Tekelec EAGLE® 5

Feature Manual - Equipment Identity Register

910-5910-001 Revision A
September 2010

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

Topics:

This chapter contains general information about the EIR documentation, the organization of this manual, and how to get technical assistance.

Overview

This manual describes the Equipment Identity Register (EIR) feature of the EAGLE 5 Integrated Signaling System (EAGLE 5 ISS). The EIR feature is used to reduce the number of GSM mobile handset thefts by providing a mechanism to assist network operators in preventing stolen or disallowed handsets from accessing the network. This control is done by comparing the International Mobile Equipment Identity (IMEI) that is provided during handset registration to a set of three lists provided by the network operator:

- Black - Mobile Stations (MS) on the Black List will be denied access to the network
- White - MSs on the White List will be allowed access to the network
- Gray - MSs on the Gray List will be allowed on the network, but may be tracked

EIR is an optional feature on the EAGLE 5 ISS, and can be turned on but not off after it is enabled using a feature access key. EIR is mutually exclusive with LNP in the system.

Scope and Audience

This manual is intended for anyone responsible for installing, maintaining, and using the EIR feature in the EAGLE 5 ISS. Users of this manual and the others in the EAGLE 5 ISS family of documents must have a working knowledge of telecommunications and network installations.

Manual Organization

This document is organized into the following chapters:

- *Introduction* contains general information about the EIR documentation, the organization of this manual, and how to get technical assistance.
- *Feature Description* provides a functional description of the EIR feature, including network perspectives, assumptions and limitations, a database overview, Service Module card provisioning and reloading, EIR user interface, and an audit overview.
- *EAGLE 5 ISS EIR Commands* describes the EAGLE 5 ISS commands that can be used for EIR feature configuration and maintenance functions.
- *EIR Configuration* provides procedures for configuring the EIR feature for use in the EAGLE 5 ISS.
- *EIR Measurements* describes EIR-related measurements, measurements reports, and methods of collection.
- *Maintenance* describes EIR-related UAMs and UIMs, EPAP status and alarm reporting, DSM status reporting to the EPAP, system hardware verification, system status reporting, and code and application data loading.

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

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.

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**.

Chapter 2

Feature Description

Topics:

This chapter provides a functional description of the EIR feature, including network perspectives, assumptions and limitations, a database overview, DSM provisioning and reloading, EIR user interface, and an audit overview.

Equipment Identity Register Overview

A handset theft problem exists in GSM networks in many countries. A person obtains a legitimate subscription to a network, and then obtains a legitimate IMSI, MSISDN, and SIM card. The person initially buys an inexpensive handset and then steals a better handset from another subscriber. Once the handset is stolen, the thief replaces the SIM card with his or her own legitimate SIM card. Because the SIM card and subscriber information contained therein (IMSI, MSISDN) are legitimate, the phone will operate and the network operator has no way to determine that the subscriber is using a stolen handset. In addition to individual handset theft, organized groups have begun stealing entire shipments of mobile handsets from warehouses and selling these handsets on the black market.

The Equipment Identity Register (EIR) is a network entity used in GSM networks that stores lists of IMEI numbers, which correspond to physical handsets (not subscribers). The IMEI is used to identify the actual handset, and is not dependent upon the International Mobile Subscriber Identity (IMSI), Mobile Station International ISDN Number (MSISDN), or the Subscriber Identity Module (SIM). The IMSI, MSISDN, and SIM are all subscriber-specific, and move with the subscriber when he or she buys a new handset. The IMEI is handset-specific.

The EIR feature can be used to reduce the number of GSM mobile handset thefts by providing a mechanism that allows network operators to prevent stolen or disallowed handsets from accessing the network. This control is done by comparing the International Mobile Equipment Identity (IMEI) that is provided during handset registration to rhe following set of three lists provided by the network operator:

- Black - Mobile Stations (MS) on the Black List are denied access to the network
- Gray - MSs on the Gray List are allowed on the network, but may be tracked
- White - MSs on the White List are allowed access to the network

The EPAP Real Time Database (RTDB) stores the White, Gray, and Black Lists of IMEI numbers. The RTDB is downloaded to Service Module cards in the EAGLE 5 ISS. When a subscriber roams to a new MSC or VLR location, the handset attempts registration with the MSC or VLR. Before the MSC registers the subscriber with the VLR, it may send a query to the EAGLE 5 ISS for EIR status of the handset. The EAGLE 5 ISS returns a response indicating whether the IMEI is allowed, disallowed, or not valid. If the IMEI is allowed, the MSC completes registration; otherwise, registration is rejected.

The RTDB may also contain associations between individual IMEIs and IMSIs. This can provide a further level of screening by directly associating a particular IMEI with a particular IMSI. This association is used in the following way:

- If an IMEI is found on a Black List, an additional check of the IMSI could then be made.
- If the IMSI from the handset matches the IMSI provisioned with the IMEI, this would override the Black List condition, and allow registration to continue. This could be used to protect against mistaken Black List entries in the database, or to prevent unauthorized "handset sharing". This association could also be used in other ways.

The EIR feature is mutually exclusive with LNP.

EIR Call Flows

When a handset roams into a new MSC/VLR area, it attempts a registration procedure with the VLR. In a network without the EIR function, this procedure results in the VLR sending a location update message to the HLR, providing the HLR with the current MSC location of the Mobile Station (MS)/handset. When the EIR function is deployed in a network, this registration procedure is interrupted in order to validate the IMEI of the MS/handset attempting to register before completing the registration procedure and updating the HLR.

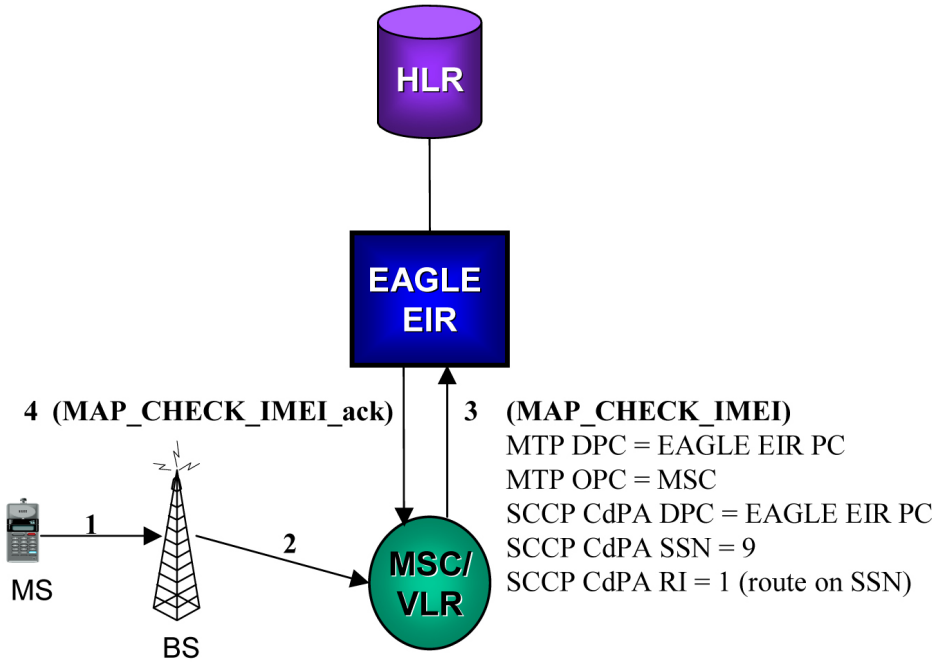
In the network with EIR, the MSC/VLR sends a MAP_CHECK_IMEI message to the EAGLE 5 ISS requesting EIR processing before sending a location update to the HLR. This message contains, at a minimum, the IMEI of the MS attempting registration. It may also contain the IMSI of the subscriber whose SIM card is currently being used in the MS/handset. Upon receipt of this message, the EIR feature searches the White, Gray, and Black Lists for a match on the IMEI. The EIR feature then returns a response to the MSC. Depending upon the result of the search, the response contains either the Equipment Status of the MS/handset (whether the IMEI for the MS/handset is allowed or not, based on its status in the White, Gray, or Black Lists), or a User Error (invalid or unknown IMEI). The MSC then either continues the registration procedure (if the IMEI is allowed), or rejects it (if the IMEI is disallowed, invalid, or unknown).

If the IMSI is also included in the message, EIR attempts to match this IMSI to one provisioned with the IMEI before sending a response to the MSC. A match on IMSI in this case overrides any Black List condition found based on the IMEI match alone, and causes a response of *MS allowed*.

Figure 1: EIR Call Flow illustrates the steps of the following EAGLE 5 ISS EIR call flow process.

1. The MS/handset roams into a new serving MSC/VLR area, and begins the registration procedure with the Base Station (BS).
2. The BS begins the registration procedure with MSC/VLR.
3. Before allowing the MS/handset to register on the network, and before updating the HLR with the new MSC information, the MSC launches a MAP_CHECK_IMEI message to the EAGLE 5 ISS for EIR feature processing. This message is either MTP-routed directly to the point code of the EAGLE 5 ISS and the EIR local subsystem, or is GT-routed and the EAGLE 5 ISS performs global title translation on the message to its own point code and the EIR local subsystem.
4. EIR retrieves the IMEI and/or IMSI from the message and searches the EIR information in the RTDB for a match. See *Table 2: Example of Individual IMEIs* and *Table 3: Logic for IMEIs in Multiple Lists*. This search may result in the IMEI being on one or more of the White, Gray, or Black Lists, or it may result in an invalid or unknown IMEI (no match). It may also result in an invalid IMSI-IMEI combination. Based on the results of the search, the EAGLE 5 ISS returns a MAP_CHECK_IMEI_ack containing either the Equipment Status (IMEI allowed or not allowed), or a User Error (invalid or unknown IMEI).
5. (Not shown). The MSC either rejects or completes the registration attempt, depending on the information returned from EIR.

Figure 1: EIR Call Flow



The RTDB EIR information contains lists of IMEIs, and an indication as to the list where they are located. There are two types of IMEIs: Individual IMEIs (*Table 2: Example of Individual IMEIs*) and ranges of IMEIs (*Table 3: Logic for IMEIs in Multiple Lists*). The Individual IMEIs are searched first. The IMEI entries in this list may also contain an association to an IMSI. If no individual IMEI match is found, IMEI ranges are searched.

EIR can support up to 32 million individual IMEIs. A total of up to 50,000 IMEI ranges are supported. The maximum EAGLE 5 ISS RTDB capacity for all EPAP service features, including EIR, G-Flex, and G-Port, is 120 million individual numbers. Entries for these other services (MSISDNs for G-Port or IMSIs for G-Flex), reduce the available capacity for IMEIs. Also, if IMSIs are entered for the "IMSI Check" option of EIR, those entries will also reduce the available IMEI capacity.

Table 2: Example of Individual IMEIs

IMEI	IMSI (optional)	White List	Gray List	Black List
12345678901234	495867256894125	No	No	Yes
234567890123456		No	Yes	No
49876523576823		No	Yes	Yes
68495868392048	495867565874236	Yes	Yes	No
29385572695759		Yes	Yes	Yes

As shown in *Table 2: Example of Individual IMEIs*, it is possible for a given IMEI to be on more than one list (on the White List, and also on the Gray and/or Black List). The logic illustrated by *Table 3: Logic*

for IMEIs in Multiple Lists is used to determine which answer to return in the CHECK_IMEI response, determined by which list or lists the IMEI is on. *Table 3: Logic for IMEIs in Multiple Lists* also shows three possible EIR Response Types. The EIR Response Type is a system-wide EIR option that is configured by the user. The combination of the setting of the EIR Response Type, the list or lists in which the IMEI is located, and the optional IMSI check determines the response that is returned to the querying MSC.

Table 3: Logic for IMEIs in Multiple Lists

Presence in List			EIR Response Type		
White	**Gray**	**Black**	**Type 1**	**Type 2**	**Type 3**
X			in White List	in White List	in White List
X	X		in Gray List	in Gray List	in Gray List
X	X	X	in Black List	in Black List	in Black List
X		X	in Black List	in Black list	in Black List
	X		in Gray List	in Gray List	unknown
	X	X	in Black List	in Black List	unknown
		X	in Black List	in Black List	unknown
			in White List	unknown	unknown

Example Scenarios

Example 1

1. A CHECK_IMEI is received with IMEI = 49876523576823, no IMSI in message.
2. An individual IMEI match is found (*Table 2: Example of Individual IMEIs*, entry 3), indicating that the IMEI is on the Gray and Black Lists. The EIR Response Type is set to Type 3, and an IMSI is not present.
3. *Table 3: Logic for IMEIs in Multiple Lists* indicates that the required response is *Unknown*.
4. EIR formulates a CHECK_IMEI error response with `Error = 7 unknownEquipment`.

Example 2

Example 2 is the same as Example 1, except that the setting of the EIR Response Type is re-provisioned by the operator to Type 2.

1. A CHECK_IMEI is received with IMEI = 49876523576823, no IMSI in message.

2. An individual IMEI match is found (*Table 2: Example of Individual IMEIs*, entry 3), indicating that the IMEI is on the Gray and Black Lists. The EIR Response Type is set to Type 2, and an IMSI is not present.
3. *Table 3: Logic for IMEIs in Multiple Lists* indicates that the required response is *Black Listed*.
4. EIR formulates a CHECK_IMEI response with `Equipment Status = 1 blackListed`.

Example 3

1. A CHECK_IMEI is received with IMEI = 12345678901234, and IMSI = 495867256894125.
2. An individual IMEI match is found (*Table 2: Example of Individual IMEIs*, entry 1) indicating that the IMEI is on the Black List.
3. The EIR Response Type is set to Type 1.
4. *Table 3: Logic for IMEIs in Multiple Lists* indicates that the normally required response would be *Black Listed*, however; because an IMSI is present in the message, and the IMEI is on the Black List, the IMSI is compared to the IMSI entry in the database for this IMEI.
5. In this case, the IMSI in the RTDB matches the IMSI in the query, thus the *Black Listed* condition is cancelled.
6. EIR formulates a CHECK_IMEI response with `Equipment Status = 0 whiteListed`.

Example 4

1. A CHECK_IMEI is received with IMEI = 12345678901234, and IMSI = 495867256894125.
2. An individual IMEI match is found (*Table 2: Example of Individual IMEIs*, entry 1), indicating that the IMEI is on the Black List.
3. The EIR Response Type is set to Type 1.
4. *Table 3: Logic for IMEIs in Multiple Lists* indicates that the normally required response would be *Black Listed*, however; because an IMSI is present in the message, and the IMEI is on the Black List, the IMSI is compared to the IMSI entry in the RTDB for this IMEI.
5. In this case, the IMSI in the RTDB does not match the IMSI in the query, the *Black Listed* condition is maintained.
6. EIR formulates a CHECK_IMEI response with `Equipment Status = 1 blackListed`.

EIR List Determination

If the EIR Global Response configuration option is set (with the eirgrsp parameter of the `chg-gsmopts` command) to a value other than off, the IMEI is treated as being on the list indicated by the EIR Global Response option, regardless of the actual status of the IMEI. No list logic processing is performed on the IMEI.

If the EIR Global Response option is set to off, the individual IMEIs are searched first. If no match is found, the range IMEIs are searched next. If the IMEI is found only on the White List after either search, the list logic processing is complete, and the White List status of the IMEI is sent to the MSC.

Black List Processing

If the IMEI is found on the Black List after either search, list logic processing continues based on the EIR Response Type, set by the eirrsptype parameter of the `chg-gsmopts` command. If the EIR Response Type is type 3, and the IMEI is not also found on the White List, the status of the IMEI is *unknown*.

If the IMEI is also found on the White List, or if the EIR Response Type is either type 1 or 2, the value of the IMSI Check option, set with the eirimsichk parameter of the `chg-gsmopts` command, is checked. If the IMSI check option is on, and the IMSI is present in the message, the RTDB is searched for the IMSI. If there is a match for the IMSI, the status of the IMEI is determined to be “White with Override.” If there is no match for the IMSI, the status of the IMEI is determined to be “Black with IMSI Match Failed.” If the value of the IMSI Check option is off, the status of the IMEI is determined to be "on the Black List".

Gray List Processing

If the IMEI is found on the Gray List after either search, list logic processing continues based on the EIR Response Type, set by the eirrsptype parameter of the `chg-gsmopts` command. If the EIR Response Type is type 3, and the IMEI is not also found on the White List, the status of the IMEI is *unknown*.

If the IMEI is also found on the White List, or if the EIR Response Type is either type 1 or 2, the status of the IMEI is determined to be "on the Gray List".

EIR Protocol

The EAGLE 5 ISS supports the EIR capability point code type and a local subsystem that is entered into the MAP table. The EIR local subsystem has a mate subsystem, and a concerned point code group assigned to it. Both ITU-I and ITU-N point codes are supported in the MAP table. The EIR subsystem cannot be set to Load Shared mode (as end nodes do not perform load sharing), but is set to Dominant or Solitary mode.

Messages for Local Subsystems

The message arrives at the EIR subsystem as Rt-on-SSN or Rt-on-GT. If the message arrives as Rt-on-SSN, it must contain either the EAGLE 5 ISS true point code or the EIR capability point code in the DPC field of the message, and EAGLE 5 ISS EIR subsystem number in the Called Party Subsystem field of the message. If EIR query has the EAGLE 5 ISS capability point code for the DPC, then the EAGLE 5 ISS processes the message, but is not able to divert this message in the event of subsystem failure.

If a message arrives at the EIR subsystem as Rt-on-GT, it should also contain a service selector that translates to the EIR subsystem. These messages also contain one of EAGLE 5 ISS capability point codes in the DPC field. The EAGLE 5 ISS also processes the message if it has the EAGLE 5 ISS true point code for the DPC, but it is not able to divert these messages in the event of subsystem failure.

If the EIR local subsystem is offline and the mated subsystem is available, the Routing Indicator is used to determine whether to reroute:

- If the message arrived Rt-on-SSN, the message is not rerouted to the mate. In this case, EAGLE 5 ISS is acting as an end node, and end nodes do not reroute. If the return on error option is set, the EAGLE 5 ISS generates a UDTS, otherwise it will discard the message.
- If the message arrived on Rt-on-GT, the message is rerouted to the mated subsystem. In this case, the EAGLE 5 ISS is acting as both STP and SCP, and STPs do reroute messages.

Multiple Local Subsystems

The EAGLE 5 ISS supports provisioning Capability Point Codes (CPCs) for two or more local subsystems, allowing local subsystems for two or more EPAP-related features to operate at the same time in the system. For example, local subsystems for the ATINP feature and the EIR feature can coexist in the system.

Though queries meant for any local system will still be processed if they are sent with DPC = STP CPC, it is strongly recommended not to use the STP CPC for such queries. Instead, the CPC for the appropriate subsystem should be used as the DPC of the message. For instance, for LNP queries use the LNP CPC, not the STP CPC; for EIR queries, use the EIR CPC, and so on.

MTP and SCCP Management to Support EIR

If the EIR local subsystem is offline, the EAGLE 5 ISS sends SSPs that cause the Rt-on-SSN message to be diverted to the mate subsystem. These do not cause the Rt-on-GT messages to be diverted. In order to make other nodes divert Rt-on-GT traffic to the mate, the EAGLE 5 ISS will send response method TFPs to the OPC of the message, when messages arrive Rt-on-GT for one of the EIR Capability Point Codes and the result of translation is the EAGLE 5 ISS EIR subsystem. This TFP should cause the OPC to divert traffic to the mate. If a message arrives Rt-on-GT for the EAGLE 5 ISS True Point Code, the EAGLE 5 ISS will not generate a TFP. Therefore, nodes that send Rt-on-GT traffic to the EAGLE 5 ISS should use an EIR Capability Point Code, not the EAGLE 5 ISS True Point Code.

If the EAGLE 5 ISS receives an RSP (Route Set Test Message - Prohibited) for an EIR Capability Point Code, and the EIR subsystem is offline, the EAGLE 5 ISS does not reply. If the EAGLE 5 ISS receives an RSR (Route Set Test Message - Restricted) for an EIR Capability Point Code, and the EIR subsystem is offline, the EAGLE 5 ISS replies with a TFP concerning the Capability Point Code. When the EIR subsystem is online, RSRT replies to both RSRs and RSPs for an EIR Capability Point Code with a TFA.

Check_IMEI Message Handling

When the CHECK_IMEI message is received by protocol, the, IMSI (if active) and SVN are parsed from the MSU. Because different vendors place the IMSI information in different locations within the message, the decoder searches for the IMSI in multiple locations.

Once the required data is parsed, a lookup is performed in the RTDB to determine the response type for the IMEI/IMSI combination.

The appropriate response message is sent to the originating MSC.

Encoding Errors

When a Response is generated, it is sent based on the CgPA information in the incoming message. However, some conditions may prevent the EAGLE 5 ISS from generating the response. Most of the errors involve GTT on the CgPA; if the incoming data is Rt-on-SSN, the number of potential errors is much smaller.

Whenever an encoding error is detected, the Response message is discarded.

Data Collection

See *EIR Measurements* for a description of the measurements collected for the EIR feature.

The `rept-stat-sccp` command output displays EIR subsystem status, EIR summary and card statistics, and CPU usage related to EIR. See *rept-stat-sccp*.

EIR List Log File

The EIR feature allows for detection and logging of subscribers using handsets that have been Black Listed or Grey Listed by a service provider. These messages are generated by the EAGLE 5 ISS and forwarded to the MPS platform for later retrieval. Messages may be forwarded from any of the provisioned Service Module cards. Messages will be received and logged independently by both MPS servers.

The files are located in the*/var*/TKLC*/epap/free* filesystem and named as follows:
`eirlog_hostname.csv`

Where:

hostname = the hostname of the MPS server that recorded the log.

Each entry in the EIR log file contains information about the caller and handset, a timestamp documenting the time the server received the log entry, and a unique identifier used for comparison with the mate server. See *EIR List Log Format* for more information about the format of the file and the fields within the file.

The log file is available via Secure FTP using the*appuser* user.

The EIR log file will contain the last 2 million entries received from the EAGLE 5 ISS. This file may be deleted through the EPAP GUI "Manage Files & Backups" screen.

EIR Log File Serviceability

The file system used by EIR Log Files is approximately 35 GB in size and is used for all of the following in addition to storing EIR log files:

- UI Configuration database backup
- Provisioning database backup
- Real-time database backup
- System log file captures

When the file system reaches 80% of it's total capacity a minor alarm is raised. A major alarm is raised at 90%. All of the files in this partition are managed from the **Debug->Manage Logs & Backups** screen on the GUI.

EIR Log entries are delivered to and stored on the MPS using a "best effort" approach. The following three major factors impact the successful delivery of a log entry:

- **Service Module card connectivity:** Service Module cards have a limited buffer for storage of EIR log entries. If the data cannot be delivered, it is discarded.
- **UDP Broadcast:** A Service Module card will broadcast a log entry to both MPS servers. Although experience shows this broadcast method on a private network to be highly reliable, it is not guaranteed.
- **MPS server availability:** If an MPS server is down or unreachable, log entries are not collected and stored. Hourly log entries may be later compared with those collected on the mate MPS server using the entry's unique identifier.

EIR List Log Format

The export IMEI Black List hits file consists of CSV entries separated by newlines. Each entry contains the following fields:

- **Time/Date stamp:** This field represents the time at which the MPS server received the entry from the Service Module card. The time is generated by the MPS using the configured system time. It will be formatted as yyyyMMddhhmmss (year, month, day, hour, minute, second).
- **Source Identifier:** This field is an IP address that uniquely identifies the Service Module card that sent the log entry. This field can be used in combination with the Source Sequence Number to correlate log entries with those on the mate MPS server.
- **Source Sequence Number:** This field is an integer that uniquely identifies the entry per source Service Module card. This field can be used in combination with the Source Identifier to correlate log entries with those on the mate MPS server.
- **IMSI:** International Mobile Subscriber Identity for this entry
- **IMEI:** International Mobile Equipment Identity for this entry
- **Response Code:** The following response codes are possible (**2** and**4** are invalid values):

  —**0:** Indicates that the IMEI is Black Listed.

  —**1:** Indicates that the IMEI is Gray Listed.

  —**3:** Indicates that the IMEI was Black Listed, but the IMSIs matched resulting in a White List Override.

  —**5:** Indicates that the IMEI was Black Listed and the IMSIs did not match resulting in Black List Continues.

For example, If an MPS server receives entry id 1234 on July 15, 2003 at exactly 4:36 PM from a Service Module card provisioned at address 192.168.120.1 indicating that Black Listed subscriber 9195551212 using handset 12345678901234 was detected, the following entry is created:

```
20030715163600,192.168.61.1,1234,9195551212,12345678901234,0
```

Additional EIR Data Files

This feature makes significant use of the */var*/TKLC/*epap/free* file system. The following files may be present:

Table 4: Additional Files

Data Type	Size	Creation	Cleanup
UI Configuration database backup	< 1K each	On demand at upgrade	Manual
Provisioning database backup	Up to 12 GB each depending on the amount of customer data and the size of the transaction logs	On demand at upgrade	Manual

Data Type	Size	Creation	Cleanup
Real-time database backup	4 GB each	On demand at upgrade	Manual
System log file captures	5-20 MB or more depending on core files, and overall life of system.	On demand by customer service	Manual
EIR Export	Depends on the amount of customer data. Less than 100MB per million instances	Manual by customer	Manual
EIR Auto Export (new for EIR)	Depends on the amount of customer data. Less than 100MB per million instances	Scheduled by customer	Automatic after transferred to customer
PDBI Import	Determined by customer need	Manual (FSTP)	Manual
PDBI Auto Import (new for EIR)	Determined by customer need	Manual (FSTP)	Automatic after data imported
PDBI Auto Import results (new for EIR)	If no errors, very small. May be up to double the PDBI Auto Import file size worst case	Automatic	Automatic after transferred to customer
EIR blacklist logs (new for EIR)	Assuming no more than 360,000 updates per hour from the EAGLE 5 ISS, each file will be no more than 25MB	Automatic	Automatic. There should be approximately 25 logs at most.

Hardware Requirements

EPAP-related features that perform an RTDB lookup require Service Module cards (DSM cards or E5-SM4G cards) running the VSCCP application. The EAGLE 5 ISS can be equipped with:

- Up to 25 (24+1) Service Module cards when EPAP is running in a T1000 AS
- Up to 32 (31+1) Service Module cards when EPAP is running in a T1200 AS

Features that do not perform an RTDB lookup require Service Module cards only for GTT processing that might be performed for the feature. These features can coexist in systems with EPAP, but do not require an EPAP connection.

MPS/EPAP Platform

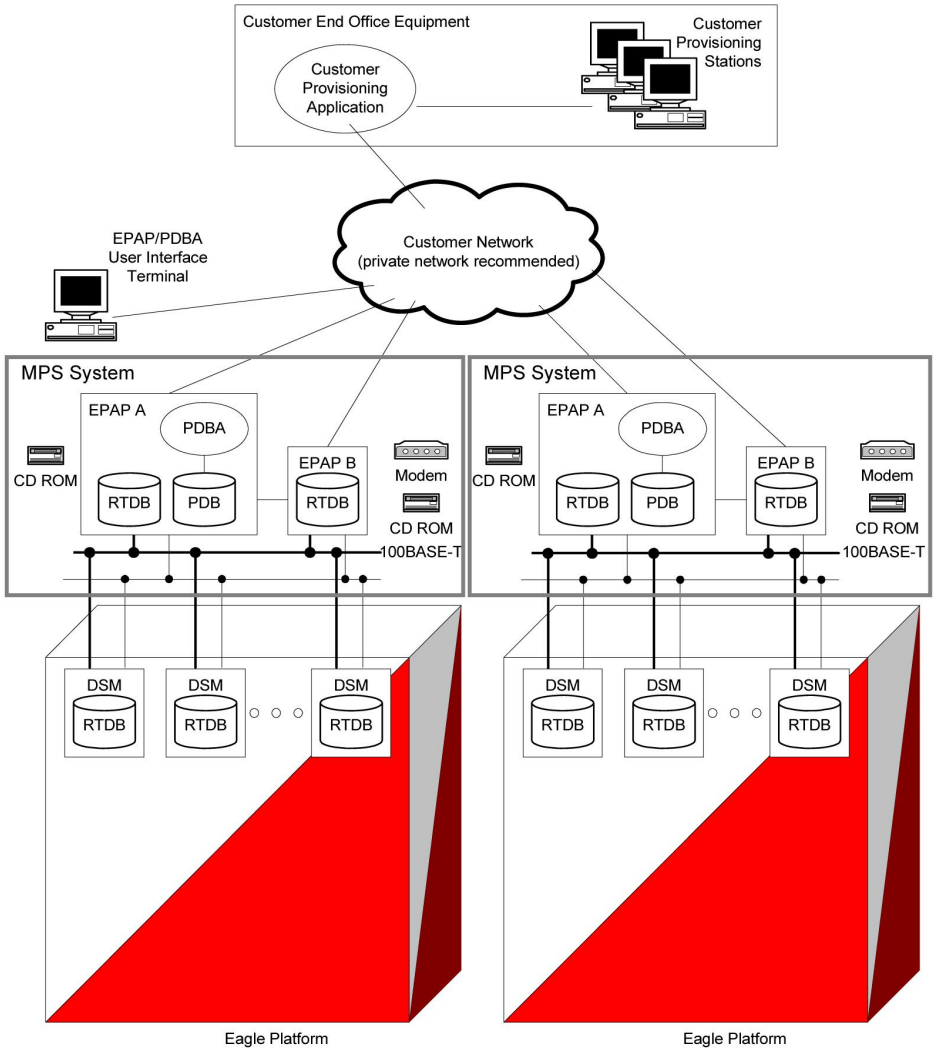
Tekelec provides the Multi-Purpose Server (MPS) platform as a subsystem of the EAGLE 5 ISS. The MPS provides support for EPAP-related features that perform Real Time Database (RTDB) lookups.

The MPS is composed of hardware and software components that interact to create a secure and reliable platform. For details about the MPS hardware, refer to *Tekelec 1000 Application Server Hardware Manual* or *Tekelec 1200 Application Server Hardware Manual*. The MPS provides the means of connecting the customer provisioning application with the EAGLE 5 ISS and accepts the customer number portability data, while accommodating numbers of varying lengths.

The EAGLE Provisioning Application Processor (EPAP) is software that runs on the MPS hardware platform. It collects and organizes customer provisioning data, and forwards the data to the EAGLE 5 ISS Service Module cards. *Figure 2: MPS/EPAP Platform Architecture* shows the overall system architecture from customer provisioning through the MPS subsystem to the EAGLE 5 ISS Service Module card databases.

Note: In this manual, Service Module card refers to either a DSM card or an E5-SM4G card unless a specific card is required. For more information about the supported cards, refer to *EAGLE 5 ISS Hardware Manual*.

Figure 2: MPS/EPAP Platform Architecture



Design Overview and System Layout

Figure 2: MPS/EPAP Platform Architecture identifies the tasks, databases and interfaces which constitute the overall system architecture. The system consists of two mated MPS servers. Each MPS contains two EPAP platforms - EPAP A and EPAP B with each containing a Real Time Database (RTDB) , Provisioning Database (PDB), servers, optical media, modems, and either network hubs when using a T1000 AS system or network switches when using a T1200 AS system . Each MPS and its associated EPAPs is an EPAP system ; the EPAP system and the mated EAGLE 5 ISS are the mated EPAP system . Each EPAP system is either a T1000 AS or a T1200 AS system with a total of four Ethernet interfaces: one from each EPAP to the 100BASE-T Ethernet and one from each EPAP to either a 10BASE-T or a 100BASE-T Ethernet. Refer to *Table 5: Service Module Card Provisioning and Reload Settings* for the link speed.

On the EAGLE 5 ISS, a set of Service Module cards, which hold the RTDB, is part of the STP. Two high-speed Ethernet links connect the Service Module cards and the EPAPs. One of the links is a 100BASE-T Ethernet bus, and the other is either a 10BASE-T or a 100BASE-T Ethernet bus. Refer to *Table 5: Service Module Card Provisioning and Reload Settings* for the link speed.

The RTDB is provisioned and maintained through the EPAPs. EPAP A and EPAP B act as the active EPAP and the standby EPAP. One link serves as the active link, and the other link as the standby link. Only one EPAP and one link are active at a time. The database is provisioned through the active link by the active EPAP; the other EPAP provides redundancy.

If the active EPAP fails, the standby EPAP takes over the role of active EPAP and continues to provision the subscriber database. If the active link fails, the active EPAP switches to the standby link to continue provisioning the Service Module cards. The two Ethernet links are part of the DSM network.

Another 100BASE-T Ethernet link exists between the EPAPs; that link is called the EPAP Sync Network.

The major modules on the EPAP are:

- Service Module card provisioning module
- Maintenance module
- RTDB module
- PDB module

The Service Module card provisioning module is responsible for updating subscriber databases on the EAGLE 5 ISS Service Module cards using the Reliable Multicast Transport Protocol (RMTP) multicast. The maintenance module is responsible for the proper functioning of the EPAP platform. The PDB module is responsible for preparing and maintaining the Real Time Database, which is the *golden copy* of the subscriber database. The PDB module can run on one of the EPAPs of either mated EAGLE 5 ISS.

Functional Overview

The main function of the MPS/EPAP platform is to provision data from the customer network to the Service Module cards on the EAGLE 5 ISS. Subscriber database records are continuously updated from the customer network to the PDB. The PDB module communicates with the maintenance module and the RTDB task over a TCP/IP connection to provision the Service Module cards on the EAGLE 5 ISS. The maintenance module is responsible for the overall stability and performance of the system.

The RTDB on the EPAP contains a coherent, current copy of the subscriber database. If the current copy of the RTDB on the Service Module cards becomes *out-of-sync* because of missed provisioning or card rebooting, the EPAP Service Module card provisioning module sends database information through the provisioning link to the Service Module cards. The Service Module cards are reprovisioned with current subscriber information.

EPAP/PDBA Overview

The EAGLE Provisioning Application Processor (EPAP) platform and the Provisioning Database Application (PDBA), coupled with the Provisioning Database Interface (PDBI) facilitate the user database required for EAGLE 5 ISS EPAP-based features. The following functions are supported:

- Accept and store subscription data provisioned by the customer
- Update and reload subscriber databases on the Service Module cards

The PDBA operates on the master Provisioning Database (PDB). The EPAP and PDBA are both installed on the MPS hardware platform.

The EPAP platform performs the following:

- Maintains an exact copy of the real time database (RTDB) on the EPAP

- Distributes the subscription database to the Service Module cards
- Maintains a redundant copy of the RTDB database

The EPAP platform is a mated pair of processors (the upper processor, called EPAP A, and the lower processor, EPAP B) contained in one frame.

During normal operation, information flows through the EPAP/PDBA software with no intervention. Subscription data is generated at one or more operations centers and is delivered to the PDBA through a TCP socket interface (PDBI). The PDBA software stores and replicates data on EPAP A on the mated EPAP system. The data is then transmitted by the EPAPs across a private network to the Service Module cards located in the EAGLE 5 ISS frame.

The primary interface to the PDBA consists of machine-to-machine messages. The interface is defined by Tekelec and is described in the Provisioning Database Interface Manual. Provisioning software compatible with the EPAP socket interface can be created or updated using the interface described in that manual.

Additionally, a direct user interface is provided on each EPAP to allow for configuration, maintenance, debugging, and platform operations. A direct user interface is also provided by the PDBA for configuration and database maintenance.

The MPS/EPAP is an open-systems platform and easily accommodates the required high provisioning rates. Compared to the traditional OAM platform, the persistent database and provisioning in an open systems platform provides these benefits:

- Variety of hardware components and vendors
- Availability of third party communication and database tools
- Standard communication protocols
- Availability of personnel with related experience

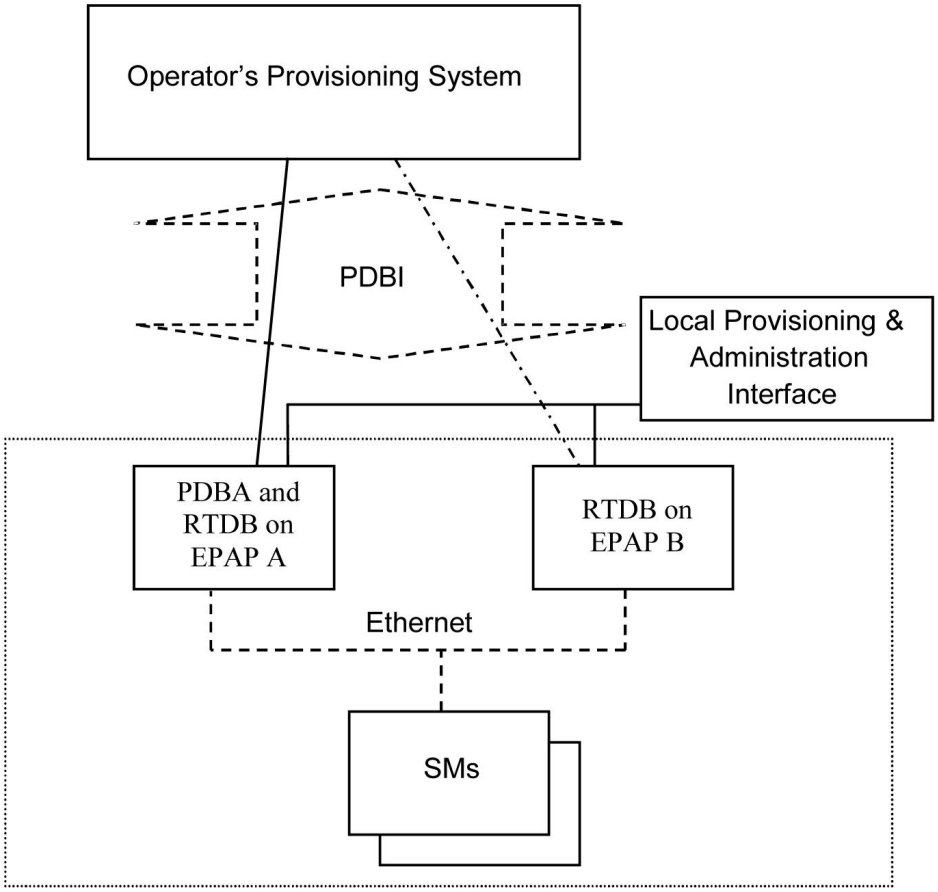
Each EPAP server maintains a copy of the Real Time Database (RTDB) in order to provision the EAGLE 5 ISS Service Module cards. The EPAP server must comply with the hardware requirements in the *MPS Hardware Manual*. *Figure 2: MPS/EPAP Platform Architecture* illustrates the EPAP architecture contained in the MPS subsystem.

Each EPAP has a dedicated optical media drive. One EPAP per EAGLE 5 ISS platform has a modem capable of supporting remote diagnostics, configuration, and maintenance. These remote operations are performed through EPAP login sessions and are accessible across the customer network as well as through a direct terminal connection to the EPAP using an RS232 connection. Refer to *Tekelec 1000 Application Server Hardware Manual* or *Tekelec 1200 Application Server Hardware Manual* for details about the hardware devices and network connections.

Subscriber Data Provisioning

Figure 3: Subscriber Data Provisioning Architecture (High Level) shows a high-level view of the subscriber data provisioning architecture. Only those parts of the EAGLE 5 ISS platform that are relevant to subscriber data provisioning are shown. This section defines requirements for the Provisioning Database Interface (PDBI) between the EPAP and the operator's provisioning system (OPS). Provisioning clients connect to the EPAPs via the PDBI. This interface contains commands that allow all of the provisioning and retrieval of subscription data. The PDBI is used for real-time provisioning of subscriber and network entity data only. Refer to *Provisioning Database Interface Manual* for more details.

Figure 3: Subscriber Data Provisioning Architecture (High Level)



A pair of active/standby EPAP servers provides the interface between the Real Time Database (RTDB) of the EAGLE 5 ISS Service Module cards and the OPS. EPAP A is equipped with both the PDB (Provisioning Database) and the RTDB, and EPAP B has only the RTDB. An EPAP with only the RTDB must be updated by the EPAP that is equpped with the PDB.

For more information about the EPAP, refer to *EPAP Administration Manual*. For more information about the MPS hardware, refer to *Tekelec 1000 Application Server Hardware Manual* or *Tekelec 1200 Application Server Hardware Manual* .

Distributed Administrative Architecture

This section describes, at a high level, the distributed administrative architecture for the EAGLE 5 ISS, including the EPAP.

Databases requiring high update and retrieval rates, such as the EPAP RTDB, are populated using redundant Ethernet connections to Service Module cards from an EPAP MPS platform.

An EPAP consists of a combined Provisioning (MySQL) and Real Time Database (RTDB). The Provisioning Database (PDB) responds to requests for updates by the active and standby RTDBs on both mated EAGLE 5 ISSs. The active EPAP RTDB is responsible for initiating multi-cast updates of changed database records to the Service Module cards after the data has been committed to the EPAP disks. Furthermore, the PDB may accept and commit more database updates while the RTDBs are completing their previous updates.

It is this overlapping of database updates, coupled with an RTDB transactional database engine and fast download time, that allows larger amounts of data at a time to be transferred from the PDB. Committing larger amounts of data at a time to the RTDB (versus a single update at a time) allows faster overall transaction rates to be achieved. The boundaries of the transaction rates become more closely related to cache size and disk cache flush time than the disk access time of a single update. Thus, successful completion of EPAP database updates only guarantees that the PDB has been updated, but it does not mean the RTDB has completed the update and sent the new subscription data to the Service Module card.

The EPAP architecture contains a local provisioning terminal and a modem for remote access, as well as other functions. A backup device can be used to back up or restore the provisioning database. The local provisioning terminal is used to manually repair the standby EPAP RTDB or to turn the subscriber database audit on or off. For additional information, refer to *Tekelec 1000 Application Server Hardware Manual*, *Tekelec 1200 Application Server Hardware Manual*, and *EPAP Administration Manual*.

EPAP (EAGLE Provisioning Application Processor)

As shown in *Figure 2: MPS/EPAP Platform Architecture*, a single MPS system contains two EAGLE Provisioning Application Processor (EPAP) servers. At any given time, only one EPAP actively communicates with the Service Module cards on the EAGLE 5 ISS. The other EPAP server is in standby mode. In addition, two MPS systems can be deployed in a mated pair configuration.

The primary purpose of the EPAP system is to maintain the Real Time Database (RTDB) and Provisioning Database (PDB), and to download copies of the RTDB to the Service Module cards.

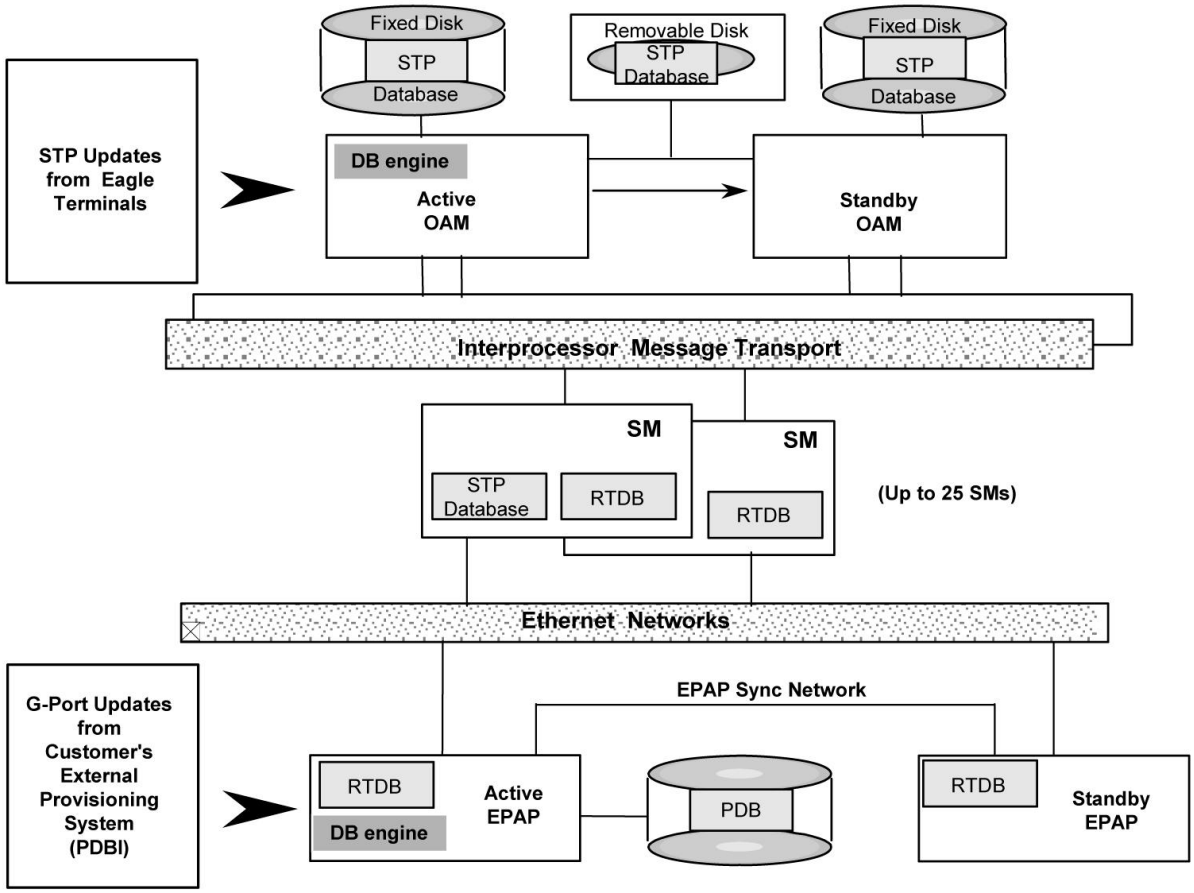
The PDB on the active EPAP receives subscription data from the customer network through the Provisioning Database Interface (PDBI), the external source of provisioning information. The Provisioning Database Application(PDBA) continually updates the PDB of the active EPAP. The PDB uses MySQL database software. After an update is applied to the active PDB, the data is sent to the RTDBs on the active and standby EPAPs.

Both the active and standby EPAPs maintain copies of the RTDB. Periodically, the Service Module card polls the active EPAP RTDB for any new updates. The active EPAP downloads the updates to the Service Module card which stores a resident copy of the RTDB.

A mated pair configuration has two mated MPS Systems, as shown in *Figure 2: MPS/EPAP Platform Architecture*. The PDB on the active EPAP automatically updates the PDB on the mate platform. The PDB on the mate platform then updates RTDBs on its EPAPs, which in turn update the RTDBs on the associated Service Module cards.

Provisioning of the EAGLE 5 ISS Service Module cards is performed through two interfaces using two different sets of commands. Provisioning is accomplished by the STP updates from EAGLE 5 ISS terminals and by updates from the customer's external provisioning system. This system of dual provisioning is illustrated in *Figure 4: Database Administrative Architecture*.

Figure 4: Database Administrative Architecture



Service Module Cards

A maximum number of Service Module cards can be provisioned with one or more EPAP-related features enabled.

- Up to 25 cards (24+1) with EPAP running on a T1000 AS
- Up to 32 cards (31+1) with EPAP running on a T1200 AS

EPAP-related features require that all Service Module cards contain 4 GB of memory. *Figure 4: Database Administrative Architecture* illustrates each Service Module card having two Ethernet links, the main DSM network on the 100BASE-T link and the backup DSM network . Refer to *Table 5: Service Module Card Provisioning and Reload Settings* for the link speed. The Service Module cards run the VSCCP software application.

The Service Module card Ethernet ports are linked to the EPAP system to receive the downloaded Real Time Database (RTDB). Multiple Service Module cards provide a means of load balancing in high-traffic situations. The RTDB on the Service Module card is in a format that facilitates rapid lookups.

Though the Service Module card copies of the RTDB are intended to be identical, the various databases may not be identical at all times for the following reasons:

- When a Service Module card is initialized, the card downloads the current copy of the database from the EPAP. While that card is being loaded, it cannot receive new updates that have arrived at the EPAP since reload began.
- Card databases can become out-of-sync with the EPAP RTDB when the EPAP receives updates from its provisioning source, but it has not yet sent the updates down to the Service Module cards. Updates are applied to the Provisioning Database (PDB) as they are received.

Two possible scenarios contribute to a condition where a Service Module card may not have enough memory to hold the entire database:

- The database is downloaded successfully to the Service Module card, but subsequent updates eventually increase the size of the database beyond the capacity of the Service Module card memory. In this situation, it is desirable for EPAP-related features to continue processing transactions, even though the database might not be up-to-date.
- When a Service Module card is booted and it is determined then that the card does not have enough memory for the entire database, the database is not loaded on that card. Each Service Module card is responsible for recognizing and reporting its out-of-memory conditions by means of alarms.

Overview of EPAP to Service Module Card Communications

Before discussing Service Module card status reporting or EPAP status reporting, it is helpful to understand the communications between the Service Module cards and the EPAP in broad terms.

- UDP - sending Service Module card status messages

  The Service Module cards and EPAPs create a UDP (User Datagram Protocol) socket which is used for status messages. One of the last things a Service Module card does when it is initialized is to send a status message to the EPAP, containing the Service Module ID, database level, and memory size. The EPAP maintains tables containing the last known status of each Service Module card. EPAP uses these to determine whether or not the Service Module card needs to download the database.

- IP - reporting EPAP maintenance data

  The Service Module cards create an TCP socket when they are initialized, and listen for connection requests. During initialization or after a loss of connectivity, the active EPAP chooses one of the Service Module cards and issues a *Connect* to establish the TCP/IP connection with that Service Module card which is referred to as the primary Service Module card. The purpose of this link is to provide a path for reporting EPAP alarms and to forward maintenance blocks to the Service Module card.

- IP Multicast - downloading GSM database

  Because of the large size of the database and the need to download it quickly on up to 32 Service Module cards, EPAP-related features use a technique known as IP multicasting. This technique is based on Reliable Multicast Transport Protocol-II (RMTP-II), a product of Globalcast Communications. IP multicasting downloads the RTDB and database updates to all of the Service Module cards simultaneously.

  The administration of IP multicasting is based on the concept of a “tree”, or stream of data, which is constantly being broadcast by the EPAP. Service Module cards that need to download the real time database or to receive database updates “join the tree”. Service Module cards can also “leave the tree”, typically when the database fills their available memory.

Service Module Card Provisioning and Reload

One of the core functions of the EPAP is to provision the Service Module cards with the Real Time Database (RTDB) updates. In order to provide redundancy for this feature, separate RMTP channels are created on each interface from each EPAP:

Table 5: Service Module Card Provisioning and Reload Settings

RMTP Channel	T1000	T1200 Running Only DSM cards	T1200 Running Only E5-SM4G cards	T1200 Running both DSM and E5-SM4G cards
EPAP A, Link A (on the main DSM network)	100BASE-T	100BASE-T	100BASE-T	100BASE-T
EPAP A, Link B (on the backup DSM network)	10BASE-T	10BASE-T	100BASE-T	10BASE-T
EPAP B, Link A (on the main DSM network)	100BASE-T	100BASE-T	100BASE-T	100BASE-T
EPAP B, Link B (on the backup DSM network)	10BASE-T	10BASE-T	100BASE-T	10BASE-T
Note: Full duplex mode is supported only when running all E5-SM4G cards on the T1200. In all other cases, half duplex mode is supported.				

Provisioning and other data is broadcast on one of these channels to all of the Service Module cards. Provisioning is done by database level in order to leave tables coherent between updates.

The Service Module cards do the following:

- Detect the need for incremental updates and send a status message to the EPAP.
- Discriminate between the various streams according to the database level contained in each message and accept updates based on the Service Module card database level.

Service Module Card Reload Model

Service Module cards may require a complete database reload in the event of reboot or loss of connectivity for a significant amount of time. The EPAP provides a mechanism to quickly load a number of Service Module cards with the current database. The database on the EPAP is large and may be updated constantly. The database sent to the Service Module card or cards will likely be missing some of these updates making it corrupt, in addition to being "back level."

EPAP Continuous Reload

It is important to understand how the EPAP handles reloading of multiple Service Module cards from different starting points. Reload begins when the first Service Module card requires it. Records are read sequentially from the Real Time Database (RTDB) from an arbitrary starting point, wrapping back to the beginning. If another Service Module card requires reloading at this time, it uses the existing record stream and notifies the Service Module card provisioning task of the first record it read. This continues until all Service Module cards are satisfied.

Service Module Card Database Levels and Reloading

The current database level when the reload started is of special importance during reload. When a Service Module card detects that the last record has been received, it sends a status message back to the EPAP indicating the database level at the start of reload. This action starts incremental loading. The Service Module card continues to reload until it is completely caught up with the current level of the RTDB. As database records are sent to the Service Module cards during reload, normal provisioning can change those records. All records changed between the start and end of reloading must be incrementally loaded before the database is coherent and usable by the Service Module card.

The following terminology is used here for the stages of database reload for a given Service Module card.

- **Stage 1 loading**: The database is being copied record for record from the golden RTDB in the EPAP to the Service Module card RTDB. The database is incoherent during stage 1 loading.
- **Incremental update**: The database is receiving all of the updates missed during stage 1 loading or some other reason, such as network outage, processor limitation, or lost communication. The database is coherent, but back-level during incremental update.
- **Current**: The database is receiving current updates from the Service Module card provisioning task.
- **Coherent:** The database is at a whole database level which means not currently updating records belonging to a database level.

EPAP Status and Error Reporting via Maintenance Blocks

The EPAP forwards all status and error messages to the Service Module cards in maintenance blocks. Maintenance blocks are asynchronously sent whenever the EPAP has something to report. The maintenance blocks eventually update EPAP Device Control Blocks (DCBs) located on the EAGLE 5 ISS. The DCBs provide the status information that is received when a `rept-stat-mps` command is issued.

Network Connections

Several customer and Tekelec-installed private networks are required to support the provisioning of subscription data. These networks are:

- *Customer Provisioning Network*
- *EPAP Sync Network*
- *DSM Networks*
- *Dial-Up PPP Network*

The following discussion is an overview of these private networks. It expands on the networks in the architecture diagram shown in *Figure 5: Customer Provisioning Network*. (For details about configuring these networks, refer to the EPAP *Administration Manual*.)

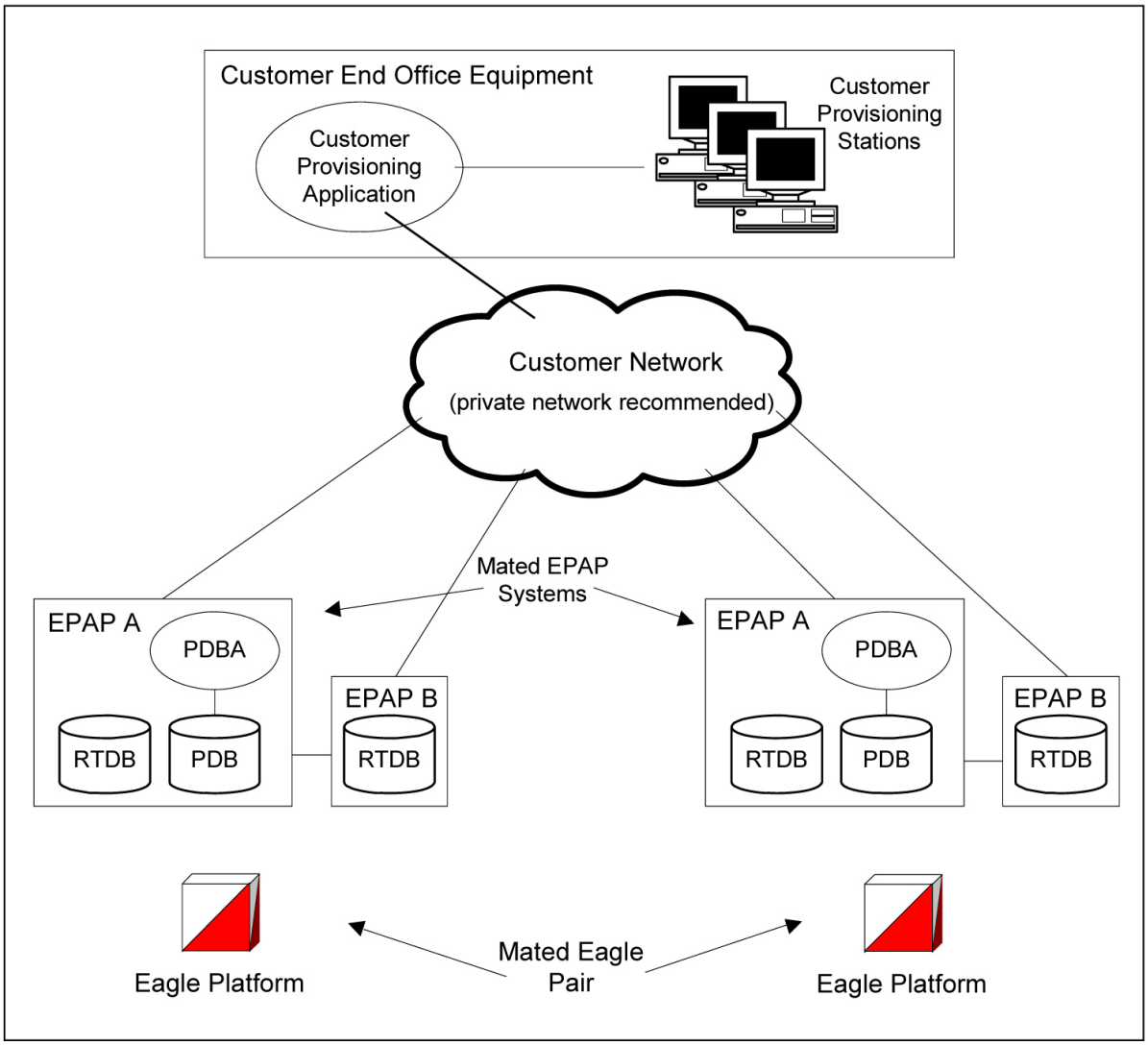
Customer Provisioning Network

The customer network carries the following traffic:

- Customer queries and responses to the PDB via the PDBI from the customer provisioning network
- Updates between PDBs of a mated EAGLE 5 ISS pair
- Updates between a PDB on one EAGLE 5 ISS and RTDBs on a mated EAGLE 5 ISS
- PDBA import/export (file transfer) traffic
- Traffic from a PDBA reloading from its mate
- EPAP and PDBA user interface traffic.

A typical customer network is shown in *Figure 5: Customer Provisioning Network*.

Figure 5: Customer Provisioning Network

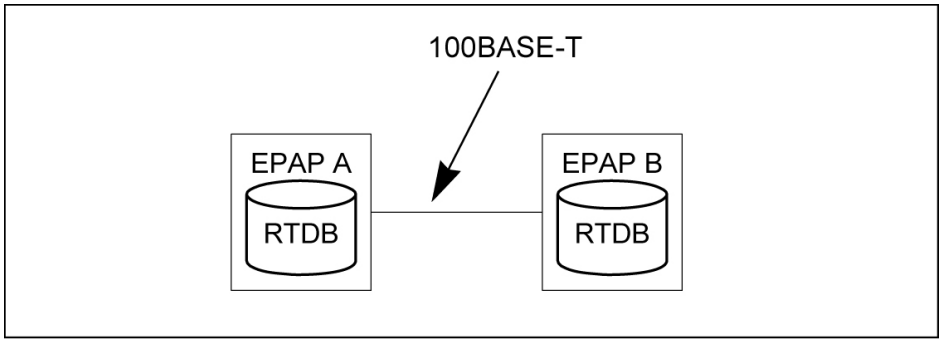


Although a dedicated network is recommended, it is possible that unrelated customer traffic can use the network as well. The determination, either to have a dedicated network or to allow other customer traffic, should be based on available external Ethernet bandwidth and network performance considerations.

EPAP Sync Network

The T1000 EPAP sync network carries RTDB and maintenance application traffic between active and standby EPAP servers on an MPS system. It synchronizes the contents of the RTDBs of both EPAP A and B. The EPAP Sync network is a single Ethernet connection between EPAP A and EPAP B running at 100BASE-T, as shown in *Figure 6: EPAP Sync Network*. The T1200 EPAP Sync network is truncated with the EPAP back up DSM connection and communicates through the switch.

Figure 6: EPAP Sync Network

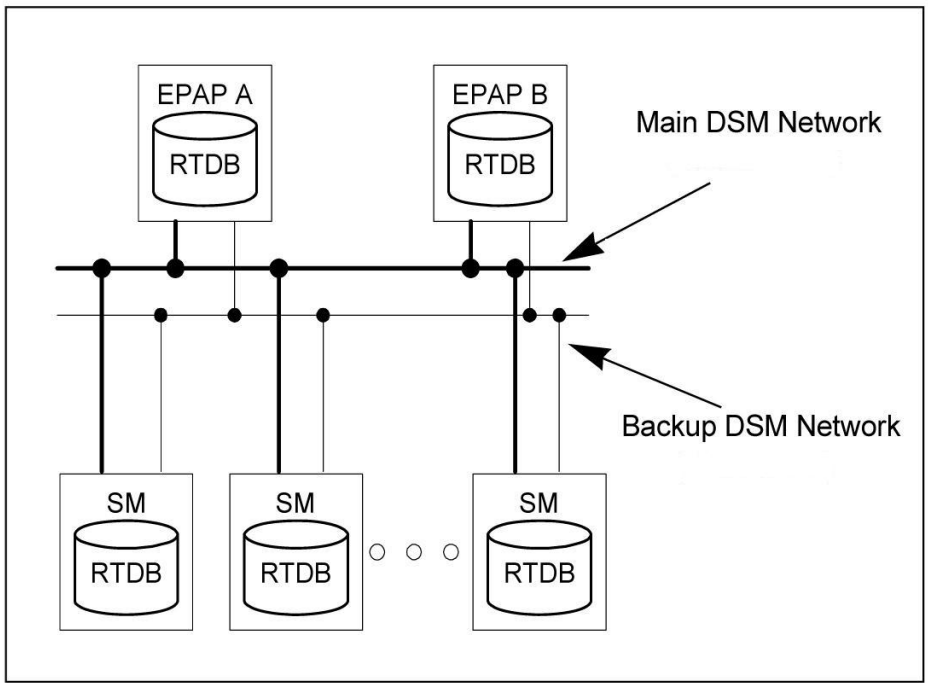


DSM Networks

The DSM networks are shown in *Figure 7: DSM Networks*. They carry provisioning data from the active EPAP RTDB to the Service Module cards. They also carry reload and maintenance traffic to the Service Module cards.

The DSM networks consist of two Ethernet networks: the main DSM network running at 100BASE-T, and the backup DSM network running at either 10BASE-T or 100Base-T. Refer to *Table 6: EPAP IP Addresses in the DSM Network* for the link speed. Both Ethernet networks connect EPAP A and EPAP B with every Service Module card on a single EAGLE 5 ISS platform.

Figure 7: DSM Networks



Maintenance information is sent from the active EPAP to an arbitrarily selected Service Module card. The selected Service Module card is known as the primary Service Module card. Static information is exchanged across this interface at initialization, and dynamic information is exchanged on occasion.

While much of the traditional OAM provisioning and database functionality is implemented on the EPAP, the maintenance reporting mechanism is still the OAM.

The first and second octets of the EPAP network addresses for this network are 192.168. (The first two octets for private class C networks are defined in RFC 1918.)

The third octet is customer specifiable for each DSM network. It is important to select values that do not interfere with the customer's network addressing scheme.

The fourth octet of the address is specified as follows:

- If the EPAP is configured as “EPAP A”, the fourth octet has a value of 100.
- If the EPAP is configured as “EPAP B”, the fourth octet has a value of 200.

Table 6: EPAP IP Addresses in the DSM Network summarizes the contents of each octet.

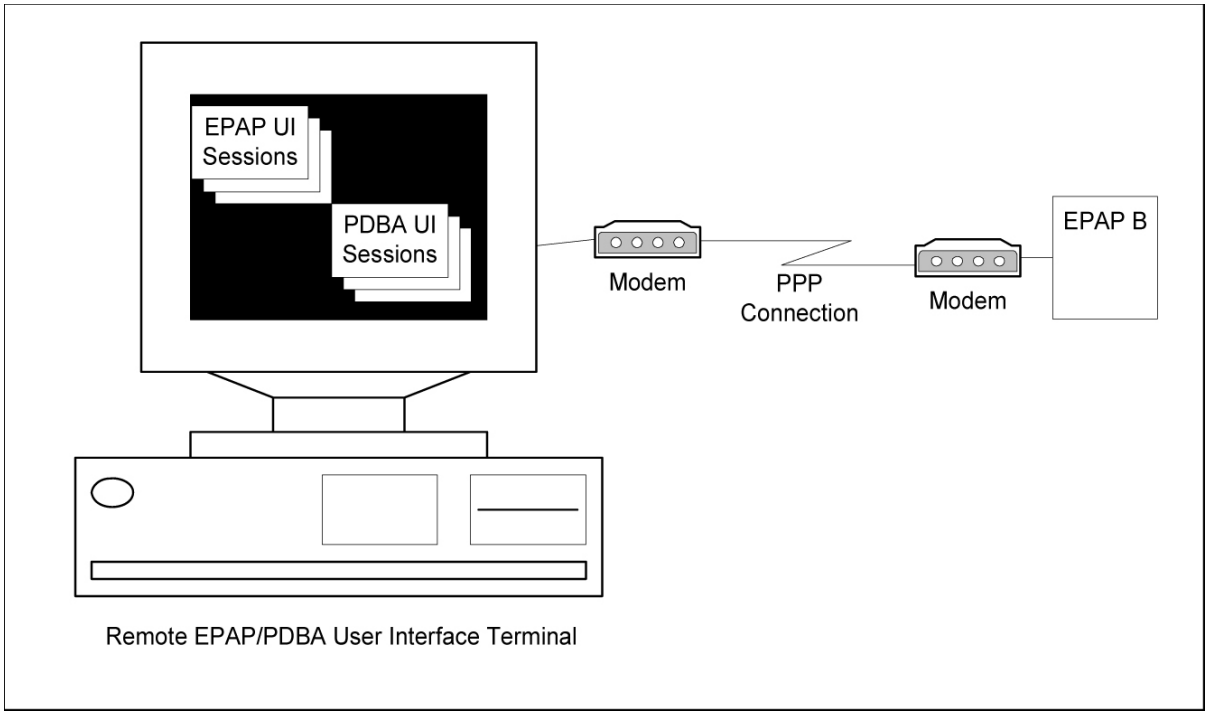
Table 6: EPAP IP Addresses in the DSM Network

Octet	Value
1	*192*
2	*168*
3	One customer-provisioned value for DSM network A and another for DSM network B
4	*100* for EPAP A and *200* for EPAP B

Dial-Up PPP Network

The dial-up PPP network allows multiple user-interface sessions to be established with the EPAP. The network connects a remote EPAP/PDBA user interface terminal with the EPAP in the EAGLE 5 ISS's MPS subsystem. The dial-up PPP network is illustrated in *Figure 8: Dial-Up PPP Network*.

Figure 8: Dial-Up PPP Network



Chapter 3

EAGLE 5 ISS EIR Commands

Topics:

This chapter contains brief descriptions of the EAGLE 5 ISS commands that are used for configuration and maintenance of the EIR feature.

EAGLE 5 ISS Commands for EIR

This chapter describes the EAGLE 5 ISS commands that are used for the configuration and maintenance of the EIR feature.

Refer to the *Commands Manual* for complete descriptions of the commands, including parameter names, valid values, and output examples for the commands.

Table 7: Commands used for EIR

Type	Commands
System Serial Number	ent/rtrv-serial-num
Card	ent/dlt/rtrv/alw/inh/init/rept-stat-card
Feature Control	chg/rtrv-feat, enable/chg/rtrv-ctrl-feat
EAGLE 5 ISS STP Self Identification	chg/rtrv-sid
Mated Application (MAP)	chg/dlt/ent/rtrv-map
Subsystem Application	chg/dlt/ent/rtrv-ss-appl
Service Selector	chg/dlt/ent/rtrv-srvsel
EIR GSM Options	chg/rtrv-gsmopts
Local Subsystem Activation	alw/inh-map-ss
Retrieve, Report Status, and Maintenance	chg-th-alm, ent-trace, init-network, init-sys, rept-stat-alm, rept-stat-db, rept-stat-mps, rept-stat-sccp, rept-stat-sys, rep-stat-trbl, rtrv-data-rtdb, rtrv-tbl-capacity

EAGLE 5 ISS EIR GSM Options Commands

The GSM Options (gsmopts) commands are used to change and report on the values of one or more of the system-level processing options maintained in the GSMOPTS table. All values are assigned initially to system defaults at STP installation time, and they can be updated later using the `chg-gsmopts` command.

The options described in *Table 8: GSMOPTS Options for EIR* apply to EIR.

Table 8: GSMOPTS Options for EIR

Parameter	Range	Description
EIRIMSICHK	OFF or ON	EIR IMSI Check status
EIRRSPTYPE	TYPE1, TYPE2, TYPE3	EIR Response Type

Parameter	Range	Description
EIRGRSP	OFF, WHITELST, GRAYLST, BLKLST, UNKNOWN	EIR Global Response status

The EIRIMSICHK (EIR IMSI Check status) parameter is used to indicate whether or not the IMSI will be used when determining if an IMEI is to be Black Listed. If this parameter is on and an IMEI is found on the Black List, then the corresponding IMSI is retrieved. If the IMSI found in the message matches the IMSI retrieved, then the IMEI is considered to be on the White List. If the IMSIs do not match or the IMSI is not found, then the IMEI will remain Black Listed.

The EIRRSPTYPE parameter is used to determine the EIR Response Type. The Response Type is used to determine how the lists are searched, as shown in *Table 9: Individual IMEI List Determination*.

Table 9: Individual IMEI List Determination

Black List	Gray List	White List	IMSI Check	IMSI Match	Result Type	LOG Entry	LOG Entry Result	MSU Result Equipment Status
Y	N	N	Y	Y	1	N	White with IMSI Override	0
Y	N	N	Y	Y	2	N	White with IMSI Override	0
Y	N	N	Y	Y	3	N	Unknown	Return Error=7
Y	N	N	Y	N	1	Y	Black with IMSI Failed	1
Y	N	N	Y	N	2	Y	Black with IMSI Failed	1
Y	N	N	Y	N	3	N	Unknown	Return Error=7
Y	N	Y	N	DC	1	Y	Black	1
Y	N	Y	N	DC	2	Y	Black	1
Y	N	Y	N	DC	3	Y	Black	1
Y	N	Y	Y	Y	1	N	White with IMSI Override	0
Y	N	Y	Y	Y	2	N	White with IMSI Override	0
Y	N	Y	Y	Y	3	N	White with IMSI Override	0
Y	Y	N	N	DC	1	Y	Black	1
Y	Y	N	N	DC	2	Y	Black	1

Black List	Gray List	White List	IMSI Check	IMSI Match	Result Type	LOG Entry	LOG Entry Result	MSU Result Equipment Status
Y	Y	N	N	DC	3	N	Unknown	Return Error=7
Y	Y	N	Y	Y	1	Y	White with IMSI Override	0
Y	Y	N	Y	Y	2	Y	White with IMSI Override	0
Y	Y	N	Y	Y	3	Y	White with IMSI Override	0
N	Y	N	Y	DC	1	Y	Gray	2
N	Y	N	Y	DC	2	Y	Gray	2
N	Y	N	Y	DC	3		Unknown	Return Error=7
N	Y	Y	DC	DC	1	Y	Gray	2
N	Y	Y	DC	DC	2	Y	Gray	2
N	Y	Y	DC	DC	3	Y	Gray	2
N	N	Y	DC	DC	1	N	White	0
N	N	Y	DC	DC	2	N	White	0
N	N	Y	DC	DC	3	N	White	0
N	N	N	DC	DC	1	N	White	0
N	N	N	DC	DC	2	N	Unknown	Return Error=7
N	N	N	DC	DC	3	N	Unknown	Return Error=7
Y	Y	Y	N	DC	1	Y	Black	1
Y	Y	Y	N	DC	2	Y	Black	1
Y	Y	Y	N	DC	3	Y	Black	1
Y	Y	Y	Y	Y	1	N	White with IMSI Override	0

Black List	Gray List	White List	IMSI Check	IMSI Match	Result Type	LOG Entry	LOG Entry Result	MSU Result Equipment Status
Y	Y	Y	Y	Y	2	N	White with IMSI Override	0
Y	Y	Y	Y	Y	3	N	White with IMSI Override	0
Y	Y	Y	Y	N	1	N	Black with IMSI Failed	1
Y	Y	Y	Y	N	2	N	Black with IMSI Failed	1
Y	Y	Y	Y	N	3	N	Black with IMSI Failed	1

For EIR Response Types 1 or 2, the IMEI searches are handled in the following manner:

- If the IMEI is found in the Black List table, the search stops without searching the White and Gray List tables. The IMEI is considered Black Listed regardless of IMEI's presence on the White or Gray List tables.
- If the IMEI is found in the Gray List table, but not found in the Black List table, the search stops without searching the White List table. The IMEI is considered Gray Listed regardless of the IMEI's presence on the White List table.

For EIR Response Type 3, the IMEI searches are handled in the following manner:

- The White List table is searched first. If the IMEI is not found in the White List table, the IMEI is treated as unknown - no other table searches need to be performed.
- If the IMEI is found in the White List table, the Black List table is searched next. If the IMEI is in the White and Black List tables, the IMEI is considered Black Listed - no need to search the Gray List table.
- If the IMEI is found in White List table, but not in the Black List table, the Gray List table is searched. If the IMEI is in the White and Gray list tables, the IMEI is considered Gray Listed. If the IMEI is in the White List table, but not in the Gray List table, the IMEI is considered White Listed.

The EIRGRSP parameter is used to turn on the EIR Global Response Type. The Global Response Type is used to override the response that is normally sent back to the MSC. The default is set to OFF. When set to OFF, the normal list logic is applied to the IMEI. If the Global Response Type is set to something other than OFF, then there is no list logic processing and the corresponding response is sent to the MSC.

EAGLE 5 ISS EIR Service Selector Commands

The EIR service selector (srvsel) commands are used to enter, delete, change, and display the service selectors required to change a service entry for a DSM service entry.

- The EIR service is eir.
- EIR supports ITU-I, ITU-N, and ITU-N24 Global Title Indicators.

  The Global Title Indicator (GTI) value can be either 2 or 4. The Numbering Plan and Nature of Address Indicator cannot be specified when the GTI is 2, and must be specified when the GTI is 4.

- EIR does not support the Service Nature of Address or the Service Numbering Plan.
- The Subsystem Number (SSN) must be defined in the MAP table, and supports the asterisk (*) value.

EAGLE 5 ISS Feature Control Commands

The `chg/rtrv-feat` commands are used to turn on and display the on/off status of features, such as the GTT feature, that are controlled with feature bits. After a feature that is controlled with a feature bit is turned on, the feature cannot be turned off.

The `enable/chg/rtrv-ctrl-feat` commands are used to enable, turn on, and display the status of features that are controlled by feature access keys. The feature access key is based on the feature part number and the serial number of the system that uses the feature, making the feature access key site-specific. When a feature is enabled by entering the `enable-ctrl-feat` command with the feature part number and feature access key, the feature is recognized by the system. Other actions might be required to make the feature fully operational, such as turning the feature on, installing hardware, and provisioning information in database tables.

Some features can be enabled with a temporary part number and feature access key for a limited trial of the feature. When the trial period expires, the feature must be enabled with a permanent part number and feature access key to continue use of the feature.

Maintenance Commands

The following commands can be used for maintenance when an EPAP-related feature is on.

Refer to the command descriptions in the *Commands Manual* for complete descriptions of the commands, including parameters, valid values, and output examples.

Table 10: Maintenance Commands

Command	Description
rept-stat-sys	Reports the status of system entities, including cards. The output includes the number of Service Module cards that are in service (IS-NR) and how many are in another state (IS-ANR, OOS-MT, OOS-MT-DSBLD).
rept-stat-sccp	Reports subsystem operating status, CPU usage, and Service Module card status. When the loc parameter is specified, the command displays detailed card traffic statistics. See the section in this manual for each feature that describes the use of the `rept-stat-sccp` command for that feature.
rept-stat-mps	Displays the overall status of the application running on the MPS (multi-purpose server). Command output for the various reports of this command include overall MPS alarm status and card status, and status for a specific Service Module card when a feature is on.
rept-stat-trbl	Includes a summary of any trouble notifications (UAMs) for local subsystems, cards, and linksets. The severity of each alarm is indicated in the output report.
rept-stat-alm	Displays the alarm counts and totals for local subsystems and DSM/EPAP IP links.

Command	Description
rept-stat-db	Displays the status information for the EAGLE 5 ISS databases. This includes the level information for each Service Module card, and for the active and standby EPAP databases. It reports database exception status such as corrupted, incoherent, or inconsistent, as well as providing the birth dates and levels. It shows the status of the PDB and RTDB databases when an EPAP-based feature is enabled.
rtrv-tbl capacity	Retrieves table use capacity summary information. For each table listed, the number of table entry elements in use and the total allowed number of table elements is presented, along with a percent (%) full value. Information is shown for some tables only if the feature that uses the table is enabled.
inh-card/alw-card	Used to change the operating state of the card from In-Service Normal (IS-NR) to Out-of-Service Maintenance-Disabled (OOS-MT-DSBLD). A craftsperson then can test the card or physically remove it from the shelf. The `alw-card` command is used to change the card from OOS-MT-DSBLD (Out-of-Service Maintenance-Disabled) to IS-NR (In-Service Normal) if card loading is successful.
inh-alm/unhb-alm	Used to allow and inhibit alarms on the Service Module card ports. The commands allow both Port A and Port B to be specified.
rtrv-data-rtdb	Retrieves Entity data, DN data, IMEI data, IMSI data, TN data, NPANXX data, and LRN data from the RTDB on an active Service Module card. If the loc parameter is specified and the target card is an active Service Module card, the RTDB data is retrieved from that card. If the loc parameter is not specified, the RTDB data is retrieved on the active Service Module card that has the lowest IMT address. The RTDB status on the active Service Module card can be coherent or incoherent.

rept-stat-sccp

The `rept-stat-sccp` command provides statistics for Service Module cards and for the services that execute on the cards. The statistics can be displayed for all Service Module cards, or for a specified card.

Refer to the *Commands Manual* for a description of the `rept-stat-sccp` command, including parameter names, valid values, and output examples for the command.

EIR Feature Statistics

The `rept-stat-sccp` command counts and displays the following statistics when the EIR feature is enabled and turned on (WARNINGS and FORWARD TO GTT are not reported for EIR):

- TOTAL = the total number of messages that contain a CheckIMEI MAP Operation.
- SUCCESS = the number of messages that passed CheckIMEI processing
- ERRORS = the number of messages that were not counted in SUCCESS.

EAGLE 5 ISS Debug Commands

The *Commands Manual* contains descriptions of debug commands that can be used in assessing and modifying system status and operation. Most of the debug commands are used only under the direction of Tekelec support personnel.

Refer to the *Commands Manual* for a complete description of the debug commands, including the `ent-trace` command.

The `ent-trace` command can be used for EIR to provide a trap-and-trace function for MSUs on the Service Module cards.

- Trap Message will be performed on a Query message with:
  - A decode error, and Trace-On-Error set
  - IMEI match
  - IMSI match
  - SSP
  - GT
- Because the Response message will not contain the IMEI or IMSI information, it will be trapped if the Query message was trapped.

CAUTION: This command can cause OAM to reset if too many MSUs are trapped.

A trace must be set on all Service Module cards; specify the card=sccp-all parameter. Use a repetition parameter (rep) to control the number of MSUs that are trapped.

The 14-digit IMEI is a trapping field. MSUs are trapped only when the SDS count (REP) is positive. If a Query and Response are both trapped, that is 2 SDS counts.

MSUs that satisfy any trigger criteria are trapped on the Service Module card, forwarded to OAM, and displayed.

Chapter 4

EIR Configuration

Topics:

This chapter identifies prerequisites and procedures for configuration of the EIR feature in the EAGLE 5 ISS.

Introduction

This chapter describes prerequisites and procedures for configuration of the EIR feature on the EAGLE 5 ISS.

The Equipment Identity Register (EIR) feature is configured on the EAGLE 5 ISS and on the EPAP (in association with either the G-Flex or G-Port feature). This chapter covers the EAGLE 5 ISS configuration only. Refer to the *EPAP Administration Manual* and *EPAP Entity Provisioning* in this manual for information about EPAP configuration.

EIR Configuration Procedure lists the steps for enabling and turning on the feature, and for the provisioning required for the feature. Each step contains a link or reference to information and procedures to use to complete the step. Feature provisioning can be performed only after the EIR feature is turned on.

Note: The EIR feature is optional and must be purchased from Tekelec before it can be used in your system. If you are not sure whether you have purchased a specific feature, contact your Tekelec Sales or Account Representative.

EPAP Entity Provisioning

It is recommended that EPAP entity (SP or RN) administration not be done until after the point code and/or subsystem number has been entered into the EAGLE 5 ISS MAP table (see Step 5).

- EPAP-administered entity data can possibly become out-of-sync with the EAGLE 5 ISS MAP table when the creation of point codes and/or subsystem numbers in the MAP table is performed after EPAP database administration.
- If this mismatch is discovered in real-time operations, a UIM (such as `SCCP did not route - DPC not in MAP tbl` or `SCCP did not route - SS not in MAP tbl`) is sent to the EAGLE 5 ISS maintenance terminal.

System Prerequisites

Before any feature that is described in this manual can be enabled, the prerequisites listed in *Table 11: System Prerequisites* are required in the system.

Table 11: System Prerequisites

Prerequisite	Verification and Provisioning
The system serial number must be correct and locked. For new installations, the system is shipped with an unlocked serial number. The serial number can	**Note:** The serial number cannot be changed after it is entered and locked in the system. Locate the serial number for the system on a label affixed to the control shelf (1100).

Prerequisite	Verification and Provisioning
be changed if necessary and must be locked after the system is on-site. For systems that are being upgraded, the serial number is usually already verified and locked.	Enter the `rtrv-serial-num` command to display the serial number and its locked status. Verify that the displayed serial number is correct for the system. If no serial number is displayed, enter the `ent-serial-num` command (without the lock parameter) to provision the serial number that appears on the control shelf label. Enter the rtrv-serial-num command and verify that the serial number was entered correctly. Enter the `ent-serial-num` command with the lock=yes parameter to lock the serial number in the system.
A sufficient number of Service Module cards must be equipped. Some features require only E5-SM4G cards and cannot use DSM cards. See specific feature prerequisites, if any, in this section. Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for information on the dimensioning rules and the database capacity requirements for EPAP-related features.	Enter the `rept-stat-card:appl=vsccp` command to list the Service Module cards in the system. If more cards or cards of a different type are needed, refer to the procedures in the *Database Administration Manual - GTT* to add Service Module cards or remove DSM cards.
The GTT feature must be on in the system. Some features require an additional GTT-related feature such as EGTT. See the specific feature prerequisites in this section.	Enter the `rtrv-feat` command to display the GTT feature status. If the GTT feature is on, the gtt=on entry appears in the output. If the gtt=off entry appears in the output, use the procedures in the *Database Administration Manual - GTT* to turn on and provision the GTT feature and any other GTT-related features and functions that will be used in the system.

EIR Feature Prerequisites

Before the EIR feature can be enabled, the following prerequisites are required in the system:

Table 12: EIR Feature Prerequisite

Prerequisite	Verification and Provisioning
The ANSIGFLEX system option cannot be set to Yes.	Enter the `rtrv-stpopts` command. Verify that the ANSIGFLEX entry does not appear in the command output or that the ANSI GFLEX entry shows a value of No.
The LNP feature cannot be on in the system.	Enter the `rtrv-ctrl-feat` command. If the LNP feature is on, shown with a quantity greater than zero for the LNP ported TNs entry in the command output, the feature described in this manual cannot be enabled.

EIR Configuration Procedure

The EAGLE 5 ISS configuration of the Equipment Identity Register (EIR) feature consists of the following steps. The steps contain links and references to detailed procedures and information needed to complete each step.

1. Verify, and provision if needed, the system prerequisites. See *System Prerequisites*.
2. Verify, and provision if needed, the feature prerequisites. See *EIR Feature Prerequisites*.
3. Enable the EIR feature, set system STP options, and turn on the EIR feature. See *Enabling and Turning On the EIR Feature*.
4. Change the self identification of the EAGLE 5 ISS node to include true point codes and EIR capability point codes. Refer to the procedures in the *Database Administration Manual - SS7*.
5. Refer to the procedures in the *Database Administration Manual - Global Title Translation* to provision the following items:

   - Translation types and mappings
   - Mated Application (MAP) table entries for the EIR feature that contain the EAGLE 5 ISS ITU-I and ITU-N true point codes, the EIR capability point codes, and the EIR subsystem number. Only solitary and dominant loadsharing are supported.

   The EIR subsystem can have a mate subsystem and a concerned point code group assigned to it in the MAP table.

   If multiple point code types for EIR are provisioned in the MAP table, then the point code type for the Subsystem Out-of-Service Request message (SOR) is determined using the following order:

   1. ANSI
   2. ITU-N
   3. ITU-N Spare
   4. ITU-I
   5. ITU-I Spare

6. Provision the state and subsystem number for the EIR local subsystem application. See *Adding the EIR Subsystem Application*.
7. Provision the service selector mechanism to route MSUs to the EIR subsystem. See *Provisioning the EIR Service Selectors*.

   The EIR service is eir.

   The Translation Type and Subsystem Number are the values assigned for the EIR local subsystem when the MAP table entries were defined. See Step 5 in this procedure. The asterisk value (*) for the Subsystem Number is supported for the EIR subsystem.

   EIR supports ITU-I, ITU-N, and ITU-N24 Global Title Indicators.

   - The gtii/gtin/gtin24 value can be either 2 or 4.
   - If the gtii/gtin/gtin24 value is 2, the np, nai, npv, or naiv parameters cannot be specified with the `ent-srvsel` command.
   - If the gtii/gtin/gtin24 value is 4, either the np and nai or the npv and naiv parameters must be specified with the `ent-srvsel` command.

   EIR does not support the Service Nature of Address or the Service Numbering Plan.
8. Provision GSM options, including the EIR Global Response status, EIR Response Type, and EIR IMSI Check status options. See *Changing the EIR Options*.
9. Activate the EIR local subsystem. See *Activating the EIR Local Subsystem*.
10. Configure the Measurements Platform feature or the E5-OAM Integrated Measurements feature if measurements are to be collected for EIR.

    Refer to the procedures in the *Database Administration Manual - System Management* for configuring the Measurements Platform feature, the E5-OAM Integrated Measurements feature, and the EAGLE OA&M IP Security feature in the EAGLE 5 ISS. (OAM-based measurements reports are not available for EIR.)

Adding a Service Module Card

This procedure is used to add Service Module cards to the database to support GTT-related features and EPAP-related features.

EPAP-based features require Service Module cards running the VSCCP application. The following cards can be used as Service Module cards running the VSCCP application in the system:

- DSM 4G – a DSM card with 4 gigabytes of memory
- E5-SM4G - an EPM-based card with 4 gigabytes of memory

The system can contain a maximum number of Service Module cards for EPAP-related features:

- Up to 25 (24+1) Service Module cards if EPAP is running in a T1000 AS
- Up to 32 (31+1) Service Module cards if EPAP is running in a T1200 AS

  - The following Warning appears when more than 25 Service Module cards have been provisioned in the system and the `enable-ctrl-feat` command is entered to enable the first EPAP-related feature in the system:

    ```
    Warning: The Eagle must be connected to an EPAP T1200 or higher
    ```

- The following Caution appears when the `ent-card` commend is entered to add the 26th Service Module card to the database and any EPAP-related feature is enabled in the system:

```
CAUTION: Please ensure EPAP Application Server is running on
         hardware supporting 32 SCCP cards e.g.: T1200.
         Re-enter command within 30 seconds to confirm change.
```

Refer to *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the Service Module card database capacity requirements.

A Service Module card occupies two card slots. A Service Module card can be inserted only in an odd/even numbered pair of empty card slots of an EAGLE 5 ISS shelf. The even-numbered card slot to the right of the odd-numbered slot where the Service Module card is to be inserted must be empty. A Service Module card cannot be inserted in slots 09 and 10 because slots 09 and 10 of each shelf contain HMUX cards, HIPR cards, or HIPR2 cards. The Service Module card is connected to the network through the odd-numbered card slot connector.

Note: Service Module cards can be inserted only in slots 01, 03, 05, 07, and 11 of the control shelf (1100).

Table 13: Service Module Card Locations

Location of the Service Module Card	Empty Card Location
Slot 01	Slot 02
Slot 03	Slot 04
Slot 05	Slot 06
Slot 07	Slot 08
Slot 11	Slot 12
Slot 13	Slot 14
Slot 15	Slot 16
Slot 17	Slot 18

Prerequisites

Before a Service Module card can be added, the prerequisites in *Table 14: System Prerequisites for Adding a Service Module Card* must be present in the system.

Table 14: System Prerequisites for Adding a Service Module Card

Prerequisite	Verification and Actions
The shelf to which the card is to be added must already be provisioned in the database.	Enter the `rtrv-shlf` command. If the shelf is not in the database, refer to the procedure for adding a shelf in the *Database Administration Manual – System Management*.
The odd/even slots in which the card will be inserted must not have a card already assigned in the database.	Enter the `rtrv-card` command. If a slot has a card assigned to it, use the dlt-card command to remove the card from the database. Refer to the `dlt-card` command description in the *Commands Manual*.
The GTT feature must be on.	Enter the `rtrv-feat` command to display the GTT feature status. If the GTT feature is on, the gtt=on entry appears in the output. If the gtt=off entry appears in the output, use the procedures in the *Database Administration Manual - GTT* to turn on and provision the GTT feature and any other GTT-related features and functions that will be used in the system.
To add more than 25 Service Module cards to the database, the EPAP that is connected to the EAGLE 5 ISS must be running on a T1200 AS.	Use visual inspection or contact the *Customer Care Center* for assistance to determine the EPAP hardware type.

Before an E5-SM4G Service Module card can be added, the prerequisite in *Table 15: Prerequisite for Adding an E5-SM4G Service Module Card* must be present in the system.

Table 15: Prerequisite for Adding an E5-SM4G Service Module Card

Prerequisite	Verification and Actions
Slots 09 and 10 in the shelf to which the E5-SM4G card will be added must contain either HIPR cards or HIPR2 cards.	Enter the `rept-stat-gpl:gpl=hipr` command and the `rept-stat-gpl:gpl=hipr2` command to list the installed HIPR cards and HIPR2 cards in the system. If the shelf does not contain HIPR cards or HIPR2 cards, refer to procedures in the *Installation Manual - EAGLE 5 ISS* to install HIPR cards or HIPR2 cards in the shelf.

Refer to the *Commands Manual* for complete descriptions of the commands that are used in this procedure. The complete descriptions include all valid parameter values and output examples.

1. Display the cards in the system by entering the `rtrv-card` command. Odd-even pairs of card locations that do not contain cards (are not listed in the output) and do not contain HMUX, HIPR, or HIPR2 cards can be used for Service Module cards.

```
    rlghncxa03w 08-03-15 16:34:56 EST  EAGLE 39.2.0
    CARD   TYPE      APPL      LSET NAME     LINK SLC LSET NAME     LINK SLC
    1201   LIMDS0    SS7ANSI   LS1           A    0   LS1           B
    1102   DSM       VSCCP     ------------  A    --  ------------  B    --
    1113   GPSM      OAM
    1114   TDM-A
    1115   GPSM      OAM
    1116   TDM-B
    1117   MDAL

;
```

2. Verify that the Service Module card to be added has been physically installed in the correct card location.

CAUTION: If the version of the BPDCM GPL on the Service Module card does not match the BPDCM GPL version in the database when the Service Module card is inserted into the card slot, UAM 0002 is generated indicating that these GPL versions do not match. If UAM 0002 has been generated, perform the alarm clearing procedure for UAM 0002 in the *Unsolicited Alarm and Information Messages* manual before proceeding with this procedure.

3. Perform this step only if the card being added will be the 26th Service Module card in the system.

   If the card is NOT the 26th Service Module card, continue to *Step 4*.

   Note: The same `ent-card` command must be entered twice within 30 seconds to complete the provisioning of the card.

   a) Enter the `ent-card` command the first time for the 26th card.

   `ent-card:loc=<card location>:type=dsm:appl=vsccp`

   When the command executes the first time and any EPAP-related feature is enabled, the following caution appears :

```
CAUTION: Please ensure EPAP Application Server is running on
         hardware supporting 32 SCCP cards e.g.: T1200.
         Re-enter command within 30 seconds to confirm change.
```

   b) Enter the same `ent-card` command the second time for the 26th card to complete the provisioning of the card.

   c) Go to *Step 5*.

4. Add the Service Module card to the database, using the `ent-card` command.
   `ent-card:loc=<card location>:type=dsm:appl=vsccp`
5. For an E5-SM4G card, verify the temperature threshold settings by performing the "Changing the High-Capacity Card Temperature Alarm Thresholds" procedure in *Database Administration Manual - SS7*.
6. Verify the change by entering the `rtrv-card` command with the card location specified.
   `rtrv-card:loc=<card location>`

```
    rlghncxa03w 08-03-15 16:34:56 EST  EAGLE 39.2.0
    CARD   TYPE      APPL      LSET NAME     LINK SLC LSET NAME     LINK SLC
    1301   DSM       VSCCP     ------------  A    --  ------------  B
;
```

7. Change the IP Address to MPS for the added card.

   `chg-ip-lnk:port=<a/b>:submask=255.255.255.0:mcast=yes:speed=100:loc=<odd-numbered card location>:ipaddr=<EPAP DSM IP address>:duplex=full`

8. Allow the added card to begin operation in the system.

   `alw-card:loc=<odd-numbered card location>`

9. Back up the database changes, by entering the following command.

   `chg-db:action=backup:dest=fixed`

   The following messages should appear; the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED) : MASP A - Backup starts on active MASP.
BACKUP (FIXED) : MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED) : MASP A - Backup starts on standby MASP.
BACKUP (FIXED) : MASP A - Backup on standby MASP to fixed disk complete.
```

10. Repeat this procedure for each Service Module card that needs to be added to the system.

Enabling and Turning On the EIR Feature

This procedure is used to enable and turn on the EIR feature in the EAGLE 5 ISS.

- The EIR feature must be enabled using the EIR feature part number 893012301 and a feature access key.

  Note: Controlled features must be purchased before you can receive a feature access key to use to enable the feature. If you are not sure if you have purchased a feature and received the feature access key, contact your Tekelec Sales Representative or Account Representative.

  The feature access key is based on the EIR feature part number and the serial number of the system, making the feature access key site-specific.

  When the EIR feature is enabled, it is permanently enabled. The EIR feature cannot be temporarily enabled.

- After the EIR feature has been enabled, the EIR feature must be turned on using the `chg-ctrl-feat` command with the EIR feature part number and the status=on parameter.

1. Enable the EIR feature. Enter the `enable-ctrl-feat` command with the EIR feature part number 893012301and the FAK.
2. Turn on the EIR feature on. Enter the `chg-ctrl-feat` command with the EIR feature part number 893012301 and the `status=on` parameter.
3. Verify the changes. Enter the `rtrv-ctrl-feat` command with part number 893012301.

```
rlghncxa03w 10-06-30 21:16:37 GMT  EAGLE5 42.0.0
The following features have been permanently enabled:
Feature Name             Partnum    Status  Quantity
HC-MIM SLK Capacity      893012707  on          64
EIR                      893012301  on      ------
```

4. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

These messages should appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first:

```
BACKUP (FIXED) : MASP A - Backup starts on active MASP.
BACKUP (FIXED) : MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED) : MASP A - Backup starts on standby MASP.
BACKUP (FIXED) : MASP A - Backup on standby MASP to fixed disk complete.
```

Provisioning the EIR Local Subsystem

The following procedures in this section are used to add or remove a local subsystem application:

- *Adding the EIR Subsystem Application*
- *Removing the EIR Subsystem Application*

See the procedures in *Changing the State of a Subsystem Application* to take the subsystem application online or offline.

Note: The EAGLE 5 ISS supports the operation of two or more local subsystems for EPAP-related features in the system at one time. For example, the local subsystems for INP and EIR can coexist in the system.

Adding the EIR Subsystem Application

This procedure is used to define the EIR subsystem application. The subsystem application can be taken online when it is defined or later in the configuration process (see *Changing the State of a Subsystem Application*).

Before the EIR local subsystem can be added to the database, the following prerequisites must exist in the system:

Table 16: EIR Local Subsystem Prerequisites

Prerequisite	Verification
The EIR feature must be enabled and turned on.	Enter the `rtrv-ctrl-feat` command. If the EIR entry with Status of on does not appear in the output, see the *Enabling and Turning On the EIR Feature* procedure.
The application specified by the appl parameter (eir) cannot already be in the database.	Enter the `rtrv-ss-appl` command. If the EIR entry appears in the output , this procedure cannot be performed.
EAGLE 5 ISS true point codes and EIR capability point codes must be defined, and entered in the Mated Application (MAP) table with a subsystem	Only one subsystem number for the application can be defined, and must be used for all point code types assigned to the local subsystem.

Prerequisite	Verification
number to be used for the EIR subsystem application.	Enter the `rtrv-sid` command, and verify that the true and capability point codes (`PCI` and `PCN` fields) needed for the feature are correct. If changes are required, refer to the procedures in the *Database Administration Manual - SS7*. Enter the rtrv-map command, and verify that the MAP table entries include EAGLE 5 ISS true point code and the SSN for the EIR local subsystem. If changes are required, refer to the procedures in the *Database Administration Manual – Global Title Translation* for provisioning solitary and dominant mated applications.

The example in this procedure reserves the subsystem number 100 for the EIR application and sets the EIR application status to `online`.

1. Add the EIR application and subsystem number, using the `ent-ss-appl` command.

   If the stat=online parameter is not specified, the status defaults to `offline`.

2. Verify the changes; enter the `rtrv-ss-appl` command.

```
    tekelecstp 10-07-25 08:02:22 EST  EAGLE5 42.0.0
    APPL   SSN  STAT
    EIR    100  online

    SS-APPL TABLE IS 25% FULL (1 OF 4)
;
```

3. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages should appear; the active Maintenance and Administration Subsystem Processor (MASP) appears first:

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Removing the EIR Subsystem Application

This procedure is used to remove a subsystem application from the database. The subsystem application to be removed must be in the database and the subsystem must be out of service.

1. Display the subsystem number for the EIR local subsystem application in the database; enter the `rtrv-ss-appl` command.
2. Display the operating status of the EIR subsystem; enter the `rept-stat-sccp` command.

   If the subsystem is out of service, shown by an entry containing OOS-MT-DSBLD for the subsystem in the `rept-stat-sccp` output, go to *Step 5*.

3. Place the EIR subsystem application out of service. Enter the `inh-map-ss` command and specify the EIR subsystem number displayed in *Step 1*.

```
inh-map-ss:ssn=100
```

```
rlghncxa03w 10-06-28 14:42:38 GMT  EAGLE5 42.0.0
Inhibit map subsystem command sent to all SCCP cards.
Command Completed.
```

4. Verify that the EIR subsystem is out of service by entering the `rept-stat-sccp` command.

   If the local subsystem is not out of service, return to *Step 3* and enter the `inh-map-ss` command with the force=yes parameter specified.

5. Remove the local subsystem application from the database, by entering the `dlt-ss-appl` command.

   When this command has successfully completed, the following message appears:

```
rlghncxa03w 09-04-05 17:34:20 EST  EAGLE 41.0.0
DLT-SS-APPL: MASP A - CAUTION: DELETED APPL SSN MAY BE REFERENCED BY GTT ENTRY
DLT-SS-APPL: MASP A - COMPLTD
;
```

6. Verify the changes; enter the `rtrv-ss-appl` command.
7. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages should appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first:

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Changing the State of a Subsystem Application

The procedures in this section are used to set the state of an existing subsystem application to either online or offline.

The online or offline status of the subsystem application is shown in the STAT field of the `rtrv-ss-appl` command output.

The `rept-stat-sccp` command displays the operating state (in or out of service) of the subsystem.

If the subsystem application is to be taken online, the subsystem application must be offline.

When the subsystem is taken online (regardless of how the subsystem was taken offline), the EAGLE 5 ISS sends SNR/SSA. A UAM is generated, indicating that the subsystem is ALLOWED.

If the subsystem application is to be taken offline, the subsystem application must be online. The subsystem must be taken out of service (OOS-MT-DSBLD) with the `inh-map-ss` command before it can be taken offline.

A subsystem application can be taken offline using coordinated state change, or forced offline without using coordinated state change.

When the `inh-map-ss` command is entered for the subsystem, a coordinated shutdown is attempted. If the coordinated shutdown fails, a UIM is generated, indicating that the shutdown failed. If the force parameter is specified, the subsystem is forced to shut down; a coordinated shutdown is not performed.

For coordinated state change, SCMG sends an SOR message to the mated subsystem and will start a T_{coord} timer (30 seconds). If SCMG receives an SOG message from the mated subsystem before the T_{coord} timer expires, SCMG will broadcast SSPs to the concerned point code group, send SBR/SSP, and take the subsystem offline. A UAM is generated, indicating that the subsystem is PROHIBITED. If the SOG is not received before T_{coord} expires, then the inhibit request is denied and a UIM is generated.

When the subsystem is taken offline without coordinated state change, the EAGLE 5 ISS sends SBR/SSPs. A UAM is generated, indicating that the subsystem is PROHIBITED.

When the EAGLE 5 ISS receives an SOR message from its mated subsystem, it will reply with an SOG message if both of the following conditions are met. If either of these conditions is not met, the EAGLE 5 ISS will not reply to the SOR message.

- The local subsystem is available
- The total load on the DSM subsystem is less than 45% of its capacity

Taking the Subsystem Application Online

Use the procedure in this section to take the subsystem application online.

1. Verify the state of the subsystem application - online or offline, by entering the rtrv-ss-appl command.

```
    tekelecstp 08-07-25 08:02:22 EST  EAGLE5 42.0.0
    APPL   SSN  STAT
    EIR    11   offline

    SS-APPL TABLE IS 25% FULL (1 OF 4)
;
```

   If the EIR subsystem is online, this procedure does not need to be performed.

2. Display the operating status of the subsystem by entering the `rept-stat-sccp` command.
3. Take the subsystem application online. Enter the `chg-ss-appl` command with the nstat=online parameter.
   `chg-ss-appl:appl=inp:nstat=online`
4. Verify the changes by entering the `rtrv-ss-appl` command.

```
    tekelecstp 08-07-25 08:02:22 EST  EAGLE5 42.0.0
    APPL   SSN  STAT
    EIR    11   online

    SS-APPL TABLE IS 25% FULL (1 OF 4)
;
```

5. Back up the new changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Taking the Subsystem Application Offline

Use the procedure in this section to take a subsystem application offline.

1. Verify the online or offline state of the subsystem application, by entering the rtrv-ss-appl command.

```
    tekelecstp 08-07-25 08:02:22 EST  EAGLE 42.0.0
    APPL   SSN  STAT
    EIR    11   online

    SS-APPL TABLE IS 25% FULL (1 OF 4)
;
```

   If the EIR subsystem application is offline, this procedure does not need to be performed.

2. Verify the operating status of the subsystem by entering the `rept-stat-sccp` command.
3. Place the subsystem out of service. Specify the subsystem number displayed in the output in *Taking the Subsystem Application Online*.

   `inh-map-ss:ssn=11`

```
    rlghncxa03w 08-06-28 14:42:38 GMT EAGLE 42.0.0
    Inhibit map subsystem command sent to all SCCP cards.
    Command Completed.
;
```

4. Verify that the subsystem is out of service, by entering the `rept-stat-sccp` command.
5. Take the subsystem offline. Enter the `chg-ss-appl` command with the nstat=offline parameter.

   `chg-ss-appl:appl=eir:nstat=offline`
6. Verify the changes by entering the `rtrv-ss-appl` command.

```
    tekelecstp 08-07-25 08:02:22 EST  EAGLE 42.1.0
    APPL   SSN  STAT
    EIR    11   offline

    SS-APPL TABLE IS 25% FULL (1 OF 4)
;
```

7. Back up the new changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Provisioning the EIR Service Selectors

The procedures in this section describe how to add, change, and remove a service selector. The information is indicated that is specific to EIR.

Refer to the *Commands Manual* for complete descriptions of the commands used in these procedures, including parameter names, valid values, and output examples for the commands.

Adding an EIR Service Selector

This procedure is used to add a service selector for the EIR feature.

The EIR feature must be enabled and turned on before an EIR service selector can be added.

1. Verify that the EIR feature is enabled and turned on, by entering the `rtrv-ctrl-feat` command.

   If the EIR feature is enabled and turned on, the status of the EIR feature is `on`

```
rlghncxa03w 10-06-30 21:15:37 GMT  EAGLE5 42.0.0
The following features have been permanently enabled:
Feature Name             Partnum    Status  Quantity
HC-MIM SLK Capacity      893012707  on            64
EIR                      893012301  on          ----
;
```

   - If the EIR feature is enabled and turned on, continue with *Step 2*.
   - If the EIR feature is not enabled or turned on, go to the *Enabling and Turning On the EIR Feature* procedure to enable and turn on the EIR feature. Then continue with *Step 2*.

2. Display the EIR service selectors in the database, using the `rtrv-srvsel:serv=eir` command.

```
rlghncxa03w 10-06-28 14:42:38 GMT  EAGLE5 42.0.0

GTII  TT   NP       NAI   SSN  SNP    SNAI   SERV
4     1    e214     intl  3    ----   -----  eir
4     2    e214     intl  *    ----   -----  eir

SRV SELECTOR table is (4 of 20992)   1 % full
;
```

3. Add the EIR service selector using the `ent-srvsel` command.

   For example, enter a command like these:

   `ent-srvsel:serv=eir:tt=35:ssn=100:gtin=4:np=e214:nai=natl`

   `ent-srvsel:serv=eir:tt=57:ssn=75:gtin=2`

4. Verify the changes; enter the `rtrv-srvsel` command with the parameters and values used in *Step 3*.

   `rtrv-srvsel:serv=eir:tt=35:ssn=100:gtin=4:np=e214:nai=intl`

```
rlghncxa03w 10-06-28 14:42:38 GMT  EAGLE5 42.0.0

GTIN  TT   NP       NAI   SSN  SNP   SNAI   SERV
4     35   e214     natl  100  ----  -----  eir

SRV SELECTOR table is (6 of 20992)   1 % full
;
```

   `rtrv-srvsel:serv=eir:tt=57:ssn=75:gtin=2`

```
rlghncxa03w 10-06-28 14:42:38 GMT  EAGLE5 42.0.0

GTIN  TT   NP       NAI   SSN   SNP    SNAI   SERV
2     57   ---      ----   75   ----   -----  eir

SRV SELECTOR table is (6 of 20992)   1 % full
;
```

5. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

The following messages should appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first:

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Removing a Service Selector

This procedure is used to remove a service selector from the database.

1. Display the service selectors in the database, using the `rtrv-srvsel` command.

   The serv, gtii, gtin, gtin24, tt, ssn, np, nai, npv, and naiv parameter values can be used to limit the amount of information displayed with the `rtrv-srvsel` command.

2. Remove the service selector from the database, using the `dlt-srvsel` command.

   To remove a service selector, the `gtii/gtin/gtin24`, `tt`, and `ssn` parameter values must be entered as shown in the `rtrv-srvsel` output.

   For example, enter a command like these:

   `dlt-srvsel:serv=eir:tt=35:ssn=100:gtin=4:np=e214:nai=natl`

   `dlt-srvsel:serv=eir:tt=57:ssn=75:gtin=2`

3. Verify the changes; enter the `rtrv-srvsel` command with the parameters and values used in *Step 2*.
4. Back up the changes, using the `chg-db:action=backup:dest=fixed` command.

   The following messages should appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first:

   ```
   BACKUP (FIXED): MASP A - Backup starts on active MASP.
   BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
   BACKUP (FIXED): MASP A - Backup starts on standby MASP.
   BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
   ```

Changing an Existing Non-EIR Service Selector to an EIR Service Selector

This procedure is used to change a non-EIR service selector to an EIR service selector for the EIR feature.

The only parameters that can be changed using this procedure are:

:nserv – New DSM service type, `EIR`

:nsnp – An EIR service selector cannot contain an SNP value; if the service selector being changed contains an SNP value, this value must be changed to none with this parameter.

:nsnai – An EIR service selector cannot contain an SNAI value; if the service selector being changed contains an SNAI value, this value must be changed to none with this parameter.

The `chg-srvsel` command requires that the gtii/gtin/gtin24, tt, np, nai, npv, naiv, ssn, and serv parameters be specified with the values shown in the `rtrv-srvsel` output for the service selector

being changed. If you want to change any of these parameter values for an EIR service selector, use the *Removing a Service Selector* procedure to remove the existing service selector. Then use the *Adding an EIR Service Selector* procedure to add the new EIR service selector with the new parameter information.

1. Display the service selectors in the database using the `rtrv-srvsel` command.

```
rlghncxa03w 03-06-28 14:42:38 GMT  EAGLE5 42.0.0
GTII  TT   NP       NAI   SSN  SNP   SNAI   SERV
4     1    e214     intl  3    ---    ---   eir
4     1    e214     intl  4    e164  intl   gport
4     1    e214     intl  5    e164  intl   smsmr
4     2    e214     intl  *    ---   ---    eir

GTIN  TT   NP       NAI   SSN  SNP   SNAI   SERV
2     75   ---      ---   57   ---   ---    eir
4     4    e214     natl  34   e164  intl   gflex
4     9    e214     natl  250  e164  intl   gflex
4     35   e214     natl  100  ---   ---    eir

SRV SELECTOR table is (8 of 20992)   1 % full
;
```

   - If the `rtrv-srvsel` output in *Step 1* does not show any EIR service selectors, continue with *Step 2*.
   - If the `rtrv-srvsel` output in *Step 1* shows at least one EIR service selector, go to *Step 3*.

2. Verify that the EIR feature is enabled and turned on; enter the `rtrv-ctrl-feat` command.

   - If the EIR feature is not enabled (does not appear in the command output) or is not turned on, go to the *Enabling and Turning On the EIR Feature* procedure to enable and turn on the EIR feature. Then continue with *Step 3*.
   - If the EIR feature is enabled and turned on, continue with *Step 3*.

3. Change the service selector, using the `chg-srvsel` command.

   For example, enter a command like the following one:

   ```
   chg-srvsel:gtin=4:tt=4:np=e214:nai=natl:ssn=34:nsnp=none
   :nsnai=none:nserv=eir
   ```

   If the snp or snai parameter values are shown as dashes in the `rtrv-srvsel` output, these parameters cannot be specified with the `chg-srvsel` command. If the gtii/gtin/gtin24 parameter value is `2`, the np, nai, npv, and naiv parameters cannot be specified with the `chg-srvsel` command.

   If the `gtii/gtin/gtin24` parameter value is `4`, either the `np` and `nai`, or the `npv` and `naiv` parameters must be specified with the `chg-srvsel` command. The np and nai parameters can be specified in place of the npv and naiv parameters, and the npv and naiv parameters can be specified in place of the np and naiv parameters so long as parameter values be specified correspond to the values shown in the `rtrv-srvsel` output.

   The gtii/gtin/gtin24, tt, ssn, np, nai, npv, or naiv parameters cannot be changed in this procedure. To change these parameters, use the *Removing a Service Selector* procedure to remove the service selector. Then use the *Adding an EIR Service Selector* procedure to re-enter the service selector as an EIR service selector.

4. Verify the changes; enter the `rtrv-srvsel` command with the parameters and values that were used in *Step 3*.

5. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages should appear; the active Maintenance and Administration Subsystem Processor (MASP) appears first:

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Changing the EIR Options

This procedure is used to change the EIR Global Response status, EIR Response Type, and EIR IMSI Check status option values with the `chg-gsmopts` command. The `chg-gsmopts` command uses these parameters to detect circular routing in the system. See *EAGLE 5 ISS EIR GSM Options Commands*.

Refer to the `chg-gsmopts` command description in the *Commands Manual* for valid parameter values, input examples, and rules for entering the command correctly.

1. Verify that the EIR feature is enabled and turned on; enter the `rtrv-ctrl-feat` command.

```
    rlghncxa03w 09-06-29 16:40:40 EST  EAGLE5 41.1.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on            64
    EIR                       893012301  on          ----
;
```

   - If the EIR feature is not enabled (the EIR entry does not appear in the output) or is not turned on, go to the *Enabling and Turning On the EIR Feature* procedure to enable and turn on the EIR feature. Then continue with *Step 2*.
   - If the EIR feature is enabled and turned on, continue with *Step 2*.

2. Display the status of the EIR options; enter the `rtrv-gsmopts` command.
3. Change the EIR options by entering the `chg-gsmopts` command with at least one of the EIR option parameters.
4. Verify the changes; enter the `rtrv-gsmopts` command.
5. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   These messages should appear; the active Maintenance and Administration Subsystem Processor (MASP) appears first:

```
BACKUP (FIXED) : MASP A - Backup starts on active MASP.
BACKUP (FIXED) : MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED) : MASP A - Backup starts on standby MASP.
BACKUP (FIXED) : MASP A - Backup on standby MASP to fixed disk complete.
```

Activating the EIR Local Subsystem

The procedure in this section explains how to activate the EIR local subsystem.

When all feature configuration is complete, the EIR subsystem application must taken online and the local subsystem must be activated to allow it to begin operation.

When the local subsystem operating state is Inhibited, the `chg-ss-appl` command can be used to change the online or offline database state of the subsystem. The `rtrv-ss-appl` command displays the online or offline provisioned value.

When the first Service Module card is loaded, the local subsystem operating state tells whether the subsystem should be considered allowed (online) or inhibited (offline). This is a database state. If the command is accepted, then the change is made to the tables and can be read after an `init-sys` command is entered to initialize the system.

When the Service Module cards are in-service and the subsystem application is online, the `alw/inh-map-ss` commands can be used to change the dynamic operating state of the local subsystem to allowed or inhibited. The `inh-map-ss` command does not necessarily force a state change, because it can fail if the mate does not send an SOG. The force=yes parameter must be specified to bypass the SOR/SOG exchange and inhibit immediately. (There is no `rtrv-map-ss` command.)

The procedures in *Changing the State of a Subsystem Application* explain how to take a local subsystem online and offline.

Table 17: Subsystem Allow/Inhibit

Command\ Subsystem State	Offline	Online
`alw-map-ss`	Command is rejected because the subsystem must be online to be in the Allowed state.	Attempts to make the local subsystem active.
inh-map-ss	Command accepted, but no action because offline implies inhibited.	Attempts to inhibit the local subsystem. Use of the force=yes parameter bypasses the SOR/SOG exchange and inhibits immediately.
`chg-ss-appl:appl=eir :nstat=online`	Changes local subsystem status to online.	No change to local subsystem status in the database.
`chg-ss-appl:appl=eir :nstat=offline`	Command is rejected because the subsystem must be inhibited to go offline.	Changes local subsystem database status to offline.

1. Display the online/offline status of the EIR subsystem application, by entering the `rtrv-ss-appl` command.

```
   tekelecstp 08-07-25 08:02:22 EST  EAGLE5 39.2.0
   APPL   SSN  STAT
   EIR    11   offline

   SS-APPL TABLE IS 25% FULL (1 OF 4)
;
```

2. Change the EIR subsystem status to online.
   `chg-ss-appl:appl=eir:nstat=online`
3. Enter the command to allow the EIR subsystem to begin operation.

```
alw-map-ss:ssn=<EIR ssn>
    integrat40 08-05-24 10:37:22 EST  EAGLE5 39.2.0
    Allow map subsystem command sent to all SCCP cards.
    Command Completed.
;
```

4. Display and verify the operating status of the EIR subsystem, by entering the `rept-stat-sccp` command.

Activating the E5-SM4G Throughput Capacity Feature

The E5-SM4G Throughput Capacity feature quantities are used to increase the processing capacity of the E5-SM4G card and of system SCCP traffic for an EAGLE 5 ISS that contains E5-SM4G cards only (no DSM cards). The achievable TPS maximums are shown in *Table 18: Maximum E5-SM4G Card and System TPS Capacity*.

Table 18: Maximum E5-SM4G Card and System TPS Capacity

Feature Quantity Part Number	Maximum TPS Capacity per E5-SM4G Card	Maximum System TPS Capacity
893019101 - Feature Quantity 5000	3125	• 75,000 TPS with one or more EPAP-related features and 24+1 cards • 96,875 TPS with one or more EPAP-related features and 31+1 cards (EPAP running on T1200 AS)
	5000	• 150,000 TPS with no EPAP-related or ELAP-related feature traffic and 31+1 cards • 120,000 TPS with G-Flex and the ANSIGFLEX STP option and 24+1 cards • 155,00 TPS with G-Flex and the ANSIGFLEX STP option and 31+1 cards (EPAP running on T1200 AS) • 40,000 TPS with ELAP and 8+1 cards • 85,000 TPS with ELAP and 17+1 cards
893019102 - Feature Quantity 6800	6800	• 210,800 TPS with no EPAP-related or ELAP-related feature traffic and 31+1 cards • 163,200 TPS with one or more EPAP-related features and 24+1 cards • 210,800 TPS with one or more EPAP-related features and 31+1 cards (EPAP running on T1200 AS) • 54,400 TPS with ELAP and 8+1 cards • 115,600 TPS with ELAP and 17+1 cards

An E5-SM4G Throughput Capacity quantity feature must be enabled using an E5-SM4G Throughput Capacity feature part number (893019101 or 893019102) and a feature access key.

The feature access key is based on the feature part number and the serial number of the EAGLE 5 ISS, making the feature access key site-specific.

Note: The E5-SM4G Throughput Capacity quantity feature must be purchased to receive the feature access key used to enable the feature. Contact your Tekelec Sales Representative or Account Representative before beginning this procedure if you have purchased the E5-SM4G Throughput Capacity quantity feature, but do not have the feature access key. A temporary feature access key is not available for this feature.

After an E5-SM4G Throughput Capacity feature is enabled and turned on, the E5-SM4G Throughput Capacity feature cannot be turned off. When the E5-SM4G Throughput Capacity feature is enabled, it is permanently enabled. The E5-SM4G Throughput Capacity feature cannot be temporarily enabled.

System Prerequisites

Before the E5-SM4G Throughput Capacity feature can be enabled, the prerequisites listed in *Table 19: System Prerequisites* are required in the system.

Table 19: System Prerequisites

Prerequisite	Verification and Provisioning
For new installations, the system serial number must be verified and locked. The system is shipped with an unlocked serial number. The serial number can be changed if necessary and must be locked after the system is on-site. For systems that are being upgraded, the serial number has already been verified and locked.	Enter the `rtrv-serial-num` command to display the serial number and its lock status. Verify that the displayed serial number is correct for the system. The serial number is shown on a label affixed to the control shelf (shelf 1100). If no serial number is displayed, or if the displayed serial number is not locked, refer to the `ent-serial-num` command description in the *Commands Manual* for instructions to enter and lock the serial number.
The GTT feature must on in the system.	Enter the `rtrv-feat` command. If the GTT feature is on, the gtt=on entry appears in the output. If the gtt=off entry appears in the output, use the procedures in the *Database Administration Manual – Global Title Translation* to turn on and provision the GTT feature and any related features and functions.

E5-SM4G Throughput Capacity Feature Prerequisite

Before the E5-SM4G Throughput Capacity feature can be enabled, the prerequisite shown in *Table 20: E5-SM4G Throughput Capacity Feature Prerequisite* is required in the system.

Table 20: E5-SM4G Throughput Capacity Feature Prerequisite

Prerequisite	Verification and Provisioning
E5-SM4G cards running the VSCCP application must be equipped. The required number of cards depends on the desired total system TPS to be achieved by the cards. See *Table 18: Maximum E5-SM4G Card and System TPS Capacity*.	Enter the `rept-stat-gpl:gpl=sccphc` command to list the E5-SM4G cards in the system. If the number of cards is not sufficient, use the procedure in *Adding a Service Module Card* to add E5-SM4G cards.

The following procedure explains how to enable an E5-SM4G Throughput Capacity quantity feature.

Note: After a quantity feature has been enabled, a feature for a higher quantity can be enabled; a feature for a lower quantity cannot be enabled. Quantity features are automatically turned on when they are enabled.

Refer to the *Commands Manual* for descriptions of the commands used in the procedure, including parameter names and valid values, rules for using the command correctly, and output examples.

1. Display the status of the features that are controlled by feature access keys. Enter the `rtrv-ctrl-feat` command.

```
    rlghncxa03w 09-07-29 16:40:40 EST  EAGLE5 41.1.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on           64
    E5-SM4G Throughput Cap    893019101  on         5000
;
```

   - If the `rtrv-ctrl-feat` output shows that the correct E5-SM4G Throughput Capacity quantity feature is enabled and its status is on, no further action is necessary.
   - If no E5-SM4G Throughput Capacity feature quantity is enabled or a higher quantity needs to be enabled, continue with step *Step 2*.

2. Enable the E5-SM4G Throughput Capacity quantity feature by entering the `enable-ctrl-feat` command with the correct part number and FAK for the desired quantity.
3. Verify the status of the E5-SM4G Throughput Capacity quantity feature by entering the `rtrv-ctrl-feat` command with the feature part number that was just enabled (893033501 or 893019102).

   `rtrv-ctrl-feat:partnum=893019102`

```
    rlghncxa03w 09-08-29 16:40:40 EST  EAGLE5 41.1.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on           64
    E5-SM4G Throughput Cap    893019102  on         6800
;
```

4. Back up the changes using the `chg-db:action=backup:dest=fixed` command.

   The following messages appear, the active Maintenance and Administration Subsystem Processor (MASP) appears first.

```
BACKUP (FIXED): MASP A - Backup starts on active MASP.
BACKUP (FIXED): MASP A - Backup on active MASP to fixed disk complete.
BACKUP (FIXED): MASP A - Backup starts on standby MASP.
BACKUP (FIXED): MASP A - Backup on standby MASP to fixed disk complete.
```

Chapter 5

EIR Measurements

Topics:

This chapter describes measurements that can be collected and generated for the EIR feature.

EIR Measurements

The EAGLE 5 ISS Measurements system supports the collection and retrieval of measurements related to the EIR feature. The EIR measurements can be collected and reported with either of the following collection methods:

- The Measurements Platform feature enabled and the Measurements Platform collection option on
- The E5-OAM Integrated Measurements feature enabled and on and the E5-OAM Integrated Measurements collection option on

15 Minute Measurements collection can be used with Measurements Platform or E5-OAM Integrated Measurements.

OAM-based measurements collection is not available for EIR.

Refer to the *Measurements* manual for for descriptions of collection methods, measurements, and measurements reports.

Refer to the *Commands Manual* for descriptions of the commands used to enable and turn on features, turn on measurements collection options, and schedule and generate measurements reports.

Refer to the procedures in the *Database Administration Manual - System Management* to configure the Measurements Platform feature or E5-OAM Integrated Measurements feature and the EAGLE OA&M IP Security feature for use with EIR.

The EIR feature must be enabled to provision scheduling of the EIR measurements reports. The EIR feature must be turned on for full measurements collection functions to operate for the feature.

Table 21: Pegs for Per System EIR Measurements describes eight measurement registers that are used specifically for the EIR feature. The registers are reported in two Per System reports for the EIR entity type: Hourly Maintenance Measurements (MTCHEIR) and Daily Maintenance Measurements (MTCDEIR). The data for these registers originates on the Service Module cards.

For IMEIs present in multiple lists, the appropriate measurement peg is determined by the logic in *Table 3: Logic for IMEIs in Multiple Lists* and the outcome of the IMSI Check.

Table 21: Pegs for Per System EIR Measurements

Event Name	Description	Type	Unit
IMEIRCV	Total number of MAP_CHECK_IMEI messages received.	System	Peg count
WHITEIMEI	Total number of searches that resulted in a match with a "White Listed" IMEI.	System	Peg count
GRAYIMEI	Total number of searches that resulted in a match with a "Gray Listed" IMEI.	System	Peg count
BLACKIMEI	Total number of searches that resulted in a match with a "Black Listed" IMEI.	System	Peg count

Event Name	Description	Type	Unit
BLKALIMEI	Total number of searches that resulted in a match with a "Black Listed" IMEI, but were allowed due to IMSI Check match.	System	Peg count
BLKNALIMEI	Total number of searches that resulted in a match with a "Black Listed" IMEI, and the IMSI in the database did not match the IMSI in the message.	System	Peg count
UNKNIMEI	Total number of searches that resulted in a match with an "unknown" IMEI.	System	Peg count
NOMTCHIMEI	Total number of searches that resulted in no match in the database.	System	Peg count

Chapter 6

Maintenance

Topics:

This chapter describes maintenance functions that can be used for the EIR feature, including EIR UAMs and UIMs, EPAP status and alarms, EIR system status reports, and code and application data loading.

EIR Alarms

Table 22: EIR UAMs lists the UAMs that specifically support the EIR feature. All EIR-related UAMs are generated to the Maintenance Output Group.

Refer to the *Unsolicited Alarm and Information Messages* manual for complete descriptions and corrective procedures for all UAMs.

Refer to the *MPS Platform Software and Maintenance Manual* for descriptions and corrective procedures for MPS related alarms.

Table 22: EIR UAMs

UAM	Severity	Message Text
0455	Critical	EIR Subsystem is not available
0456	Critical	EIR Subsystem is disabled
0457	Minor	EIR Subsystem normal, card(s) abnormal
0458	None	EIR Subsystem is available
0459	None	EIR Subsystem is removed

EIR UIMs

Table 23: EIR UIMs lists the UIMs that specifically support the EIR feature.

Refer to the *Unsolicited Alarm and Information Messages* manual for complete descriptions of all UIM text, formats, and recoveries.

Table 23: EIR UIMs

UIM	Text	Description	Recovery
1030	Inh EIR SS request already outstanding	An `inh-map-ss` command is already entered and queued.	None
1031	Failure Inhibiting EIR SS	The `inh-map-ss` command was unsuccessful in taking the EIR subsystem off-line.	Enter the `inh-map-ss` command with the `force` parameter.

UIM	Text	Description	Recovery
1102	Invalid Length for Map IMEI Parameter	The EIR subsystem received a Check-IMEI message in which the Map IMEI parameter had an invalid length.	None
1103	LSS:No Map IMEI Parameter present	The EIR subsystem received a Check-IMEI message in which the Map IMEI parameter is not present	None
1306	GSMOPTS: EIR Global Response is ON	The EIR Global Response Type is on. The EIR Global Response Type is set by the `chg-gsmopts` command and the `eirgrsp` parameter.	For information about `eirgrsp`, refer to the `chg-gsmopts` command in the *Commands Manual*
1307	GSMOPTS: EIR Global Response is OFF	The EIR Global Response Type is off. The EIR Global Response Type is set by the `chg-gsmopts` command and the eirgrsp parameter.	For information about `eirgrsp`, refer to the `chg-gsmopts` command in the *Commands Manual*.

EPAP Status and Alarms

Because EPAP has no direct means of accepting user input or displaying output messages on EAGLE 5 ISS terminals, maintenance, measurements, and status information are routed through a Service Module card. EPAP sends two types of messages to the Service Module card: *EPAP Maintenance Blocks* and *DSM Status Requests*. Each message type is discussed in the following sections.

EPAP Maintenance Blocks

The active EPAP generates and sends maintenance blocks to the primary Service Module card. One maintenance block is sent as soon as the IP link is established between the active EPAP and the primary Service Module card. Additional maintenance blocks are sent whenever the EPAP needs to report any change in status or error conditions. The information returned in maintenance blocks is included in the output of the `rept-stat-mps` and `rept-stat-sccp` commands.

The EPAP sends maintenance blocks that contain at least the following information:

- Status of EPAP 'A' - actual states are active, standby, and down (inoperative). Maintenance blocks include a field for this information so that it can be forwarded to the EPAP A Device Control Block (DCB), where it is available for the output of the `rept-stat-mps` command.
- Status of EPAP 'B' - actual states are active, standby, and down (inoperative). Maintenance blocks include a field for this information so that it can be forwarded to the EPAP B DCB, where it is available for the output of the `rept-stat-mps` command.
- Identification of Active EPAP - a field to identify the active EPAP.

- Congestion Indicator - an indicator showing provisioning link congestion. The link between the EPAPs and the external source of provisioning data can become congested in high-provisioning traffic situations. When this occurs and subsequently as the congestion clears, the EPAP sends maintenance blocks to the Service Module card. The EPAP must ensure that no more than one maintenance block per second is sent to the primary Service Module card if the only reason is to report a change in congestion status.
- Alarm Conditions - an error code field. If the EPAP needs to report an alarm condition, it puts an appropriate UAM identifier in this field.
- Current MPS Database Size - a field indicating the current RTDB size. The Service Module card uses this information to calculate the percentage of memory utilized by the RTDB.

DSM Status Requests

When the EPAP needs to know the status of a Service Module card, it sends a DSM status request to that Service Module card. Because status messages are sent over UDP, the EPAP broadcasts the DSM status request (to all Service Module cards) and each Service Module card returns its status to the EPAP.

DSM Status Reporting to the EPAP

The sections that follow describe the DSM status reporting for the EPAP.

DSM Status Messages – When Sent

Service Module cards send a DSM status message to the EPAP when any the following events occur in the Service Module card:

- The Service Module card is booted.
- The Service Module card receives a DSM Status Request message from the EPAP
- The Service Module card determines that it needs to download the entire database, for example, if the Service Module card determines that the RTDB needs to be downloaded (for instance, if the database is totally corrupted), or if a craftsperson requests that the database be reloaded.
- The Service Module card starts receiving database downloads or database updates. When a Service Module card starts downloading the RTDB or accepting database updates, it sends a DSM Status Message informing the EPAP of the first record received. This helps the EPAP keep track of downloads in progress.

DSM Status Messages Fields

The DSM Status Message provides the following information to the EPAP:

- **DSM Memory Size**. When the Service Module card is initialized, it determines the amount of memory present. The EPAP uses the value to determine if the Service Module card has enough memory to hold the RTDB.

  Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the Service Module card database capacity requirements.
- **Load Mode Status**. This indicator indicates whether or not 80% of the IS-NR (In-Service Normal) LIMs have access to SCCP services.

EIR System Status Reports

Status reporting described here includes the following:

- System status
- EIR status
- Service Module card memory capacity status
- Loading mode support status

System Status Reporting

The `rept-stat-sys` command supports the Service Module cards running the VSCCP application.

The `rept-stat-sccp` command supports the Service Module cards running the VSCCP application and reports EIR statistics.

EIR Status Reporting

The `rept-stat-mps` command supports EIR system reporting. rept-stat-mps concentrates on reporting the status of the provisioning system. See "Maintenance and Measurements User Interface Commands", for more details. EIR statistics are placed in the `rept-stat-sccp` command.

Service Module card Memory Capacity Status Reporting

As described in the *DSM Status Messages Fields*, the Service Module card sends a message to the EPAP containing the amount of memory on the Service Module card. The EPAP determines whether the Service Module card has enough memory to store the RTDB and sends an ack or nak back to the Service Module card indicating whether or not the Service Module card has an adequate amount of memory. Refer to the *Dimensioning Guide for* EPAP *Advanced* DB *Features Technical Reference* for important information on the dimensioning rules and the Service Module card database capacity requirements**.**

When the EPAP sends database updates to the Service Module cards, the update messages include a field that contains the new database memory requirements. Each Service Module card monitors the DB size requirements, and issues a minor alarm if the size of the DB exceeds 80% of its memory. If a database increases to the point that there is insufficient Service Module card memory, a major alarm is issued.

The `rept-stat-mps:loc=xxxx` command shows the amount of memory used by the RTDB as a percent of available Service Module card memory.

Loading Mode Support Status Reporting

The OAM application determines whether or not the system is in an unstable loading mode since it knows the state of all LIM and Service Module cards in the system. When the loading mode is unstable, the `rept-stat-sys` command reports the existence of the unstable loading mode and the specific conditions that caused it. Refer to *Loading Mode Support*, for more details.

Code and Application Data Loading

In general, administrative updates can occur while a Service Module card is loading. The Service Module card should also remain in an in-transition state if the STP portion of the database has completed loading and is waiting for the RTDB to download.

Service Module Card Code Loading

The EAGLE 5 ISS OAM performs code loading of the Service Module card.

EPAP Application Data Loading

The EIR feature requires that new TDM-resident data tables be loaded in addition to those currently supported by EAGLE 5 ISS. The GPL and data loading support this additional table loading while maintaining support for loading the existing EAGLE 5 ISS tables.

In order to support both RTDB and EAGLE 5 ISS data loading, the Service Module card GPL verifies its hardware configuration during initialization to determine if it has the capacity to support the RTDB.

The Service Module card GPL application data loader registers all tables for loading, independent of the EIR feature provisioning and main board / applique hardware configuration. As a result, load requests are always identical. During loading, multiple Service Module card load requests are combined into a single download, reducing the overall download time. The Service Module card stores or discards RTDB table data based on whether or not it has RTDB-capable hardware for features like G-Port, G-Flex, INP, and EIR.

The OAM, on the other hand, downloads or sets memory boundaries for the EIR options, HOMERN, and service selector tables only if the EIR feature is provisioned. When the EIR feature is not provisioned, the OAM does not attempt to read these tables from disk. Instead, empty tables (i.e., tables without entries) are downloaded. All other tables requested for loading are read from disk and downloaded routinely.

Non EIR Data Initialization

If the Service Module card's hardware configuration cannot support the RTDB, the EIR tables are marked as absent during Service Management System initialization. Memory is not reserved for the EIR table data. EIR tables are registered with the application data loader (ADL), specifying a data discard function. EIR table data is discarded during loading by the ADL discard function, rather than storing it in memory.

EPAP-Service Module Card Loading Interface

The Service Module card must convey to the EPAP that it needs to download the RTDB. This occurs when the Service Module card sends a Full Download Request message to the EPAP.

Loading Mode Support

No more than 16 LIMs can be serviced by each Service Module card.

80% Threshold of Support

Loading mode is based on the ability of the system to provide SCCP service to at least 80% of the LIMs.

Service Module Card Capacity

An insufficient number of Service Module cards that are in the IS-NR (In Service - Normal) or OOS-MT-DSBLD (Out of Service - Maintenance Disabled) relative to 80% of the number of provisioned LIMs is called a "failure to provide adequate SCCP capacity."

Insufficient SCCP Service

It is also possible for LIMs or Service Module cards to be inhibited or to have problems that prevent them from operating normally. If enough Service Module cards are out of service, it may not be possible for the remaining is-nr Service Module cards to service at least 80% of the number of is-nr LIMs. This is called "insufficient SCCP service." When this occurs, some of the LIMs are denied SCCP service. It is possible to inhibit LIMs to bring the ratio back to 16:1 (or better).

Conditions That Create an Unstable Loading Mode

The current system implementation interrupts and aborts card loading upon execution of an STP database `chg` command. Loading mode support denies the execution of EAGLE 5 ISS database `chg` commands when the system is in an unstable loading mode. An unstable loading mode exists when any of the following conditions are true:

- The system's maintenance baseline has not been established.
- Less than 80% of the number of LIMs provisioned are IS-NR or OOS-MT-DSBLD.
- The number of IS-NR and OOS-MT-DSBLD Service Module cards running the VSCCP application is insufficient to service at least 80% of all provisioned LIMs.
- Insufficient SCCP service occurs when an insufficient number of is-nr Service Module cards are available to service at least 80% of the number of is-nr LIMs.
- LIM cards are being denied SCCP service and any Service Module cards are in an abnormal state (oos-mt or IS-ANR).

Effects of System in an Unstable Loading Mode

- No affect on RTDB downloads or updates.

  Unstable loading mode has no impact on RTDB downloads or the stream of RTDB updates.
- `rept-stat-sys` reports unstable loading mode.

  When the loading mode is unstable, the `rept-stat-sys` command response reports the existence of the unstable loading mode and the specific trigger that caused it.
- No STP database updates allowed.

  After an STP database has been loaded, that database can be updated (as long as the system is not in an unstable loading mode). However, if an STP update arrives during STP database loading, the Service Module card aborts the current loading, issues a class 01D7 obit, and reboots.

Using the force Option

Use the force option to force the execution of commands that would put the system in unstable loading mode (such as the `ent-card` and `inh-card` commands).

Glossary

A

ADL — Application Data Loader

B

BS — Base Station

C

CgPA — Calling Party Address

The point code and subsystem number that originated the MSU. This point code and subsystem number are contained in the calling party address in the SCCP portion of the signaling information field of the MSU. Gateway screening uses this information to determine if MSUs that contain this point code and subsystem number area allowed in the network where the EAGLE 5 ISS is located.

CPC — Capability Point Code

A capability point code used by the SS7 protocol to identify a group of functionally related STPs in the signaling network.

CSV — Comma-separated value

The comma-separated value file format is a delimited data format that has fields separated by the comma character and records separated by newlines (a newline is a special character or sequence of characters signifying the end of a line of text).

D

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
DC	Direct Current
DCB	Device Control Block
DPC	Destination Point Code DPC refers to the scheme in SS7 signaling to identify the receiving signaling point. In the SS7 network, the point codes are numeric addresses which uniquely identify each signaling point. This point code can be adjacent to the EAGLE 5 ISS, but does not have to be.
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).

E

EIR	Equipment Identity Register

E

	A network entity used in GSM networks, as defined in the 3GPP Specifications for mobile networks. The entity stores lists of International Mobile Equipment Identity (IMEI) numbers, which correspond to physical handsets (not subscribers). Use of the EIR can prevent the use of stolen handsets because the network operator can enter the IMEI of these handsets into a 'blacklist' and prevent them from being registered on the network, thus making them useless.
EPAP	EAGLE Provisioning Application Processor
EPAP-related features	Features that require EPAP connection and use the Real Time Database (RTDB) for lookup of subscriber information. • ANSI Number Portability Query (AINPQ) • ANSI-41 AnalyzedInformation Query – no EPAP/ELAP (ANSI41 AIQ) • Anytime Interrogation Number Portability (ATI Number Portability, ATINP) • AINPQ, INP, G-Port SRI Query for Prepaid, GSM MAP SRI Redirect, IGM, and ATINP Support for ROP • A-Port Circular Route Prevention (A-Port CRP) • Equipment Identity Register (EIR) • G-Flex C7 Relay (G-Flex) • G-Flex MAP Layer Routing (G-Flex MLR) • G-Port SRI Query for Prepaid • GSM MAP SRI Redirect to Serving HLR (GSM MAP SRI Redirect)

E

- GSM Number Portability (G-Port)
- IDP A-Party Blacklist
- IDP A-Party Routing
- IDP Relay Additional Subscriber Data (IDPR ASD)
- IDP Relay Generic Routing Number (IDPR GRN)
- IDP Service Key Routing (IDP SK Routing)
- IDP Screening for Prepaid
- INAP-based Number Portability (INP)
- Info Analyzed Relay Additional Subscriber Data (IAR ASD)
- Info Analyzed Relay Base (IAR Base)
- Info Analyzed Relay Generic Routing Number (IAR GRN)
- Info Analyzed Relay Number Portability (IAR NP)
- INP Circular Route Prevention (INP CRP)
- IS41 Mobile Number Portability (A-Port)
- IS41 GSM Migration (IGM)
- MNP Circular Route Prevention (MNPCRP)
- MO-based GSM SMS NP
- MO-based IS41 SMS NP
- MO SMS Generic Routing Number (MO SMS GRN)
- MO- SMS B-Party Routing
- MO SMS IS41-to-GSM Migration
- MT-based GSM SMS NP
- MT-based GSM MMS NP
- MT-based IS41 SMS NP
- MTP Routed Messages for SCCP Applications (MTP Msgs for SCCP Apps)
- MTP Routed Gateway Screening Stop Action (MTPRTD GWS Stop Action)
- Portability Check for MO SMS

E

- Prepaid IDP Query Relay (IDP Relay, IDPR)
- Prepaid SMS Intercept Phase 1 (PPSMS)
- Service Portability (S-Port)
- S-Port Subscriber Differentiation
- Triggerless ISUP Framework Additional Subscriber Data (TIF ASD)
- Triggerless ISUP Framework Generic Routing Number (TIF GRN)
- Triggerless ISUP Number Portability (TIF NP)
- Triggerless ISUP Framework Number Substitution (TIF NS)
- Triggerless ISUP Framework SCS Forwarding (TIF SCS Forwarding)
- Triggerless ISUP Framework Simple Number Substitution (TIF SNS)
- Voice Mail Router (V-Flex)

Equipment Identity Register (EIR) See EIR.

F

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-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.

G

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).
GSM	Global System for Mobile Communications
GT	Global Title Routing Indicator
GTT	Global Title Translation 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.
GUI	Graphical User Interface The term given to that set of items and facilities which provide the user with a graphic means for manipulating screen data rather than being limited to character based commands.

H

H

HLR	Home Location Register
HOMERN	Home Network Routing Number Prefix

I

IMEI	International Mobile Equipment Identifier
IMSI	International Mobile Subscriber Identity
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.
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 switching protocol. It provides packet routing, fragmentation and re-assembly through the data link layer.
ISDN	Integrated Services Digital Network
ISDN	Integrated Services Digital Network

I

Integrates a number of services to form a transmission network. For example, the ISDN network integrates, telephony, facsimile, teletext, Datex-J, video telephony and data transfer services, providing users with various digital service over a single interface: voice, text, images, and other data.

ISS — Integrated Signaling System

L

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.

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.

LNP — Local Number Portability

LSS — Local Subsystem

M

M

MAP	Mobile Application Part
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. 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.
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.
MS	Mobile Station The equipment required for communication with a wireless telephone network.
MSC	Mobile Switching Center
MSISDN	Mobile Station International Subscriber Directory Number

M

The MSISDN is the network specific subscriber number of a mobile communications subscriber. This is normally the phone number that is used to reach the subscriber.

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 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.

MTP

The levels 1, 2, and 3 of the SS7 protocol that control all the functions

M

necessary to route an SS7 MSU through the network.

O

OAM	Operations, Administration, and Maintenance The application that operates the Maintenance and Administration Subsystem which controls the operation of the EAGLE 5 ISS.
OPC	Originating Point Code
OPS	Operator Provisioning System

P

PDB	Provisioning Database
PDBA	Provisioning Database Application There are two Provisioning Database Applications (PDBAs), one in EPAP A on each EAGLE 5 ISS. They follow an Active/Standby model. These processes are responsible for updating and maintaining the Provisioning Database (PDB).
PDBI	Provisioning Database Interface The interface consists of the definition of provisioning messages only. The customer must write a client application that uses the PDBI request/response messages to communicate with the PDBA.
PPP	Point-to-Point Protocol

R

RFC	Request for Comment

R

	RFCs are standards-track documents, which are official specifications of the Internet protocol suite defined by the Internet Engineering Task Force (IETF) and its steering group the IESG.
RMTP	Reliable Multicast Transport Protocol
RN	Routing Number
RSP	Remote Signaling Point Represents an SS7 network node (point code) that signaling must be sent to. An RSP has an SS7 domain (ANSI, ITUI, ITUN), a point code, and an optional Adjacent Server Group. Remote Signaling Point A logical element that represents a unique point code within a particular SS7 domain with which the SS7 application's Local Signaling Point interacts.
RSR	Reset Request Route Set Test – Restricted message
RTDB	Real Time Database

S

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

S

	appropriate database, and sending it back to the originator of the request.
Service Module card	DSM card or E5-SM4G card that contains the Real Time Database (RTDB) downloaded from an EPAP or ELAP system.
SIM	Subscriber Identity Module An ID card the size of a credit card for GSM network subscribers, and is typically referred to as a chip card or smartcard.
SOG	Subsystem Out-of-Service Grant Service Order Gateway
SOR	Support of Optimal Routing System Out of Service Request
SP	Signaling Point A set of signaling equipment represented by a unique point code within an SS7 domain.
SS	Subsystem
STP	Signal Transfer Point The STP is a special high-speed switch for signaling messages in SS7 networks. The STP routes core INAP communication between the Service Switching Point (SSP) and the Service Control Point (SCP) over the network.

T

T

TCP	Transfer Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TDM	Terminal Disk Module
TFA	TransFer Allowed (Msg)
TFP	TransFer Prohibited (Msg) A procedure included in the signaling route management (functionality) used to inform a signaling point of the unavailability of a signaling route.

U

UAM	Unsolicited Alarm Message A message sent to a user interface whenever there is a fault that is service-affecting or when a previous problem is corrected. Each message has a trouble code and text associated with the trouble condition.
UDP	User Datagram Protocol
UDTS	Unitdata Transfer Service An error response to a UDT message.
UI	User Interface
UIM	Unsolicited Information Message A message sent to a user interface whenever there is a fault that is not service-affecting or when a previous

U

problem is corrected. Each message has a trouble code and text associated with the trouble condition.

V

VLR — Visitor Location Register

A component of the switching subsystem, within a GSM network. The switching subsystem includes various databases which store individual subscriber data. One of these databases is the HLR database or Home Location Register; and the VLR is another.

VSCCP — VxWorks Signaling Connection Control Part

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