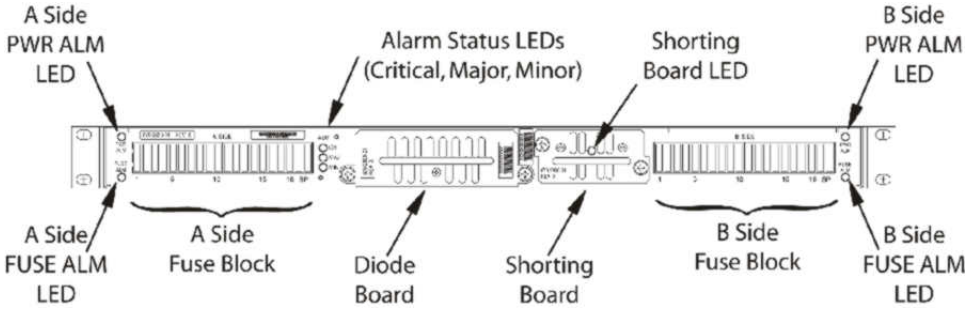


Table 38: Fuse and Alarm Panel Front Items (P/N 870-2804-xx)

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

Table 39: Fuse State and LED condition (P/N870-2804-01). presents possible alarm LED states and corresponding fuse conditions.

Table 39: Fuse State and LED condition (P/N870-2804-01).

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),		Red	Red

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

Figure 64: Fuse and Alarm Panel Rear (P/N870-2804-01). and *Table 40: Fuse and Alarm Panel Rear Items (P/N870-2804-01).* describes the rear panel configuration. Refer to the *Installation Manual* for cabling connection information.

Figure 64: Fuse and Alarm Panel Rear (P/N870-2804-01).

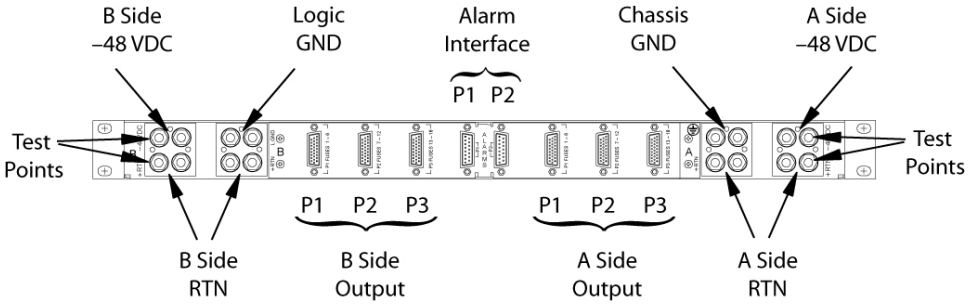


Table 40: Fuse and Alarm Panel Rear Items (P/N870-2804-01).

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: • 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: • P1 - Fuses 1 through 6 • P2 - Fuses 7 through 12

Fuse Panel Item	Description
	• P3 - Fuses 13 through 18
Alarm Interface	15-pin “D” connectors: • P1 to the EAGLE • P2 to a power distribution breaker panel

Table 41: Fuse and Alarm Panel Specifications (P/N870-2804-01). presents the power requirements and physical dimensions for the FAP.

Table 41: Fuse and Alarm Panel Specifications (P/N870-2804-01).

Power Requirements	
Voltage	–48VDC
Current Capacity	60 amp “A” or “B”
Power Dissipation	8 W, no fuse load
Dimensions	
Height Width Depth	1.75 inches (4.4 cm) 21.5 inches (53.8 cm) 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 65: 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 the *Maintenance Manual*

Figure 65: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Front and *Table 42: 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 65: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Front

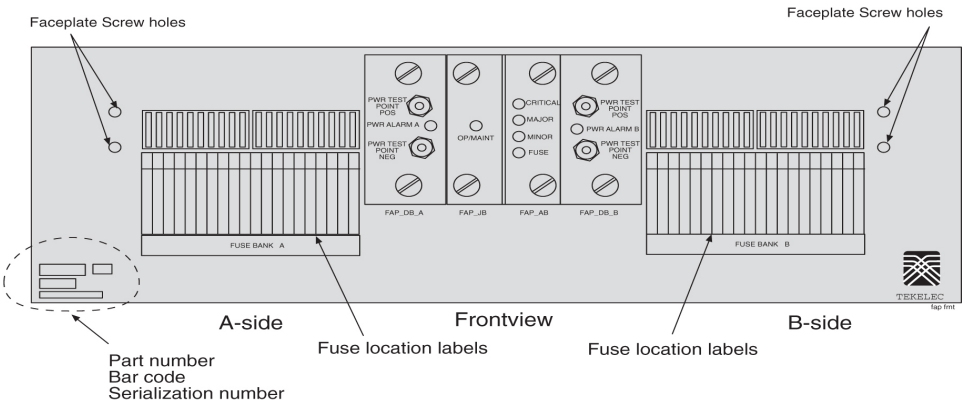


Table 42: Fuse and Alarm Panel Front Items

Fuse Panel Item	Description
Fuse Positions	Two groups of 20 GMT fuses
PWR ALARM	LED indicator for A or B diode board input power • Green - input power applied • Red - no input power to board
OP/MAINT	LED indicator for mode of operation • Green - normal • Red - maintenance
FUSE	LED indicator for fuse fail alarm • 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 66: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear and *Table 43: 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 the *Installation Manual* for cabling connection information.

Figure 66: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear

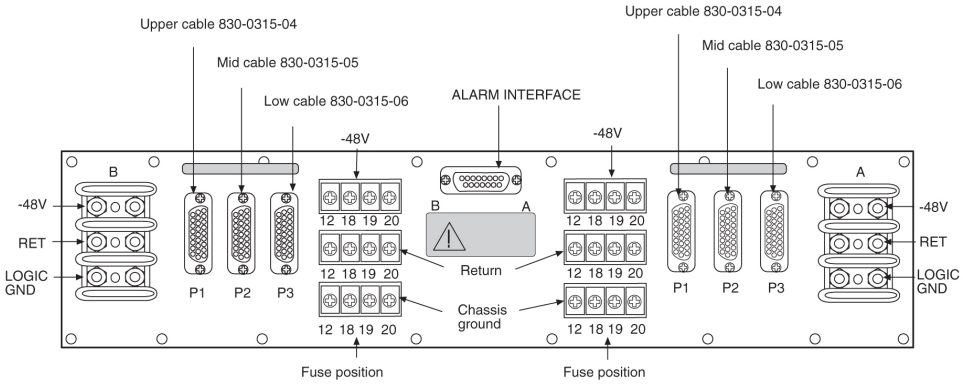


Table 43: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Rear

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

Fuse Panel Item	Description
–48VDC, Chassis Ground, and RTN Outputs B	26-pin "D" connectors, P1, P2, and P3 for B-side outputs.

Table 44: Fuse and Alarm Panel (P/N 870-1606-xx/870-2320-xx) Specifications

Power Requirements	
Voltage	–48VDC
Current Capacity	40 amp "A" or "B" for P/N 870-1606-01 40 amp "A" or "B" for P/N 870-1606-02 Rev A and B 40 amp "A" or "B" for P/N 870-2320-01 Rev A through H 60 amp "A" or "B" for P/N 870-1606-02 Rev C 60 amp "A" or "B" for P/N 870-2320-01 Rev J
Power Dissipation	8 W, no fuse load
Dimensions	
Height Width Depth	3 inches (7.6 cm) 17 inches (43.2 cm) 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 67: 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.

Theholdover 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 68: 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 my be replaced with TOLA cards. For wiring information on TOLA cards see the Installation Manual.

- 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 67: Holdover Clock, Card Location

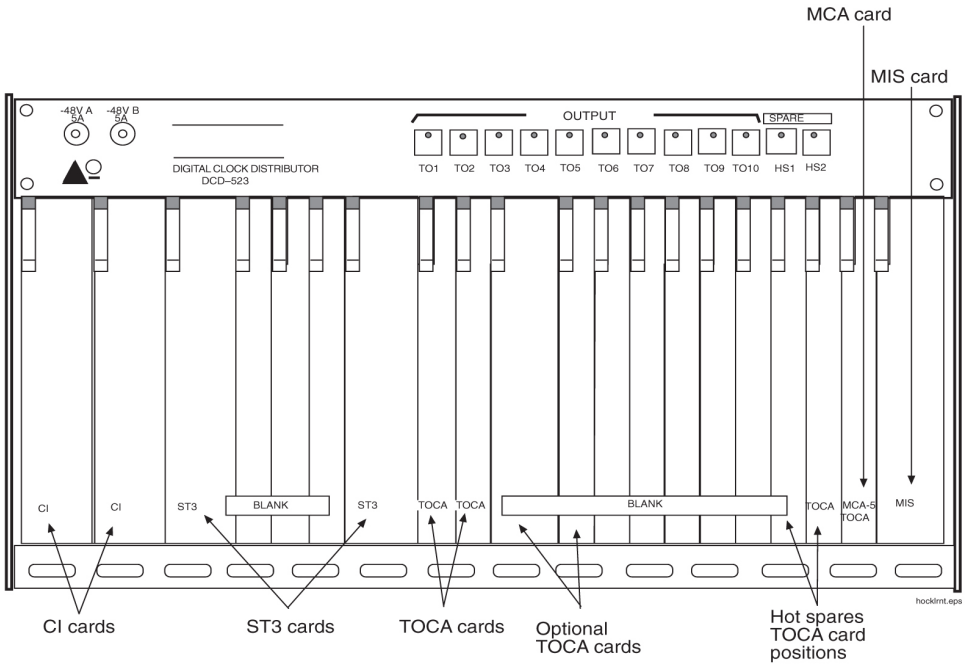
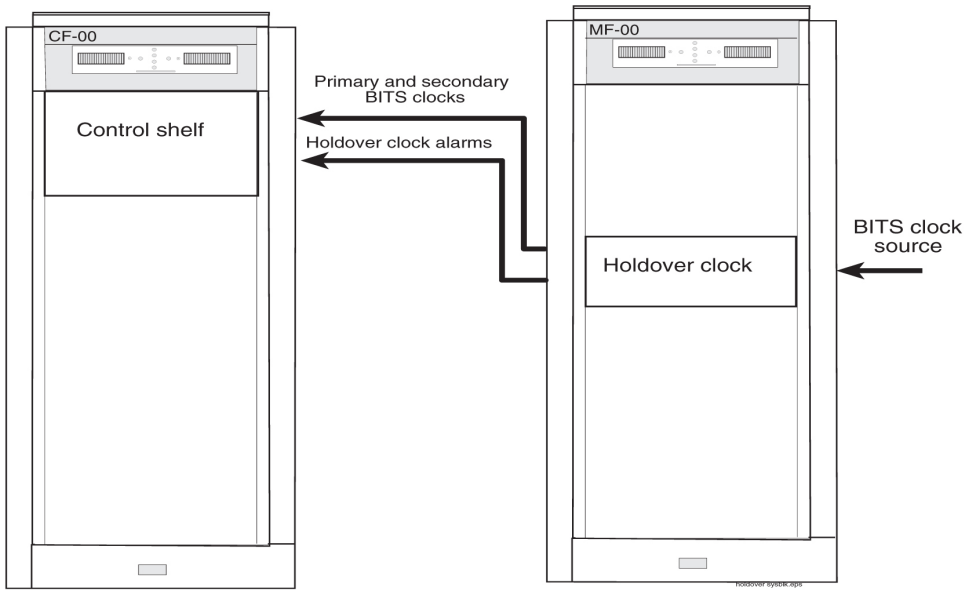


Figure 68: Holdover Clock, Frame Connections



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 69: 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.

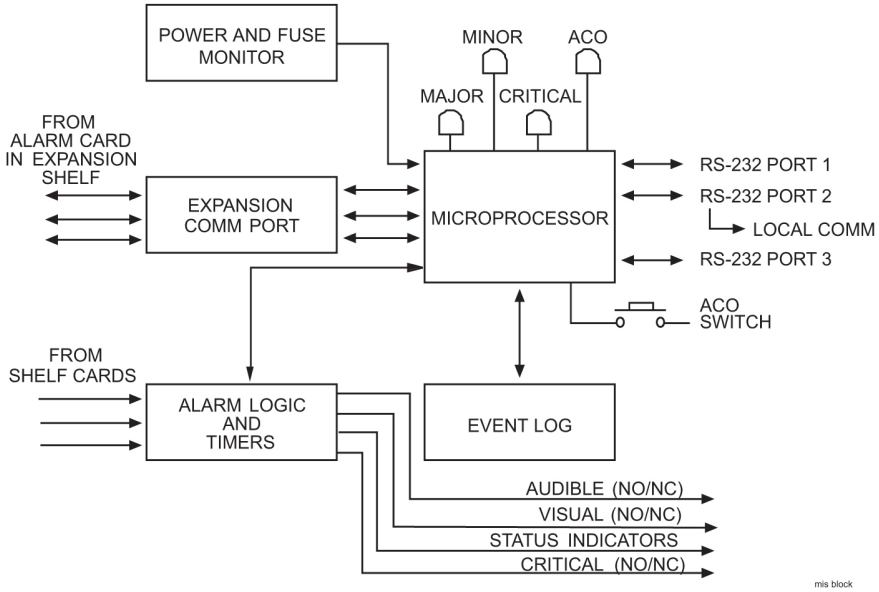
Output alarms from the Timing Output Composite Clock Automatic (TOCA) cards, input reference alarms from the clock inputs, and failure alarms from any card in the shelf are sent to the MIS card. Status indications including clock loss and port alarms are also monitored by the MIS card.

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 69: Maintenance Interface System Card Block Diagram*).

Figure 69: 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 SOURCE ACTIVE 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 eachTOCA 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 PORT ALM 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 the Installation Manual for instructions about cabling both the TOCA and TOLA clock outputs.

MCA Card

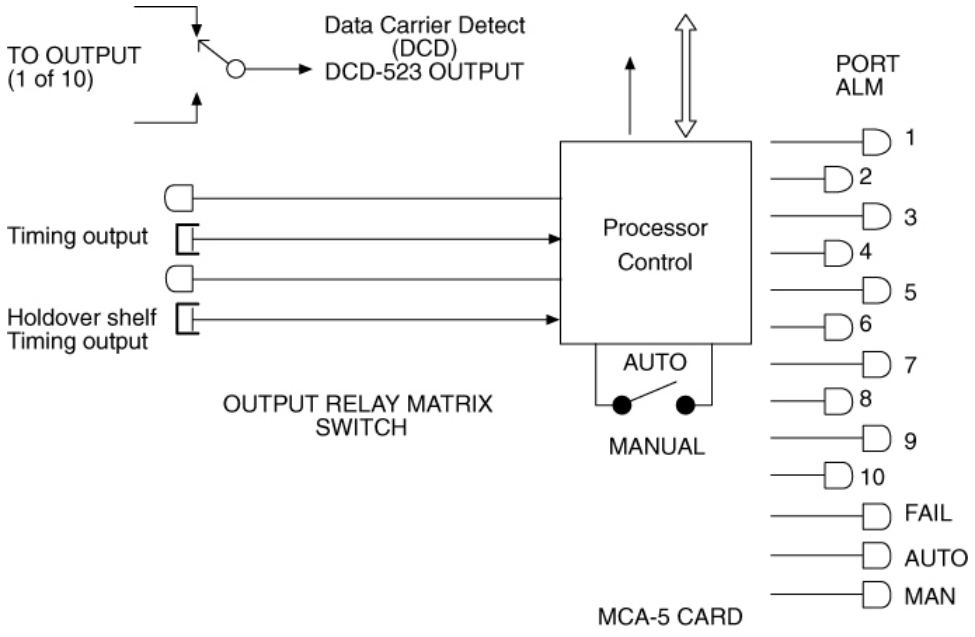
The Matrix Controller Automatic-5 card (MCA)(P/N 804-0251-01) controls the output protection switch matrix just above the holdover shelf and card slots on the hold over clock. It monitors the protection matrix push-button for activation. The MCA card requires the presence of at least one Hot Spare (HS) 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 70: MCA-5 Card and Output Protection Matrix



Chapter 4

Hardware Descriptions - OEM-Based Products

Topics:

OEM-Based Product Descriptions

Original Equipment Manufacturer (OEM)-based products use Common Off-The-Shelf (COTS) components configured in a Tekelec standard or heavy-duty frame. Systems are configured at Tekelec 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 Tekelec 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.

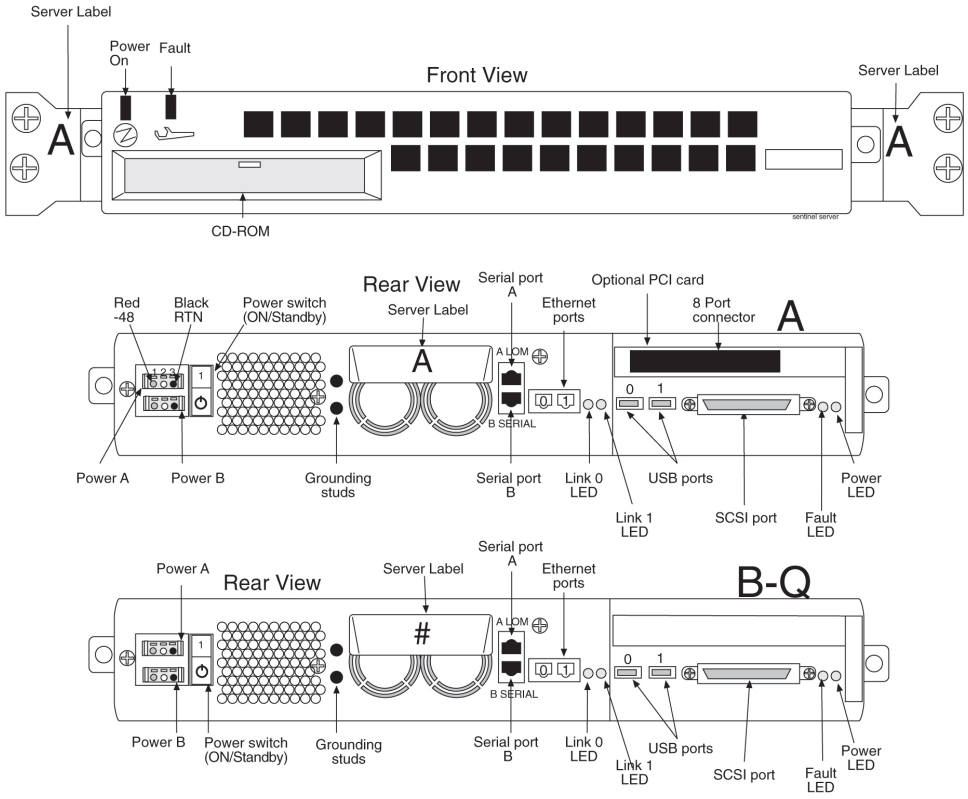
Table 45: System Specifications

Server Node Specifications	
Dimensions and Weight	44.0 mm (1.73 in.)
Height	437.2 mm (17.21 in.)

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

Figure 71: ESP Server Front and Rear Views



ESP Server LEDs

Table 46: 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 46: 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	• ON Operating system stopped • OFF No faults detected • Blinking — Fault detected
Rear Panel	Link Activity	Green	One LED for each standard IP interface (two)

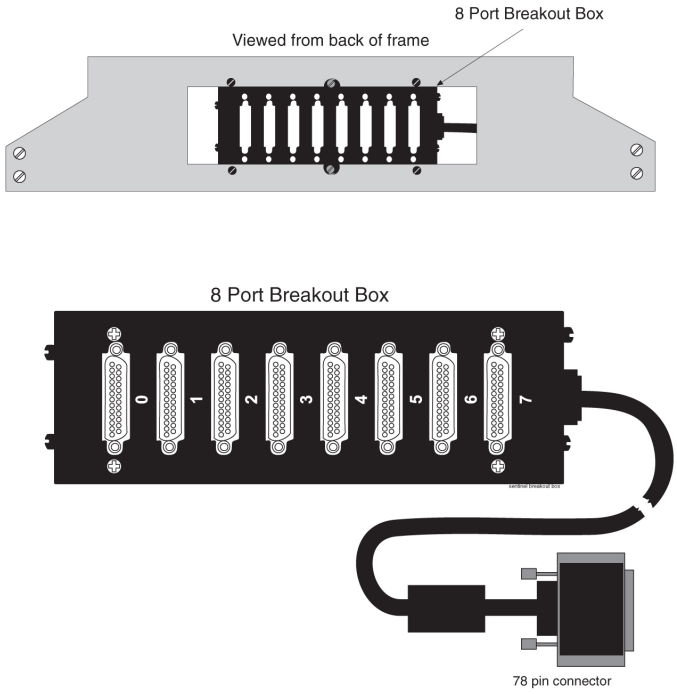
SAI/P Card

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 72: 8-Port Connector* shows the details of the Connector Box.

Figure 72: 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:

- *Ethernet Hubs*
- *Routers*

- *Ethernet Switches*
- *OEM-Based Peripheral Elements*

Ethernet Hubs

The following section provides an overview of the Ethernet hubs used in OEM-based products. The hubs cross-connect the components in OEM-based products functioning as an internal Local Area Network (LAN). The hubs support domain-switched dual-speeds and a maximum of sixteen RJ45 ports each. The chip technology enables hubs to identify and accept either 100 Mbps or 10 Mbps LAN interfaces on a per-port basis.

Figure 73: Hub Front View and *Figure 74: Hub Rear View* show the front and rear views of the hub.

Figure 73: Hub Front View

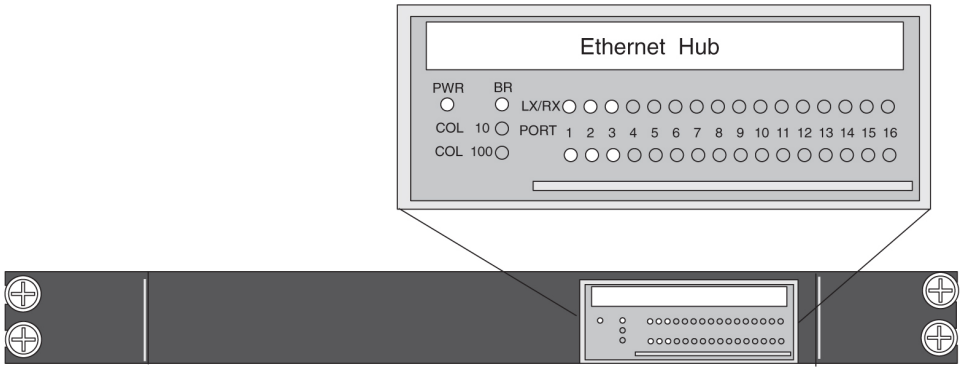


Figure 74: Hub Rear View

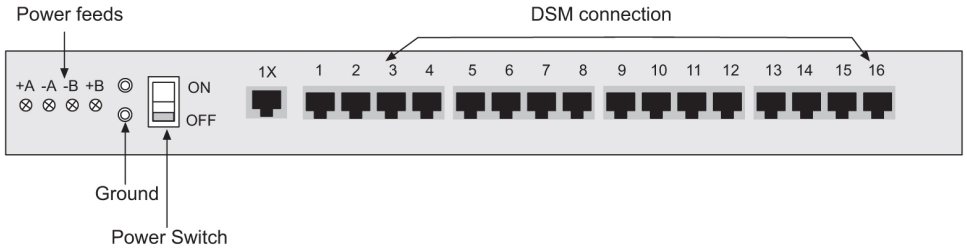


Table 47: Hub LEDs describes the LEDs located on the front of the hubs.

Table 47: Hub LEDs

LED	Color	Description
PWR	Green	Lights whenever the power is applied
COL 10	Red	Intermittent blink during a 10Mbps domain collision
COL 100	Red	Intermittent blink during a 100Mbps domain collision

LED	Color	Description
BR	Green	Lights whenever the bridge module is installed
100/AUTO (Per Port)	Green	• Lights whenever speed is 100 Mbps • Unlit whenever speed is 10 Mbps • Blinks whenever a link is not connected or when auto-negotiating
LK/RX (Per Port)	Green	• Lights steadily whenever port is operational • Blinks whenever port is receiving data

Routers

The routers used in OEM-based products are configured by Tekelec 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 75: Front View Routers* shows the front view of the routers and *Table 48: Router Front LEDs* describes the LED indicator functions on the front of the router.

Figure 75: Front View Routers

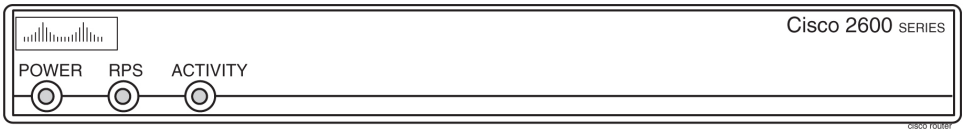


Table 48: Router Front LEDs

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 76: Rear View Isolation Router and *Figure 77: 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 49: Router Rear LEDs* describes the LED indicators on the rear of the routers.

Figure 76: Rear View Isolation Router

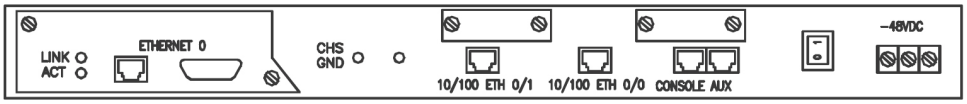


Figure 77: Rear View Dial-in Router

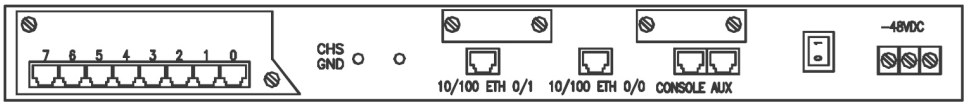


Table 49: Router Rear LEDs

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

Figure 78: Ethernet Switch

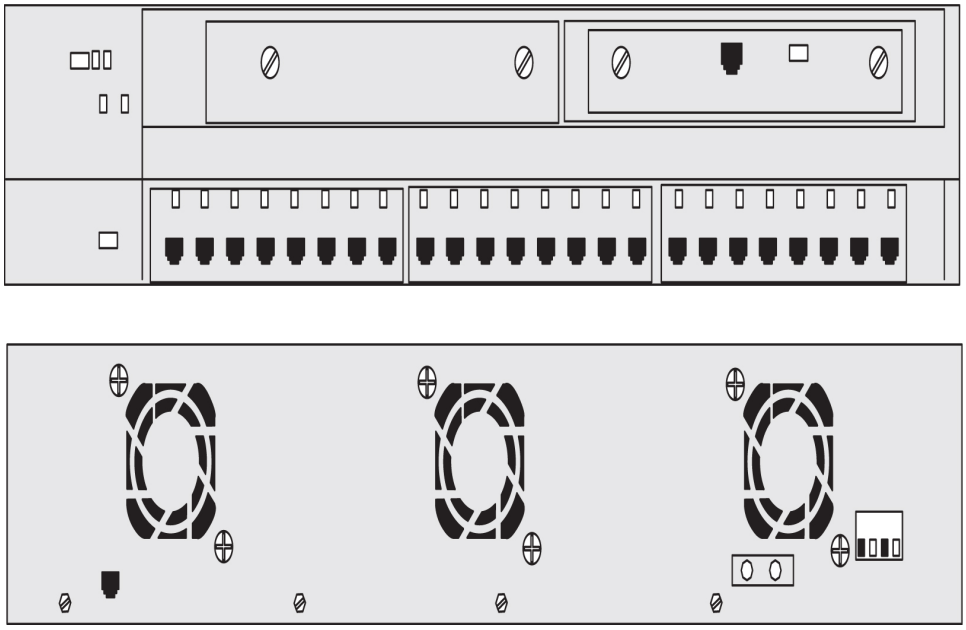


Table 50: Ethernet Switch LEDs describes the LEDs located on the front of the switches.

Table 50: Ethernet Switch LEDs

LED	Description
System	**Green**-Indicates when power is present to the switch and the power switch is in the ON position. **Amber**-Indicates power is present but system is not functioning properly
1 and 2	Indicates expansion boards WS-X2932-XL are installed and functioning LED 1 (Left board) LED 2 (Right board)
RPS (Always OFF)	Off when the redundant power supply is not present. Redudant power supply is not configured
Pressing the MODE switch on the front of the WS-C2924-XL-EN changes the per-port LED indications to the following.	
STAT (port status) Default	**Off**-No link. **Solid green**-Link present. **Flashing green**-Activity. Port is transmitting or receiving data. **Alternating green/amber**-Link fault. Error frames can affect connectivity, and errors such as excessive collisions, CRC errors, and alignment and jabber errors are monitored for a link-fault indication.

LED	Description
	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 scuffle all port LEDs are green, the switch is using 50 percent or more of its total bandwidth capacity. If the right-most LED is amber, the switch is using less than 50 percent of its total bandwidth. If the LED to the left of the right-most LED is amber, the switch is using less than 25 percent of its total capacity, and so on.
FDUP (port full-duplex)	**Off**-Port is operating in half duplex. **Green**-Port is operating in full duplex.
100 (port speed)	**Off**-Port is operating at 10 Mbps. **Green**-Port is operating at 100 Mbps.

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 79: Telect Breaker Panel Front View* for the location of the breaker panel drip tray.

Figure 79: Telect Breaker Panel Front View shows the details of the front view of the breaker panel

Figure 79: Telect Breaker Panel Front View

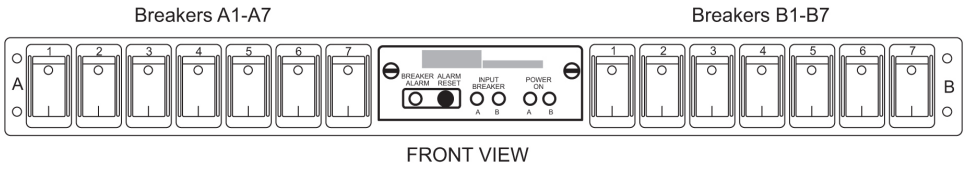
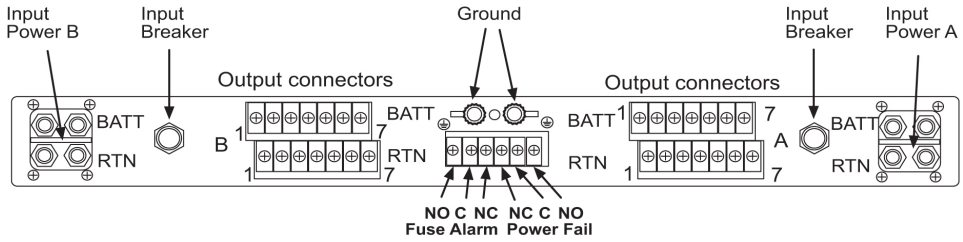


Figure 80: Telect Breaker Panel Rear View shows the rear details of the breaker panel.

Figure 80: 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 81: Telect Breaker Panel Alarms provides details of the alarm panel on the Telect Breaker Panel.

Figure 81: Telect Breaker Panel Alarms

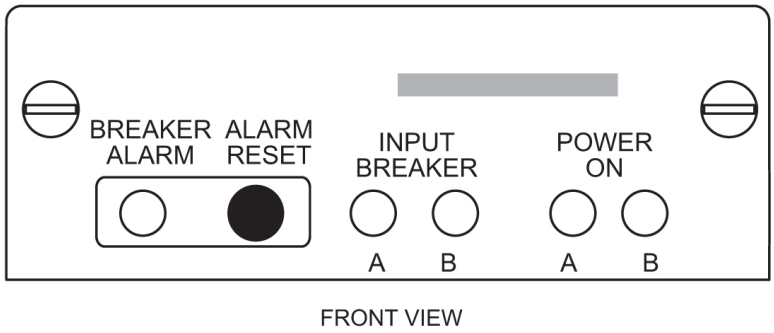


Table 51: Breaker Panel LEDs lists the status LEDs on the Telect Breaker Panel.

Table 51: 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)

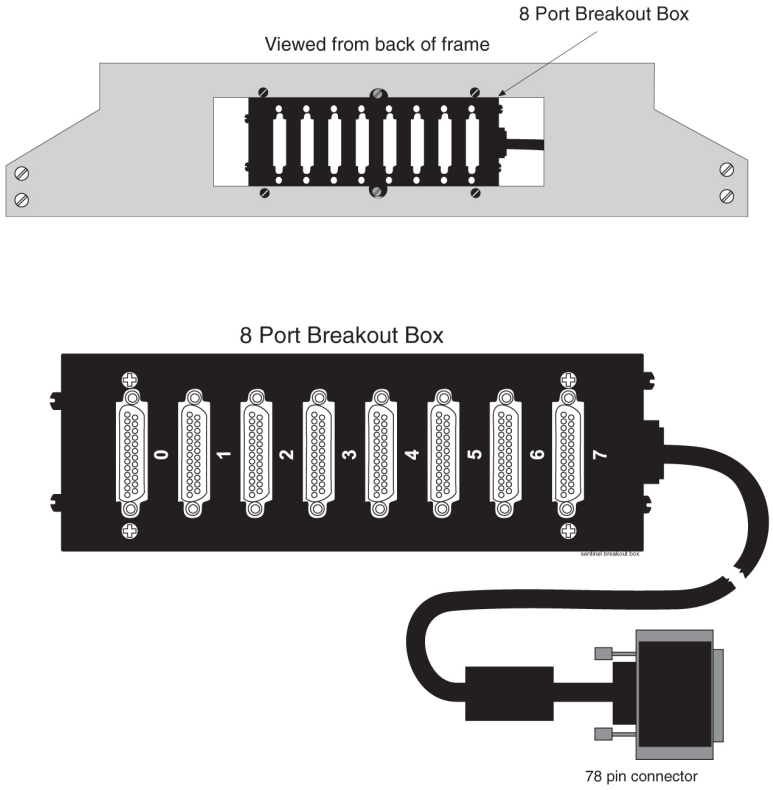
LED	Color	Description
Breaker Alarm	Red	Lights whenever an output circuit breaker has tripped or turned off
Input Breaker A/B	Green	Lights whenever Side A/B is receiving input power (Not lit if input breaker is tripped)

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 AX*i* systems.

Figure 82: Eight Port Breakout Box



Chapter 5

Site Engineering - EAGLE 5 ISS

Topics:

Safety and Cautionary Information

DANGER:

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

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:

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 Tekelec 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 Tekelec 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 OAPs and 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 870-2872-01) 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/m^2). The floor loading is determined by using the following equation:

Total equipment weight/floor area = distributed floor capacity.

Following are the maximum weights of Tekelec frames:

- Maximum weight of EAGLE 5 ISS Control or Extension frames: 850 lbs (386 kg).
- Maximum weight of a two T1000/T1100 server frame (for example, the MPS frame), including AC and DC LSMS frames: 600 lbs (273 kg).
- Maximum weight of an application frame with up to six T1000/T1100 servers: 925 lbs (421 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 (see *Figure 83: 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

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 83: Logic Grounding with FAP (P/N 870-0243-08)* and *Figure 84: Logic Grounding with FAP (P/N 870-1606-xx/870-2320-xx)* for wiring information.

Figure 83: Logic Grounding with FAP (P/N 870-0243-08)

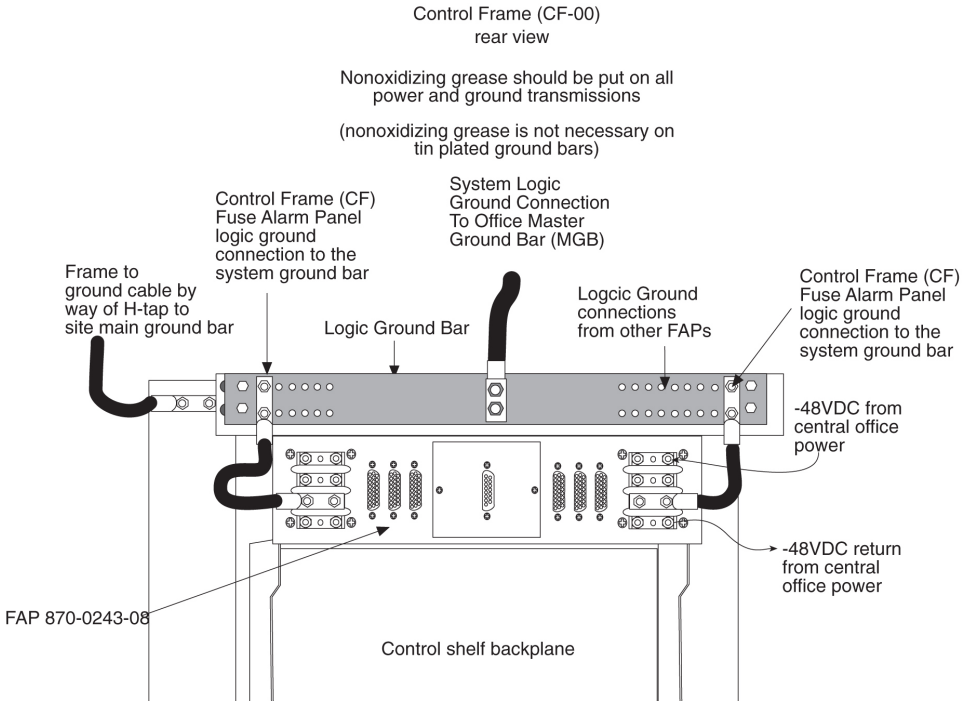
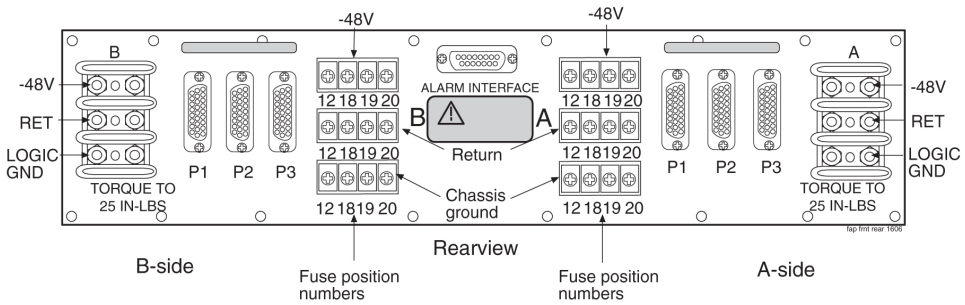
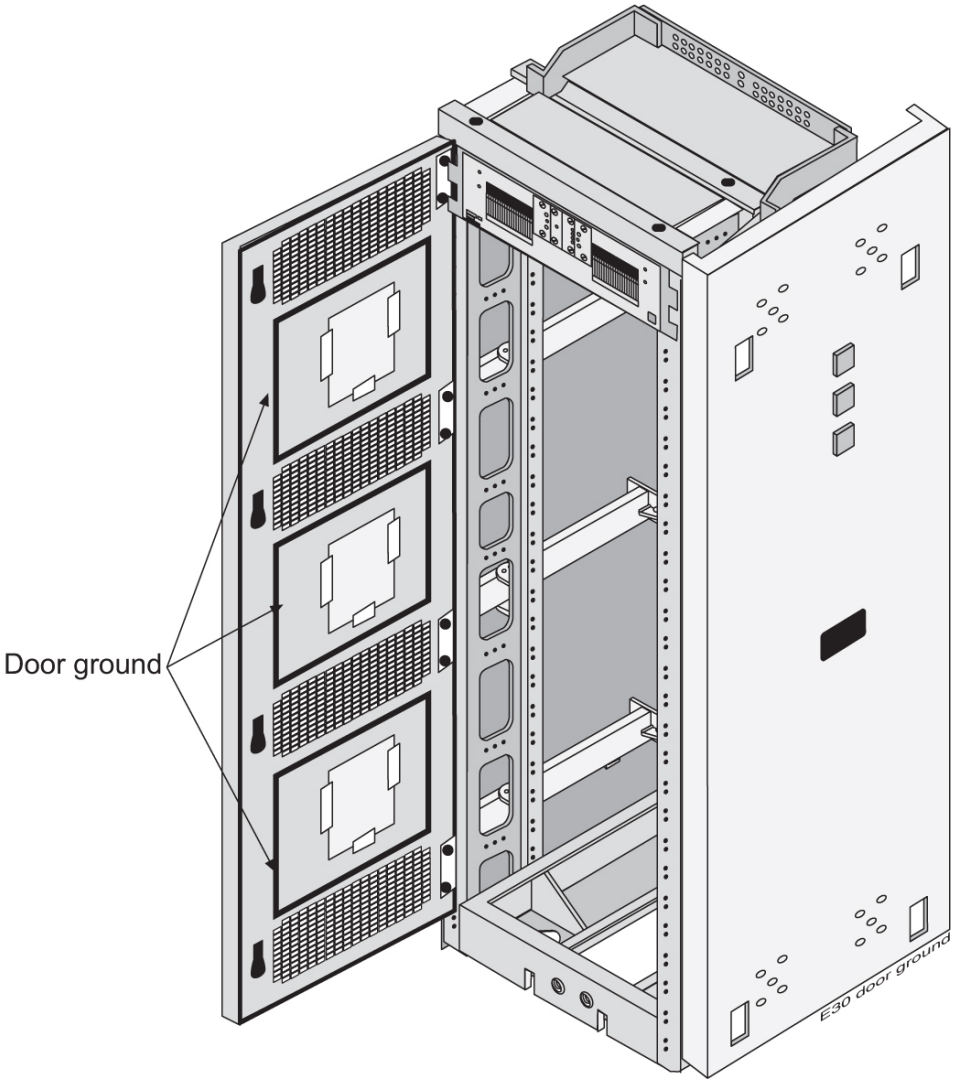


Figure 84: Logic Grounding with FAP (P/N 870-1606-xx/870-2320-xx)



The doors installed are grounded to the frame through a double lug ground wire (see *Figure 85: Door Grounding*) and through a screw-down latch.

Figure 85: 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 0.6 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.

Link Interface Module (LIM) Requirements

Procedure – Link Interface Module Requirements

Total the following items to determine LIM requirements; any fractional items should be rounded up to the next whole number.

Low-Speed Link Interface module (LSLIM):

- SS7 DSOA links/2
- SS7 OCU links/2
- E1 links/2

+1 ILA +1= total LIM requirements

High Speed Link Interface Module (HSLIM):

- SS7 ATM/T1 links

+1= total LIM requirements

Message Flow Control (MFC)

Message Flow Control allows an Eagle card to 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 flow controls any and all traffic across the IMT.

MFC is a framework allowing 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. Either TVG or MFC can be used, but not both at the same time.

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 services and system 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).

Cards Type Requirements for SCCP Application with Group Ticket Voucher (TVG)

Group Ticket Voucher (TVG) allows the EAGLE 5 ISS to assign transactions to available resources. With TVG, EAGLE 5 ISS provisioning for SCCP cards is defined on a transactions per second (TPS) basis, where the desired TPS of the system will be determined by the amount of TSM and DSM cards configured. For example, if the user needs 10,000 TPS (regardless of the number of links) 12 (10,000/850) TSM cards or six (10,000/ 1700) DSM cards should be configured. TPS values for individual LIM card types are.

- 53 TPS for low-speed links
- 480 TPS for ATM links
- 1000 TPS for IPMLIM links

The number of TVG requests that can be made per card is a function of the number of cards in the system, and decreases as the number of active cards increase. It is approximately 1/(Nx10-6) for N cards. For a system with 250 cards, it is limited to about 3300 TVG requests/second. With the introduction of the MPL card, in a non-HMUX system, there cannot be more than 131 cards (MPL, SCCP, and SLAN) in the system.

CAUTION: It is Tekelec's recommendation that cards running the SCCP application be uniformly distributed in the EAGLE 5 ISS to provide a more even SCCP load distribution. During normal operation unevenly distributed SCCP cards in an EAGLE 5 ISS would not have any network or system impacts. However, should a particular SCCP 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.

Note: The MPL card improves the functionality of SS7 routing within the EAGLE 5 ISS by increasing the number of SS7 links theEAGLE 5 ISS can handle for each LIM card. This allows the EAGLE 5 ISS to interact in larger SS7 networks as well as decreasing the size of an EAGLE 5 ISS (for example, previously 250 cards would be required to support 500 links, now only 63 MPL cards are required).

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

The Database Communications Module (DCM) (P/N 870-1671-xx or P/N 870-1945-01) can be used in EAGLE 5 ISS 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 5 ISS systems.

The DCM card is compatible with EAGLE 5 ISS 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 Cards

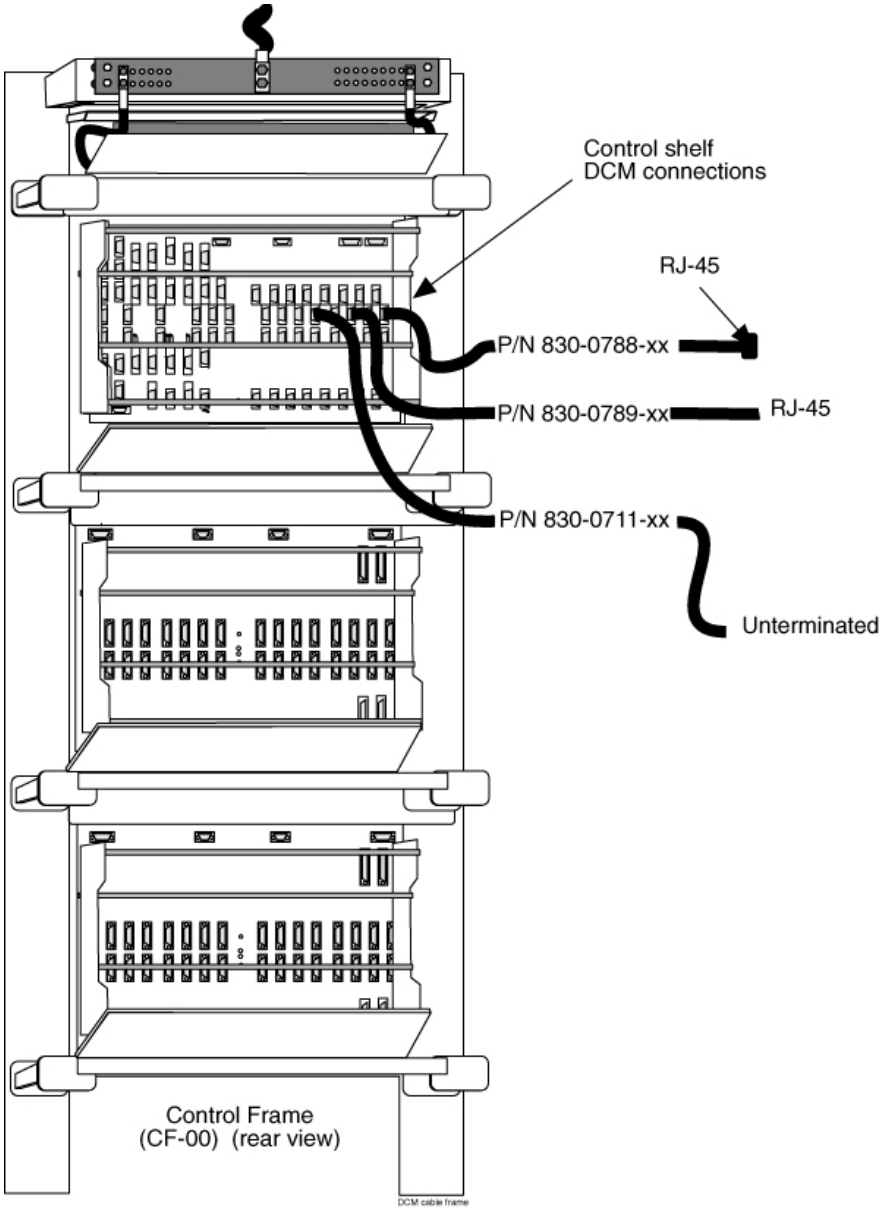
The DCM, EDCM, and E5-SM4G cards support only Category 5 (100-Ohm) shielded twisted pair cables. In order to meet Electromagnetic Interference (EMI) requirements, the cards may require a point-to-point connection or a connection to a hub/router. This must be identified to the customer who may be preparing 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-BASE TX interface to unterminated (P/N 830-0711-xx)

Figure 86: 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 5 ISS 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 HMUX and MAS dedicated card slots.

Single-Slot EDCM and EDCM-A

The Single-Slot Enhanced Data Communications Module EDCM (P/N 870-2372-01) and EDCM-A (P/N 870-2508-02) require only a single frame slot. It can be placed into any slot, odd or even, which has been provisioned for an Enhanced Data Communications Module (EDCM). Otherwise it duplicates the performance of the Double-Slot EDCM.

Note: Cards may be provisioned in any slot where they physically fit except for the HMUX and MAS dedicated card slots.

The following cards can be configured from the single-slot EDCM and have these provisioning requirements:

- Signaling Transport Cards (STC) can be provisioned in any slot to support an Integrated Applications System (IAS) such as the Integrated Sentinel. Only three STC cards may be provisioned on each shelf.
- General Purpose Service Modules (GPSM-II) cards can be provisioned in card slots (1113 and 1115).
- Measurements Collection and Polling Modules (MCPM) can be provisioned an any slot.

Appendix A

Hardware Baselines

Topics:

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 5 ISS Release 41.0 through 41.1 in *EAGLE 5 ISS Release 41.0 Through 42.0* .
- EAGLE 5 ISS Cable Assemblies and Adapters:
  - E1 Cable Assemblies in *Table 53: E1 Cable Assemblies*
  - T1 MIM LIM Cable Assemblies *Table 54: T1 MIM LIM Cable Assemblies*
  - Terminal/Printer Cables and Adapters *Table 58: Terminal/Printer Cables and Adapters*
  - Modem Cables and Adapters *Table 59: Modem Cables and Adapters*
  - Tekelec 1000 Site Specific Cables *Table 60: Tekelec Application Server Site Specific Cables*

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 5 ISS Release 41.0 Through 42.0

Table 52: Hardware Baseline EAGLE 5 ISS Release 41.0 Through 42.0

NAME	PART NUMBER	REV	41.0	41.1	42.0
Air Management Card	870-1824-01	A	X *Step 17*	X *Step 17*	X *Step 17*
Air Management Card	870-1824-02	A	X *Step 17*	X *Step 17*	X *Step 17*
CTRL SHELF	870-0775-03	E	X *Step 13*	X *Step 13*	X *Step 13*
CTRL SHELF	870-2321-02	A	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*
CTRL SHELF	870-2321-08	A	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*

NAME	PART NUMBER	REV	41.0	41.1	42.0
CTRL SHELF	870-2377-02	A	X *Step 3*, *Step 7*	X *Step 3*, *Step 7*	X *Step 3*, *Step 7*
DCM	870-1945-01	A	X	X	X
DCM	870-1945-02	A	X	X	X
DCM	870-1945-03	A	X	X	X
DCMX	870-1984-01	A	X	X	X
DSM, (1) GB MEM	870-1984-02	A3	X	X	X
DSM, (1) GB MEM	870-1984-08	A	X *Step 19*	X *Step 19*	X *Step 19*
DSM, (1) GB MEM	870-1984-09	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
DSM, (1) GB MEM	870-1984-15	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
DSM, (1) GB MEM	870-1984-17	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
DSM, (1) GB GPSM-II Based	870-2371-02	A	X *Step 19*	X *Step 19*	X *Step 19*
DSM, (1) GB GPSM-II Based	870-2371-06	A	X *Step 19*	X *Step 19*	X *Step 19*
DSM, (1) GB GPSM-II Based	870-2371-08	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
DSM, (1) GB GPSM-II Based	870-2371-13	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
DSM, (2) GB MEM	870-1984-03	A	X	X	X
DSM, (4) GB MEM	870-1984-05	A	X	X	X

NAME	PART NUMBER	REV	41.0	41.1	42.0
DSM, (4) GB MEM	870-1984-06	A	X *Step 19*	X *Step 19*	X *Step 19*
DSM, (4) GB MEM	870-1984-07	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
DSM, (4) GB MEM	870-1984-13	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
DSM, (4) GB MEM	870-1984-16	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
E1/T1 MIM	870-2198-01	G	X	X	X
E1/T1 MIM	870-2198-02	A	X	X	X
E1/T1 MIM	870-2198-03	A	X *Step 19*	X *Step 19*	X *Step 19*
E1/T1 MIM	870-2198-04	A	X *Step 19*	X *Step 19*	X *Step 19*
E1/T1 MIM	870-2198-07	A	X *Step 19*, *Step 21*	X *Step 19*, *Step 21*	X *Step 19*, *Step 21*
E1-ATM	870-2455-01	B	X	X	X
E1-ATM	870-2455-02	B	X	X	X
E1-ATM	870-2455-03	A	X *Step 20*	X *Step 20*	X *Step 20*
E1-ATM	870-2455-05	A	X *Step 20*	X *Step 20*	X *Step 20*
E5-ATM	870-1872-01	A	X *Step 22*	X *Step 22*	X *Step 22*
E5-ATM	870-1872-02	A	X *Step 22*	X *Step 22*	X *Step 22*
E5-E1T1	870-1873-02	A	X *Step 22*	X *Step 22*	X *Step 22*
E5-E1T1	870-1873-03	A	X *Step 22*	X *Step 22*	X *Step 22*
E5-E1T1	870-1873-04	A	X *Step 22*	X *Step 22*	X *Step 22*

NAME	PART NUMBER	REV	41.0	41.1	42.0
E5-ENET	870-2212-02	A	X Step 22	X Step 22	X Step 22
E5-ENET	870-2212-03	A	X Step 22	X Step 22	X Step 22
E5-ENET	870-2212-04	A	X Step 22	X Step 22	X Step 22
E5-ENET	870-2212-05	A	X Step 22	X Step 22	X Step 22
E5-IPSM	870-2877-01	A	X Step 22	X Step 22	X Step 22
E5-IPSM	870-2877-02	A	X Step 22	X Step 22	X Step 22
E5-MASP	870-2900-01	A	X Step 22 Step 26,	X Step 22 Step 26,	X Step 22 Step 26,
E5-MDAL	870-2903-01	C	X Step 22 Step 25	X Step 22 Step 25	X Step 22 Step 25
E5-SM4G (Double-slot)	870-2860-01	F	X Step 22	X Step 22	X Step 22
E5-SM4G (Double-slot)	870-2860-02	A	X Step 22	X Step 22	X Step 22
E5-TSM	870-2943-03	B	X Step 22	X Step 22	X Step 22
EDCM (Single-slot)	870-2372-01	E	X	X	X
EDCM (Single-slot)	870-2372-08	A	X Step 20, Step 23	X Step 20, Step 23	X Step 20, Step 23
EDCM (Single-slot)	870-2372-13	A	X Step 20, Step 23	X Step 20, Step 23	X Step 20, Step 23
EDCM-A (Single-slot)	870-2508-01	A	X Step 19, Step 24	X Step 19, Step 24	X Step 19, Step 24

NAME	PART NUMBER	REV	41.0	41.1	42.0
EDCM-A (Single-slot)	870-2508-02	A	X *Step 19*, *Step 24*	X *Step 19*, *Step 24*	X *Step 19*, *Step 24*
EDSM-2G (MCPM)	870-2372-03	A	X	X	X
EDSM-2G (MCPM)	870-2372-07	A	X *Step 19*	X *Step 19*	X *Step 19*
EDSM-2G (MCPM)	870-2372-09	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
EDSM-2G (MCPM)	870-2372-14	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
EDSM-2G (MCPM)	870-2372-15	A	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*	X *Step 19*, *Step 20*
EXTN SHELF	870-0776-02	C	X *Step 27*	X *Step 27*	X *Step 27*
EXTN SHELF	870-0776-03	D	X *Step 27*	X *Step 27*	X *Step 27*
EXTN SHELF	870-0776-06	A	X	X	X
EXTN SHELF	870-0776-07	A	X	X	X
EXTN SHELF	870-0776-08	A	X	X	X
EXTN SHELF	870-0776-11	A	X	X	X
EXTN SHELF	870-2378-01	A	X *Step 5*	X *Step 5*	X *Step 5*
EXTN SHELF	870-2378-02	A	X *Step 5*	X *Step 5*	X *Step 5*
FAP	870-1606-01	A	X	X	X
FAP	870-1606-02	A	X *Step 4*	X *Step 4*	X *Step 4*

NAME	PART NUMBER	REV	41.0	41.1	42.0
FAP	870-1606-02	C	X Step 15	X Step 15	X Step 15
FAP	870-1606-05	A	X Step 15	X Step 15	X Step 15
FAP	870-1823-01	B	X	X	X
FAP	870-2320-01	A	X Step 5	X Step 5	X Step 5
FAP	870-2320-01	J	X Step 14	X Step 14	X Step 14
FAP	870-2320-03	A	X Step 5	X Step 5	X Step 5
FAP- CF/EF	870-0243-08	C	X	X	X
FAP- MISC	870-0243-09	C	X	X	X
FAP	870-2804-01	B	X	X	X
GPSM-II	870-2360-01	E	X Step 10	X Step 10	X Step 10
GPSM-II	870-2360-05	A	X Step 19	X Step 19	X Step 19
GPSM-II	870-2360-06	A	X Step 19, Step 20	X Step 19, Step 20	X Step 19, Step 20
GPSM-II	870-2360-08	A	X Step 19, Step 20	X Step 19, Step 20	X Step 19, Step 20
GPSM-II	870-2360-09	A	X Step 19, Step 20	X Step 19, Step 20	X Step 19, Step 20
HCMIM	870-2671-01	P	X Step 16	X Step 16	X Step 16
HCMIM	870-2671-02	B	X Step 16	X Step 16	X Step 16
HCMIM	870-2671-03	A	X Step 16	X Step 16	X Step 16
HIPR	870-2574-01	D	X	X	X
HIPR	870-2574-02	A	X	X	X

NAME	PART NUMBER	REV	41.0	41.1	42.0
HIPR2	870-2872-01	A		X Step 28	X Step 28
HIPR2	870-2872-02	A		X	X
HMUX	870-1965-01	A	X Step 11	X Step 11	X Step 11
HMUX	870-1965-03	A	X Step 11	X Step 11	X Step 11
LIM-ATM (1) 4Mb RAM	870-1293-02	A	X Step 8	X Step 8	X Step 8
LIM-ATM (2) 4Mb RAM	870-1293-03	A	X Step 8	X Step 8	X Step 8
LIM-ATM	870-1293-06	A	X Step 9	X Step 9	X Step 9
LIM-ATM	870-1293-07	A	X Step 9	X Step 9	X Step 9
LIM-ATM	870-1293-08	B	X Step 9	X Step 9	X Step 9
LIM-ATM	870-1293-10	A	X Step 9,Step 21	X Step 9,Step 21	X Step 9,Step 21
LIM-ATM	870-1293-13	A	X Step 9,Step 21	X Step 9,Step 21	X Step 9,Step 21
MDAL	870-0773-04	B	X	X	X
MDAL	870-0773-05	A	X	X	X
MDAL	870-0773-06	A	X	X	X
MDAL	870-0773-08	A	X	X	X
MDAL	870-0773-09	A	X	X	X
MDAL	870-0773-10	A	X	X	X
MPL	870-2061-01	A	X	X	X

NAME	PART NUMBER	REV	41.0	41.1	42.0
MPL	870-2061-03	A	X Step 19	X Step 19	X Step 19
MPL	870-2061-04	A	X Step 19, Step 21	X Step 19, Step 21	X Step 19, Step 21
MPL	870-2061-06	A	X Step 19, Step 21	X Step 19, Step 21	X Step 19, Step 21
TDM	870-0774-10	A	X Step 6, Step 7, Step 12	X Step 6, Step 7, Step 12	X Step 6, Step 7, Step 12
TDM	870-0774-11	A	X Step 12	X Step 12	X Step 12
TDM-GTI	870-0774-15	B	X Step 12	X Step 12	X Step 12
TDM-GTI	870-0774-18	A	X Step 12	X Step 12	X Step 12
TSM-256	870-1289-02	A	X	X	X
TSM-256	870-1289-03	A	X	X	X
TSM-256	870-1289-04	A	X	X	X
TSM-256	870-1289-06	A	X	X	X
TSM-256	870-1289-07	A	X	X	X
TSM-512	870-1290-02	A	X	X	X
TSM-512	870-1290-03	A	X	X	X
TSM-512	870-1290-04	A	X	X	X
TSM-768	870-1291-02	A	X	X	X
TSM-768	870-1291-03	A	X	X	X
TSM-768	870-1291-04	A	X	X	X
TSM-1024	870-1292-02	A	X	X	X

NAME	PART NUMBER	REV	41.0	41.1	42.0
TSM-1024	870-1292-03	A	X	X	X
TSM-1024	870-1292-04	A	X	X	X
FAN ASSY	890-1038-01	D	X	X	X
FAN ASSY	890-0001-01	A	X Step 18	X Step 18	X Step 18
FAN ASSY	890-0001-02	A	X Step 18	X Step 18	X Step 18
FAN ASSY	890-0001-04	A	X Step 18	X Step 18	X Step 18
KIT, E1	890-1037-01	A	X	X	X
KIT, E1	890-1037-06	A	X	X	X
KIT, HLDOVR CLK ASSY	890-1013-01	A	X	X	X
MPS in Heavy Duty Frame	890-1801-01	E	X	X	X
MPS in Heavy Duty Frame	890-1801-02	A	X	X	X
MPS DC Frame	890-1843-01	C	X	X	X
MPS DC Frame	890-1843-02	A	X	X	X
MPS Netra-to-Tekelec 1000 Field Upgrade Kit	870-2735-01	A	X	X	X
MPS Netra-to-Tekelec 1000 Field Upgrade Kit	870-2735-02	A	X	X	X

EAGLE 5 ISS Cable Assemblies and Adapters

Table 53: E1 Cable Assemblies

Tekelec 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 54: T1 MIM LIM Cable Assemblies

Tekelec P/N		Description
non-ROHS	ROHS	
830-0949-xx	830-1198-01	T1 LIm to MPL Cable Adapter
830-0948-xx	830-1197-xx	T1 MIM Lim XX ft. Unterminated
830-0857-xx	830-1185-01	Adapter A Clk in HMUX
830-0846-xx	830-1183-01	DB-25M to DB-25F and DB-15F Y Clk / HS Timing

Table 55: E5-ATM Adapters

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

Table 56: ENET Adapters

Tekelec 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

Tekelec P/N	Description
830-1104-03	DB-26M to RJ45 10/100/1000

Table 57: Fast Copy Adapters

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

Table 58: Terminal/Printer Cables and Adapters

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

Table 59: Modem Cables and Adapters

Tekelec 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 60: Tekelec Application Server Site Specific Cables

Tekelec P/N		Description
non-ROHS	ROHS	

Tekelec P/N		Description
830-0963-xx	830-1201-xx	Optional DB9F/DB25M 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

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 HMUX cards in Tekelec standard frames.
3. Control shelf P/N 870-2377-02 with backplane P/N 850-0330-06 can be used in Tekelec heavy-duty frames.
4. Required for Tekelec standard frames. Rev. C required for HCMIM shelves.
5. Required for Tekelec heavy-duty frames. Rev. J required for HCMIM shelves.
6. Required for Master Timing Feature (T1 clocking).
7. Required for HMUX 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 5 ISS Software Release 30.0 all MCAP cards must be replaced by GPSM-II cards (P/N 870-2360-01). GPSM-II cards are installed at the factory or by Tekelec Technical Support and are not installed by customers.
11. Beginning with EAGLE 5 ISS Software Release 30.0 all IPMX cards must be replaced by High-Speed Multiplexer (HMUX) cards (P/N 870-1965-03). Beginning with EAGLE 5 ISS software release 33.0, all IPMX cards must be replaced by either HMUX cards or High-Speed IMT Router (HIPR) Cards (P/N 870-2574-02). A mixture of HMUX and HIPR cards within one IMT ring is possible, provided HIPR is installed on both IMT A and IMT B on a given shelf. HMUX and HIPR cards are installed at the factory or by Tekelec Technical Support and are not installed by customers.
12. Beginning with EAGLE 5 ISS Software Release 30.0 Terminal Disk Module (TDM) cards must be P/N 870-0774-10 and later.
13. NEBS will support HMUX with minor modifications and cable 830-1185-01. NEBS will support Master Timing with adapter 830-1183-01.
14. 60 Amp FAP required for Tekelec Heavy-duty frames that contain shelves with HCMIM modules.
15. 60 Amp FAP required for standard frames that contain shelves with HCMIM modules.
16. Requires two HIPR modules for each shelf containing HCMIM, and requires fan tray 890-0001-04.
17. Required in all empty slots in shelves when using fan tray 890-0001-xx.

18. Required for shelves that contain HCMIM modules.

19. Has K6 II processor.

20. Has COMM processor adapter.

21. Has PQFP processor.

22. Requires HIPR 870-2574-xx or 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 870-2900-xx).

26. Requires E5-MDAL (P/N 870-2903-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.

Glossary

A

AATM	ATM Appliqué
AC	Alternating Current Application Context Authentication Center Area Code
ACT	Activate
AINF	Application Interface Appliqué An integrated appliqué that supports the DS0A, DSCS and V.35 interfaces on the same appliqué. The AINF appliqué can be configured as either a DS0A, OCU, or V.35 interface from the user terminal.
ALM	Alarm Card
ANSI	American National Standards Institute An organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system. ANSI develops and publishes standards. ANSI is a non-commercial, non-government organization which is funded by more than 1000 corporations, professional bodies, and enterprises.
AP	Application Processor
AS	Application Server

A

	A logical entity serving a specific Routing Key. An example of an Application Server is a virtual switch element handling all call processing for a unique range of PSTN trunks, identified by an SS7 DPC/OPC/CIC_range. Another example is a virtual database element, handling all HLR transactions for a particular SS7 DPC/OPC/SCCP_SSN combination. The AS contains a set of one or more unique Application Server Processes, of which one or more normally is actively processing traffic.
	Application Simulator
	Test tool that can simulate applications and/or SMSCs.
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.
ATMANSI	The application used for high-speed ANSI ATM signaling links.

B

BITS	Building Integrated Timing System
	The Building Integrated Timing System (BITS) clocks come directly from the central office BITS clock

B

	source or indirectly from an optional holdover clock installed in the system.
BP	Board Prom

C

CC	Country Code
CD	Carrier Detect Compact Disk
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	Clock Interface Card
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 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.

C

	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 5 ISS and perform OAM, TDM, and database functions for the EAGLE 5 ISS. 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.
Control Shelf	The shelf in the EAGLE 5 ISS 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 (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	Communications Processor
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check

C

	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
DC	Direct Current
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

D

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. 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

E

	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-E1T1	EPM-based E1/T1 Multi-Channel Interface Module An EPM-based card that provides E1 and T1 connectivity. The E5 indicates the card is for existing EAGLE 5 control and extension shelves. 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).
EBI	Extended Bus Interface A local bus and not connected to the IMT bus. This allows every two card locations to communicate with each other without going over the IMT bus.
EDCM	Enhanced Database Communication Module
EF	Extension Frame
ELAP	EAGLE Local Number Portability Application Processor

E

EMI	External Machine Interface Protocol used to connect to SMSCs, developed by LogicaCMG.
ENET	Can refer to a generic hardware type that supports one or more Ethernet interfaces.
EOAM	Enhanced Operation, Administration, and Maintenance The application used by the GPSM-II card for enhanced OAM functions.
EPAP	EAGLE Provisioning Application Processor
EPM	Embedded Platform Module 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. Embedded Processor Module A card that contains an Intel Celeron 1GHz processor, 256MB RAM, and other enhancements, intended as replacement for K6 DCM-class cards.
EPROM	Erasable Programmable Read Only Memory A type of storage device in which the data is determined by an electrical charge stored in an isolated transistor. The isolation is good enough to retain the charge almost indefinitely (more than ten years) without an external power source. The EPROM is programmed by charging the isolated transistor. The EPROM can be erased by applying ultraviolet light to the chip's surface

E

	through a quartz window in the package, allowing the chip to be reprogrammed.
EROUTE	The application used on the Signaling Transport Card (STC and E5-STC) for the EAGLE 5 ISS with EAGLE 5 Integrated Monitoring Support feature. The E5IS feature does not support 24-bit ITU-N point codes.
ESP	Expanded Services Platform 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.

F

FAN	Cooling fan feature. The EAGLE 5 ISS 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 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.

G

GB	Gigabyte — 1,073,741,824 bytes

G

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 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).
GPSM	General Purpose Service Module
GSM	Global System for Mobile Communications
GTI	Global Title Indicator
GTT	Global Title Translation

G

	A feature of the signaling connection control part (SCCP) of the SS7 protocol that the EAGLE 5 ISS uses to determine which service database to send the query message when an MSU enters the EAGLE 5 ISS and more information is needed to route the MSU. These service databases also verify calling card numbers and credit card numbers. The service databases are identified in the SS7 network by a point code and a subsystem number.
GX25	X.25 Gateway A software feature that allows the system to send and receive traffic to and from an X.25 network, and convert the packet to a Signaling System #7 Message Signaling Unit (SS7 MSU).

H

HCAP	High-Speed Communications & Applications Processor
HDI	High Density Interconnect
HDLC	High Level Data Link Control
High Speed IMT Packet Router	See HIPR.
High-Speed Multiplexer	See HMUX.
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

H

	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).
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.
HMUX	High-Speed Multiplexer A card that supports the requirements for up to 1500 links, allowing communication on IMT buses between cards, shelves and frames. HMUX cards interface to 16 serial links, creating a ring from a series of point to point links. Each HMUX card provides a bypass multiplexer to maintain the ring's integrity as cards are removed and inserted into an operational shelf. High-Speed IMT Multiplexer, a replacement card for the IPMX.
HS	High Speed
HSL	High-Speed Link

I

ID	Identity, identifier

I

ILA	Integrated LIM Appliqué
IMT	Inter-Module-Transport The communication software that operates the inter-module-transport bus on all cards except the LIMATM, DCM, DSM, and HMUX.
IMTA	Internal Message Transport Address
INAP	Intelligent Network Application Part
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 signaling capability than the conventional SCP-based approach. Intelligent Network (IN) Portability
Integrated Sentinel	The Integrated Sentinel product provides monitoring capabilities for Signaling System 7 (SS7) links. Integrated Sentinel includes network surveillance capabilities and fault-management functions.
IP	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

I

	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 SSEDCM/E5-ENET cards.
IPLIM	The application used by the SSEDCM/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 (IPLIMI, IPLIM) run on the SSEDCM/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

I

	memory board in a single-slot assembly running the IPS application.
IS-NR	In Service - Normal
ISS	Integrated Signaling System
ISUP	ISDN User Part
ITU	International Telecommunications Union

K

KHz	Kilo Hertz (1000 Hertz)

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.
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.
LCA	Logic Cell Array
LED	Light Emitting Diode

L

	An electrical device that glows a particular color when a specified voltage is applied to it.
LFS	Link Fault Sectionalization A feature in the EAGLE 5 ISS that allows the maintenance personnel to perform a series of far end loopback tests, from the EAGLE 5 ISS and identify faulty segments of an SS7 transmission path up to and including the remote network element.
LIM	Link Interface Module 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 appliqués provide level one and some level two functionality on SS7 signaling links.
LIM-ATM	A link interface module (LIM) with the ATM interface.
Link	Signaling Link Signaling Link 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.
LM	Layer Management

L

LNP	Local Number Portability
LSL	Low-speed Link
LSMS	Local Service Management System

M

M256	256 Megabyte Memory Expansion Card
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 5 ISS. 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.
MASP	Maintenance and Administration Subsystem Processor 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.

M

	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.
MB	Megabyte — A unit of computer information storage capacity equal to 1,048, 576 bytes.
MCA	Matrix Controller Assembly
MCAP	Maintenance Communications & Applications Processor
MCPM	Measurement Collection and Polling Module The Measurement Collection and Polling Module (MCPM) provides comma delimited core STP measurement data to a remote server for processing. The MCPM is an EDSM with 2 GB of memory running the MCP application.
MDAL	Maintenance Disk and Alarm
MF	Miscellaneous Frame
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

M

	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.
MSU	Message Signal Unit The SS7 message that is sent between signaling points in the SS7 network with the necessary information to get the message to its destination and allow the signaling points in the network to set up either a voice or data connection between themselves. The message contains the following information: • The forward and backward sequence numbers assigned to the message which indicate the position of the message in the traffic stream in relation to the other messages. • The length indicator which indicates the number of bytes the message contains. • The type of message and the priority of the message in the

M

signaling information octet of the message.

- The routing information for the message, shown in the routing label of the message, with the identification of the node that sent message (originating point code), the identification of the node receiving the message (destination point code), and the signaling link selector which the EAGLE 5 ISS uses to pick which link set and signaling link to use to route the message.

N

NC
Network Cluster
Network Code
Not Compliant

NCR
Nested Cluster Routing
A feature that allows the system to support full point code entries on different routes within a cluster.

NEBS
Network Equipment Building Systems

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

O

Subsystem which controls the operation of the EAGLE 5 ISS.

OCU — Office Channel Unit

The interface used with the LIMOCU card.

OEM — Original Equipment Manufacturer

OS — 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

PR — Problem Report

R

RAM — Random Access Memory

A type of computer memory that can be accessed randomly; that is, any byte of memory can be accessed without touching the preceding bytes.

R

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

S

SCCP	Signaling Connection Control Part
SCN	Switched Circuit Network
SCP	Service Control Point Service Control Points (SCP) 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. Secure Copy
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

S

	a block of memory that allows transfers from memory to occur without delaying the application processor.
SCSI bus	Small Computer System Interface bus
SCTP	Stream Control Transmission Protocol
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 5 ISS that copies MSUs selected through the gateway screening process and sends these MSUs over the Ethernet to an external host computer for further processing.
SS	Subsystem
SS7	Signaling System #7
SS7IPGW	SS7 IP Gateway An application used by the DCM/SSEDCM card for IP

S

	point-to-multipoint capability within an ANSI network.
SSEDCM	Single Slot Enhanced Data Communications Module
STC	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 STPs are ultra-reliable, high speed packet switches at the heart of SS7 networks, which terminate all link types except F-links. STPs are nearly always deployed in mated pairs for reliability reasons. Their primary functions are to provide access to SS7 networks and to provide routing of signaling messages within and among signaling networks.
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

S

	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.
TA	Technical Advisory
TCP/IP	Transmission Control Protocol/Internet Protocol
TDM	Terminal Disk Module Time Division Multiplexing
TO	Timing Output
TOCA	Timing Output Composite Automatic
TPS	Transactions Per Second
TSC	Time Slot Counter
TSM	Translation Services Module Provides translation capability and Global Title Translation (GTT) implementation for the Local Number Portability (LNP) function and is used for downloading

T

	gateway screening tables to link interface modules (LIMs).
TVG	Group Ticket Voucher
TX	Transmit

U

UL	Underwriters Laboratories

V

VCC	Virtual Channel Connection Voice Call Continuity The 3GPP has defined the Voice Call Continuity (VCC) specifications in order to describe how a voice call can be persisted, as a mobile phone moves between circuit switched and packet switched radio domains.