Tekelec EAGLE® 5
Integrated Signaling System

Feature Manual - G-Flex® C7 Relay

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This product is covered by one or more of the following U.S. and foreign patents:

U.S. Patent Numbers:

5,732,213; 5,953,404; 6,115,746; 6,167,129; 6,324,183; 6,327,350; 6,456,845; 6,606,379; 6,639,981; 6,647,113; 6,662,017; 6,735,441; 6,745,041; 6,765,990; 6,795,546; 6,819,932; 6,836,477; 6,839,423; 6,885,872; 6,901,262; 6,914,973; 6,940,866; 6,944,184; 6,954,526;6,954,794; 6,959,076; 6,965,592; 6,967,956; 6,968,048; 6,970,542; 6,987,781; 6,987,849; 6,990,089; 6,990,347; 6,993,038; 7,002,988; 7,020,707; 7,031,340; 7,035,239; 7,035,387; 7,043,000; 7,043,001; 7,043,002; 7,046,667; 7,050,456; 7,050,562; 7,054,422; 7,068,773; 7,072,678; 7,075,331; 7,079,524; 7,088,728; 7,092,505; 7,108,468; 7,110,780; 7,113,581; 7,113,781; 7,117,411; 7,123,710; 7,127,057; 7,133,420; 7,136,477; 7,139,388; 7,145,875; 7,146,181; 7,155,206; 7,155,243; 7,155,505; 7,155,512; 7,181,194; 7,190,702; 7,190,772; 7,190,959; 7,197,036; 7,206,394; 7,215,748; 7,219,264; 7,222,192; 7,227,927; 7,231,024; 7,242,695; 7,254,391

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Introduction

Overview

This manual provides an overview of the G-Flex® C7 Relay feature of the EAGLE 5 ISS (Integrated Signaling System). The G-Flex feature enables efficient Home Location Register (HLR) management in International Telecommunications Union (ITU) networks, American National Standards Institute (ANSI) networks, Global System for Mobile communications (GSM) networks, and IS-41 networks. The G-Flex C7 Relay node is located in the operator's C7/SS7 network between the Mobile Switching Centers (MSCs) and HLRs. G-Flex optimizes the use of subscriber numbers and number ranges by providing a logical link between any MSISDN number and any IMSI. This arrangement allows subscribers to be moved easily from one HLR to another.

The G-Flex feature is optional on the EAGLE 5 ISS, and can be turned on, but not off, via a feature access key. Note that G-Flex and North American LNP (Local Number Portability) are mutually exclusive on an EAGLE 5 ISS node. The Global Title Translations (GTT) feature is required for operation of the G-Flex feature.

Scope and Audience

This manual is intended for anyone responsible for installing, maintaining, and using the G-Flex 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:

- Chapter 1 Introduction, contains general information about the G-Flex documentation, the organization of this manual, and how to get technical assistance.
- Chapter 2 Feature Description, provides a functional description of G-Flex, including network perspectives, assumptions and limitations, a database overview, DSM provisioning and reloading, G-Flex user interface, SDS commands, and the G-Flex relay function.
- Chapter 3 EAGLE 5 ISS G-Flex Commands, describes the user interface in detail.
- Chapter 4 G-Flex Feature Activation, describes how to activate the G-Flex feature.
- Chapter 5 Maintenance and Measurements, describes maintenance and measurements in detail, including EPAP status and alarms, hardware verification messages, TSM emulation mode, G-Flex system status reports and commands, code and application data loading, and alarms.

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.

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	**WARNING**: (This icon and text indicate the possibility of *equipment damage*.)
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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
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2

Feature Description

G-Flex C7 Relay Overview

In today's mobile networks, subscribers are assigned to Home Location Registers (HLRs) and AuCs (Authentication Centers) via blocks or ranges of subscriber numbers. These ranges are used by MSCs (Mobile Switching Centers) to route many types of signalling messages to HLRs/AuCs. There are several types of numbers that identify subscribers, both of which are assigned by MSCs to HLR/AuCs via this range mechanism.

- MSISDN (Mobile Station International Integrated Services Digital Network) numbers, which use numbering plan E.164
- IMSI (International Mobile Subscriber Identity) numbers, which use numbering plan E.212
- MIN (Mobile Identification Number), which uses the E.164 numbering plan
- MDN (Mobile Directory Number), which uses the E.164 numbering plan

Problems arose in areas such as network load balancing and efficient use of HLR capacity. G-Flex is a feature designed to alleviate some of these problems by allowing the operator to flexibly assign individual subscribers to HLRs and route signaling messages, based on subscriber numbering, accordingly. The current phase of development applies to routing to HLRs only. In the future, this capability may be expanded to include routing to other intelligent devices such as SCPs (Service Control Points) and VMSCs (Voice Mail Service Centers), depending on market needs.

NOTE: In this document, the term HLR is used to include AuC, as applicable.

Today's rigid scheme for assigning subscribers to HLRs leads to several inefficiencies for network operators. Below are a few examples:

- When IMSI numbers, which identify the SIM (Subscriber Identity Module), get lost or are otherwise out of service, “holes” sometimes open in the IMSI ranges. These holes result in HLR capacity that cannot be used because switches will not be routing messages using those lost numbers anymore.
- In many cases, subscribers are “split” across multiple HLRs, as their IMSI range can point to a different HLR than their MSISDN range. Operators must take special steps to ensure that calls are not mishandled.
- With the advent of MNP (Mobile Number Portability), the MSISDN no longer indicates the subscription network. This leads to holes in the MSISDN ranges that address HLRs. As in the case with IMSIs, these MSISDN holes result in HLR capacity that cannot be used by existing MSC routing schemes.
- With the advent of MNP, operators need to handle message routing based on MSISDNs that are imported to the network from another operator, and so do not fit into the existing range mechanism at all.
- Prepaid service may result in the allocation of a large block of IMSIs to an HLR, many of which may not be put in service for a while.
- Corporate clients may reserve a large block of numbers that must be assigned to an HLR. Many of these may not be used for a while, if ever.

Product Description

The G-Flex C7 Relay node is located in the operator's C7/SS7 network between the MSCs and HLRs. It can also serve as the direct interface to other networks. G-Flex can be deployed as an integrated part of the STP (Signal Transfer Point) function or as a stand-alone node.

G-Flex optimizes the use of subscriber numbers and number ranges by providing a logical link between any MSISDN number or IMSI, and an HLR. This allows subscribers to easily be moved from one HLR to another.

It also allows each HLR to be filled to 100% of its capacity by allowing subscriber number ranges to be split over different HLRs and individual subscriber numbers to be assigned to any HLR. Another benefit is that subscriber number routing data is not required to be maintained in all MSCs in the network.

G-Flex is optional on the EAGLE 5 ISS, and can be turned on (but not turned off) via a feature access key. G-Flex and North American LNP (Local Number Portability) are mutually exclusive on an EAGLE 5 ISS node.

Call Flows

As stated in the preceding sections, several types of subscriber numbers can be used as a basis for routing messages to HLRs: IMSI, MSISDN, MIN, and MDN. In actuality, there are two flavors of IMSI routing: one that uses the actual IMSI, which is an E.212 number, and one that uses the Mobile Global Title (MGT), which is an E.214 number derived from the IMSI. G-Flex handles both of these cases in addition to the MSISDN/MIN/MDN cases, which use the E.164 numbering plan. The following subsections address these three cases.

In GSM networks, each network entity (for example, MSC, HLR, VLR [Visitor Location Register]) is identified by an E.164 entity address. Note that GSM networks also route messages based on E.164 entity addresses when those addresses are known by the sender. While the routing of these messages must also be handled by the G-Flex C7 Relay, this functionality is not considered to be a core part of the G-Flex functionality. These numbers are not expected to be populated in the G-Flex database and so messages routed using these addresses should fall through to normal (or enhanced) GTT (Global Title Translation). Therefore, call flows for this type of routing are not described here.

The call flows in this section show only one possible scenario for how messages are routed in the network and where various stages of GTT are performed. The G-Flex C7 Relay may perform intermediate or final GTT and/or replace the SCCP (Signaling Connection Control Part) CdPA (Called Party Address) with the HLR entity address, depending on the message received and provisioned data. All call flows here assume the G-Flex C7 Relay is integrated with the EAGLE 5 ISS.

MGT (E.214) Routing

The partial Update Location procedure, detailed in **Figure 2-1** , is an example of E.214 mobile global title routing. This routing is employed in situations where the E.164 address of the receiving node (HLRB) is not yet known by the sending node (VLRA).

In order to update information about the subscriber's location, VLRA sends a MAP (Mobile Application Part) Update_Location message to the G-Flex Relay (possibly via a Gateway MSC [Mobile Switching Center]).

The steps in **Figure 2-1** are cross-referenced in the following procedure.

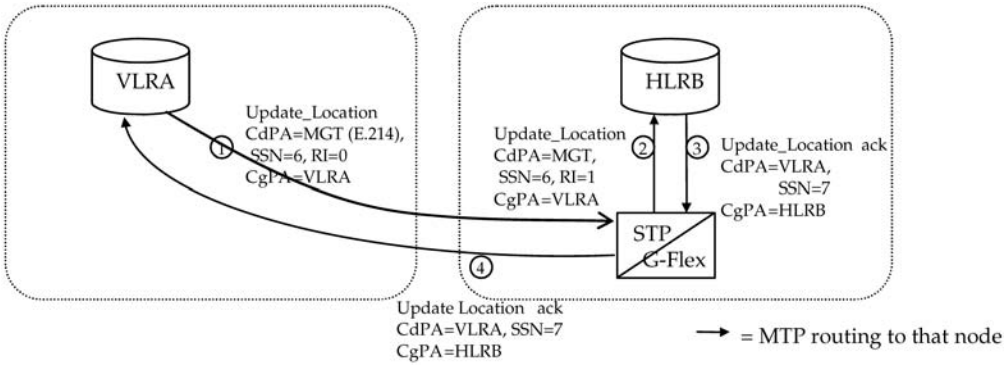
1. The message is received at the G-Flex Relay. Global title information triggers G-Flex processing. Since the SCCPCdPA contains an E.214 number, G-Flex first converts the E.214 number to an international E.212 number before searching the G-Flex database (GFDB) with the E.212 number (Step 1). G-Flex also handles the case where an E.212 number is received in the SCCPCdPA. In this case, the database is searched directly using the E.212 number.

2. G-Flex finds a match with HLRGT information and routes the message to the designated DPC (HLRB) (Step 2).

3. HLRB responds to VLRA with an Update_Location **ack**. This message has the E.164 address of VLRA in the SCCPCdPA and is routed by normal (or enhanced) GTT, not G-Flex (Step 3).

4. The message is relayed to VLRA (Step 4).

Figure 2-1. E.214 (E.212) Routing Example - Location Updating



There are other MAP messages from VLR (Visitor Location Register) to HLR that also fall into this category of requiring E.214 global title routing. All of these messages are handled the same way by G-Flex, using the process described above.

IMSI (E.212) Routing

G-Flex processing, when it receives a message routed with an E.212 number in the SCCP CdPAGTA (Global Title Address), is essentially the same as when an E.214 number is received. The only difference is that the number does not have to be converted to E.212 (since it is already E.212) before doing the database lookup. Therefore, those call flows are not shown here.

MSISDN/MIN/MDN (E.164) Routing

A mobile terminated call results in the GMSC (Gateway Mobile Switching Center) querying the HLR through the use of the called number as a GTA. G-Flex is used to locate the appropriate HLR. The partial mobile terminated call procedure detailed in **Figure 2-2** is an example of MSISDN global title SCCP addressing. This applies to MIN and MDN routing numbers as well.

The steps in **Figure 2-2** are cross-referenced in the following procedure.

1. A call is originated and an IAM (Initial Address Message) is sent from the originating network to the subscription network (Step 1).

2. Digit analysis at GMSCB detects a mobile terminated call to a mobile station and generates a MAP Send_Routing_Info (SRI) message to the G-Flex Relay (Step 2).

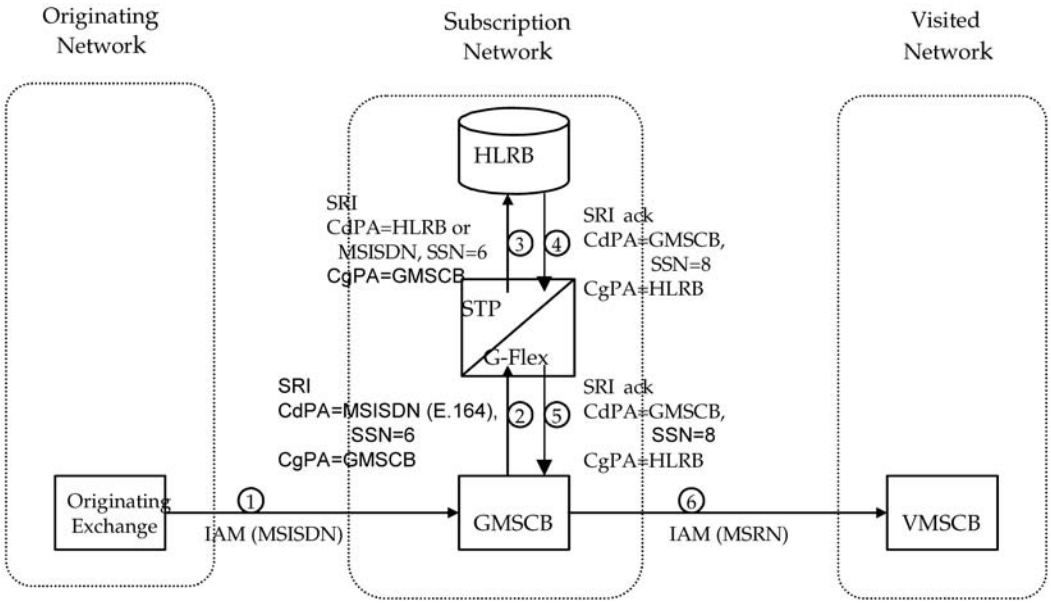
3. The EAGLE 5 ISS receives the message. Global title information triggers G-Flex processing. Since the SCCPCdPA contains an E.164 number, G-Flex searches the GFDB with the E.164 number, which must be converted to an international number if it is not one already. The G-Flex finds a match with HLRGT information and routes the message to the designated DPC (HLRB) (Step 3).

4. HLRB responds to GMSCB with an SRI**ack**. This message has the E.164 address of GMSCB in the SCCPCdPA, and is routed by normal (or enhanced) GTT, not G-Flex (Step 4).

5. The message is relayed to GMSCB (Step 5).

6. GMSCB sends an IAM containing the MSRN (Mobile Station Roaming Number) to the visited network (Step 6).

Figure 2-2. Mobile Terminated Call



Other MAP messages that are routed using MSISDN/MIN/MDN global title routing to an HLR are handled the same way by G-Flex. This includes mobile terminated short messages, for example.

EPAP Provisioning Blacklist

This feature provides checks to prevent the inadvertent provisioning of protected address strings into the EPAP database. If a protected address string is provisioned into the PDB as a DN, DN Block or IMSI, the EAGLE 5 ISS may incorrectly route messages. This feature allows the user to define a list of prohibited address strings that are not allowed as DN, DN Block, or IMSI address strings. The E.164 addresses of all HLRs should be provisioned in the provisioning blacklist.

DigitAction Expansion

The DigitAction Expansion provides more flexibility to formulate the SCCPCalled Party Address (SCCP) Global Title Address (GTA) field of the MAP messages relayed by G-Flex.

Without DigitAction Expansion, G-Flex supports four options (none, insert, prefix, and replace) to overwrite the SCCPCdPAGTA field. With DigitAction Expansion, four additional options (delcc, delccprefix, spare1, and spare2) are included to overwrite the SCCPCdPAGTA field.

The rules for formatting the SCCPCdPAGTA field are based on the value specified in the DigitAction field. If DigitAction = none, the EAGLE 5 ISS does not overwrite the SCCPCdPAGTA. For all other values, the EAGLE 5 ISS formats the SCCPCdPAGTA according to the value assigned to DigitAction. Refer to **Table 2-1** for examples of DigitAction Expansion on the SCCPCdPAGTA of an outgoing message when the Entity ID = 1404 and the default country code = 886.

Table 2-1. DigitAction Applications

DigitAction	Value in Incoming CdPAGTA	Value in Outgoing CdPAGTA	Meaning
none	886944000213	886944000213	No change to the Called Party GTA (default)
prefix	886944000213	1404886944000213	Prefix Called Party GTA with the entity id
replace	886944000213	1404	Replace Called Party GTA with the entity id
insert	886944000213	8861404944000213	Insert entity id after country code. (CC + Entity Id + NDC + SN)
delccprefix	886944000213	1404944000213	Delete country code and add prefix
delcc	886944000213	944000213	Delete country code
spare1	886944000213	treated as none	No change to the Called Party GTA (default)
spare2	886944000213	treated as none	No change to the Called Party GTA (default)

DigitAction Expansion is provisioned via the PDBI Enter Network Entity or Update Network Entity commands. DigitAction Expansion can also be modified via the Add an NE and Update an NEGUI screens.

G-Flex SCCP Service Re-Route Capability

This feature is used when the G-Flex database is incoherent with MPS data and the GTT data is valid. G-FlexSCCP Service Re-Route provides the capability to re-route the traffic from the EAGLE 5 ISS to other G-Flex database nodes and inform the originating nodes to re-route the G-Flex service related traffic to other G-Flex service nodes.

This feature is designed to handle and control re-routing of G-Flex traffic from an affected node to alternate nodes within an operators network. This feature is an optional feature and doesn't affect the normal G-Flex functionality. This feature also provides the option to mark G-Flex*OFFLINE* to perform a controlled re-routing during this state.

G-Flex MAP Layer Routing

This feature allows subscriber digits to be obtained from either the SCCP layer or the MAP layer of a message during G-Flex database lookup. This ability resolves the issue of truncation of digits by the mobile switching center (MSC) that may occur in the SCCP layer.

This feature applies only to MAP Update_Location (UL), MAP Send_Parameters, and MAP Send_Authentication_Information (SAI) operations within GSM messages. These three MAP messages commonly encode the SCCP CdPA GTA in the E.214 format (MGT) where trailing IMSI digits may be truncated from MGT, and these messages always include IMSI in the MAP layer. CdPA digits from the SCCP layer are always used to route all other MAP messages.

Commands

This section lists the maintenance and measurements user interface commands for the G-Flex feature. These commands allow provisioning, operations, and maintenance activities for DSM cards. For details, refer to Chapter 3, Maintenance and Measurements Commands .

Commands listed here include:

- **rept-stat-sys**
- **rept-stat-sccp**
- **rept-stat-mps**
- **rept-meas**
- r**ept-stat-trbl**
- **rept-stat-alm**
- **rept-stat-db**
- **inh-card** / **alw-card**
- **ent-card** / **rtrv-card** / **dlt-card**
- **chg-gpl** / **act-gpl** / **rtrv-gpl** / **rept-stat-gpl** / **copy-gpl**
- **ent-bp** / **dlt-bp** / **disp-bp** / **disp-mem** / **set-mem**
- **inh-alm** / **unhb-alm**
- **pass**, including the following commands:
  - **pass:cmd='ping'**
  - **pass:cmd='netstat'**
  - **pass:cmd='nslookup'**
  - **pass:cmd='arp'**
  - **pass:cmd='help'**

The complete functionality of the commands is described in detail in the *Commands Manual.* That document also provides the actual parameter names, valid values, and output for the commands.

Assumptions/Limitations

The following assumptions and limitations are present.

1. The EAGLE 5 ISS does not perform any conversion in the SCCP portion of the message to support message routing across the domain boundary (ANSI to ITU and visa versa).

2. The EAGLE 5 ISS supports message routing across network boundaries (ITU-N to ITU-I) and visa versa. However, GTT and/or enhanced GTT (EGTT) neither modify the National Indicator bit in the CdPAAI nor convert the CdPAPC (Point Code) to match the network type.

3. For messages with E.214 numbers in the SCCPCdPA, a simple conversion can form an E.212 number. The E.212 number formed in this way is the full IMSI of the subscriber, that is, it is assumed that no truncation

occurs when the E.214 number is originally formed from the E.212 number. Such truncation is allowed by the E.214 recommendation.

4. This feature allows for up to eight MSISDN numbers per subscriber (that is, per IMSI) to be related. It is assumed that operators do not need to support more than eight MSISDN numbers per subscriber. (Expansion to eight MSISDN numbers is anticipated in the near future.)

5. No overload controls are required beyond the existing EAGLE 5 ISS lower level mechanisms (for example, for MTP congestion, etc.)

6. Using combinations of GTT selectors (GTI [Global Title Indicator], TT [Translation Type], NP [Number Portability], and NAI) as triggers for G-Flex processing plus SSN discrimination will provide the ability to limit G-Flex processing to only the messages for which it is appropriate.

7. G-Flex C7 Relay supports message routing to a single network node for a particular subscriber. For example, an individual subscriber cannot have some messages routed to his HLR and other messages routed to a separate AuC. In this example, G-Flex does not support the AuC being collocated with the HLR. The G-Flex design allows for expansion to include routing to multiple network elements (corresponding to multiple services) for the same subscriber.

8. For performance estimates, EAGLE 5 ISS-generated UDTS messages will count as two processed messages.

General Requirements

Numbering

1. Incoming called party numbers (from the SCCP portion) destined for G-Flex processing are conditioned to fit the GDB requirements where possible:

    - If the GTT selectors available in the incoming message match an entry in the G-Flex selector table, then the service numbering plan from the selector table entry uses that number's numbering plan. Further conditioning is applied based on this new numbering plan.

    - If the GTT selectors available in the incoming message match an entry in the G-Flex selector table, then the service nature of address from the selector table entry uses that number's nature of address. Further conditioning is applied based on this new nature of address.

    - If the nature of address is National (Significant), the default CC (country code for E.164 or E.214) or default MCC (for E.212) is prepended to the number for GDB look up. The default code to be used by the EAGLE 5 ISS must be previously provisioned by the EAGLE 5 ISS operator. If not, a UIM (Unsolicited Information Message) is issued, and the message falls through to GTT.

    - If the nature of address is Subscriber, the default CC + default NC (network code for E.164 or E.214) or default MCC + default MNC (for E.212) are prepended to the number. The default codes to be used by the EAGLE 5 ISS must be previously provisioned by the EAGLE 5 ISS operator. If not, a UIM is issued, and the message falls through to GTT.

    - If the numbering plan is E.214, the CC + NC part of the number is replaced with its corresponding MCC + MNC from the provisioned conversion data. If no matching CC + NC has been provisioned, a UIM is issued, and the message falls through to GTT.

2. Numbers with fewer than five digits after the above conditioning are not used for G-Flex. In this case, a UIM is issued, and the message falls through to GTT.

3. Numbers with more than 15 digits after the above conditioning are not used for G-Flex. In this case, a UIM is issued, and the message falls through to GTT.

Maintenance

Validation of G-Flex Hardware Configuration

DSM card loading has been modified to verify the validity of the hardware configuration for the DSM cards. Hardware verification includes the following:

- DSM Main Board Verification

  An AMD-K6 (or better) main board is required to support the G-Flex VSCCP application on the DSM card. EAGLE 5 ISS maintenance stores the validity status of the VSCCP card's main board configuration.

  NOTE: The system does not allow the G-Flex feature to be turned on if the hardware configuration is invalid.

  When the VSCCP application is initializing, it determines the main board type. The SCCP maintenance block is the mechanism used to relay the main board information to OAM. This requires that the application software be loaded to the VSCCP card and then the main board information received in the SCCP maintenance block must be verified. If the main board is determined to be invalid for the G-Flex application, loading of the VSCCP card is automatically inhibited.

- DSM Applique Memory Verification

  The VSCCP application performs two types of memory validation to determine whether or not a DSM has sufficient memory to run G-Flex:

  — *Local Memory Validation*. When the G-Flexfeature access key is first enabled, or any time the G-Flex feature is enabled and the DSM is initializing, VSCCP checks to see if the DSM has at least one D1G applique.

  — *Real-Time Memory Validation (during card initialization)*. Once communications between the DSM and EPAP have been established, and the DSM has joined the RMTP Tree, the EPAP starts downloading the RTDB to the DSM card. After the DSM card has downloaded the RTDB, it continues to receive database updates as necessary. The EPAP includes the size of the current RTDB in all records sent to the DSM. The DSM card compares the size required to the amount of memory installed, and issues a minor alarm once the database exceeds 80% of the DSM memory. If the database completely fills the DSM memory, a major alarm is issued, the DSM leaves the RMTP tree, and the DSM's status changes to IS-ANR/Restricted. The DSM continues to carry traffic.

- Actions Taken When Hardware Determined to be Invalid

  When the hardware configuration for a DSM card is determined to be invalid for the G-Flex application, SCM automatically inhibits loading for that specific DSM card. A major alarm is generated indicating that card loading for that DSM card has failed and has been automatically inhibited (that is, prevented from reloading again). Refer to Chapter 5, G-Flex Related Alarms for the specific alarm that is generated. When card loading has been inhibited, the primary state of the card is set to **`oos-mt-dsbld,`** and the secondary state of the card is set to **`MEA`** (Mismatch of Equipment and Attributes).

  The following actions apply to a DSM card determined to be invalid:

— The DSM will not download the EAGLE 5 ISS databases.

— The DSM will not download the real-time RTDB from the EPAP.

— The DSM will not accept RTDB updates (that is, add, change, delete) from the EPAP, nor will it accept EAGLE 5 ISS database updates.

To activate loading of a DSM card that has been automatically inhibited, the craftsperson must enter the **alw-card** command (**alw-card:loc=xxxx**).

- Unstable Loading Mode

  At some point, having a number of invalid DSM cards results in some of the LIMs (Link Interface Module) being denied SCCP services. There is a threshold that needs to be monitored: if the number of valid DSMs is insufficient to provide service to at least 80% of the IS-NRLIMs, the system is said to be in an unstable loading mode. For other reasons why an EAGLE 5 ISS might be in an unstable loading mode, refer to Chapter 5, Loading Mode Support Status Reporting .

Maintenance Commands

The following commands are used for G-Flex maintenance.

- The debug command **ent-trace** traps G-Flex MSUs (Message Signaling Unit) based on the point code of the switch that generated the MSU (SSP), a particular DN, or IMSI. Note that an MSU is considered to be a G-FlexMSU after its CdPASSN is determined to be a HLRSSN. For MSISDN and IMSI, the comparison is based on the search key built from the CdPAGTAI (Global Title Address Information) after any conditioning. The existing GTSCCP trigger also applies to G-Flex messages.

- The command **rept-stat-mps** reports current G-Flex statistics. An MSU is considered to be a G-FlexMSU after its CdPASSN is determined to be a HLRSSN. This command reports G-Flex statistics on a single SCCP card basis or on a G-Flex system basis.

For more information, refer to Chapter 5, Maintenance and Measurements Commands .

G-Flex Loading Mode Support

Loading mode support is not applicable for RTDB updates, since DSM cards use incremental loading from the EPAP. EAGLE 5 ISSAdministrative updates are allowed while a DSM card is loading and the system is above the 80% card stability threshold. If it is below the 80% threshold, loading mode support allows EAGLE 5 ISS administrative updates to be rejected while cards finish loading and cross the 80% or better threshold.

For G-Flex, loading mode support is applicable for database updates originating from the EAGLE 5 ISSGPSM-II's (General Purpose Service Module II cards) destined for the DSM cards.

Audit Requirements

The G-Flex audit does not change EAGLE 5 ISS's compliance to STP audit requirements, to which it currently adheres. New G-Flex database tables residing on the EAGLE 5 ISSTDM fixed disks are audited by the existing EAGLE 5 ISS audit, which only verifies tables on the EAGLE 5 ISS active and standby TDMs. There are new audit mechanisms for new G-Flex tables residing on the EPAP platform that are downloaded to the DSM cards. The new audit mechanisms consist of the following.

- On each DSM card and on the standby EPAP, a background audit calculates checksums for each G-FlexRTDB table record and compares the calculated checksum against the checksum value stored in each record. If they are not the same, then a *databasecorrupt* alarm is issued.

- A process that runs periodically on the active EPAP (approximately every five seconds or less) sends the latest RTDB database level to all the DSM cards and the standby EPAP. If the database levels do not match, the standby EPAP or DSM card issues a *diff level* alarm.

For more information on the new audit mechanisms, refer to the *EPAP Administration Manual*.

G-Flex MAP Layer Routing

When the SCCP CdPA in a message receiving G-Flex service is truncated by the MSC, G-Flex needs to use the subscriber number from the MAP layer for routing.

The G-Flex MAP Layer Routing feature allows subscriber digits to be obtained from either the SCCP layer or the MAP layer of a message during G-Flex database lookup. This ability resolves the issue of truncation of digits by the mobile switching center (MSC) that may occur in the SCCP layer.

The G-Flex MAP Layer Routing feature allows the user to specify whether the subscriber digits are obtained from the SCCP or MAP layer when performing G-Flex database lookup. This is a user-configurable G-Flex option.

This feature applies only to MAP Update_Location, Send_Parameters, and MAP Send_Authentication_Information operations within GSM messages. These three MAP operations commonly encode the SCCP CdPA GTA in the E.214 format (MGT) where trailing IMSI digits may be truncated from MGT, and these messages always include IMSI in the MAP layer. CdPA digits from the SCCP layer are always used to route all other MAP messages.

NOTE: As part of this feature, the G-Flex feature is converted from a feature bit to a FAK and part number.

Feature Control Requirements

The G-Flex MAP Layer Routing feature has the following feature control requirements:

- The G-Flex feature must be enabled and turned on (FAK for part number 893-0219-01) before the G-Flex MLR feature can be enabled.
- The G-Flex MLR feature requires a FAK for part number 893-0217-01
- If the **ansigflex** option in **`chg-stpopts`** command is turned on, then the feature cannot be enabled.
- A temporary FAK cannot be used to enable the G-Flex or the G-Flex MLR features.
- If the G-Flex feature is turned on with the feature bit before upgrade occurs, then the feature is automatically enabled and turned on with the FAK after upgrade.
- The G-Flex and G-Flex MLR features cannot be turned off after being turned on.

Limitations

ANSI G-Flex traffic at 1700 TPS per DSM card and 5000 TPS per E5-SM4G card is not supported by the G-Flex MLR feature. ANSI traffic operates at standard G-Flex TPS rates if the G-Flex MLR feature is turned on.

EPAP Provisioning Blacklist

This feature provides blacklist functionality for protected E.164 addresses of network elements, such as HLRs. All G-Flex provisioning data is checked against this blacklist to prevent inadvertent population of protected E.164 addresses into the G-Flex database as MSISDNs.

The G-Flex blacklist ranges are stored in the PDB database. G-Flex blacklist ranges are not sent to or stored in the RTDB.

The customer is responsible for determining the ranges of address strings that should be considered, protected, and entered into the blacklist. Reliability of this feature depends on the completeness of the blacklist.

CAUTION: If the G-Flex blacklist does not include all protected address strings in the customer network and one of those protected address strings is provisioned as a DN, DN Block, or IMSI, there will be unintended message routing, possibly causing network outages.

Provisioning of the E.164 addresses for this feature is only made via the EPAPGUI. The EPAPGUI is used to retrieve, view, and delete entries in the blacklist. EPAPGUI menus to add and delete G-Flex blacklist ranges are only accessible to PDBA group and the User Administration (uiadmin) user.

A maximum of 150 blacklist ranges are supported by the EPAP. A valid G-Flex blacklist range is defined by two address strings of 5-15 hexadecimal digits, where the ending address is greater than or equal to the beginning address. Address strings must be of the same length. G-Flex blacklist ranges cannot overlap. A valid G-Flex blacklist range cannot conflict with DN, DN block, or IMSI values in the PDB. If a conflict is determined, the blacklist range will be rejected.

When provisioning a valid G-Flex blacklist range, this feature also verifies that Network Entity address strings do not conflict with DN, DN Block or IMSI address strings within the same EPAPPDB.

This feature also verifies that Network Entity address strings do not conflict with DN, DN Block or IMSI address strings within the same EPAPPDB. The command is rejected if a conflict is found.

This feature also provides for PDBI checks against the blacklist ranges when the PDBI is used for the provisioning of DNs, DN blocks, and IMSIs. The command is rejected if a conflict is found.

This feature also provides for PDBI checks against the Network Entity table in memory when the PDBI is used for the provisioning of DNs, DN blocks, and IMSIs. The command is rejected if a conflict is found.

The provisioning of blacklist ranges do not cause PDB database levels to increment.

G-Flex Relay Function

G-Flex Relay Function (GFRF) is, in a way, an enhancement to GTT functionality. GFRF involves the following main enhancements to EAGLE 5 ISS's GTT.

- **Increased number of translations** – The GTT limit is 270,000 total translations. With GFRF, the number is millions. However, the GFRF translations are only from international MSISDNs and IMSIs to HLRs.

- **Number conditioning** – Since the GDB stores MSISDNs and IMSIs as international numbers and does not store MGTs, G-Flex provides the capability to condition incoming numbers to be international MSISDNs or IMSIs for the database look up.

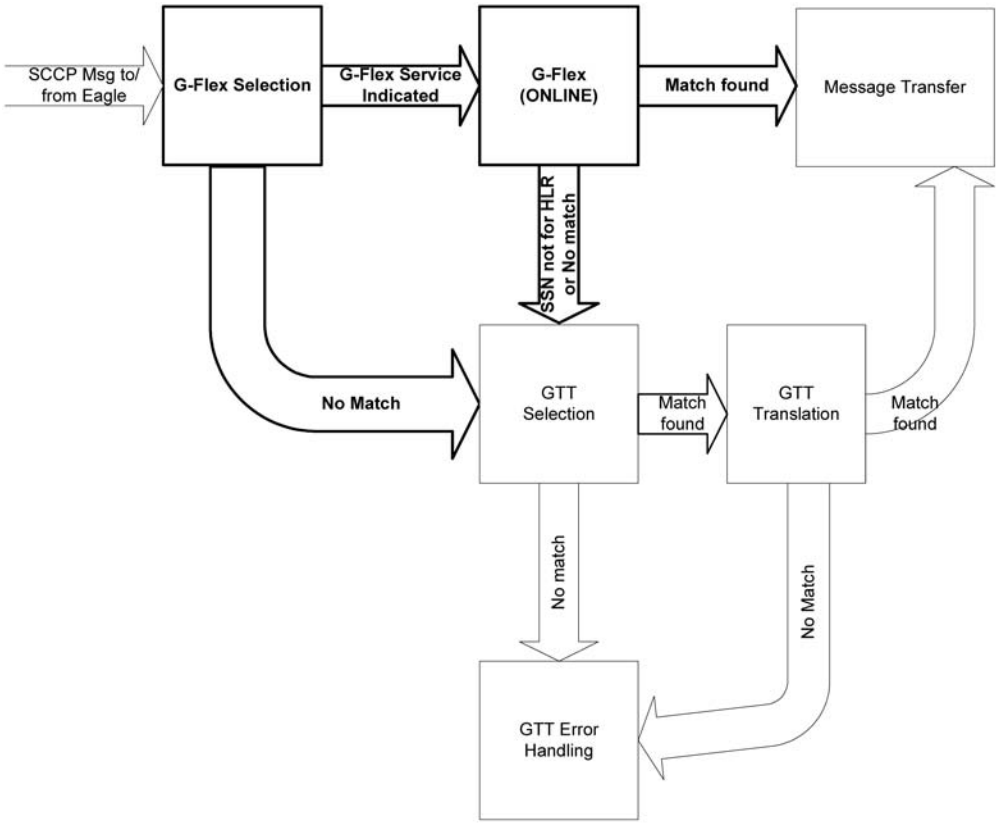
- **Provides discrimination of messages that need its functionality** – Since G-Flex is currently only used for translating to HLRs, it provides a method to identify which messages should receive G-Flex Relay *vs*. GTT. This is provided via a G-Flex service selector table that defaults back to the GTT Selector table if a match is not found, and by providing SSN-based discrimination.

- **Variable number of digits** – There is no fixed number of digits for MSISDNs or IMSIs. For example, a 12-digit MSISDN can coexist with a 15-digit one. However, the number of digits of the stored numbers must be between 5 and 15.

- **Replacement of GT with entity address** – The ability to set the outgoing CdPAGT (NP, NAI, ES, GTAI) to the HLR's international entity number is provided.

Figure 2-3 shows the basic functional diagram for SCCP, with the new parts for G-Flex in bold.

Figure 2-3. Functional Diagram – G-Flex in SCCP



In order to keep the diagram simple, the only error conditions shown are the no-match cases for G-Flex and GTT selectors and translations. G-Flex has its own error handling for some cases that issues UIMs and peg measurements appropriately before letting the MSU fall through to GTT translation. Also, there are error conditions in GTT selection, GTT translation, and message transfer that are handled by GTT error handling.

G-Flex Relay is performed in the following stages.

1. The message arrives at EAGLE 5 ISS**`route-on-gt.`** The EAGLE 5 ISS decodes the SCCP portion and uses the data to perform G-Flex selection based on the CdPAGT fields other than the ES and GTAI. The result of this selection provides two pieces of data, identification of the **`np`** and **`nai`** for G-Flex and a G-Flex service indicator. The service indicator is G-Flex if GFRF is required. If a G-Flex selector does not match the incoming GT fields, then GTT selection is attempted. It is possible that G-Flex and GTT selectors will not match the incoming GT fields. In this case, GTT error handling is used.

2. If stage 1 indicates that G-Flex Relay is required and if the message is not a UDTS-generated by the EAGLE 5 ISS, the EAGLE 5 ISS performs SSN-based discrimination. If the G-Flex state is ONLINE, then step Item 3 is performed. Otherwise, G-FlexSCCP Service Re-Route is performed.

3. The conditioned number is looked up in the GDB.

4. If the number is found, the translation data for the number is used to alter and route the message.

5. If G-Flex Relay is not required, or the number is not found in the GDB, the set of GTT translations is used for translation.

Table 2-2 lists possible combinations for G-Flex selector and G-Flex data provisioning, and the resulting action of G-Flex relay.

Table 2-2. G-Flex Relay Data Combinations

G-Flex Selector Matches Incoming GT	Number in GDB	EAGLE 5 ISS Action
No	N/A	GTT used
Yes	No	Fall-through to GTT
Yes	Yes	G-Flex translation

GFRF is divided into the following subtasks. Each is described in the sections that follow.

- Conversion of national/local numbers to international numbers
- Conversion of E.214 MGT to E.212 international IMSI
- Database lookup
- Message forwarding
- Error handling

Conversion of National/Local Numbers to International Numbers

G-Flex stores international DNs and IMSIs in its database. SCCPCdPA numbers may need to be converted to international numbers in order to do a database lookup. When a message needs GFRF and has either a national (significant) number or *Subscriber Number* as the Service NAI, then the national/local to international number conversion is triggered. G-Flex uses the SCCPCdPAGTAI number and its SNAI to convert to an international number based on the numbering plan. Refer to **Table 2-3** .

Table 2-3. National/Local Numbers to International Numbers Conversion Logic

Service Numbering Plan	Service Nature of Address	Action
E.164	National (Significant) number	Prepend GTAI digits with the default E.164 country code (CC).
E.164	Subscriber number	Prepend GTAI digits with the default E.164 country code (CC) and network code (NC).
E.212	National (Significant) number	Prepend GTAI digits with the default mobile country code (MCC).
E.212	Subscriber number	Prepend GTAI digits with the default mobile country code (MCC) and mobile network code (MNC).
E.214	National (Significant) number	Prepend GTAI digits with the default E.164 country code (CC).
E.214	Subscriber number	Prepend GTAI digits with the default E.164 country code (CC) and network code (NC).
Other	N/A	Assume the default to be E.164 International number

Notes:

- If any of the default CC, NC, MCC, or MNC are required for conversion and are not provisioned in the database, GFRF issues a UIM and falls through to GTT.
- If the converted number is fewer than five digits, GFRF falls through and performs GTT on the message. GFRF issues a UIM when a converted number is fewer than five digits.
- If the converted number is more than 15 digits, then GFRF issues a UIM when the number exceeds 15 digits and falls through to GTT.
- GFRF uses the conditioned number for database lookup purposes only and does not modify the CdPAGTAI in the message unless **`rcgta=yes`** or **`ccgt=yes`**.
- For the G-Flex selector-specified service numbering plan (IMSI, DN, or MGT), the numbering plan in the incoming message is replaced with the G-Flex Selector service numbering plan (E.164, E.212, or E.214, respectively). This is for G-Flex database lookup purposes only.

Conversion of E.214 MGT to E.212 IMSI

Since the GDB does not store MGTs, the messages with E.214 MGT in the CdPAGTAI are converted to an E.212 International IMSI in order to perform the GDB lookup. G-Flex maintains a logical MGT2IMSI conversion table to perform this conversion. The MGT2IMSI conversion table contains up to ten entries of E.164 part (CC + NC digits) and its corresponding E.212 part (MCC + MNC). If a G-Flex message has E.214 as the CdPA numbering plan, GFRF performs the following steps to derive the E.212 International IMSI:

1. GFRF uses MGT as the key and does a lookup in the MGT2IMSI conversion table to find a match on E.164 part (CC + NC digits).
2. If a match is found, GFRF replaces the matched digits of the MGT with the corresponding E.212 part (MCC + MNC digits). If a match is not found, a UIM is issued and the GFRF falls through to GTT.

3. GFRF uses this complete E.212 International IMSI number to do the database lookup.

NOTE: If the IMSI for a particular country/network is the complete 15 digits and the E.164 CC + NC for that country is more than five digits, the MGT generated could contain a truncated MSIN. This is possible because the converted MGT is more than 15 digits and the maximum number of digits allowed in the MGT is 15 digits. (Refer to E.214 for more details on conversion.) Under these circumstances, the MGT is truncated at 15 digits. Therefore, the MGT-to-IMSI reconversion would not regenerate a complete IMSI and would lead to incorrect results and errors.

Database Lookup

GFRF performs the G-Flex database lookup using either the complete international DN or IMSI. If the DN or IMSI number is found in the database and it has an HLR translation, GFRF extracts the HLR translation data and generates a forwarding message. GFRF falls through and performs GTT for the following error cases:

- The DN number is not present in the database.
- The IMSI number is not present in the database.

The preceding error cases do not generate any UIM or UAM (Unsolicited Alarm Message), but fall through to GTT processing.

If the G-Flex database lookup is for GTI=2 and is an even number of digits ending in 0, then the G-Flex database performs a less than or equal to lookup for the odd number of digits (digit length minus 1). If a match is found, G-Flex saves the record and record index. It then tries to continue to find an exact match on the even number of digits. If the exact match is found in the G-Flex database, then the HLR translation data corresponding to the even number of digits record is used. Otherwise the HLR translation data corresponding to the found odd number of digits record is used. If the even and odd translation is not found, then the GFRF falls through and performs GTT.

The important issue is that the less than or equal to search re-enters the search where the comparison left off. This minimizes any impact on performance for this special case.

Message Forwarding

GFRF Forwarding Message: MTP Portion

G-Flex modifies the MTP routing label to include HLRPC as the DPC and EAGLE 5 ISS's own PC as the OPC. G-Flex modifies the MTP Level 2 length based on the size of the forwarding message. **Table 2-4** lists the fields modified by GFRF.

Table 2-4. GREF Forwarding Message: MTP Portion

Fields	Values
MTP Level 2 length	Number of octets in response MSU starting from MTP3SIO field. If number of octets is greater than 63, Level 2 length is set to 63
MTP Level 3 DPC	Point code obtained from the HLRGT information in G-Flex database
MTP Level 3 OPC	EAGLE 5 ISS’s true PC

GFRF Forwarding Message: SCCP Portion

Replacing the CdPA GTAI digits with the HLR entity number

When a MSISDN or IMSI number is found in the database and the Replace GT flag is set for this entry, GFRF replaces the CdPAGTAI digits with the provisioned HLR entity number. G-Flex also modifies the numbering plan (E.164), nature of address (international), and encoding scheme to match the HLR entity number.

GFRF does not replace the Global Title Indicator format (GTI) element of the GT.

Replacing of SSN in the CdPA

When the HLR translation data includes a SSN, GFRF replaces the SSN in the called party address of the message with the new SSN. If the SSN is not present in the incoming message, then GFRF updates the Subsystem Number Indicator and includes the new SSN in the called party address of the message before it forwards the message to the next node.

Inclusion of OPC in the CgPA

When the routing indicator of the calling party address is set to *Route on SSN*, and no SPC is present in it, the OPC from the received message is taken and inserted into the CgPA before the message is forwarded to the next node.

Deleting the CdPA GT Digits

When G-Flex performs Final-GTT, the routing indicator of the called party address is set to **`Route on SSN`**. G-Flex provides an option to delete the global title present in the called party address. If the **`Delete GT`** option is set, G-Flex modifies the GTI to zero and deletes the GT information from the SCCPCdPA before the message is forwarded to the end node. **Table 2-5** summarizes the possible changes by GFRF to the SCCP fields.

Table 2-5. GFRF Forwarding Message: SCCP Portion

Field	Value
SCCPCdPA Length	New CdPA length after the possible modifications
SCCPCdPA Routing indicator	Routing indicator obtained from the G-Flex database. (GT or DPCSSN)
SCCPCdPA Global Title Indicator	Same as incoming message or zero
SCCPCdPASubsystem Number Indicator	Same as incoming message or replaced/inserted with the subsystem number indicator based on the existence of the SSN provisioned in the HLR translation
SCCP CdPA SSN	Same as incoming message or replaced/inserted with the SSN provisioned in the HLR translation
SCCP CdPA GT	Same as incoming message or replaced or deleted with HLR entity address provisioned in the database
SCCPCgPA Length	New CgPA length after the possible modifications

Field	Value
SCCPCgPAPoint Code Indicator	Same as incoming message *or* if CgPARI is “Route on SSN” and PCI is not 1, then set PCI to 1
SCCP CgPA SPC	If the CgPARI is “Route on SSN” and no point code is present in the CgPASPC, then the OCP is included as the SPC (Secondary Point Code)
SCCPCdPASubsystem Number Indicator	Same as incoming message or replaced/inserted with the Subsystem Number indicator based on the existence of the SSN provisioned in the HLR translation

Error handling

The purpose of the Error handling is to discard or return messages that encounter routing and database failures and cannot be delivered to the HLR. When GFRF is unable to transfer a message and the return on error is *set*, then GFRF follows the same error handle procedures followed by GTT. The *data* field of the UDT message and the reason cause for return are included in UDTS message.

GFRF follows the same error handling procedures as GTT for the following error cases:

- Routing failures
- Network Congestion

Forwarding message after replace GT and/or Insertion of OPC or SSN is greater than the CCS7 message limit (272 bytes).

An exception to GTT error handling is when the GFRF database entry cannot be found. In this case, it is not considered an error and the GFRF capability will forward the message to GTT processing.

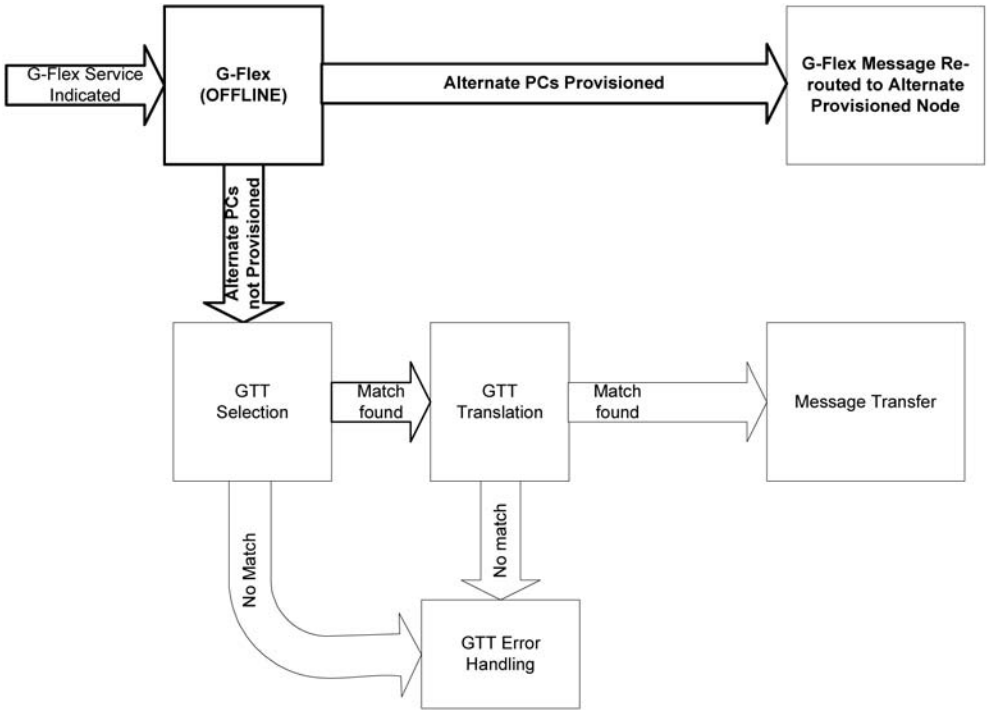
G-Flex SCCP Service Re-Route Capability

This feature is designed to handle and control re-routing of G-Flex traffic from an affected node to alternate nodes within an operators network. This feature is an optional feature and doesn't affect the normal G-Flex functionality. This feature consists of the following main functions:

- Service State
- G-Flex Re-routing
- G-Flex Capability Point Codes

Figure 2-4 shows the basic functional diagram for the G-FlexSCCP Service Re-Route feature, with the new parts for specific for this feature in bold.

Figure 2-4. Functional Diagram – G-Flex SCCP Service Re-Route (OFFLINE)



Service State

Service state is part of the G-FlexSCCP Service Re-Route capability. Service state is used to indicate the current state of G-Flex, either *ONLINE* or *OFFLINE*. Service state also gives the user the option to mark G-Flex as *OFFLINE* or *ONLINE* based on the current behavior. If a G-Flex problem is identified, G-Flex can be marked *OFFLINE* to initiate the re-routing procedure. In the case when SCCP cards need to be reloaded for some reason, G-Flex can be marked *OFFLINE* until enough cards are in-service and then bring G-Flex*ONLINE* in a controlled fashion. This feature also provides the option to mark G-Flex *OFFLINE* to perform a controlled re-routing during this state.

G-Flex Re-routing

G-Flex re-routing is an optional feature and is enabled by defining a list of alternate PCs or by defining the GTT option. G-Flex re-routing is activated by marking G-Flex *OFFLINE*. When G-Flex is *OFFLINE* and alternate PCs are provisioned, any messages destined for G-Flex are re-routed to the available alternate PCs that are defined for G-Flex. If alternate PCs are not provisioned or none are available, then the GTT option is used. If the GTT option is set to YES, then messages destined for G-Flex will fall through to GTT as part of the re-routing procedure.

Re-routing is applied to all G-Flex messages (based on SRVSEL). There is no distinction of DPC of the messages. The DPC of the message can be either True, Secondary, or Capability Point code.

G-Flex Capability Point Codes

Capability Point Codes (CPC) are also supported for G-Flex. The use of G-Flex capability point code aids the adjacent nodes in knowing about G-Flex outages. When G-Flex is brought down though administrative commands, all traffic destined to this G-Flex node will generate a Transfer Prohibited (TFP) message to the adjacent node

about the G-FlexCPC. The TFP response to the adjacent node causes the traffic originating nodes to stop sending G-Flex traffic to this node. All G-Flex traffic coming into this node is sent to the alternate G-Flex nodes. Adjacent nodes will initiate route-set-test procedures after receipt of the TFP response.

If the messages are destined to the EAGLE 5 ISS true point code, then TFP messages are not generated when the G-Flex service is OFFLINE. The originator would not be aware of the outage.

Once G-Flex is back in service on the EAGLE 5 ISS, a Transfer Allowed (TFA) message is sent to the traffic originating adjacent nodes in response to route-set-test message. The traffic originating nodes will then start sending G-Flex traffic to the original G-Flex node.

G-Flex Capability point codes can be provisioned when the G-Flex feature is ON. There can be more than one Capability Point Code assigned to G-FlexCPCType.

When the G-Flex feature is turned ON and the G-Flex service state is set to *OFFLINE*, the user can change the service to *ONLINE* at any point. Once the feature is turned *ONLINE*, G-Flex will start processing messages if at least one SCCP card is IS-NR.

The G-Flex service can be set to *OFFLINE* at any point. This causes the EAGLE 5 ISS to stop processing G-Flex traffic and re-routing is performed.

The G-Flex service state is persistent. Booting the OAM or all the SCCP cards will not change the service state. Commands must be used to change the service state.

G-Flex supports up to 7 alternate PCs per domain. All 6 domains (ANSI, ITU-I, ITUN14, ITUN14 spare, ITU-I spare and ITUN24) are supported. An entire set of alternate PCs are considered as a re-route set. A GTT option is supported for G-FlexSCCP Service Re-Route. When the G-Flex service is *OFFLINE*, G-Flex messages fall though to GTT based on the GTT option. This option is set to *YES* by default.

G-Flex SCCP Service Re-Route Summary

If the G-Flex service is not normal (because the RTDB is not in sync with MPS or if cards are misrouting G-Flex messages) then the G-Flex service state should be changed to *OFFLINE*.

Before changing G-Flex service to *OFFLINE*, it should be decided what kind of re-routing will be used during the outage. The EAGLE 5 ISS supports re-routing data to alternate point codes or falling through to GTT as two possible options. Re-routing to alternate point codes has priority over falling though to GTT. Examples of the two options follow:

Option 1

Define alternate point codes to re-route G-Flex traffic. This is the recommended option. Up to 7 alternate G-Flex nodes can be provisioned to re-route all the incoming G-Flex traffic. Once provisioned, the G-Flex service can be changed to *OFFLINE*. This example has any incoming being G-Flex traffic being load-shared to point codes based on the relative cost.

```
chg-sccp-
serv:serv=GFLEX:pci1=1-1-1:rc1=10:pci2=2-2-2:rc2=10:pci3=3-3-3:rc3=10:pci4
=4-4-4:rc4=10 chg-sccp-
serv:serv=GFLEX:pci1=5-5-5:rc1=10:pci2=6-6-6:rc2=10:pci3=7-7-7:rc3=10:pci4
=8-8-8:rc4=10 chg-sccp-serv:serv=GFLEX:state=offline
```

Option 2

With this option default GTT translations are provisioned for G-Flex service. Then the **chg-sccp-serv** command is used to provision GTT=YES. All G-Flex messages will fall through to GTT. An example command follows:

`chg-sccp-serv:serv=GFLEX:GTT=YES` (it is YES by default)

Once the G-Flex re-routing data is provisioned, G-Flex service can be changed to *OFFLINE*. At this point all G-Flex traffic will be re-routed. The use can take necessary steps to correct the G-Flex service on the node. Until all the cards or enough cards are in active state with valid G-Flex database, G-Flex service should not be changed to *ONLINE*.

Table 2-6 shows the actions taken when the G-Flex service is offline, a message arrives at the affected node requiring G-Flex service, and SCCP cards are available.

Table 2-6. G-Flex SCCP Re-route Summary

Result of service selector	DPC	Alternate point code defined and available	GTT to be performed as fall through	Message Handling	Network Management
G-Flex	G-Flex Capability PC	Yes	N/A	Re-route to alternate point code based on relative cost	TFP concerning CPC
G-Flex	G-Flex Capability PC	No*	Yes	Fall through to GTT and perform GTT	TFP concerning CPC
G-Flex	G-Flex Capability PC	No*	No	Generate UDTS (return cause = network failure)	TFP concerning CPC
G-Flex	G-Flex Capability PC	Not Defined	Yes	Fall through to GTT and perform GTT	TFP concerning CPC
G-Flex	G-Flex Capability PC	Not Defined	No	Generate UDTS (return cause = no xlation for this addr)	TFP concerning CPC
Not G-Flex	G-Flex Capability PC	N/A	N/A	Perform appropriate Service/GTT	None
G-Flex	True or Secondary PC or non-G-FlexCPC	Yes	N/A	Re-route to alternate point code based on relative cost	None
G-Flex	True or Secondary PC or non-G-FlexCPC	No*	No	Generate UDTS (return cause = network failure)	None
G-Flex	True or Secondary PC or non-G-FlexCPC	No*	Yes	Fall through to GTT and perform GTT	None
G-Flex	True or Secondary PC or non-G-FlexCPC	Not Defined	Yes	Fall through to GTT and perform GTT	None
G-Flex	True or Secondary PC or non-G-FlexCPC	Not Defined	No	Generate UDTS (return cause = no xlation for this addr)	None

Result of service selector	DPC	Alternate point code defined and available	GTT to be performed as fall through	Message Handling	Network Management
Not G-Flex	True or Secondary PC or non-G-FlexCPC	N/A	N/A	Perform appropriate Service/GTT	None
* Alternate point codes are defined and unavailable (prohibited or congested).					

Table 2-7 shows the actions of LIM re-route functionality when SCCP cards are unavailable or down.

Table 2-7. G-Flex LIM Re-route Message Handling Summary

Routing Indicator in Incoming Message	DPC	Full or Partial Failure	G-Flex Service Status	Message Handling	Network Management
rt-on-gt	G-Flex Capability PC	Full	N/A	Generate UDTS	TFP concerning CPC, UPU
rt-on-gt	Non G-Flex Capability PC	Full	N/A	Generate UDTS	TFP concerning CPC, UPU
rt-on-gt	True PC	Full	N/A	Generate UDTS	UPU
rt-on-gt	G-Flex Capability PC	Partial*	ONLINE	Generate UDTS	None
rt-on-gt	True PC or non G-Flex Capability PC	Partial*	ONLINE	Generate UDTS	None
rt-on-gt	G-FlexCPC	Partial*	OFFLINE	Generate UDTS	TFP concerning CPC, UPU
rt-on-gt	True PC or non-G-FlexCPC	Partial*	OFFLINE	Generate UDTS	None
* It is considered a partial failure if some SCCP cards are available but overloaded.					

MPS/EPAP Platform

Tekelec provides the MPS (Multi-Purpose Server) platform as a subsystem of the EAGLE 5 ISS. The MPS provides support for the AINPQ, A-Port, EIR , G-Flex, G-Port, IGM, and INP features.

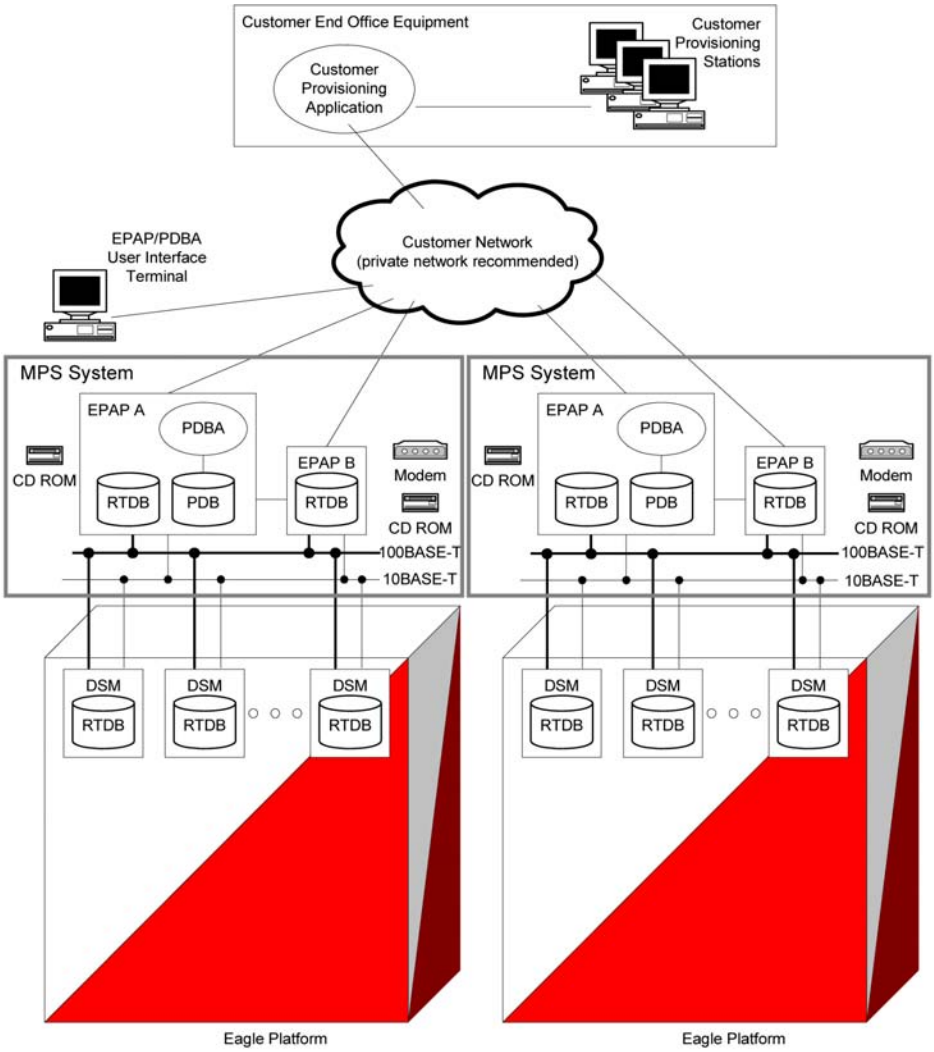
The MPS is composed of hardware and software components that interact to create a secure and reliable platform. (For details about the MPS hardware, refer to the *Tekelec 1000 Application Server Hardware Manual*.) The MPS provides the means of interfacing the customer provisioning application with the EAGLE 5 ISS. It connects the customer 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 it to the EAGLE 5 ISS DSM cards. Figure 2-5 shows the overall system architecture, providing a graphic overview of MPS/EPAP platform from customer provisioning through the MPS subsystem to the EAGLE 5 ISS DSM databases.

NOTE: The EAGLE 5 ISS supports more than one type of hardware card that provides the DSM function. The cards differ in the size of database and the transactions/second rate that they support. In this manual, the term DSM is used to mean any hardware card that supports the DSM function, unless a specific

card (such as E5-SM4G) is mentioned. For more information about the hardware cards that support the DSM function, refer to the *Hardware Manual - EAGLE 5 ISS*.

Figure 2-5. MPS/EPAP Platform Architecture



Design Overview and System Layout

Figure 2-5 illustrates the overall system architecture and identifies the different tasks, databases and interfaces involved. The system consists of two mated MPS servers. Each MPS contains two EPAP platforms, EPAP A and EPAP B, each containing a RealTime Database (RTDB), a Provisioning Database (PDB), servers, optical media , modems, and network hubs. Each MPS and its EPAPs may be thought of as an ‘EPAP system’; the EPAP system and the mated EAGLE 5 ISS is referred to as the ‘mated EPAP system’. Each EPAP system is a T1000 AS system with a total of four Ethernet interfaces: one from each EPAP to the 100Base-T Ethernet and one from each EPAP to the 10Base-T Ethernet.

On the EAGLE 5 ISS platform side, a set of DSM cards, which hold the RTDB database, is part of the STP. Two high-speed Ethernet links connect the DSM cards and the EPAPs. One of the links is a 100BASE-T Ethernet bus, and the other is a 10BASE-T Ethernet bus.

The RTDB database 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 as the standby link. At any given time, there is only one active EPAP and one active link. The database is provisioned through the active link by the active EPAP; the other EPAP provides redundancy.

In case of failure of the active EPAP, the standby EPAP takes over the role of active EPAP and continues to provision the subscriber database. In the case where the active link fails, the active EPAP switches to the standby link to continue provisioning the DSM 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.

Major modules on the EPAP are the

- DSM provisioning module
- Maintenance module
- RTDB module
- PDB module

The DSM provisioning module is responsible for updating subscriber databases on the EAGLE 5 ISS DSM 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 of the mated EAGLE 5 ISSs.

Functional Overview

The main function of the MPS / EPAP platform is to provision the data from the customer network to the DSM 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 DSM cards on the EAGLE 5 ISS. The maintenance module is responsible for the overall stability and performance of the system.

It is possible for the current copy of the RTDB database on the DSM cards to get out-of-sync due to missed provisioning or card rebooting. Therefore, the RTDB on the EPAP contains a coherent, current copy of the subscriber database. The EPAP-DSM provisioning task sends database information out on the provisioning link. The DSM cards act as the receivers and are reprovisioned.

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 DSM 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 DSM 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 transmit by the EPAPs across a private network to the DSM 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

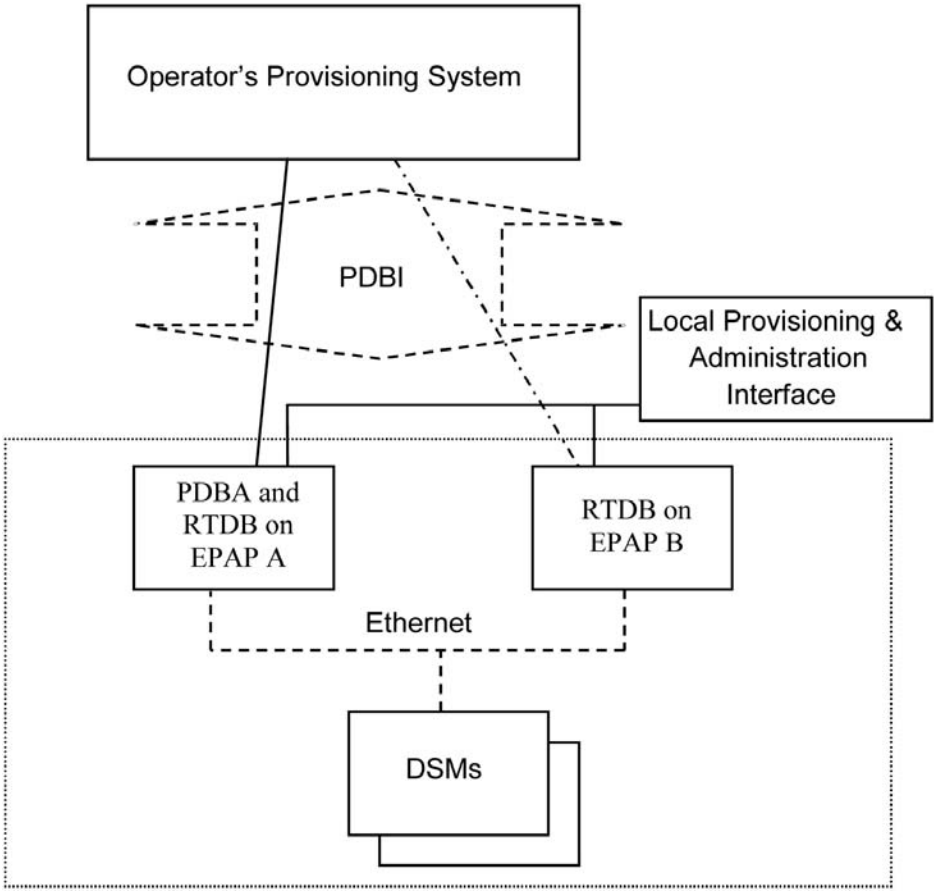
Each EPAP server maintains a copy of the Real-Time Database (RTDB) in order to provision the EAGLE 5 ISS DSM cards. The EPAP server must comply with the hardware requirements in the *MPS Hardware Manual*. **Figure 2-5** illustrates the EPAP architecture contained in the MPS subsystem.

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 the *Tekelec T1000 Application Server Hardware Manual* for details about the hardware devices and network connections.

Subscriber Data Provisioning

Figure 2-6 shows the current 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 PDBI (Provisioning Database Interface) between the EPAP and the operator's provisioning system (OPS). Provisioning clients connect to the EPAPs via the Provisioning Database Interface (PDBI). This interface contains commands that allow all of the provisioning and retrieving of subscription data. The PDBI is used for real-time provisioning of subscriber and network entity data only. Refer to the *Provisioning Database Interface Manual* for more details.

Figure 2-6. Subscriber Data Provisioning Architecture (High Level)



A pair of active/standby EPAP servers provides the interface between the Realtime Database (RTDB) of the EAGLE 5 ISS DSM cards (Database Service Modules) and the OPS. EPAP A is equipped with both the PDB (Provisioning Database) and the RTDB database, and EPAP B has just the RTDB. An EPAP with just the RTDB must be updated by the EPAP that has the PDB.

For more information about the EPAP, refer to the *EPAP Administration Manual*. For more information about the MPS hardware, refer to the *Tekelec 1000 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.

In general, EAGLE 5 ISS database updates are sent via an EAGLE 5 ISS terminal across an RS232 serial port to the active OAM (Operation Administration and Maintenance). The active OAM commits the update to TDM fixed disk and then sends the update control information to the standby OAM and to the rest of the network cards. When all databases are updated, the active OAM responds with a *Command Completed* indication to the user terminal. EAGLE 5 ISS database updates are generally considered to be EAGLE 5 ISS link, linkset, route, destination, mated application, gateway screening, and global title types of information.

Databases requiring high update and retrieval rates, (compared to the rates provided by the OAM) are not administered via EAGLE 5 ISS terminals. These databases,such as the EPAP RTDB, are populated using redundant Ethernet connections to DSM cards from an EPAPMPS platform.

An EPAP consists of a combined Provisioning (MySQL) and RTDB database. The Provisioning Database (PDB) responds to requests for updates by the active and standby RTDB databases on both mated EAGLE 5 ISSs. The active EPAPRTDB database is responsible for initiating multi-cast updates of changed database records to the DSM cards after the data has been committed to the EPAP disks. Furthermore, the PDB may accept and commit more database updates while the RTDB databases 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 DSM 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 EPAPRTDB database or to turn the subscriber database audit on or off. For additional information, refer to the *Tekelec T1000 Application Server Hardware Manual* and *EPAP Administration Manual*.

EPAP (EAGLE Provisioning Application Processor)

As shown in **Figure 2-5** , a single MPS system contains two EPAP (EAGLE Provisioning Application Processor) servers. At any given time, only one actively communicates with the DSM (Database Service Module) boards. 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 systems is to maintain the RTDB and PDB and to download copies of the RTDB to the DSM cards on the EAGLE 5 ISS.

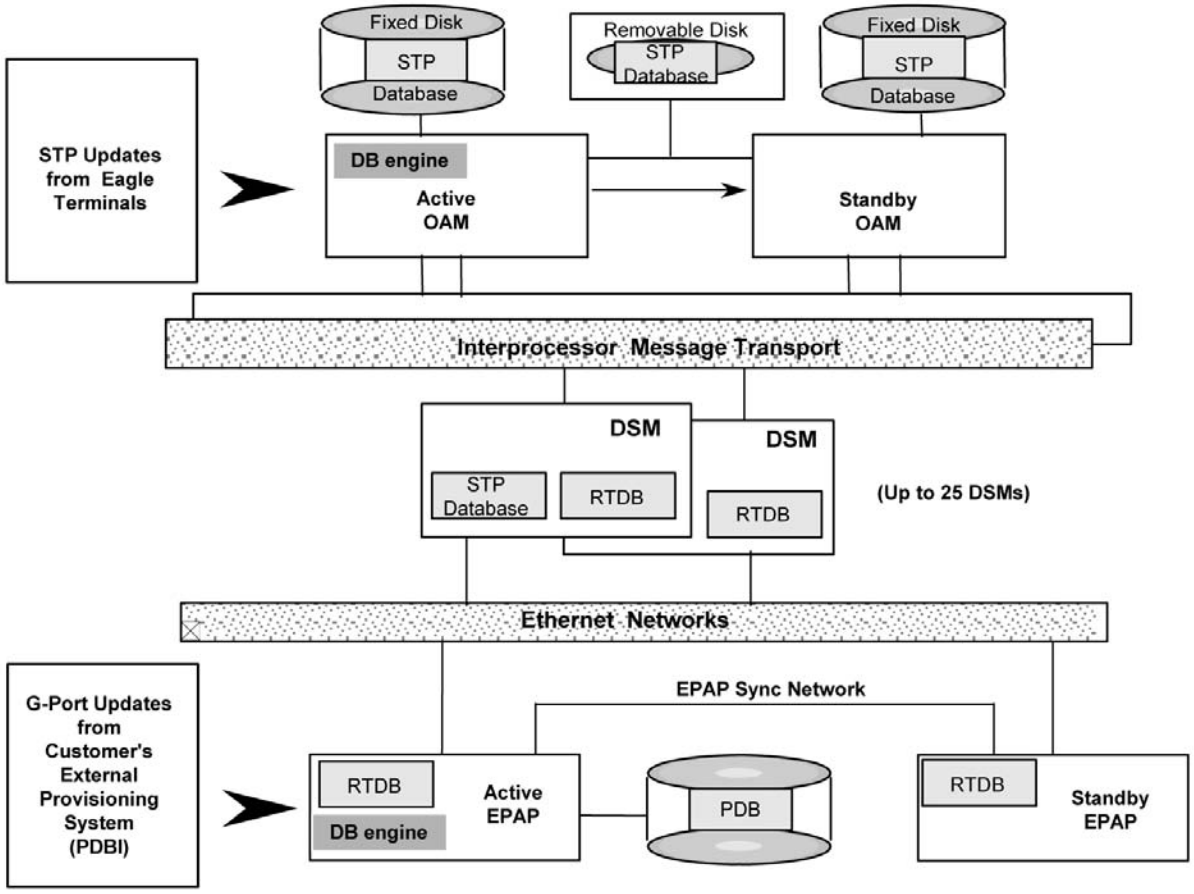
The PDB on the active EPAP receives subscription data from the customer network through the PDBI, the external source of provisioning information. The PDBA continually updates the active EPAP's PDB. The PDB uses MySQL database software. Once an update is applied to the active PDB, it is sent to the RTDBs on the active and standby EPAPs.

Both the active and standby EPAPs maintain copies of the RTDB. Periodically, the DSM card polls the active EPAP RTDB for any new updates. The active EPAP downloads the updates to the DSM for its own resident copy of the RTDB database.

In a mated-pair configuration, there are two mated MPS Systems, as shown in **Figure 2-5** . The PDB on the active EPAP automatically updates the PDB on the mate platform. The PDB on the mate platform then updates its EPAP RTDBs, which in turn update the RTDBs on the associated DSM cards.

Provisioning of the EAGLE 5 ISS's DSM 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 2-7** .

Figure 2-7. Database Administrative Architecture



Database Service Module Cards

From 1 to 25 DSM cards can be provisioned with the G-Flex feature enabled. TheG-Flex feature requires that all DSM cards contain 4 GB of memory. **Figure 2-7** illustrates each DSM card having two Ethernet links, the main DSM network on the 100BASE-T link and the backup DSM network on the 10BASE-T link.

The extra memory holds a copy of the RTDB. The DSM Ethernet ports are linked to the EPAP systems to receive the downloaded RTDBs. The DSM cards run a version of the SCCP software application that has been ported to the VxWorks operating system. To differentiate the DSM-VxWorks-SCCP application from the SCCP that runs on Translation Services Module (TSM) cards, the DSM version is named ‘VSCCP’.

Multiple DSM cards provide a means of load balancing in high-traffic situations. The DSM database is in a format that facilitates rapid lookups. Each DSM contains an identical database. Furthermore, all DSM G-Flex subscriber databases are identical to the RTDB maintained by the EPAPs.

However, the various databases may not be identical at all times for several reasons. First of all, when a DSM card is initialized, it 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. Another condition that can result in databases being out-of-sync occurs when the EPAP receives updates from its provisioning source, but it has not yet sent them down to the DSM cards. Updates are applied to the Provisioning Database (PDB) as they are received.

Two possible scenarios contribute to a condition where a DSM may not have enough memory to hold the entire database. In the first case, the database is downloaded successfully to the DSM, but subsequent updates eventually increase the size of the database beyond the capacity of the DSM memory. In this situation, it is desirable to continue processing G-Flex transactions, even though the database may not be as up-to-date as it could be.

The other case occurs when a DSM card is booted. If 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 DSM is responsible for recognizing and reporting its out-of-memory conditions by means of alarms.

Overview of EPAP to DSM Communications

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

- UDP - sending DSM status messages

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

- IP - reporting EPAP maintenance data

  The DSM 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 DSM cards and issues a *Connect* to establish the TCP/IP connection with that DSM card (referred to as the primary DSM). The purpose of this link is to provide a path for reporting EPAP alarms and to forward maintenance blocks to the DSM.

- IP Multicast - downloading GSM database

  Because of the large size of the database and the need to download it quickly on up to 25 DSM cards, G-Flex uses 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 DSM 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. DSM cards that need to download the real time database or to receive database updates “join the tree”. DSM cards can also “leave the tree”, typically when the database fills their available memory.

DSM Provisioning and Reload

One of the core functions of the EPAP is to provision the DSM cards with the RTDB database updates. In order to provide redundancy for this feature, separate RMTP channels are created on each interface from each EPAP:

- EPAP A, Link A (on the main DSM network, 100BASE-T)
- EPAP A, Link B (on the backup DSM network, 10BASE-T)
- EPAP B, Link A (on the main DSM network, 100BASE-T)

- EPAP B, Link B (on the backup DSM network, 10BASE-T)

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

The DSM 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 according to the DSM card's current database level.

DSM Reload Model

DSM 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 DSM cards with the current database. The database on the EPAP is large and may be updated constantly. The database sent to the DSM 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 DSM cards from different starting points. Reload begins when the first DSM card requires it. Records are read sequentially from the real-time database from an arbitrary starting point, wrapping back to the beginning. If another DSM card requires reloading at this time, it uses the existing record stream and notifies the DSM provisioning task of the first record it read. This continues until all DSM cards are satisfied.

DSM Database Levels and Reloading

The current database level when the reload started is of special importance during reload. When a DSM 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 DSM card continues to reload until it is completely caught up with the current level of the RTDB. As database records are sent to the DSM 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 DSM card.

The following terminology is used here for the stages of database reload for a given DSM.

- **Stage 1 loading**: The database is being copied record for record from the golden RTDB in the EPAP to the DSM 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 (e.g., network outage, processor limitation, lost communication, etc.). The database is coherent, but back-level during incremental update.
- **Current**: The database is receiving current updates from the DSM provisioning task.
- **Coherent:** The database is at a whole database level, that is, not currently updating records belonging to a database level.

DSM Reload Requirements

DSM cards may require a complete database reload if there is a reboot or loss of connectivity for a significant amount of time. The EPAP provides a mechanism to quickly load a number of DSM cards with the current database. The RTDB on the EPAP is large and can be updated constantly from the customer’s provisioning network.

The upload process is divided into two stages:

1. Sequentially send the initial database records.
2. Send any updates missed since the beginning of the first stage.

The DSM reload stream uses a separate RMTP channel from the provisioning and incremental update streams. This allows DSM multicast hardware to filter out the high volume of reload traffic for DSM cards that do not require it.

DSM cards do the following:

- Detect the need for stage 1 loading and send a status message to the EPAP.
- Identify the first record DSM was able to read in the above status message if a record stream is already in progress.
- Handle the record stream regardless of the starting point (that is, records starting with the middle record of the middle table).
- Expect tables to be sent in a particular order and therefore detect any gap in the record stream.
- Send a status message if a gap is detected. Stage 1 loading is essentially reset to the last update received.
- Handle wrapping from the last record from the last table to the first record of the first table of the last update received.
- Know when they have received all the required records to proceed to stage 2 loading.`
- Send a status message when stage 1 loading is complete, indicating the database level at the beginning of stage 1.
- Detect when the master RTDB crosses a memory boundary during stage 1 loading; the card automatically reboots and then auto-inhibits.

DSM Reload Requirements

DSM cards may require a complete database reload if there is a reboot or loss of connectivity for a significant amount of time. The EPAP provides a mechanism to quickly load a number of DSM cards with the current database. The RTDB on the EPAP is large and can be updated constantly from the customer's provisioning network. As the RTDB is sent to the DSM cards, it can possibly miss some updates, making it inconsistent as well as back level.

The upload process is divided into two stages, one that sequentially sends the initial database records and another that sends any updates missed since the beginning of the first stage. The DSM reload stream uses a separate RMTP channel from the provisioning and incremental update streams. This allows DSM multicast hardware to filter out the high volume of reload traffic from DSM cards that do not require it.

DSM cards do the following:

- Detect the need for stage 1 loading and send a status message to the EPAP.
- Identify the first record DSM was able to read in the above status message if a record stream is already in progress.
- Handle the record stream regardless of the starting point (that is, accommodate records starting with the middle record of the middle table).
- Expect tables to be sent in a particular order and therefore detect any gap in the record stream.

- Send a status message if a gap is detected. Stage1 loading is essentially reset to the last update received.
- Handle wrapping from the last record from the last table to the first record of the first table.
- Know when they have received all the required records to proceed to stage 2 loading.
- Send a status message when stage 1 loading is complete, indicating the database level at the beginning of stage 1.
- Detect when the master RTDB crosses a memory boundary during stage 1 loading; the card automatically reboots and then auto-inhibits.

EPAP Status and Error Reporting via Maintenance Blocks

The EPAPs forward all status and error messages to the DSM 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 2-8** . (For details about configuring these networks, refer to the *EPAP Administration Manual*.)

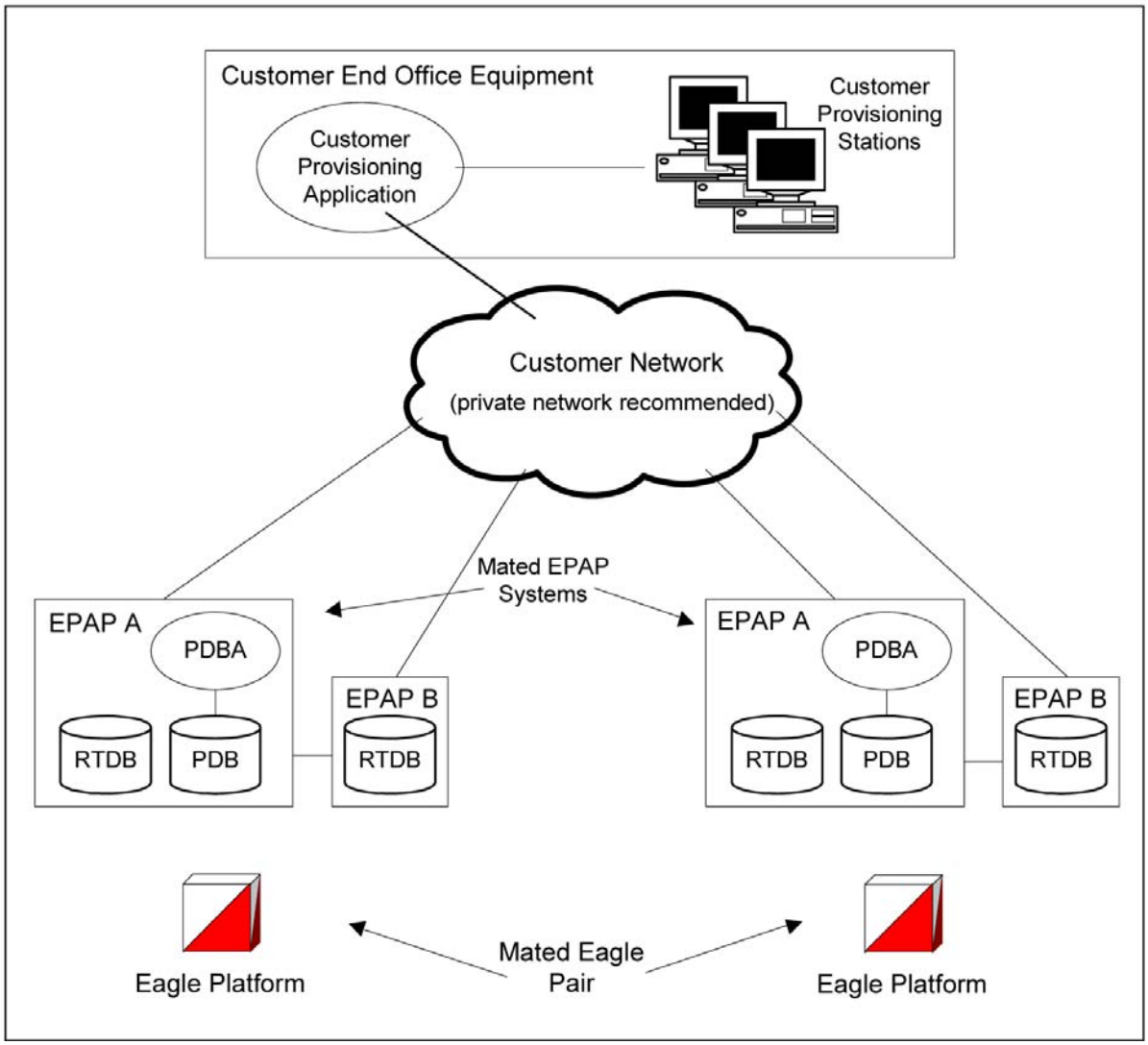
Customer Provisioning Network

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 2-8** .

Figure 2-8. Customer Provisioning Network

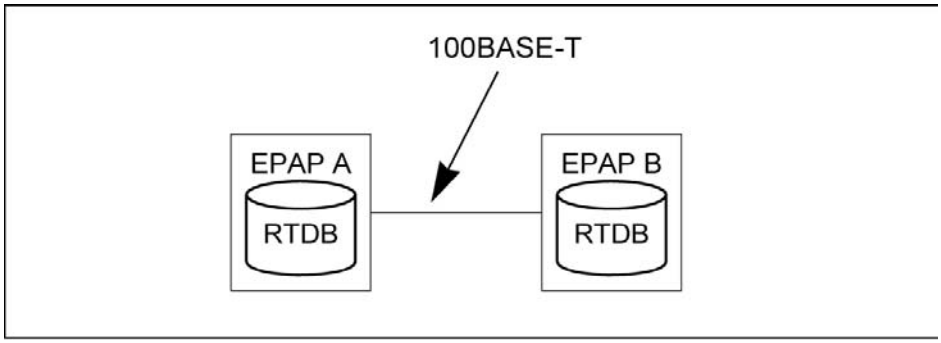


Although a dedicated network is recommended, it is possible that unrelated customer traffic can use the network as well. The determination, either to have a dedicated network or to allow other customer traffic, should be based on available external Ethernet bandwidth and network performance considerations.

EPAP Sync Network

The 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 2-9** .

Figure 2-9. EPAP Sync Network

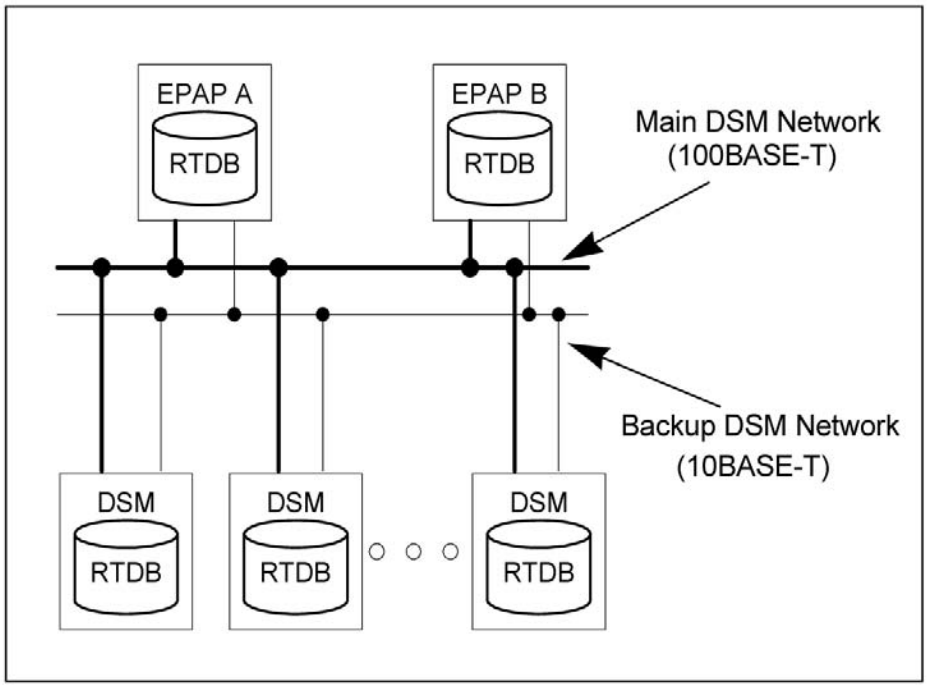


DSM Networks

The DSM card networks are shown in **Figure 2-10** . They carry provisioning data from the active EPAP RTDB to the DSM cards. They also carry reload and maintenance traffic to the DSM cards.

The DSM networks consist of two Ethernet networks: the main DSM network running at 100BASE-T, and the backup DSM network running at 10BASE-T. Both Ethernet networks connect EPAP A and EPAP B with every DSM card on a single EAGLE 5 ISS platform.

Figure 2-10. DSM Card Networks



Maintenance information is sent from the active EPAP to an arbitrarily selected DSM card. The selected DSM is known as the primary DSM. 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 1597.)

The third octet is a 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 2-8 summarizes the contents of each octet.

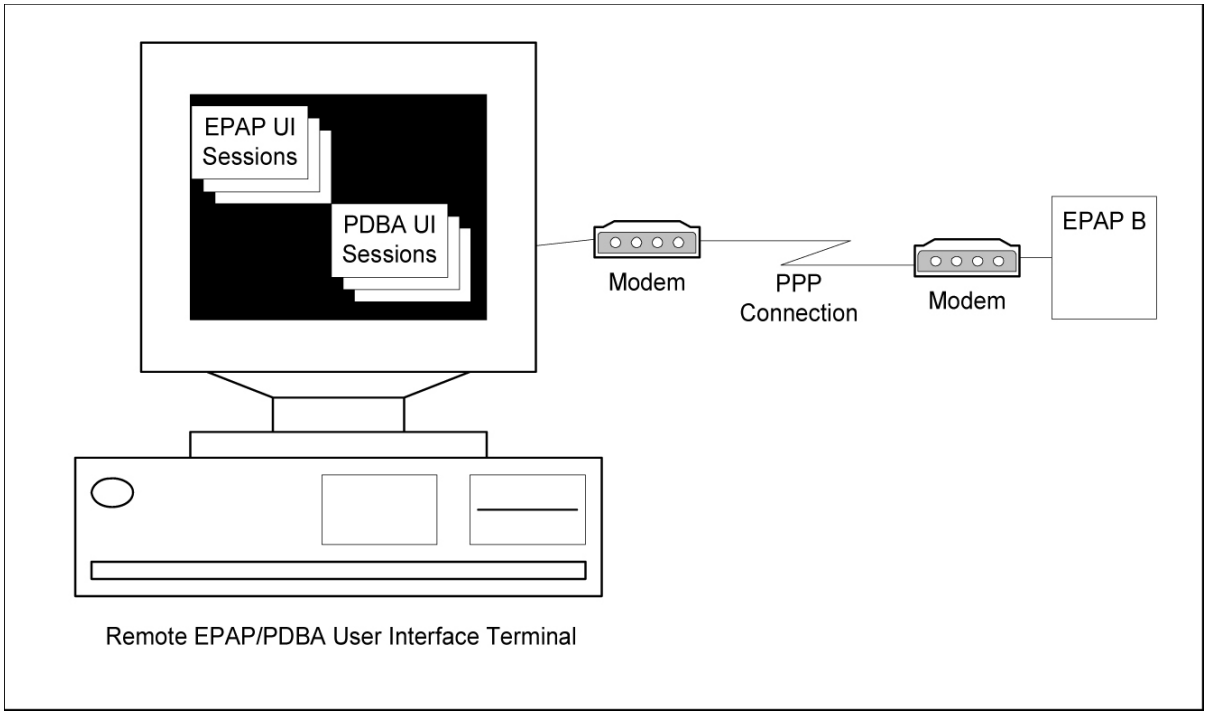
Table 2-8. EPAP IP Addresses in the DSM Network

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‘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 2-11 .

Figure 2-11. Dial-Up PPP Network



Network Perspectives

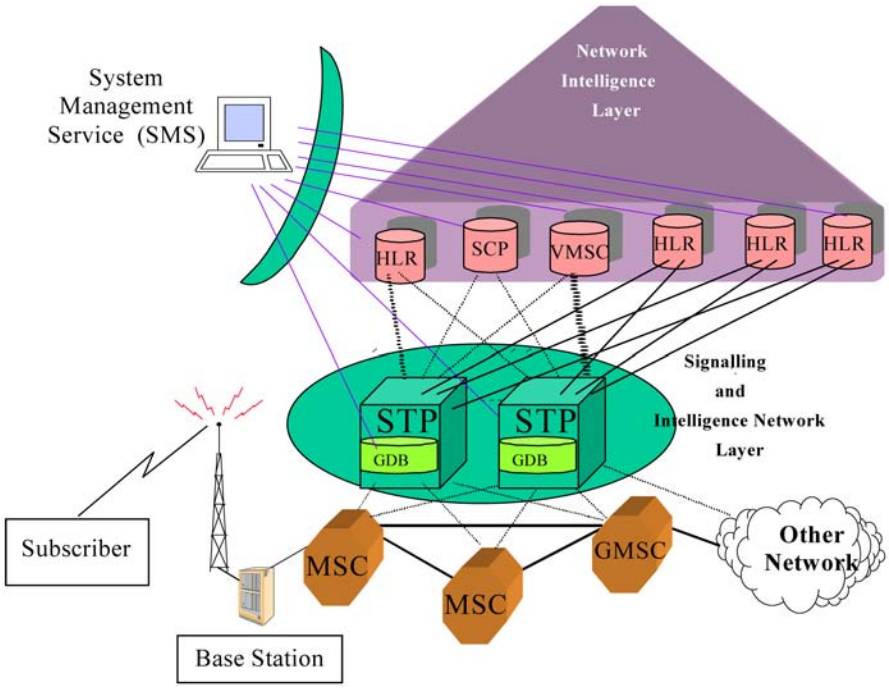
The EAGLE 5 ISS solution for G-Flex can be deployed in the network in two ways:

- As an integrated EAGLE 5 ISSG-Flex node
- As a stand-alone EAGLE 5 ISSG-Flex relay function

Integrated EAGLE 5 ISS/G-Flex Node

Figure 2-12 shows the location of the Integrated EAGLE 5 ISS/G-Flex in a mobile network. This uses the Integrated EAGLE 5 ISS/G-Flex relay function solution to do HLR translations along with final GTT and routing functions.

Figure 2-12. Location of an Integrated EAGLE 5 ISS/G-Flex Node in Wireless Network

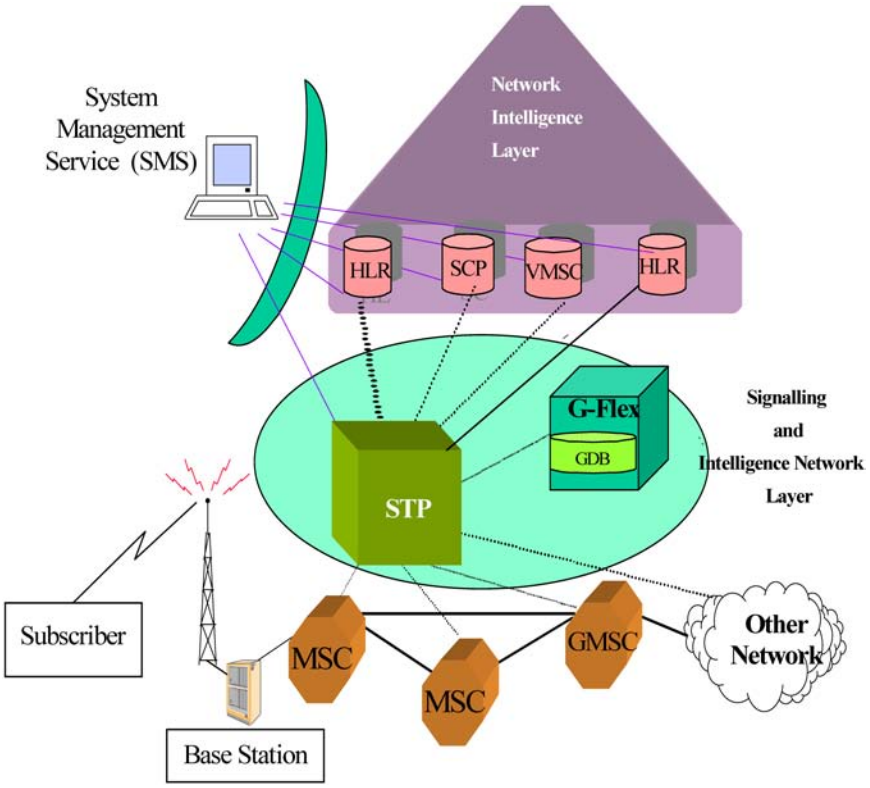


Stand-Alone EAGLE 5 ISS G-Flex Relay Function

Figure 2-13 shows the location of G-Flex in a wireless network. This performs only the G-Flex relay function, while the EAGLE 5 ISS performs the STP functions. One advantage of such a setup is that the impact on the network due to the introduction of this new node is minimal. The originating nodes continue to route messages to the same EAGLE 5 ISS. The existing EAGLE 5 ISS forwards only HLR-destined (or AuC-destined messages if the HLR is integrated) to the G-Flex relay function based on the DN and IMSI/MGT number ranges. All HLR-provisioned subscriber numbers must be provisioned in the GDB (G-Flex database) before the G-Flex relay function is brought into service.

Once in service, the G-Flex relay function performs the HLR translations on incoming messages and then either MTP routes the message through the EAGLE 5 ISS directly to the end node or forwards the translated message back to the EAGLE 5 ISS. If the EAGLE 5 ISS is capable of broadcasting SCCP subsystem management messages (that is, SSPs and SSAs) to the G-Flex node, then G-Flex could directly route the messages to the HLR entity numbers. It could then forward the message to the EAGLE 5 ISS so that the forwarded messages could be easily translated to derive a HLR address. Note that the GTT (global title translation) data must be carefully set up to prevent looping between EAGLE 5 ISS and the G-Flex node.

Figure 2-13. Location of a G-Flex Node in Wireless Network



Serviceability Hints

The following hints are offered to aid in the serviceability of G-Flex databases:

- Mated Application Considerations
- Entity Point Codes and Routes

Mated Application Considerations

An EPAP-administered entity data can possibly become out-of-sync with the EAGLE 5 ISS mated application table because the creation of entity point codes (and/or subsystem numbers) in the mated application table is not performed at database administration time.

If this mismatch is discovered in real-time operations, a UIM message (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. This message means the MSU was discarded.

For this reason, it is recommended that the entity (SP or RN) not be administered until the entity point code (and/or subsystem number) has been entered into the EAGLE 5 ISS mated application (MAP) table.

Entity Point Codes and Routes

Verification that an entity point code exists in the route table and has a route is not performed at database administration time. Therefore, it is possible for the EPAP entity data to be out-of-sync with the EAGLE 5 ISS route table.

If an out-of-sync condition is discovered during real-time operation, a UIM is sent to the EAGLE 5 ISS maintenance terminal, indicating one of these conditions:

- Destination point code is not in the route table.
- Destination point code exists in the route table but is not assigned a route.
- Destination point code exists in the route table and has been assigned a route, but it is out of service.

3

EAGLE 5 ISS G-Flex Commands

Introduction

This section describes the user interface and provides command examples needed to administer the G-Flex feature. The exact command syntax, specifications, and command classes are provided in the *Commands Manual.* The command examples are provided to convey the intention of the user interface requirements.

System Debug Services (SDS) Commands

The following section describes SDS command **`ent-trace`** used with G-Flex.

MSU Trap and Trace Command

The G-Flex Relay Function uses the existing **`ent-trace`** command functionality to provide a trap-and-trace feature for MSUs on the SCCP card. The G-Flex Relay Function introduces two new triggers so the user can trigger on DN and IMSI.

The user can create a MSU trigger on the SCCP card on any one or more of the criteria (both old and new) defined in the following using the **`ent-trace`** command. When multiple trigger criteria are entered, the MSU is trapped when any of the criteria are satisfied.

CAUTION: As with other debug commands, this command can cause OAM to reset if too many MSUs are trapped.

- **E.164 MSISDN number (MSISDN)** – Use this criterion to trap messages immediately before performing a G-Flex search based on the MSISDN numbers defined in the G-Flex database. This parameter allows a

variable number of digits (from 5 to 15). The number specified must be an International E.164 number (MSISDN or Entity Number).

- **E.212 IMSI number (IMSI)** – Use this criterion to trap messages immediately before performing a G-Flex search based on the IMSI numbers defined in the G-Flex database. This parameter allows a variable number of digits (from 5 to 15). The number specified must be an international E.212 IMSI. This parameter cannot be used to trap on E.214 MGT.

- **Global Title digits (GT)** – Use this criterion to trap messages based on CdPA Global Title Address (that is, either E.164, E.214 MGT, or E.212 number) present in the SCCP part of the message.

- **SSP point code** (MSC or VLRPC, for example) – After the SSN has been determined to belong to a G-Flex entity object, use this criterion to trap messages based on CgPA (Calling Party Address) SPC present in the SCCP part of the message. If no point code is present in CgPASPC, the criteria is matched with the OPC present in the MTP part of the message.

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

MSUs that satisfy any of the trigger criteria are trapped on the SCCP card, are forwarded to OAM, and are displayed. Refer to *Commands Manual* for a complete description of the **ent-trace** command.

Provisioning Hierarchy for the G-Flex Database

Part of the database is administered from the EPAP to the DSM cards, and part is administered from the EAGLE 5 ISSGPSM-IIs to the DSM cards. In general, the EAGLE 5 ISSterminal interfaces use the **ent** commands to enter new data into the database, **chg** commands to change existing data in the database, and **dlt** commands to delete data in the database.

EAGLE 5 ISS Terminal Database Commands

EAGLE 5 ISS chg-ctrl-feat Commands

The **chg-ctrl-feat** command administers the G-Flex feature. It has three variations, each of which is described in the following: **enable-ctrl-feat,chg-ctrl-feat** and **rtrv-ctrl-feat**. For further details on these commands, please refer to the *Commands Manual*.

- **enable-ctrl-feat:Enable Control Feature Command** – The **enable-ctrl-feat** command enables the G-Flex and G-Flex Map Layer Routing features available for the system. A command example follows.

```
enable-ctrl-feat:partnum=893xxxxxx:fak=xxxxxxxxxxxxxx
    rlghncxa03w 06-06-01 16:40:40 EST  EAGLE 35.0.0
    ENABLE-CTRL-FEAT:  MASP A - COMPLTD
;
```

- **chg-ctrl-feat: Change Control Feature Status Command** – The **chg-ctrl-feat** command activates optional features available for the system. Features can only be turned on. Once the feature is turned on, it cannot be turned off. The **chg-ctrl-feat** command turns on the G-Flex numbering capability and provides mutual exclusion between LNP and G-Flex. The GTT feature is a prerequisite for G-Flex. The **chg-ctrl-feat** command also provides the processor, DRAM, and disk capacity validation required to

support the G-Flex feature. This command updates the MAS configuration table. A command example follows.

```
 tekelecstp 06-07-26 14:47:58 EST EAGLE 36.0.0 chg-ctrl-feat :partnum=893018001:status=on
Command entered at terminal #4. CHG-CTRL-FEAT: MASP A - COMPLTD
```

- **`rtrv-ctrl-feat`: Retrieve Control Feature Status Command** – The **`rtrv-ctrl-feat`** command displays the feature status for the G-Flex feature. An example of command output follows.

```
rlghncxa03w 08-01-30 16:40:40 EST  EAGLE5 38.0.0
    The following features have been permanently enabled:
    Feature Name              Partnum    Status  Quantity
    HC-MIM SLK Capacity       893012707  on            64
    Command Class Management  893005801  on          ----
    Prepaid SMS Intercept Ph1 893006701  on          ----
    Intermed GTT Load Sharing 893006901  on          ----
    MNP Circ Route Prevent    893007001  on          ----
    XGTT Table Expansion      893006101  on        400000
    XMAP Table Expansion      893007710  on          3000
    Large System # Links      893005910  on          2000
    Routesets                 893006403  on          8000
    EAGLE5 Product            893007101  on          ----
    EAGLE Product             893007201  off         ----
    IP7 Product               893007301  off         ----
    Network Security Enhance  893009101  off         ----
    Telnet                    893005701  on          ----
    Port Chk for MO SMS       893009301  on          ----
    LNP ELAP Configuration    893010901  on          ----
    15 Minute Measurements    893012101  off         ----
    EAGLE OA&M IP Security    893400001  off         ----
    SCCP Conversion           893012001  on          ----
    SE-HSL SLK Capacity       893013005  on            64
    GSM Map Screening (GMS)   893013201  on          ----
    Enhanced GMS (EGMS)       893012401  on          ----
    MTP MAP Screening         893013501  on          ----
    Spare Point Code Support  893013601  on          ----
    GSM MAP SRI Redirect      893014001  on          ----
    ISUP NP with EPAP         893013801  on          ----
    Origin-Based MTP Routing  893014201  on          ----
    ITUN-ANSI SMS Conversion  893015301  on          ----
    Flexible GTT Load-Sharing 893015401  on          ----
    IDP Screening for Prepaid 893015501  on          ----
    Origin Based SCCP Routing 893014301  on          ----
    Lrg BICC MSU for IP Sig   893018401  off         ----
    VFLEX                     893016701  on          ----
    Transaction Based GTT LS  893017101  on          ----
    Hex Digit Support for GTT 893018501  on          ----
    E5-SM4G Throughput Cap    893019101  on          ----
    G-Flex MAP Layer Routing  893021701  on          ----
    G-Flex                    893021901  on          ----

;
```

EAGLE 5 ISS G-Flex System Options Commands

The G-Flex system options (**`gsmopts`**) commands change and display G-Flex-specific system options in the EAGLE 5 ISS database. It has two variations, each of which is described in the following: **`chg-gsmopts`** and **`rtrv-gsmopts`**. For further details on these commands, refer to the *Commands Manual*.

- **chg-gsmopts: Change G-Flex System Options Command** – The **`chg-gsmopts`** command changes G-Flex-specific system options in the database. This command updates the GSMOPTS table. Up to 10 CCNC/MCCMNC numbering plan conversion parameter combinations can be created. If “none” is specified for MCCMNC, then the CCNC combination is deleted. The default parameters are always overwritten when

specified. The **chg-gsmopts** command determines whether the G-Flex feature uses digits from the SCCP or MAP layer for database lookup.

```
Command : chg-gsmopts            Class = DATABASE
```

Parameter	Optional/ Mandatory	Range	Description
CCNC	Optional	2-8 digits	Country Code and Network Code
DEFMAPVR	Optional	1-3 digits	Default MAP version
DEFMCC	Optional	3 digits, none	E212 Default Mobile Country Code
DEFMNC	Optional	1-4 digits, none	E212 Default Mobile Network Code
GFLEXMAPLAYERRTG	Optional	on, off	G-Flex MAP layer routing status
GSM21S41	Optional	1-15 digits, none	GSM to IS41 migration prefix
IS412GSM	Optional	1-15 digits, none	IS41 to GSM migration prefix
MCCMNC	Optional	4-7 digits, none	Numbering plan for the MSRN
MSISDNTRUNC	Optional	0-5 digits	MS ISDN truncation digits
MSRNDIG	Optional	rn, rndn, ccrndn	Routing number
SRFADDR	Optional	1-15 digits	Entity address of the MNP_SRF node
SRIDN	Optional	tcap, sccp	SRIDN location

Command examples follow.

```
chg-gsmopts:defmcc=214:defmnc=34

chg-gsmopts:ccnc=33322123:mccmnc=21434

chg-gsmopts:ccnc=334:mccmnc=22435

chg-gsmopts:ccnc=334:mccmnc=none

chg-gsmopts:gflexmaplayerrtg=on
```

- **rtrv-gsmopts:Retrieve G-Flex System Options Command** – The **rtrv-gsmopts** command retrieves all G-Flex-specific system options from the database. The **rtrv-gsmopts** command displays the G-Flex MAP Layer Routing status.

  The following example displays output for the **rtrv-gsmopts** command when the G-Flex MAP Layer feature is enabled and turned on.

```
tekelecstp 08-01-04 20:34:22 EST  EAGLE 38.0.0
    GSM OPTIONS
```

```
----------------------
DEFMCC           = NONE
DEFMNC           = NONE
SRFADDR          = NONE
MSRNDIG          = RN
DEFMAPVR         = 1
IS412GSM         = NONE
MSISDNTRUNC      = 0
MIGRPFX          = SINGLE
GSM2IS41         = NONE
GFLEXMAPLAYERRTG = ON
```

- **`chg-stpopts`**: **Change STP Options Command** – Use the **`chg-stpopts`** command to change the values of one or more of the STP node level processing option indicators maintained in the STP's options table. The **`chg-stpopts`** command prevents the **ansigflex** option from being enabled in the G-Flex MAP Layer Routing feature is enabled.

EAGLE 5 ISS G-Flex Service Selector Commands

The G-Flex service selector (**`srvsel`**) commands are a new set of commands that provision new selectors for the G-Flex service, providing greater flexibility when provisioning the type of messages that require G-Flex processing. There are four variants, each of which is described in the following sections: **`ent-srvsel`**, **`chg-srvsel`**, **`dlt-srvsel`**, and **`rtrv-srvsel`**. For further details on the EAGLE 5 ISSG-Flex service selector commands (such as command rules and output format), refer to the *Commands Manual*.

- **ent-srvsel: Enter G-Flex Service Selectors Command** – The **`ent-srvsel`** command specifies that the applicable G-Flex service selectors indicating G-Flex processing is required. The available parameters follow:

```
Command : ent-srvsel            Class = DATABASE
```

Parameter	Optional/ Mandatory	Range	Description
GTI, GTIA, GTII, GTIN, GTIN24	Mandatory	1-4	Global Title Indicator
SERV	Mandatory	gport, gflex, inpq, inpmr	GSM service
SSN	Mandatory	0-255, *	Subsystem Number
TT	Mandatory	0-255	Translation Type
NAI	Optional	sub, rsvd, natl, intl	Nature Of Address Indicator
NAIV	Optional	0-127	NAI Value
NP	Optional	e164, generic, x121, f69, e210, e212, e214, private	Numbering Plan
NPV	Optional	0-15	Numbering Plan Value
SNAI	Optional	sub, natl, intl	Service Nature Of Address Indicator
SNP	Optional	e164, e212, e214	Service Numbering Plan

- **chg-srvsel: Change G-Flex Service Selector Command** – The **`chg-srvsel`** command specifies the applicable G-Flex selectors required to change an existing G-Flex selector entry. The available parameters follow:

```
Command : chg-srvsel            Class = DATABASE
```

Parameter	Optional/ Mandatory	Range	Description
GTI, GTIA, GTII, GTIN,GTIN24	Mandatory	1-4	Global Title Indicator
SSN	Mandatory	0-255, *	Subsystem Number
TT	Mandatory	0-255	Translation Type
NAI	Optional	sub, rsvd, natl, intl	Nature Of Address Indicator
NAIV	Optional	0-127	NAI Value
NP	Optional	e164, generic, x121, f69, e210, e212, e214, private	Numbering Plan
NPV	Optional	0-15	Numbering Plan Value
NSERV	Optional	gport, gflex, inpq, inpmr, smsmr, mnpsms, eir	New GSM service
NSNAI	Optional	sub, natl, intl, rnidn, none	New Service Nature Of Address Indicator
NSNP	Optional	e164, e212, e214, none	New Service Numbering Plan

- **dlt-srvsel: Delete G-Flex Service Selector Command** – The **`dlt-srvsel`** command deletes a G-Flex service selector. The available parameters follow:

```
Command : dlt-srvsel            Class = DATABASE
```

Parameter	Optional/ Mandatory	Range	Description
GTI, GTIA, GTII, GTIN,GTIN24	Mandatory	1-4	Global Title Indicator
SSN	Mandatory	0-255, *	Subsystem Number
TT	Mandatory	0-255	Translation Type
NAI	Optional	sub, rsvd, natl, intl	Nature Of Address Indicator
NAIV	Optional	0-127	NAI Value
NP	Optional	e164, generic, x121, f69, e210, e212, e214, private	Numbering Plan
NPV	Optional	0-15	Numbering Plan Value

- **rtrv-srvsel: Retrieve G-Flex Service Selector Command** – The **`rtrv-srvsel`** command displays a list of administered G-Flex service selector combinations. All output is sorted first by service, then by global

title domain (ANSI first, followed by ITU), GTI, translation type, numbering plan, and by the nature of address indicator. The output can be filtered by specifying any optional parameter. The available parameters follow:

```
Command : rtrv-srvsel            Class = DATABASE
```

Parameter	Optional/ Mandatory	Range	Description
GTI, GTIA, GTII, GTIN,GTIN24	Optional	1-4	Global Title Indicator
NAI	Optional	sub, rsvd, natl, intl	Nature Of Address Indicator
NAIV	Optional	0-127	NAI Value
NP	Optional	e164, generic, x121, f69, e210, e212, e214, private	Numbering Plan
NPV	Optional	0-15	Numbering Plan Value
SERV	Optional	gport, gflex, inpq, inpmr	GSM service
SNAI	Optional	sub, natl, intl, rnidn, rnndn, rnsdn,ccrndn	Service Nature Of Address Indicator
SNP	Optional	e164, e212, e214	Service Numbering Plan
TT	Optional	0-255	Translation Type

EAGLE 5 ISS G-FLEX SCCP Service Commands

The **sccp-serv** commands allow for services to be taken ON and OFF line and their processing load to be shifted to other designated nodes. These commands also support the assignment of PCs to PC groups used for G-FlexSCCP Service Re-Route assignment. There are three variants, each of which is described in the following sections: **chg-sccp-serv**, **dlt-sccp-serv**, and **rtrv-sccp-serv**.

Entries (using the **chg-sccp-serv** command) are provisioned in the SCCP-SERV table, and are shown by the **rtrv-sccp-serv** command output. This reduces the maximum number of entries that the MRN table can contain by the number of entries shown in the **rtrv-sccp-serv** command output. For more information on provisioning MRN tables, refer to the *Database Administration Manual - Global Title Translations* manual.

For further details on the EAGLE 5 ISSG-FlexSCCP service commands (such as command rules and output format), refer to the *Commands Manual*.

- **chg-sccp-serv: Change G-FlexSCCP Service Command** – The **chg-sccp-serv** command is used to add point codes to an existing service group, or to change the Relative Cost (RC) of existing point codes in a group. SCCP Service groups are organized by service (G-Flex or G-Port) and point code network type (ANSI, ITU-I, Spare ITU-I, ITU-N, Spare ITU-N, or ITUN-24). Up to seven PCs may be in a network type grouping for service re-route load sharing. This command allows for additions/modifications of up to 4 PCs at once. The point code parameters support the Spare Point Code subtype prefix **s-** for ITU-I and ITU-N point codes. The available parameters follow:

```
Command : chg-sccp-serv Class = DATABASE
```

Parameter	Optional/ Mandatory	Range	Description
SERV	Mandatory	gport, gflex	Service
STATE	Optional	offline, online	Status
GTT	Optional	no, yes	Global Title Translation
PC1, PCA1, PCI1, PCN1, PCN241	Optional	Refer to *Commands Manual*	Post GTT-translated PC
RC1	Optional	00-99	Relative Cost
PC2, PCA2, PCI2, PCN2, PCN242	Optional	Refer to *Commands Manual*	Post GTT-translated PC
RC2	Optional	00-99	Relative Cost
PC3, PCA3, PCI3, PCN3, PCN243	Optional	Refer to *Commands Manual*	Post GTT-translated PC
RC3	Optional	00-99	Relative Cost
PC4, PCA4, PCI4, PCN4, PCN244	Optional	Refer to *Commands Manual*	Post GTT-translated PC
RC4	Optional	00-99	Relative Cost

- **dlt-sccp-serv: Delete G-FlexSCCP Service Command** – The **`dlt-sccp-serv`** command is used remove entries from the SCCP Service table. A single command may either remove a PC from a group, or remove the entire group. The available parameters follow:

```
Command : dlt-sccp-serv Class = DATABASE
```

Parameter	Optional/ Mandatory	Range	Description
SERV	Mandatory	gport, gflex	Service
PC1, PCA1, PCI1, PCN1, PCN241	Optional	Refer to *Commands Manual*	Post GTT-translated PC
PC2, PCA2, PCI2, PCN2, PCN242	Optional	Refer to *Commands Manual*	Post GTT-translated PC
PC3, PCA3, PCI3, PCN3, PCN243	Optional	Refer to *Commands Manual*	Post GTT-translated PC
PC4, PCA4, PCI4, PCN4, PCN244	Optional	Refer to *Commands Manual*	Post GTT-translated PC
ALL	Optional	No, Yes	Yes will delete the entire group

- **rtrv-sccp-serv: Retrieve G-FlexSCCP Service Command** – The **`rtrv-sccp-serv`** command is used to display the SCCP Service application relationship information maintained by the EAGLE 5 ISS. Point codes are grouped by service. The sample output that follows indicates that the G-Port and G-Flex features are turned on and the SCCP Service table is empty.

```
          tekelecstp 05-12-20 08:32:58 EST  37.5.0
          rtrv-sccp-serv
          Command entered at terminal #4.
             ------------------------------------
             Service     : GFLEX
             State       : Offline
             GTT Option  : Yes
             ------------------------------------
             ------------------------------------
             Service     : GPORT
             State       : Offline
             GTT Option  : Yes
             ------------------------------------
     ;
```

EAGLE 5 ISS Feature Key Control Commands

These commands are used to enable, update, view, and control the G-Flex features on the EAGLE 5 ISS. A separate Feature Access Key is required to turn on each feature. Features must be purchased in order to have access to the Feature Access Key, which must be used when enabling these features.

There is no temporary key associated with the G-Flex feature and once it is turned on, it cannot be turned off. There are two steps that will be taken to turn the G-Flex feature on. The first step is to enable the feature. The second step is to turn the status to on.

Part number 893021901 is used to enable the G-Flex feature on the EAGLE 5 ISS. Once the FAK is enabled and turned on, it cannot be turned off.

Part number 893021701 is used to enable the G-Flex MAP Layer Routing feature on the EAGLE 5 ISS.

EAGLE 5 ISS chg-db: Change Database Commands

The **chg-db** commands copies the EAGLE 5 ISSTDM resident G-Flex database tables during database backup, restore, and repair.

EAGLE 5 ISS rept-stat-db: Report Database Status

The **rept-stat-db** command displays both the EAGLE 5 ISS and the G-Flex database status and level information for each DSM network card, and for the active and standby EPAP databases.

Maintenance and Measurements Commands

This section provides a description of the maintenance and measurements commands for the G-Flex features. The commands that follow allow provisioning, operations, and maintenance activities for DSM cards.

Commands

The command examples shown illustrate the requirements and provide suggestions for suitable names and output. The complete functionality of the commands is described in detail in the *Commands Manual*, and the actual parameter names, valid values, and output for the commands are provided.

Commands described here include:

- rept-stat-sys
- rept-stat-sccp
- rept-stat-mps
- rept-meas
- rept-stat-trbl
- rept-stat-alm
- rept-stat-db
- inh-card / alw-card
- ent-card / rtrv-card / dlt-card
- chg-gpl / act-gpl / rtrv-gpl / rept-stat-gpl / copy-gpl
- chg-gpl / act-gpl / rtrv-gpl / rept-stat-gpl / copy-gpl
- ent-bp / dlt-bp / disp-bp / disp-mem / set-mem
- inh-alm / unhb-alm
- pass

rept-stat-sys

The **rept-stat-sys** command syntax is not modified, but the report output now displays the status of the DSM cards. The remainder of the report is unchanged.

rept-stat-sccp

The command handling and scroll area output for the **rept-stat-sccp** command includes the DSM card. The **loc** parameter displays detailed card traffic statistics.

Samples of the reports produced by these commands are shown in the following two examples.

- **rept-stat-sccp**

```
    Command entered at terminal #3.
;
    tekelecstp 00-06-23 13:34:22 EST EAGLE  37.5.0
    SCCP SUBSYSTEM REPORT IS-NR          Active      -----
    GSM  SUBSYSTEM REPORT IS-NR          Active      -----
    SCCP Cards Configured= 4  Cards IS-NR= 2  Capacity Threshold = 100%
    CARD   VERSION      PST          SST          AST       MSU USAGE  CPU USAGE
    ------------------------------------------------------------------------------
    1212   101-001-000  IS-NR        Active       ALMINH       45%         30%
    1301   101-001-000  IS-NR        Active       ------       35%         20%
    1305   -----------  OOS-MT       Isolated     ------        0%          0%
    2112   -----------  OOS-MT-DSBLD Manual       ------        0%          0%
    ------------------------------------------------------------------------------
```

```
    SCCP Service Average MSU Capacity = 40%       Average CPU Capacity = 25%
    AVERAGE MSU USAGE PER SERVICE:
      GTT   = 15%  GFLEX =  5%
    TOTAL SERVICE STATISTICS:
      SERVICE    SUCCESS    ERRORS    WARNINGS    FORWARD TO GTT    TOTAL
      GTT:          1995         5           -                 -     2000
      GFLEX:         500         1           4                10      515
    Command Completed.
;
```

- **rept-stat-sccp:loc=1106**

```
Command entered at terminal #4.
;
    tekelecstp 00-06-23 13:34:22 EST EAGLE 37.5.0
    CARD  VERSION      TYPE    PST           SST       AST
    1106  101-010-000  DSM     IS-NR         Active    -----
      ALARM STATUS       = No Alarms.
      GTT:   STATUS = ACT       MSU USAGE = 10%
      GFLEX: STATUS = ACT       MSU USAGE = 10%
CPU USAGE = 15%

    CARD SERVICE STATISTICS:
      SERVICE    SUCCESS    ERRORS    WARNINGS    FORWARD TO GTT    TOTAL
      GTT:          1995         5           -                 -     2000
      GFLEX:         500         1           4                10      515
   Command Completed.
;
```

rept-stat-mps

There are two variants of this new command.

- **rept-stat-mps -** produces a summary report showing the overall status of the G-Flex provisioning system and a moderate level of information for each DSM card.
- **rept-stat-mps:loc=xxxx -** produces a more detailed report showing the G-Flex status of a specific DSM card. Note that this version of the command displays the percent utilization of a particular DSM memory.

Samples of the reports produced by these commands are shown in the following two examples.

- **rept-stat-mps**

```
Command entered at terminal #4.
;
    Integrat40 00-06-24 10:37:22 EST EAGLE 37.5.0
                       VERSION       PST           SST        AST
    EPAP A             026-015-000   IS-NR         Active     -----
              ALARM STATUS = No Alarms
    EPAP B             026-015-000   IS-NR         Active     -----
              ALARM STATUS = No Alarms
    CARD   PST          SST       GSM STAT   G-Flex STAT
    1106   IS-NR        Active    ACT        ACT
    1201   IS-ANR       Active    SWDL       SWDL
    1205   OOS-MT-DSBLD Manual    -------    -------
    1302   OOS-MT       Fault     -------    -------
    1310   IS-ANR       Standby   SWDL       SWDL
    CARD 1106 ALARM STATUS = No Alarms
    CARD 1201 ALARM STATUS = No Alarms
    CARD 1205 ALARM STATUS = No Alarms
    CARD 1302 ALARM STATUS = No Alarms
```

```
    CARD 1310 ALARM STATUS = No Alarms
    Command Completed.
;
```

- **`rept-stat-mps:loc=1106`**

```
    Command entered at terminal #4.
;
    integrat40 99-09-24 10:37:22 EST EAGLE 37.5.0
    CARD  VERSION         TYPE    PST           SST        AST
    1106  101-9-000       DSM     IS-NR         Active     -----
      DSM PORT A                  IS-NR         Active     -----
      DSM PORT B                  IS-NR         Active     -----
      GTT STATUS          = ACT
      GSM STATUS          = ACT
      ALARM STATUS        = No Alarms.
      DSM MEMORY USAGE    = xxx%
    Command Completed.
;
```

rept-meas

This command includes G-Flex measurements in the output sent to the EAGLE 5 ISS Terminal. Refer to the *Commands Manual* for details of the command.

rept-stat-trbl

This command includes the G-Flex subsystem and DSM/EPAPIP link alarms. Refer to the *Commands Manual* for details of this command.

rept-stat-alm

This command includes the alarm totals of the G-Flex subsystem and DSM/EPAPIP links. Refer to the *Commands Manual* for details of this command.

rept-stat-db

This command displays both EAGLE 5 ISS and G-Flex database status and level information for each DSM network 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 birthdates and levels. For details about this command, refer to the *Commands Manual*.

Hourly Maintenance Report

The Hourly Maintenance Report, generated automatically, includes the alarm totals of the G-Flex subsystem and DSM/EPAPIP links. A sample follows.

```
eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5072.0000 REPT COND GSM SS
    "GSM SS :0440,MTCEINT-0,SA,99-10-10,16:00:01,,,,*C"
;
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5077.0000 REPT COND EPAPDSM
    "EPAPDSM :0084,MTCEINT-0,SA,99-10-10,16:00:01,,,,**"
;
```

```
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5007.0000 REPT COND CARD
    "CARD 1102:0422,SCMMA,SA,99-10-10,16:00:01,,,,**"
;
    eagle10506 99-09-13 16:00:01 EST EAGLE 37.5.0
    3561.0000 REPT COND ALARM STATUS
    "ALARMS:PERM. INHIBITED,0,0,0"
    "ALARMS:TEMP. INHIBITED,0,0,0"
    "ALARMS:ACTIVE,10,14,3"
    "ALARMS:TOTAL,10,14,3"
;
```

inh-card / alw-card

The command-handling and scroll area output for these commands includes the DSM card. Refer to the *Commands Manual* for details of these commands.

- **inh-card** is not inhibited unless it is a TSM, DCM, DSM, ACM, or LIM card.
- If the specified card is the only in-service VSCCP card, the **force=yes** parameter is required.
- If inhibiting this VSCCP card would cause less than 80% of the IS-NRLIMs to have VSCCP service (that is, cause the system to enter an unstable loading mode), the **force=yes** parameter is required.

ent-card / rtrv-card / dlt-card

The command-handling and scroll area output for these commands includes the DSM card. For the **ent-card** command, the **APPL=VSCCP** is supported. Refer to the *Commands Manual* for details of this command.

- If the addition of a LIM card exceeds the system's VSCCP service capabilities, the **force=yes** parameter is required.

A sample of the reports produced by these commands is shown in the following example.

```
    ent-card:loc=1201:type=dsm:appl=VSCCP
    Command entered at terminal #3.
;


  Command Completed.
;
```

chg-gpl / act-gpl / rtrv-gpl / rept-stat-gpl / copy-gpl

The command-handling and scroll area output for these commands include the VSCCPGPL. Refer to the *Commands Manual* for details of these commands.

Samples of the reports produced by these commands are shown in this example.

```
    act-gpl:appl=VSCCP:ver=26-1-0
    Command entered at terminal #3.
;
    tekelecstp 99-10-24 06:54:39 EST EAGLE 37.5.0
    VSCCP activate on 1114 completed
    VSCCP activate on 1116 completed
;
    rtrv-gpl:appl= VSCCP
```

```
    Command entered at terminal #3.
;
    tekelecstp 99-10-04 07:01:08 EST EAGLE 37.5.0
    GPL Auditing  ON
    APPL  CARD  RELEASE      APPROVED         TRIAL        REMOVE TRIAL
    VSCCP 1114  026-001-000  026-001-000      026-001-000  026-001-000
    VSCCP 1116  026-001-000  026-001-000      026-001-000  -----------
    rept-stat-gpl:appl= VSCCP
    Command entered at terminal #3.
;
    tekelecstp 99-10-04 12:55:50 EST EAGLE 37.5.0
    APPL  CARD      RUNNING           APPROVED      TRIAL
    VSCCP 1205      026-001-000 ALM    026-001-000   026-001-000
    VSCCP 1211      026-001-000 ALM+   026-001-000   -----------
    Command Completed.
;
```

ent-bp / dlt-bp / disp-bp / disp-mem / set-mem

The command-handling and scroll area output for these commands includes the DSM card. (These commands recognize the DSM boards.)

- The **CARD=<GPL><Subsystem>** is supported for the VSCCPGPL.

A sample of the reports produced by these commands is shown in the following example.

```
disp-bp:card=vsccp-all:
Command Accepted - Processing
    tekelecstp 99-01-20 19:21:10 EST EAGLE 37.5.0
    disp-bp:card=vsccp-all
    Command entered at terminal #1.
;
    tekelecstp 99-12-04 01:38:29 EST EAGLE 37.5.0
    SDS Installed Breakpoint Report from IMT Address H'0005
    BP Address  Memory-Dump Address        Conditions               Rpt Ct  Ind
    ----------  -------------------------  -----------------------  ------  ---
    H'0000a974                             1- ANY                     1      0
        Code Breakpoint                    2- ANY
;
```

chg-sid / dlt-sid

These commands are used to change and report on the self-identification of the EAGLE 5 ISS. The self-identification identifies the EAGLE 5 ISS to other signaling points in the network. This command includes a CPC type for G-Flex.

The CPC parameter is used to support incoming messages routed via Intermediate GTT (rt-gt) to the EAGLE 5 ISS (with DPC = CPC) for G-Flex. Refer to the *Commands Manual* for details of this command.

inh-alm / unhb-alm

These commands allow both Port A and Port B to be specified for the **dev=dlk**. This allows alarms to be inhibited on the DSM ports. Refer to the *Commands Manual* for details of these commands.

chg-ip-card / rtrv-ip-card

These commands allow you to provision and report on the Internet Protocol networking parameters for any given DSM card. Use the **loc** parameter to specify a DSM card, and the **dnsa** and **dnsb** parameters to specify a default router. Refer to the *Commands Manual* for details of these commands.

chg-ip-lnk / rtrv-ip-lnk

These commands allow you to provision and report on the Internet Protocol link table. Use the **loc** parameter to specify a DSM card. Refer to the *Commands Manual* for details of these commands.

ent-ip-host / dlt-ip-host / rtrv-ip-host

These commands allow you to provision, remove, and report on the entries in the Internet Protocol host table. The IP host table defines local and remote host names for IP addresses. Use the **host** parameter to specify the logical name for the device associated with the IP address in the **ipaddr** parameter. Refer to the *Commands Manual* for details of these commands.

pass

The **pass** command allows remote execution of a selected command by the targeted card. (These commands recognize the DSM boards.) Selected commands are allowed as follows.

- **pass:cmd="ping"**
- **pass:cmd="netstat"**
- **pass:cmd="nslookup"**
- **pass:cmd="arp"**
- **pass:cmd="help"**

For this feature, the **loc** parameter must be a VSCCP card location. For other details of the pass command, refer to *Commands Manual*.

pass: cmd="Ping"

The **'ping' pass** command supports troubleshooting of the private EPAP/DSMIP network. The following example demonstrates typical usage.

```
    eagle10506 99-08-11 08:43:45 EST EAGLE 37.5.0
    pass:loc=1215:cmd="ping     -h"
    Command entered at terminal #2.
;
    eagle10506 99-08-11 08:43:45 EST EAGLE 37.5.0
    PASS: Command sent to card
;
    eagle10506 99-08-11 08:43:45 EST EAGLE 37.5.0
    Usage: ping <hostname | ipaddr> [-h] [-i size] [-n count]
    Options:
```

```
    -h        Displays this message
    -i count  Number of pings to send. Range=1..5. Default=3.
    -n size   Sets size of ICMP echo packet. Range=12..2048. Default=64.
    hostname  Name of machine to ping
    ipaddr    IP Address of machine to ping (d.d.d.d)
;
```

pass:cmd="netstat"

The **'netstat'pass** command supports troubleshooting of network interface and routing configuration problems within the private EPAP/DSMIP network.

The following examples demonstrate typical usage.

```
eagle10506 99-08-11 08:43:00 EST EAGLE 37.5.0
    pass:loc=1215:cmd="netstat  -h"
    Command entered at terminal #2.
;
    eagle10506 99-08-11 08:43:00 EST EAGLE 37.5.0
    PASS: Command sent to card
;
    eagle10506 99-08-11 08:43:00 EST EAGLE 37.5.0
    Usage: netstat [-a] [-i] [-h] [-m data|sys|dd] [-p icmp|ip|tcp|udp] [-r]
    Options:
        -a        display socket information for all protocols
        -h        Displays this message
        -i        display interface information for all interfaces
        -m        display buffer pool information for 1 of the system pools
        -p        display socket information for 1 of the protocols
        -r        display the route table information
;
```

pass:cmd="nslookup"

The **'nslookup' pass** command supports debugging of domain name server (DNS) to IP addressing tables. DNS is not supported for EPAP cards for the initial release.

The following examples demonstrate typical usage.

```
    eagle10506 99-08-11 08:45:57 EST EAGLE 37.5.0
    pass:loc=1215:cmd="nslookup"
    Command entered at terminal #2.
;
    eagle10506 99-08-11 08:45:57 EST EAGLE 37.5.0
    PASS: Command sent to card
;
    eagle10506 99-08-11 08:45:57 EST EAGLE 37.5.0
    Usage: nslookup [hostname|ipaddr]
    Options:
        hostname  String name
        ipaddr    d.d.d.d
;
```

pass:cmd="arp"

The **'arp' pass** command supports the verification of and correction of IP stack ARP tables. In general, this command is not required for normal operation.

The following examples demonstrates typical usage.

```
    eagle10506 99-08-11 08:43:23 EST EAGLE 37.5.0
```

```
    pass:loc=1215:cmd="arp      -h"
    Command entered at terminal #2.
;
    eagle10506 99-08-11 08:43:23 EST EAGLE 37.5.0
    PASS: Command sent to card
;
    eagle10506 99-08-11 08:43:23 EST EAGLE 37.5.0
    Usage: arp [-a] [-d ipaddr] [-f] [-h] [-s ipaddr enetaddr]
    Options:
        -a        Display All entries in ARP table
        -d        Delete specified entry (ipaddr) from ARP table
        -f        Flush all entries from ARP table
        -h        Displays this message
        -s        Set ARP table entry to associate ipaddr with enetaddr
        enetaddr  x:x:x:x:x:x
        ipaddr    d.d.d.d
;
    eagle10506 99-08-11 08:43:25 EST EAGLE 37.5.0
    ARP command complete
;
```

pass:cmd="help"

The **'help' pass** command provides a list of supported **pass** commands for the target location.

The following examples demonstrates typical usage.

```
    eagle10506 99-08-11 08:42:18 EST EAGLE 37.5.0
    pass:loc=1215:cmd="help"
    Command entered at terminal #2.
;
    eagle10506 99-08-11 08:42:18 EST EAGLE 37.5.0
    PASS: Command sent to card
;
    eagle10506 99-08-11 08:42:18 EST EAGLE 37.5.0
    List of commands supported is:
    nslookup
    netstat
    arp
    ping
    help
    END of LIST
;
```

4

G-Flex Feature Activation

Introduction

This chapter identifies prerequisites for the G-Flex feature activation procedure, an overview of the activation steps, and a matching number of detailed step descriptions to turn on the G-Flex feature. The G-Flex feature activation is performed at the EAGLE 5 ISS.

The G-Flex features optimizes the use of subscriber numbers and number ranges in a GSM Mobile Network by providing a logical link between any Mobile Station international ISDN (MSISDN) number and any International Mobile Station Identifier (IMSI). This feature allows subscribers to be moved easily from one Home Location Register (HLR) to another. The G-Flex feature applies to ANSI, ITU-I (international), and ITU-N (national) networks.

The G-Flex feature, and other related features, are optional and can be purchased from Tekelec. If you are not sure whether you have purchased a specific feature, contact your Tekelec Sales or Account Representative.

CAUTION: Once a feature has been turned on with the `chg-ctrl-feat` command, it cannot be turned off. Since features may overwrite other features or create changes in the database, assure that you have a license and full technical support from Tekelec before turning on this or any feature.

The G-Flex feature requires a DSM or E5-SM4G card running the VSCCP application. Systems with TSM cards running the SCCP application need to be upgraded to DSM cards prior to turning on the G-Flex feature.

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

Procedures described in the remainder of this manual apply only to the G-Flex feature and can only be performed if the G-Flex feature is turned on.

The following features are related to the G-Flex feature (see your Tekelec Sales or Account Representative for additional information):

- Global Title Translation (GTT)
- Enhanced Global Title Translation (EGTT)
- Variable-Length Global Title Translation (VGTT)
- EAGLE Provisioning Application Processor (EPAP)

Prerequisites

The G-Flex feature activation assumes that the features Global Title Translation (GTT), Enhanced Global Title Translation (EGTT), and Variable-Length Global Title Translation (VGTT) are already provisioned. Refer to the *Database Administration Manual - Features* for provisioning procedures.

The G-Flex feature activation assumes that the EPAP software is already configured; refer to *EPAP Administration Manual*, EPAP Software Configuration.

The G-Flex feature activation assumes that DSM cards to be installed and TSM cards to be removed are identified:

- Note installed DSM card locations if any
- Note available odd-even card slots for DSM card installation
- Note installed TSM card locations
- Note adjacent odd-even TSM card slot number positions for DSM card replacement

  NOTE: TSM cards use one card slot; DSM cards require two card slots, odd-even.
- Determine DSM card IP addresses and have them available during the activation procedure.

For in-service systems, schedule DSM card replacement in maintenance window that allows the reboot of DSM cards (**`init-card:loc=<DSM card location>`**) one at a time.

CAUTION: In an in-service environment and when replacing TSM cards with DSM cards, initialize one DSM card at a time. Verify its return to IS-NR state before initializing another DSM card. This precaution keeps cards in service and precludes an interruption of SCCP services.

For in-service systems with TSM cards running SCCP traffic, one DSM card must be installed in an available double-slot odd-even location and provisioned for VSCCP prior to inhibiting the SCCP card. The DSM card running the VSCCP application will take over the SCCP traffic (**`alw-card`**) once the SCCP card becomes inhibited.

CAUTION: SCCP traffic redundancy will be lost if inhibiting two SCCP cards at a time with only one VSCCP card available in their place. Redundancy will be re-established once the two SCCP cards are replaced with a second VSCCP card.

For in-service systems that already have the G-Port and/or INP feature enabled, only perform steps Step 70 through Step 86 to turn on the G-Flex feature. With the G-Port and/or INP feature enabled, the DSM cards already contain the RTDB database.

For new systems, DSM cards may be rebooted all at one time using the **`init-card:appl=vsccp`** command.

For new systems, GTT, EGTT, and VGTT features may be turned on prior to or immediately following the reboot of all DSM cards.

Feature Activation Overview

This section provides an overview of the G-Flex feature activation procedure. The procedure is described in detail in section Feature Activation Procedure .

The feature activation consists of these sections:

- Configure system for HLR destinations in Step 1 through Step 28 .
- Install DSM cards in available slots and configure for VSCCP in Step 29 through Step 44 .
- Replace TSM cards configured for SCCP with DSM cards configured for VSCCP and inhibit/remove any remaining SCCP cards in Step 45 through Step 69 .
- Turn on the G-Flex feature in Step 70 through Step 86 .

Step 1 through Step 28 configure the system to be able to communicate with the system of the HLR database. The route to this database may already be configured. Perform these steps to verify that you have entered all HLR destinations for G-Flex and make configuration changes as needed.

1. Display and note current system settings for point codes (PCs) and capability point codes (CPCs), destination point codes (DPCs), routes, and linksets using Step 1 through Step 7 .
2. Use **`rtrv-sid`** command to display current PCs and CPCs.
3. Use **`rtrv-dstn`** command to display current DPCs.
4. Use **`rtrv-rte`** command to display current route configurations.
5. Identify PCs and CPCs; determine new PC and CPC to be entered in Step 9 .
6. Use **`rtrv-stpopts`** command to display PC or CPC format if ITU-N network.
7. Use **`rtrv-map`** command to display PCs of mated applications in database; remove system PC from table if necessary (refer to *Database Administration Manual - Features*, Removing A Mated Application).

   CAUTION

   CAUTION: Changing a system's point code requires a system reboot using the `init-sys` command to fully implement the changes. The `init-sys` command causes a complete system reload and should be used only in an environment that is not in service. Using this command ensures the updated self identification information is loaded onto all cards, but does interrupt service.

8. Change PC, CPC, DPC, route, linkset, and LIM card configurations for the HLR database using Step 9 through Step 28 .
9. Use **`chg-sid`** command to configure PC and CPC by network type.
10. Use **`init-sys`** command to initialize system if changes were made in Step 9 to any **`pca/pci/pcn`** parameter.

    CAUTION

    CAUTION: The `init-sys` command causes a complete system reload and should be used only in an environment that is not in service. Using this command ensures the

updated self identification information is loaded onto all cards, but does interrupt service.

CAUTION: When the `init-sys` command executes, the system does not retain the manually initiated state (for example, OOS-MT-DSBLD) for the signaling link, card, or terminal. After the command executes, the system attempts to bring all provisioned links, cards, and terminals on line, including those that were previously out of service. You will need to manually put each device back into its previous state after the system is back on line. Print or electronically capture the output of the `rept-stat-slk`, `rept-stat-card`, and `rept-stat-trm` commands for reference prior to issuing the `init-sys` command. To restore a device to its previous state, issue the appropriate inhibit/deactivate command listed in the Commands Manual in the Related Commands section for each of the above rept-stat commands.

11. Use **`rtrv-sid`** command to display new PC and CPC.
12. Use **`ent-dstn`** command to enter DPC for HLR destinations.
13. Use **`rtrv-dstn`** command to display new HLRDPC.
14. Use **`ent-ls`** command to enter linkset and assign DPC for HLR destinations.
15. Use **`rtrv-ls`** command to display new linkset and assigned DPC for HLR destinations.
16. Use **`ent-card`** command to enter LIM card(s) into database.
17. Use **`rtrv-card`** command to display new LIM card(s) in database.
18. Use **`ent-slk`** command to assign signaling link(s) to LIM card(s).
19. Use **`rtrv-slk`** command to display new signaling link(s) assigned to LIM card(s).
20. Use **`ent-rte`** command to assign route to new DPC.
21. Use **`rtrv-rte`** command to display route assigned to new DPC.
22. Use **`ent-map`** command to enter mated application into database.
23. Use **`rtrv-map`** command to display new mated application in database.
24. Use **`alw-card`** command to allow LIM card(s).
25. Use **`rept-stat-card`** command to display status of new LIM card(s) in database.
26. Use **`act-slk`** command to activate new signaling link(s) for LIM card(s).
27. Use **`rept-stat-slk`** command to display IS-NR status of signaling link(s).
28. Use **`rtrv-card`** command to confirm the new LIM card(s) and identify VSCCP cards (DSM cards running VSCCP application) and SCCP cards (TSM cards running SCCP application).

CAUTION: When adding DSM cards in an in-service environment, you must take care not to interrupt traffic. Before replacing SCCP cards with DSM cards, first install a VSCCP card in an available odd-even double-slot prior to removing SCCP cards to make additional room for other DSM cards.

29. Install and configure DSM card(s) in available odd-even slots as needed using Step 30 through Step 44 .
30. Install DSM card(s) in available odd-even slots and verify green IMT bus LEDs.
31. Use **`ent-card`** command to enter DSM card(s) as VSCCP card(s) into database.
32. Use **`rtrv-card`** command to display new VSCCP card(s) in database.
33. Use **`rtrv-ip-lnk`** command to display current link parameters associated with the VSCCP card.
34. Use **`chg-ip-lnk`** command to set the IP address port and speed associated with the VSCCP card.
35. Use **`rtrv-ip-lnk`** command to display changed link parameters.
36. Use **`rtrv-ip-host`** command to display current IP host information in database.
37. Use **`ent-ip-host`** command to add host name and IP address for each VSCCP link.
38. Use **`rtrv-ip-host`** command to display changed IP host information.
39. Use **`chg-ip-card`** command to set local domain and IP router address if necessary.
40. Use **`rtrv-ip-card`** command to display changed VSCCP card information.
41. Use **`alw-card`** command to boot DSM card in TSM emulation mode.
42. Use **`rept-stat-card`** command to display IS-NR status of VSCCP card.
43. Use **`pass`** command to test presence of EPAP hosts on network.

44. Repeat Step 30 through Step 43 to add all DSM cards (N+1) to be installed in available slots.

Go to the next step to start replacing TSM cards.

45. Replace TSM card(s) with DSM cards if applicable, and add DSM card(s) to database using Step 46 through Step 68.

46. Use **rtrv-card** command to display TSM cards running the SCCP application (SCCP cards) in database.

47. Use **rept-stat-card** command to display SCCP cards in IS-NR status.

48. Use **inh-card** command to inhibit SCCP card(s)

49. Use **rept-stat-card** command to display OOS-MT-DSBLD status of SCCP card(s).

50. Use **dlt-card** command to delete SCCP card(s) from database.

51. Use **rtrv-card** command to verify removal of SCCP cards from database.

52. Remove first TSM card from shelf.

53. Remove second TSM card from shelf.

54. Install DSM card in shelf and verify green IMT bus LEDs.

55. Use **ent-card** command to enter DSM card as VSCCP card into database.

56. Use **rtrv-card** command to display new VSCCP card in database.

57. Use **rtrv-ip-lnk** command to display current link parameters associated with VSCCP card.

58. Use **chg-ip-lnk** command to set the address port and speed associated with VSCCP card.

59. Use **rtrv-ip-lnk** command to display changed link parameters associated with the VSCCP card.

60. Use **rtrv-ip-host** command to display IP host information in database.

61. Use **ent-ip-host** command to add host name and IP address for VSCCP link.

62. Use **rtrv-ip-host** command to display changed IP host information in database.

63. Use **chg-ip-card** command to set local domain and IP router address if necessary.

64. Use **rtrv-ip-card** command to display changed VSCCP card information.

65. Use **alw-card** command to boot DSM card in TSM emulation mode.

66. Use **rept-stat-card** command to display IS-NR status of VSCCP card.

67. Use **pass** command to test presence of EPAP hosts on network.

68. Repeat Step 46 through Step 67 to replace all adjacent TSM cards identified in the prerequisites and to be replaced with DSM cards.

69. Repeat Step 48 through Step 52 to inhibit any remaining TSM cards running the SCCP application and remove them from database and shelf.

NOTE : The G-Flex feature cannot be turned on until TSM cards running the SCCP application are removed from the system.

CAUTION: Contact the Customer Care Center at this point for assistance in completing this G-Flex activation procedure. Do not proceed without consulting with the Customer Care Center.

70. Turn on and configure G-Flex feature using Step 72 through Step 86.

71. Use **enable-ctrl-feat** command to enable G-Flex feature.

72. Use **chg-ctrl-feat** command to turn on G-Flex feature.

73. Use **enable-ctrl-feat** to enable G-Flex MAP Layer Routing feature.

74. Use **chg-ctrl-feat** command to turn on G-Flex MAP Layer Routing feature.

75. Use **chg-gsmopts**command to turn on G-Flex MAP Layer Routing option.

76. Use **chg-stpopts** command to enter default country code (CC) and default network destination code (NDC) to convert nature of address indicator (NAI) of MSISDNs to international format (**nai=intl**).

77. Use **rtrv-stpopts** command to verify changes of CC and NDC.

78. Use **chg-gsmopts** command to change GSM options.

79. Use **rtrv-gsmopts** command to verify changes to GSM options.

80. Use **ent-srvsel** command to enter G-Flex service selectors.

81. Use **rtrv-srvsel** command to verify changes to G-Flex service selectors.

CAUTION: When you have an in-service environment and you are replacing TSM cards with DSM cards, initialize one DSM card at a time. Verify its return to IS-NR state before initializing another card. This precaution keeps cards in service and precludes an interruption of SCCP services.

82. Use **`init-card:loc=<DSM card>`** command to load RTDB, OAM, GPL, and GTT data to VSCCP card.
83. Use **`rept-stat-card`** command to display IS-NR status of VSCCP card.
84. Repeat Step 82 and Step 83 to reboot each DSM card.

    NOTE: Once the G-Flex feature is turned on, always boot the DSM cards with the init-card :loc=<DSM card location> command.

85. Use **chg-sccp-serv:serv=gflex:state=online** to set the G-Flex service to online.
86. Confirm success of activation procedure with **`rept-stat-sccp`**, **`rept-stat-mps`**, and **`rept-stat-db:display=all`** commands.

    EPAP can now administer G-Flex entity objects and G-Flex subscribers. For details about performing these actions, refer to the *EPAP Administration Manual*.

The detailed G-Flex activation procedure is described next.

Feature Activation Procedure

1. Before changing a true point code (PC) and adding a capability point code (CPC) for the G-Flex feature, display the current values of the self-identification configuration (shown in Step 2), the destination point codes (DPCs) (shown in Step 3), and the routes and linksets assigned to the DPCs (shown in Step 4).

   The G-Flex feature applies to ANSI, ITU-I (international), and ITU-N (national) networks.

2. Display the current self identification of the system (PC and CPC) using the **`rtrv-sid`** command.

   This is an example of the possible output:

```
rlghncxa03w 01-10-07 00:57:31 GMT EAGLE  37.5.0
PCA           PCI           PCN           CLLI            PCTYPE
001-001-001   1-100-1       11111         rlghncxa03w     OTHER
CPCA
001-002-001   001-002-002       001-002-003      001-002-004
CPCI
1-101-1       1-101-2           1-101-3          1-101-4
CPCN
11121         11122             11123            11124
```

   If the ITUDUPPC (ITU national duplicate point code) feature is on, the ITU national point code also contains a group code. The group code is a two-character field from aa to zz that is entered as the last subfield of an ITU national point code, nnnnn-gc (for example, 2112-aa).

3. Display the current destination point codes in the destination point code table (**`dpca/dpci`**/**`dpcn`**) using the **`rtrv-dstn`** command.

   This is an example of the possible output:

```
rlghncxa03w 01-10-10 11:43:04 GMT EAGLE 37.5.0
DPCA        CLLI        BEI ELEI  ALIASI   ALIASN      DOMAIN
201-001-001 rlghncxa03w no  ---   -------  ----------  SS7
DPCI        CLLI        BEI ELEI  ALIASA       ALIASN  DOMAIN
2-100-1     rlghncxa03w no  ---   222-210-000  12001   SS7
DPCN        CLLI        BEI ELEI  ALIASA       ALIASI  DOMAIN
21111       rlghncxa03w no  ---   222-200-200  2-121-1 SS7
DESTINATION ENTRIES ALLOCATED:       2000
        FULL DPC(s):                    3
        NETWORK DPC(s):                 0
        CLUSTER DPC(s):                 0
```

```
        TOTAL DPC(s):                  3
        CAPACITY (% FULL):             1%
X-LIST ENTRIES ALLOCATED:            500
```

4. Display the current route configuration using the **rtrv-rte** command.

   This is an example of the possible output:

```
rlghncxa03w 01-10-07 11:43:04 GMT  EAGLE 37.5.0
DPCA          ALIASI     ALIASN      CLLI     LSN         RC APCA
201-001-001   1-111-1    11121       adp1     ls000001    10 240-012-002
                                              ls000002    10 240-012-002
                                              ls000003    20 240-012-002
                                              ls000004    30 240-012-002
                                              ls000005    40 240-012-002
                                              ls000006    50 240-012-002
DPCI        ALIASN      ALIASA      CLLI     LSN         RC APCI
2-100-1     121111      240-111-111 idp1     ls100001    10 1-234-5
                                              ls100002    10 1-234-6
                                              ls100003    20 1-234-7
                                              ls100004    30 1-234-1
                                              ls100005    40 1-234-2
                                              ls100006    50 1-234-3
DPCN        ALIASA      ALIASI      CLLI     LSN         RC APCN
21111       011-222-111 0-001-1     ndp1     ls200001    10 11111
                                              ls200002    10 11112
                                              ls200003    20 11113
                                              ls200004    30 11114
                                              ls200005    40 11115
                                              ls200006    50 11116
```

5. If the system's point code **(pca/pci/pcn)** or capability point code **(cpca/cpci/cpcn)** to be configured in this procedure is shown in Step 2 , Step 3 , or Step 4 , choose another point code to configure with this procedure (Step 9).
6. If configuring the system point code or capability point code **(pcn** or **cpcn)** of an ITU-N network, view the current value of the ITU-N point code format.

   Otherwise continue with Step 7 . Enter the **rtrv-stpopts** command and specify the ITU-N point code format option **npcfmti**. The **npcfmti** option identifies how the ITU-N point code is entered into the database and how it is displayed in any outputs. The value is shown in the **NPCFMTI** field.

   This is an example of the possible output:

```
rlghncxa03w  01-10-17 16:02:05 GMT  EAGLE 37.5.0
STP OPTIONS
----------------------
MTPT31CTL            1
MTPLTI             yes
MTPLTCTDPCQ          3
MTPLTST          10000
MTPXLQ             500
MTPXLET           0100
MTPXLOT            90%
MTPDPCQ           1750
TFATFRPR          1000
MTPRSI             yes
MTPRSIT           5000
MTPLPRST           yes
MTPT10ALT        30000
SLSCNV           perls
UIMRD              yes
CRITALMINH          no
DISPACTALMS         no
NPCFMTI        4-4-4-2
DEFCC                49
DEFNDC              177
DSMAUD               on
```

If you wish to change the format of the ITU-N point code, go to section "ITU National Point Code Formats" in the *Database Administration Manual - SS7*. Then continue with Step 7 .

7. Display the mated applications in the database using the **rtrv-map** command.

These are examples of possible output:

```
rlghncxa03w 01-10-07  11:43:04  GMT  EAGLE 37.5.0
PCA           SSN  RC  MPCA           MSSN MATERC SRM MRC GRP NAME
001-001-001     5  10                      --- ---
rlghncxa03w 01-10-07  11:43:04  GMT  EAGLE 37.5.0
PCN           SSN  RC  MPCN           MSSN MATERC SRM MRC GRP NAME
11111           5  10  12347             5    20
rlghncxa03w 01-10-07  11:43:04  GMT  EAGLE 37.5.0
PCI           SSN  RC  MPCI           MSSN MATERC SRM MRC GRP NAME
2-100-1         5  20  3-200-1        250      99 --- --- abcdefgh
```

If the system's point code is shown in the **rtrv-map** command output (in the **PCA**, **PCI**, **PCN**, **MPCA**, **MPCI**, or **MPCN** fields), remove the system's point code from the mated application table. Refer to procedure "Removing a Mated Application" in the *Database Administration Manual - Global Title Translation*.

If the system's point code or capability point code is a destination point code of a route, select a point code that is not the destination point code of a route (see output of the **rtrv-rte** command in Step 4) and not in the destination point code table (see output of the **rtrv-dstn** command in Step 3).

8. Change PC, CPC, DPC, route, linkset, and LIM card configurations for the HLR database using Step 9 through Step 28 .

CAUTION: Changing a system's point code requires a system reboot using the init-sys command to fully implement the changes. The init-sys command causes a complete system reload and should be used only in an environment that is not in service. Using this command ensures the updated self identification information is loaded onto all cards but does interrupt service.

9. Configure the system's point code (**pca/pci/pcn**) and capability point code (**cpca/cpci/cpcn**) by network type using the **chg-sid** command.

For example, enter one of these commands:

```
chg-sid:pca=003-001-001:cpca=003-002-001
chg-sid:pci=1-100-2:cpci=1-102-1
chg-sid:pcn=11112:cpcn=11125
```

where:

:pca/pci/pcn
The point code used to uniquely identify the system.

:cpca/cpci/cpcn
The point code used by the SS7 protocol to identify a group of functionally related EAGLE 5 ISSs in the signaling network to which the EAGLE 5 ISS belongs.

After successful completion of this command, the system returns the following output:

```
rlghncxa03w 01-10-07 00:57:31 GMT EAGLE 37.5.0
CHG-SID: MASP A - COMPLTD
```

When any of the **pca/pci/pcn** parameters have changed, the system needs to be reinitialized. The following caution message is displayed:

```
CAUTION: SYSTEM SITE ID HAS BEEN CHANGED, MANUAL RE-INITIALIZATION IS NEEDED
```

CAUTION: The init-sys command causes a complete system reload and should be used only in an environment that is not in service. Using this command ensures the updated self identification information is loaded onto all cards, but does interrupt service.

When the `init-sys` command executes, the system does not retain the manually initiated state (for example, OOS-MT-DSBLD) for the signaling link, card, or terminal. After the command executes, the system attempts to bring all provisioned links, cards, and terminals on line, including those that were previously out of service. You will need to manually put each device back into its previous state after the system is back on line. Print or electronically capture the output of the `rept-stat-slk`, `rept-stat-card`, and`rept-stat-trm` commands for reference prior to issuing the `init-sys` command. To restore a device to its previous state, issue the appropriate inhibit/ deactivate command listed in the *Commands Manual* in the Related Commands section for each of the above `rept-stat` commands.

10. Reinitialize the system by entering the **`init-sys`** command if changes were made in Step 9 to any **`pca/pci/pcn`** parameter.

NOTE: The `init-sys` command must be entered twice within 30 seconds for the system to re-initialize. If the `init-sys` command is not executed twice within 30 seconds, the attempt to re-initialize the system is aborted.

When the **`init-sys`** command is first entered, this message should appear.

```
rlghncxa03w 01-10-07 00:57:31 GMT EAGLE 37.5.0
CAUTION: This command causes a complete system reload, and
will result in traffic loss.
Re-enter command within 30 seconds to confirm.
```

When the **`init-sys`** command is re-entered within the 30 second time limit, this message should appear.

```
rlghncxa03w 01-10-07 00:57:31 GMT EAGLE 35.0.0
Init System command issued at terminal #3
```

From the time that the **`init-sys`** command is accepted, you must wait approximately two minutes before you can perform Step 11 (logging into the system). If the terminal is in the VT-100/VT-320 mode, the terminal display will be refreshed with non-zero alarm counts. During this two-minute interval, an intermediate screen refresh occurs, which is caused by the MASP's role change from active to standby and from standby to active. This screen refresh is typically a partial refresh and the alarm indicators are set to zero.

If you are logged into the system in the KSR mode, the only response you will receive of being able to log into the system is the message 'UAM 0009, MASP became active'. UAM 0009 could be issued twice due to a possible transient MASP role change (switching from active to standby). Following the execution of the **`init-sys`** command, the MASP that was active before the **`init-sys`** command was entered will be the active MASP again when the system has finished reinitializing.

11. Verify the SID changes using the **`rtrv-sid`** command.

This is an example of the possible output:

```
durhncxa03w 01-10-07 00:57:31 GMT EAGLE 37.5.0
PCA              PCI             PCN           CLLI            PCTYPE
001-001-001      1-100-2         11112         rlghncxa03w     OTHER
003-001-001
CPCA
001-002-001       001-002-002       001-002-003      001-002-004
003-002-001
CPCI
1-101-1           1-101-2           1-101-3          1-101-4
1-102-1
CPCN
11121             11122             11123            11124
11125
```

12. Enter a destination point code for the HLR location in the Destination Point Code table by network type using the **ent-dstn** command.

For example, enter one of these commands:

```
ent-dstn:dpca=301-100-100
ent-dstn:dpci=2-100-2
ent-dstn:dpcn=21112
```

where:

:dpc/dpca/dpci/dpcn
The destination point code being added to the database

The system returns this message:

```
rlghncxa03w 01-10-17 15:35:05 GMT EAGLE 37.5.0
Destination table is (40 of 4000) 1% full
ENT-DSTN: MASP A - COMPLTD
```

13. Verify the changes using the **rtrv-dstn** command and specifying the DPC that was entered in Step 12 .

For example, enter one of these commands:

```
rtrv-dstn:dpca=301-100-100
rtrv-dstn:dpci=2-100-2
rtrv-dstn:dpcn=21112
```

This is an example of the possible output **for DPCA**s.

```
rtrv-dstn:dpca=301-100-100
RLGHNCXA03W 01-10-30 21:16:37 GMT EAGLE 37.5.0
DPCA        CLLI        BEI ELEI  ALIASI       ALIASN      DOMAIN
301-100-100 --------    no  ---   2-100-2      21112       SS7
            SPC          NCAI
            -----------  no
Destination table is (20 of 2000) 1% full
```

This is an example of the possible output **for DPCI**s.

```
rtrv-dstn:dpci=2-100-2
RLGHNCXA03W 01-10-30 21:16:37 GMT EAGLE 37.5.0
DPCI        CLLI        BEI ELEI  ALIASA       ALIASN      DOMAIN
2-100-2     --------    no  ---   301-100-100  21112       SS7
            SPC          NCAI
            -----------  no
Destination table is (20 of 2000) 1% full
```

This is an example of the possible output **for DPCNs**.

```
rtrv-dstn:dpcn=21112
RLGHNCXA03W 01-10-30 21:16:37 GMT EAGLE 37.5.0
DPCN        CLLI        BEI ELEI  ALIASA       ALIASI  DOMAIN
21112       --------    no  ---   301-100-100  2-100-2 SS7
            SPC          NCAI
            -----------  no
Destination table is (20 of 2000) 1% full
```

14. Enter a linkset with the **ent-ls** command, and assign it to the destination point code by network type.

For example, enter one of these commands:

```
ent-ls:lsn=ls300001:apca=240-020-001:lst=c
ent-ls:lsn=ls400001:apci=2-200-2:lst=c
ent-ls:lsn=ls500001:apcn=21122:lst=c
```

where:
:lsn
The name of the linkset
:apc/apca/apci/apcn

Adjacent point code – the point code identifying the node that is next to the system

:lst

The linkset type of the specified linkset

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-17 16:23:21 GMT  EAGLE 37.5.0
Link set table is ( 114 of 1024)  12% full
ENT-LS: MASP A - COMPLTD
```

15. Verify the changes using the **rtrv-ls** command and specifying the linkset name.

For example, enter one of these commands:

```
rtrv-ls:lsn=ls300001
rtrv-ls:lsn=ls400001
rtrv-ls:lsn=ls500001
```

For lsn300001, the system returns output similar to the following:

```
                              L3T  SLT
LSN         APCA (SS7)   SCRN SET  SET BEI LST LNKS GWSA GWSM GWSD SLSCI NIS ls300001
240-020-001
 scr1  1    2   no  a   0
    on   off  off  no    on
CLLI         TFATCABMLQ  MTPRSE  ASL8
RLGHNCXA03W  1           no      no
                      L2T       L1              PCR PCR
LOC  PORT SLC TYPE   SET BPS   MODE TSET ECM   N1  N2
Link set table is (114 of 1024) 12% full
```

For lsn400001, the system returns output similar to the following:

```
                              L3T  SLT
LSN          APCI (SS7)  SCRN  SET  SET BEI LST LNKS GWSA GWSM GWSD SLSCI NIS ls400001 2-200-2
     scr1  1    2   no  a   0
    on   off  off  no    on
CLLI         TFATCABMLQ  MTPRSE  ASL8
RLGHNCXA03W  1           no      no
                      L2T       L1              PCR PCR
LOC  PORT SLC TYPE   SET BPS   MODE TSET ECM   N1  N2
Link set table is (114 of 1024) 12% full
```

For lsn500001, the system returns output similar to the following:

```
                              L3T  SLT
LSN          APCN (SS7)  SCRN  SET  SET BEI LST LNKS GWSA GWSM GWSD SLSCI NIS ls500001 21122
       scr3  1    2   no  a   0
    on   off  off  no    on
CLLI         TFATCABMLQ  MTPRSE  ASL8
RLGHNCXA03W  1           no      no
                      L2T       L1              PCR PCR
LOC  PORT SLC TYPE   SET BPS   MODE TSET ECM   N1  N2
Link set table is (114 of 1024) 12% full
```

16. Add the LIM cards to the database using the **ent-card** command.

For this example, enter these commands:

```
ent-card:loc=1105:type=limocu:appl=ccs7itu
ent-card:loc=1106:type=limocu:appl=ccs7itu
```

where:

:loc

Specifies the slot number for the card.

:type

Specifies that the card is a LIMOCU card.

:appl

Specifies that the application is CCS7ITU.

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-12 09:12:36 GMT  EAGLE 37.5.0
ENT-CARD: MASP A - COMPLTD
```

17. Verify the changes using the **rtrv-card** command with the card location specified.

For this example, enter these commands:

```
rtrv-card:loc=1105 rtrv-card:loc=1106
```

These are examples of the possible output:

```
RLGHNCXA03W 01-10-30 09:12:36 GMT EAGLE 37.5.0
CARD   TYPE          APPL      PORT A LSET (SLC)   PORT B LSET (SLC) 1105
   LIMOCU       CCS7ITU   --------    (--)    --------    (--)

RLGHNCXA03W 01-10-30 09:12:36 GMT EAGLE 37.5.0
CARD   TYPE          APPL      PORT A LSET (SLC)   PORT B LSET (SLC) 1106
   LIMOCU       CCS7ITU   --------    (--)    --------    (--)
```

18. Assign signaling links to the LIM cards using the **ent-slk** command.

For example, enter these commands:

```
ent-slk:loc=1105:port=a:lsn=ls400001:slc=0:l2tset=1
ent-slk:loc=1106:port=a:lsn=ls500001:slc=0:l2tset=1
```

where:

:loc
The card location of the LIM that the SS7 signaling link will be assigned to.

:port
The port on the card specified in the **loc** parameter.

:lsn
The name of the linkset that will contain the signaling link.

:slc
The signaling link code. The **slc** must be unique within the linkset. It must be the same at both the system location and the distant node.

:l2tset
The level 2 timer set table. A signaling link may be assigned to any of the twenty tables.

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-07 08:29:03 GMT  EAGLE 37.5.0
ENT-SLK: MASP A - COMPLTD
```

Signaling links are the only elements in the database directly supported by a hardware device. When a link is added to a linkset, the link remains in the state OOS-MT-DSBLD (out of service maintenance disabled) until it is activated; see Step 26.

19. Verify the changes using the **rtrv-slk** command, specifying the card location and port of the signaling link entered in Step 18.

```
rtrv-slk:loc=1105:port=a
rtrv-slk:loc=1106:port=a
```

This is an example of the possible output.

```
RLGHNCXA03W 01-10-19 21:16:37 GMT EAGLE 37.5.0
                                  L2T         L1               PCR  PCR
LOC   PORT LSN       SLC TYPE     SET  BPS    MODE TSET  ECM   N1   N2 1105 A ls400001 0
LIMOCU
   1    56000  ---  ---   BASIC ---  -----
RLGHNCXA03W 01-10-19 21:16:37 GMT EAGLE 37.5.0
```

```
                                  L2T         L1              PCR  PCR
LOC   PORT LSN       SLC TYPE     SET  BPS    MODE TSET  ECM   N1   N2 1106 A ls500001 0
LIMOCU
   1    56000  ---  ---   BASIC ---  -----
```

20. Add a route for the new DPC by network type using the **ent-rte** command.

For example, enter one of these commands:

```
ent-rte:dpca=301-100-100:lsn=ls300001:rc=10
ent-rte:dpci=2-100-2:lsn=ls400001:rc=10
ent-rte:dpcn=21112:lsn=ls500001:rc=10
```

where:

:dpc/dpca/dpci/dpcn

Destination point code of the node that the traffic is bound for

:lsn

The name of the linkset that will carry the traffic bound for the node specified by the destination point code.

:rc

The relative cost (priority) for this route.

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-07 08:28:30 GMT  EAGLE 37.5.0
ENT-RTE: MASP A - COMPLTD
```

21. Verify the changes using the **rtrv-rte** command and specifying the destination point code of the route.

This is an example of the possible output:

```
rlghncxa03w 01-10-07 11:43:04 GMT  EAGLE 37.5.0
DPCA         ALIASI         ALIASN    CLLI       LSN      RC APCA
201-001-001  1-111-1        11121     adp1       ls000001 10 240-012-002
                                                 ls000002 10 240-012-002
                                                 ls000003 20 240-012-002
                                                 ls000004 30 240-012-002
                                                 ls000005 40 240-012-002
                                                 ls000006 50 240-012-002 301-001-001
  1-111-1        11121     adp1        ls300001
 10 240-020-001 DPCI
         ALIASN      ALIASA       CLLI       LSN      RC APCI
2-100-1      121111      240-111-111  idp1       ls100001 10 1-234-5
                                                 ls100002 10 1-234-6
                                                 ls100003 20 1-234-7
                                                 ls100004 30 1-234-1
                                                 ls100005 40 1-234-2
                                                 ls100006 50 1-234-3 2-100-2
     121111      240-111-111   idp1        ls400001
 10 1-200-2 DPCN
        ALIASA      ALIASI        CLLI       LSN      RC APCN
21111       011-222-111 0-001-1       ndp1       ls200001 10 11111
                                                 ls200002 10 11112
                                                 ls200003 20 11113
                                                 ls200004 30 11114
                                                 ls200005 40 11115
                                                 ls200006 50 11116 21112
      011-222-111 0-001-1       ndp1        ls500001
 10 11122
```

22. Add a mated application to the database by network type using the **ent-map** command.

For this example, enter this command:

```
ent-map:pca=003-001-001:ssn=12:rc=0:mpca=004-004-004:mssn=250 :materc=99 :grp=grp10
ent-map:pci=2-100-1:ssn=12:rc=20:mpci=3-200-1:mssn=50 :materc=99:grp=grp03
ent-map:pcn=11112:ssn=12:rc=10:mpcn=11114:mssn=250:materc=99 :grp=grp07
```

where:

:pc/pca/pci/pcn

The point code of the primary signaling point that is to receive the message.

:ssn

Subsystem number – the subsystem address of the primary point code that is to receive the message.

:rc

The relative cost

:mpc/mpca/mpci/mpcn

The point code of the backup signaling point that is to receive the message.

:mssn

Mate subsystem number – the subsystem address of the backup point code that is to receive the message.

:materc

Mate relative cost.

:grp

The name of the concerned signaling point code group that contains the point codes that should be notified of the subsystem status. This parameter applies to both RPCs/SSNs.

When each of these commands have successfully completed, this message should appear.

```
RLGHNCXA03W  01-10-07 00:28:31 GMT EAGLE 37.5.0
ENT-MAP:  MASP A - COMPLTD
```

23. Verify the changes using the **rtrv-map** command.

These are examples of possible output.

```
rlghncxa03w 01-10-07  11:43:04  GMT  EAGLE 37.5.0
PCA            SSN  RC MPCA           MSSN MATERC SRM MRC GRP NAME
001-001-001      5  20 004-004-004    250      99 --- --- GRP10
003-001-001     12   0 004-004-004    250      99 --- --- GRP10
rlghncxa03w 01-10-07  11:43:04  GMT  EAGLE 37.5.0
PCN            SSN  RC  MPCN          MSSN MATERC SRM MRC GRP NAME
11111            5  20  12347         250      99 --- --- GRP07
11112           12   0  12347         250      99 --- --- GRP07
rlghncxa03w 01-10-07  11:43:04  GMT  EAGLE 37.5.0
PCI            SSN  RC  MPCI          MSSN MATERC SRM MRC GRP NAME
1-100-1          5   0  3-200-1       250      99 --- --- GRP03
2-100-1         12  20  3-200-1        50      99 --- --- GRP03
```

24. Allow the LIM cards that were entered in Step 16 by using the **alw-card** command.

For example, enter these commands:

```
alw-card:loc=1105
alw-card:loc=1106
```

This message appears:

```
RLGHNCXA03W  01-10-30 21:20:37 GMT EAGLE 37.5.0
Card has been allowed.
```

25. Verify the in-service normal (IS-NR) status of the cards using the **rept-stat-card** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-27 16:43:42 GMT  EAGLE 37.5.0
CARD  VERSION            TYPE    APPL      PST           SST       AST 1101 100-000-00003-000
ASM SCCP IS-NR
 Active    --- 1102 100-000-00003-000 ASM SCCP IS-NR
  Active    ---
1103  100-000-00003-000  ACMENET STPLAN    IS-NR         Active    ---
1104  100-000-00003-000  ACMENET GLS       IS-NR         Active    --- 1105 100-000-00003-000
LIMOCU CCS7ITU IS-NR
 Active    --- 1106 100-000-00003-000 LIMOCU CCS7ITU IS-NR
 Active    ---
1113  100-000-00002-000  MCAP    OAM       IS-NR         Active    ---
1114  100-000-00002-000  TDM               IS-NR         Active    ---
1115  100-000-00002-000  MCAP    OAM       IS-NR         Active    ---
```

```
1116  100-000-00002-000  TDM              IS-NR        Active    ---
1117  100-000-00002-000  MDAL             IS-NR        Active    ---
1201  100-000-00003-000  LIMDS0  SS7ANSI  IS-NR        Active    ---
1202  100-000-00002-000  LIMV35  SS7GX25  IS-NR        Active    ---
1203  100-000-00003-000  LIMV35  SS7ANSI  IS-NR        Active    ---
1204  100-000-00003-000  LIMATM  ATMANSI  IS-NR        Active    ---
1205  100-000-00001-000  DCM     IPLIM    IS-NR        Active    ---
1207  100-000-00001-000  DCM     SS7IPGW  IS-NR        Active    ---
1303  100-000-00001-000  DCM     IPLIM    IS-NR        Active    ---
1305  100-000-00001-000  DCM     SS7IPGW  IS-NR        Active    ---
```

26. Activate the signaling links entered in Step 18 using the **act-slk** command.

For example, enter these commands

```
act-slk:loc=1105:port=a
act-slk:loc=1106:port=a
```

The link changes its state from *OOS-MT-DSBLD* (out-of-service maintenance-disabled) to *IS-NR* (in-service normal). The output confirms the activation.

```
RLGHNCXA03W 01-10-07 11:11:28 GMT EAGLE 37.5.0
Activate Link message sent to card
```

27. Verify the in-service normal (IS-NR) status of the signaling link using the **rept-stat-slk** command.

For example, enter these commands:

```
rept-stat-slk:loc=1105
rept-stat-slk:loc=1106
```

This message should appear.

```
RLGHNCXA03W 01-10-30 21:16:37 GMT EAGLE 37.5.0
SLK      LSN        CLLI       PST     SST     AST 1105,A ls400001
  ---------- IS-NR   Avail   ----
Command Completed.
RLGHNCXA03W 01-10-30 21:16:37 GMT EAGLE 37.5.0
SLK      LSN        CLLI       PST     SST     AST 1106,A ls500001
  ---------- IS-NR   Avail   ----
Command Completed.
```

28. Display the new LIM cards in the database using the **rtrv-card** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-15 16:34:56 GMT EAGLE 37.5.0
CARD   TYPE          APPL      PORT A LSET (SLC)   PORT B LSET (SLC)
1101   ASM           SCCP      --------    (--)    --------    (--)
1102   ASM           SCCP      --------    (--)    --------    (--)
1103   ACMENET       STPLAN    --------    (--)    --------    (--)
1104   ACMENET       GLS       --------    (--)    --------    (--) 1105 LIMOCU CCS7ITU
ls400001
     ( 00
)    --------    (--) 1106 LIMOCU CCS7ITU ls500001
    ( 00
)    --------    (--)
1113   MCAP          OAM
1114   TDM
1115   MCAP          OAM
1116   TDM
1117   MDAL
1201   LIMDS0        SS7ANSI   lsn1        (00)    lsn2        (01)
1202   LIMV35        SS7GX25   lsngwy      (00)    --------    (--)
1203   LIMV35        SS7ANSI   lsn2        (00)    lsn1        (01)
1204   LIMATM        ATMANSI   atmgwy      (00)    --------    (--)
1205   DCM           IPLIM     ipgwy1      (00)    ipgwy3      (01)
1207   DCM           SS7IPGW   ipgwy2      (00)    --------    (--)
1303   DCM           IPLIM     ipgwy1      (00)    ipgwy3      (01)
1305   DCM           SS7IPGW   ipgwy4      (00)    --------    (--)
```

Determine a location where the double-slot DSM card can be inserted. The output shows slots 1107 and 1108 are not occupied. Also determine adjacent (odd-even slots) SCCP cards for later TSM card replacements.

29. Install and configure DSM card(s) as needed in available odd-even slots using Step 30 through Step 44 .

For our example, install a DSM card in slots 1107 and 1108.

30. Install the DSM card in slots 1107 and 1108.

The DSM card requires two slots and must be installed in an odd slot with an adjacent empty even slot on its right side.

a. Open the ejector levers on the DSM card.

Carefully align the card's edges with the top and bottom card guides. Then push the card along the length of the card guides until the rear connectors on the card engage the mating connectors on the target shelf backplane.

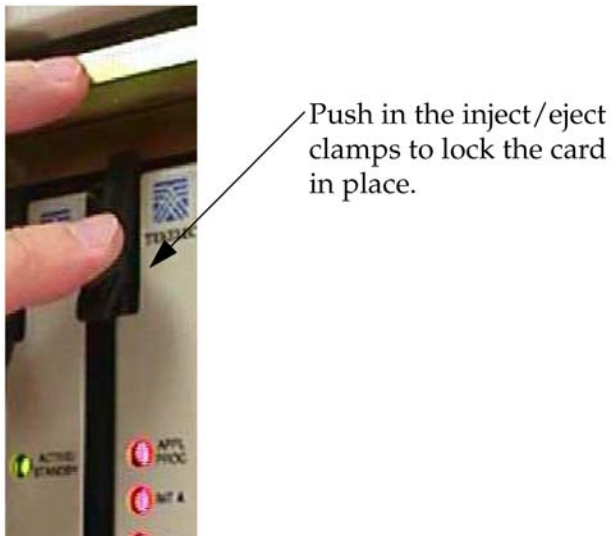
b. Press the left edge of the card's faceplate using constant pressure until you feel the card's progress cease.

WARNING: Do not impact the faceplate in order to mate the connectors. Any impact to the card's faceplate can damage the faceplate, the pins, or the connectors.

c. Push in the top and bottom inject/eject clamps.

This locks the card in place and ensures a strong connection with the pins on the target shelf backplane.

Figure 4-1. Push in Inject/Eject Clamps



d. Verify that both IMT bus LEDs are green.

e. Install the cabling required to connect the DSM card to the MPS.

Refer to the *Installation Manual* for details.

31. Add the DSM card to the database and configure it as VSCCP card using the **ent-card** command.

For this example, enter this command.

```
ent-card:loc=1107:type=dsm:appl=vsccp
```

where:
:loc

Specifies the slot number for the card. The slot number must be an odd number.

:type

Specifies that the card is a DSM card.

:appl

Specifies that the application is VSCCP.

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-12 09:12:36 GMT  EAGLE 37.5.0
ENT-CARD: MASP A - COMPLTD
```

32. Verify the VSCCP card using the **rtrv-card** command with the card location specified.

For this example, enter this command:

```
rtrv-card:loc=1107
```

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 09:12:36 GMT EAGLE 37.5.0
CARD   TYPE          APPL      PORT A LSET (SLC)   PORT B LSET (SLC) 1107 DSM VSCCP
     --------    (--)    --------    (--)
```

33. Display the current link parameters associated with the VSCCP card in the database by entering the **rtrv-ip-lnk** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 21:14:37 GMT EAGLE 37.5.0
LOC PORT IPADDR     SUBMASK      DUPLEX   SPEED MACTYPE  AUTO  MCAST
1107 A   ---------  --------     HALF     10    DIX      NO    NO
1107 B   ---------  --------     HALF     10    DIX      NO    NO
```

34. Enter the IP address port and speed associated with the VSCCP card in the database using the chg-ip-lnk command.

For this example, enter these commands:

```
chg-ip-
lnk:loc=1107:port=a:duplex=half:ipaddrr=192.168.122.1 :mactype=dix:spee
d=100:mcast=yes:submask=255.255.255.0
```

```
chg-ip-
lnk:loc=1107:port=b:duplex=half:ipaddrr=192.168.123.1 :mactype=dix:spee
d=10:mcast=yes:submask=255.255.255.0
```

where:

:loc

The card location of the VSCCP card within the EAGLE 5 ISS.

:port

The port ID. The port parameter of the chg-ip-lnk command specifies the physical interface of the DSM card.

:ipaddr

IP address assigned to the port. This is a TCP/IP address expressed in standard "dot notation." IP addresses consist of the system's network number and the machine's unique host number.

:duplex

This is the mode of operation of the interface.

:speed

This is interface bandwidth in megabits per second. The speed is either 100 Mbps for main DSM network or 10 Mbps for backup DSM network.

:mactype

This is the Media Access Control Type of the interface. Specify dix for the Digital/Inter/Xerox de facto standard for the Ethernet.

:mcast

This is the Multicast Control of the interface.

:submask

The subnet mask of the IP interface, in the form of an IP address with a restricted range of values.

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

```
RLGHNCXA03W 01-10-30 21:18:37 GMT EAGLE 37.5.0
CHG-IP-LNK: MASP A - COMPLTD
```

35. Verify the new link parameters associated with the VSCCP card in the database by entering the **rtrv-ip-lnk** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 21:14:37 GMT EAGLE 37.5.0
LOC  PORT IPADDR        SUBMASK       DUPLEX SPEED MACTYPE AUTO MCAST
1107 A    192.168.122.1 255.255.255.0 HALF   100   DIX     NO   YES
1107 B    192.168.123.1 255.255.255.0 HALF   10    DIX     NO   YES
```

36. Display the current IP host information in the database by entering the **rtrv-ip-host** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 21:17:37 GMT EAGLE 37.5.0
IPADDR          HOST
192.1.1.32      KC_HLR2
192.1.1.50      DN_MSC1
192.1.1.52      DN_MSC2
```

37. Add the host name and IP address for each VSCCP link using the **ent-ip-host** command.

For example, enter these commands:

```
ent-ip-host:host=vsccp_1107_a:ipaddr=192.168.122.1
ent-ip-host:host=vsccp_1107_b:ipaddr=192.168.123.1
```

where:

:host

Specifies the host name. Each VSCCP link must be specified separately.

:ipaddr

Specifies the IP network address for each EPAP. The first three octets of the IP address must be the same as MPS A and B ports, respectively. The fourth octet identifies the DSM card and must have a a unique octet identifier for the card's IP address; we recommend numbering the DSM cards sequentially, using values 1 to 25. (This example shows the assignment of the first DSM card.)

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-30 21:18:37 GMT EAGLE 37.5.0
ENT-IP-HOST: MASP A - COMPLTD
```

38. Verify the new IP host information in the database by entering the **rtrv-ip-host** command.

The following is an example of the possible output.

```
RLGHNCXA03W 01-10-30 21:19:37 GMT EAGLE 37.5.0
IPADDR          HOST
192.1.1.32      KC_HLR2
192.1.1.50      DN_MSC1
192.1.1.52      DN_MSC2
192.168.122.1   VSCCP_1107_A
192.168.123.1   VSCCP_1107_B
```

NOTE: Most G-Flex customer private networks do not require setting up a default router for the DSM card. However, if your network configuration does require a default router to connect the DSM card communication to the EPAP, then only one default router is assignable to each DSM card. Assign the default router address to each DSM card as shown in this step.

39. Change the TCP/IP information for the VSCCP card in the database using the **chg-ip-card** command.

For this example, enter this command:

```
chg-ip-card:loc=1107:domain=nc.tekelec.com :defrouter=192.168.122.250
```

where:

:loc
The location of the VSCCP card within the EAGLE 5 ISS.
:domain
The domain name of domain server.
:defrouter
Default router address. The IP address for default router. This is a TCP/IP address expressed in standard “dot notation”. IP addresses consist of the system’s network number and the machine’s unique host number.

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-30 21:20:37 GMT EAGLE 37.5.0
CHG-IP-CARD: MASP A - COMPLTD
```

40. Verify the new TCP/IP parameters associated with the VSCCP card in the database by entering the **rtrv-ip-card** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 21:21:37 GMT EAGLE 37.5.0
   LOC  1107
     SRCHORDR  LOCAL
     DNSA      -----------
     DNSB      -----------
     DEFROUTER  192.168.122.250
     DOMAIN    NC.TEKELEC.COM
```

41. Boot the DSM card that was added in Step 31 in TSM emulation mode by using the **alw-card** command.

For example, enter this command:

```
alw-card:loc=1107
```

This message appears:

```
RLGHNCXA03W  01-10-30 21:20:37 GMT EAGLE 37.5.0
Card has been allowed.
```

42. Verify the in-service normal (IS-NR) status of the VSCCP card using the **rept-stat-card** command.

This is an example of the possible output.

```
RLGHNCXA03W 01-10-27 16:43:42 GMT  EAGLE 37.5.0
CARD  VERSION              TYPE   APPL      PST            SST      AST
1101    100-000-00003-000  ASM     SCCP      IS-NR         Active    ---
1102    100-000-00003-000  ASM     SCCP      IS-NR         Active    ---
1103    100-000-00002-000  ACMENET STPLAN        IS-NR         Active    ---
1104    100-000-00003-000  ASM     GLS       IS-NR         Active    ---
1105    100-000-00003-000  LIMOCU  CCS7ITU       IS-NR         Active    ---
1106    100-000-00003-000  LIMOCU  CCS7ITU       IS-NR         Active    ---
1107    100-000-00003-000  DSM     VSCCP         IS-NR         Active    ---
1113    100-000-00002-000  MCAP    OAM       IS-NR         Active    ---
1114    100-000-00002-000  TDM                IS-NR         Active    ---
1115    100-000-00002-000  MCAP    OAM       IS-NR         Active    ---
1116    100-000-00002-000  TDM                IS-NR         Active    ---
1117    100-000-00002-000  MDAL               IS-NR         Active    ---
1201    100-000-00003-000  LIMDS0  SS7ANSI       IS-NR         Active    ---
1202    100-000-00002-000  LIMV35  SS7GX25       IS-NR         Active    ---
1203    100-000-00003-000  LIMV35  SS7ANSI       IS-NR         Active    ---
```

```
1204    100-000-00003-000  LIMATM  ATMANSI       IS-NR         Active    ---
1205    100-000-00001-000  DCM     IPLIM     IS-NR         Active    ---
1207    100-000-00001-000  DCM     SS7IPGW       IS-NR         Active    ---
1303    100-000-00001-000  DCM     IPLIM     IS-NR         Active    ---
1305    100-000-00001-000  DCM     SS7IPGW       IS-NR         Active    ---
```

43. Test the presence of the EPAP hosts on the network using the **pass** command with the **ping** parameter.

This command is invoked with a destination (either a hostname or IP address). For example, enter the following command:

```
pass:loc=1107:cmd="ping 192.168.122.100".
pass:loc=1107:cmd="ping 192.168.122.200".
pass:loc=1107:cmd="ping 192.168.123.100".
pass:loc=1107:cmd="ping 192.168.123.200".
```

After successful completion of each command, the system returns output similar to the following:

```
rlghncxa03w 00-06-27 08:30:44 GMT EAGLE 37.5.0
pass: loc=1107: cmd="ping 192.168.122.100"
Command entered at terminal #1.
;
rlghncxa03w 00-06-27 08:30:44 GMT EAGLE 37.5.0
PASS: Command sent to card
;
rlghncxa03w 00-06-27 08:30:44 GMT EAGLE 37.5.0
PING command in progress
;
rlghncxa03w 00-06-27 08:30:46 GMT EAGLE 37.5.0
PING 192.168.122.100: 56 data bytes
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=0.time=5. ms
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=1.time=0. ms
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=2.time=0. ms
----192.168.100.3 PING Statistics----
3 packets transmitted, 3 packets received, 0% packet loss
round-trip (ms) min/avg/max = 0/1/5
PING command complete
```

If the **pass** commands with the **ping** parameter is not successful, verify the the correct connection of the hardware cabling and try again. If the command fails again, contact the Customer Care Center .

44. Repeat Step 30 through Step 43 to add all DSM cards (N+1) to be installed in available slots.

Go to the next step to start replacing TSM cards with DSM cards.

45. Replace TSM card(s) with DSM cards if applicable and add DSM card(s) to the database using Step 46 through Step 68 .

In this procedure, you are removing two existing adjacent TSM cards and replace them with a double-slot DSM card in slots 1101 and 1102.

> **NOTE: When adding DSM cards in an in-service environment, you must take care not to interrupt traffic. Before replacing SCCP cards with DSM cards, first install a VSCCP card in an available double-slot.**

46. Display the TSM cards running the SCCP application in the database using the **rtrv-cardcommand.**

This is an example of the possible output:

```
RLGHNCXA03W 01-10-15 16:34:56 GMT EAGLE 37.5.0
CARD   TYPE            APPL            PORT A LSET  (SLC)  PORT B LSET  (SLC) 1101 ASM SCCP
      --------        (--)    --------             (--) 1102 ASM SCCP
      --------        (--)    --------               (--)
1103   ACMENET       STPLAN         --------        (--)    --------               (--)
1104   ACMENET       GLS               --------        (--)    --------               (--)
1105   LIMOCU          CCS7ITU        ls300001        (00)    --------               (--)
1106   LIMOCU          CCS7ITU        ls400001        (00)    --------               (--)
1107   DSM               VSCCP          ls300001          (00)      --------
(--)
1113   MCAP              OAM
1114   TDM
```

```
1115   MCAP              OAM
1116   TDM
1117   MDAL
1201   LIMDS0          SS7ANSI         lsn1              (00)      lsn2               (01)
1202   LIMV35          SS7GX25         lsngwy               (00)     --------
(--)
1203   LIMV35          SS7ANSI        lsn2                  (00)     lsn1
(01)
1204   LIMATM        ATMANSI       atmgwy              (00)     --------                 (--)
1205   DCM             IPLIM             ipgwy1              (00)     ipgwy3
(01)
1207   DCM             SS7IPGW        ipgwy2              (00)     --------
(--)
1303   DCM             IPLIM             ipgwy1              (00)    ipgwy3
(01)
1305   DCM             SS7IPGW         ipgwy4              (00)    --------
(--)
```

Determine the cards to be removed from the database. In this procedure, you will remove the SCCP cards in card locations **1101 and 1102**.

47. Display the SCCP cards that are in service with the **rept-stat-card:stat=nr** command.

For this example, enter the following command:

```
rept-stat-card:stat=nr
```

This is an example of the possible output:

```
RLGHNCXA03W 01-10-27 16:43:42 GMT  EAGLE 37.5.0
CARD  VERSION           TYPE        APPL        PST        SST      AST 1101 100-000-00003-000
ASM SCCP
    IS-NR      Active    --- 1102 100-000-00003-000 ASM SCCP
     IS-NR      Active    ---
1103  100-000-00003-000  ACMENET STPLAN           IS-NR      Active    ---
1104  100-000-00003-000  ACMENET GLS           IS-NR      Active    ---
1105  100-000-00003-000  LIMOCU  CCS7ITU          IS-NR      Active    ---
1106  100-000-00003-000  LIMOCU  CCS7ITU          IS-NR      Active    ---
1107  100-000-00003-000  DSM     VSCCP            IS-NR      Active    ---
1113  100-000-00002-000  MCAP    OAM           IS-NR      Active    ---
1114  100-000-00002-000  TDM                   IS-NR      Active    ---
1115  100-000-00002-000  MCAP    OAM           IS-NR      Active    ---
1116  100-000-00002-000  TDM                   IS-NR      Active    ---
1117  100-000-00002-000  MDAL                     IS-NR      Active    ---
1201  100-000-00003-000  LIMDS0  SS7ANSI          IS-NR      Active    ---
1202  100-000-00002-000  LIMV35  SS7GX25          IS-NR      Active    ---
1203  100-000-00003-000  LIMV35  SS7ANSI          IS-NR      Active    ---
1204  100-000-00003-000  LIMATM  ATMANSI          IS-NR      Active    ---
1205  100-000-00001-000  DCM     IPLIM         IS-NR      Active    ---
1207  100-000-00001-000  DCM     SS7IPGW          IS-NR      Active    ---
1303  100-000-00001-000  DCM     IPLIM         IS-NR      Active    ---
1305  100-000-00001-000  DCM     SS7IPGW          IS-NR      Active    ---
```

48. Inhibit the SCCP cards using the **inh-card** command and specifying the card locations.

inh-card:loc=1101

inh-card:loc=1102

When each command has successfully completed, this message appears:

```
RLGHNCXA03W 01-10-12 09:12:36 GMT  EAGLE 37.5.0
Card has been inhibited.
```

49. Verify that the SCCP cards are in the Out-of-Service Maintenance-Disabled (OOS-MT-DSBLD) state with the **rept-stat-card** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-27 16:43:42 GMT  EAGLE 37.5.0
CARD  VERSION           TYPE           APPL      PST          SST       AST
1101  100-000-00003-000  ASM            SCCP      OOS-MT-DSBLD    Isolated  ---
```

```
1102  100-000-00003-000  ASM            SCCP      OOS-MT-DSBLD    Isolated  ---
1103  100-000-00002-000  ACMENET        STPLAN  IS-NR         Active    ---
1104  100-000-00002-000  ACMENET        STPLAN  IS-NR         Active    ---
1105  100-000-00003-000  LIMOCU         CCS7ITU IS-NR         Active    ---
1106  100-000-00003-000  LIMOCU         CCS7ITU IS-NR         Active    ---
1107  100-000-00003-000  DSM            VSCCP    IS-NR         Active    ---
1113  100-000-00002-000  MCAP           OAM       IS-NR         Active    ---
1114  100-000-00002-000  TDM               IS-NR         Active    ---
1115  100-000-00002-000  MCAP           OAM        IS-NR           Active    ---
1116  100-000-00002-000  TDM                  IS-NR         Active    ---
1117  100-000-00002-000  MDAL                    IS-NR         Active    ---
1201  100-000-00003-000  LIMDS0         SS7ANSI   IS-NR         Active    ---
1202  100-000-00002-000  LIMV35         SS7GX25   IS-NR         Active    ---
1203  100-000-00003-000  LIMV35         SS7ANSI   IS-NR         Active    ---
1204  100-000-00003-000  LIMATM         ATMANSI    IS-NR        Active    ---
1205  100-000-00001-000  DCM            IPLIM     IS-NR         Active    ---
1207  100-000-00001-000  DCM            SS7IPGW   IS-NR         Active    ---
1303  100-000-00001-000  DCM            IPLIM     IS-NR         Active    ---
1305  100-000-00001-000  DCM            SS7IPGW   IS-NR         Active    ---
```

50. Remove the SCCP cards from the database using the **dlt-card** command.

The **dlt-card** command has only one parameter, **loc**, which is the location of the card.

For this example, enter these commands:

```
dlt-card:loc=1101
dlt-card:loc=1102
```

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-12 09:12:36 GMT  EAGLE 37.5.0
DLT-CARD: MASP A - COMPLTD
```

51. Verify that the SCCP cards are removed from the database using the **rtrv-card** command and specifying the cards that were removed in Step 50 .

For this example, enter these commands:

```
rtrv-card:loc=1101
rtrv-card:loc=1102
```

After successful completion of this command, the system returns the following message:

```
E2144 Cmd Rej: Location invalid for hardware configuration
```

52. Locate the TSM card to be removed from the shelf.

Because the TSM card takes just one slot and the DSM card requires two slots, the DSM card must be installed in an odd slot that is adjacent to an even slot on its right side. In this procedure, you will remove two TSM cards from slots 1101 and 1102 to make space for one DSM card.

a. Push the inject/eject clamps outward from the card's faceplate (top clamp in the "UP" position, bottom clamp in the "DOWN" position). Pull the levers away from the shelf until they are parallel to the floor.

Gently pull the card towards you until the card clears the shelf.

Figure 4-2. Push Inject/Eject Clamps Outward

b. Place the card you have removed in an electrostatic discharge (ESD) protective container, or place the card in the spare card storage shelf.

53. Repeat Step 52 to remove the second TSM card.

54. Install the DSM card in slots 1101 and 1102.

a. Open the ejector levers on the DSM card.

Carefully align the card's edges with the top and bottom card guides. Then push the card along the length of the card guides until the rear connectors on the card engage the mating connectors on the target shelf backplane.

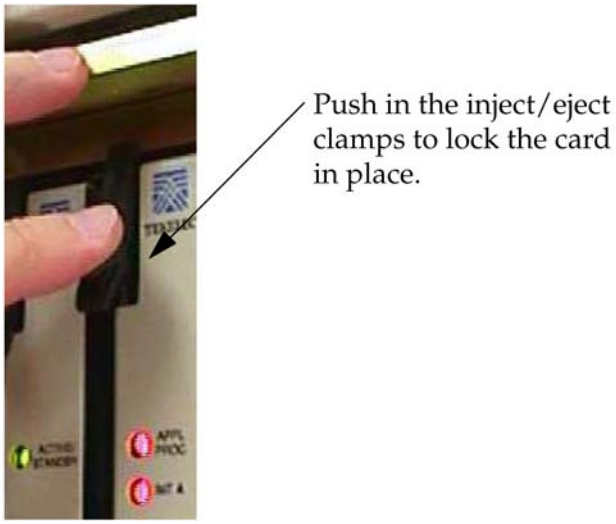
b. Press the left edge of the card's faceplate using constant pressure until you feel the card's progress cease.

WARNING: Do not impact the faceplate in order to mate the connectors. Any impact to the card's faceplate can damage the faceplate, the pins, or the connectors.

c. Push in the top and bottom inject/eject clamps.

This locks the card in place and ensures a strong connection with the pins on the target shelf backplane.

Figure 4-3. Push in Inject/Eject Clamps



d. Verify that both IMT bus LEDs are green.

e. Install the cabling required to connect the DSM card to the MPS.
Refer to the *Installation Manual* for details.

55. Add the DSM card to the database and assign the VSCCP application using the **ent-card** command.

For this example, enter this command:

```
ent-card:loc=1101:type=dsm:appl=vsccp
```

where:

:loc
Specifies the slot number for the card. The slot number must be an odd number.
:type
Specifies that the card is a DSM card.
:appl
Specifies that the application is VSCCP.

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-12 09:12:36 GMT  EAGLE 37.5.0
ENT-CARD: MASP A - COMPLTD
```

56. Display the new VSCCP card using the **rtrv-card** command with the card location specified.

For this example, enter this command:

```
rtrv-card:loc=1101
```

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 09:12:36 GMT EAGLE 37.5.0
CARD   TYPE          APPL      PORT A LSET (SLC)   PORT B LSET (SLC) 1101 DSM VSCCP
     --------    (--)    --------    (--)
```

57. Display the current link parameters associated with the VSCCP card in the database by entering the **rtrv-ip-lnk** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 21:14:37 GMT EAGLE 37.5.0
LOC PORT IPADDR          SUBMASK    DUPLEX SPEED MACTYPE AUTO MCAST
1101 A   ------------    ---------- HALF   10    DIX     NO   NO
1101 B   ------------    ---------- HALF   10    DIX     NO   NO
1107 A   ------------    ---------- HALF   10    DIX     NO   NO
1107 B   ------------    ---------- HALF   10    DIX     NO   NO
```

58. Change the link parameters associated with the VSCCP card in the database using the chg-ip-lnk command.

For this example, enter these commands:

chg-ip-lnk:loc=1101:port=a:duplex=half:ipaddrr=192.168.122.2 :mactype=dix:speed=100:mcast=yes:submask=255.255.255.0

chg-ip-lnk:loc=1101:port=b:duplex=half:ipaddrr=192.168.123.2 :mactype=dix:speed=10:mcast=yes:submask=255.255.255.0

where:

:loc

The card location of the card within the EAGLE 5 ISS.

:port

The port ID. The port parameter of the chg-ip-lnk command specifies the physical interface of the DSM card.

:ipaddr

IP address assigned to the port. This is a TCP/IP address expressed in standard "dot notation." IP addresses consist of the system's network number and the machine's unique host number.

:duplex

This is the mode of operation of the interface.

:speed

This is interface bandwidth in megabits per second. The speed is either 100 Mbps for main DSM network or 10 Mbps for backup DSM network.

:mactype

This is the Media Access Control Type of the interface. Specify dix for the Digital/Inter/Xerox de facto standard for the Ethernet.

:mcast

This is the Multicast Control of the interface.

:submask

The subnet mask of the IP interface, in the form of an IP address with a restricted range of values.

When this command has successfully completed, the following message should appear.

```
RLGHNCXA03W 01-10-30 21:18:37 GMT EAGLE 37.5.0
CHG-IP-LNK: MASP A - COMPLTD
```

59. Verify the new link parameters associated with the VSCCP card in the database by entering the **rtrv-ip-lnk** command.

The following is an example of the possible output.

```
RLGHNCXA03W 01-10-30 21:14:37 GMT EAGLE 37.5.0
LOC  PORT IPADDR        SUBMASK       DUPLEX SPEED MACTYPE AUTO MCAST 1101 A    192.168.122.2
255.255.255.0 HALF   100   DIX     NO   YES
1101 B    192.168.123.2 255.255.255.0 HALF   10    DIX     NO   YES
1107 A    192.168.122.1 255.255.255.0 HALF   100   DIX     NO   YES
1107 B    192.168.123.1 255.255.255.0 HALF   10    DIX     NO   YES
```

60. Display the current IP host information in the database by entering the **rtrv-ip-host** command.

The following is an example of the possible output.

```
RLGHNCXA03W 01-10-30 21:17:37 GMT EAGLE 37.5.0
IPADDR          HOST
192.1.1.32      KC_HLR2
192.1.1.50      DN_MSC1
192.1.1.52      DN_MSC2
```

```
192.168.122.1   VSCCP_1107_A
192.168.123.1   VSCCP_1107_B
```

61. Add the host name and IP address for each VSCCP link using the **ent-ip-host** command.

For example, enter these commands:

```
ent-ip-host:host=vsccp_1101_a:ipaddr=192.168.122.2
ent-ip-host:host=vsccp_1101_b:ipaddr=192.168.123.2
```

where:

:host
Specifies the host name. Each VSCCP link must be specified separately.
:ipaddr
Specifies the IP network address for each EPAP. The first three octets of the IP address must be the same as MPS A and B ports, respectively. The fourth octet identifies the DSM card and must have a a unique octet identifier for the card's IP address; we recommend numbering the DSM cards sequentially, using values 1 to 25. (This example shows the assignment of the second DSM card.)

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-30 21:18:37 GMT EAGLE 37.5.0
ENT-IP-HOST: MASP A - COMPLTD
```

62. Verify the new IP host information in the database by entering the **rtrv-ip-host** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 21:19:37 GMT EAGLE 37.5.0
IPADDR          HOST
192.1.1.32        KC_HLR2
192.1.1.50        DN_MSC1
192.1.1.52        DN_MSC2
192.168.122.1   VSCCP_1107_A
192.168.123.1   VSCCP_1107_B
192.168.122.2   VSCCP_1101_A
192.168.123.2   VSCCP_1101_B
```

NOTE: Most G-Flex customer private networks do not require setting up a default router for the DSM card. However, if your network configuration does require a default router to connect the DSM card communication to the EPAP, then only one default router is assignable to each DSM card. Assign the default router address to each DSM card as shown in this step.

63. Enter local domain and IP router address for the VSCCP card using the **chg-ip-card** command.

For this example, enter this command:

```
chg-ip-card:loc=1107:domain=nc.tekelec.com
:defrouter=192.168.122.250
```

where:

:loc
The card location of the card within the EAGLE 5 ISS.
:domain
The domain name of domain server.
:defrouter
Default router address. The IP address for default router. This is a TCP/IP address expressed in standard "dot notation". IP addresses consist of the system's network number and the machine's unique host number.

After successful completion of this command, the system returns the following message:

```
RLGHNCXA03W 01-10-30 21:20:37 GMT EAGLE 37.5.0
CHG-IP-CARD: MASP A - COMPLTD
```

64. Verify the local domain and IP router address associated with the VSCCP card in the database by entering the **rtrv-ip-card** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-30 21:21:37 GMT EAGLE 37.5.0
LOC  1101
     SRCHORDR  LOCAL
     DNSA      -----------
     DNSB      -----------
     DEFROUTER  192.168.122.250
          DOMAIN     NC.TEKELEC.COM
```

65. Boot the DSM card that was inhibited in Step 48 in TSM emulation mode by using the **alw-card** command.

This message appears:

```
RLGHNCXA03W  01-10-30 21:20:37 GMT EAGLE 37.5.0
Card has been allowed.
```

66. Verify the in-service normal (IS-NR) status of the VSCCP card using the **rept-stat-card** command.

This is an example of the possible output:

```
RLGHNCXA03W 01-10-27 16:43:42 GMT  EAGLE 37.5.0
CARD  VERSION            TYPE    APPL           PST           SST       AST
1101  100-000-00003-000  DSM     VSCCP            IS-NR       Active    ---
1103  100-000-00002-000  ACMENET STPLAN           IS-NR       Active    ---
1104  100-000-00003-000  ASM     GLS              IS-NR       Active    ---
1105  100-000-00003-000  LIMOCU  CCS7ITU          IS-NR       Active    ---
1106  100-000-00003-000  LIMOCU  CCS7ITU          IS-NR       Active    ---
1107  100-000-00003-000  DSM     VSCCP            IS-NR       Active    ---
1113  100-000-00002-000  MCAP    OAM              IS-NR       Active    ---
1114  100-000-00002-000  TDM                    IS-NR       Active    ---
1115  100-000-00002-000  MCAP    OAM            IS-NR       Active    ---
1116  100-000-00002-000  TDM                    IS-NR       Active    ---
1117  100-000-00002-000  MDAL                       IS-NR       Active    ---
1201  100-000-00003-000  LIMDS0  SS7ANSI          IS-NR       Active    ---
1202  100-000-00002-000  LIMV35  SS7GX25          IS-NR       Active    ---
1203  100-000-00003-000  LIMV35  SS7ANSI          IS-NR       Active    ---
1204  100-000-00003-000  LIMATM  ATMANSI          IS-NR       Active    ---
1205  100-000-00001-000  DCM     IPLIM          IS-NR       Active    ---
1207  100-000-00001-000  DCM     SS7IPGW          IS-NR       Active    ---
1303  100-000-00001-000  DCM     IPLIM            IS-NR       Active    ---
1305  100-000-00001-000  DCM     SS7IPGW          IS-NR       Active    ---
```

67. Test the presence of the EPAP hosts on the network using the **pass** command with the **ping** parameter.

This command is invoked with a destination (either a hostname or IP address).

For example, enter the following command:

```
pass:loc=1101:cmd=”ping 192.168.122.100”.
pass:loc=1101:cmd=”ping 192.168.122.200”.
pass:loc=1101:cmd=”ping 192.168.123.100”.
pass:loc=1101:cmd=”ping 192.168.123.200”.
```

After successful completion of each command, the system returns output similar to the following:

```
rlghncxa03w 00-06-27 08:30:44 GMT EAGLE 37.5.0
pass: loc=1101: cmd="ping 192.168.122.100"
Command entered at terminal #1.
;
rlghncxa03w 00-06-27 08:30:44 GMT EAGLE 37.5.0
PASS: Command sent to card
```

```
;
rlghncxa03w 00-06-27 08:30:44 GMT EAGLE 37.5.0
PING command in progress
;
rlghncxa03w 00-06-27 08:30:46 GMT EAGLE 37.5.0
PING 192.168.122.100: 56 data bytes
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=0.time=5. ms
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=1.time=0. ms
64 bytes from tekral.nc.tekelec.com (192.168.122.100):icmp_seq=2.time=0. ms
----192.168.100.3 PING Statistics----
3 packets transmitted, 3 packets received, 0% packet loss
round-trip (ms) min/avg/max = 0/1/5
PING command complete
```

If the **pass** command with the **ping** parameter is not successful, verify the the correct connection of the hardware cabling and try again. If the command fails again, contact the Customer Care Center .

68. Repeat Step 46 through Step 67 to replace all adjacent TSM cards identified in the prerequisites and to be replaced with DSM cards.

69. Repeat Step 46 through Step 52 to inhibit any remaining TSM cards running the SCCP application and remove them from database and shelf.

NOTE : The G-Flex feature cannot be turned on until TSM cards running the SCCP application are removed from the system.

CAUTION: At this point in the procedure, contact the Customer Care Center for assistance in completing this G-Flex activation procedure). Do not proceed without consulting with the Customer Care Center .

70. Turn on the G-Flex feature using Step 72 through Step 86 .

71. Enable the G-Flex feature using the following command:

```
enable-ctrl-feat:partnum=893021901:fak=<fak>
```

72. Turn on the G-Flex feature using the following command:

```
chg-ctrl-feat:partnum=893021901:status=on
```

The system returns the following output:

```
rlghncxa03w 01-10-11 11:34:04 GMT EAGLE 37.5.0
chg-ctrl-feat: MASP A - COMPLD
```

73. Enable the G-Flex MAP Layer Routing feature using the following command:

```
enable-ctrl-feat:partnum=893021701:fak=<fak>
```

74. Turn the G-Flex MAP Layer Routing Feature ON by entering the following command:

```
chg-ctrl-feat:partnum=893021701:status=on
```

75. Turn the G-Flex MAP Layer Routing option ON by entering the following command:

```
chg-gsmopts:gflexmaplayerrtg=on
```

76. Enter the default country code (CC) and default network destination code (NDC) to convert the nature of address indicator (NAI) of MSISDNs to the international format (**nai=intl**) with the **chg-stpopts** command.

Enter the command by network type. For an ANSI network, for example, enter the following command:

```
chg-stpopts:defcc=1:defndc=972
```

For an ITU-I or ITU-N network, for example, enter the following command:

```
chg-stpopts:defcc=1:defndc=38:dsmaud=on:npcfmti=2-9-2-1
```

where:

:defcc
The default country code.

:defndc
The default network destination code.
:dsmaud
The DSM audit running state (*on* or *off*).
:npcfmt1
The ITU National Point Code Format Identifier, which identifies how the ITU-N point code is entered into the database and how it is displayed in all EAGLE 5 ISS outputs. This code is a 14-bit integer.

After successful completion of this command, the system returns the following output:

```
rlghncxa03w 01-10-07 00:57:31 GMT EAGLE 37.5.0
CHG-STPOPTS: MASP A - COMPLTD
```

77. Verify the new country code and network destination code using the **rtrv-stpopts** command.

This is an example of the possible output in an ANSI network:

```
rlghncxa03w 01-10-07 00:57:31 GMT EAGLE 37.5.0
STP OPTIONS
----------------------
DEFCC                1
DEFNDC             972
```

This is an example of the possible output in an ITU-I or ITU-N network:

```
rlghncxa03w 01-10-07 00:57:31 GMT EAGLE 37.5.0
STP OPTIONS
-----------------------
NPCFMTI         2-9-2-1
DEFCC                1
DEFNDC              38
DSMAUD              on
```

78. Change the default mobile country code (MCC) and default mobile network destination code (MNDC) to convert the nature of address indicator (NAI) of IMSIs to the international format (**nai=intl**).

Enter the **chg-gsmopts** command by network type. For an ANSI network, for example, enter the following command:

```
chg-gsmopts:ccnc=1972:defmcc=919:defmnc=6666:mccmnc=9196666
```

For an ITU/N network, for example, enter the following command:

```
chg-gsmopts:defmcc=214:defmnc=34:ccnc=334:mccmnc=22435
```

where:

:ccnc
Defines the E214 country code and network code.
:defmcc
Defines the default GSM mobile country code.
:defmnc
Defines the default GSM mobile network code.
:mccmnc
Defines the E212 mobile country code and mobile network code.

The system returns the following message:

```
rlghncxa03w 00-08-20 09:04:14 GMT EAGLE 37.5.0
CHG-GSMOPTS: MASP A - COMPLTD
```

79. Verify the changes using the **rtrv-gsmopts** command.

This command displays all GSM (Global System for Mobile Telecommunication) system options from the database.

This is an example of the possible output in an ANSI network:

```
rlghncxa03w 00-08-20 09:04:14 GMT EAGLE 37.5.0
GSMOPT OPTIONS
----------------------
DEFMCC=919
DEFMNC=6666
CCNC=1977
MCCMNC=9196666
```

This is an example of the possible output in an ITU-I or ITU-N network:

```
rlghncxa03w 00-08-20 09:04:14 GMT EAGLE 37.5.0
GSMOPT OPTIONS
----------------------
DEFMCC=214
DEFMNC=34
CCNC=334
MCCMNC=22435
```

80. Use the **ent-srvsel** command to enter the G-Flex service selectors by network type.

This command assigns applicable service selectors required to specify the service entry for DSM services.

For an ANSI network, for example, the following commands show how to set up service selector combinations for G-Flex services:

```
ent-srvsel:gtia=2:tt=10:snp=e164:snai=intl:serv:gflex
ent-srvsel:gtia=2:tt=11:snp=e164:snai=natl:serv:gflex
ent-srvsel:gtia=2:tt=12:snp=e164:snai=sub:serv:gflex
```

For an ITU-I network, for example, enter the following command:

```
ent-srvsel:gtii=4:tt=1:snp=e164:snai=intl:serv:gflex:nai=intl
:np=e164
```

where:

:gti/gtia/gtii/gtin
Specifies the global title translation indicator (2 = ANSI, ITU; 4 = ITU). **:tt** - specifies the translation type.

:snp
Defines the service numbering plan (e164, e212, or e214).

:snai
Specifies the international Service Nature of Address Indicator.

:serv
Specifies the service feature.

:nai
Specifies the nature of address indicator.

:np
Specifies the numbering plan.

The system returns the following message:

```
rlghncxa03w  01-10-07 00:28:31 GMT EAGLE 37.5.0
Service Selector table is (114 of 1024) 11% full
ENT-SRVSEL:  MASP A - COMPLTD
```

81. Verify the changes using the **rtrv-srvsel** command.

This command retrieves a list of administered service selector combinations. Avoid lengthy output by filtering the list using various parameter combinations. (The selector table can have over 1,000 entries.)

For example, enter this command:

```
rtrv-srvsel:gtia=2
```

```
rtrv-srvsel:gtii=2
rtrv-srvsel:gtii=4
```

After successful completion of this command, the system returns output similar to the following:

```
rlghncxa03w  01-10-28  00:29:31 GMT EAGLE 37.5.0
GTIA  TT  NP     NAI   NPV  NAIV  SNP   SNAI   SERV
2     10  ---    ---   ---  ---   e164  intl   gflex
2     11  ---    ---   ---  ---   e164  natl   gflex
2     12  ---    ---   ---  ---   e164  sub    gflex

rlghncxa03w  01-10-28  00:29:31 GMT EAGLE 37.5.0
GTII  TT  NP     NAI   NPV  NAIV  SNP   SNAI   SERV
2     0   e164   intl  ---  ---   e164  intl   gflex
2     1   e164   intl  ---  ---   e164  intl   gflex

rlghncxa03w  01-10-28  00:29:31 GMT EAGLE 37.5.0
GTII  TT  NP     NAI   NPV  NAIV  SNP   SNAI   SERV
4     1   e164   intl  ---  ---   e164  intl   gflex
4     2   e164   intl  ---  ---   e164  intl   gflex
```

CAUTION: When you have an in-service environment and you are replacing TSM cards with DSM cards, initialize one DSM card at a time. Verify its return to IS-NR state before initializing another DSM card. This precaution keeps cards in service and precludes an interruption of SCCP services.

NOTE: GTT, EGTT, and VGTT traffic are routed based on the global titles in the OAM database while G-Flex, G-Port, and INP traffic is routed based on the global title in the RTDB. Rebooting a DSM card running the VSCCP application causes both the OAM and RTDB databases on the DSM card to reload.

82. Reload a DSM card using the **`init-card`** command.

For example, enter this command:

```
init-card:loc=1101
```

The system returns the following message:

```
rlghncxa03w  01-10-07 00:28:31 GMT EAGLE 37.5.0
Command entered at terminal #3.
Init Card command issued to card 1101
```

83. Verify its return to IS-NR state with the **`rept-stat-card`** command.

(Wait until in-service state is restored.)

This is an example of the possible output:

```
RLGHNCXA03W 01-10-07 00:30:42 GMT  EAGLE 37.5.0
CARD  VERSION              TYPE     APPL     PST      SST     AST 1101 100-000-00003-000 DSM
VSCCP IS-NR   Active  ---
1103  100-000-00002-000    ACMENET  STPLAN   IS-NR    Active  ---
1104  100-000-00003-000    ASM      GLS      IS-NR    Active  ---
1105  100-000-00003-000    LIMOCU   CCS7ITU  IS-NR    Active  ---
1106  100-000-00003-000    LIMOCU   CCS7ITU  IS-NR    Active  ---
1107  100-000-00003-000    DSM      VSCCP    IS-NR    Active  ---
1113  100-000-00002-000    MCAP     OAM      IS-NR    Active  ---
1114  100-000-00002-000    TDM               IS-NR    Active  ---
1115  100-000-00002-000    MCAP     OAM      IS-NR    Active  ---
1116  100-000-00002-000    TDM               IS-NR    Active  ---
1117  100-000-00002-000    MDAL              IS-NR    Active  ---
1201  100-000-00003-000    LIMDS0   SS7ANSI  IS-NR    Active  ---
1202  100-000-00002-000    LIMV35   SS7GX25  IS-NR    Active  ---
1203  100-000-00003-000    LIMV35   SS7ANSI  IS-NR    Active  ---
1204  100-000-00003-000    LIMATM   ATMANSI  IS-NR    Active  ---
1205  100-000-00001-000    DCM      IPLIM    IS-NR    Active  ---
1207  100-000-00001-000    DCM      SS7IPGW  IS-NR    Active  ---
```

```
1303  100-000-00001-000    DCM      IPLIM    IS-NR    Active  ---
1305  100-000-00001-000    DCM      SS7IPGW  IS-NR    Active  ---
```

84. After the **init-card** and the **rept-stat-card** commands show that service is successfully restored, repeat Step 82 and Step 83 for each DSM card in your system.

85. Enter the **chg-sccp-serv:serv=gflex:state=online** command to set the G-Flex service state online.

86. Confirm that essential activation procedures are successful.

a. Use **rept-stat-sccp** to verify all your DSM cards are loaded and are IS-NR (in-service normal) status.

b. Use **rept-stat-mps** to verify all your DSM cards and the EPAP are connected and operational.

c. Use **rept-stat-db:display=all** to verify database levels are identical for the EPAPPDB and RTDB and the RTDBs on the DSM cards.

The G-Flex feature is now installed, activated, and ready for operations.

The 1100 TPS/DSM for ITU NP Feature

This procedure is used to enable and turn on the 1100 TPS/DSM for ITU NP feature. This feature provides up to 26,400 transactions per second when the maximum number of DSM cards are installed in the EAGLE 5 ISS and one or more EPAP-related features (such as G-Port, G-Flex, A-Port, INP, EIR, Migration) are enabled and turned on.

This feature can be enabled only for DSM cards that are rated at 850 transactions per second (TPS).

CAUTION: The increase of the DSM card capacity, 1100 TPS per DSM card, assumes incoming traffic consists of at least 30% of GTT routed traffic that does not require EPAP based lookup. If more than 70% of incoming traffic requires EPAP based lookup, Group Ticket Voucher (TVG) may shutdown and overall TVG capacity of 1100 for the card may not be met.

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

The **enable-ctrl-feat** command enables the 1100 TPS/DSM for ITU NP feature by inputting the feature's access key and the feature's part number with these parameters:

:fak
The feature access key provided by Tekelec. The feature access key contains 13 alphanumeric characters and is not case sensitive.

:partnum
The Tekelec-issued part number of the 1100 TPS/DSM for ITU NP feature, 893018001.

After the 1100 TPS/DSM for ITU NP feature has been enabled, the feature must be turned on with the **chg-ctrl-feat** command. The **chg-ctrl-feat** command uses these parameters:

:partnum
The Tekelec-issued part number of the 1100 TPS/DSM or ITU NP feature, 893019101.

:status=on
Used to turn the 1100 TPS/DSM for ITU NP feature on.

Activating the 1100 TPS/DSM for ITU NP Feature

Before you start:

The 1100 TPS/DSM for ITU NP feature cannot be enabled with a temporary feature access key.

The 1100 TPS/DSM for ITU NP feature cannot be enabled if:

- The EAGLE 5 ISS does not contain any DSM cards.
- The LNP feature is enabled.

  The status of the LNP feature is shown with the **rtrv-ctrl-feat** command output.

- The ANSI G-Flex STP Option is enabled.

  The status of the ANSI G-Flex STP Option is shown in the **rtrv-stpopts** command output.

- The GTT feature is not turned on.

  The status of the GTT feature is shown in the **rtrv-feat** command output.

The **enable-ctrl-feat** command requires that the database contain a valid serial number for the EAGLE 5 ISS, and that this serial number is locked. This can be verified with the **rtrv-serial-num** command. The EAGLE 5 ISS is shipped with a serial number in the database, but the serial number is not locked. The serial number can be changed, if necessary, and locked once the EAGLE 5 ISS is on-site, with the **ent-serial-num** command. The **ent-serial-num** command uses these parameters.

:serial

The serial number assigned to the EAGLE 5 ISS. The serial number is not case sensitive.

:lock

Specifies whether or not the serial number is locked. This parameter has only one value, yes, which locks the serial number. Once the serial number is locked, it cannot be changed.

NOTE: To enter and lock the EAGLE 5 ISS's serial number, the ent-serial-num command must be entered twice, once to add the correct serial number to the database with the serial parameter, then again with the serial and the lock=yes parameters to lock the serial number. Verify that the serial number in the database is correct before locking the serial number. The serial number can be found on a label affixed to the control shelf (shelf 1100).

The 1100 TPS/DSM for ITU NP feature increases the processing capacity of SCCP traffic for an EAGLE 5 ISS processing EPAP-based traffic to 26,400 transactions per second. To achieve this increase in SCCP processing capacity, a maximum of 25 DSM cards must be provisioned and installed in the EAGLE 5 ISS.

1. Display the status of the 1100 TPS/DSM feature by entering the **rtrv-ctrl-feat** command.

The following is an example of the possible output:

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0

The following features have been permanently enabled:
   Feature Name              Partnum    Status  Quantity
   TPS                       893000110  on      1000
   ISUP Normalization        893000201  on      ----
   Prepaid SMS Intercept Ph1 893006701  on      ----
   MNP Circ Route Prevent    893007001  on      ----
   1100 TPS/DSM for ITU NP   893018001  on      ----

   The following features have been temporarily enabled:
   Feature Name   Partnum    Status  Quantity  Trial Period Left
   TPS            893000140  on      4000      20 days 8 hrs 57 mins

   The following features have expired temporary keys:
   Feature Name              Part Num
   OnOffFeatV                893492401
```

2. Based on the output from the previous step, do one of the following:

   - If the **rtrv-ctrl-feat** output shows that the 1100 TPS/DSM for ITU NP feature is enabled, shown by the entry 1100 TPS/DSM for ITU NP, and its status is **on**, no further action is necessary.
   - If the feature is enabled, and its status is **off**, skip Step 3 through Step 12 , and go to Step 13 .
   - If the rtrv-ctrl-feat output shows that the LNP feature is enabled, this procedure cannot be performed. The 1100 TPS/DSM for ITU NP feature cannot be enabled if the LNP feature is enabled.
   - If the 1100 TPS/DSM for ITU NP and LNP features are not enabled, go to Step 3 .

3. Determine whether the G-Flex feature is turned on by entering the **rtrv-ctrl-feat**.

   (If the G-Flex feature is off, then the ANSIGFLEX option is not displayed in the **rtrv-stpopts** output in Step 4 .)

   The status of the G-Flex feature is shown by the entry **G-Flex** in the **rtrv-ctrl-feat** output.

   - If the G-Flex feature is turned off, skip to Step 5 .
   - If the G-Flex feature is turned on, go to Step 4 .

4. Verify that the ANSI G-Flex option is not enabled or turned on by entering the **rtrv-stpopts** command.

   The 1100 TPS/DSM ITU NP feature cannot be enabled if the ANSI G-Flex option is turned on.

   The ANSI G-Flex option is shown by the entry **ANSIGFLEX** in the **rtrv-stpopts** output. If the **ANSIGFLEX** entry is displayed in the **rtrv-stpopts** output, both the G-Flex and the GTT features are turned on.

   - If the ANSIGFLEX value is **yes** in the **rtrv-stpopts** output , the ANSI G-Flex option is enabled and the remainder of this procedure cannot be performed.
   - If the ANSIGFLEX value is **no** in the **rtrv-stpopts** output, the ANSI G-Flex option is *not* enabled. Skip Step 5 and go to Step 6 .

5. Determine whether the GTT feature is turned on by examining the output of the **rtrv-feat** command.

   The 1100 TPS/DSM ITU NP feature cannot be enabled unless the GTT feature is turned on. The GTT feature is shown by the entry **GTT** in the **rtrv-feat** output executed in Step 3 .

   - If the GTT feature is turned on, go to Step 6 .
   - If the GTT feature is turned off, perform ”Adding an SCCP card” in the *Database Administration Manual - Global Title Translation* manual to turn the GTT feature on and to add the required number of DSM cards to the database. After ”Adding an SCCP card” has been performed, go to Step 11 (skip Step 6 through Step 10).

6. Verify the number of DSM cards that are provisioned in the database using the **rept-stat-gpl:gpl=sccphc** command.

   This is an example of the possible output.

```
rlghncxa03w 07-05-01 11:40:26 GMT EAGLE5 37.5.0
GPL    CARD   RUNNING      APPROVED     TRIAL
VSCCCP 1201  126-002-000  126-002-000  126-003-000
VSCCCP 1203  126-002-000  126-002-000  126-003-000
VSCCCP 1207  126-002-000  126-002-000  126-003-000
VSCCCP 1213  126-002-000  126-002-000  126-003-000
VSCCCP 1215  126-002-000  126-002-000  126-003-000
VSCCCP 1305  126-002-000  126-002-000  126-003-000
VSCCCP 1313  126-002-000  126-002-000  126-003-000
```

```
VSCCCP 2103  126-002-000  126-002-000  126-003-000
Command Completed
```

7. Based on the output shown in Step 6, do one of the following:

- If the required number of DSM cards are provisioned in the database, go to Step 8.
- If the required number of DSM cards are not provisioned in the database, perform "Adding an SCCP card" in the *Database Administration Manual - Global Title Translation* to add the required number of DSM cards to the database. After "Adding an SCCP card" has been performed, go to Step 8.

8. Display the serial number in the database with the **rtrv-serial-num** command.

This is an example of the possible output.

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0

System serial number = nt00001231

System serial number is not locked
.
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0 Command Completed
```

9. Compare the actual serial number (located on a label affixed to the control shelf, shelf 1100) to the output shown in Step 8, and do one of the following:

- If the serial number is correct and locked, go to Step 13 (skip Step 10 through Step 12)
- If the serial number is correct but not locked, go to Step 12 (skip Step 10 and Step 11).
- If the serial number is not correct, but is locked, this feature cannot be enabled and the remainder of this procedure cannot be performed. Contact the Customer Care Center to get an incorrect and locked serial number changed.

10. Enter the correct serial number into the database using the **ent-serial-num** command with the serial parameter.

For this example, enter this command.

```
ent-serial-num:serial=<EAGLE 5 ISS's correct serial number>
```

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

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0
ENT-SERIAL-NUM: MASP A - COMPLTD
```

11. Verify that the serial number entered into step 7 was entered correctly:

a. Enter the **rtrv-serial-num** command.

This is an example of the possible output.

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0
System serial number = nt00001231

System serial number is not locked.

rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0
Command Completed
```

b. If the serial number was not entered correctly, repeat steps Step 10 and Step 11 and re-enter the correct serial number.

12. Lock the serial number in the database by entering the **ent-serial-num** command with the serial number shown in Step 8 (if the serial number shown in Step 8 is correct) or with the serial number shown in Step 10 (if the serial number was changed in Step 10), and with the **lock=yes** parameter.

For this example, enter this command.

ent-serial-num:serial=<EAGLE 5 ISS's serial number>:lock=yes

When this command has successfully completed, a message similar to the following should appear.

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0
ENT-SERIAL-NUM: MASP A - COMPLTD
```

13. Enable the 1100 TPS/DSM for ITU NP feature with the permanent key by entering the **enable-ctrl-feat** command.

    For this example, enter this command.

    enable-ctrl-feat:partnum=893018001:fak=<1100 TPS/DSM for ITU NP feature access key>

    NOTE: The values for the feature access key (the fak parameter) are provided by Tekelec. If you do not have the feature access key for the 1100 TPS/DSM for ITU NP feature, contact your Tekelec Sales Representative or Account Representative.

    When the **enable-crtl-feat** command has successfully completed, a message similar to the following should appear.

    ```
    rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0
    ENABLE-CTRL-FEAT: MASP B - COMPLTD
    ```

14. Do one of the following:

    - If you do not wish to turn the 1100 TPS/DSM for ITU NP feature on, skip this step and go to Step 16. If you do not turn this feature on, the transaction rate will remain at 850 TPS/DSM.
    - If you do wish to turn on the 1100 TPS/DSM for ITU NP feature, enter the **chg-ctrl-feat** command, specifying the 1100 TPS/DSM for ITU NP feature part number used in Step 13 and the **status=on** parameter and enter the command again as shown in Step 15.

    For this example, enter this command:

    chg-ctrl-feat:partnum=893018001:status=on

    The following output message appears:

    ```
    CAUTION: Rated TPS for this feature supports an engineered GTT traffic mix of no more than 70
    percent EPAP-based traffic. Re-enter the command within 30 seconds to confirm change.
    ```

    CAUTION: If the EPAP-based traffic is higher than 70% of all traffic on the EAGLE 5ISS, the DSM cards performance may not reach 1100 TPS per DSM.

15. Re-enter the chg-ctrl-feat command to turn the feature ON.

    For example **chg-ctrl-feat:partnum=893018001:status=on**

    When this command has successfully completed, a message similar to the following should appear:

    ```
    rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0
    CHG-CTRL-FEAT: MASP B - COMPLTD
    ```

16. Verify the changes by entering the **rtrv-ctrl-feat** command with the 1100 TPS/DSM for ITU NP feature part number specified in Step 14 or Step 15.

    rtrv-ctrl-feat:partnum=893018001

    The following is an example of the possible output.

    ```
    rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0
    The following features have been permanently enabled:
    ```

```
Feature Name              Partnum   Status Quantity
TPS                       893000110 on     1000
ISUP Normalization        893000201 on     ----
Prepaid SMS Intercept Ph1 893006701 on     ----
MNP Circ Route Prevent    893007001 on     ----
1100 TPS/DSM for ITU NP   893018001 on     ----

The following features have been temporarily enabled:
Feature Name              Partnum Status Quantity Trial Period Left
TPS                       893000140 on     4000 20 days 8 hrs 57 mins

The following features have expired temporary keys:
Feature Name               Part Num
OnOffFeatV                 893492401
```

17. Backup the new changes by entering:

chg-db:action=backup:dest=fixed

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.
```

18. If you wish to turn off TPS/DSM for ITU NP feature, enter the **chg-ctrl-feat** command, specifying the 1100 TPS/DSM feature part number used in step Step 14 and the **status=off** parameter.

For this example, enter this command.

chg-ctrl-feat:partnum=893018001:status=off

The following output message appears:

```
CAUTION: This command decreases the total TPS of the SCCP system from 1100 to 850 TPS for each
DSM card.
```

19. Confirm that you wish to turn off TPS/DSM for ITU NP feature by re-entering the command, as shown below, within 30 seconds:

chg-ctrl-feat:partnum=893018001:status=off

When this command has successfully completed, the following message should appear.

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.5.0
CHG-CTRL-FEAT: MASP B - COMPLTD
```

Activating the E5-SM4G Throughput Capacity Feature

This procedure is used to enable and turn on the E5-SM4G Throughput Capacity feature. This feature provides up to 75,000 transactions per second when the maximum number of E5-SM4G cards are installed in the EAGLE 5 ISS and one or more EPAP-related features (such as G-Port, A-Port, G-Flex) are enabled and turned on.

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

The **enable-ctrl-feat** command enables the E5-SM4G Throughput Capacity feature by inputting the feature's access key and the feature's part number with these parameters:

:fak

The feature access key provided by Tekelec. The feature access key contains 13 alphanumeric characters and is not case sensitive.

:partnum

The Tekelec-issued part number of the E5-SM4G Throughput Capacity feature, 893019101.

This feature cannot be enabled with a temporary feature access key.

The E5-SM4G Throughput Capacity feature cannot be enabled if:

- The LNP feature is enabled.
- The STPLAN feature is turned on.
- The GTT feature is not turned on.

The E5-SM4G Throughput Capacity feature cannot be enabled unless the EAGLE 5 ISS contains E5-SM4G cards, and E5-SM4G cards cannot be installed in the EAGLE 5 ISS unless HIPR cards are installed in all shelves containing E5-SM4G cards. Enter the **rept-stat-gpl:gpl=hipr** command to verify if HIPR cards are installed in all shelves containing E5-SM4G cards.

The status of the LNP feature is shown with the **rtrv-ctrl-feat** command output.

The status of the GTT is shown in the **rtrv-feat** command output.

The **enable-ctrl-feat** command requires that the database contain a valid serial number for the EAGLE 5 ISS, and that this serial number is locked. This can be verified with the **rtrv-serial-num** command. The EAGLE 5 ISS is shipped with a serial number in the database, but the serial number is not locked. The serial number can be changed, if necessary, and locked once the EAGLE 5 ISS is on-site, with the **ent-serial-num** command. The **ent-serial-num** command uses these parameters.

:serial

The serial number assigned to the EAGLE 5 ISS. The serial number is not case sensitive.

:lock

Specifies whether or not the serial number is locked. This parameter has only one value, yes, which locks the serial number. Once the serial number is locked, it cannot be changed.

NOTE: To enter and lock the EAGLE 5 ISS's serial number, the ent-serial-num command must be entered twice, once to add the correct serial number to the database with the serial parameter, then again with the serial and the lock=yes parameters to lock the serial number. Before locking the serial number, insure that the serial number in the database is correct. The serial number can be found on a label affixed to the control shelf (shelf 1100).

Once the E5-SM4G Throughput Capacity feature has been enabled, the feature must be turned on with the **chg-ctrl-feat** command. The **chg-ctrl-feat** command uses these parameters:

:partnum

The Tekelec-issued part number of the E5-SM4G Throughput Capacity feature, 893019101

:status=on

used to turn the E5-SM4G Throughput Capacity feature on.

This feature increases the processing capacity of SCCP traffic for an EAGLE 5 ISS processing EPAP-based traffic to 75,000 transactions per second. To achieve this increase in SCCP processing capacity, a maximum of 25 E5-SM4G cards must be provisioned and installed in the EAGLE 5 ISS.

1. Display the status of the E5-SM4G Throughput Capacity feature by entering the **rtrv-ctrl-feat** command.

   Possible output of this command follows:

   ```
   rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
   The following features have been permanently enabled:
   ```

```
Feature Name              Partnum    Status  Quantity
IPGWx Signaling TPS       893012814   on      20000
ISUP Normalization        893000201   on      ----
Command Class Management  893005801   on      ----
Intermed GTT Load Sharing 893006901   off     ----
XGTT Table Expansion      893006101   off     ----
XMAP Table Expansion      893007710   on      3000
Large System # Links      893005910   on      2000
Routesets                 893006401   on      6000
HC-MIM SLK Capacity       893012707   on      64

The following features have been temporarily enabled:

Feature Name              Partnum    Status  Quantity     Trial Period Left
Zero entries found.

The following features have expired temporary keys:

Feature Name              Partnum
Zero entries found.
MNP Circ Route Prevent    893007001 On        ----  20 days 8 hrs 57 mins
```

If the **rtrv-ctrl-feat** output shows that the E5-SM4G Throughput Capacity feature is enabled, shown by the entry E5-SM4G Throughput Cap, and its status is on, no further action is necessary.

If the **rtrv-ctrl-feat** output shows that the LNP feature is enabled, this procedure cannot be performed. The E5-SM4G Throughput Capacity feature cannot be enabled if the LNP feature is enabled.

If the feature is enabled, and its status is off, go to Step 9 (skip Step 2 through Step 8).

If the E5-SM4G Throughput Capacity and LNP features are not enabled, go to Step 2 .

2. Enter the **rtrv-feat** command to verify the status of the STPLAN feature.

To enable the E5-SM4G Throughput Capacity feature, the STPLAN feature cannot be turned on.

The STPLAN feature is shown by the entry LAN in the **rtrv-feat** output.

If the STPLAN feature is turned on, this procedure cannot be performed.

If the STPLAN feature is turned off, go to Step 3

3. Verify that the GTT feature is turned on.

To enable the E5-SM4G Throughput Capacity feature, the GTT feature must be turned on. The GTT feature is shown by the entry GTT in the rtrv-feat output executed in Step 2 . If the GTT feature is turned on, go to Step 4 . If the GTT feature is turned off, perform the "Adding an SCCP card" in the *Database Administration Manual* - Global Title Translation in order to:

- Turn the GTT feature
- add the required number of E5-SM4G cards to the database

After the "Adding an SCCP card" step has been performed, go to Step 5 (skip Step 4).

4. Verify the number of E5-SM4G cards that are provisioned in the database using the **rept-stat-gpl:gpl=sccphc** command.

This is an example of the possible output.

```
rlghncxa03w 07-05-01 11:40:26 GMT EAGLE5 37.0.0
GPL     CARD   RUNNING       APPROVED      TRIAL
SCCPHC  1201   126-002-000   126-002-000   126-003-000
SCCPHC  1203   126-002-000   126-002-000   126-003-000
SCCPHC  1207   126-002-000   126-002-000   126-003-000
SCCPHC  1213   126-002-000   126-002-000   126-003-000
SCCPHC  1215   126-002-000   126-002-000   126-003-000
SCCPHC  1305   126-002-000   126-002-000   126-003-000
```

```
SCCPHC  1313   126-002-000   126-002-000   126-003-000
SCCPHC  2103   126-002-000   126-002-000   126-003-000
Command Completed
```

If the required number of E5-SM4G cards are provisioned in the database, go to Step 5 .

If the required number of E5-SM4G cards are not provisioned in the database, perform the "Adding an SCCP card" in the *Database Administration Manual* - Global Title Translation to add the required number of E5-SM4G cards to the database. After the required number of E5-SM4G cards are provisioned in the database, go to Step 5 .

5. Verify whether HIPR cards are installed on all the EAGLE 5 ISS shelves containing E5-SM4G cards using the **rept-stat-gpl:gpl=hipr** command.

```
the rept-stat-gpl:gpl=hipr command.
rlghncxa03w 07-05-01 11:40:26 GMT EAGLE5 37.0.0
GPL     CARD   RUNNING       APPROVED      TRIAL
HIPR    1109   126-002-000   126-002-000   126-003-000
HIPR    1110   126-002-000   126-002-000   126-003-000
HIPR    1209   126-002-000   126-002-000   126-003-000
HIPR    1210   126-002-000   126-002-000   126-003-000
HIPR    1309   126-002-000   126-002-000   126-003-000
HIPR    1310   126-002-000   126-002-000   126-003-000
HIPR    2109   126-002-000   126-002-000   126-003-000
HIPR    2110   126-002-000   126-002-000   126-003-000
Command Completed
```

If HIPR cards are installed in all shelves containing E5-SM4G cards , go to Step 6 .

If HIPR cards are not installed on all shelves containing E5-SM4G cards, refer to the *Installation Manual - EAGLE 5 ISS* and install the HIPR cards on each of the shelves. Once the HIPR cards have been installed, go to Step 6 .

6. Display the serial number in the database with the **rtrv-serial-num** command.

An example of output from this command follows:

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
System serial number = nt00001231

System serial number is not locked.

rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
Command Completed
```

If the serial number is correct and locked, go to Step 10 (skip Step 7 , Step 8 , and Step 9). If the serial number is correct but not locked, go to Step 9 (skip Step 7 and Step 8). If the serial number is not correct, but is locked, this feature cannot be enabled and the remainder of this procedure cannot be performed. Contact the Customer Care Center to get an incorrect and locked serial number changed. The serial number can be found on a label affixed to the control shelf (shelf 1100).

7. Enter the correct serial number into the database using the **ent-serial-num** command with the serial parameter .

For this example, enter this command:

ent-serial-num:serial=<EAGLE 5 ISS's correct serial number>

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

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
ENT-SERIAL-NUM:  MASP A - COMPLTD
```

8. Verify that the serial number entered into Step 7 was entered correctly using the **rtrv-serial-num** command.

An example of output from this command follows:

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
System serial number = nt00001231

System serial number is not locked.

rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
Command Completed
```

If the serial number was not entered correctly, repeat Step 7 and Step 8 and re-enter the correct serial number.

9. Lock the serial number in the database by entering the **ent-serial-num** command with the serial number shown in Step 6, if the serial number shown in Step 6 is correct, or with the serial number shown in Step 8, if the serial number was changed in Step 7, and with the l**ock=yes** parameter.

For this example, enter this command:

ent-serial-num:serial=<EAGLE 5 ISS's serial number>:lock=yes

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

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
ENT-SERIAL-NUM:  MASP A - COMPLTD
```

10. Enable the E5-SM4G Throughput Capacity feature with the permanent key by entering the **enable-ctrl-feat** command.

For this example, enter the following command:

enable-ctrl-feat:partnum=893019101:fak=<E5-SM4G Throughput Capacity feature access key>

NOTE: The values for the feature access key (the fak parameter) are provided by Tekelec. If the feature access key for the E5-SM4G Throughput Capacity feature is not known, contact your Tekelec Sales Representative or Account Representative.

When the **enable-crtl-feat** command has successfully completed, this message appears:

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
ENABLE-CTRL-FEAT: MASP B - COMPLTD
```

Note: If you do not wish to turn the E5-SM4G Throughput Capacity feature on, go to Step 12 (and skip Step 11) .

11. Turn the E5-SM4G Throughput Capacity feature using the **chg-ctrl-feat** command, specifying the E5-SM4G Throughput Capacity feature part number used in Step 10 and the **status=on** parameter.

For example, enter the following command:

chg-ctrl-feat:partnum=893019101:status=on

NOTE: Once this feature is turned on, it cannot be turned off.

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

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
CHG-CTRL-FEAT: MASP B - COMPLTD
```

12. Verify the changes by entering the rtrv-ctrl-feat command with the E5-SM4G Throughput Capacity feature part number specified in Step 10 or Step 11 .

For example, enter the following command:

rtrv-ctrl-feat:partnum=893019101

An example of output from this command follows:

```
rlghncxa03w 07-05-28 21:15:37 GMT EAGLE5 37.0.0
The following features have been permanently enabled:

Feature Name              Partnum   Status Quantity
E5-SM4G Throughput Cap    893019101   on      ----

The following features have been temporarily enabled:

Feature Name              Partnum    Status  Quantity     Trial Period Left
Zero entries found.
G-Port Circ Route Prevent 893007001 On        ----  20 days 8 hrs 57 mins

The following features have expired temporary keys:
Feature Name              Partnum
Zero entries found.
```

13. Backup the new changes using the **chg-db:action=backup:dest=fixed** command.

The following messages appear, with the active Maintenance and Administration Subsystem Processor (MASP) appearing first, as shown.

```
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.
```

5

Maintenance and Measurements

Hardware Requirements

The G-Flex feature requires DSM-based boards to run the VSCCPGPL. The EAGLE 5 ISS may be equipped with from 1 to 25 DSM boards to support G-Flex.

CAUTION: Having a mix of SCCP and VSCCP card types is not permitted with the G-Flex feature enabled. That is, VSCCP cards and SCCP cards cannot coexist in a system operating the G-Flex feature. Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the DSM database capacity requirements.

EPAP Status and Alarms

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

EPAP Maintenance Blocks

The active EPAP generates and sends maintenance blocks to the primary DSM. One maintenance block is sent as soon as the IP link is established between the active EPAP and the primary DSM. 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 so this information 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 so this information 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 DSM. The EPAP must ensure that no more than one maintenance block per second is sent to the primary DSM 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 DSM 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 DSM card, it sends a DSM status request to that DSM card. Since status messages are sent over UDP, the EPAP broadcasts the DSM status request (to all DSM cards) and each DSM 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

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

- The DSM card is booted
- The DSM card receives a DSM Status Request message from the EPAP
- The DSM card determines that it needs to download the entire database, for example, if the DSM 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 DSM card starts receiving database downloads or database updates. When a DSM 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 DSM card is initialized, it determines the amount of memory present. The EPAP uses the value to determine if the DSM 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 DSM 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.

Hourly Maintenance Report

The Hourly Maintenance Report, generated automatically, includes the alarm totals of the G-Flex subsystem and DSM/EPAPIP links. A sample follows.

```
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5072.0000 REPT COND GSM SS
    "GSM SS :0440,MTCEINT-0,SA,99-10-10,16:00:01,,,,*C"
;
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5073.0000 REPT COND INP SS
    "INP SS :0440,MTCEINT-0,SA,99-10-10,16:20:01,,,,*C"
;
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
```

```
    5077.0000 REPT COND EPAPDSM
    "EPAPDSM :0084,MTCEINT-0,SA,99-10-10,16:00:01,,,,**"
;
    eagle10506 99-10-10 16:00:01 EST EAGLE 37.5.0
    5007.0000 REPT COND CARD
    "CARD 1102:0422,SCMMA,SA,99-10-10,16:00:01,,,,**"
;
    eagle10506 99-09-13 16:00:01 EST EAGLE 37.5.0
    3561.0000 REPT COND ALARM STATUS
    "ALARMS:PERM. INHIBITED,0,0,0"
    "ALARMS:TEMP. INHIBITED,0,0,0"
    "ALARMS:ACTIVE,10,14,3"
    "ALARMS:TOTAL,10,14,3"
;
```

G-Flex System Status Reports

Status reporting described here includes the following:

- System status
- G-Flex status
- DSM card memory capacity status
- Loading mode support status

System Status Reporting

The **rept-stat-sys** command supports the DSM cards running the VSCCP application.

The **rept-stat-sccp** command supports the DSM cards running the VSCCP application and reports G-Flex statistics.

G-Flex Status Reporting

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

DSM Memory Capacity Status Reporting

As described in the DSM Status Messages Fields , the DSM card sends a message to the EPAP containing the amount of memory on the DSM board. The EPAP determines whether the DSM card has enough memory to store the RTDB and sends an ack or nak back to the DSM card indicating whether or not the DSM 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 DSM database capacity requirements**.**

When the EPAP sends database updates to the DSM cards, the update messages include a field that contains the new database memory requirements. Each DSM 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 DSM 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 DSM 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, SCCP, and DSM 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

DSM Code Loading

The EAGLE 5 ISSOAM code loads the DSM card.

EPAP Application Data Loading

The G-Flex 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 VSCCP GPL verifies its hardware configuration during initialization to determine if it has the capacity to support the RTDB.

The VSCCP GPL application data loader registers all tables for loading, independent of the G-Flex feature provisioning and main board / applique hardware configuration. As a result, load requests are always identical. During loading, multiple DSM load requests are combined into a single download, reducing the overall download time. The DSM 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 G-Flex options, HOMERN, and service selector tables only if the G-Flex feature is provisioned. When the G-Flex 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 G-Flex Data Initialization

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

G-Flex Data Initialization

If the DSM card detects G-Flex-capable hardware, the G-Flex tables are registered with ADL, specifying a data load function. Any G-Flex table data downloaded are stored in memory during loading.

EPAP-DSM Loading Interface

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

Loading Mode Support

No more than 16 LIMs can be serviced by each SCCP (or VSCCP) 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.

VSCCP Capacity

An insufficient number of VSCCP 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 VSCCP cards to be inhibited or to have problems that prevent them from operating normally. If enough VSCCP cards are out of service, it may not be possible for the remaining is-nr VSCCP 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 sccp cards is insufficient to service at least 80% of all provisioned LIMs.
- Insufficient SCCP service occurs when an insufficient number of is-nr VSCCP cards are available to service at least 80% of the number of is-nr LIMs.
- LIM cards are being denied SCCP service and any VSCCP 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.

  When in an unstable loading mode, the EAGLE 5 ISS does not accept STP database updates. When updates are rejected, the reason is given as:

  E3112 Cmd Rej: Loading Mode unstable due to SCCP service is deficient.

  The **`inh-card`** and **`alw-card`** commands can be used to alter SCCP service levels to achieve the 80% threshold. This can be repeated for each card until the system is able to supply SCCP services to at least 80% of the is-nr LIMs. The remaining 20% LIM or supporting VSCCP cards may remain out of service until the stream of database updates ceases. This stream of updates can be temporarily interrupted to allow the remaining 20% of the system to come in service.

  Once 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 DSM aborts the current loading, issues a class 01D7 obit, and reboots. **Figure 5-1** shows an example.

Figure 5-1. Obit Message for Abort of Card Loading

```
tekelecstp 97-04-08 12:29:04 EAGLE 35.0.0
------------------------------------------------------------------------
     Card 1317   Module RADB_MGR.C  Line  337  Class 01d7
        Card 1317   Module RADB_MGR.C  Line  337  Class 01d7
        Register Dump :
            EFL=00000246    CS =0058        EIP=0000808d    SS =0060
            EAX=000a6ff3    ECX=000a0005    EDX=00000000    EBX=000a6fa0
            ESP=00108828    EBP=0010882c    ESI=001f1e10    EDI=00000000
            DS =0060        ES =0060        FS =0060        GS =0060

        Stack Dump :
        [SP+1E]=001f    [SP+16]=0000    [SP+0E]=000a    [SP+06]=0010
        [SP+1C]=1e10    [SP+14]=0004    [SP+0C]=6fa0    [SP+04]=8850
        [SP+1A]=0010    [SP+12]=001f    [SP+0A]=0004    [SP+02]=0001
        [SP+18]=886c    [SP+10]=4928    [SP+08]=7ec3    [SP+00]=504b

        User Data Dump :

        14 02 fa ed 01 01 1d 01 5a 01 00                    ........Z..

    Report Date:97-04-08  Time:12:29:04
```

Using the force Option

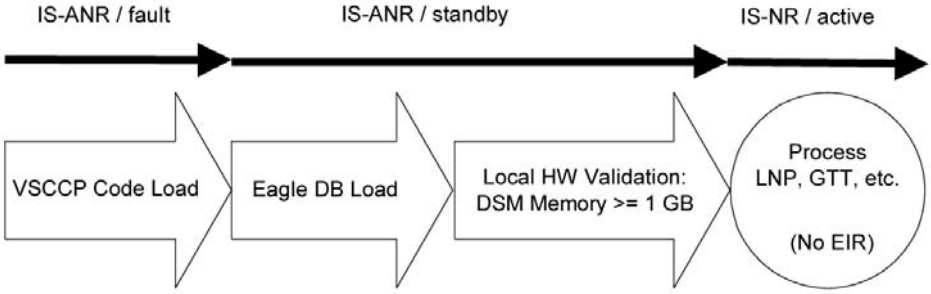
Use the force option to force the execution of commands that would put the system in unstable loading mode. If executing the **`ent-card`** or **`inh-card`** commands would cause the system to enter an unstable loading mode, use the force option on the command.

State Transitions During Start-Up

Figure 5-2 through Figure 5-9 show the transitions that a DSM card goes through as it boots, loads code and data, and runs various VSCCP services. These figures do not illustrate every possible situation, but they do include the most common scenarios involving the EIR feature.

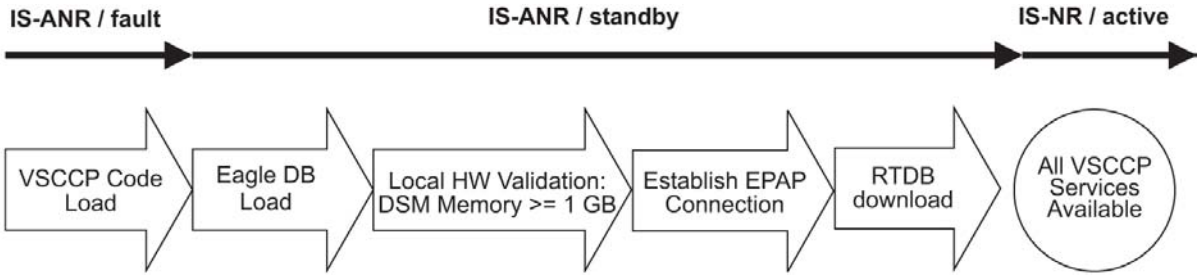
In Figure 5-2, the G-Flex feature is not enabled, and the DSM card can operate in TSM emulation mode, although it does not provide G-Flex operation.

Figure 5-2. G-Flex Not Enabled, DSM Running in TSM Emulation



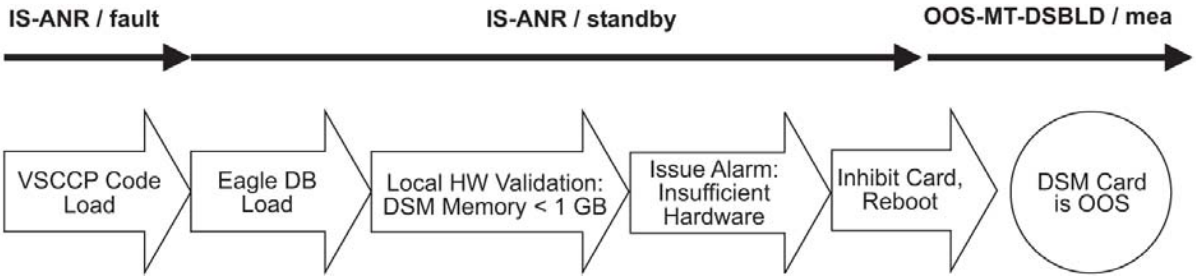
In **Figure 5-3** , the G-Flex feature is enabled, and the DSM card memory is at least 1 GB and is connected to the EPAP. A normal DSM card operating sequence occurs, providing G-Flex service.

Figure 5-3. G-Flex Enabled, Normal Operating Sequence



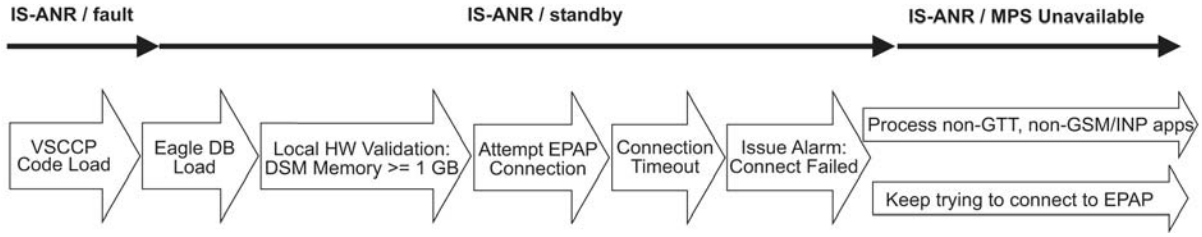
In **Figure 5-4** , the G-Flex feature is enabled, but the DSM card memory is less than 1 GB. The EIR feature cannot begin operation. Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the DSM database capacity requirements.

Figure 5-4. G-Flex Enabled, but DSM Memory Less Than 1 GB



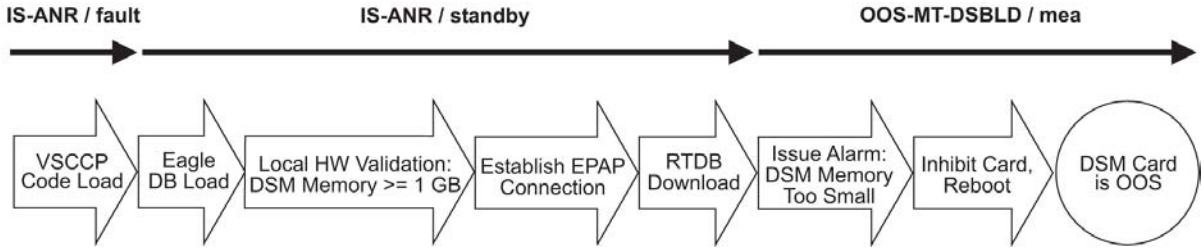
In **Figure 5-5** , the G-Flex feature is enabled, the DSM card memory has at least 1 GB, but the DSM card is unable to connect EPAP; the G-Flex cannot begin operation.

Figure 5-5. G-Flex Enabled, but DSM Not Connected to EPAP



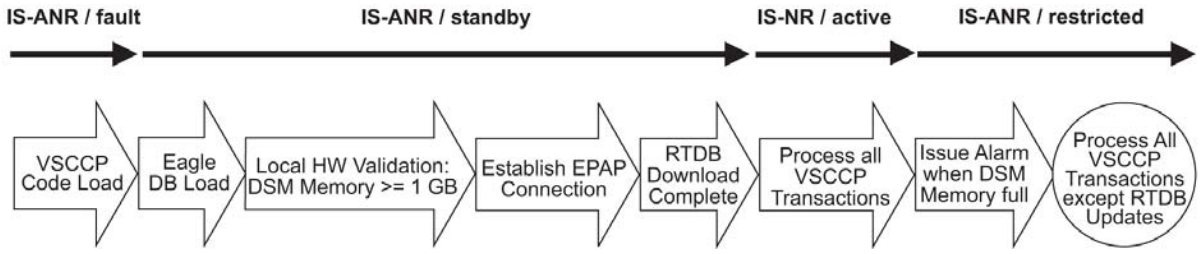
In **Figure 5-6** , the G-Flex feature is enabled, the DSM card has the required 1 GB memory and is connected to the EPAP, but the DSM card is too small for the required database; the G-Flex cannot begin operation. Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the DSM database capacity requirements**.**

Figure 5-6. G-Flex Enabled, but DSM Memory Insufficient for Database



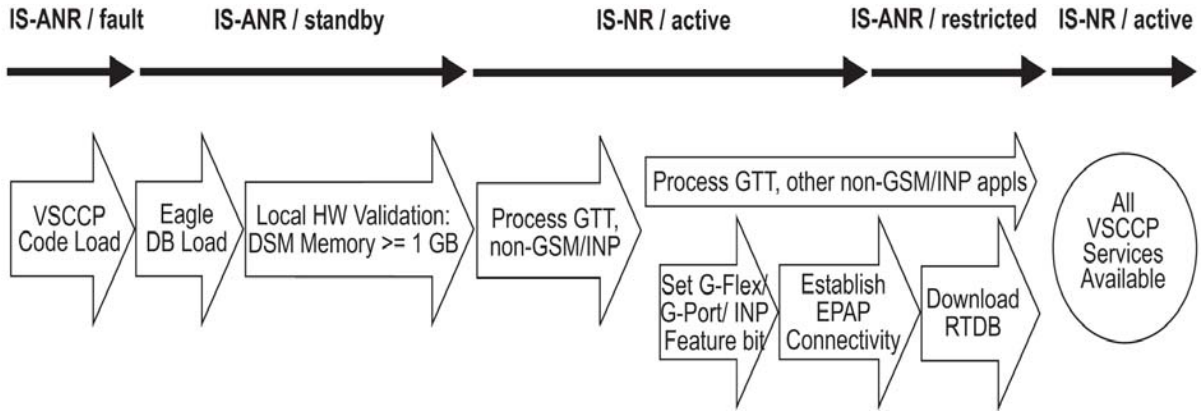
In **Figure 5-7** , the G-Flex feature is enabled, the DSM card is connected to the EPAP, but the RTDB grows eventually to exceed the capacity of the DSM card memory, despite its memory size of at least 1 GB (an alarm is issued when the DSM memory becomes full from the RTDB update). The G-Flex cannot begin operation. Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the DSM database capacity requirements**.**

Figure 5-7. G-Flex Enabled, but Database Exceeds DSM Memory



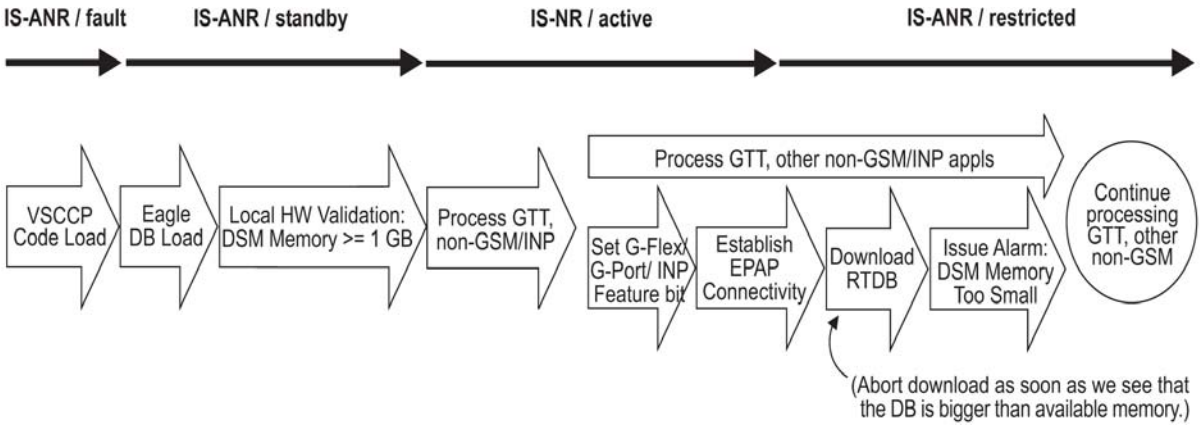
In **Figure 5-8** , the G-Flex feature is not initially enabled; the DSM card memory has at least 1 GB but no EPAP connection; the DSM card is running other applications when the G-Flex feature is turned on; the DSM has sufficient memory to provide G-Flex service.

Figure 5-8. G-Flex Not Enabled at First, but then Activated on DSM



In **Figure 5-9** , the G-Flex feature is not initially enabled; the DSM card memory has at least 1 GB but no EPAP connection, and is running other applications when the G-Flex feature is turned on. However, the DSM card memory is insufficient for the needed database, and the cannot provide G-Flex operation. Refer to the *Dimensioning Guide for EPAP Advanced DB Features Technical Reference* for important information on the dimensioning rules and the DSM database capacity requirements**.**

Figure 5-9. G-Flex Activation Unsuccessful due to Insufficient Database



G-Flex Related Alarms

Refer to the *Maintenance Manual* for a complete description and the associated corrective procedure for all G-Flex related UAMs.

EPAP - DSM Connection Status

The EPAP and the DSM are connected over a 100-Mbit Ethernet link and use TCP/IP. If this connection is inoperative, the DSM generates an appropriate UAM. Loss of connectivity or inability of the EPAP to communicate (for example, hardware or software failure) is detected and reported within 10 seconds.

EPAP UAMs

The maintenance blocks from the EPAP have a field used to identify error message requests. The DSM processes the incoming maintenance blocks and generates the requested UAM. The actual EPAPUAMs are defined in the *Maintenance Manual*; the DSM only acts as a delivery agent.

DSM Failure

No new alarms have been created to report DSM failure. The existing card alarm UAM 013, *Card is isolated from the system*, indicates a DSM card failure. The DSM failure alarm is output to the Card Output Group.

DSM-EPAP Link

Two alarms are used to indicate the DSM-to-EPAP link status:

- 0084, *IP Connection Unavailable* (Major)
- 0085, *IP Connection Available* (Normal/Clearing)

The DSM-EPAPLink alarms are output to the Link Maintenance Output Group. See the *Maintenance Manual* for details on these UAM formats.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
**  3582.0084 ** VSCCP PORT B   1217          IP Connection Unavailable
```

DSM Hardware-Related Alarms

A major alarm appears when a DSM card does not have the hardware configuration required for the G-Flex application. Loading the DSM card is automatically inhibited. Card alarms can be inhibited and uninhibited with the **inh-alm** and **unhb-alm** commands. The DSM Hardware-Related alarms are output to the Card Output Group.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
   station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
** 0012.0441 ** CARD 1108 VSCCP          Incorrect main board - CPU
```

A major alarm is displayed when a DSM card detects that its applique memory is at least 80% full. The actual memory usage can be displayed by entering the **rept-stat-mps:loc=xxxx** command.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
    station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
**  0012.0446 ** CARD 1108 VSCCP         RTDB database capacity is 80% full
```

A critical alarm is generated when a DSM card detects that its applique memory is 95% full. Loading of the DSM card is automatically inhibited when it reaches 100% of capacity. The actual memory usage can be displayed by entering the **rept-stat-mps:loc=xxxx** command.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
    station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
*C  0012.0442 *C CARD 1108 VSCCP         RTDB database capacity is 95% full
```

A major alarm is displayed when a DSM card does not have an applique with at least 1 GB of memory or does not have enough capacity for the RTDB. This alarm is generated whenever the DSM detects that its memory cannot contain the RTDB.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
                    station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
**  0012.0422 ** CARD 1108 VSCCP         Insufficient extended memory
```

When the **alw-card** command is executed, loading of the DSM card is attempted. The following message appears, indicating that card loading is no longer inhibited.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
    station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
    0012.0423    CARD 1108 VSCCP         Card reload attempted
```

DSM Database Audit Alarm

During an audit of the DSM cards, the status of the RTDB is examined and an alarm is raised when a corrupted database is found.

When any RTDB database becomes corrupted, a major alarm is raised. The DSMDatabase Audit alarm is output to the Card Output Group.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
    station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
** 0012.0443 ** CARD 1108 VSCCP        RTDB Database is corrupted
```

DSM Database Alarms

During the operation of DSM cards, the status of databases is examined and alarms can be raised. When a DSM card's RTDB is inconsistent (that is, DSM card’s birthdate and level do not match the active EPAPRTDB birthdate and level), a minor alarm is raised. The DSMDatabase alarms are output to the Card Output Group.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
    station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
*   0012.0444 * CARD 1108 VSCCP        RTDB Database is inconsistent
```

While the EPAPRTDB database is being downloaded to a DSM card, it is in an incoherent state. An alarm is raised.

Example:

```
  1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
    station1234 99-09-30 16:28:08 EST EAGLE 37.5.0
*   0012.0448 * CARD 1108 VSCCP        RTDB Database is incoherent
```

When an inconsistent, incoherent, or corrupted DSMRTDB has been fixed (that is, repaired) when the DSM card is in an **is-nr** condition, an alarm is raised.

Example:

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
    station1234 00-04-30 16:28:08 EST EAGLE 37.5.0
    0012.0445 CARD 1108 VSCCP          RTDB Database has been corrected
```

G-Flex Subsystem Alarms

The same alarms that are output for an SCCP subsystem are output for the G-Flexsubsystem (including G-Flex traffic). See **Table 5-1** .

Table 5-1. G-Flex Subsystem Alarms

UAM #	Severity	Message Text	Output Group (UI Output Direction)
0328	None	SCCP is available	**gtt**
0329	None	SCCP capacity normal, card(s) abnormal	**gtt**
0330	Major	SCCPTPS Threshold exceeded	**gtt**
0331	Critical	SCCP is not available	**gtt**
0335	None	SCCP is removed	**gtt**
0336	Major	LIM(s) have been denied SCCP service	**gtt**
0526	None	Service is available	sys_maint
0527	Minor	Service abnormal	sys_maint
0528	Critical	Service is not available	sys_maint
0529	Critical	Service is disabled	sys_maint
0530	None	Service is removed	sys_maint

G-Flex Related UIMs

UIM formats for the EGTT feature support the new GTT requirements. The *EAGLE 5ISS Maintenance Manual* contains a complete description of all UIM text and formats. See **Table 5-2** for the G-FlexUIMs. All of the the G-Flex related UIMs are output to the Application Subsystem Output Group.

Table 5-2. G-Flex UIMs

UIM #	Text	Description	Action
1242	**Conv to intl num - Dflt CC not found**	Default CC is not defined	Define the default CC by **chg-stpopts:defcc=xxxx**
1243	**Conv to intl num - Dflt NC not found**	Conversion to international number failed because default NC was not found	Define the default NDC by **chg-stpopts:defndc=xxxx**
1244	**Conv to intl num – Dflt MCC not found**	Default MCC is not defined	Define the default MCC by **chg-gsmopts:defmcc=xxxx**
1245	**Conv to intl num – Dflt MNC not found**	Default MNC is not defined	Define the default MNC by **chg-gsmopts:defmnc=xxxx**
1246	**Invalid length of conditioned digits**	Length of the conditioned international number is <5 or >15	Use an international number with length within this range.
1247	**Conversion of MGT to IMSI not possible**	The E.212 part for the E.214 MGT digit not found in the database	Enter the E.212 part (MCC + MNC) for the E.214 MGT part (CC + NDC) in the database using **chg-gsmopts:ccndc=xxxxxx:mccmnc=yyyyyy**
1384	**G-Flex MLR: Op without IMSI erroneous**	The G-Flex MLR Function encountered an or operation that did not contain an IMSI parameter	No action necessary
1385	**G-Flex MLR: Op without IMSI skipped**	The G-Flex MLR Function encountered a operation that did not contain an IMSI parameter	No action necessary
1386	**G-Flex MLR: Op with bad TCAP skipped**	The G-Flex MLR Function encountered problems decoding the TCAP and MAP layers of a message prior to attempting to identify an IMSI parameter	No action necessary
1387	**G-Flex MLR: Op with bad IMSI skipped**	The G-Flex MLR Function encountered an IMSI parameter that contains fewer than 5 digits or more than 15 digits	No action necessary

G-Flex Measurements

Refer to the *Maintenance Manual* for for detailed measurement usage information.

OAM Based Measurements

The collection of measurements is a separate task from reporting. Measurements collection is activated automatically upon system power-up, or through administrative commands. Collection is organized by ENTTYPE and reporting period. Collection occurs per link every 5 minutes, and separately every 30 minutes.

Measurements are generated on the application cards and periodically collected by the OAM and stored for later retrieval on the TDMs. The command related to measurements collection is *chg-meas*.

Reports can be scheduled or printed on-demand. Scheduled and on-demand reports are accessible by the following administrative commands:

- *chg-meas* -Turns collection on/off and schedules automatic report generation.
- *rtrv-meas-sched* -Verifies collection state and automatic report schedules.
- *rept-meas* - Generates individual measurement reports for schedule-enttype-entid combinations.

Before a report is printed, measurement collection must be activated. Refer to the *Commands Manual* for more information on how to use measurement commands.

Measurements Platform

The Measurements Platform (MP) is required for an EAGLE 5 ISS with more than 700 links. It provides a dedicated processor for collecting and reporting STP, LNP, INP, G-FLEX, and G-PORT measurements data. The interface to the customer's network supports the FTP transfer of Measurements reports to an FTP server. Following collection, scheduled reports are automatically generated and transferred to the customer's FTP server via the FTP interface.

NOTE: Existing FTP file server reports are overwritten by subsequent requests that produce the identical file name.

Reports can be scheduled or printed on-demand. Scheduled and on-demand reports are accessible by the following administrative commands:

- *chg-measopts* - Used to enable or disable the automatic generation and FTP transfer of scheduled measurement reports to the FTP server.
- *rept-stat-meas* - Reports the status of the measurements subsystem including card location and state, Alarm level, and Subsystem State.
- *rept-ftp-meas* - Manually initiates generation and FTP transfer of a measurements report from the MCPM to the FTP server.
- *rtrv-measopts* - Generates a user interface display showing the enabled/disabled status of all FTP scheduled reports.

The following G-FlexMSUmeasurements are supported for the G-Flex feature.

Table 5-3. Pegs for G-Flex

Event Name	Description	Unit
`gfgtmatch`	G-FlexGTTs with Match – The total number of G-FlexGlobal Title Translation successfully completed.	Peg count
`gfgtnomch`	G-FlexGTTs No Match – The total number of G-Flex Global Title Translations completed that did not match an entry in the G-Flex database.	Peg count

Event Name	Description	Unit
gfgtnolkup	G-FlexGTTs No Look-up – The total number of G-Flex Global Title Translations that could not be looked up in the G-Flex database because of some error. **NOTE: This counter is not available via `rept-meas` by TT.**	Peg count

The following measurement events are included on the STP Daily Maintenance (MTCD) and STP Day-to-Hour (MTCDTH) measurement reports and include peg counts for G-FLEX MSUs. These reports are similar to those used for GTT. The existing GTT/SCCP measurements are used for both GTT and G-Flex and appear in the same reports.

• MSSCCPFL	MSUs discarded due to SCCP routing failure Also includes G-FlexMSUs that got a match from either the G-Flex or GTT database, but cannot be routed because of PC (Point Code) or SS (SubSystem) congestion, PC or SS unavailable, SS unequipped, or an unqualified error.
• GTTUN0NS	GTT unable to perform; no such type. Also includes G-FlexGTTMSUs that did not match on new selectors (GTI, NP, NAI) in addition to ones not matching on TT.
• GTTUN1NT	GTT unable to perform: no translation on this address Also includes G-FlexMSUs that fell through to GTT, obtained a selector match but still did not get a match on the GTA.
• GTTPERFD	Number of GTT performed Also includes G-FlexMSUs that got a match in either the G-Flex or GTT database. These measurements can also be used to determine the following: • Total number of G-FlexMSUs: **`X = gfgtmatch + gfgtnomch + gfgtnolkup`** • Number of non-G-FlexGTTMSUs: **`(gttperfd + gttun1nt + gttun0ns) - (X)`**

This implementation does not discriminate between the MSSCCPFL, GTTUN0NS, GTTUN1NT, or GTTPERFD pegs for G-Flex or GTT applications. For example, a search failure could result from a problem in either the G-Flex or GTT database.

Measurement Reports

Measurements are available with these report commands. Refer to the *Commands Manual* for detailed usage information.

OAM Based	
• Per STP system, 24-hour total	**`rept-meas:type=systot:enttype=stp`**
• Per STP system, by TT	**`rept-meas:type=systot:enttype=tt:tt=xxx`**

• Per system, daily	**rept-meas:type=mtcd:enttype=stp**
• Per system, day-to-hour	**rept-meas:type=mtcdth:enttype=stp**
MP Based	
• Per STP system, 24-hour total	**rept-ftp-meas:type=systot:enttype=stp**
• Per STP system, by TT	**rept-ftp-meas:type=systot:enttype=tt**
• Per system, daily	**rept-ftp-meas:type=mtcd:enttype=stp**
• Per system, day-to-hour	**rept-ftp-meas:type=mtcdth:enttype=stp**

Glossary

A

ACM	Address Complete Message
ACM	*Application Communications Module*
ADL	Application Data Loader
AI	Address Indicator
AI	Application Initializer
AINPQ	ANSI-41 INP Query
ANSI	American National Standards Institute
A-Port	ANSI-41 Mobile Number Portability
ARP	Address Resolution Protocol
AS	Application Server

C

CC	Connection Confirmed
CC	Country Code
CCS7	Common Channel Signaling System #7 See also SS7.
CCS7ITU	The generic program load and application for the ITU SS7 signaling links that is used with card types **`limds0, limch, limocu, limv35, lime1, and limt1`**.
CdPA	Called Party Address
CgPA	Calling Party Address
CLLI	Common Language Location Identifier
CPC	Capability Point Code
CSR	Customer Service Request

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
DB	Daughter Board
DB	Documentation Bulletin
DCB	Device Control Block
DCM	Database Communication Module The DCM provides IP connectivity for applications. Connection to a host is achieved through an ethernet LAN using the TCP/IP protocol.

Destination	The node to which the signaling link traffic is routed. This destination is identified by a point code, either a full point code or a cluster point code.
DN	Directory number A DN can refer to any mobile or wireline subscriber number, and can include MSISDN, MDN, MIN, or the wireline Dialed Number.
DPC	Destination Point Code The point code of the signaling point to which the MSU is routed. This point code can be adjacent to the EAGLE 5 ISS, but does not have to be.
DPCA	Destination Point Code ANSI
DPCI	Destination Point Code International
DRAM	Dynamic Random Access Memory A type of memory chip that has to be refreshed periodically.
DSM	Database Service Module.

E

EGTT	Enhanced Global Title Translation
EIR	Equipment Identity Register
Enhanced Global Title Translation	A feature that is designed for the signaling connection control part (SCCP) of the SS7 protocol. The EAGLE 5 ISS uses this feature to determine to which service database to send the query message when a Message Signaling Unit (MSU) enters the system.
EPAP	EAGLE Provisioning Application Processor
ES	Encoding Scheme
ES	Extension Shelf
ESD	Electro-Static Discharge

F

FTP	Feature Test Plan
FTP	File Transfer Protocol.

G

GB	Gigabyte — 1,073,741,824 bytes
GDB	GSM Real-time Database
GFDB	G-Flex Database
G-Flex	GSM Flexible numbering A feature that allows the operator to flexibly assign individual subscribers to HLRs and route signaling messages, based on subscriber numbering, accordingly.
GMSC	Gateway MSC
GPL	Generic Program Load
G-Port	GSM Mobile Number Portability A feature that provides mobile subscribers the ability to change the GSM subscription network within a portability cluster, while retaining their original MSISDN(s).
GPSM-II	General Purpose Service Module
GSM	Global System for Mobile Communications
GT	Global Title Routing Indicator

GTA	Global Title Address
GTAI	Global Title Address Information
GTI	Global Title Translation Indicator
GTT	Global Title Translation.
GUI	Graphical User Interface

H

HLR	Home Location Register
HOMERN	Home Network Routing Number Prefix

I

IAM	Initial Address Message
ID	Identity
ID	Identity, identifier
IGM	IS41 GSM Migration
IMSI	International Mobile Station Identifier
IMT	Inter-Module-Transport
	The communication software that operates the inter-module-transport bus on all cards except the LIMATM, DCM, DSM, and HMUX.
INP	INAP-based Number Portability
INP	Intelligent Network (IN) Portability
INP	INAP-based Number Portability
Integrated Services Digital Network	The network services that provide end-to-end digital connections to which users have access to a wide range of services through a limited set of standard user to network interfaces.
IP	Intelligent Peripheral
IP	Internet Protocol
IP^7	Tekelec's Internet Protocol to SS7 Interface
IS-ANR	In Service - Abnormal
	The entity is in service but only able to perform a limited subset of its normal service functions.
ISDN	Integrated Services Digital Network
IS-NR	In Service - Normal
ISDN	Integrated Services Digital Network
ISS	Integrated Signaling System
ITU	International Telecommunications Union
ITUDUPPC	ITU National Duplicate Point Code
	This feature applies only to 14-bit ITU national point codes. This feature allows an EAGLE 5 ISS mated pair to route traffic for two or more countries that may have overlapping point code values.

K

KSR	Keyboard Send/Receive Mode

L

LIM	Link Interface Module
Link	Signaling Link
LNP	Local Number Portability

M

MAP	Mated Application Part
MAP	Mobile Application Part
MAS	Maintenance and Administration Subsystem
	A set of cards located in the Control Shelf, used to provide a central management point for the EAGLE 5 ISS. The MAS provides user interface, maintenance communication, peripheral services, alarm processing, system disk interface, and measurements using the following three subassemblies: GPSM-II, TDM, and MDAL.
MASP	Maintenance and Administration Subsystem Processor
Mated Application	The point codes and subsystem numbers of the service databases that messages are routed to for global title translation.
MCC	Mobile Country Code
MCPM	Measurement Collection and Polling Module
MDN	Mobile Dialed Number
MDN	Mobile Directory Number
MGT	Mobile Global Title
MIN	Mobile Identification Number
MNP	Mobile Number Portability
MP	Measurement Platform
MPS	Multi-Purpose Server
MRN	Message Reference Number
	Mated Relay Node
MSC	Mobile Switching Center
MSISDN	Mobile Station International Subscriber Directory Number
	The MSISDN is the number dialed by someone trying to reach the subscriber.
MSRN	Mobile Station Roaming Number
MSU	Message Signaling Unit
MTP	Message Transfer Part
MTP	Module Test Plan

N

NAI	Nature of Address Indicator
NAIV	NAI Value
NC	Network Cluster
NC	Network Code
NDC	Network destination code
NDC	Network Data Collection

NE	Network Element
NE	North East
NP	Number Plan
NP	Numbering Plan
NP	Number Portability
NPV	Numbering Plan Value

O

OAM	Operations, Administration, and Maintenance
OOS-MT	Out of Service - Maintenance
OPC	Originating Point Code
OPS	Operator Provisioning System

P

PC	Point Code.
PCI	Peripheral Component Interface
PCI	Point Code International
PCI	Protocol Control Information
PDB	Provisioning Database
PDBA	Provisioning Database Application
PDBI	Provisioning Database Interface
PPP	Point-to-Point Protocol

R

RC	Relative Cost
RC	Restriction Criteria
Restricted	The network management state of a route, link set, or signaling link that is not operating properly and cannot carry all of its traffic. This condition only allows the highest priority messages to sent to the database entity first, and if space allows, followed by the other traffic. Traffic that cannot be sent on the restricted database entity must be rerouted or the traffic is discarded.
RFC	Request for Comment
RI	Routing Indicator
RMTP	Reliable Multicast Transport Protocol
RN	Routing Number
Route	A path to another signaling point.
RTDB	DSM Real-time database

S

SCCP	Signaling Connection Control Part
SCM	System Configuration Manager System Configuration Matrix.
SDS	System Debug Services

Service Nature of Address Indicator	An internal G-Port parameter that allows a user to specify how to interpret the signaling connection control part (SCCP) called party address (CdPA) GTA of a LOCREQ/SMSREQ message.
SIM	Subscriber Identity Module
SIO	Service Information Octet
SIO	Service Information Octet.
SNAI	Service Nature of Address Indicator
SP	Service Provider
SP	Signaling Point
Spare Point Code	The EAGLE ITU International/National Spare Point Code feature allows a network operator to use the same Point Codes across two networks (either ITU-I or ITU-N). The feature also enables National and National Spare traffic to be routed over the same linkset. The EAGLE uses the MSU Network Indicator (NI) to differentiate the same point code of one network from the other. In accordance with the SS7 standard, unique Network Indicator values are defined for Point Code types ITU-I, ITU-N, ITU-I Spare, and ITU-N Spare.
SPC	Secondary Point Code
	Spare Point Code
SPC	Signaling Point Code
SPC	Stored Program Control
SRI	Send Routing Information
SRI	Send_Route_Information Message
SS	Subsystem
SS7	Signaling System #7
SSN	Subsystem Number
SSN	SS7 Subsystem Number
SSP	Subsystem Prohibited network management message.
	Subsystem Prohibited SCCP (SCMG) management message. (CER) Service Switching Point (SS7 Network)
STP	Signal Transfer Point.
Subsystem Number	The subsystem number of a given point code. The subsystem number identifies the SCP application that should receive the message or the subsystem number of the destination point code to be assigned to an X.25 address or the LNP subsystem of the EAGLE 5 ISS. A value of the routing indicator portion of the global title translation data commands indicating that no further global title translation is required for the specified entry.

T

TCP	Transfer-Cluster-Prohibited
TCP	Transfer Control Protocol
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TDM	Terminal Disk Module.
TPS	Transactions Per Second
TSM	Translation Service Module
TSM	Translation Services Module
TT	Translation Type.

U

UAM	Unsolicited Alarm Message.
UDP	User Datagram Protocol
UDT	Unit Data Transfer
UDTS	Unit Data Transfer Service
UI	User Interface
UIM	Unsolicited Information Message
UL	Underwriters Laboratories
UPU	User Part Unavailable

V

VGTT	Variable Length GTT A feature that provides the ability to provision global title entries of varying lengths to a single translation type or GTT set. Users are able to assign global title entries of up to 10 different lengths to a single translation type or GTT set.
VLR	Visitor Location Register
VSCCP	VxWorks Signaling Connection Control Part The application used by the DSM card to support the G-Flex, G-Port, INP, EIR, and LNP features. If the G-Flex, G-Port, INP, or LNP feature is not turned on, and a DSM card is present, the VSCCP GPL processes normal GTT traffic.

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D

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F

G

R

S