Critical Release Notice

Publication number: 297-8213-550
Publication release: Standard 09.03

The content of this customer NTP supports the
SN07 (DMS) and ISN07 (TDM) software releases.

Bookmarks used in this NTP highlight the changes between the baseline NTP and the current release. The bookmarks provided are color-coded to identify release-specific content changes. NTP volumes that do not contain bookmarks indicate that the baseline NTP remains unchanged and is valid for the current release.

Bookmark Color Legend

Black: Applies to new or modified content for the baseline NTP that is valid through the current release.

Red: Applies to new or modified content for NA017/ISN04 (TDM) that is valid through the current release.

Blue: Applies to new or modified content for NA018 (SN05 DMS)/ISN05 (TDM) that is valid through the current release.

Green: Applies to new or modified content for SN06 (DMS)/ISN06 (TDM) that is valid through the current release.

Purple: Applies to new or modified content for SN07 (DMS)/ISN07 (TDM) that is valid through the current release.

Attention!
Adobe® Acrobat® Reader™ 5.0 or higher is required to view bookmarks in color.

Publication History

September 2004

Standard release 09.03 for software release SN07 (DMS) and ISN07 (TDM).

Change of syntax entry in Maintenance overview section on page 1-5 according to CR Q00891462.

March 2004

Standard release 09.02 for software release SN06 (DMS) and ISN06 (TDM).

Change of phone number from 1-800-684-2273 to 1-877-662-5669, Option 4 + 1.

297-8231-550

DMS-100 Family

Subscriber Carrier Module-100S

Maintenance Manual

XPM10 and up   Standard 09.01   August 1998

NORTHERN TELECOM

DMS-100 Family

Subscriber Carrier Module-100S

Maintenance Manual

Publication number: 297-8231-550
Product release: XPM10 and up
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Revision history

This document has been revised for release NA17. Information about troubleshooting an SMS line equipped mismatch has been added in an Appendix.

Contents

About this document

How to check the version and issue of this document

The version and issue of the document are indicated by numbers, for example, 01.01.

The first two digits indicate the version. The version number increases each time the document is updated to support a new software release. For example, the first release of a document is 01.01. In the *next* software release cycle, the first release of the same document is 02.01.

The second two digits indicate the issue. The issue number increases each time the document is revised but rereleased in the *same* software release cycle. For example, the second release of a document in the same software release cycle is 01.02.

To determine which version of this document applies to the software in your office and how documentation for your product is organized, check the release information in *Product Documentation Directory*, 297-8991-001.

This document is written for all DMS-100 Family offices. More than one version of this document may exist. To determine whether you have the latest version of this document and how documentation for your product is organized, check the release information in *Product Documentation Directory*, 297-8991-001.

References in this document

The following documents are referred to in this document:

- *Alarm Clearing Procedures*
- *Card Replacement Procedures*
- *Digital Interface Between the SLC96 Digital Loop Carrier System and a Local Digital Switch*, TR-TSY-000008
- *Input/Output System Reference Manual*, 297-1001-129
- *PMDEBUG User Guide, Technical Assistance Manual*, TAM-1001-004
- *Product Documentation Directory*, 297-8991-001

- *Translations Guide*
- *XPM Translations Guide*

What precautionary messages mean

The types of precautionary messages used in NT documents include attention boxes and danger, warning, and caution messages.

An attention box identifies information that is necessary for the proper performance of a procedure or task or the correct interpretation of information or data. Danger, warning, and caution messages indicate possible risks.

Examples of the precautionary messages follow.

ATTENTION Information needed to perform a task

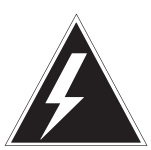
ATTENTION

If the unused DS-3 ports are not deprovisioned before a DS-1/VT Mapper is installed, the DS-1 traffic will not be carried through the DS-1/VT Mapper, even though the DS-1/VT Mapper is properly provisioned.

DANGER Possibility of personal injury

DANGER
Risk of electrocution
Do not open the front panel of the inverter unless fuses F1, F2, and F3 have been removed. The inverter contains high-voltage lines. Until the fuses are removed, the high-voltage lines are active, and you risk being electrocuted.

WARNING Possibility of equipment damage



WARNING
Damage to the backplane connector pins
Align the card before seating it, to avoid bending the backplane connector pins. Use light thumb pressure to align the card with the connectors. Next, use the levers on the card to seat the card into the connectors.

CAUTION Possibility of service interruption or degradation

> **CAUTION**
> **Possible loss of service**
> Before continuing, confirm that you are removing the card from the inactive unit of the peripheral module. Subscriber service will be lost if you remove a card from the active unit.

How commands, parameters, and responses are represented

Commands, parameters, and responses in this document conform to the following conventions.

Input prompt (>)

An input prompt (>) indicates that the information that follows is a command:

>BSY

Commands and fixed parameters

Commands and fixed parameters that are entered at a MAP terminal are shown in uppercase letters:

>BSY CTRL

Variables

Variables are shown in lowercase letters:

>BSY CTRL ctrl_no

The letters or numbers that the variable represents must be entered. Each variable is explained in a list that follows the command string.

Responses

Responses correspond to the MAP display and are shown in a different type:

```
FP 3 Busy CTRL 0: Command request has been submitted.
FP 3 Busy CTRL 0: Command passed.
```

The following excerpt from a procedure shows the command syntax used in this document:

1 Manually busy the CTRL on the inactive plane by typing

>BSY CTRL ctrl_no
and pressing the Enter key.

where

ctrl_no is the number of the CTRL (0 or 1)

Example of a MAP response:

```
FP 3 Busy CTRL 0: Command request has been submitted.
FP 3 Busy CTRL 0: Command passed.
```

Maintenance summary

The subscriber carrier system consists of the Subscriber Carrier Module-100S (SMS) and one or more Remote Concentrator SLC-96 (RCS) modules. This document contains descriptions and step-by-step information to maintain the system at an efficient operating level. This information relates to the SMS, RCS, and DS-1 links.

This chapter provides the maintenance plan for the SMS-RCS subsystem. The plan includes maintenance of the following:

- the SMS module
- the RCS module
- the DS-1 links that connect the SMS and RCS
- the line cards and subscriber loops

  Note: An SMS is an extended peripheral module (XPM). When the name XPM appears in this document, the related information applies directly to the SMS. The related information also applies to the whole class of XPM modules.

This chapter contains the following sections:

- Functional description. This section contains a summary of the SMS, RCS, and DS-1 links. This section highlights the functions and the software processes that support these functions.
- Fault conditions. This section identifies problems that can occur in the following:
  - — components
  - — the links that connect these components
  - — the software that controls the voice and message flow
- Automatic maintenance. This section identifies the system actions that identify and correct a fault. These system actions include:
  - — a switch of activity (SWACT)
  - — protection switching as a result of a defective DS-1 link

- routine exercise (REx) tests
- automatic subscriber lines tests

- Escalation to manual maintenance. This section discusses manual protection switching. Manual protection switching occurs when the SMS cannot switch a protection link into service. The SMS cannot switch a protection link into service after the SMS detects a fault on a primary link.

  Note: The information in this chapter assumes that all components and software processes function normally.

Functional description of the SMS

The SMS is a redundant peripheral module with two units. The SMS has an active unit and a standby unit. The SMS units support call processing and system control. The units operate in hot standby configuration. One unit is active and the mate unit is on standby. When the system detects a fault on the active unit, standby control on the mate unit takes over. This unit maintains full control of the links until the system corrects the failure. The units of the SMS are identical. The primary tasks of the SMS are as follows:

- interface to DS30 and DS-1 links
- connection of peripheral-side (P-side) and central-side (C-side) channels
  - network to SMS to RCS messaging
  - special service hairpin connections
  - maintenance test connections. For example, a metal bypass to test subscriber loops
- connections for calls that originate from the RCS
- report of call originations to the computing module (CM)
- connections and ring control for calls that terminate on the RCS
- supply of tones to the RCS-subscriber
  - dial tone to request dialed digits
  - busy tone to indicate the called party is already busy
  - reorder tone to indicate the system cannot establish the connection
  - ringback tone to indicate that the line of the party the calling party calls is ringing

- take down of connections to and from the RCS-subscriber
- record of dial pulse digits
- detection of use of flash feature
- forward messages RCS to CM and CM to RCS.
- reception and issue of coin service control messages that include:
  — coin first pay stations
  — dial tone first pay stations
  — semi-post pay stations
- loss padding
- switch of activity (SWACT)
- download of provisioning data
- audit of hardware and internal records
- start of internal diagnostics
- protection switching

The SMS configuration

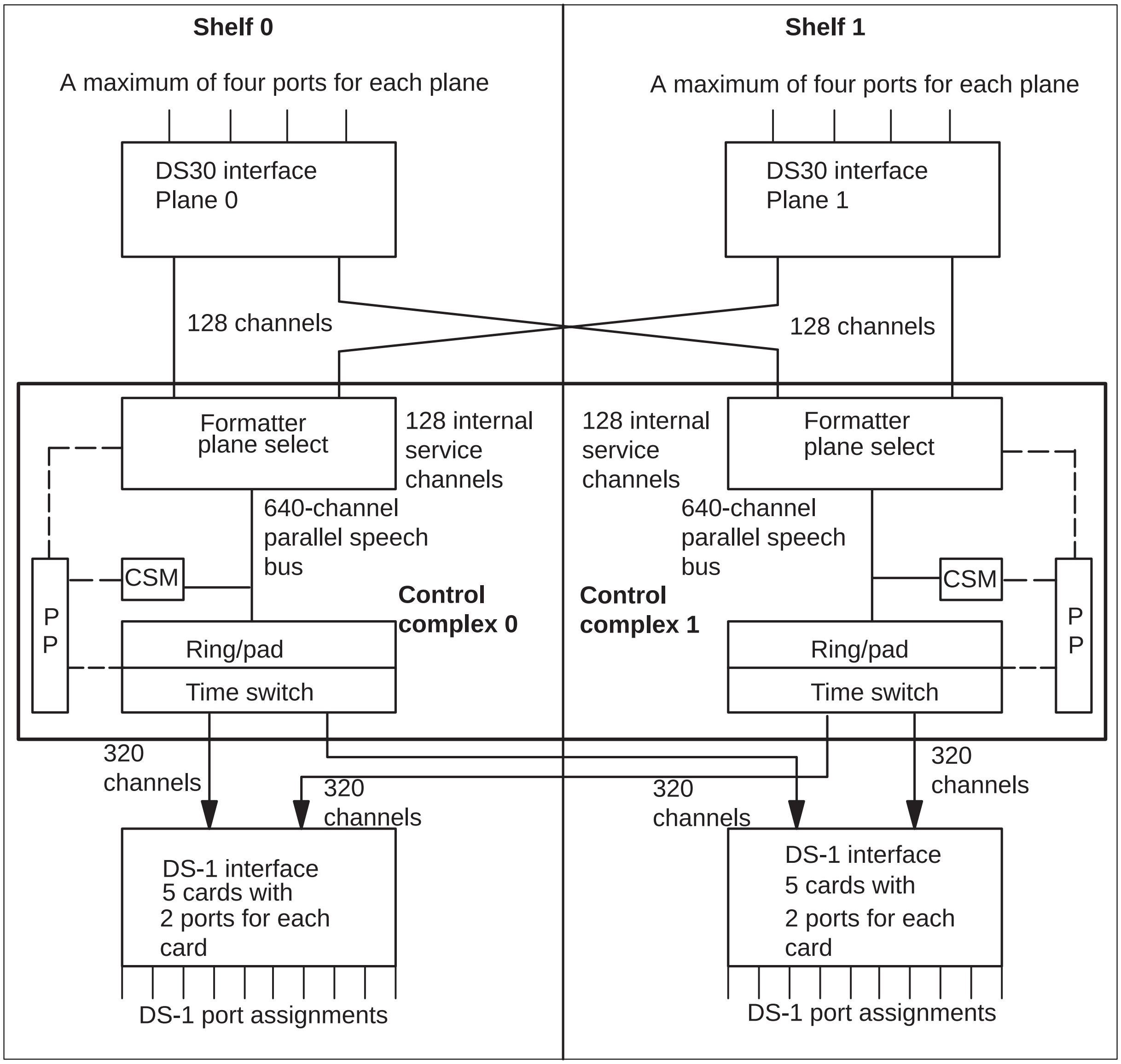
The SMS is based on line group controller (LGC) architecture. To convert the LGC to the SMS, insert the three SMS cards. The three SMS cards are as follows:

- the ring/pad card (NT6X80)
- the A/B-DDL card (NT6X86)
- the DS-1 interface card (NT6X85)

The configuration of the SMS based on the LGC architecture appears in the SMS configuration diagram. A description of the configuration follows the figure. Refer to this diagram when you read the description of the following:

- the SMS connection to the DMS switch network through the DS30 links
- the SMS connection to the RCS through DS-1 links
- the function of the cards in each unit of the SMS

The SMS configuration



The network attaches to the SMS with a maximum of four pairs of DS30 links. These links connect in the SMS to two DS30 interface cards (NT6X40), one in shelf 0 and one in shelf 1. Each card supplies four DS30 ports, and provides a maximum of eight ports on a fully equipped SMS. Plane 0 to plane 1 both have four dedicated ports. The system distributes port assignments to the two DS30 cards. Plane 0 receives even-numbered links. Plane 1 receives odd-numbered links. A minimum of three ports for each SMS, three pairs of duplicated links, are required for interface with the network module.

The universal processor (UP) card (NTMX77) replaces separate master and signal processor and memory cards. Electrically erasable programmable read only memory (EEPROM) on the NTMX77 card contains firmware for downloading. Firmware in EEPROM allows you to load firmware on a manually busy (ManB) XPM or unit separate from the RAM load. The UP links some cards through the A-bus. The UP polls each card and sends or receives messages by direct memory access (DMA). The memory access protocol is card specified. The following commands allow firmware loading from the central control (CC) to a ManB XPM to occur.

>LOADFW PM

or

>LOADFW UNIT unit_no

On the C-side of the GPP, 16 DS30A links (6X40AC or AD) can connect each shelf to a junctored network (JNET). A DS512 link (6X40FA or FB) can connect each shelf to an enhanced network (ENET). The maximum C-side channel capacity of a cabinet with four GPP shelves is 1920.

Feature AN1121 allows loop around diagnostics for XPMs with 6X40 cards at version AD or FB. The enhanced diagnostic checks for missing or failed 6X40AD or FB cards. The diagnostic improves the tests of the interface section on the 6X41 card. Failure of one 6X40 card does not cause loss of service. Failure does not occur because links that connect to the matrix cards are completely redundant through the active unit.

Enter 6X40AD or FB in field PEC6X40 in table LTCINV to activate the enhanced diagnostics of the 6X40AD and FB cards. The system generates a PM777 log that contains a card list to indicate faults.

The speech bus formatter card (NT6X41) multiplexes the incoming speech to a 640-channel bus. Each formatter handles 512 speech channels for each network plane. The formatter card adds 512 speech channels to 128 internal service channels. The formatter converts the 512 plus 128 channels to a 640 channel bus to the SMS control complex.

The NT6X42 card performs channel supervision message (CSM) control. The CSM is a 40-bit message that contains 24 synchronization bits, 8 integrity bits, and 8 data bits. The system transfers the complete message over 40 frames. The integrity bit between the peripheral module (PM) that sends the CSM and the PM that receives the CSM must match. The CM informs the PM of the integrity value the PM will receive. The integrity check makes sure the integrity value follows a correct path from one PM to another PM. The 8-bit data byte relays data about call setup, maintenance, and other PM data.

The time switch card (NT6X44) receives pulse coded modulation (PCM) speech data. The NT6X44 card switches the data to the correct P-side ports and channels under unified processor (UP) directives. The time switch adds A- and B-signaling bits and tones, and system control messages from the message and tone card (NT6X69). The time switch makes these additions to the correct channels on the DS-1 links.

The speech from the SMS to the RCS weakens in the Pad/Ring card (NT6X80) with 0- to 7-dB loss. A 0- to 7-dB loss reduces echo and other noise.

The A/B derived data link (DDL) message card (NT6X86) inserts A-, B-, and DDL-bits in the PCM data stream. The A/B DDL NT6X86 card extracts A-, B-, and DDL-bits from the PCM data stream.

The DS-1 interface cards (NT6X85) convert the PCM speech data from parallel to serial format. The NT6X85 transmits the PCM speech data to the RCS. Each 6X85 card contains two DS-1 ports, which provide two-way voice data and signaling interface to the RCS.

The XPM peripheral loader (XPL) card (NT7X05) can reduce XPM simplex time. The NT7X05 card allows the system to transfer XPM software loads to the XPM. The NT7X05 card allows the system to store software loads in local storage in an XPM unit that is in service. The NT7X05 provides storage of XPM loads and images in a stable memory card that does not have a mechanical base. The card allows replacement of a current loadfile with a new loadfile. During the replacement of a file, the last image is available for recovery actions. To transfer the software to the NTMX77, instruct the XPM unit to load from the NT7X05 card. Use the enhanced LOADPM command, when the PM is ManB. Use the enhanced LOADPM command with the following parameters to load the local image:

```
>LOADPM [PM] LOCAL IMAGE
        [ACTIVE]
        [INACTIVE]
        [UNIT]
```

or

Use the following parameters to load the local loadfile:

WARNING
Possible service interruption
The LOCAL LOADFILE option of the LOADPM command has a parameter of [<file> string}]. If you use this file_name parameter, you must use the loadfile named in the parameter. The loadfile named in the parameter is not patched. Do not use this parameter unless you revive the NOPATCH option of the loadfile.

>LOADPM [PM] LOCAL LOADFILE
[ACTIVE]
[INACTIVE]
[UNIT]

Note: Only peripherals that are not ISDN support the IMAGE parameter.

The XPL uses image technology to improve peripheral loading. The CM has a high level of image control because the system monitors changes to restart survivable objects in the XPM. Restart survivable objects are static data and code, in the form of patches. The XPL dumps an image and copies NTMX77 RAM in an XPM unit. The XPM unit can be in service (InSv), active or inactive. The XPL copies the image to the NT7X05. If an XPM reload is necessary, the system restores the image from the NT7X05 to the UP RAM.

Note: You cannot dump an image of an embedded processor. Use the LOADPM command with the CC CMR parameters to load the CMR processor from the CM.

To dump images manually to the NT7X05 card, use the enhanced PM MAP level command LOADPM. Manually dump images to the NT7X05 card when the XPM is InSv. Use the parameters that follow:

>XPMSTOR [PM] CC [loadfile_name]
[ACTIVE]
[INACTIVE]

Note: If you enter the loadfile_name, the name must be the name of the file entered in field LOAD in inventory table LTCINV.

When you first install the NT7X05 card, the loadfile is invalid. Load the loadfile with the XPMSTOR parameter. Use the enhanced QUERYPM command with the new FILES option to view the state of files on the NT7X05. An example of the QUERYPM command follows.

>QUERYPM FILES

Example of a MAP response:

```
Unit 0:
   NT7X05 load File: ** Mismatch **
   NT7X05 Image File:   ESS05AW
   CMR LOAD:   CMR03A
Unit 1:
   NT7X05 load File: ** Mismatch **
   NT7X05 Image File:   ESS05AW
   CMR LOAD:   CMR03A
```

When loading is necessary, the CM checks to see if the NT7X05 is entered. If NT7X05 is present, the recovery software loader (RSL) transfers the name of the desired load file. The RSL indicates if the image or loadfile must be loaded from the CM to the unified processor (UP). The RSL checks for the loadfile name on the NT7X05. If the load name test passes, the RSL restores the image or load to the UP. To avoid delays in loading a good file, the restore/loading process checks the image/loadfile integrity. Operating company personnel can use the enhanced QUERYPM command again to view the state of files on the NT7X05. The following example shows this procedure:

>QUERYPM FILES

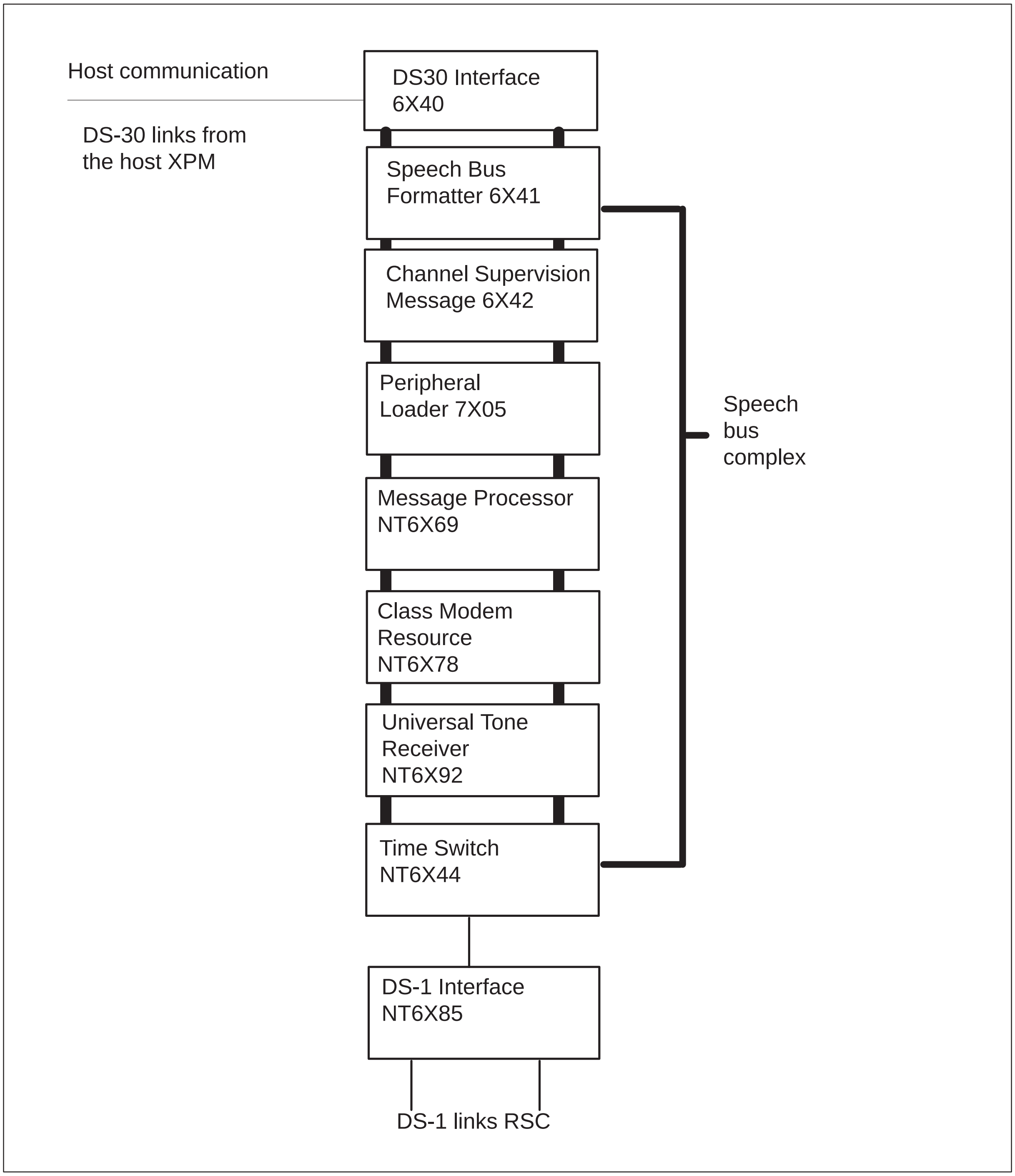
Example of a MAP response:

```
Unit 0:
   NT7X05 load File: ESS05AW
   NT7X05 Image File:ESS05AW
   CMR LOAD:   CMR03A
Unit 1:
   NT7X05 load File: ESS05AW
   NT7X05 Image File:ESS05AW
   CMR LOAD:   CMR03A
```

The SMS internal messaging

The following diagram shows the message paths in the SMS.

Message paths in SMS



The UP formulates the SMS messages intended for the CM. The UP directs the messages. The UP sends the messages through the DS30 cards from the message and tone card (NT6X69). The CM messages are placed on channel 0 of DS30 links 0 and 2. The message and tone card extract messages from the CM and the DS30 interface card. The UP scans the message and tone card, accesses the messages, and interprets the messages.

The 6X69 and the DS30 card exchange C-side messages over a wired link. These C-side messages to the network use DS30 protocol. The message and tone card allows message exchange between the active and inactive SMS units. The system uses intermodule communication (IMC) protocol to send messages over a wired link. The section XPM intermodule communication describes this procedure.

The DS30 cards and the time switch exchange control messages over a wired link.

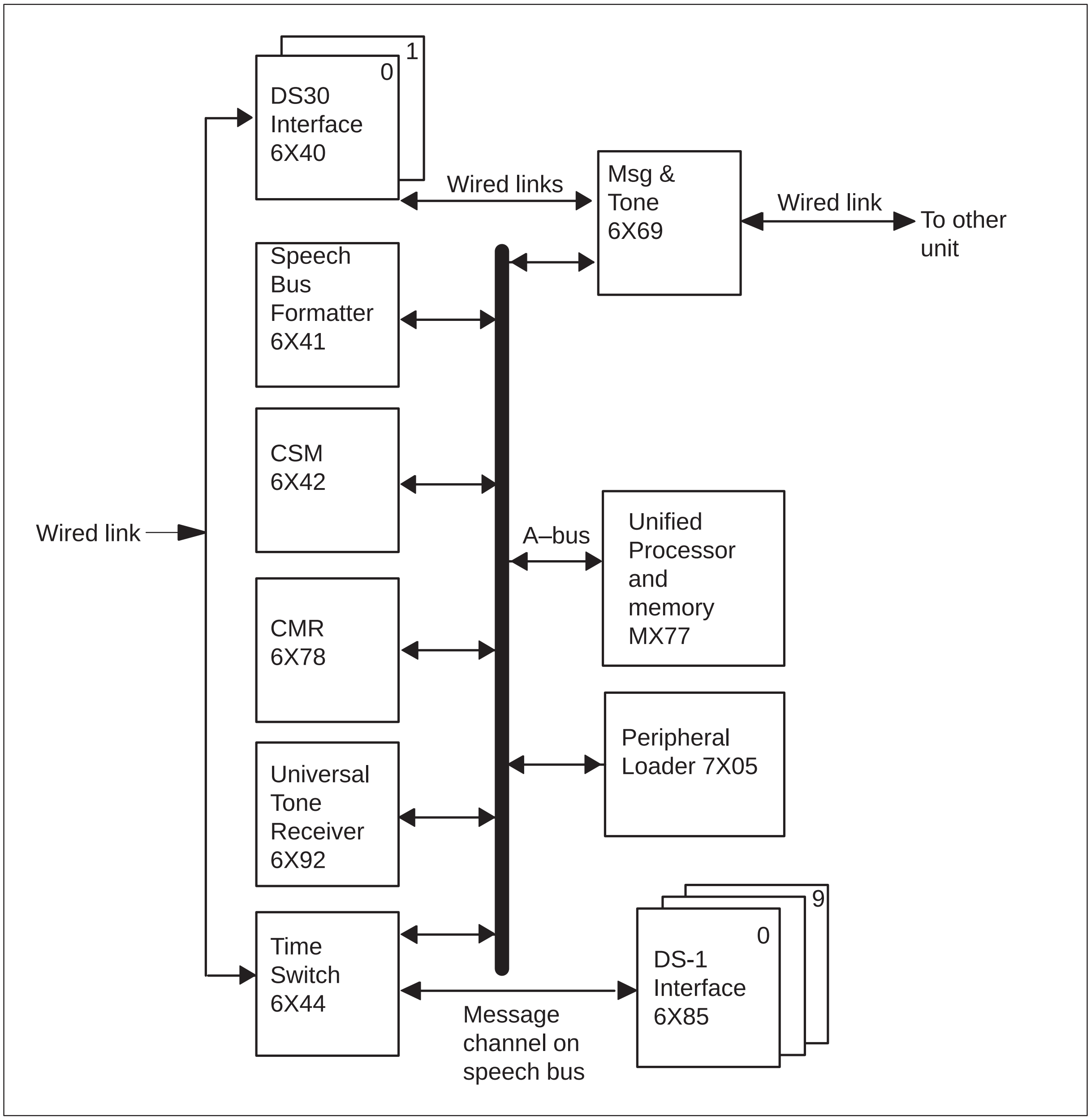
The system uses a message channel through the time switch to send control and state messages to and from the DS-1 cards. The time switch exchanges one message channel for each DS-1 link with each DS-1 card. Each DS-1 card handles two links, so that each card has two message channels.

The NT6X92 card identifies and processes tones for channels on the parallel speech bus. Another name for the NT6X92 is the universal tone reciever (UTE).

The NT6X78 custom local area signaling service (CLASS) modem resource (CMR) card supports Calling Number Delivery (CND) and other CLASS services. The CMR card provides the Analog Display Services Interface (ADSI) protocol to transmit CLASS data between the CM and customer premises equipment (CPE). The CPE complies with the ADSI protocol. For more information on CLASS and the CMR card refer to *XPM Translations Reference Manual*.

The system processes speech from the RCS to the network the same way as speech from the network to the RCS. The only difference is that the speech from the RCS does not pass through the pad/ring cards. A DS-1 card receives the incoming speech. The time switch removes messages and signaling bits. The incoming speech switches to the correct C-side channel. The CSM card adds CSM and parity bits. The formatter card demultiplexes the incoming speech. The DS30 cards transmit the speech to the network.

Functional block diagram of the SMS with XPM PLUS



Spontaneous Call Waiting with disposition (DSCWID)

You must have the NT6X78AB, the NT6X69AD, and the NT6X92BB cards to comply with the ADSI protocol. The ADSI protocol supports CLASS features that provide information that relies on display to subscribers with ADSI-compatible CPE. An example of information that relies on a display is DSCWID.

The proprietary DSCWID feature is revised to comply with the Bellcore TR-416. Bellcore TR-416 describes the requirements for DSCWID. Bellcore TR-416 specifies how this feature interfaces with the following:

- an ADSI set. A ADSI CPE that can display options on screen.
- an SCWID set. A CPE that can deliver caller identification (CID) data. The CPE does not comply with the ADSI protocol.
- an 2500 set. A CPE that can signal Dual Tone Multi-Frequency (DTMF), but cannot off-hook delivery of CID data. The CPE does not comply with the ADSI protocol.

The CC sends tones to alert the DSCWID subscriber of a pending call, and the CPE of pending caller data. For example, a line with the DSCWID option has a call established. A second call attempts to terminate to that line. The CC provides one of two types of alerting signals: a Subscriber Alerting Signal (SAS), or an SAS that precedes a CPE Alerting Signal (CAS). The tone the subscriber recognizes as the call waiting tone (CWT) is the SAS. The CAS alerts the CPE of incoming data if the subscriber line has the Caller Identification (CID) feature.

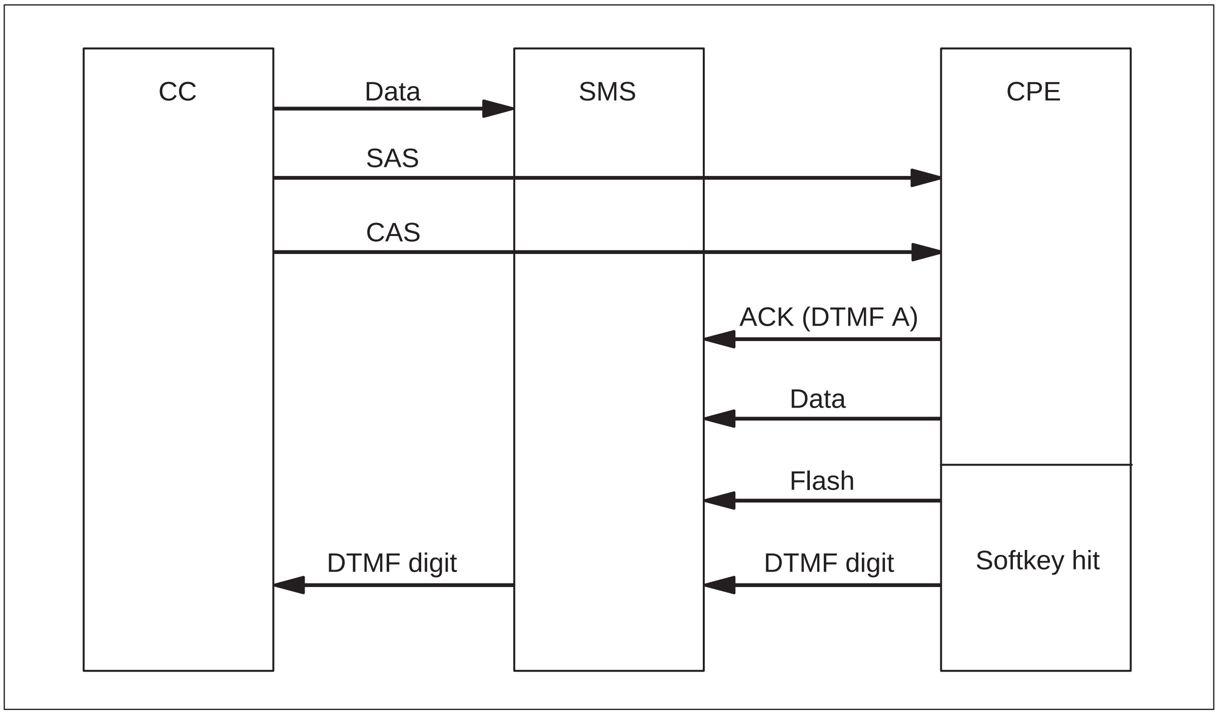
The DSCWID CPE generates an acknowledgment (ACK) tone in response to alerting tones. The ACK tone indicates that the DSCWID CPE can receive DSCWID data. The UTR card in the SMS collects the ACK tone. If the CPE is ADSI compatible, the system sends a DTMF A ACK signal in response to the CAS. If the CPE is a SCWID CPE, the CPE sends a DTMF D ACK signal in response to the CAS. When alerting tones are sent, the subscriber can control the handling of the incoming call.

To respond to the tones, the subscriber can use the following:

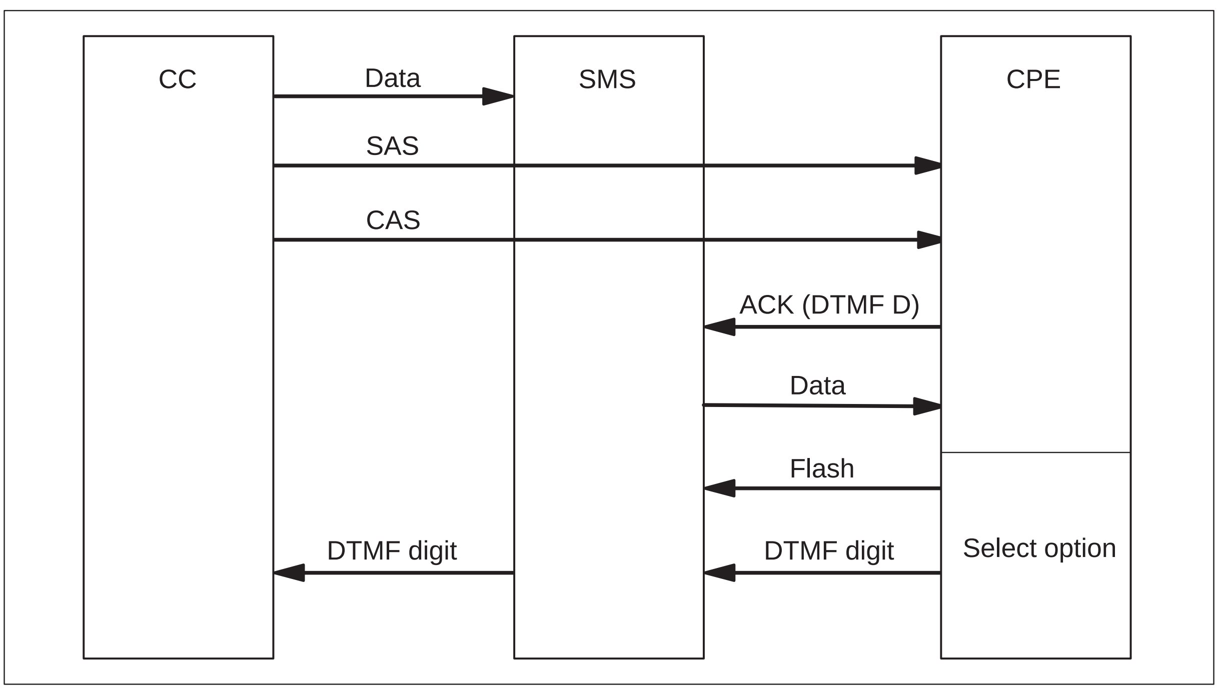
- the CPE softkeys if the CPE is ADSI
- the hard-coded keys if the CPE is a SCWID or a 2500 set

If the CPE does not send an acknowledgment tone in response, the system treats the CPE as a 2500 set. The following diagrams show examples of responses from the three set types.

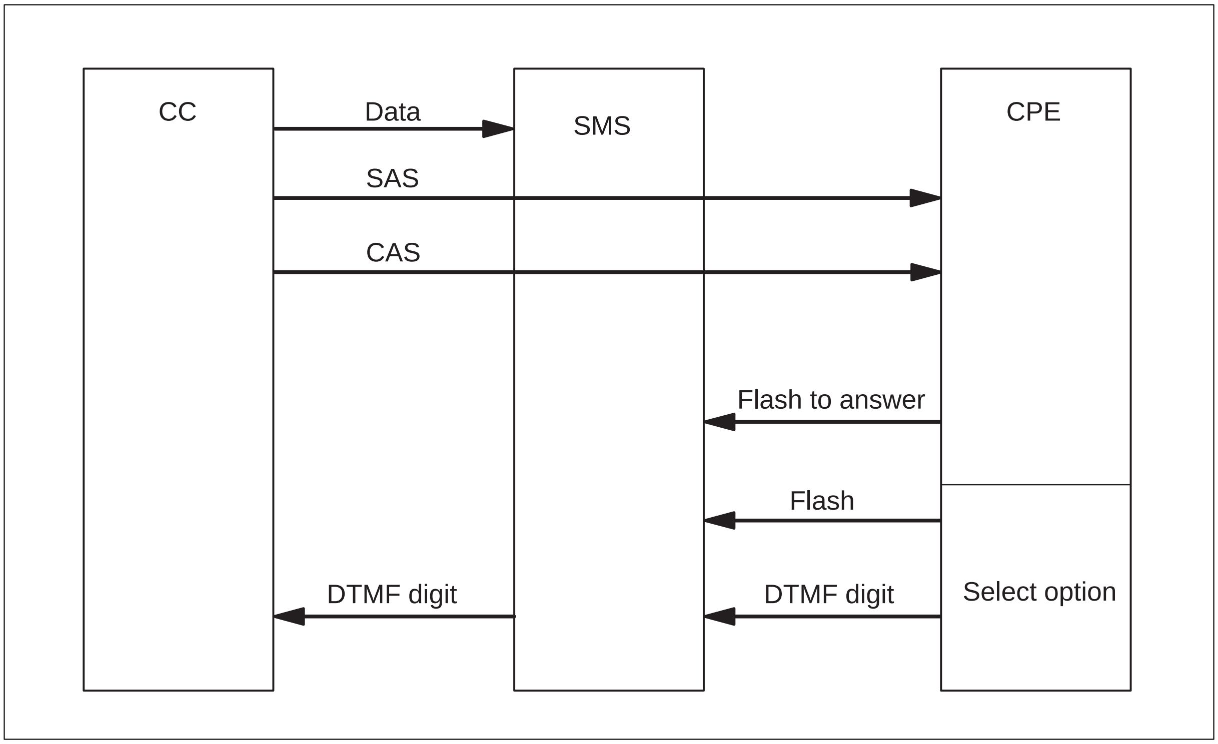
Example of a DSCWID call on an ADSI set



Example of a DSCWID call on a SCWID set



Example of a DSCWID call on a 2500 set



When a UTR channel is not available, the system continues to send alerting signals to the CPE. If all UTR channels are not available, the system does not send data to the CPE. In the proprietary DSCWID, when the SMS cannot attach a UTR, the SMS ignores a flash. For Bellcore compliance, the switch must provide options if the SMS detects a flash and the switch cannot attach a UTR. For compliance, the SMS sends a flash to the CC if the SMS cannot attach a UTR in 400 ms. If the CC does not acknowledge the notification of a pending call in 10 s, the system sends a second signal. If the CPE does not receive display data because UTR channels are not available, the system holds the data. If alerting occurs again, the system sends the data again.

After the SMS receives a flash signal from a customer ADSI compatible CPE, the SMS starts a T-tone timer. The T-tone timer times for the maximum time allowed between a flash and the DTMF on an ADSI set. The timeout is 600 ms. During the timeout, the speech path is muted. The SMS starts the T-tone timer for the first option selection during a DSCWID call. The CPE type does not affect this process. Any ADSI DSCWID option selections that follow also initiate the T-tone timer.

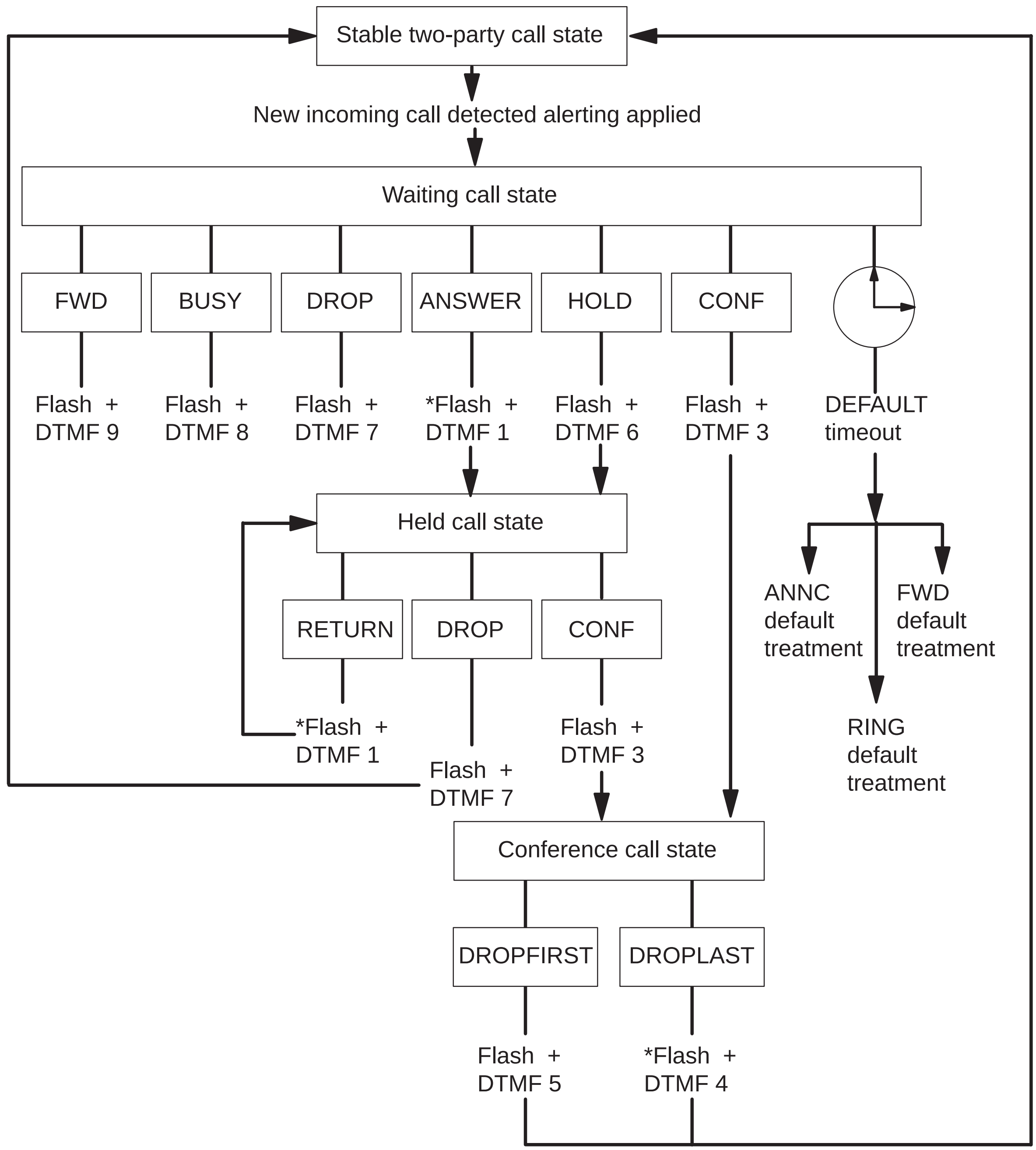
Later DSCWID option selections on a SCWID or 2500 set use a new timer (T-flash). The system uses the T-flash time when a subscriber answers the call. The T-flash timer allows time for the customer to select an option after a flash. Before this timer, 600 ms did not allow a subscriber to flash and dial a DTMF digit.

The operating company can set the T-flash timer from 1 to 8 s. The default is 1.5 s. The SMS starts the T-flash timer if the NONADSI field in table DSCWDTYP is Y. The SMS starts the T-flash timer when the SMS receives a flash signal from the SCWID of a customer. The SMS starts the T-flash timer when 2500 set during the held or conference call state. The SMS must keep track of the DSCWID call state and the type of CPE. The SMS must keep track of this information because the timer used depends on this information. If the SMS cannot attach a UTR before 400 ms, the RETURN option applies.

The CC attempts to stay synchronized with the CPE at all times. This close supervision prevents problems. A problem occurs when the CPE tries to perform a function, and the switch does not process the option. The switch does not process the option based on the call state. As described in diagram DSCWID with ADSI set allocations, available call waiting allocation options are as follows:

- Answer the new call and put the current call on hold
- Disconnect the current call and answer the new call
- Forward the new call
- Connect the new call to a busy announcement
- Put the new call on hold after connection to a hold announcement
- Conference the new call with the current call

The DSCWID with ADSI set allocations



Note 1: An * indicates that a flash can accomplish the same function as sending the DTMF code for that digit.

Note 2: If a set that is not ADSI has hard-coded keys for DSCWID allocations, or the subscriber can provide a DTMF-digit in 600 ms, allocations can be available. Allocations can be available if NONADSI = Y in table DSCWDTYP for the specified DSCWID type.

Thr XPM intermodule communication

The extended multiprocessor system (XMS)-based PM (XPM) uses the IMC links to exchange call processing and diagnostic messages. The IMC links transmit software loads and related data between the active and inactive units. The two IMC links used in the XPM are the following:

- the message protocol and tone card (NT6X69)
- the unified processor card (NTMX77)

The message protocol card is the primary IMC link in the XPM. All types of IMC messaging between XPM units use the message protocol card.

The message protocol card is an IMC link that connects each XPM unit. The XPM units use the IMC link to exchange the following:

- link state and connection information between the active unit and the inactive unit. This data allows the inactive unit to maintain stable calls if a switch of activity (SWACT) occurs.
- software loads and related data from the active unit to the inactive unit. This exchange occurs when the C-side links on the inactive unit are down.
- maintenance and diagnostic messages from the CM to the inactive unit when message links to the inactive unit do not function
- the active unit transmits the results of diagnostic tests that occur on the inactive unit to the CM.

The unified processor IMC link is a universal synchronous/asynchronous receiver/transmitter (USART) link that connects the unified processors in both units. The unified processor IMC link has the following functions:

- the load small diagnostic programs from the in-service active unit to the out-of-service inactive unit
- the supply of information for how to diagnose faults in the mate unit when the message protocol card IMC link does not function

The CM data synchronization

The XPMs have several requirements to maintain system sanity. The node and port tables in both units must remain synchronized. Common tuples for both units must contain the same data. The same internal indexes must reference common tuples to both units. Maintain identical indexes in both units to allow processes to communicate between units. Active processes continue to function after a warm SWACT. When XPMs were first designed, this synchronization was easy to maintain. Synchronization of the mate unit node and port tables is difficult to maintain with the new functionalities.

Data is set in the active unit of an XPM through the node and link return-to-service (RTS). Data is also set through state changes that are triggered externally. Data goes to the inactive XPM unit through the group and separate messages of the current XPM data-synchronization mechanism. To perform this procedure, the system uses the following:

- An IMC filter that blocks all separate XPM data-synchronization messages.
- The CM supplied static and dynamic data for the SMS. The system also uses any subtending P-side nodes in the SMS where the SWACT occurs.

Node table synchronization occurs in the XPM. The inactive unit orders the node table of the inactive unit like the active unit table. The active unit sends a map of the node table of the active unit during a bulk download of configuration data. The inactive unit uses the map to complete the datafill for the node table of the inactive unit. This process occurs as the XPM receives data from the CM.

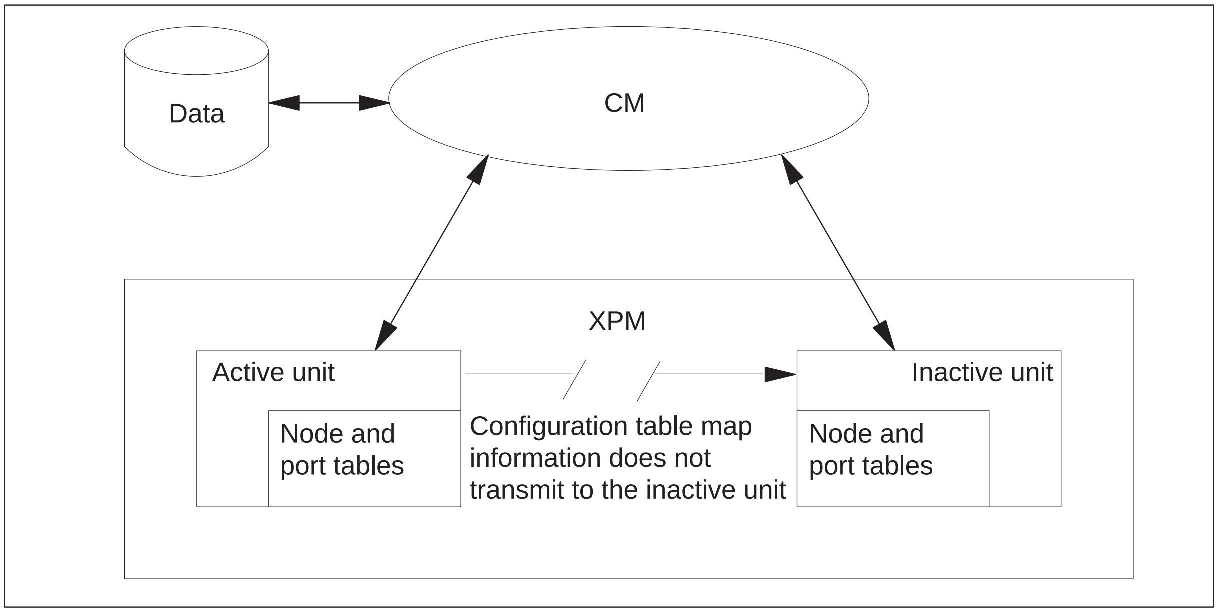
The inactive unit does not use the node map to write dynamic updates. The inactive unit expects data in exactly the same order as the active unit. When the inactive unit is running, the node and port tables of the inactive unit remain synchronized with the active unit. Units can lose synchronization if one unit loses an earlier dynamic update. The active unit can contain a temporary inter-processor message link (IPML). The IPML broadcasts loading in the node table of the IPML when a dynamic update occurred. This procedure causes the tables to lose synchronization. The tables lose synchronization because temporary IPMLs are only added in the node table of the active unit.

Node table synchronization enhancements

Feature AF5678, XPM Node Table Sync Redesign creates table PMNODES. This table contains a list of all nodes in each XPM. This table transfers XPM node information to the new CM load during a software upgrade. This transfer makes sure the new CM software contains the correct node order for each XPM that becomes active. The CM controls the sequence and data entry in node and port tables in both XPM units. The CM and the tables in both active and inactive XPM units maintain synchronization. The XPMs with this table management system do not use mapping information to maintain synchronization.

Table PMNODES is a read only table. The system adds and deletes tuples when data entries occur in related inventory tables, like RCCINV and LCMINV. The system rejects user attempts to update this table. The system checks the XPM resources when addition or change of a tuple for a subtending node occurs. Warnings appear when an XPM does not have the table space, port, or terminal resources to support the new requirements. For a complete description of the datafill for table PMNODES, refer to the *XPM Translations Reference Manual*.

Enhanced XPM node table synchronization



Feature AF5678 adds a new software component, configuration data table (CDT) management. The CDT bind interface allows XPM applications to bind an aspect with the set of procedures of the CDT bind interface. This event occurs during initial program load (IPL). An XPM with a software load bound with the new CDT management system notifies the CM during an XPM node data audit. The CM starts a CDT audit every 5 min. This action starts the XPM node data audit in the XPMs.

The CDT/XPM node audit converts XPMs with compatible software loads to the new node table management control. The CDT/XPM node audit checks the sanity of converted XPMs. To maintain backward compatibility, XPMs with software loads without CDT management capability continue to maintain mate unit synchronization. The XPMs with software loads without CDT management capability continue to maintain mate unit synchronization.

The CM controls both units of an XPM node when conditions occur as follows:

- The CDT/XPM node data audits update the tuple(s) of that node in table PMNODES. The updated tuple(s) and the data and indexes sequence of the tuples in the XPM node and port tables match.
- The CM had control of both units in a previous software load.

- The system adds a new XPM, but not during a one night process (ONP) conversion. Nodes added during ONP are not new nodes. These nodes must be in-service.

Note: When an office receives an initial software load with the new node table management system, the CM gains control. The CM gains control of compatible XPM node and terminal tables during the next scheduled CDT/XPM node data audits. If the system takes an XPM out-of-service (OOS), the CM does not assume control automatically. The audits must convert an XPM to the CDT management system and align the CM with the node tables. When this condition occurs, the CM assumes control.

The CM starts the audit request to an XPM with a VERTUPLE message. The message has a parameter that identifies how the XPM must respond. The XPM can send a message with specified tuples of data or a checksum of the table. The system requests tuple data to supply the CM with the required information to convert an XPM to CDT management control. If differences are present between the active and inactive unit tables, the CM aligns to the active unit table. The CM sets the XPM ISTb. After the system converts an XPM to CDT, the system always requests a checksum of the table. The system requests this checksum when the CDT audit runs.

The system uses checksums of node and port table data to verify synchronization of XPM nodes under the CDT management system. To calculate checksums, the system regenerates each tuple in the XPM table. After the system formats a tuple, the system calculates the checksum for that tuple. The system adds the calculated checksum to the table checksum for that XPM. The system verifies the XPM checksums against corresponding checksums that the CM generates. In both methods, when synchronization does not occur, that unit is set ISTb. During the next audit cycle, the system clears the ISTb condition if the unit checksum coincides with the CM checksum.

The XPM node and port tables are compressed when the system takes both units OOS and downloads new configuration data. This process allows the CM to manage the node and port tables correctly.

The CM becomes more active in the maintenance of the node table integrity in XPMs. When the CM becomes more active, the XPMs become less active. The XPM must accept the CM data as the XPM receives the CM data. The XPM cannot correct or adjust data.

To implement the enhanced synchronization capability that feature AF5678 provides, the following functions are created or changed:

- The XPM does not derive node table data from a part of data sent from the CM. The CM specifies all the data that the node and port tables contain. The XPM stores this data.
- The CM notifies operating company personnel if resources are not available on an XPM when inventory tables change. The state of the XPM, ManB of OOS, does not affect the notification.
- The XPM does not compare node tables between units. The CM makes sure the node tables in each unit match because the CM controls the content of each table. When an inactive unit is RTS with the NODATSYNC option, a configuration download from the CM does not occur. Configuration download only occurs when both units are OOS and RTS at the same time.
- Node and port table aspect and access routines allow applications to access the data. The system provides users with read-only access to applications. The CM continuously updates tuples in XPM tables when the XPM is INSV.
- The system establishes a new external node number to internal node number look-up table in the XPM. This table provides fast conversion from external to internal node numbers and eliminates the possibility of collisions.
- An enhanced messaging interface includes status information between the CM and XPM. The new interface contains the following:
  - — addition of a sequence number from 1 to 255 in the header to detect lost messages
  - — a byte of data transfer state information, which informs the XPM if more messages follow
  - — a count of tuples that the messages affect
  - — table format identification to identify the version of XPM table software. To maintain backward compatibility, the current node table management software in the XPM remains until XPM06.

Information flows to and from the SMS

The system transmits information flows between the following parts of the DMS-100 network:

- the SMS and the RCS for control messaging and speech/signaling
- the CM for control messaging
- other peripheral modules for speech/supervision messaging

Control messaging between the SMS and the RCS

The derived data link (DDL) is the message protocol that transfers messages from the SMS to the RCS. The DDL transfers messages from the RCS to the SMS. The DDL is a 2.2 Kbit/s data path. The system robs frame signaling (Fs) bits to form the DDL.

A Superframe includes 12 193-bit frames. A framing bit precedes each frame. These framing bits are Ft or Fs bits. In the SMS-RCS subsystem, two Superframes pass unchanged. The system robs the next four Superframes of Fs bits. The DDL bits replace the robbed F bits. The DDL link has 24 bits. The system robs the Fs bits at a card in the RCS, or at the time switch card in the SMS.

The DDL messaging The 8085 microprocessor of the A/B-DDL message card sends DDL messages to the time switch. The DS-1 PCM data stream includes these messages. The 8085 microprocessor extracts the DDL message from incoming PCM. The DDL facility processes DDL messages. The DDL facility is software in the SP.

The DL message has 24 consecutive bits. The arrangement of the bits appears in the following table.

The DDL message bits and field names

DDL bits	Field name
Bits 1 through 11	Concentrator field (C-field). When a C-field is not available to send on the DDL link, the 8085 microprocessor sends an idle pattern on the DDL link. The RCS sends an idle pattern when a new C-field is not present.
Bits 12 through 14	Spoiler bits (fixed pattern of 010). Spoiler bits are inserted at set positions in the DDL to make sure that the DDL never duplicates a signaling pattern.

Note: If the M-, A-, or S-fields do not change between messages, the 8085 microprocessor sends the previous field patterns. The RCS, at the other end, also sends the same patterns. The 8085 microprocessor sends information to the UP when a DDL field changes. The RCS does not transmit idle patterns.

—continued—

The DDL message bits and field names (continued)

DDL bits	Field name
Bits 15 through 17	Maintenance field (M-field). The M-field on the A-link carries information for all shelves. This M–field controls card and customer loop testing.
Bits 18 and 19	Alarm data link field (A-field). The A-field on the A-link carries alarm and system control information for all shelves.
Bits 20 through 23	Protection line switch field (S-field). The S-field on the A-link controls the switching of the DS-1 protection link.
Bit 24	Spoiler bit field (fixed pattern of 1)
Note: If the M-, A-, or S-fields do not change between messages, the 8085 microprocessor sends the previous field patterns. The RCS, at the other end, also sends the same patterns. The 8085 microprocessor sends information to the UP when a DDL field changes. The RCS does not transmit idle patterns.	
—end—	

When RCS shelf groups AB and CD operate in Mode II, these shelf groups use the C-field. This field carries information for shelves A, B, C, and D. This information includes control of assignment and deassignment of subscribers to DS-1 channels, hook changes, and activation of the PCM looping test.

Speech/signaling between the SMS and the RCS

The SMS and RCS use A- and B-bit messaging to exchange speech and signal information. The A- and B-bits are 1 or 0. To construct messages, the system assembles the SMS and RCS bits in the following patterns:

- steady state 0
- steady state 1
- modulated 0
- modulated 1

These patterns indicate different signaling states. The SMS sends the following signaling information to the RCS for each channel:

- start or stop ringing
- start or stop forward disconnect
- scan for on-hook and off-hook
- collect ANI/Coin information
- collect channel maintenance information

The UP collects the return signaling information from the RCS. This information includes the following data:

- call origination
- call disconnect
- digit collection
- automatic number identification (ANI)/coin
- answer
- flash

The RCS never sends the modulated 1 and 0 messages to the SMS. The RCS sends steady 1 and 0 messaging. The SMS can send modulated 1 and 0 to the RCS.

The system decodes A- and B-bit messages in a different way for each type of RCS line card. For example, a pattern for a single-party line card and the same pattern for a coin card can have different indications.

The UP contains the A/B-bit facility software section. The A/B-bit facility makes sure that the 8085 microprocessor operates correctly. The A/B-bit facility scans incoming RCS signaling information for each channel. The A/B-bit facility scans each channel for origination, answer, flash, disconnect, and other subscriber telephone states. The definition for each state follows:

- Origination—subscriber line goes off-hook from on-hook. The subscriber line stays off-hook for a minimum of 400 ms.
- Digit collection—subscriber line pulses 7.5 to 12 times every 1 s, with a break percentage of 58 to 64%. The digit-to-digit time-out is 300 ms.
- Answer (to ringing)—subscriber line goes off-hook from on-hook. The subscriber line stays off-hook for a minimum of 200 ms.
- Flash—subscriber line goes on-hook from off-hook. The subscriber line stays on-hook for a minimum of 400 ms and maximum of 1550 ms. The subscriber line returns to the off-hook state for a minimum of 200 ms.

- Disconnect—subscriber goes on-hook from off-hook and stays on-hook for a minimum of 1550 ms (flash option allowed). When the flash option is not allowed, disconnect occurs when a subscriber line goes on-hook from off-hook. The subscriber stays on-hook for a minimum of 400 ms.

The DIGC_ROUTINE, part of the UP, detects and collects digits. The DIGC_ROUTINE counts and reports these digits to the A/B-bit facility.

Control messaging between the SMS and the CM

The CM and an SMS exchange control messages over dedicated control channels, like 0, on links 0 and 2. The exchange occurs on the DS30 links. The control information includes the following:

- messages to the CM
  - change of subscriber state
  - dialed digits
  - maintenance information
- messages from the CM
  - speech channel allocation for SMS-to-RCS or SMS-to-other peripheral connection
  - integrity values for supervision of SMS-to-other PM connections
  - provisioning data for the SMS
  - maintenance operation

Speech/supervision messaging between the SMS and other PMs

The SMS and other PMs exchange speech and channel supervision messages (CSM) over a speech channel connected through the network modules. The CM establishes these connections as part of the call set-up procedures. The protocol to exchange speech samples allows the transmission of supervision bits across the channel. The SMS sends and receives CSM. The CSMs are 40-bit sequences. These CSMs contain the integrity value for the connection and other PM-to-PM control messages.

Call processing

The SCM-100S CM Call Processing feature supports call processing for telephone calls between subscribers. This description includes call control for Modes I, II, and III.

The SMS allows the system to perform the following call processing tasks:

- scan for a change in subscriber line state
- assign a DS-1 channel to a subscriber that goes off-hook (Mode II)

- send dial tone to an off-hook subscriber that originated a call
- scan for and collecting digits
- ring a subscriber line
- send audible ringback tone to a calling subscriber
- trip ringing on a called subscriber when that subscriber goes off-hook
- disconnect the call-holding bridge on telephone keysets.

The SMS call processing and call control features monitor and control these activities through signals and messages sent to the RCS. The DDL link and A- and B-signaling bits compose these messages.

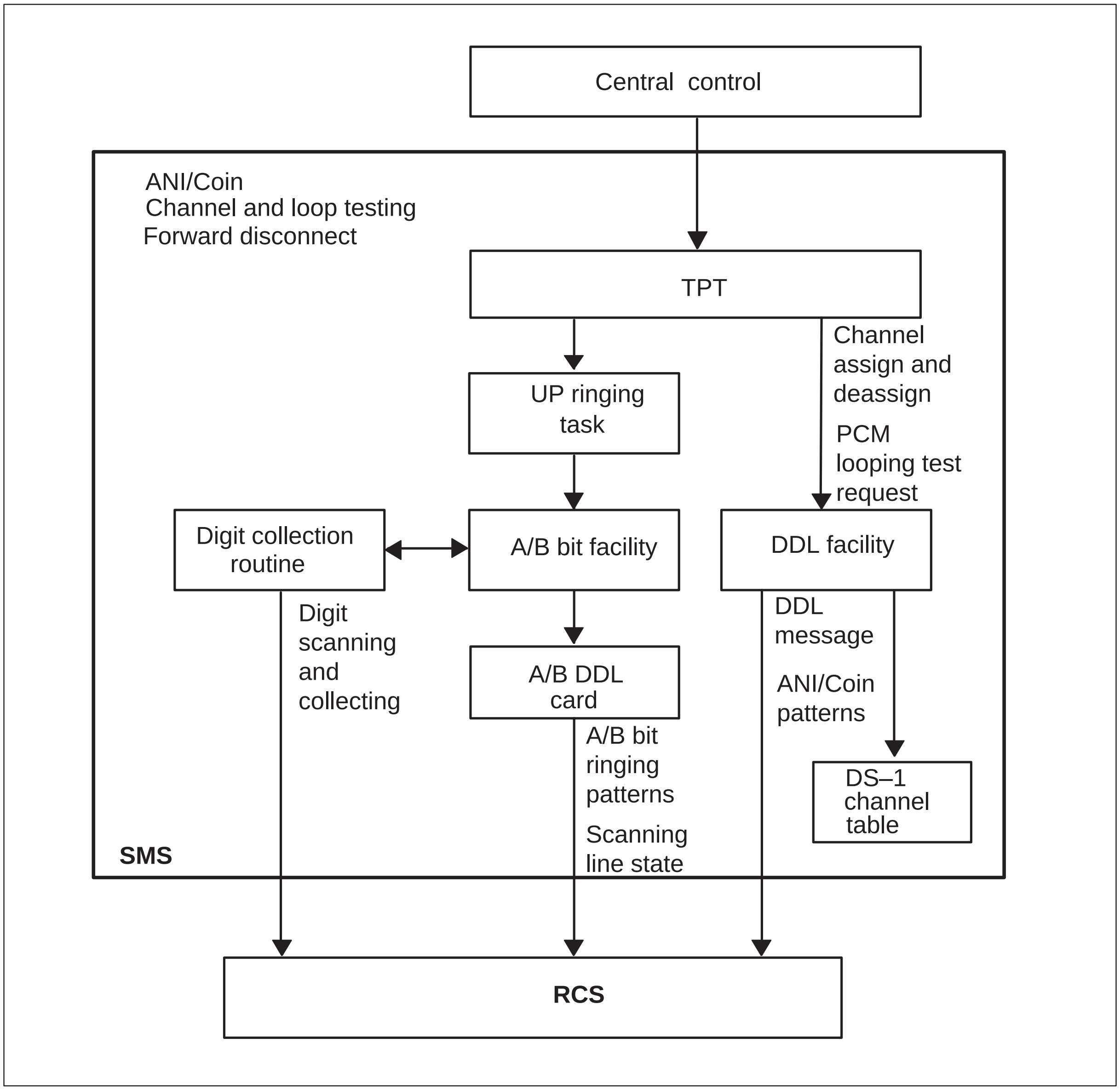
Call processing software modules

The following list includes SMS software modules that initiate call control operations for line circuits, subscriber loops, and telephone sets:

- terminal processing task (TPT)
- derived data link (DDL) facility
- the A/B-bit facility
- the UP ringing task
- the SMS maintenance

The relationship of these modules appear in the following diagram. A description of each module appears after the diagram.

Call processing software modules



The TPT software module The TPT processes call processing primitives or messages that the CM sends to the SMS. These messages determine if the TPT sends TPT messages to other call processing software.

The CM messages include the following lists and requests:

- lists of active and equipped subscriber loops that connect to an RCS
- requests to service subscriber loops on an RCS with services like ringing, dial tone, digit collection, and related call processing functions

- requests for channel and loop tests
- requests for the system to generate a forward disconnect pattern on a channel to an RCS. The forward disconnect pattern causes a line card with an associated keyset to force the keyset to drop the call-holding bridge. The keyset drops the call-holding bridge on abandoned telephone calls.
- requests for ANI and coin functions

  Note: The system performs forward disconnect processing for single-circuit line cards that connect to keysets. The forward disconnect signaling pattern causes the line card to short the loop tip and ring together. The process causes key telephone sets to drop the call-holding bridge on abandoned calls.

After the TPT software receives CM primitives, the TPT software sends messages to other call processing software areas. Important messages include the following:

- messages to the DDL facility that request the DDL facility to assign or deassign a channel to a subscriber loop. These messages can request a PCM loop test as part of the assign message (Mode II).
- messages to the DDL facility that request the DDL facility to make channels associated with equipped, active loops available. The DDL facility maintains an inventory of available DS-1 channels.
- messages to the A/B-bit facility. The messages request the A/B-bit facility to inspect equipped, active subscriber loops for on-hook and off-hook states. The facility also performs the following functions:
  - collect digits
  - send out ANI and coin requests to the RCS
  - scan the responses to ANI and coin requests
  - send or cancel the forward disconnect signaling pattern on the correct channel to the specified subscriber loop
- messages to the UP ringing task that request the UP ringing task to start or stop ringing on a subscriber loop

  Note: Single-circuit cards in Mode II have DS-1 channel assignments that are fixed.

The DDL facility software module

The TPT messages that the DDL facility receives determine the messages that the DDL facility sends to the RCS. The DDL messages can include assignment of DS-1 channels to subscriber loops, and activation of the PCM loop test.

The DDL facility maintains an inventory of available DS-1 channels. When DDL facility receives TPT messages that request channels assignments and deassignments (Mode II), the DDL facility updates this inventory. Subscriber lines that connect to a Mode I or Mode III RCS have set DS-1 channel assignments. The state of these channels is open in the inventory. Software areas, like the A/B-bit facility, use this inventory to find channels available for work related to these channels.

The A/B-bit facility software module

The A/B-bit facility carries out the following operations associated with A- and B-bits:

- transmission of signaling information to an RCS that requests the following RCS functions:
  - scan subscriber lines
  - perform ANI or coin operations
  - ring subscriber lines
  - stop ringing on subscriber lines
- reception of A-bit signaling information from the RCS. The A/B-bit facility checks the bit patterns for:
  - origination
  - answer
  - flash
  - disconnect
  - dial pulses for digit collection
  - ANI or coin responses
- processing of information related to the start or cancellation of the forward disconnect pattern on a channel

The UP ringing task software module

The UP ringing task and the A/B-bit facility initiate or cancel ringing on a P-side channel. These components initiate or cancel ringing to respond to a TPT message.

The UP receives a start or stop ringing message from the TPT. After the UP receives a message, the UP ringing task sends messages to the A/B-bit facility. The A/B-bit facility sends the required A- and B-bits on the correct P-side channel. This process generates a ringing pattern. The A/B-DDL message card sends the signaling bits. The A/B-bit facility scans the P-side channel for signaling patterns that indicate a subscriber answered the telephone. When the A/B-bit facility detects an answer, the facility sends a confirmation message to the UP ringing task.

In Mode II, hook state for subscriber lines transmits in the C-field as an activity message. The message moves from the RCS to the DDL facility.

The SMS maintenance software module

The SMS maintenance software makes sure that the SMS-RCS subsystem performs accurately. When operating company personnel issue the busy (BSY), return to service (RTS), or test (TST) commands at the MAP terminal, the CM transmits messages. The CC sends associated messages to SMS maintenance software. The SMS maintenance software processes CM messages that request open or close SMS P-side ports. If errors occur, SMS maintenance software informs the CM.

The SMS maintenance software performs the following tasks:

- transmission of RCS alarm information to the CM
- activation of channel and loop tests
- update of data tables

The SMS maintenance software allows the operating company personnel to protect switch protection lines manually.

The following sections describe the system setup required for call processing. These sections describe the sequence of events that occurs during call processing.

Call processing setup

Call processing requires the following setup:

- The UP maintenance software loads static data tables
- The UP maintenance software to opens configured SMS P-side ports because of a CM request. The UP maintenance software closes ports that remain
- The UP maintenance software allows external signaling for all channels on opened P-side ports. This condition allows the A/B-bit facility to transmit the required A-bits and B-bits on the channels.

- The DDL facility sets equipped, active channels to available in the inventory of the DDL facility. A TPT message causes the process to occur.
- The TPT sends a message to the A/B-bit facility. This message requests the A/B-bit facility to scan equipped, active channels for off-hook.

Call processing sequence of events—originating end

The following sequence of events occurs during call processing at the originating end of a call:

1 The A/B-bit facility scans for A-bit and B-bit pattern changes, that indicate if a subscriber goes off-hook. If the A/B-bit facility detects an off-hook, the A/B-bit facility sends a message to TPT software.

   In Mode II, the DDL facility receives a message from the RCS through the C-field of the DDL message. This message indicates an off-hook subscriber.

2 In Modes I and III, subscribers a set DS-1 channel assignments. Assignment of a subscriber line to a channel does not require additional messaging.

   In Mode II, the TPT decodes the message from the A/B-bit facility. The TPT requests that the DDL facility assign a channel to the subscriber line. The TPT indicates if a PCM looping test must occur on the DS-1 channel. The DDL facility, through the A/B-DDL message card, sends a channel assignment message to the RCS.

   If the PCM looping test fails, the DDL facility reports the failure to SMS maintenance. The system disables transmission that uses the DS-1 channel.

3 After the DDL facility assigns a channel, the TPT connects dial tone to the subscriber loop. The TPT sends dial tone over the DS-1 channel assigned to the subscriber line.

4 The TPT sends a message to the A/B-bit facility. The TPT requests that the A/B-bit facility scan for digits.

5 If the subscriber dials digits, the A/B-bit facility digit collection routine collects the digits. The digit collection routine from the TPT sends the digits to the TPT. The CM receives the digits from the TPT.

6 The TPT connects audible ringing tone to the subscriber loop. The TPT sends a message to the A/B-bit facility. The TPT requests that the A/B-bit facility scan the subscriber loop for on-hook.

Call processing sequence of events—terminating end

The following sequence of events occurs during call processing at the terminating end of a call:

1. The TPT sends a message to the UP ringing task to start ringing the called subscriber loop.
2. The UP ringing task schedules ringing. The UP ringing task sends a message to the A/B-bit facility to scan for answers. The A/B-bit facility directs the A/B-DDL message card to send ringing patterns to the RCS.
3. When the A/B-bit facility detects an answer, the A/B-bit facility sends a confirmation message to the UP ringing task.
4. The UP ringing task directs the A/B-bit facility to stop ringing on the subscriber loop. The UP ringing task sends the TPT a message that indicates the subscriber answered.
5. The TPT sends a message to the A/B-bit facility. The TPT requests that the A/B-bit facility scan for on-hook on the called subscriber line.
6. The A/B-bit facility scans the originating and terminating subscriber loops. The A/B-bit facility sends the TPT a message when one of the loops goes on-hook.
7. When a loop goes on-hook, the TPT sends the DDL facility a message to remove assignment from the DS-1 channel. The DDL facility removes assignment from the DS-1 channel from the associated subscriber loop.

Call processing with UTR

When the original terminal is on an SMS with a UTR, the CM sends the SMS important information about digit collection. The CM commands the SMS to start digit collection. The SMS obtains a receiver. The SMS connects the originator to the receiver. The SMS collects and reports the digits. The SMS appears in the following figure.

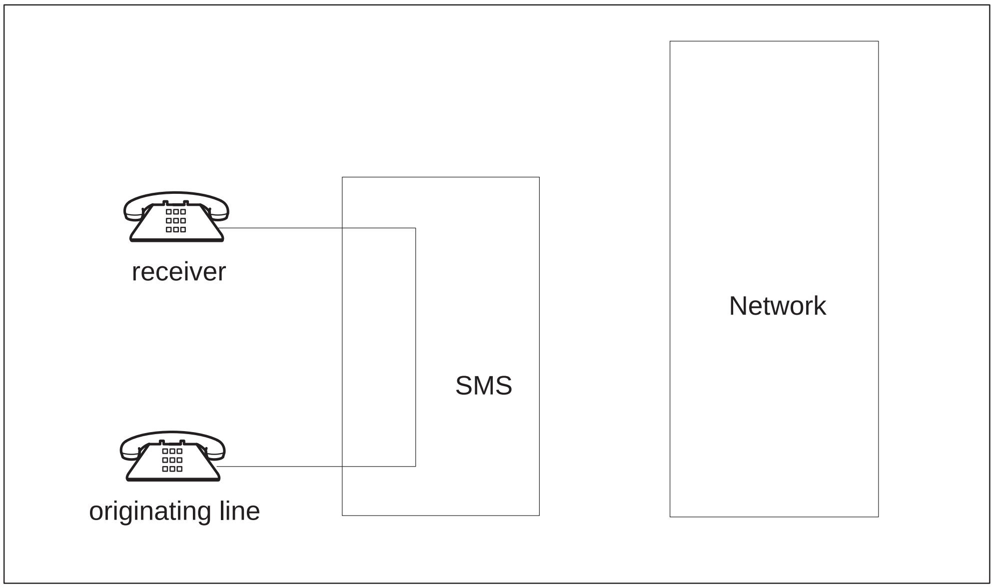
A present UTR does not affect the responsibilities of the line, except in the following conditions:

- where the digits arrive from
- the allocation and deallocation of the UTR channel for digit collection.

When a UTR is present, the SMS performs tasks like the allocation and deallocation of receivers. The SMS performs tasks like how to make and free connections. The CM does not perform these tasks.

When digit collection functions are not required, the terminal stops digit collection. When the terminal stops digit collection, deallocation of the receiver occurs. From this point, the call continues as before.

Configuration for digit collection with UTR present



Warm SWACT

A Warm SWACT allows the inactive unit of the SMS to maintain established calls (calls in the talking state). The inactive unit of the SMS can process new calls. The inactive unit takes control of the SMS in a switch of activity with the mate of the inactive unit. When a warm SWACT occurs, The SMS does not maintain calls in a transient state, like dialing or ringing. Subscribers are dropped. When the subscribers originate again, the subscribers receive dial tone immediately, except Mode II dual circuits. In Mode II dual circuits, the subscriber must go on-hook to originate a call again.

The improved Warm SWACT feature allows calls that survive a controlled Warm SWACT to activate subscriber features. The improved Warm SWACT handling is active when only supported subscriber features are active on the line call.

Continuous data updates and bulk data updates, contain information about the SMS-RCS subsystem. These updates occur when information is transferred from the active to the inactive unit of the SMS during a Warm SWACT. Refer to Data mismatch for more information.

The following limits apply to the Warm SWACT feature:

- The Warm SWACT feature maintains calls. If a subscriber line test is active and a Warm SWACT occurs, the test fails.
- Synchronization of call data between mates occurs when call processing does not occur. Bandwidth limits on the IMC link between the two SMS units and limited UP real time do not allow call processing. Under heavy traffic, call data in the inactive unit is not always up-to-date. The system can drop some established calls when a SWACT occurs.
- An established calls that remains over an *uncontrolled* Warm SWACT does not maintain the hook-flash capability to initiate flash-activated subscriber features. Examples of flash-activated subscriber features are call transfer, three-way calling, conference calls, call parking, and executive busy override. This established call cannot initiate flash-activated subscriber features for the rest of the call. Hook flashes are ignored.

  For example, subscriber A calls subscriber B and establishes a speech path. A system-detected fault occurs. The system initiates an uncontrolled Warm SWACT on the XPM connected to subscriber A. The subscriber maintains the speech path. When subscriber A attempts to set up a three-way call, the system ignores the hook flash.

- The Enhanced Warm SWACT features improve the XPM code in the SMS that handles the Warm SWACT operation. This feature allows flash-activated subscriber features to maintain flash-hook ability over a *controlled* Warm SWACT under specified conditions. These conditions relate to the line service options for the line that survived the SWACT.

  Note: The enhanced warm SWACT feature is for *controlled* warm SWACTS only. An enhanced warm SWACT occurs when the following events occur:

- operating company personnel issue the SWACT command
- the SWACT occurs as part of the REX test sequence.

The following examples describe the abilities and limits of the enhanced Warm SWACT feature:

- Subscriber A calls subscriber B, and establishes a speech path. A REX test causes a Warm SWACT to occur on the SMS that connects to subscriber A. The speech path continues over the SWACT. Subscriber A flashes the hook switch to set up a three-way call. Subscriber A receives a dial tone. Subscriber A dials the third party number. The third party answers and subscriber A flashes the hook switch to connect subscriber B. The three-way call is complete.

- Subscriber A calls subscriber B and establishes a speech path. Subscriber A has the call waiting (CWT) line service option. A third party dials subscriber A. Subscriber A receives information about the waiting call. A controlled Warm SWACT occurs on the SMS that connects to subscriber A. When subscriber A attempts to place subscriber B on hold to access the waiting call, the system ignores the hook flash. The speech path between subscribers A and B remains.
- On calls that originate from a coin telephone the call is not always maintained during a warm SWACT. Heavy traffic or no answer at the terminating end can prevent the maintenance of a call during a warm SWACT. If this event occurs the coin is not returned or collected. The coin remains in the hopper. The calling-party receives a dial tone and can redial the call. If the calling-party presses the switch hook, the coin telephone returns the coin.
- The system maintains timing for a billing call when a Warm SWACT occurs.
- The system deactivates the enhanced Warm SWACT feature when an unsupported subscriber feature is active over the Warm SWACT. The nonenhanced Warm SWACT handling is the default to handle the call when unsupported subscriber features are present. The system ignores hook flashes. Far-end changes are taken down the call. The system ignores conference key messages and transfer key messages. The system ignores call park key messages, and busy override key messages from a business set.

A SWACT can occur when a subscriber line test is in progress. An RCS creates a connection to the metallic test pair. When a SWACT occurs, the current test fails. Operating company personnel can release the connection to the metallic test pair, access the test network again, and retry the test.

Warm SWACT and the SWACT back feature

The XPM Pre-SWACT/Post-SWACT Audit, feature AF5007, improves the Warm SWACT operation. Feature AF5007 denies the SWACT if the inactive unit cannot maintain activity or communication with the CM. Under these conditions, this feature can SWACT back to the original active unit. The software that drives this feature is the SWACT controller.

The system routes all manual requests and selected system requests for SWACTs to the SWACT controller in the CM. The SWACT controller polls PM diagnostic history data in the CM and XPM state data. Do not confuse the CM and XPM state data with XPM static data. The SWACT controller denies the request for a Warm SWACT or allows a Warm SWACT to proceed. The data polled determines the actions of the SWACT controller.

If the SWACT controller denies a manual request for a SWACT, you receive this information. You receive a reason for the denial. The message informs you that you can enter the SWACT FORCE command to override the SWACT controller. If you decide to override the SWACT controller, the system attempts a WARM SWACT. The system does not consult diagnostic history or state data. The active unit of the XPM drops activity. The active unit becomes the inactive unit. This unit remains in-service until the new active unit verifies two-way communication with the CM. The new active unit verifies the ability to maintain activity.

If two-way communication is available and the new active unit can maintain activity, the inactive unit becomes system busy. The inactive unit returns to service. If communication fails or the new active unit cannot maintain activity, a SWACT back to the original active unit occurs. Refer to the following figure for an example of a SWACT back.

For controlled and uncontrolled SWACTs, the SWACT is complete when the CC receives a gain message from the new active unit. The CC acknowledges the gain to the original active unit. When a SWACT occurs, the CC and the SMS exchange a series of drop and gain messages that describe activity. The following table describes common phrases found in these messages.

Message phrases that describe CC to SMS SWACT communication

Message phrase	Explanation
Original active unit	Active unit before the SWACT (unit 0)
Original inactive unit	Inactive unit before the SWACT (unit 1)
New active unit	Active unit after the SWACT (unit 1)
New inactive unit	Inactive unit after the SWACT (unit 0)
Gain message	The message the new active unit (unit 1) sends to the CC to inform the CC that unit 1 gains activity
Gain acknowledge message	The message the CC sends to original active unit to confirm the new active unit sends messages
Gain acknowledge received	Message original active unit sends to CC to confirm the new active unit passed the post-SWACT audit
Drop message	Message the original active unit (unit 0) sends to the CC to inform the CC that unit 0 dropped activity

During a SWACT back, the original active unit attempts to regain activity. If successful, the inactive unit becomes system busy and returns to service. The active unit remains in service. The system maintains calls that have stability from the original active unit over the SWACT back. The system drops new calls made after the SWACT. The system drops new calls made before SWACT back. If a SWACT back is not successful, both units of the XPM become system busy and return to service.

> ***Note 1:*** After a SWACT back, operational measurements and peg counts do not start again.
>
> ***Note 2:*** The system does not support the SWACT controller feature during XPM or CM overload.

The SWACT back ability is available for the following commands that you issue:

- SWACT
- SWACT TEST
- SWACT NOW
- SWACT ALL
- SWACT FORCE
- TST REX NOW
- BSY ACTIVE
- BSY UNIT unit_no

where

unit_no is the number of the active unit

Note: The SWACT back ability is available for a rating exercise (REx) test that the REx scheduler initiates. For more information on interaction between this feature and REx tests, refer to Routine exercise test on page 1-42.

Feature AF5006, PM Diagnostic History, provides a database of information on each XPM unit that subtends the DMS-100 switch. The SWACT controller uses this information to determine if an inactive unit can maintain activity if a warm SWACT occurs. The system resets the collected information when the unit correctly gains activity.

The SWACT controller polls data in the XPM to determine if the inactive unit can maintain activity. The XPM communicates to the SWACT controller query if the active unit can comply with the request to drop activity. State data determines if the active unit can or cannot drop activity. For more information about XPM state data, refer to the section on Pre-gain audit in this document.

Pre-SWACT and post-SWACT audits

Feature AN0538, SMS Pre-SWACT/Post-SWACT Audit, improves the warm SWACT operation. Feature AN0538 denies the SWACT if the inactive unit cannot maintain activity or communication with the CC. Under these conditions, feature AN0538 can SWACT-back to the original active unit. The software that drives this feature is the SWACT controller in the CC with an autonomous ability in the SMS software.

Pre-SWACT audit

Before the active system initiates a SWACT, the active SMS unit queries the mate SMS unit over the intermodule communication (IMC) links. The active SMS unit messages the SWACT controller in the CC. Feature AN0538 improves the pre-SWACT audit of the inactive unit to include the state of the unit during diagnostics. Feature AN0538 assigns a weighted value to the results of the diagnostics. The pre-SWACT audit query results in a boolean pass or fail.

If the SWACT controller denies a manual request for a warm SWACT, the MAP terminal provides information on the denied request. The MAP terminal provides a detailed reason for the denial. The MAP terminal informs you that you can enter the SWACT FORCE command to override the SWACT controller. If you override the SWACT controller, the system attempts a warm SWACT. The system does not consult diagnostic history or state.

Post-SWACT audit

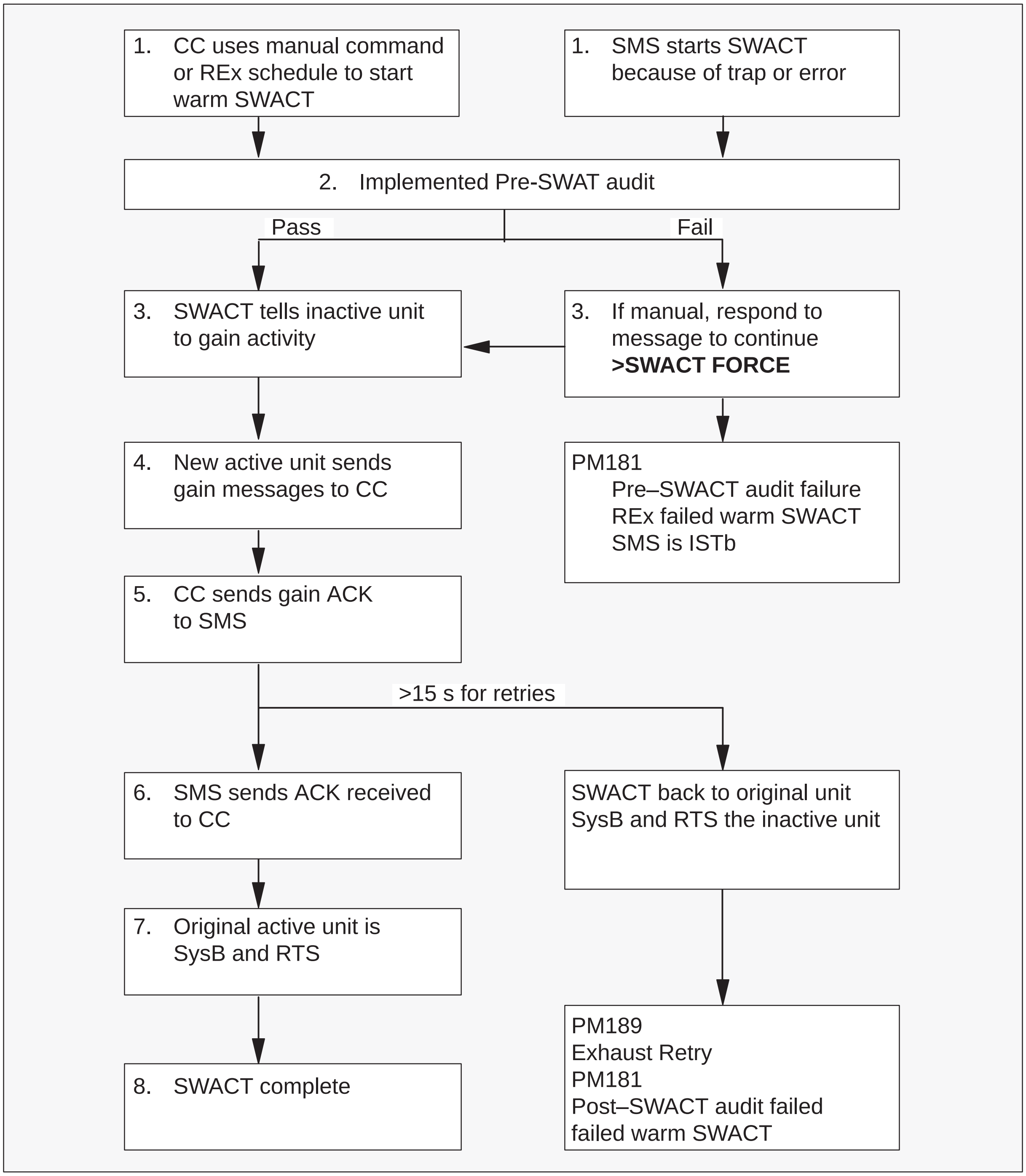
After a SWACT, the inactive unit can become system busy and return to service if the following two events occur:

- two-way communication is available with the CC
- the new active unit can maintain activity

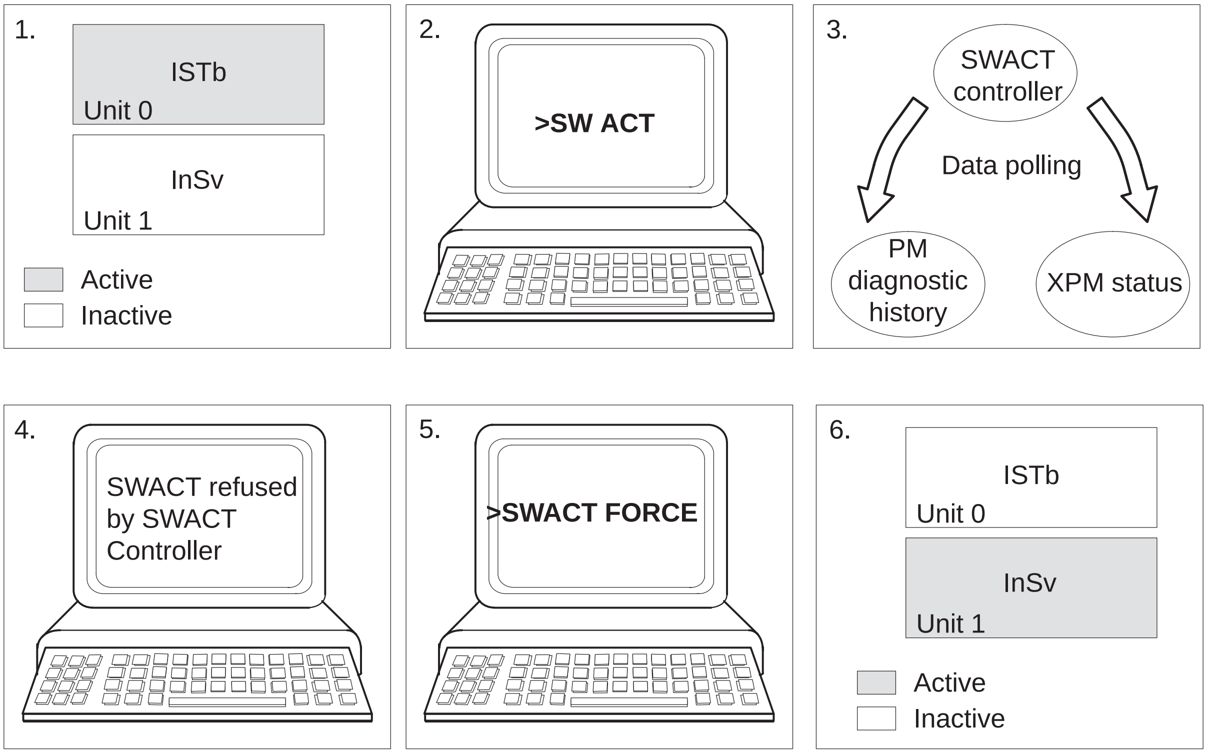
The earlier active unit remains in service until the new active unit can verify two-way communication with the CC. The new active unit verifies that the unit can maintain activity. Communication can fail and the new active unit cannot maintain activity always. If one of these events occurs the SMS initiates a SWACT-back to the original active unit.

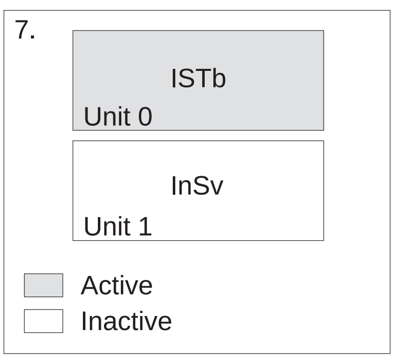
The sequence for a controlled and uncontrolled SWACT and the SWACT-back operation of feature AN0538 appears in this figure. The following sections describe this feature.

SWACT sequence



SWACT back example





1. Both units are in service. Unit 0 is active.
2. The user attempts a Warm SWACT from unit 0 to unit 1.
3. The SWACT controller in the CM polls PM diagnostic history data in the CM and XPM state data in the XPM.
4. Polled data determines that the SWACT controller denies a user’s request for a Warm SWACT.
5. Override the SWACT controller.
6. Unit 0 drops activity. Unit 0 remains in service while post-SWACT audits are run on unit 1.
7. Post-SWACT audits detect a problem in unit 1 that causes a SWACT back to unit 0.

SWACT-back

If an SMS does not receive a gain-acknowledged message from the CC, the original active SMS unit initiates a SWACT-back. During a SWACT-back, the original active SMS unit attempts to regain activity. If successful, the inactive unit is set SysB and returns to service. The active unit remains in service. The system maintains stable calls from the original active unit over the SWACT-back. The system drops all new calls made after the SWACT. The system drops all new calls made before the SWACT-back. If a SWACT-back is not successful, both SMS units before are SysB and return to service.

> ***Note 1:*** After a SWACT-back, the system does not initialize operational measurements (OM) and peg counts again.
>
> ***Note 2:*** The system does not support this feature during SMS or CC overload.

The SWACT-back is available for the following manual SWACT commands:

- SWACT
- SWACT TST
- SWACT NOW
- SWACT ALL
- SWACT FORCE
- TST REx NOW
- BSY UNIT unit_no

  where

  unit_no   is the number of the active unit
- BSY ACTIVE

> ***Note:*** A SWACT-back is available for a REx test that the REx scheduler initiated. Refer to Routine exercise test for more information actions between this feature on how this feature and REx tests.

Routine exercise test

A REx test includes a series of tests performed on an XPM unit. The best test schedule is for the system scheduler or operating company personnel to initiate an XPM unit test each day. The REx test combines the diagnostic and operational routines available on XPMs. The REx test results have the following four classes:

- not performed
- passed
- failed
- manual action aborted. You used maintenance action with the FORCE parameter or the ABTK command from another MAP terminal with the XPM posted

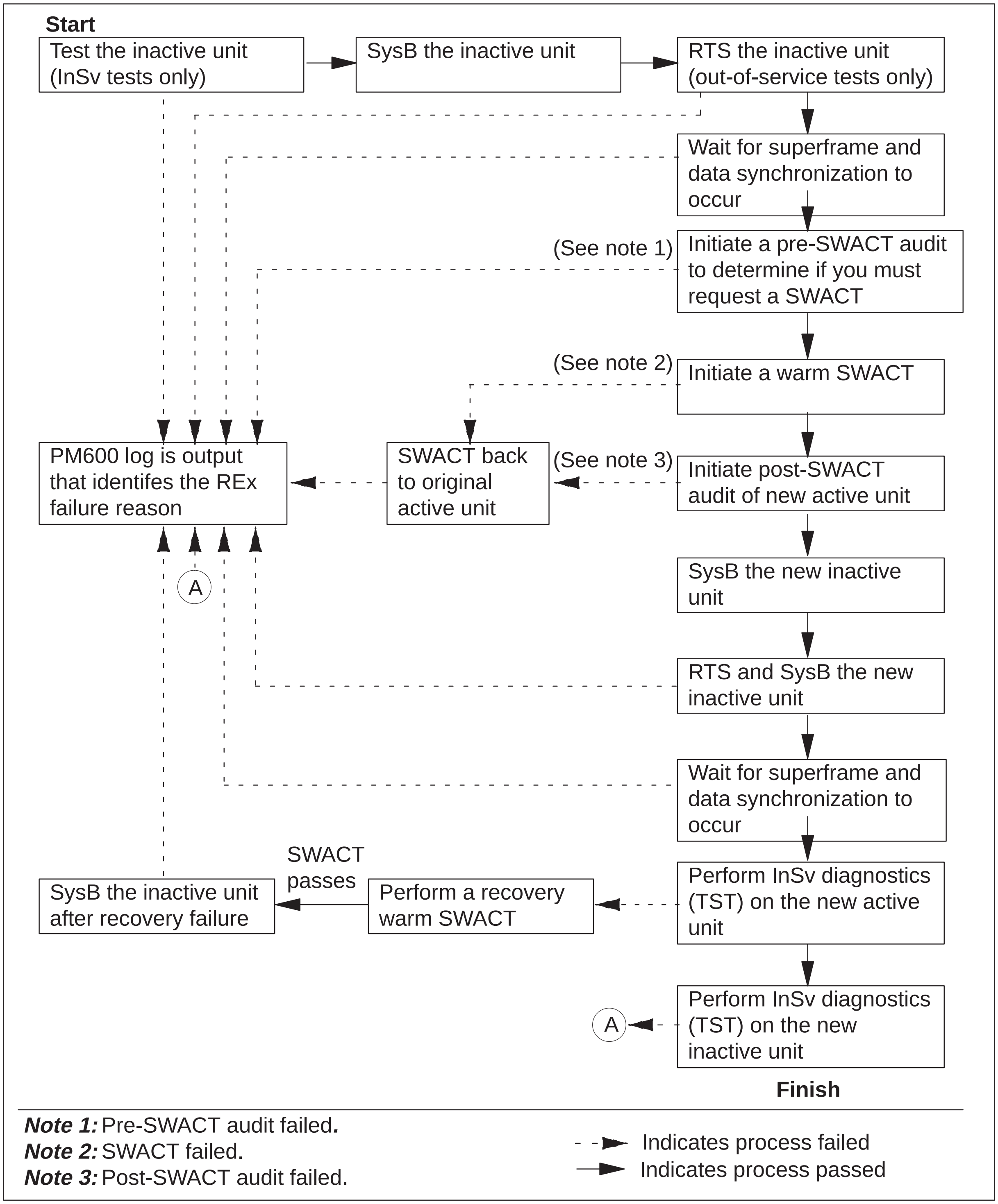
All four REx test result classes output a log or display a message at the MAP terminal. The maintenance record contains only passed and failed REx tests. Failure reasons are available for failed REx tests.

The following list contains the sequence of events that the REx test state machine or controller performs:

1. Test the inactive unit, includes InSv tests only.
2. SysB the inactive unit.
3. RTS the inactive unit. This action includes out-of-service (OOS) tests only.
4. Wait for superframe and data synchronization to occur.
5. Perform a pre-SWACT audit.
6. Perform a warm SWACT.
7. Maintain call processing capability on previous active unit.
8. Perform a post-SWACT audit.
9. SWACT back to previously active unit, if necessary.
10. SysB the new inactive unit.
11. RTS the inactive unit.
12. Wait for superframe and data synchronization to occur.
13. Run InSv diagnostics (TST) on the new active unit.
14. Run InSv diagnostics (TST) on the inactive unit.

The REx state machine, controller and actions appear in the following figure.

REx state machine actions



If a REx test fails, the system generates a PM600 log. The PM600 log initiates a major alarm for the XPM that failed the REx test. The major alarm appears at the MAP terminal under the PM banner at the top of the display.

If an in-service (InSv) or out-of-service (OOS) diagnostic test fails, the REx failure reason includes the mnemonic. The mnemonic is an easy-to-remember abbreviation. The mnemonic is for the failed diagnostic and the failed unit (0 or 1).

Log PM600 details the following:

- start time of the steps the REx test initiated
- the unit that the REx step affected
- the failure reason

The log includes REx steps that occurred after the failed step. These steps are recovery actions the REx test initiates because of the failure. The log includes the number if the REx action is unit specific. Unit specific actions include BSY unit, RTS unit, TST unit, and synchronization. The log does not include the REx action that affects the node, like SWACT, and BSY both units. The additional data of the logs contains a cardlist and mnemonic of the failed diagnostic. The diagnostics and a description of the diagnostic appear in the following table.

Diagnostic name and description

Diagnostic name (mnemonic)	Description of diagnostic
ABDIAG	A/BBits
CMRDIAG	CMR Card
CSMDIAG	CSM Diag
CSSPCH	Network Links
DS1DIAG	P–Side DS–1
FORMATR	Local Formatter
MSGDIAG	6X69 Messaging Card
MSG IMC	MC Link
PADRING	6x80 Pad/Ring
PS LOOP	P–side Loops

—continued—

Diagnostic name and description (continued)

Diagnostic name (mnemonic)	Description of diagnostic
PS SPCH	P–side Speech Links
SMSAB	6x81 A/B Bits
SMS MSG	SMS A/B DDL Msg
SPCH DG	Speech Path
SYNC DG	Sync Diag
TONE DG	Tone Diag
TS DIAG	Time Switch Diag
UTRDIAG	UTR Card
—end—	

The system stores a REx maintenance record for each XPM that contains the following information:

- REx scheduler, if the XPM is in the system
- date/time and result (passed/failed) of the last REx
- failure reason, diagnostics failures, and a list of defective cards (if it applies) if the last REx failed
- date/time of previous failed REx
- date/time of first passed REx after a previous failure

The following restrictions apply to REx tests:

- The system REx (SREx) controller only runs REx on one XPM at a time if the office uses the NT-40 processor. Super Node supports REx tests that run in order for a maximum of ten XPMs with the same REx test class.
- For REx to run, the node must be one of the following:
  - — InSv
  - — ISTb because of a REx test failure
  - — in-service trouble because P-side DS-1 links are out-of-service.
- If the system cannot start a Warm SWACT, REx terminates.
- After correct completion of REx, the XPM has a new active unit, because of the SWACT.

- If a restart occurs during a REx, the system does not generate the PM600 log. The system does not generate the PM600 log because the restart deallocates the temporary data store that creates the PM600 log.
- A SWACT controller override is not available for a manual REX test. Refer to SWACT controller section in this document.

REX state machine interface to the pre-SWACT and post-SWACT audits

The REx state machine or controller allows the SWACT controller to refuse to attempt a SWACT. For information on the pre-SWACT and post-SWACT audits, refer to Pre-SWACT and post-SWACT audits in this document. The REx controller:

- calls the SWACT controller during the pre-SWACT step before the system initiates the SWACT request. The SWACT controller determines if a SWACT can proceed, based on:
  - the diagnostic history of the unit maintained in the diagnostic history database
  - the result of the last SWACT attempt to the inactive unit
  - the data that the XPM returned in the pre-SWACT query message.

  An XPM can fail the pre-SWACT step of REx. Failures do not always appear in the DiagHist level of the MAP display. Failures do not appear if the reasons for the pre-SWACT failure do not include diagnostic failures.

- Accounts for SWACT denial and failure reasons.
- Terminates a REx test if the system denies a SWACT.
- Terminates a REx test if a SWACT occurs, but the active unit of the XPM does not change. The active unit of the XPM does not change from the time the REx test starts. The REx terminates without recovery actions. The SWACT code submits a BSY/RTS of the inactive unit.

- Displays the failure reason for a SWACT denial or failure performed during a manual REx at the MAP terminal as *REx failed*. Use the command string TST REx QUERY for the posted XPM to obtain the reason for the failure. The system generates a PM600 log report that details the REx failure reason.

SREX scheduler feature AF3771

Feature AF3771, System REx Controller: XPM Maintenance, provides the SuperNode switch with an SREX controller. The SREX controller coordinates the system REx tests under a common REx scheduler. This feature allows you to schedule SMS REx tests when other REx tests are in progress. The SREX controller can REx test the whole switch more easily and in less time. The switch includes peripherals like the SMS. Feature AF3771 allow you to find and resolve REx test failures faster, which reduces outages in the field. The SREX controller allows the operating company personnel to:

- change the test order of peripherals
- coordinate between manual and system initiated REx tests
- receive alarms for SMS not REx tested in a time limit set in table REXSCHED

The SREX scheduler allows you to enter the CI level command REXTEST and the following parameters:

- The SUSPEND parameter suspends REx tests for one maintenance window. A maintenance window is the time between the REx START and STOP time entered in table OFCVAR under parameter NODEREXCONTROL.
- The RESUME parameter resumes REx tests suspended with the SUSPEND parameter.
- The QUERY parameter displays the state of the REx test, active or suspended.
- The HELP parameter displays a short description of the REx test.

  Note: A maximum of 10 concurrent XPM REx tests of each type can run at the same time.

The REx test order for feature AF3771 appears in the following list:

- critical nodes, like CM and MS
- the number of days between the last system or manual REx test and now
- the internal PM (SMS) number order

You must enter data in table REXSCHED to establish the REx schedule for the SMS. The REx coordinator needs the information in this table to schedule the tests according to operating companies specifications. Enter data in table REXSCHED to disable the test . For more information on table REXSCHED, refer to the data design section of the *Translations Guide*.

When the SMS is not REx tested for more than 7 days, the system generates log report IOAU112.

ANI and coin functions

Automatic number identification (ANI) and coin functions support coin features and ANI for the SMS-RCS subsystem. The ANI and coin functions appear as one feature. The software and hardware used to implement both ANI and coin are equivalent.

Coin features apply to dial tone first (CDF) and coin first (CMF) lines. Coin features have the following abilities:

- scan for off-hook
- check for coin presence
- check for coin presence during local call overtime
- return coins
- collect coins

The ANI feature allows you to determine if a two-party line is active from the tip or ring side of the line. The ANI normally makes this request to obtain the correct billing responsibility for a call.

The system implements ANI and coin features through A-bit and B-bit signal patterns transmitted between the SMS and the RCS. These signal patterns include A-bits and B-bits. A maximum of nine signal states can occur. The SMS transmits the following signals from the SMS to the RCS:

- negative loop mode
- channel test
- positive loop mode
- ground start
- –R ringing
- positive coin check
- positive coin control
- negative coin control

- negative coin check

The RCS transmits the following signals to the SMS in response to SMS signals:

- on-hook
- off-hook
- coin ground
- unequipped

These signaling states are associated with specified A-bit and B-bit patterns. The Bell Communications Research document *Digital Interface Between the SLC-96 Digital Loop Carrier System and a Local Digital Switch* describes these patterns. The RCS can receive a pattern on a DS-1 channel. If this event occurs the line card of the channel places a voltage on the tip-ring pair. These voltages can be negative or positive. These voltages can cause operations like ringing, coin return, or coin collect to occur.

Both CDF and CMF lines use the SCD233 coin card. The card contains one line circuit. An RCS shelf that operates in Modes I or III can contain a maximum of 12 SCD233 coin cards. The four shelves of a fully equipped RCS can contain a maximum of 48 coin cards. This information applies to shelves that operate in Modes I or III

In Mode II, you must place coin cards in one of the four slots on the right side of an RCS shelf. When you first plug in the coin card, the card receives a permanent DS-1 channel.

Dial tone first Loop

A dial tone first (CDF) loop starts in a negative loop mode with –48 V on the ring side. The CDF starts with a grounded tip side. When the subscriber lifts the telephone handset, switchhook contacts and coin equipment relays establish a current path from ring to tip.

The RCS detects a change in current that the CDF loop sends. This change in current indicates an off-hook. The RCS sends a pattern of A-bits and B-bits to the 8085 microprocessor. The 8085 microprocessor is in the A/B-DDL message card. This A-bit and B-bit pattern notifies the microprocessor if the subscriber goes off-hook.

The SMS A/B-bit facility detects this origination through the 8085 microprocessor. The SMS A/B-bit facility sends a message to the TPT. The TPT informs the CM of the origination. The CM directs the TPT to connect dial tone to the subscriber.

The subscriber can begin to dial. The subscriber must deposit the correct number of coins for a local call before dialing completes. If the subscriber does not deposit the correct amount a recording activates. The recording instructs the subscriber to start the call again and deposit the correct amount. The cycle of this announcement occurs two times. If the subscriber does not deposit the required amount at the end of two announcements, the system disconnects the call.

The DMS-100 switch checks for coin presence through a negative coin check on the SCD233 coin card. The 8085 microprocessor sends an A-bit and B-bit pattern to the RCS. The A- and B-bit pattern requests that the RCS check for coin presence. If the RCS finds a coin, specified contacts close in the coin telephone set. The RCS detects a ground signal. The RCS sends a signaling pattern of A-bits and B-bits to the 8085 microprocessor. The signaling pattern associates with the coin ground signal. The signaling pattern indicates that the subscriber deposited a coin. The A/B-bit facility scans the coin ground pattern. The A/B-bit facility sends a message to the TPT. The message indicates that the A/B-bit facility received a coin ground pattern. The TPT informs the CM that the A/B-bit facility received a coin ground pattern.

If the RCS does not detect a coin ground pattern, the subscriber receives a recording.

Coin first line

A coin first (CMF) line begins in ground start mode with -48 V on the ring side of the loop. The tip side is open.

When a subscriber lifts the telephone handset, the RCS does not detect origination unless the subscriber deposits the correct number of coins.

When the subscriber deposits the correct number of coins, specified switchhook contacts and coin set relays establish a current path. The current path is from ring to ground. The RCS detects the ground current. The RCS sends a signaling pattern to the 8085 microprocessor. This signaling pattern indicates that ground current is present.

The A/B-bit facility detects the origination. The A/B-bit facility sends a message to the TPT. The TPT informs the CM of the origination. The CM directs the TPT to connect dial tone to the subscriber line.

Local coin overtime

At the end of the first time period for a call, an announcement instructs the subscriber deposit additional coins for the call to continue. A quarter is an example of a coin that you can deposit to continue a call. The SMS sends the RCS a positive coin check pattern to check if the quarter is present. If the subscriber does not deposit a coin, the system disconnects the call. An announcement for an additional deposit occurs at the end of each overtime period.

Coin collect and coin return

To collect coins, the CM sends a coin collect message to the TPT. The TPT decodes this message. The TPT directs the A/B-bit facility to send an outgoing A-bit and B-bit signaling pattern to the RCS. The A-bit and B-bit signaling pattern requests that the RCS have the coin set collect the deposited coins. The 8085 microprocessor sends the signaling pattern to the RCS. The RCS applies a positive coin-collect voltage to the tip of the coin loop with the ring open. This voltage on the tip causes the coin telephone to deposit the coins into the hopper.

If the DMS-100 switch detects an on-hook before the system connects a call, the CM sends the TPT a message. The CM requests that the TPT return the coin. The TPT decodes this message. The TPT directs the A/B-bit facility to send an outgoing signaling pattern to the RCS. These signaling patterns are A-bit and B-bit. The A-bit and B-bit signaling pattern requests that the RCS have the coin set return the deposited coins.

The 8085 microprocessor sends the signaling pattern to the RCS. The RCS applies a negative voltage to the tip side of the loop with the ring side open. This voltage on the tip side of the loop causes the coin set to return the coin or coins.

ANI

To request ANI, the CM sends a message to the TPT. After the TPT decodes this message, the TPT directs the A/B-bit facility to initiate ANI on the correct loop. The 8085 microprocessor sends an ANI request to the RCS.

If the tip party is off-hook, the RCS detects a tip party ground pattern. If the tip–party is on hook, the RCS detects an on-hook pattern. This on-hook pattern indicates the ring party is off-hook.

ANI and coin function limits

The following limits apply to ANI and coin functions:

- Coin cards can be in the four slots on the right of an RCS shelf only. This coin card position applies if the shelf is part of a shelf group that operates in Mode II. In Modes I or III coin cards can be in any slot. One DS-1 channel must remain open.
- The SMS-RCS subsystem does not support semi-postpay lines.

This feature interacts with the SMS Warm SWACT feature. When a Warm SWACT occurs, the Warm SWACT affects billing calls and coin return. Refer to the description of Warm SWACT on page 1-33.

P-side channel management

The SMS P-side channel management supports channel allocation in the SMS-RCS subsystem. The P-side channel allocation associates an RCS terminal identification (ID) to a P-side port on the SMS connected to the RCS. The P-side channel allocation associates an RCS terminal ID to a channel on a DS-1 link. The DS-1 link is present between the RCS and SMS.

Terminal ID in the RCS corresponds to a specified RCS and a specified line circuit of the line card for the RCS. The RCS has a maximum of 96 line circuits. An RCS terminal ID associated with an SMS P-side port and DS-1 channel helps to establish a communication link. The DMS-100 system associates an RCS terminal ID with an SMS P-side port and a DS-1 channel. This association establishes a communication link between the RCS line circuit and the SMS.

An RCS shelf group can be operating in Modes I or III. If this event occurs specified P-side ports and DS-1 channels must connect a specified line circuit to the SMS. The DMS-100 switch allocates the ports and channels internally.

In Mode II, the system allocates channels dynamically. The SMS sends a trunk assign message. The SMS sends this message over the C-field of the DDL. The DDL associates a DS-1 channel with a specified line circuit.

SCM-100 operator verification

Operator verification on RCS lines uses three-port conference cards. The following limits apply to operator verification on a busy RCS line:

Note: The operator cannot verify a line that is part of a call with a custom calling feature activated. The operator cannot verify a line that the system routes through trunks of trunk group OP fail.

When verification cannot proceed, operating company personnel receive one of the following responses:

- busy tone (60 ipm) indicates normal access is available. Operating company personnel cannot access the busy tone now for one of the following reasons. The busy tone has an activated custom calling feature or the busy tone connects to another operator.
- reorder tone (120 ipm) indicates normal access is not available

When verification can proceed, the operator hears a quiet line, conversation, or announcement on the line.

Line conditions and system actions appear in the following table.

The **>QUERYPM** command and command strings **>QUERYPM FLT** and **>TST REX QUERY** contain information about the last REx. System and manually initiated RExs store and display a new date/time and state (passed/failed) in the REx maintenance record. *Passed* means that the REx completed with no errors. *Failed* means that the REX did not complete because of an error. The **>QUERY PM** and **>TST REX QUERY** commands provide this information.

If the REx fails, perform one of the following actions to return the XPM to service from ISTB:

- a manual RTS
- a manual REx
- an automated REx

Line conditions for operator verification

Line condition	Characteristics	DMS response
Idle line	Normal access available voice and voice/data	Normal connection made. Tone and ringing are not present.
	Normal access not available voice and voice/data	Reorder tone (120 ipm)
	—continued—	

Line conditions for operator verification (continued)

Line condition	Characteristics	DMS response
Busy line	Line is traffic busy, voice and voice/data, simple line	Access connection is complete. Operating company personnel can hear conversation, quiet line, reorder, busy tone, announcement, or other indications that the line is traffic busy. ***Note:*** The data signals are not reliable after verification because of conference port use. The line option: `NO DOUBLE CONNECTION (NDC),` does not allow tests and verificaiton if the line is busy.
	Line up to permanent announcement or receiver off-hook (ROH) tone	Permanent signal tone
	Line up to temporary tone or announcement	Same as traffic busy common line
	System rings line	Operator receives busy tone (60 ipm)
	Line in hunting with an idle line in the group	Normal access connection made. Tone and ringing are not present.
	Line in hunting all the lines in the group are busy	Same as traffic busy common line
	Data-only line	Verification denied. Busy tone (60 ipm)
	Line activated with custom calling feature	Operator receives busy tone (60 ipm)
Line verification in progress	Line becomes idle during verification	No-test-access connection dropped. Normal access connection retained

—continued—

Line conditions for operator verification (continued)

Line condition	Characteristics	DMS response
	Line goes off-hook during verification	Normal access connection retained. Customer does not receive dial tone
	Attempt to activate custom calling feature	System ignores transient state while line line verification occurs
Line with cutoff on disconnect option	Line has the cutoff-on-disconnect (COD) option	Operator can obtain a verification connection. If the party that is not verify goes on-hook, the system takes the call down. Operating company personnel receive a busy tone (60 ipm).

—end—

Functional description of the RCS

The remote concentrator SLC-96 (RCS) is a digital loop carrier that serves a maximum of 96 subscribers. The RCS connects to the DMS-100 through the SMS.

Three to five DS-1 links connect the RCS to the SMS. Two to four of these links are active DS-1 links and one link is an optional DS-1 protection link. Each active DS-1 digital link supports 24 time slots, or channels. The RCS contains channel banks, or shelf groups. Each shelf group contains common equipment and channel units (line cards).

The RCS provides the following common equipment:

- link interface unit (LIU), interfaces a shelf to a DS-1 link.
- time assignment unit, acts as a carrier concentrator in Mode II.
- multiplex unit, supports special services.
- alarm control unit, handles alarm control information.
- special service unit, processes special service functions.
- channel test unit, tests channel units and subscriber loops.
- data link unit, processes functions from the data link.
- line switch unit, performs protection switching.
- power unit, provides power to a shelf group.
- transmit receive unit performs encoding, decoding, channel timing, multiplexing and framing for a DS-1 digroup.

The RCS can be configured with single-party, multi-party, coin and special service lines. Single-party and multi-party channel units contain two dependent line circuits. Coin and special services channel units contain one line circuit.

Modes

Each shelf group can operate in one of the following three modes, Mode I, II, or III:

- In Mode I, each subscriber has a dedicated DS-1 channel. The RCS supports up to 96 subscriber lines. The RCS connects to the SMS through a maximum of four primary DS-1 links.
- In Mode II, two primary DS-1 links connect the RCS to the SMS. A total of 48 subscribers must compete for 24 time slots on a DS-1 link.

- In Mode III, the RCS operates with one DS-1 link for each shelf group. The RCs uses a multiplexer to multiplex channels from the two shelves on a shelf group on one DS-1 link.

Derived data link

Messaging between the RCS and the SMS uses the derived data link (DDL). To create the DDL, data messages are placed on the framing bit of the PCM stream on DS-1 links A and C. Refer to "DDL message bits and field names" table in the next module for an explanation of the DDL message fields. The DDL consists of:

- the C-field (slot assignment)
- the M-field (maintenance messages)
- the A-field (alarm messages)
- the S-field (protection switch messages)

All fields are present on the A-link. When shelf group AB operates in Mode II, use of the C-field can occur. When shelf group CD operates in Mode II, the DDL is present on the C link. The C-field is the only field present on the C-link DDL. The data link unit processes DDL messages.

The A- and B-bit on each DS-1 channel transmits signaling and supervision information. Signaling and supervision information allows the RCS to perform call processing on link B, link C and link D. A failure does not affect call processing. A failure results in the loss of link A and the associated DDL messaging between the SMS and RCS. To take advantage of this ability of the RCS, define all the links to the RCS as message links. This definition is necessary because of the configuration of the I/O system software. The defined links are not message links.

To keep track of simulated message links when the RCS remains in-service (INSV) with loss of the DDL link is difficult. The following are additional problems that occur when the RCS remains INSV with loss of the DDL link:

- You must disable all PM maintenance on the RCS. Maintenance messages to the RCS use the DDL link. The state of the RCS is not known from the time of the failure until the A-link returns to service.
- You must turn off different audits that use the DDL link. Node audit and line diagnostics are examples of audits that must be closed.

The RCS has one message link (link A) because of the previous problems. Loss of service on this link places the RCS out-of-service (OOS). Call processing is still possible on link B, link C, and link D.

Functional description of the DS-link

The DS-1 links connect the SMS to the RCS. The SMS provides a maximum of 20 DS-1 links to the SMS remotes. Each remote terminates from two to four primary DS-1 links from an SMS. The number of links depend on the mode of operation. An optional protection link can configure each remote. A primary DS-1 link failure can occur or the switch operator can place the DS-1 link OOS. When this condition occurs, the protection link makes sure that communication continues between the SMS and the RCS.

The DS-1 links connect to the SMS P-side through the DS-1 interface card (NT6X85). The DS-1 links terminate on a link interface unit in the RCS.

Each SMS shelf is equipped with DS-1 interface cards. The number of RCSs that the DS-1 links connect determines the number of interface cards. Each DS-1 card connects to the control coupler of both shelves. A maximum of five DS-1 interface cards are on each shelf. Each DS-1 interface card provides two DS-1 ports.

Port assignments for each shelf are as follows:

- shelf 0: ports 0, 1, 4, 5, 8, 9, 12, 13, 16, 17
- shelf 1: ports 2, 3, 6, 7, 10, 11, 14, 15, 18, 19

The active unit controls all the DS-1 ports (0-19). This control does not depend on the location of the ports.

A DS-1 link carries 24 channels. Each channel contains 8 bits of PCM data. The SMS and the RCS recognize the beginning of 24-channel sequences by a framing bit in front of the sequence. Each 24-channel sequence sends 192 bits of information and a framing bit. These 193 bits of information are called a channel frame.

SMS fault conditions

Several types of faults can occur on the components of the SMS-RCS configuration. In the host computer office, the C-side links from the SMS to the network can go down. When these network links have defects, loss of messaging from the computing module (CM) and subscriber service can occur. A DS30 card in the SMS that has faults can affect communication with the CM.

Any circuit card in the SMS, like the power converter card, can have faults. The circuit card can cause a problem with subscriber service. Some SMS equipment other than circuit cards can develop faults.

The SMS P-side links carry messages that are important to the maintenance of subscriber service. A defective P-side link can damage subscriber service. In a P-side link, a channel must be available for a call attempt to be successful. Signal or software problems can make a channel not available for a subscriber call.

The next sections of the report describe the XPM parity fault and data mismatch.

Parity on the XPM

On NT6X45 or NTMX77 based XPMs, a parity system performs integrity checks on the main memory systems. Parity adds 1 bit of data to each byte stored. This action allows the hardware that maintains this additional bit to detect any single bit memory fault.

A parity fault indicates a memory integrity fault. To fix parity faults, you must load the unit again. If executing code encounters a fault, the XPM is insane. The XPM must drop activity immediately. The XPM must go OOS. The parity audit initiates an interrupt instead of a bus error. The parity audit identifies memory faults before code execution hits the memory faults.

The CM handles parity faults when possible. When the CM handles parity faults, the RTS is performed as efficiently as possible.

The following are the three types of parity faults:

- *intermittent*

  This fault occurs when the system detects a fault, but does not detect an error when the RCM reads the location again.

- *soft*

  This fault occurs when the system detects a fault and finds an error when the RCM reads the location again. The system does not find an error when the RCM writes to the location.

- *hard*

  This fault occurs when the RCM detects a fault and cannot reread or write to the memory location. The hardware is defective and you must replace the associated memory card.

A PM181 log informs operating company personnel about the type of parity fault. Logs PM128 and PM106 inform the operating company personnel of the action the CM performs. Logs PM128 and PM 106 also inform the operating company personnel if the CM cleared the fault. The command string **>QUERYPM FLT** informs the user about the type of parity fault.

The individual cards with memory (NT6X46, NT6X47, or NTMX77) have the parity hardware. A priority 6 interrupt to the local CPU reports parity faults.

The level 6 interrupt autovector in an XPM is bound to an assembly interrupt handler. The handler has one handler entry point for each interrupt level. The assembly interrupt handler receives interrupts detected during standard code execution, or by the parity audit. The assembly interrupt handler decides which handler functions to perform.

Parity faults

Feature AN0741, Parity Improvements, enhances the ability of the XPM to collect and report additional information on parity trap faults. Faults detected by parity audits are also enhanced to provide more information. This new information includes the exact address of the fault, and if the fault is in code or not. Feature AN0741 also updates interfaces to log PM189 and trap PM185 reporting to include this new information. The Parity Improvements feature depends on features AF5680 (XPM Exception Traceback Enhancements) and AF5682 (XPM Code Protection).

Feature AN0741 provides the following parity fault handling improvements:

- Unify the parity audit and parity trap handlers.
- Improve the data captured and saved by the new handler to:
  - use the information stored in the card status register (SR)
  - localize the parity fault to an exact byte address
  - perform hard/soft/intermittent fault categorization
  - query to determine if the fault is in code
- Update interfaces to the PM189 and PM185 log reporting systems, to include the new information.

Parity interrupt handler

The interrupt handler generates data on a memory fault. The interrupt handler stores the data to the correct area for reporting and action. The requirements for this function are:

- Define a single entry point which can be bound as an interrupt handler.
- Be continuously available and correctly handle interrupts starting from the time it is bound.
- Be able to correctly distinguish between the two conditions under which an interrupt can be raised (entered from parity audit or not).
- Localize the fault to a specified byte address.

- Perform low-level categorization of the fault (hard/soft/intermittent) regardless of the interrupt source.
- Determine if the fault address is in code space or not in code space.
- Leave the fault indication in place if the fault is not corrected.
- Save the fault data according to where the interrupt originated.
- Exit the handler according to where the interrupt originated.

XPM code protection (AF5682) The parity audit process examines protected memory areas and memory areas not protected. Feature AF5682 allows the system to write to a write-protected memory area. When the system writes to a write-protected memory area, the system allows for pattern testing a parity fault location byte. Feature AF5682 also allows querying if a given physical address lies in loaded code. You must determine if the parity fault occurred in execution space. Then the parity exception handler can initiate the most efficient recovery process.

Exception Traceback Enhancements (AF5680)

An exception is a special condition at either the read only memory (ROM) or the task level that preempts normal processing. Both internal and external conditions can cause exceptions. Task level exception processing reports critical information on hardware and software states. This process reports if a hardware or software fault prevents normal operation of the XPM unit. The process will then restore the task to a known point of execution. The process will allow the task to perform recovery actions. If recovery is not possible, the task level exception processing initiates local maintenance to restart or reset the XPM unit.

Memory allocation (AF5391)

Feature AF5391 addresses memory management issues. Feature AF5391 provides more flexibility in memory operation. This flexibility protects code and critical data from damage by errant software. This flexibility reduces the risk of outages.

Protected memory will be allocated for protectable patches when none is available. If protected memory allocation fails, use memory that is not protected to store the patch. When possible, store local patches in non-DMA memory. The unified processor (UP) will allocate more non-DMA.

System component interactions

The system components interact with the XPM exception processing system to recover from error exceptions. The system components report and display information about error exceptions. The system components are listed below.

- CM
- PMDEBUG
- XPM maintenance

If the system detects a fatal error, the system initiates local maintenance action to drop activity from an active unit only. The maintenance action resets or restarts the unit. When in an INSV state, the XPM unit reports exception errors to the CM in the form of unsolicited messages. The XPM generates a report for each exception not reported in the trap buffer. The CM receives the report and acknowledges the message. The CM separately logs into PMDEBUG to extract the exception information and generates a PM185 log report. The PMDEBUG provides the ability to view and delete exceptions data from the trap buffer at the task level.

Exception Recovery Action

Exception recovery consists of three different operations:

- severity (fatal or recoverable)
- process fatal trap
- recover task (non-fatal trap)

When the recovery process is complete, the exception reporting system is notified that new trap data is available. The exception reporting system is also notified that exception handling is complete. The recovery process can set up the trapped task for recovery and allows it to resume. The recovery process also can initiate a maintenance action to restart or reset the unit.

If the trap is not fatal, the selected task will be restored to a point of execution. This action allows the task to restore to a known state. The process of recovery does not consists of a task restart. The process of recovery forces the task to perform a multi-level exit back to the task mainline. The task recovery model specifies that a task provide a mainline. A mainline is a do forever loop that calls the main body of the steady state code. After a task provides a mainline, an optional call to a recovery procedure occurs. The task starts again following a recoverable trap. The task is forced to return to the next instruction following the call to the main body of code. The next instruction must call to a recovery procedure used by the task to realize the task has taken a fault. The instruction allows the task to take special recovery action or a branch back to the start of the loop.

An enhancement to exception recovery deals with the Direct Memory Access Memory Management Unit (MX77 DMA MMU). You must take special action when you attempt to recover from an MX77 DMA MMU error. In the past, when a DMA MMU error occurred, the exception processing system selected the interrupted task. This action also occurred if the software on the MX77 did not involve the error. The task selected determines if the error was fatal because an MMU error is not fatal. The results of the fatal evaluation depend on the trapped task.

The failed processor is the processor that caused the fault. The failed processor can not process that a problem occurred. If the access is for a read from MX77 memory, the external processor will receive invalid data. If the access is to write to MX77 memory, data will not be written. The trap is considered fatal. The trap causes maintenance action to initiate to restart or you reset the unit.

Data mismatch

Three types of updates keep the inactive unit of the SMS provided with the data needed to control maintenance and call processing:

- static data
- bulk
- dynamic

Static data

Static data holds SMS-RCS configuration information, like the association between SMS P-side ports and RCS link numbers. The CM sends the SMS-RCS configuration information to both units of the SMS when the SMS returns to service. The CM also sends this information to an in-service SMS when Table RCSINV or Table LNINV is modified.

When operating company personnel alter configuration information, the system sets the SMS to in-service trouble (ISTb). The system provides information that a static data mismatch is present. The system also provides information for the correct action to take.

Static data defines the RSC-S configuration. Static data does not change as calls connect and disconnect. When static data in the host computer and static data in the SMS do not match, data damage can result. A mismatch of static data can cause the host computer to act like a line is present. The SMS does not act like a line is present. and this mismatch of data can result in lost calls.

Feature AF5678, Node Table Sync Redesign, alters the method of clearing the ISTb condition for XPMs with software loads. The software loads support configuration data table (CDT) management.

Each XPM unit has tables that contain information. The information is about nodes that each XPM unit connects to and terminals that each XPM unit uses. The two systems that determine unit table mismatches are as follows:

- Mate unit matching compares the inactive unit tables with the active unit. Mate unit matching sets the XPM ISTb in case of mismatch. The active unit sends table mapping information to the inactive unit during updates. An inactive unit with ISTb condition can be BSY and RTS. The NODATASYNC option causes a configuration download to the inactive unit.
- Node table audits determine if the XPM information corresponds to data in the computing module (CM) table PMNODES. To prevent differences in datafill for the XPM units, the CM maintains all node information. To clear an ISTb condition on one unit, BSY and RTS the XPM. For a complete description of the datafill for table PMNODES, introduced in feature AF5678, refer to the *XPM Translations Reference Manual*.

Feature AF5678, Node Table Sync Redesign, introduces the following error handling changes.

- Table Control applications that change inventory tables reject tuples that cannot be supported when a peripheral does not have the required resources available.
- The node table audit raises an ISTb condition on an XPM that has a node table mismatch with the CM. Manually BSY and RTS the XPM to clear the ISTb condition.
- A negative acknowledgment from the XPM causes the loading or RTS process to abort. The negative acknowledgment occurs during the download of the configuration data table (CDT) node or port information during a bulk download.
- A negative acknowledgment from the XPM raises an ISTb condition on the XPM. The negative acknowledgment occurs during the download of the node CDT or port CDT data during a dynamic configuration update.

Feature AF6966 provides DMS with the ability to detect the removal or installation of a line circuit in a remote terminal (SLC-96). The feature allows the Subscriber Carrier Module-1-S (SMS) or Subscriber Carrier Module-100S Remote (SMSR) to respond to the reception of the unequipped signaling pattern from the remote terminal. Feature AF6966 notifies the CM of the event. The CM changes the line state to line module busy (LMB) or IDL which allows the CM to react to the line equipped message. The CM changes the line state based on the state of the line indicated in the message. This feature addresses detection of lines not equipped in a remote terminal operating in the MODE 1 configuration.

The system generates a minor alarm when at least one datafilled line on the remote terminal becomes unequipped. One of the following methods can clear the minor alarm:

- insert a line card
- remove the datafill in the computing module for the line card that is missing

If a line card is inserted, the system will RTS the line within 20 seconds. A BSY/RTS must be performed on the SLC to update the line state in the XPM under certain conditions. This function is performed if the line state is LMB and datafill in the CM for the missing line card is removed. The line state in the XPM is updated automatically under certain conditions. This function is performed if the line state is IDL and datafill in the CM for the missing line card is removed.

Bulk data update

Warm SWACT is enabled and both units of the SMS are in-service. The inactive unit requests a bulk transfer of critical dynamic data from the active unit. Critical dynamic data maintains established calls and continues call processing if a SWACT occurs. This transfer is a bulk data update.

If the inactive unit is out-of-service, the inactive unit requests a bulk data update when the inactive unit returns to service (RTS).

Bulk data includes RCS status, P-side and C-side port statuses (open/closed) and call processing data. An example of call processing data is connection of an exact line circuit to an exact DS-1 channel.

A bulk data update transfers the following information from the active SMS unit to the inactive unit. This transfer occurs when the inactive unit returns to service.

- RCS status (in-service or busy)
- frequency selective ringing (FSR) codes
- subscriber states (idle or busy)

A bulk data update brings the inactive unit of the SMS up-to-date with the active unit.

Dynamic data update

A dynamic data update occurs on an continuous basis. Changed data in the active unit is updated in the inactive unit. Dynamic data updates include the following information:

- RCS status (in-service or busy)
- FSR codes
- subscriber states
- channel reassignment
- port statuses
- DS-1 link information

When the bulk transfer of critical data is complete, communication continues between the mates. Information continues to flow from the active unit to the inactive unit. This flow of information is an ongoing data update. As these data change, the inactive unit is updated. The inactive unit is updated to maintain the ability to take over call processing from its mate if a switch of activity (SWACT) occurs.

The following table lists critical dynamic data transferred to the inactive unit. The active unit sends this data to its mate. The data is sent in bulk, then on a continuous basis, as data in the active unit change.

Critical dynamic data

Dynamic data	Condition for change
Call data	Call established or disconnected.
Terminal status	Terminal (line or trunk) put into or taken out-of-service.
Port status	P- or C-side port change in state (open or close) is requested.
DS-1 maintenance	Maintenance or data synchronization reporting over DS-1 links is enabled or disabled.
P-side node status	P-side node (RCS) is busied or returned to service.
Protection switching	Protection switching is enabled, disabled, switched, or unswitched.
Nailed-up connections	P-side to P-side nailed-up connection for special services is established or taken down.

Critical dynamic data allows the inactive unit to take over call processing from its mate. The inactive unit retains a majority of established calls.

Enhanced Dynamic Data Sync (EDDS)

Dynamic data describes the link and node states in the XPM needed to support call processing. The link and node states are normally set in the active unit of an XPM through the node and link RTS. These states are also set in the active unit of an XPM through state changes triggered by external forces. These states propagate to the inactive XPM unit through the bulk and individual messages of the XPM data sync mechanism.

The EDDS is a necessary component of a SWACT because EDDS preserves call processing. A Warm SWACT occurs when the active unit of an XPM drops activity. The drop in activity is caused by an XPM trap, REX test or other causes. A warm SWACT preserves call and unit states and calls continue without interruption. For a warm SWACT to succeed, the inactive unit must be in service (INSV).

If the inactive unit was previously out of service (OOS), either manually busy (ManB), system busy (SysB), or C-side busy (CBsy), the following events happen during a return to service (RTS).

- The inactive unit is initialized.
- The OOS tests are run on the inactive unit.
- If the inactive unit static data checksum is wrong, the CM sends new static data. The CM marks the inactive unit in-service trouble (ISTb).
- The active unit sends dynamic data to the inactive unit (bulk synchronization).
- The CM marks the inactive unit INSV.

RCS fault conditions

In the RCS, line cards can become defective and cause problems with subscriber service. Subscriber loops attached to these line cards can also become defective.

Programmable power/miscellaneous alarm

Operating company personnel can wire an alarm for a power fault or a different fault on an RCS. Operating company personnel can also datafill how severe the minor or major alarm is in table RCSINV. When the alarm occurs, the DMS-100 switch generates a PM128 log report. The PM128 log report indicates how severe the alarm is and contains a text string that describes the alarm. The log identifies the location of the RCS with the alarm. This same text string appears at the MAP terminal when the RCS on which the alarm occurred is posted and the command string **>QUERYPM FLT** is entered. This text is datafilled in table RCSINV. The alarm text must be consistent with the problem the *hard-wired* alarm is configured.

DS-1 link fault conditions

The DS-1 links that connect the SMS-RCS subsystem can have several faults. These faults can include frame losses, slips and bipolar violations. If a DS-1 protection link does not switch a defective DS-1 link, the remote RCS can lose contact with the host computer office. The system can lose subscriber service.

SMS automatic maintenance

SMS basic audits

The SMS basic audits check data in the SMS to make sure that hardware integrity and consistency are present. The following list describes the basic audits:

- ring/pad card audit (NT6X80BA)
- XPM parity audit
- unsolicited report handler audit
- timeswitch connection audit
- P-side port and node audit
- call processing connection audit
- IMC link audit
- CMR card audit

Ring/pad card audit

The ring/pad card drives FSR and provides signals to attenuate calls. The ring/pad card audit checks indicators on the ring/pad card. The indicators on the ring/pad card show if a one ms interrupt is properly generated. The indicators on the ring/pad card also show if the PROM and RAM on the card are fault free. If this diagnostic fails twice continuously, a PM181 log is generated. The audit drives a Warm SWACT of the SMS to switch to the shelf with a good ring/pad card. Log PM181 indicates the amount of memory that failed (PROM or RAM).

Note: The one ms interrupt is tied to link timing. The ring/pad card is synchronized when writing PCM values to a DS-1 link.

XPM parity audit

The XPM parity audit runs as a low priority background task in the UP card. When the XPM parity audit runs, the audit reads memory locations in blocks. If the audit finds a defective area in the memory location, the audit reads the location again. If the area is defective after the second read, the audit tries to write a test pattern to the defective memory location.

The CM acts on the XPM parity audit to correct the memory fault as efficiently as possible.

Unsolicited report handler audit

The unsolicited report handler audit causes a software error (PM180) message when the RCS sends the SMS an undefined unsolicited message. An example of an undefined unsolicited message is:

```
Invalid timeswitch connection found.
```

This unsolicited message indicates that:

- a software digroup to DS-1 channel connection does not have a corresponding hardware connection
- a hardware connection does not have corresponding software digroup to DS-1 channel connection

The DMS switch takes down the invalid timeswitch connection.

Timeswitch connection audit

The timeswitch connection audit checks and corrects timeswitch connection errors between the SMS and RCS after every SMS SWACT. This operation is necessary because message transfer between the active and inactive SMS units occurs at a lower priority than other tasks. Message transfer contains call connection information and other data. As the result, after a SWACT, the newly active and formerly active SMS units can contain different information.

After a SWACT, the SMS requests that the RCS report its timeswitch connections. The timeswitch connection audit compares the timeswitch connections to SMS connections. If the audit finds an error between SMS and RCS connections, a software error message is generated. The connections are made idle.

P-side port and node audit

The P-side port and node audit compares the status of the SMS P-side port and node (RCS) with the status of the port and node as recorded by the CM. The P-side port and node audit takes corrective action when the audit discovers a mismatch. When the audit discovers a mismatch in port status, a PM181 log with the following reason must occur. Operational measurement (OM) PM2ERR must increment by one.

```
Port Status Mismatch
```

The audit discovers a mismatch in node status. A PM181 log with the following reason must occur and OM PM2ERR must increment by one.

```
Node Status Mismatch
```

Call processing connection audit

The call processing connection audit maintains an order for the SMS and RCS timeswitch connection records. The audit takes down connections associated with connection release and connection setup messages. The SMS sends the connection release and connection setup messages to the RCS. The connection release and connection setup messages fail to receive acknowledgments from the RCS.

IMC link audit

The system audits both IMC links in the SMS, one between the NT6X69 cards and one between the NT6X45 cards. The system audits the IMC links to monitor the sanity of messages between the units. If the IMC audit fails and the fault is detected at the node level, the node, both units of the SMS, is placed in the ISTb state. If the fault is detected at the unit level, the fault unit is placed in the ISTb state.

When the IMC link audit detects an IMC link failure, the following events occur:

- a fault is reported to the CM
- the link is closed and SMS status changes to ISTb
- the SMS processors no longer use link
- a SWACT is prevented

Refer to “Handling an IMC link fault” in the “Trouble isolation and correction” section in this document for corrective action. When the fault is fixed, the system audit opens the link again.

CMR card audit

An audit runs in-service diagnostics approximately every minute on the CMR card. If an in-service fault is detected, the SMS is set to in-service trouble (ISTb). A PM181 log is generated. The PM181 log indicates that calling number delivery (CND) is not working for RCS lines connected to the SMS. Operating company personnel can perform maintenance on the defective CMR card as required after the system generates this log.

Pre-SWACT and post-SWACT audits

The SWACT audits provide a mechanism in the XPM that increases SWACT reliability. The mechanism prevents a SWACT to a mate unit that cannot maintain activity. If a SWACT occurs and the newly active unit does not establish two-way communication with the CM, a SWACT back to the originally active unit is attempted. The new mechanism in the XPM that provides this additional SWACT reliability is based on the following audits:

- pre-SWACT audits
  - pre-drop
  - pre-gain
- post-SWACT audits
  - post-drop
  - post-gain

The pre-SWACT audit and the post-SWACT audit are present in every unit. A SWACT involves a drop of activity by one unit and a gain of activity by the mate unit of a peripheral. Each audit has a different action in the different states of a SWACT. The audits that control a SWACT within the XPM are described in more detail in the following sections.

Pre-drop audit

The pre-drop audit accepts a request to drop activity. The pre-drop audit determines if the mate unit is in a condition to accept activity. The pre-drop audit runs only in the active XPM unit.

One of two possible sources can initiate a SWACT of the peripheral:

- the CM, in the form of a request to the active unit to drop activity
- the active XPM unit, which causes an autonomous SWACT

To determine if activity must be dropped, the pre-drop audit evaluates the following information:

- source of the request (CM or XPM)
- type of drop request
- known status and history of the currently active unit
- known status and history of the inactive mate unit

For a CM-initiated SWACT, the SWACT Controller queries the XPM. The pre-drop audit in the XPM responds to this query. The pre-drop audit informs the CM if the active unit can comply with a request to drop.

Pre-gain audit

The pre-gain audit monitors the XPM status data in the inactive unit. The pre-gain audit sends the XPM status data to the pre-drop audit in the active unit. The pre-drop audit uses the XPM status data to determine if the active unit must drop activity. The XPM status data examined by the audit includes the following:

- Facility audits – the XPM records the result of the last run for each diagnostic in the facility audit for a given peripheral.
- Status information contained within the unit – this information includes if the inactive unit:
  - is in-service and ready
  - has CM links OK
  - does not have corrupt static data
  - is in synchronization
  - is not jammed as the inactive unit

  Note: An inactive unit cannot reach all diagnostic paths. You may need to perform a manual SWACT with the FORCE option. This action clears a failure from the pre-gain audit record.

The pre-gain audit continues to monitor and report unit status and condition information while the unit is inactive. The pre-drop audit uses the information provided by the pre-gain audit to determine if the active unit can drop activity. A Warm SWACT occurs and the post-gain audit in the newly active unit begins to run.

Post-gain audit

The post-gain audit runs in the newly active unit. The post-gain audit verifies that the unit establishes two-way communication with the CM. If the unit establishes communication with the CM, the newly active unit maintains activity.

If the communication check fails, the unit forces a drop of activity to initiate a SWACT back to the originally active unit. In this occurrence, the pre-drop audit does not refuse the SWACT. The pre-drop audit allows the SWACT to proceed. If the SWACT back fails, the XPM node is busied and returned to service.

Post-drop audit

The post-drop audit runs in the newly inactive unit. The newly inactive unit remains in service for a temporary period. The newly inactive unit does not initialize. The post-drop audit cleans up the call processing data structures of calls that are not stable and stable calls that are not synchronized. If a

SWACT back is not needed or a SWACT back is complete, the XPM informs the CM. The inactive unit is busied and returned to service.

Digital phase lock loop (DPLL) clock failure

The enhanced field failure information feature allows the system to identify when a loss of synchronization causes a system busy. The system busy follows a DPLL clock failure. The CM acknowledges the reception of the sync lost message. If the SMS does not receive the acknowledgment, the SMS goes system busy. The next time the SMS is in service, the SMS generates a sync_was_lost log. This feature also provides information on when the DPLL clock has problems. The feature logs all large out-of-phase readings.

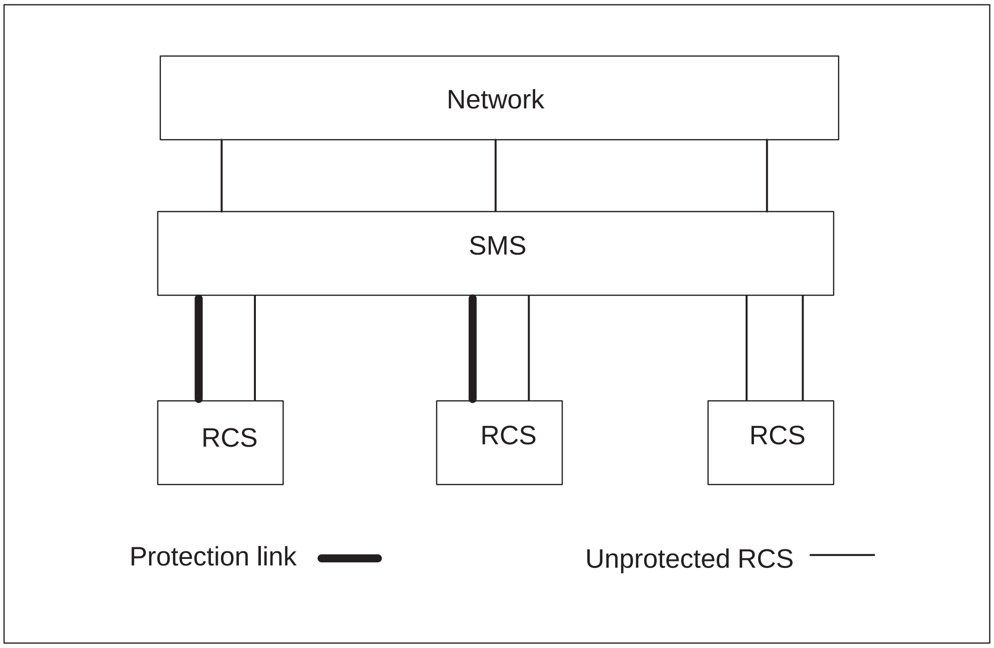
DS-1 link automatic maintenance

Protection switching

Protection switching is important for DS-1 maintenance. Protection switching is a DMS-100 backup feature. Protection switching makes sure that communication between an SMS and an RCS continues if the connection between the two fails.

A protection link occupies one DS-1 P-side port of an SMS. A protection link connects a single RCS. Each RCS contains from one to four primary lines. The number of lines depends on the modes of the shelf groups and at most one protection line. Each protection link serves only the RCS where it connects. The following figure shows a normal protection link configuration.

Protection link configuration



Protection switches are initiated:

- automatically by the RCS or SMS
- manually by operating company personnel who use the CARRIER level PROTSW command
- during execution of the FELP command

The FELP command enables a continuous loopback on all 24 DS-1 channels of a specified link.

When a protection switch occurs, calls in the talking state are maintained. For POTS and coin lines, calls in the ringing state are also maintained. The protection line carries voice and signaling information. If the A-link is protection switched (or C-link in Mode II), the protection line carries system control information.

This section calls a protection line a protection link. This section calls a DS-1 link that normally works a primary link.

The SMS is put into service. Protection switching is automatically enabled for each primary link of an RCS equipped with a protection link. If a protection link is added to an RCS, all primary lines that connect to that RCS are enabled for protection switching.

Causes of automatic protection switching

Either an SMS or an RCS can initiate a protection switch after a primary link failure is detected. The module that detects the failure initiates the protection switch.

The SMS initiates a switch for the following faults:

- bipolar violations (BpV) exceeding the threshold datafilled in table CARRMTC
- loss of signal that lasts for a time greater than the threshold datafilled in table CARRMTC
- removal of a DS-1 interface card

The RCS initiates a protection switch for the following two failures:

- bipolar violations (BpV) that exceed the threshold setting on the line interface unit (LIU) card
- loss of DS-1 framing

The SMS initiates a protection switch back to the normal line under the following conditions:

- bipolar violations on the line fall below the threshold in table CARRMTC
- frame synchronization resumes without slips for a threshold time, as datafilled in table CARRMTC when frame loss caused the protection switch
- the DS-1 card interfacing to the line is replaced when removal of the DS-1 card caused the protection switch

The DS-1 A-link carries system messaging between the SMS and the RCS. The DS-1 A-link has priority over the B-link, C-link and D-link. The system always executes a switch request for link A. If the A-link fails and cannot be restored, the RCS remains in-service if at least one other link operates correctly.

Automatic protection switch requests for links other than the A-link are treated on a first-come, first-serve basis. Two or more switch requests for non-A-links can generate at the same time. A group of lines can fail together. The protection link goes to the shelf that, in alphabetical order, is first. The B shelf supersedes C, which in turn supersedes D.

If a fault is present and another fault occurs, protection switching works by switching the lowest-lettered link. This condition applies to link B, link C and link D. Protection switching only works for this condition if the end that detects the fault does not have another fault on a link. The SMS and RCS are the ends that detect the fault.

Three tables must be datafilled to support protection switching: table CARRMTC, table LTCPSINV and table RCSINV. How to datafill tables CARRMTC, LTCPSINV, and RCSINV is described in the *Translations Guide*.

Automatic protection switching for INSV, SysB, ManB, and PBsy primary DS-1 links

The SMS supports automatic protection link switching for INSV, SysB, ManB and P-side busy (PBsy) primary DS-1 links.

If a protection link is not INSV at the start, a protection switch cannot occur. A protection switch cannot occur on a link that has had protection switching manually disabled. If a fault is present on the A-link, protection switching cannot occur for the B-, C- or D-shelves. A protection switch to the A-shelf because of an A-link fault has priority over other shelves.

If a fault is present on the A-link, DDL messaging is lost. Without DDL messaging, protection switch messages for the B-, C- or D-shelves cannot be sent to the RCS or the SMS.

INSV and SysB primary DS-1 links If the SMS detects a fault on a primary link, the SMS immediately attempts to switch the protection link into service to replace the defective DS-1 link. If the RCS requests a protection switch, the SMS attempts to activate the protection switch. If a protection switch fails, a correct alarm condition is raised. Refer to protection switching scenarios 1, 2, 3, 4 and 13.

Protection switching priority always goes to the A-link. A protection switch request for the A-shelf drops any other shelf that uses the protection link from the protection link. Refer to scenario 5.

Two or more faults can occur at the same end of a configured SMS-RCS. When two or more faults occur, the protection link switches to the first shelf that requests the switch. This action occurs if none of the faults are on the A-link. Refer to scenario 6.

Both the SMS and the RCS can request a protection switch at the same time. When the request occurs at the same time, the protection link switches for the lowest-lettered shelf. For example, shelf B is a lower letter than shelf C. Refer to scenarios 7, 8 and 9.

A fault can occur for RCS shelf hardware which causes the protection link to switch to that shelf. The fault causes the protection link to become system busied and the protection link remains switched for that shelf. The primary link that serves the shelf that has faults is system busied. Calls cannot be processed for the shelf that has faults. Refer to scenario 10.

Note: The switch to the shelf that has faults causes a fault to be detected on the protection link. This action occurs even if the protection facility is not defective.

If the protection link is switched and the SMS detects a problem with the protection link, the system releases this protection link. Both protection and primary links are system busied. Refer to scenarios 11 and 12.

Scenarios of protection switching for INSV and SysB primary links

The following scenarios of protection switching apply to primary DS-1 links that are INSV and SysB:

Scenario 1

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The RCS detects a fault on the C-link.
- The C-shelf is protection switched.

Scenario 2

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The SMS detects a fault on the C-link.
- The C-shelf is protection switched.

Scenario 3

All DS-1 links, which includes the protection link, are in-service. Protection switching is disabled for the C-link. Faults are not present on any link.

- The RCS detects a fault on the C-link.
- Protection switch does not occur. The C-link is system busied.

Scenario 4

All primary DS-1 links are in-service. The protection link is out-of-service (SysB or ManB). Faults are not present on any link.

- The SMS detects a fault on the C-link.

- A protection switch does not occur. The C-link is system busied.
- The RCS detects a fault on the A-link.
- A protection switch does not occur. The A-link is system busied.

  Note: If the RCS is in Mode II or III, the RCS is system busied because all DS-1 links are out-of-service.

Scenario 5

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The SMS detects a fault on the C-link.
- The C-shelf is protection switched.
- The SMS detects a fault on the A-link.
- The protection link is dropped from the C-shelf. The protection link switches to the A-shelf. The C-link is system busied.

Scenario 6

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The SMS detects a fault on the C-link.
- The C-shelf is protection switched.
- The SMS detects a fault on the B-link.
- The protection link remains switched on the C-shelf. The B-link is system busied.

Scenario 7

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The RCS detects a fault on the C-link. At the same time, the SMS detects a fault on the B-link.
- The B-shelf is protection switched. The C-link is system busied.

Scenario 8

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any links.

- The SMS detects a fault on the C-link.
- The C-shelf is protection switched.
- The RCS detects a fault on the B-shelf.
- The B-shelf is protection switched and the C-link is system busied.

Note: When the RCS detects a fault and a shelf is already protection switched, the RCS sends an IDLE code to the SMS. A correct switch request (for the B-shelf in these scenarios) follows an IDLE code to the SMS. When the SMS receives the IDLE code, the SMS releases the protection link. In Scenario 8, the SMS again detects the C-link fault after the SMS releases the protection line. At the same time, the RCS requests a switch for the B-shelf. The B-shelf is the lower lettered shelf and has priority over the C-shelf. The B-shelf is switched. The same condition applies to Scenario 9.

Scenario 9

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The RCS detects a fault on the C-link.
- The C-shelf is protection switched.
- The SMS detects a fault on the B-shelf.
- The B-shelf is protection switched and the C-link is system busied.

Scenario 10

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The transmit receive unit card of the RCS C-shelf is removed.
- The SMS detects a fault (frame loss) on the C-link. Removal of the transmit receive unit card causes frame loss on the RCS transmit side of the DS-1 link.
- The protection link is switched for the C-link.
- The SMS detects a fault (frame loss) on the protection link because the transmit receive unit card is removed,.
- The protection link is system busied.
- The C-link is system busied.
- The protection link is *not* released because no fault is present with any part of the protection link. This scenario also applies for B- and D-shelf transmit receive units.

Scenario 11

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The C-shelf link is broken.
- The SMS and RCS detect frame loss on the C-link.
- The protection link is switched for the C-link.
- The protection link is broken.
- The SMS detects a fault on the protection link.
- The protection link is system busied.
- The C-link is system busied.
- The protection link is released from the C-link because a fault is present with the protection link facility.

Scenario 12

All DS-1 links, which includes the protection link, are in-service. Faults are not present on any link.

- The A-shelf transmit receive unit card is removed.
- The SMS detects a fault (frame loss) on the A-link and the protection link.
- The protection link is system busied.

- The A-link is system busied.
- The protection link is *not* switched.

The SMS notes the protection link as having faults. The A-shelf transmit receive unit serves the A-link and protection link. The protection link is not switched to the A-shelf.

Note: The SMS can switch the protection link to the A-shelf for a short time. The switch depends on table CARRMTC datafill for field local carrier group alarm set filter time (LCGAST) for the primary and protection links. The switch occurs when table CARRMTC field LCGAST for the protection link is greater than the LCGAST for the A-link.

Scenario 13

The A-, B- and D-links are in-service. The B-shelf is protection switched because of a fault on the B-link. The C-link is system busy (SysB) because of a fault.

- The fault on the B-link clears.
- The protection link releases from the B-shelf and switches to the SysB C-link.
- The C-link returns to service.

ManB and PBsy primary DS-1 links

Automatic protection switching for the B-, C- or D-shelf cannot occur if the equivalent DS-1 link is ManB or PBsy. Automatic protection switching can occur for a ManB or PBsy A-link. Refer to Scenario 1 in this section.

If the RCS requests a protection switch for the A-shelf, the request is granted. The protection link is switched for the A-shelf. The link state (INSV, SysB, ManB, or PBsy) does not matter. If a fault occurs at the near end (SMS) and the A-link is ManB or PBsy, a protection switch does not occur. If the SMS detects a fault on the A-link before the A-link becomes ManB or PBsy, the protection link switches to the A-shelf. The SMS scans for a near end fault or fault clear if the DS-1 link is INSV or SysB. The SMS is only aware of the DS-1 status before the DS-1 becomes ManB or PBsy. Refer to scenarios 2 and 3 that follow.

If the RCS detects a fault on a ManB link, other than the A-link, a protection switch does not occur. If the RCS detects another fault on an INSV link, other than the A-link, a protection switch does not occur. This action is a result of RCS protection switching functionality. The SMS handles this occurrence in a different way. If the SMS detects a fault on a ManB link, other than the A-link, a protection switch does not occur. If the SMS detects another fault on an INSV link, a protection switch occurs. Refer to scenarios 4 and 5.

If the RCS detects a fault on a ManB link other than the A-link, a protection switch does not occur. The SMS can detect another fault on an INSV link other than the A-link. If this link has greater priority than the defective ManB link, a protection switch does not occur. For example, the D-link has priority over the C-link. The RCS is designed to give some links priority over other links. If the RCS detects a fault on a ManB link, other than the A-link, a protection switch does not occur. The SMS can detect another fault on an INSV link other than the A-link. If this link is of lower priority than the defective ManB link, a protection switch occurs for the defective INSV link. Refer to scenarios 6, 7, and 8.

Note: The A-link has a fault and the A-link is ManB. A protection switch cannot occur for the B-, C- or D-shelves when this condition occurs. If a fault is present on the A-link, DDL messaging is lost. Without DDL messaging, messages between the RCS or the SMS that request a protection switch are not sent. Refer to scenario 9 that follows.

Scenarios of protection switching for ManB and PBsy primary links

The following scenarios of protection switching apply to ManB and PBsy primary DS-1 links:

Scenario 1

The C-link is ManB. The protection link is INSV and available. A fault is not present on the C-link.

- The RCS detects a fault on the C-link.
- The protection link is *not* switched for the ManB link.

Scenario 2

The A-link is ManB. The protection link is INSV and available. A fault is not present on the A-link.

- The RCS detects a fault on the A-link.
- The protection link is switched to the A-shelf.

  Note: Call processing does not occur for the A-shelf until the A-link is INSV.

Scenario 3

The A-link is ManB. The protection link is INSV and available. A fault is not present on the A-link.

- A fault occurs on the A-link toward the SMS.
- The protection link is *not* switched.

  Note: The SMS does not scan for near-end faults on the A-link because the link is ManB. The SMS does not know the A-link fault is present.

Scenario 4

The C-link is ManB. The A-, B- and D-links are INSV. The protection link is INSV and available. Faults are not present on any DS-1 link.

- The RCS detects a fault on the C-link.
- The protection link is *not* switched for the ManB link.
- The RCS detects a fault on the B-link.
- A protection switch cannot occur because the RCS already detected a fault on the C-link. This action is a result of RCS protection switching functionality.
- The B-link is system busied.

Scenario 5

The C-link is ManB. The A-, B- and D-links are INSV. The protection link is INSV and available. Faults are not present on any DS-1 link.

- A fault occurs on the C-link toward the SMS.
- The protection link is *not* switched for the ManB link.
- The SMS detects a fault on the B-link.
- The protection link is switched to the B-link.

Scenario 6

The C-link is ManB. The RCS detects a fault on the C-link. The A-, B- and D-links are INSV. The protection link is INSV and not in use.

- The SMS detects a fault on the D-link.
- A protection switch does not occur because of an RCS design result. The D-link is system busied.

Scenario 7

The C-link is ManB. The RCS detects a fault on the C-link. The A-, B- and D-links are INSV. The protection link is INSV and available.

- The SMS detects a fault on the B-link.
- The protection link is switched to the B-shelf.

Scenario 8

The C-link is ManB. A fault is present on the C-link toward the SMS. The A-, B- and D-links are INSV. The protection link is INSV and available.

- The SMS detects a fault on the D-link.
- The protection link is switched to the D-shelf.

Scenario 9

The A-link is ManB. The B-, C- and D-links are INSV. The protection link is INSV and available. Faults are not present on any DS-1 link.

- A fault occurs on the A-link. For scenario 9, SMS or RCS can detect the fault.
- The SMS or RCS detects a fault on the C-link.
- The protection link is *not* switched for the C-shelf. The C-shelf is system busied.

Subscriber lines automatic maintenance

A normal schedule controls automatic testing of subscriber lines on line circuits and loops. The switch operator is involved in initial scheduling only. In a DMS-100 office, the system performs automatic testing under the lines maintenance subsystem.

Not all subscriber lines meet the set standards of quality. The lines that fail are identified and posted to the switch operator. The failures are posted at the line test position (LTP) or by output reports generated by the automatic line testing (ALT) log subsystem. Refer to *Input/Output System Reference Manual* 297–1001–129 for additional information. The identified failures are manually tested and corrected.

Escalation to manual maintenance

The SMS detects a fault on a primary link. The SMS cannot switch a protection link into service. The maintenance personnel can manually protection switch the DS-1 link that has faults from the MAP terminal. Manual protection switching and the scenarios where manual protection switching takes place are discussed in “Manual protection switching” on page 1-85.

When the quality of subscriber lines deteriorates or faults are identified, you can conduct tests on lines as discussed under “Manual lines testing.” Manual lines testing is found in the “Trouble isolation and correction” section in this document. The following diagnostics can be executed when the RCS line card is set up for testing:

- channel loss
- noise
- echo return loss
- loop detector
- ANI and coin presence
- ringing
- coin collect and coin return

These diagnostics are discussed under “Diagnostic tests for lines.” Diagnostic tests for lines are found in the “Trouble isolation and correction” section in this document.

Manual protection switching

You can perform a manual protection switch for a primary DS-1 link. The status of the primary link (INSV, SysB, ManB, or PBsy) does not affect this function. To perform a manual protection switch for a primary DS-1 link, the SMS and the protection link must be INSV. If the protection link is already in use by another link, it is not necessary to first release the protection link. Refer to scenarios 1 and 2 in this section.

If you attempt a manual protection switch and the protection link is already switched, operating company personnel are prompted with a message. The message indicates that the protection link is already switched. A question also displays and asks if the switch must be accomplished. Operating company personnel can continue to perform the protection switch or not continue to perform the protection switch. When you perform a manual protection switch, four methods to release a manual protection are available:

- A manual protection switch release (refer to scenario 6)
- A manual protection switch for another link (refer to scenario 7)

- An automatic protection switch is requested for the A-shelf. The SMS is manually switched for another shelf. The protection link is dropped from the B-, C- or D-shelf and switched to the A-shelf. Automatic protection switching for the A-shelf overrides manual protection switching for the B-, C-, or D-shelves. Refer to scenario 7.

An automatic switch request for the A-shelf overrides a manual switch for the B-, C- or D-shelves. An automatic switch request for the B-, C- or D-shelf never overrides a manual switch request. Refer to scenarios 3 and 4.

If a fault is present on the A-link, a protection switch cannot occur or be maintained for the B-, C- or D-shelves. If a fault is present on the A-link, DDL messaging is lost. Without DDL messaging, messages between the RCS or the SMS that request a protection switch for the B-, C- or D-shelves are not sent. Refer to scenario 5.

Scenarios of manual protection switching

Scenario 1

The C-shelf is protection switched because of a C-link fault detection. Faults are not present on any other primary link. The protection link is INSV.

- A manual switch to the B-shelf is requested.
- The B-shelf is protection switched.
- The C-link is system busied.

Scenario 2

The C-shelf is protection switched because of C-link fault detection. Faults are not present on any other primary links. The protection link is INSV.

- A manual switch to the C-shelf is requested.
- The protection link is manually switched to the C-shelf.

Scenario 3

The C-shelf is manually protection switched. Faults are not present on any primary links. The protection link is INSV.

- A fault is detected on the A-link.
- The protection link is dropped from the C-shelf. The protection link is switched to the A-shelf.

Scenario 4

The C-shelf is manually protection switched. Faults are not present on any primary link. The protection link is INSV.

- A fault is detected on the B-link.
- The protection link remains switched to the C-shelf. The B-shelf is system busied.

Scenario 5

The A-shelf is defective. Faults are not present on any other primary link. The protection link is INSV.

- A manual switch request is issued for the B-shelf.
- The manual switch request fails because of a loss of the DDL caused by the defective A-shelf.

Scenario 6

The A-shelf is manually protection switched. Faults are not present on any DS-1 link.

- A manual release of the protection link is requested.
- The protection link is released from the A-shelf.

Scenario 7

The C-shelf is manually protection switched. Faults are not present on any primary links. The protection link is INSV.

- A manual switch to the B-shelf is requested.
- The protection link drops from the C-shelf and switches to the B-shelf.

Manual protection link release

You can manually release manual or automatic protection switches. The primary link can have a defect and the protection link is released. The protection link immediately switches back to the defective primary link when this condition occurs. Refer to scenario 1.

The protection link can release when the primary link is *not* defective. When this condition occurs, the protection link is switched for any other primary link with a fault. Refer to scenarios 2 and 3. If a defective primary link is not permanently switched, you must disable protection switching for that primary link.

Scenarios of manual protection link release

Scenario 1

The C-shelf is protection switched because of a defective C-link. The protection link is INSV.

- You manually release the protection link.
- The protection link is immediately switched back to the C-shelf.

Scenario 2

The C-shelf is manually protection switched. Faults are not present on any primary link. The protection link is INSV.

- Manually release the protection link.
- The protection link remains released until an automatic or a manual protection switch is performed.

Scenario 3

The C-shelf is manually protection switched. A fault is present on the B-link. The B-link is system busy. Faults are not present on the A-, C- or D-links. The protection link is INSV.

- Manually release the protection link.
- The protection link is switched for the B-link.
- The B-link returned to service.

Enabling and disabling protection switching

Users can disable protection switching for any primary link. Operating company personnel can attempt to disable protection switching for a link that is automatically or manually protection switched. The system prompts personnel with a message that indicates the link is protection switched. The system prompts users with a question that asks if they want to continue. If the users want to continue, the link is disabled for protection switching and the protection link is released. Refer to scenarios 1, 2 and 3.

If a disabled primary link is defective and protection switching for the link is enabled, an automatic protection switch is attempted. Follow the rules described in “Automatic protection switching for InSv, SysB, ManB, and PBsy primary DS-1 links” on page 1-76 to attempt an automatic protection switch.

Protection switching is initially enabled for all primary links with the addition of a protection link to the RCS.

Note: To perform full disable protection switching, both the DMS switch and the RCS ends must be disabled for protection switching.

Scenarios of enabling and disabling protection switching

Scenario 1

All primary DS-1 links and the protection link are INSV. Faults are not present on any links.

- The B-link is disabled for protection switching.
- The SMS and RCS detect a fault on the B-link.
- A protection switch does not occur. The B-link is system busied.

Scenario 2

Protection switching is disabled for the A-link. A fault is present on the A-link. The A-shelf is *not* protection switched. The A-link is system busied. Faults are not present on any other DS-1 link. The protection link is INSV.

- A fault is detected on the B-link.
- A protection switch does not occur. The DDL messaging is lost because the A-link is defective and a protection switch to the B-, C- or D-shelf cannot occur. The B-link is system busied.
- The A-link is enabled for protection switching.
- The protection link switches to the A-shelf.
- The A-link returns to service.

Scenario 3

The protection link is switched to the B-shelf because of a defective B-link. Other DS-1 links are not defective.

- Protection switching is disabled for the B-shelf.
- The protection link is released from the B-shelf. The B-link is system busied.

Manually busy, switched primary links

If the B-, C- or D-shelf is automatically protection switched, the primary link is *not* manually protection switched. The primary link that corresponds is manually busied. The protection link is released. Refer to scenario 1.

The B-, C- or D-shelf is manually protection switched and the corresponding primary link is manually busied. When this condition occurs, the protection link is *not* released. Refer to scenario 2.

The A-shelf is automatically or manually protection switched and the A-link is manually busied. When this condition occurs, the protection link remains switched to the A-shelf. Refer to scenario 3.

Scenarios of manually busy, switched primary links

Scenario 1:

The C-shelf is protection switched because of a defective C-link. Faults are not present on any other primary link.

- The C-link is manually busied.
- The protection link is released.

Scenario 2:

The C-shelf is manually protection switched.

- The C-link is manually busied.
- The protection link is *not* released. The protection link is switched for the C-shelf.

Scenario 3:

The A-shelf is protection switched because of a defective A-link. Faults are not present on any other primary link.

- The A-link is manually busied.
- The protection link remains switched on the A-shelf.

Operational considerations

The following list covers important items for protection switching:

- If a ManB primary link is protection switched, the FORCE option must be used to RTS the link. When the RTS command is used without the FORCE option, DS-1 diagnostics are run on the link. These diagnostics fail when the link is protection switched. If the DS-1 diagnostics fail, the link is not returned to service. The use of the FORCE option bypasses diagnostics.
- When an RCS request causes a protection switch, the CARRIER level of the MAP display indicates the primary link is protection switched. The system generates a log. The log indicates that the far end (RCS) initiated the protection switch.

  Protection switching status can be queried at the PM level of the MAP display. Post the RCS and enter the command string QUERY PM FLT. A message appears that indicates the far end (RCS) initiated the protection switch.

- Call processing cannot proceed over a protection link if the protection link is switched for a manually busy primary link.
- The SMS detects a fault and a protection switch occurs. The CARRIER level of the MAP display indicates that the primary link is protection switched. The CARRIER level of the MAP display also indicates the type of DS-1 fault like LCGA, BPV OOS. The system generates a log. The log indicates that the near-end SMS initiated the protection switch.

  To query protection switching status at the PM level of the MAP display, post the RCS. Enter the command string **>QUERYPM FLT**. The system displays a message that indicates the near-end SMS initiated the protection switch.

- The RCS detects a fault that results in a protection switch. The A- and B-bits received from the RCS cannot be determined for up to 120 ms.
- A fault is present on the protection link toward the RCS (RCS protection link receive side). A fault is also present on the A-link toward the SMS. No other faults are present on the A-link or protection link. The SMS executes a protection switch to the A-link and one-way transmission from the shelf occurs.

  The SMS receives a minor alarm from the RCS. The protection link and the A-link remain INSV. The minor alarm is received from the RCS and the A-shelf is protection switched because of SMS fault detection. The protection line must be checked for faults.

- The system generates logs when a protection line switch or release occurs.
- The system generates logs when a primary link is enabled or disabled for protection switching. Logs indicate the type of switch (automatic or manual) and which end (RCS or SMS) initiated the switch.
- The PM level of the MAP terminal can display shelf alarm status and protection switching status for a particular RCS.

  The CARRIER level of the MAP display shows the DS-1 link status. The CARRIER level of the MAP display indicates any protection switch for a given set of DS-1 links.

  Maintenance personnel can perform manual protection switching commands at the CARRIER level of the MAP terminal.

SMS hardware

This chapter describes the subscriber carrier system hardware components which give the subscribers the full resources of a digital switching system for call processing and maintenance.

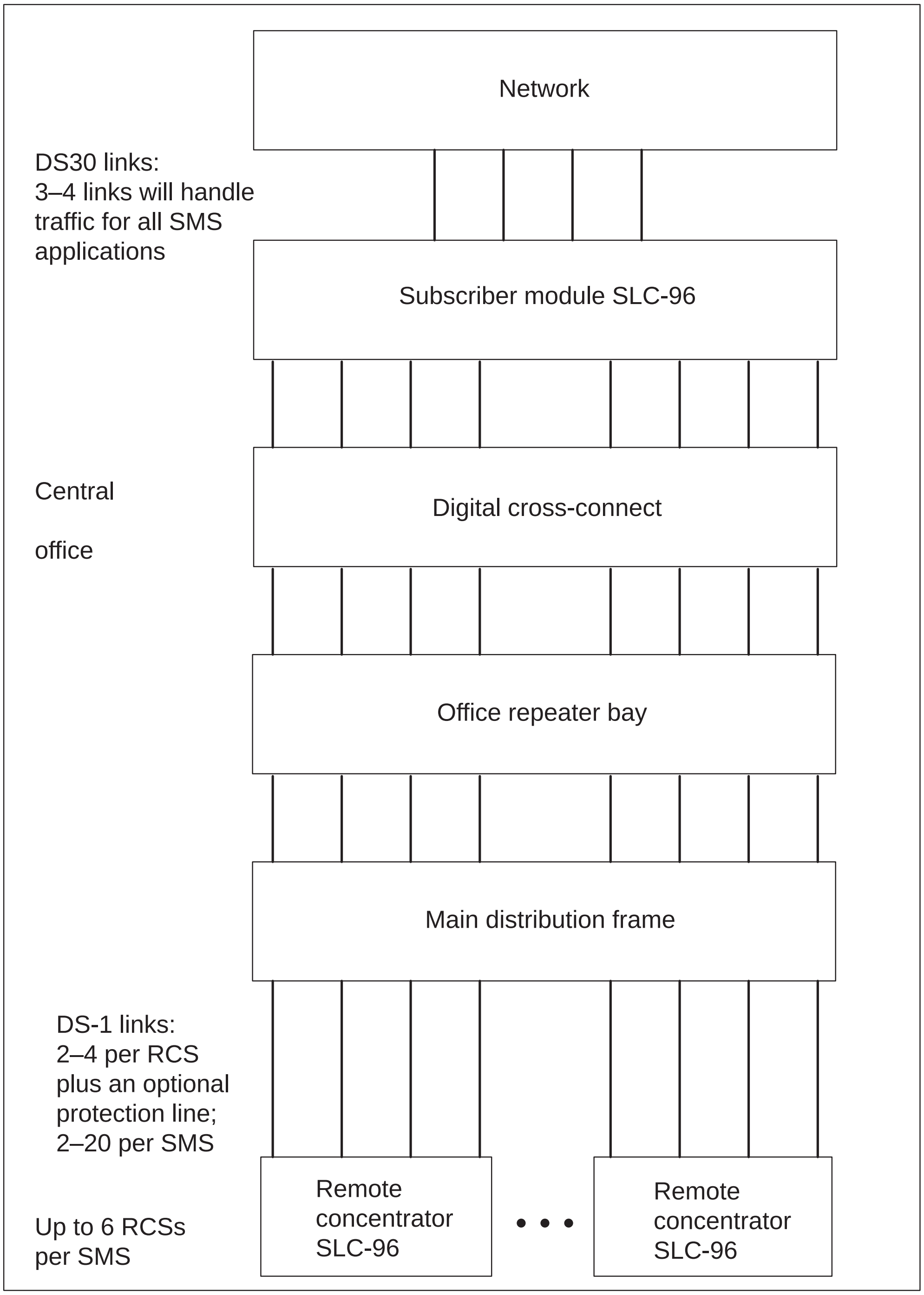
Hardware components

The hardware components are discussed in subsequent sections of this chapter as follows:

- SMS module
- RCS module
- DS-1 links connecting the SMS and the RCS

The layout of central office equipment required for the SMS-RCS configuration is shown in the following figure.

SMS–RCS configuration



SMS module

The SMS module resides in a subscriber carrier equipment (SCE) frame or a cabinetized version of the frame and is comprised of two units. Unit 0 occupies the lower shelf; unit 1 occupies the upper shelf. The SCE frame and its cabinetized version can house up to two SMS modules each. SMS module 0 refers to the lower two units; SMS module 1 refers to the upper two units. The SCE frame is shown in the following figure. A comparison between the SCE frame and the cabinet version is shown in the figure SMS–RSC configuration.

The SMS is a redundant PM; that is, each unit is able to support call processing and system control. The units operate in hot standby configuration; one unit is active while the other unit, called the mate unit, is on standby. When a fault occurs in the active unit, standby control on the mate unit takes over. This unit then maintains full control of the links until the failure is corrected.

The units consist of LGC cards, the pad/ring card, and two unique SMS cards: the A/B DDL message card and the SLC-96 DS-1 interface card. A custom local area signaling services (CLASS) modem resource (CMR) card is also provisioned when CLASS features are provided.

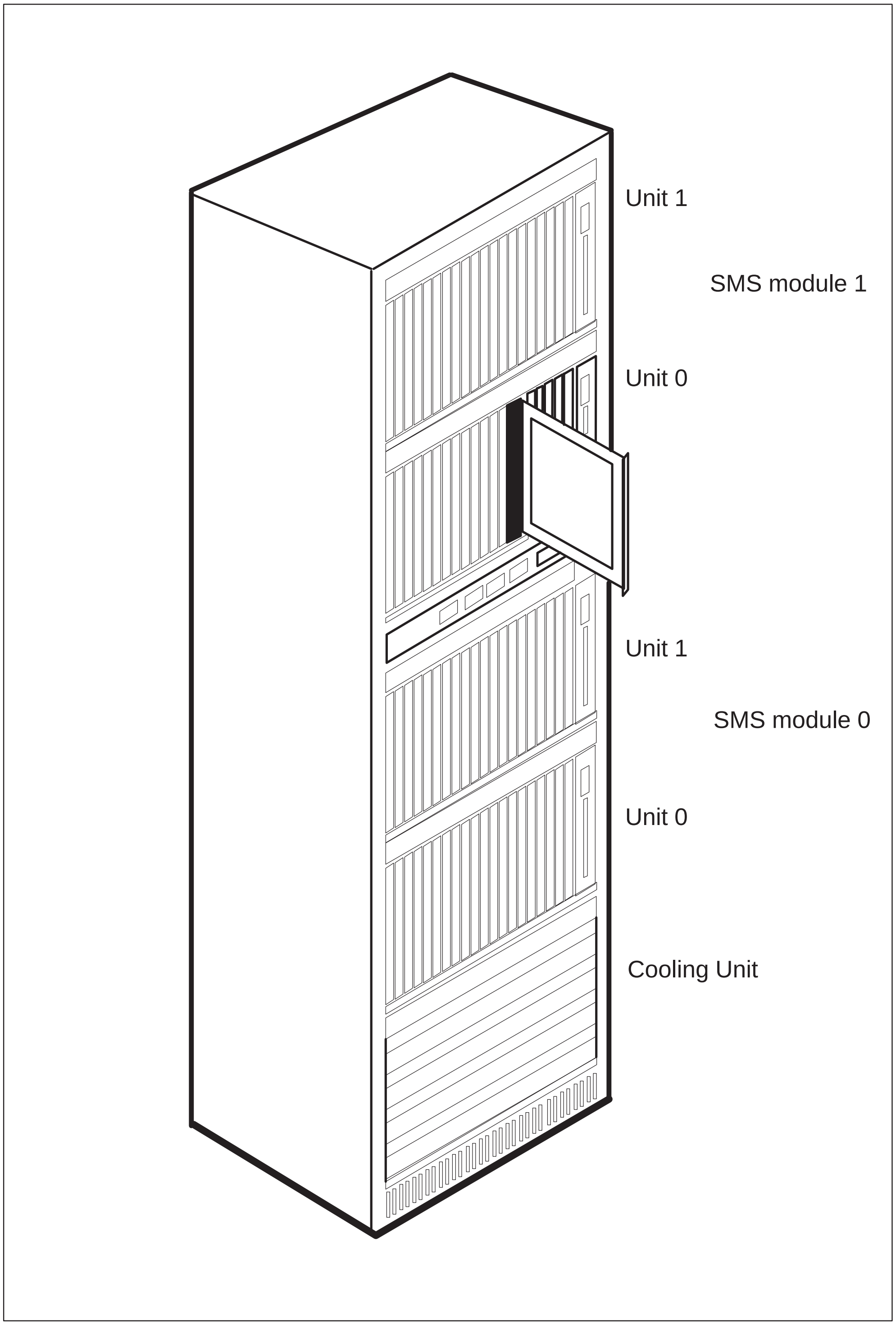
A Universal Tone Receiver (UTR) circuit pack (NT6X92BB) may also be provisioned. The UTR card provides a dedicated channel for digit collection during call setup, thereby unloading the network for a portion of call setup responsibility.

Limitations and restrictions

The following limitations apply to the SMS-RCS subsystem:

- The SMS is not supported by the Remote Switching Center.
- Intraswitching currently is unsupported.
- Emergency stand-alone (ESA) currently is not supported.

SMS SCE frame



The RCS module

The remote concentrator SLC-96 (RCS) module comprises up to four line shelves labeled A, B, C, and D. Shelves A and B form the upper shelf group, AB; shelves C and D form the lower shelf group, CD. Each shelf group operates independently in one of three modes.

Mode I

An RCS in Mode I has nonconcentrated shelf groups, meaning that every subscriber loop, which is associated with a circuit number, has a dedicated DS-1 channel. In Mode I operation, the RCS supports up to 96 subscriber lines and connects to the SMS through up to four primary DS-1 links. Mode I is used primarily for single- and multiparty lines, with both types of lines using dual-circuit, message line cards.

Mode II

An RCS in Mode II has concentrated shelf groups. Because only two primary DS-1 links connect the RCS to the SMS, 48 subscribers must compete for the 24 time slots on a DS-1 link. Single-circuit and dual-circuit line cards can be mixed in Mode II, but special–service and coin cards can be placed only in the four rightmost slots of each shelf. Up to eight single-circuit line cards are allowed for each Mode II shelf group.

In Mode II, an RCS supports up to 96 subscriber lines or a combination of 64 subscriber lines and 16 special-service and coin cards.

Mode III

An RCS in Mode III uses nonconcentrated shelf groups. This mode normally supports special services, but it can also support coin cards. This mode operates with one DS-1 link for each shelf group and uses a multiplexer to multiplex channels from the two shelves on a shelf group onto one DS-1 line. Shelves are equipped with single-circuit line cards only.

In Mode III, an RCS supports up to 48 special-service and coin cards.

The DS-1 links connecting the SMS and the RCS

An SMS provides a maximum of 20 DS-1 links to its remotes. Each remote terminates from two to four primary DS-1 links, depending on its mode of operation, from an SMS. In addition, each remote is configured with an optional protection link. This protection link ensures continued communication between an SMS and an RCS if a primary DS-1 link fails or is placed out-of-service by the switch operator.

Note: All DS-1 links from an RCS module must terminate on the same SMS.

An RCS in Mode I has up to four primary DS-1 links to the SMS, plus an optional protection link. This configuration allows a maximum of four Mode I remotes, including protection links, to hang off the SMS.

Note: If no protection links are configured, up to five RCS modules in Mode I may be configured. If fewer than the maximum four primary links are configured, the SMS may support up to six RCS Mode I modules.

An RCS in Mode II or Mode III has up to two primary DS-1 links to the SMS, plus an optional protection link. Therefore, the SMS supports a maximum of six RCS modules in these modes.

Each shelf group in an RCS module can operate independently in one of the three modes. This mixed mode of operation allows the operating company to plan for the gradual growth of the SMS-RCS subsystem as dictated by traffic requirements. For instance, an RCS shelf group operating in Mode I can be converted to Mode II operation. This configuration frees up a DS-1 link, which can then be used to provide protection switching for the RCS module. Refer to the *Translation Guide* for mode conversion procedures.

The derived data link (DDL)

The DDL, as its name implies, is not an actual physical link but is derived from 24 consecutive supervisory bits to form a special data path with a transmission rate of 2.2 kilobits/second. This derived data link is present on the RCS A-link (that is, the DS-1 link terminating at shelf A). If the RCS is in Mode II, the DDL is present on the C-link.

The DDL is used to send and receive information between the SMS and the RCS, including control of subscriber assignment and deassignment to specific DS-1 channels, hook transitions, and activation of the pulse code modulation (PCM) looping test.

Protection links

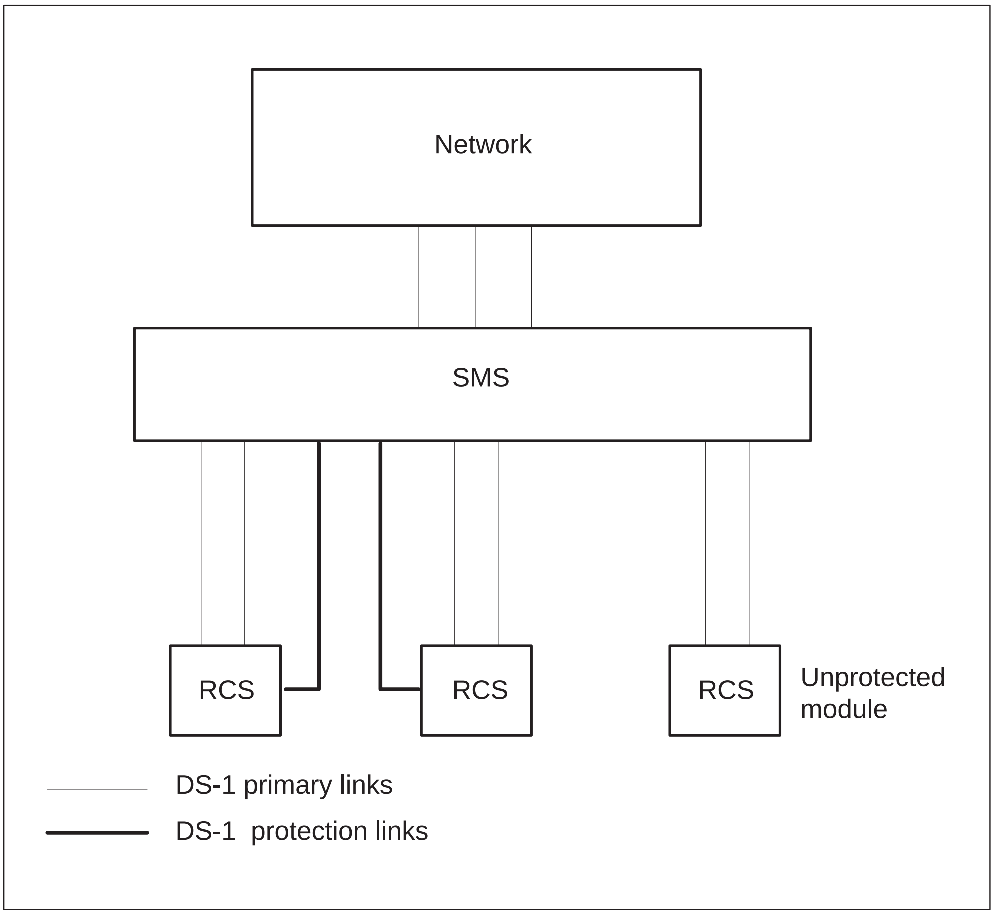
Protection switching is a DMS-100 backup feature that ensures continued communication between an SMS and an RCS if a DS-1 link connecting the two fails.

A protection link occupies one DS-1 P-side port of an SMS and connects a single RCS. Each RCS has from one to four primary lines, depending on the modes of its shelf groups, and at most, one protection line. Each protection line serves only the RCS to which it connects. A typical protection line configuration is shown in the following figure.

Protection switches are initiated automatically by the RCS or SMS, manually by operating company personnel using the CARRIER level protection switch (PROTSW) command, or during execution of the far end loop test (FELP) command. The FELP command enables a continuous loop back on all 24 DS-1 channels of a specified link.

When a protection switch occurs, calls in the talking state are maintained. For plain ordinary telephone service (POTS) and coin lines, calls in the ringing state are also maintained. The protection line carries voice and signaling information, and if the A-link (or C-link in Mode II) is protection switched, system control information as well.

Protection link configuration



Additional components

Not applicable.

SMS signaling

Signaling for SMS

This section describes the signaling protocols that the subscriber module SLC-96/remote concentrator SLC-96 (SMS-RCS) subsystem uses. The following sections discuss SMS-RCS signaling format, signaling protocols and the features the format and protocols support.

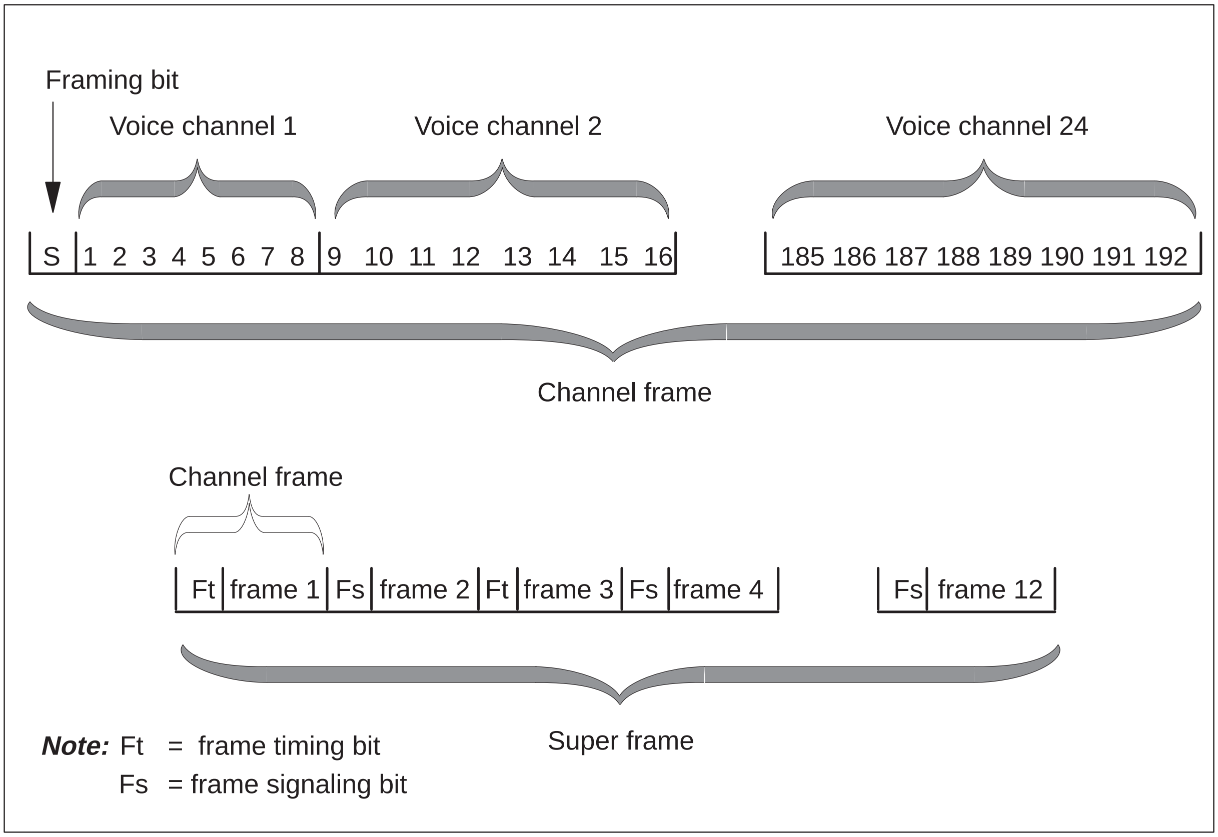
SMS-RCS signaling links

The SMS and the RCS exchange information over DS-1 lines that use an extended super frame format. The DS-1 lines operate at a rate of 1.544 Mbps with a sampling frequency of 8000 frames every second.

The DS-1 link consists of 24 channels. Each channel contains eight bits of pulse code modulation (PCM) data. A framing bit, also referred to as a S-bit, appears at the front of the sequence. This framing bit makes sure that the SMS and the RCS recognize the beginning of each 24-channel sequence. The system sends 192 bits of information during each 24-channel sequence, plus a framing bit. This action is referred to as a channel frame.

These channel frames carry speech, signaling or operations information. The following figure is the format of a DS-1 frame.

Format of a DS-1 frame



The previous figure also shows a superframe. A superframe contains 12 channels. A DDL frame, which does not appear in the previous figure, consists of six superframes or 72 channel frames.

The 24-bit pattern conveys three types of information:

- frame pattern sequence
- facility data link performance
- cyclic redundancy check

The frame pattern sequence (FPS) is 001110. Every fourth framing bit that begins at the fourth bit carries an FPS bit. The FPS and the cyclic redundancy check (CRC) define an in-frame condition.

The 4Kbit per second facility data link (FDL) bit begins with the first framing bit. Every other frame carries an FDL messaged bit.

Every fourth bit carries the cyclic redundancy check (CRC), which begins with the second bit. The system performs a block check field six times in an extended super frame. The CRC-6 check detects bits that emulate an FSP bit, and determines when an out-of-frame condition is present.

Signaling protocols

The SMS-RCS subsystem uses the following protocols to communicate and provide subscriber services:

- A- and B-bit messaging
- Derived data link (DDL) messaging
- Nailed-up cross-connections

A- and B- bit messages

In every sixth and twelfth channel frame, the system steals the least important bits from each channel. The system steals these bits at the RCS transmit/receive unit card or at the SMS time switch. The A-bits replace the least significant bits from the sixth frame. The B-bits replace the least significant bits from the twelfth frame. The A- and B-bits pass information that relate to specific channels.

An 8085 microprocessor on the A/B DDL message card sends A- and B-bits to the time switch. The microprocessor inserts these bits in the PCM data sent to the DS-1 lines. The 8085 microprocessor also extracts A- and B-bits from the PCM data that the time switch sends. The SMS signaling processor (SP) processes the A- and B-bits.

DDL messages

As shown in the previous figure, the framing bits used for channel frames alternate between frame timing bits (Ft) and frame signaling bits (Fs). Each superframe contains the same sequence of six Ft bits and six Fs bits.

Ft bits identify the first time slot in each channel frame. Fs bits identify the A- (sixth) and B- (twelfth) channel frames of a superframe. The A-frame carries A-bits. The B-frame carries B-bits. The framing pattern of Ft and Fs bits appears below:

```
1(Ft) 0(Fs) 0(Ft) 0(Fs) 1(Ft) 1(Fs) 0(Ft) 1(Fs) 1(Ft)
1(Fs) 0(Ft) 0(Fs)
```

The frame signaling pattern, formed with Fs bits, is as follows:

```
111 000 111 000
```

These 12 bits transfer the signaling pattern from two superframes. The system takes the Fs bits from the next four superframes. This action occurs at the transmit receive unit card in the RCS or at the time switch card in the SMS. Special supervisory bits are inserted in the place of the robbed signaling bits. The 24 consecutive supervisory bits form a special data link called a derived data link (DDL).

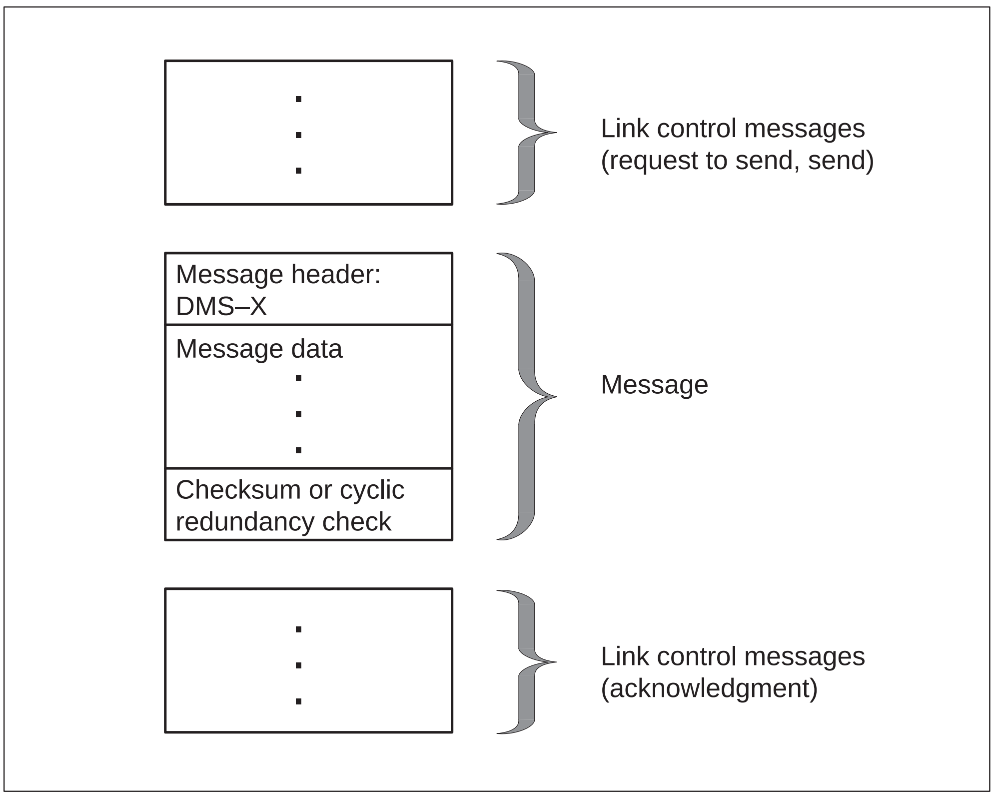
The DDL is a 2.2 kilobit/second (Kb/s) data path of supervisory bits always present on the RCS A-link. The DDL is also present on the C-link when shelf group CD is in Mode II. The system uses the C-field part of the DDL.

DMS–X protocol

The DMS–X protocol is a half-duplex protocol used on DS30A links between the remote cluster controller RCC and the SMS. The DMS–X protocol includes a cyclic redundancy check (CRC) code for error detection.

The DMS–X protocol is an inter-terminal process that contains handshaking messages. With handshaking messages, two terminals inform each other of the current terminal condition that applies to messaging through message transfer. The following figure illustrates a general form of handshaking protocol that creates DMS–X protocol.

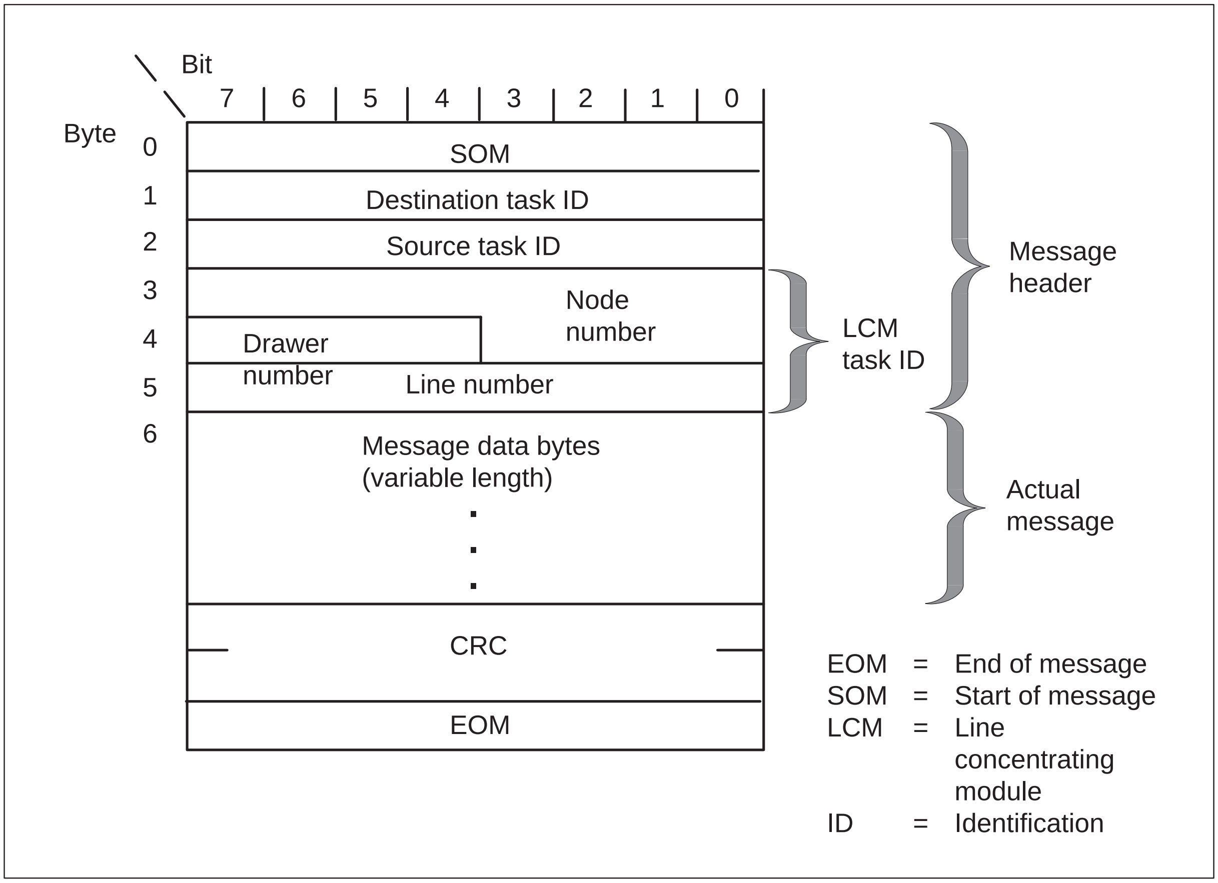
DMS–X handshaking protocol



Message time-out and message checksum or CRC calculation performs message error detection. In the event of protocol, checksum, or CRC failure on an outgoing message, the sending node retries the send sequence. On an incoming message failure, the sending node reroutes the message over an alternate control side (C-side) link. Hardware redundancies provide a minimum of one alternative path to and from a node.

The format of DMS–X messages appears in the following figure.

DMS–X message format



The system transmits the message over a link, with link control messages before and after the transmission. Messaging occurs between active programs in the SMS and in the RCC. Many tasks for processes communicate with each other through messages over the DS30A links.

The DMS–X message header is the first six bytes as follows:

- The first byte is the start of message.
- The second byte is the destination task identification (ID) of the message. An outgoing message uses this ID to identify the process to receive the message.
- The third byte is the source task ID. An incoming message uses this ID to identify the process that sent the message.
- The last three bytes are the task ID number.

The number of bytes in the actual message or data varies. The CRC occupies two bytes and detects transmission errors. The end of message occupies one byte.

Nailed-up cross-connections

To support applications that require special-service cards, a nailed-up cross-connection is set up and maintained through software. A nailed-up cross connection is also called a hairpin connection. This connection is a peripheral-side (P-side) cross-connection. All information flows from an RCS to the SMS.

The system switches information from the SMS to a DS-1 line. This line leads to a second RCS or other piece of digital equipment. The information is not switched through the network.

SMS-RCS signaling functions

A- and B-bit messaging

A- and B-bit messaging supports the subscriber services that the following sections describe.

Plain ordinary telephone service (POTS) Plain ordinary telephone service is provided for both single-party and multiparty. Multiparty includes two-party automatic number identification (ANI) and operator number identification (ONI) and four- or eight-party ONI.

Coin features Coin first (CCF) and dial tone first (CDF) are provided as coin features.

The SMS sends the following signaling information to the RCS on a per-channel basis:

- start or stop ringing
- start or stop forward disconnect
- scan for on-hook and off-hook
- collect ANI/Coin information
- collect channel maintenance information

The SMS collects return signaling information from the RCS that includes the following data:

- call origination
- call disconnect
- digit collection
- ANI/coin
- answer
- flash

A- and B-bit messages are decoded in a different way for each type of RCS line card. An example of this condition is when a specific pattern for a single-party line card can indicate a different pattern for a coin card.

Universal tone receiver (UTR) features The RCS lines that connect an SMS can use the optional UTR feature. This feature removes part of the processing load from the central control (CC) and implements the load in the PM.

When the UTR feature is present on the SMS, the SMS performs all digit collection functions. Digit collection occurs at the originating terminal.

The digit collection functions include:

- the allocation of a free receiver
- the establishment of a path to the receiver
- the collection and processing of digits
- the deallocation of the receiver

With a UTR, the CC conveys the need for a receiver to the SMS. The SMS goes through the following steps:

1. Request a UTR channel.
2. Instruct the UTR to start monitoring tones.
3. When monitoring starts, the system informs the SMS of digits and normally performs some translations functions on the digits.
4. When the the receiver is no longer required, the SMS makes the allocated UTR channel available.

From this point on the call proceeds normally.

The system requires a receiver request to start the sequence. When the request arrives from a SMS with no UTR, processing continues.

Call processing features Coin call and Automatic Number Identification (ANI) processing are grouped as one feature. The software and hardware used to implement both features are similar.

Coin features apply to coin dial-tone first (CDF) and coin first (CCF) lines and consist of the following capabilities:

- ability to scan for off-hook
- ability to check for coin presence
- ability to check for coin presence during local call overtime
- ability to return coins
- ability to collect coins

The ANI feature provides a way to determine when a two-party line is active from the tip or the ring side of the line. This request obtains the correct billing responsibility for a call.

Both ANI and coin features are implemented through A- and B-bit signaling patterns transmitted between the SMS and the RCS. These signaling patterns consist of A- and B-bits and can contain up to nine signaling states.

The following signals are transmitted from the SMS to the RCS:

- negative loop mode
- channel test
- positive loop mode
- ground start
- –R ringing
- positive coin check
- positive coin control
- negative coin control
- negative coin check

The following signals are transmitted from the RCS to the SMS in response to SMS signals:

- on-hook
- off-hook
- coin ground
- unequipped

These signaling states associate with specific A- and B-bit patterns. The Bellcore document *Digital Interface Between the SLC96 Digital Loop Carrier System and a Local Digital Switch* (TR-TSY-000008) describes these bit patterns.

PBX line The private branch exchange line provides capabilities for a loop start and a ground start.

Custom calling services The following custom calling services are provided:

- speed calling
- call waiting
- three-way calling
- call forwarding

Custom local area signaling services (CLASS) features The following CLASS features are supported:

- calling number delivery (CND)
- automatic call back (ACB)
- automatic recall (AR)
- customer originated trace (COT)
- calling number delivery blocking (CNDB)

Ringing The following ringing types are supported:

- bridged ringing
  - single-party
- superimposed ringing
  - multiparty
    - four-party fully selective
    - eight-party semiselective
- coded
- frequency selective ringing (FSR)

The SMS supports ringing on subscriber lines attached to an RCS. The SMS sends different A- and B-bit signaling patterns over DS-1 lines to a connected RCS. This action causes the RCS to ring subscriber telephone sets.

The DMS-100 switch uses specific signaling patterns for coin, special service, and single-part lines and multiparty lines. These signaling patterns are described in the Bell Communications Research document, *Digital Interface Between the SLC96 Digital Loop Carrier System and a Local Digital Switch* (TR-TSY-000008).

The SMS-RCS subsystem supports all currently available types of ringing. The types of ringing include coded, FSR, and superimposed. A single RCS uses one type of ringing at a time.

Frequency selective ringing The SMS-RCS subsystem supports FSR for single-party, two-party, four-party and Meridian Digital Centrex (MDC) lines. There are two types of FSR channel units or cards. These cards are referred to as FSR cards in this document. The following are the FSR cards in the SMS-RCS subsystem:

- SCD222 for 900-Ω loops

- SCD252 for 1500-Ω loops

A specified RCS supports one type of ringing. For example, an RCS supports FSR but not coded, or coded but not FSR. A field in table RCSINV indicates the type of ringing an RCS uses. Refer to the data schema section of the *Translations Guide* for more information on Table RCSINV datafill.

All line cards on an RCS use the type of ringing employed. When the system employs FSR, single-party and coin line cards can be provisioned on the RCS with FSR cards. The single-party and coin cards employ –R ringing.

Three FSR systems are normally used: decimonic, harmonic and synchromonic. Refer to the *Translations Guide* for more information about FSR.

Dialing Two types of dialing are supported: dial pulse and Digitone.

Tones The following tones are supported:

- dial tone
- audible ringback
- reorder
- busy

Universal Tone Receiver (UTR) features

Subscriber lines that subtend an SMS can use the optional universal tone receiver (UTR) feature. This feature allows part of the processing load to be removed from the HOST computing module (CM) and implemented in the PM.

When the UTR feature is present on the SMS, the SMS performs all digit collection functions. These digit collection functions occur at the location of the subscriber terminal. These functions include:

- the allocation of a free receiver
- the establishment of a path to the receiver
- the collection of digits
- the processing of digits
- the deallocation of the receiver

With a UTR, the SMS goes through the following steps:

1 Request a UTR channel.

2 Instruct the UTR to start monitoring tones.

3 When monitoring starts, the system informs the SMS of collected digits. The SMS normally performs some translations functions on the digits.

4 When the receiver is no longer required, the SMS frees the allocated UTR channel.

Note: The system requires a receiver request to start the sequence.

The SMS creates alerting tones to support the Deluxe Spontaneous Call Waiting Identification (DSCWID) feature. A line with the DSCWID option can establish a call and have a second call attempt to terminate that line. When this event occurs, the SMS alerts the system. The types of signals that alert the system are Subscriber Alerting Signal (SAS) or an SAS followed by a Customer Premises Equipment (CPE) Alerting Signal (CAS). The tones alert the DSCWID subscriber of the pending call, and the DSCWID CPE of pending caller data.

The SAS is the tone that the subscriber recognizes as the “Call Waiting Tone”. The CAS alerts the CPE of forthcoming data. The system requires SAS followed by a CAS to trigger an Analog Display Services Interface (ADSI) compatible CPE to display the DSCWID options. The CAS tone prepares the CPE to receive Caller Identification (CID) data.

The DSCWID CPE generates an acknowledge (ACK) tone to indicate readiness to receive DSCWID data. If the CPE is ADSI compatible, the CPE sends a DTMF A ACK signal in response to the CAS. When the CPE is a SCWID CPE, the CPE sends a DTMF D ACK signal in response to the CAS. When the system sends an alerting tone, the subscriber can control disposition to the incoming call. The subscriber uses the following keys to control the disposition:

- CPE softkeys when the CPE is ADSI
- hard-coded keys when the CPE is a SCWID
- hard-coded keys when the CPE is a 2500 set

A T-tone timer sets the maximum acceptable time between sending a flash and the DTMF digit on an ADSI set. The SMS receives a flash signal from the ADSI compatible CPE of the customer. The SMS starts a T-tone timer. The value of T-tone is 600 ms. The system mutes the speech path during the T–tone timer. The system uses the T-tone timer for the initial option of a DSCWID call, and the CPE type does not affect this event. Any subsequent DSCWID options on an ADSI set also use the T-tone timer.

Any subsequent DSCWID options on a SCWID or 2500 use a new timer (T-flash). The system uses T-flash after the subscriber answers a call with SCWID and 2500 sets. This action provides the customer with enough time to select an option after a flash. T-flash is a operating company controlled timer that can be set from 1 to 8 s. The default value is 1.5 s. The SMS starts the T-flash timer when the NON-ADSI field is set to “Y”. The SMS receives a flash signal from the SCWID or 2500 set of the customer during the held or conference call state. When the SMS cannot attach a UTR before 400 ms, the SMS applies the RETURN option.

Note: For Bellcore TR-416 compliance, the SMS must provide options when the SMS detects a flash and cannot attach a UTR. The SMS sends a flash to the CC when the SMS cannot attach a UTR in 400 ms. The SMS initiates this event to make sure that the SMS complies with this requirement.

Meridian Digital Centrex (MDC) on SMS The SMS-RCS subsystem supports Integrated Business Network (IBN) features. The SMS does not support trunks, so that IBN features that require trunks must terminate on equipment other than an SMS. Station features are limited to 500/2500 sets and attendant consoles. This limit is present because the SMS does not support Meridian business sets (MBS) or data units.

DDL messaging

The 8085 microprocessor of the A/B DDL message card also sends DDL messages. The 8085 microprocessor sends these messages to the time switch in the DS-1 PCM data stream. The microprocessor extracts the DDL message from incoming PCM. Software in the SP, called the DDL facility, processes DDL messages.

The DDL message consists of 24 consecutive bits, grouped as shown in the “DDL message bits and field names” table.

DDL message bits and field names

DDL bits	Field name	Explanation
Bits 1 –11	Concentrator field (C-field)	To operate in Mode II, shelf groups AB and CD use the C-field. This field carries information for shelves A, B, C and D. The information includes control of subscriber assignment and deassignment to DS-1 channels, hook transitions and activation of the PCM looping test. Refer to Note 1.
Bits 12–14	Spoiler bits (fixed pattern of 010)	Spoiler bits are inserted at preassigned positions in the DDL to make sure that the DDL cannot duplicate a signaling pattern.
Bits 15–17	Maintenance field (M-field)	The M-field on the A-link carries information for all shelves, and controls card and customer loop testing. Refer to Note 2.
Bits 18–19	Alarm data link field (A-field)	The A-field on the A-link carries alarm and system control information for all shelves. Refer to Note 2.
Bits 20–23	Protection line switch field (S-field)	The S-field on the A-link controls the switching of the DS-1 protection link. Refer to Note 2.
Bit 24	Spoiler bit field (fixed pattern of 1)	Operating company personnel insert the spoiler bit at the preassigned position in the DDL. This action makes sure that the DDL cannot duplicate a signaling pattern.

Note 1: When a C-field is not available to send on the DDL link, the 8085 microprocessor sends an idle pattern on the DDL link. The RCS also sends an idle pattern when no new C-field is present.
Note 2: When the M-, A-, or S-fields do not change between messages, the 8085 microprocessor sends the previous field patterns. The RCS at the other end sends the same patterns. The 8085 microprocessor sends information to the SP only when a DDL field changes. The system does not transmit idle patterns.

Nailed-up cross-connections

Nailed-up connections support the following special services features:

- maintenance and table control for nailed-up specials on SMS
- SMS special services
- digital dataphone service (DDS) hairpin
- direct inward dial (DID) PBX by hairpin
- integrated local specials

One endpoint of the nailed-up connection must terminate on a switch that supports these special services. This action provides support for applications like foreign exchange and off-premises extension.

Table control for nailed-up specials on SMS This feature implements CC code to support nailed-up peripheral-side to peripheral-side (P-side to P-side) cross-connections on any DS-1 links located on the same SMS.

Special services feature The special services feature implements peripheral processor code to support nailed-up P-side to P-side cross-connections on any DS-1 links located on the same RCS.

This feature also provides and maintains connections between pairs of P-side channels, lines, or a combination of lines and channels on an SMS. This action occurs in response to a CC request. These connections remain until the CC sends a message to disconnect the connections.

Connections for special services are as follows:

- line to line
- DS-0 to DS-0
- line to DS-0 or DS-0 to line

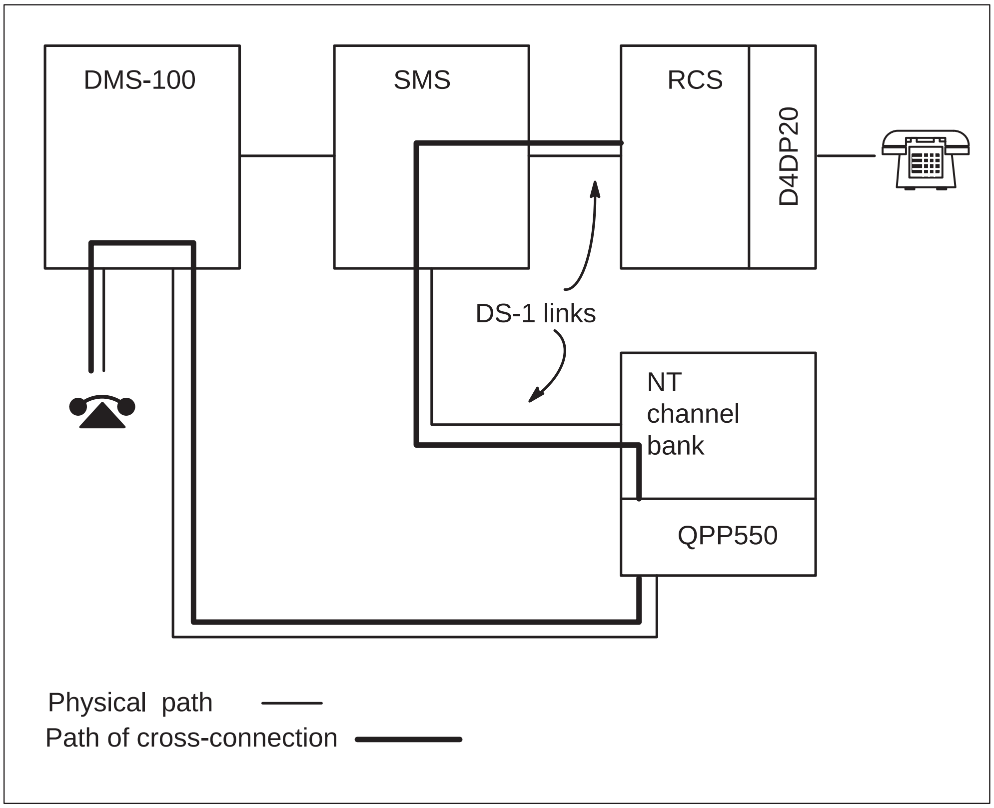
Digital dataphone service (DDS) hairpin feature The Digital dataphone service (DDS) hairpin feature supports 2.4, 4.8 and 9.6 Kb/s data cards. These cards, which transfer data over DS-1 links, employ a nailed-up cross-connection that the DMS switch sets up. A normal data path appears in the following Dataport cross–connection figure.

The 2.4, 4.8, and 9.6 data cards are used for data transmission only. For an NT channel bank, these data cards work with an associated card. For example, the D4DP20 card works with the QPP550 card.

Note: The 56 kilobit/second DDS card (D4DP70) is not supported now.

The dataport cross-connection figure is an example of one possible data connection setup. The cross-connection figure shows information that flows from the data card through the RCS and SMS into a channel bank or some other digital facility. In this event, the digital facility is a Nortel (Northern Telecom) channel bank. From the channel bank, data flows to the DMS-100 and switches to the terminating party. The terminating party can be a computer, another digital switch, or some other device.

Dataport cross–connection on an SMS–RCS subsystem



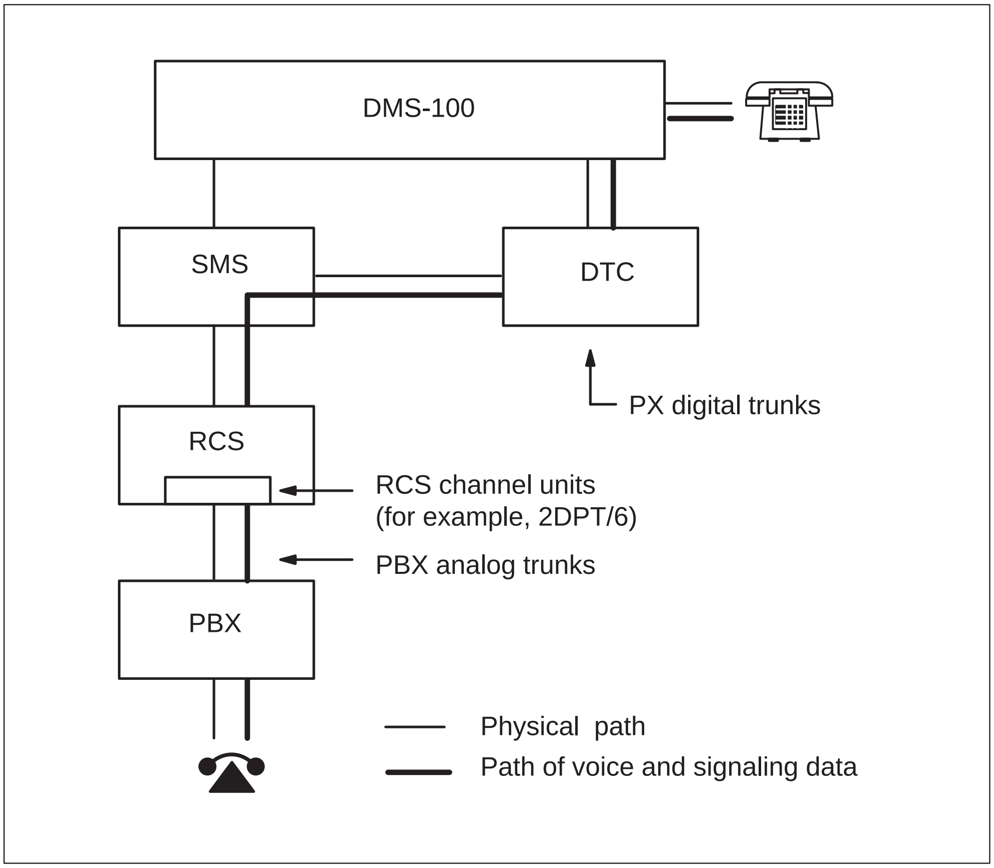
A- and B-bits are not inserted into the information path for the DDS hairpin connection. This difference is the important difference between DDS hairpin connections and other special-service connections. This difference occurs because DDS protocol uses the same bits as the A- and B- signaling bits. The DDS protocol bit occupies position one in a byte.

Direct inward dial (DID) PBX by hairpin This feature uses the following items:

- special-services channel units in an RCS
- a hairpin connection
- a DS-1 link from an SMS to a DTC
- other piece of telephone equipment

The following DID PBX configuration figure illustrates this feature.

DID PBX configuration example



Integrated local specials The special plain ordinary telephone service (SPOTS) channel unit (S9CD271A) supports POTS and special services like the following:

- INWATS
- OUTWATS
- TWX
- PBX

The SPOTS channel unit is configured in loop or ground start mode. When SPOTS channel units are configured in loop start, the units do not support PBX. The SPOTS channel units cannot support PBX lines because these lines require ground-start signaling and ground-start mode.

Ground-start lines are different from loop-start lines. The system handles loop-start (tip and ring) in a different way to signal an off-hook. The system acknowledges ground-start off-hooks but not loop start off-hooks.

The SPOTS channel unit has the following characteristics:

- two voice-frequency, two-wire channels associated with each channel unit
- accessible for mechanized loop testing
- there is no gain or frequency setting
- required special service unit (SSU) to be configured in the associated RCS
- single-party 20 Hz ringing (–R ringing)

Refer to manufacturer documentation for more information.

The following limits associate with the SPOTS channel unit as used in the SMS-RCS subsystem:

- The system assigns a channel for both loop- and ground-start configurations. A minimum of one DS-0 channel must be available for nondedicated channel units, when the units are present on the RCS.

  Note: Mode I does not have this limit, since four DS-1 links connect an RCS to an SMS. A DS-0 channel is present for every circuit.

- The use of a SPOTS card in Mode III is not recommended because a Mode III RCS multiplexes 48 circuits on to two DS-1 links. Channel units on a Mode III RCS must have a single circuit. The SPOTS channel unit has two circuits, loop and ground. The system cannot disable the circuit that is not in use.

Note: The S9CD271A SPOTS channel unit, which is not recommended for use in a Mode III RCS, can be used for this purpose. Even-numbered circuits can be assigned in Mode III.

- The SPOTS channel unit does not provide for tip-ring reversal. Tip-ring reversal is a signal for many switches to indicate a toll call to the originating party. When this event occurs, the system can restrict the SPOTS channel unit to nontoll calls. This restriction occurs when the system connects the SPOTS channel unit to a PBX or other piece of equipment that requires tip-ring reversal.

The system tests the SPOTS channel unit the same as a single-party line. The system supports the following tests on the SPOTS channel:

- off-hook detection
- on-hook detection
- echo return loss
- single party ringing
- carrier channel loss
- idle channel noise

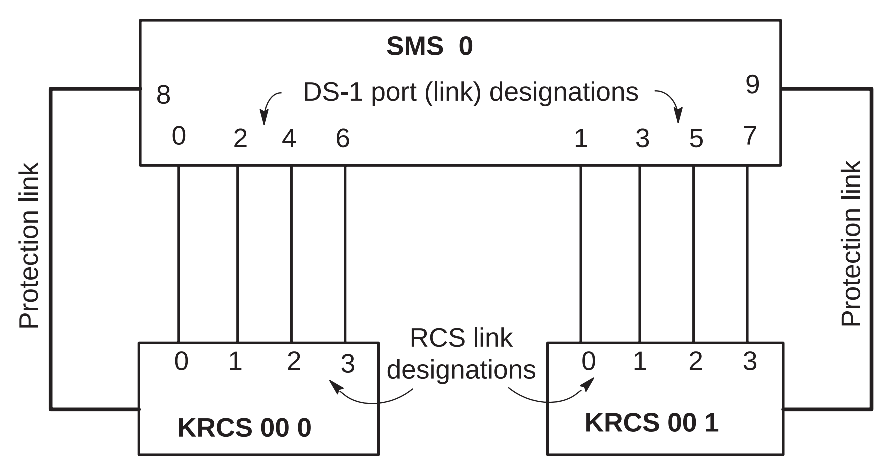
Converting from Mode I to Mode II

Mode I to Mode II conversion

Two procedures follow for conversion from Mode I to Mode II operation. This conversion can be required to free up DS-1 links to the remote site for additional SLC-96 systems.

Use the procedure on page 4-3 if at least two links are available (entered as NILTYPE in table LTCPSINV). The examples in the procedure apply to the example configuration shown in the following figure. The example shows that two remote concentrator SLC-96 (RCS) modules in Mode I; KRCS 00 0 can change to Mode II operation.

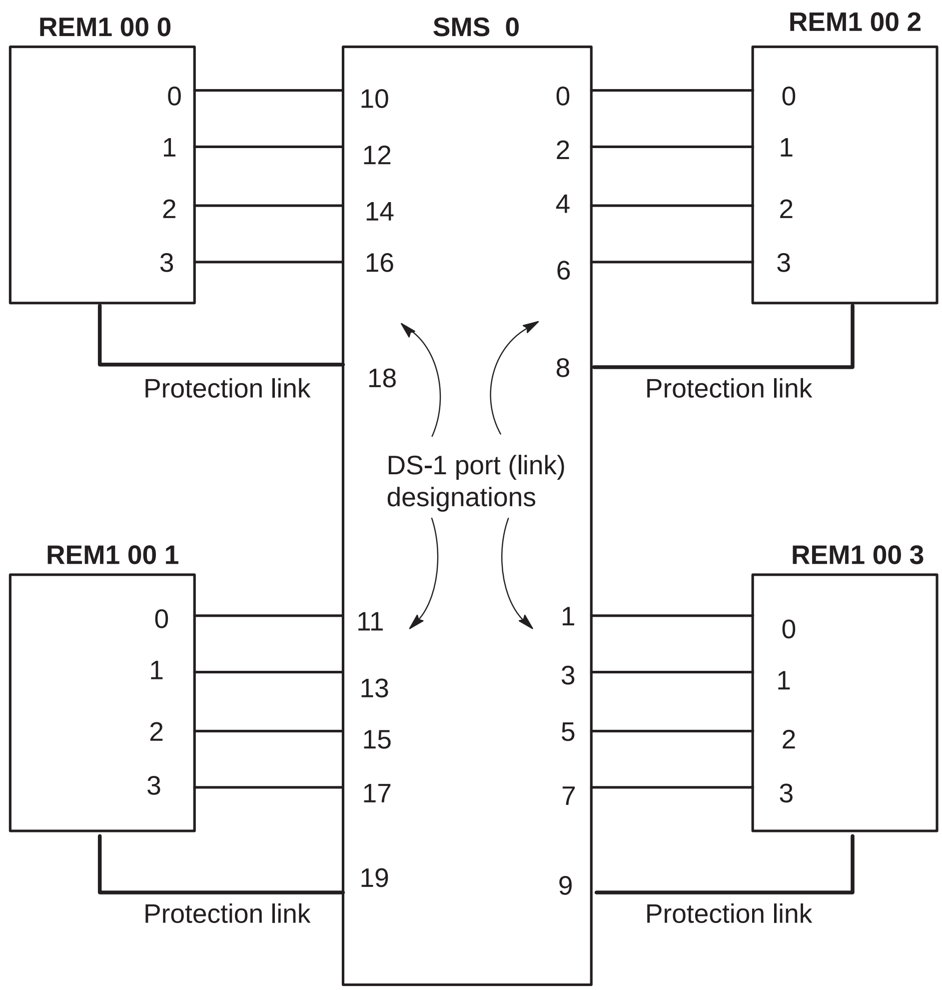
Example configuration for procedure Mode I to Mode II conversion (two available links)



Note: Ports 10–19 are not assigned.

Use the procedure on page 4-10 if no links are available. The examples in the procedure apply to the example configuration shown in the following figure. The example shows that four RCS modules operating in Mode I; REM1 00 2 can convert to Mode II.

Example configuration for procedure Mode I to Mode II conversion (no available links)



Note: The SMS has no available ports.

Two available links

In the following procedure, two links entered as NILTYPE in table LTCPSINV change to DS-1. The system uses the two new DS-1 links to busy and change the remote to Mode II. When the system makes the conversion, the PORT numbers are assigned again to any two of the original four primary link names. Links that are not used change to NILTYPE in table LTCPSINV. Static data on the SMS are updated. The remote returns to service.

Mode I to Mode II conversion (two available links)

At the maintenance and administration position (MAP) terminal

1 In Mode II operation, you cannot enter special-service or coin cards in the first eight slots of each shelf in the remote. To verify this statement, obtain a hardcopy of table LNINV. To obtain a hard copy of table LNINV type

>TABLE LNINV
>SEND printer
>POS len
>LIST 96
>SEND PREVIOUS
>QUIT

where

printer is the local printer mnemonic
len is the line equipment number

Example:

>TABLE LNINV

>SEND PRT

>POS KRCS 00 0 00 00

>LIST 96

>SEND PREVIOUS

>QUIT

Also obtain a hardcopy of table LTCPSINV.

2 To change the entry in table RCSINV from Mode I to Mode II, you must change the SMS ports. To change the SMS ports, enter table LTCPSINV and select two (NILTYPE) ports not used. To select two (NILTYPE) ports not used, type

>TABLE LTCPSINV
>POS SMS sms no

Example:

>TABLE LTCPSINV

>POS SMS 0

```
SMS 0
(0 DS1 DEFAULT N) (1 DS1 DEFAULT N) (2 DS1 DEFAULT N)
(3 DS1 DEFAULT N) (4 DS1 DEFAULT N) (5 DS1 DEFAULT N)
(6 DS1 DEFAULT N) (7 DS1 DEFAULT N) (8 DS1 DEFAULT N)
(9 DS1 DEFAULT N) (10 NILTYPE) (11 NILTYPE) (12 NILTYPE)
(13 NILTYPE) (14 NILTYPE) (15 NILTYPE) (16 NILTYPE)
(17 NILTYPE) (18 NILTYPE) (19 NILTYPE) $
```

3 Change two NILTYPE ports to DS-1 ports. To make sure that DS-1 cards are present, type

>CHA
>QUIT

Example:

>CHA

```
MACHINES NOT IN SYNC – DMOS NOT ALLOWED
JOURNAL FILE UNAVAILABLE – DMOS NOT ALLOWED
ENTER Y TO CONTINUE PROCESSING OR N TO QUIT
```

>Y

Step through the fields until the port to change appears. Press the Enter key to step through the fields.

`PSLNKTAB: 10 NILTYPE`
> 10 DS1 DEFAULT N

`PSLNKTAB: 12 NILTYPE`
> 12 DS1 DEFAULT N

Step through the fields that remain until the tuple to change appears.

`ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.`
>Y

```
TUPLE CHANGED
JOURNAL FILE INACTIVE
```

>QUIT

4 To post and busy the remote from the PM MAP level, type

>MAPCI;MTC;PM
>POST RCS site rcs_no unit_no
>BSY

Example:

>MAPCI;MTC;PM

>POST RSC KRCS 00 0

>BSY

```
“CALLS WILL BE AFFECTED.  PLEASE CONFIRM (YES OR NO)”
```

>YES

5 In table RCSINV, change the remote from Mode I to Mode II. To specify the two ports that changed from NILTYPE to DS1, type

>TABLE RCSINV
>POS rcs no
>CHA

Example:

>TABLE RCSINV

>POS KRCS 00 0

>CHA

```
MACHINES NOT IN SYNC – DMOS NOT ALLOWED
JOURNAL FILE UNAVAILABLE – DMOS NOT ALLOWED
ENTER Y TO CONTINUE PROCESSING OR N TO QUIT
```

>Y

Step through the fields until the SHLFGRPMODE field appears. Press the Enter key to step through the fields.

```
SHLFGRPMODE: MODE1
```
>MODE2

```
PORT:  0
```
> 10

```
PORT:  2
```

```
>$

LOOPTEST:
>N

SHLFGRPMODE: MODE1
>MODE2

PORT:  4
> 12

PORT:  6
>$

LOOPTEST:
>N
```

Step through the fields that remain until the tuple to change appears. Press the Enter key to step through the fields that remain.

```
 KRCS  00 0 MIS 1   0   1    C   8  NOLOAD  SMS 0
    MODE2   (10)$ N    MODE2   (12)$ N     S      WP1B    Y  8
              N        MISC_ALARM     MAJOR 35 DAVIS DRIVE RTP


ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
>Y

 WARNING:  Static data not updated for SMS 0
 You must BSY and RTS the SMS
 TUPLE CHANGED
 JOURNAL FILE INACTIVE
```

6 The remote changed to Mode II. The four links used earlier in Mode I operation are free. Enter table RCSINV again. Assign the PORT numbers again to any two of the four free links. (In the example, links 4 and 6 are assigned again.)

>POS rcs no
>CHA
>QUIT

Example:

>TABLE RCSINV

>POS KRCS 00 0

>CHA

```
MACHINES NOT IN SYNC – DMOS NOT ALLOWED
JOURNAL FILE UNAVAILABLE – DMOS NOT ALLOWED
ENTER Y TO CONTINUE PROCESSING OR N TO QUIT
```

>Y

Step through the fields until the PORT field appears. Press the Enter key to step through the fields.

```
SHLFGRPMODE: MODE2
PORT:  10
```
> 4

```
LOOPTEST: N
SHLFGRPMODE: MODE2
PORT:  12
```
> 6

```
LOOPTEST: N
```
Step through the fields that remain until the tuple to change appears. Press the Enter key to step through the fields.

```
KRCS  00 0 MIS 1    0     1    C   8  NOLOAD  SMS 0
   MODE2   (4)$ N     MODE2   (6)$ N     S      WP1B     Y  8
             N        MISC_ALARM        MAJOR
```

```
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
```
>Y

```
WARNING:  Static data not updated for SMS 0
You must BSY and RTS the SMS
TUPLE CHANGED
JOURNAL FILE INACTIVE
```

>QUIT

7 In table LTCPSINV, change the two free links that remain *and* the two links that make the conversion to NILTYPE. To change the links, type

>TABLE LTCPSINV
>POS SMS sms no
>CHA
>QUIT

Example:

>TABLE LTCPSINV

>POS SMS 0

>CHA

```
MACHINES NOT IN SYNC – DMOS NOT ALLOWED
JOURNAL FILE UNAVAILABLE – DMOS NOT ALLOWED
ENTER Y TO CONTINUE PROCESSING OR N TO QUIT
```

>Y

Step through the fields until the port to change appears. Press the Enter key to step through the fields.

```
PSLNKTAB: 0 DS1 DEFAULT N
```
> 0 NILTYPE

```
PSLNKTAB: 2 DS1 DEFAULT N
```
> 2 NILTYPE

```
PSLNKTAB: 10 DS1 DEFAULT N
```
> 10 NILTYPE

```
PSLNKTAB: 12 DS1 DEFAULT N
```
> 12 NILTYPE

Step through the fields that remain until the tuple to change appears. Press the Enter key to step through the fields that remain.

```
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
```
>Y

```
TUPLE CHANGED
JOURNAL FILE INACTIVE
```

>QUIT

8 Post and busy the SMS at the PM level and perform a warm SWACT.

>MAPCI;MTC;PM
>POST SMS sms no
>BSY UNIT inactive unit no
>RTS UNIT inactive unit no
>SWACT

Example:

>MAPCI;MTC;PM

>POST SMS 0

>BSY UNIT 0

>RTS UNIT 0

>SWACT

```
A warm SwAct will be performed
This action will take this PM and all of
Its Subtending Nodes temporarily out of service
and <#> active terminals may be affected
Please confirm (“YES” or “NO”):
```

>Y

```
SMS 0 SwAct Passed
```

9 To translate the P-side links and return to service any P-side links that are busy, type

>TRNSL P
>RTS LINK link no

Example:

>TRNSL P

```
LINK  0: RCS KRCS 00 0  0;CAP MS; STATUS: OK ,P; MSGCOND: CLS
LINK  1: RCS KRCS 00 1  0;CAP MS; STATUS: OK ,P; MSGCOND: OPN
LINK  2: RCS KRCS 00 0  1;CAP MS; STATUS: OK ,P; MSGCOND: CLS
LINK  3: RCS KRCS 00 1  1;CAP MS; STATUS: OK ,P; MSGCOND: OPN
LINK  4: RCS KRCS 00 0  2;CAP MS; STATUS: OK ,P; MSGCOND: CLS
LINK  5: RCS KRCS 00 1  2;CAP MS; STATUS: OK ,P; MSGCOND: OPN
LINK  6: RCS KRCS 00 0  3;CAP MS; STATUS: OK ,P; MSGCOND: CLS
LINK  7: RCS KRCS 00 1  3;CAP MS; STATUS: OK ,P; MSGCOND: OPN
LINK  8: RCS KRCS 00 0   ;PROTLINE
LINK  9: RCS KRCS 00 1   ;PROTLINE
```

In this example, all links are already in service (that is, STATUS is OK). MSGCOND for links 0, 2, 4, and 6 is CLS (closed) because KRCS 00 0 is busy.

10 To post the RCS and return the RCS to service, type

>POST RCS rcs no
>RTS

Example:

>POST RCS KRCS 00 0

>RTS

No available links

Use the following procedure if links are not available (that is, NILTYPE ports are not present in table LTCPSINV). The ports the protection links from two other remotes use, are borrowed to make the conversion to Mode II. Then the PORT numbers change back to any two of the original four primary links. The PROTLINEs restore to the remotes.

Mode I to Mode II conversion (no available links)

At the MAP terminal

1 In Mode II operation, you cannot enter special-service or coin cards in the first eight slots of each shelf in the remote. Obtain a hardcopy of table LNINV from the printer to verify this statement. To obtain a hard copy of table LNINV, type

>TABLE LNINV
>SEND printer
>POS len
>LIST 96
>SEND PREVIOUS
>QUIT
where

printer is the local printer mnemonic
len is the line equipment number

Example:

>TABLE LNINV

>SEND PRT

>POS REM1 00 0 00 00

>LIST 96

>SEND PREVIOUS

>QUIT

Also obtain a hard copy of table LTCPSINV.

2 To change the entry in table RCSINV from Mode I to Mode II, you must change the SMS ports. If NILTYPE ports are not available in table LTCPSINV, borrow the ports the protection links from two other remotes use.

Note: These protection links will be off-lined in this procedure. Protection switching for these remotes will be disabled.

To determine which links are protection links, type

>MAPCI;MTC;PM
>POST SMS sms no
>TRNSL P

Example:

>MAPCI;MTC;PM

>POST SMS 0

>TRNSL P

```
LINK  0: RCS REM1 00 2  0;CAP MS; STATUS: OK ;MSGCOND: OPN
LINK  1: RCS REM1 00 3  0;CAP MS; STATUS: OK ;MSGCOND: OPN
LINK  2: RCS REM1 00 2  1;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  3: RCS REM1 00 3  1;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  4: RCS REM1 00 2  2;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  5: RCS REM1 00 3  2;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  6: RCS REM1 00 2  3;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  7: RCS REM1 00 3  3;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  8: RCS REM1 00 2   ;PROTLINE
LINK  9: RCS REM1 00 3   ;PROTLINE
LINK  10: RCS REM1 00 0  0;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  11: RCS REM1 00 1  0;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  12: RCS REM1 00 0  1;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  13: RCS REM1 00 1  1;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  14: RCS REM1 00 0  2;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  15: RCS REM1 00 1  2;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  16: RCS REM1 00 0  3;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  17: RCS REM1 00 1  3;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  18: RCS REM1 00 0   ;PROTLINE
LINK  19: RCS REM1 00 1   ;PROTLINE
```

3 After choosing two protection links, access table RCSINV. To make sure the protection links do not belong to the changing remote to Mode II, type

>TABLE RCSINV
>POS rcs no

Example:

>TABLE RCSINV

>POS REM1 00 2

```
REM1  00 2 MIS 1    0     1    C   8  NOLOAD  SMS 0
   MODE1   (0) (2)$     MODE1   (4) (6)$     S     WP1B
  Y  8
              N        MISC_ALARM       MAJOR  35 DAVIS
DRIVE RTP
```

The remote to convert in this example uses SMS port 8 for the protection link of the remote. The system borrows protection links 9 and 19 to convert REM1 00 2 to Mode II operation.

4 At the CARRIER level, to offline the two links used, type

>MAPCI;MTC;TRKS;CARRIER
>POST SMS sms no
>BSY carrier no
>OFFL carrier no

Repeat this procedure for other link.

Example:

>MAPCI;MTC;TRKS;CARRIER

>POST SMS 0

The maximum size of the posted set is five. You can enter the NEXT command until the protection lines appear in the posted set.

```
N  CLASS SITE SMS  Ck  D ALRM  SLIP  FRME  BER ES SES STATE PROT
-----------------------------------------------------------------

0  REMOTE  HOST  0    5   C         0     0   <-7   0   0   INSV
1  REMOTE  HOST  0    6   C         0     0   -7.0  0   0   INSV
2  REMOTE  HOST  0    7   C         0     0   -7.0  0   0   INSV
3  REMOTE  HOST  0    8   C         0     0   -7.0  0   0   INSV
4  PROTLN  HOST  0    9   C         0     0   -7.0  0   0   INSV
```

>BSY 4; OFFL 4

```
OK
 N  CLASS SITE SMS  Ck  D ALRM  SLIP  FRME BER ES SES  STATE  PROT
 -----------------------------------------------------------------

 0  REMOTE  HOST  0    5   C         0     0   <-7   0   0   INSV
 1  REMOTE  HOST  0    6   C         0     0   -7.0  0   0   INSV
 2  REMOTE  HOST  0    7   C         0     0   -7.0  0   0   INSV
 3  REMOTE  HOST  0    8   C         0     0   -7.0  0   0   INSV
 4  PROTLN  HOST  0    9   C         0     0   -6.9  0   0   OFFL
```

Repeat this procedure for the other link.

5 To post and offline the remote to change to Mode II, type

>MAPCI;MTC;PM
>POST RCS rcs no
>BSY
>OFFL

Example:

>MAPCI;MTC;PM

>POST REM1 00 2

>BSY

```
“CALLS WILL BE AFFECTED.  PLEASE CONFIRM (YES OR NO)”
```
>YES

>OFFL

6 In table RCSINV, to delete the protection links from REM1 00 1 and REM1 00 3, type

>TABLE RCSINV
>POS rcs no
>CHA

Example:

>TABLE RCSINV

>POS REM1 00 1

>CHA

Step through the fields until the PROT field appears. Press the ENTER key to step through the fields.

```
PROT:  Y
```
>N

Step through the fields that remain until the tuple to change appears.

```
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
```
>Y

```
 TUPLE CHANGED
 JOURNAL FILE INACTIVE
```

Repeat this procedure for REM1 00 3.

7 In table RCSINV, change the remote to convert from Mode I to Mode II. To specify the SMS ports from which protection links were deleted earlier (in our example, ports 9 and 19), type

>POS rcs no
>CHA

Example:

>POS REM1 00 2

>CHA

Step through the fields until the SHLFGRPMODE field appears. Press the Enter key to step through the fields.

```
SHLFGRPMODE: MODE1
```
>MODE2

```
PORT:  0
```
>9

```
PORT: 2
```
>$

```
LOOPTEST:
```
>N

```
SHLFGRPMODE: MODE1
```
>MODE2

```
PORT:  4
```
>19

```
PORT:  6
```
>$

```
LOOPTEST:
```

>N

```
REM1  00 2 MIS 0    0     1    A   8  NOLOAD  SMS 0
   MODE2   (9)$ N      MODE2   (19)$ N     S      WP1B     Y  8
             N        MISC_ALARM     MAJOR  35 DAVIS DRIVE RTP
```

```
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
```
>Y

```
WARNING:  Static data not updated for SMS 0
You must BSY and RTS the SMS
TUPLE CHANGED
JOURNAL FILE INACTIVE
```

8 Now that the remote changed to Mode II, links 0, 2, 4, and 6 are freed up. Return the PROTLINEs to their original port names. To complete this action, you must change the PORT numbers in Table RCSINV to any two of the four links freed up. To change the PORT numbers in Table RCSINV to any two of the four links that are free, type

>POS rcs no
>CHA

Example:

>POS REM1 00 2

>CHA

Step through the fields until the PORT field appears. Press the Enter key to step through the fields.

```
SHLFGRPMODE: MODE2
PORT:  9
```
>0

```
LOOPTEST:  N
SHLFGRPMODE:  MODE2
PORT:  19
```
>2

```
LOOPTEST:  N
```
Step through the fields that remain until the tuple to change appears. Press the Enter key to step through the fields.

```
REM1  00 2 MIS 0    0     1    A   8  NOLOAD  SMS 0
   MODE2   (0)$ N      MODE2   (2)$ N     S      WP1B     Y  8
             N        MISC_ALARM      MAJOR  35 DAVIS DRIVE RTP
```

```
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
>Y

 WARNING:  Static data not updated for SMS 0
 You must BSY and RTS the SMS
 TUPLE CHANGED
 JOURNAL FILE INACTIVE
```

9 Two protection links were deleted when the remote converted to Mode II back to table RCSINV. To add these two links to the two remotes from where the links were borrowed, type

>POS rcs no
>CHA
>QUIT

Example:

>POS REM1 00 1

>CHA

Step through the fields until the PROT field appears. Press the Enter key to step through the fields.

```
PROT:  N
>Y

PORT:
>9
```

Step through the fields that remain until the tuple to change appears.

```
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
>Y

 TUPLE CHANGED
 JOURNAL FILE INACTIVE
```

Repeat this procedure for REM1 00 3. Specify the original PORT number of the remote. The original PORT number is 19.

>QUIT

10 To change the two links freed in step 7 that remain to NILTYPE in table LTCPSINV type,

>TABLE LTCPSINV
>POS sms no
>CHA
>QUIT

Example:

>TABLE LTCPSINV

>POS SMS 0

>CHA

```
MACHINES NOT IN SYNC – DMOS NOT ALLOWED
JOURNAL FILE UNAVAILABLE – DMOS NOT ALLOWED
ENTER Y TO CONTINUE PROCESSING OR N TO QUIT
```

>Y

Step through the fields until the port to change appears. Press the Enter key to step through the fields.

```
PSLNKTAB:  4 DS1 DEFAULT N
```
>4 NILTYPE

```
PSLNKTAB:  6 DS1 DEFAULT N
```
>6 NILTYPE

Step through the fields that remain until the tuple to change appears.

```
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
```
>Y

```
TUPLE CHANGED
JOURNAL FILE INACTIVE
```

>QUIT

11 To go to the CARRIER level and return to service the protection links that were offline in step 4, type

>MAPCI;MTC;TRKS;CARRIER
>POST SMS sms no
>BSY carrier no
>RTS carrier no

Example:

>MAPCI;MTC;TRKS;CARRIER

>POST SMS 0

The maximum size of the posted set is five. You can enter the NEXT command until the protection lines appear in the posted set.

```
N  CLASS SITE SMS   Ck  D ALRM  SLIP  FRME BER ES SES STATE  PROT
-----------------------------------------------------------------

0  REMOTE  HOST  0    5   C         0     0   <–7   0   0   INSV
1  REMOTE  HOST  0    6   C         0     0   –7.0  0   0   INSV
2  REMOTE  HOST  0    7   C         0     0   –7.0  0   0   INSV
3  REMOTE  HOST  0    8   C         0     0   –7.0  0   0   INSV
4  PROTLN  HOST  0    9   C         0     0   –6.9  0   0   OFFL
```

>BSY 4; RTS 4

```
OK
 N  CLASS SITE SMS  Ck  D ALRM  SLIP  FRME BER ES SES  STATE  PROT
 -----------------------------------------------------------------

 0  REMOTE  HOST  0    5   C         0     0   <–7   0   0   INSV
 1  REMOTE  HOST  0    6   C         0     0   –7.0  0   0   INSV
 2  REMOTE  HOST  0    7   C         0     0   –7.0  0   0   INSV
 3  REMOTE  HOST  0    8   C         0     0   –7.0  0   0   INSV
 4  PROTLN  HOST  0    9   C         0     0   –7.0  0   0   INSV
```

12 To post and busy the SMS at the PM level, and update static data to activate the datafill changes, type

>MAPCI;MTC;PM
>POST SMS sms no
>BSY UNIT inactive unit no
>RTS UNIT inactive unit no
>SWACT

Example:

>MAPCI;MTC;PM

>POST SMS 0

>BSY UNIT 0

>RTS UNIT 0

>SWACT

```
A warm SwAct will be performed
This action will take this PM and all of
its subtending nodes temporarily out of service
and <#> active terminals may be affected.
Please confirm (“YES” or “NO”):
```

>Y

```
SMS 0 SwAct Passed
```

13 To translate the P-side links and return to service any P-side links that are busy, type

>TRNSL P
>RTS LINK link no

Example:

>TRNSL P

```
LINK  0: RCS REM1 00 2  0;CAP MS; STATUS: OK ,P;MSGCOND: CLS
LINK  1: RCS REM1 00 3  0;CAP MS; STATUS: OK ;MSGCOND: OPN
LINK  2: RCS REM1 00 2  1;CAP  S; STATUS: OK ,P;MSGCOND: CLS.
LINK  3: RCS REM1 00 3  1;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  4: RCS REM1 00 2  2;CAP  S; STATUS: OK ,P;MSGCOND: CLS.
LINK  5: RCS REM1 00 3  2;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  6: RCS REM1 00 2  3;CAP  S; STATUS: OK ,P;MSGCOND: CLS.
LINK  7: RCS REM1 00 3  3;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  8: RCS REM1 00 2   ;PROTLINE
LINK  9: RCS REM1 00 3   ;PROTLINE
LINK  10: RCS REM1 00 0  0;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  11: RCS REM1 00 1  0;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  12: RCS REM1 00 0  1;CAP  S; STATUS: OK ;MSGCOND: OPN.
LINK  13: RCS REM1 00 1  1;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  14: RCS REM1 00 0  2;CAP  S; STATUS: OK ;MSGCOND: OPN.
LINK  15: RCS REM1 00 1  2;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  16: RCS REM1 00 0  3;CAP  S; STATUS: OK ;MSGCOND: OPN.
LINK  17: RCS REM1 00 1  3;CAP  S; STATUS: OK ;MSGCOND: OPN
LINK  18: RCS REM1 00 0   ;PROTLINE
LINK  19: RCS REM1 00 1   ;PROTLINE
```

In this example, all links are already in service (that is, STATUS is OK). MSGCOND for links 0, 2, 4, and 6 is CLS (closed) because REM1 00 2 is offline.

14 To post the RCS converted to Mode II, busy the RCS, and return the RCS to service, type

>POST RCS rcs no
>BSY
>RTS

Example:

>POST RCS REM1 00 2

>BSY

>RTS

SMS recovery procedures

This section contains a recovery procedure that restores a Subscriber Carrier Module-100S (SMS) host computer to service. Maintenance personnel use this procedure in a DMS-100/200 office.

Recovering an SMS

Application

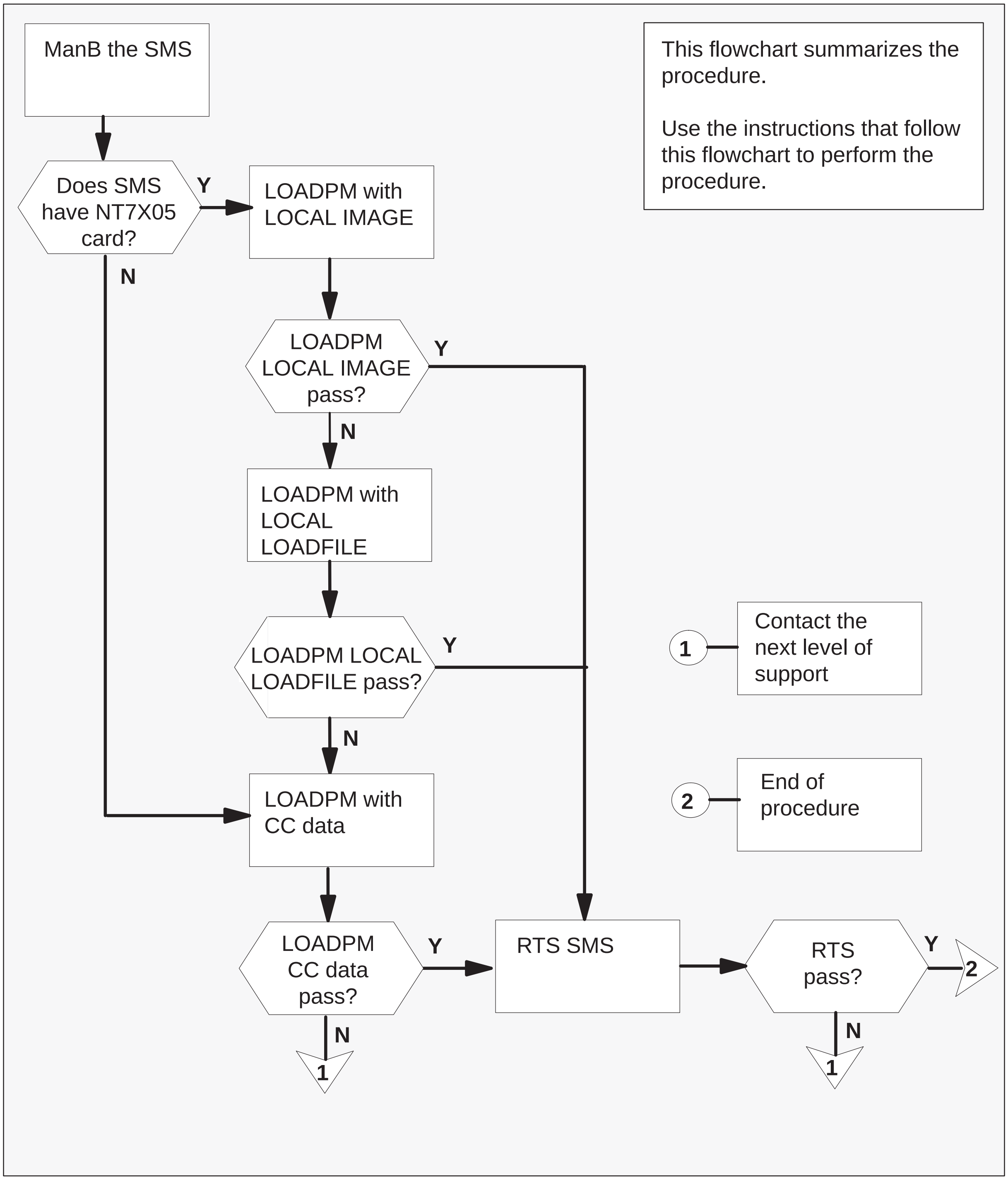
Use this procedure to return an SMS to service (RTS).

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart that follows provides an overview of the procedure.

Recovering an SMS (continued)

Summary of Recovering an SMS



Recovering an SMS (continued)

Recovering an SMS

At the MAP terminal

1 Enter this recovery procedure when the MAP display indicates the following:

- both units of a posted SMS are out-of-service (OOS)
- a critical alarm occurs

2 To manbusy (ManB) the SMS, type

>BSY PM
and press the Enter key.

Recovering an SMS (continued)

3 The peripheral loader card (NT7X05) allows local loading of the SMS data. Local data loading reduces recovery time. To determine if the NT7X05 card is provisioned, type:

>QUERYPM FILES
and press the Enter key.

Example of a MAP display:

```
   CM   MS   IOD   Net   PM   CCS   LNS   Trks   Ext   APPL
    .    .     .      .  1 SMS    .        .       .
 .                         *C*
 SMS             SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit     PM     2        0        2        0        2        25
 2 Post     SMS    1        0        0        0        0         1
 3 ListSet
 4                        SMS      0 ISTb  Links_OOS:  CSide 0,  PSide 0
 5 TRNSL_               Unit 0:  Inact SysB
 6 TST_                 Unit 1:  Inact SysB
 7 BSY_
 8 RTS_              QUERYPM files
 9 OffL               UNIT 0:
10 LoadPM_                NT7X05 Load File:   ESS05AW
11 Disp_                  NT7X05 Image File:  ESS05AW
12 Next_                  CMR Load:  CMR03
13 SwAct               UNIT 1:
14 QueryPM                NT7X05 Load File:   ESS05AW
15                        NT7X05 Image File:  ESS05AW
16 IRLINK                 CMR Load:  CMR03
17 Perform
18
```

Note: If the NT7X05 card is not provisioned the MAP response is: `NT7X05 not datafilled,   QUERYPM files invalid`

If the NT7X05 card	Do
is provisioned	step 4
is not provisioned	step 6

Recovering an SMS (continued)

4

CAUTION
LOCAL IMAGE cannot load ISDN units
Do not LOADPM from the LOCAL IMAGE on units with ISDN capability. The NT7X05 card does not support ISDN. Use LOCAL LOADFILE or load from the central control (CC) on units with ISDN.

To load the SMS from the local image, type

>LOADPM PM LOCAL IMAGE
and press the Enter key.

If the load	Do
passes	step 7
fails	step 5

5

WARNING
Possible service interruption
The LOCAL LOADFILE option of the LOADPM command has a parameter of [<file> string}]. If you use this file_name parameter, use the loadfile named in the parameter. The loadfile named in the parameter is not patched. Only use this parameter when you need the NOPATCH option of the loadfile.

To load the SMS from the local loadfile, type

>LOADPM PM LOCAL LOADFILE
and press the Enter key.

If the load	Do
passes	step 7
fails	step 6

Recovering an SMS (continued)

6 To load the SMS from the CC, type

>LOADPM PM
and press the Enter key.

If the load	Do
passes	step 7
fails	step 12

7 To return the peripheral module (PM) to service, type

>RTS PM
and press the Enter key.

If system response	Do
is `RTS PASSED` on both units	step 13
is `RTS FAILED` on one unit	step 8
is `RTS FAILED` on both units	step 12

8 To test the manually busy (ManB) unit, type

>TST UNIT unit_no
and press the Enter key.

where

unit_no is the number of the tested SMS unit (0 or 1)

If the system response	Do
is `TST PASSED`	step 9
is `TST FAILED`	step 12
is `TST FAILED` with card list	step 11

9 To return the ManB unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

Recovering an SMS (end)

unit_no is the number of the SMS unit (0 or 1) to test

10

CAUTION
Data match in progress
An ISTb alarm appears after an RTS passes on both units. Wait 3-5 min for the system to clear this alarm. This process allows a dynamic data match between active and inactive units.

Use the information that follows to determine your next action.

If the system response	Do
is `RTS PASSED`	step 13
is `RTS FAILED`	step 12

11 Go to the SMS card replacement procedures section in this document and replace the defective card(s) on the list. Complete the procedure. Return to this procedure at step 8.

12 For additional help, contact the next level of support.

13 The procedure is complete. If the system displays other alarms, refer to the appropriate alarm clearing procedure. The appropriate procedure is in the SMS alarm clearing procedures section of this document.

SMS alarm clearing procedures

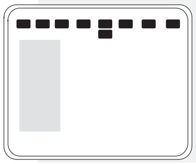
This section contains card replacement procedures for the Subscriber Carrier Module-100S (SMS) Remote within DMS-100/200 offices. The alarm indicates the procedure that maintenance personnel must use to clear the trouble.

Maintenance personnel use the procedures to clear alarms as the alarms appear at the MAP terminal display.

Procedures in this section correspond to the alarms as the alarms appear at the MAP display. These procedures are in alphabetical order to allow maintenance personnel to locate the procedures.

PM SMS critical

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	EIO
.	.	.	.	**nSMS**	.	.	.	.	.
				C					

Indication

An SMS under the PM subsystem header at the MTC level of the MAP display indicates a PM critical alarm.

Meaning

The indicated number (n) of SMSs are in the critical state.

Result

Call processing ceases.

Common procedures

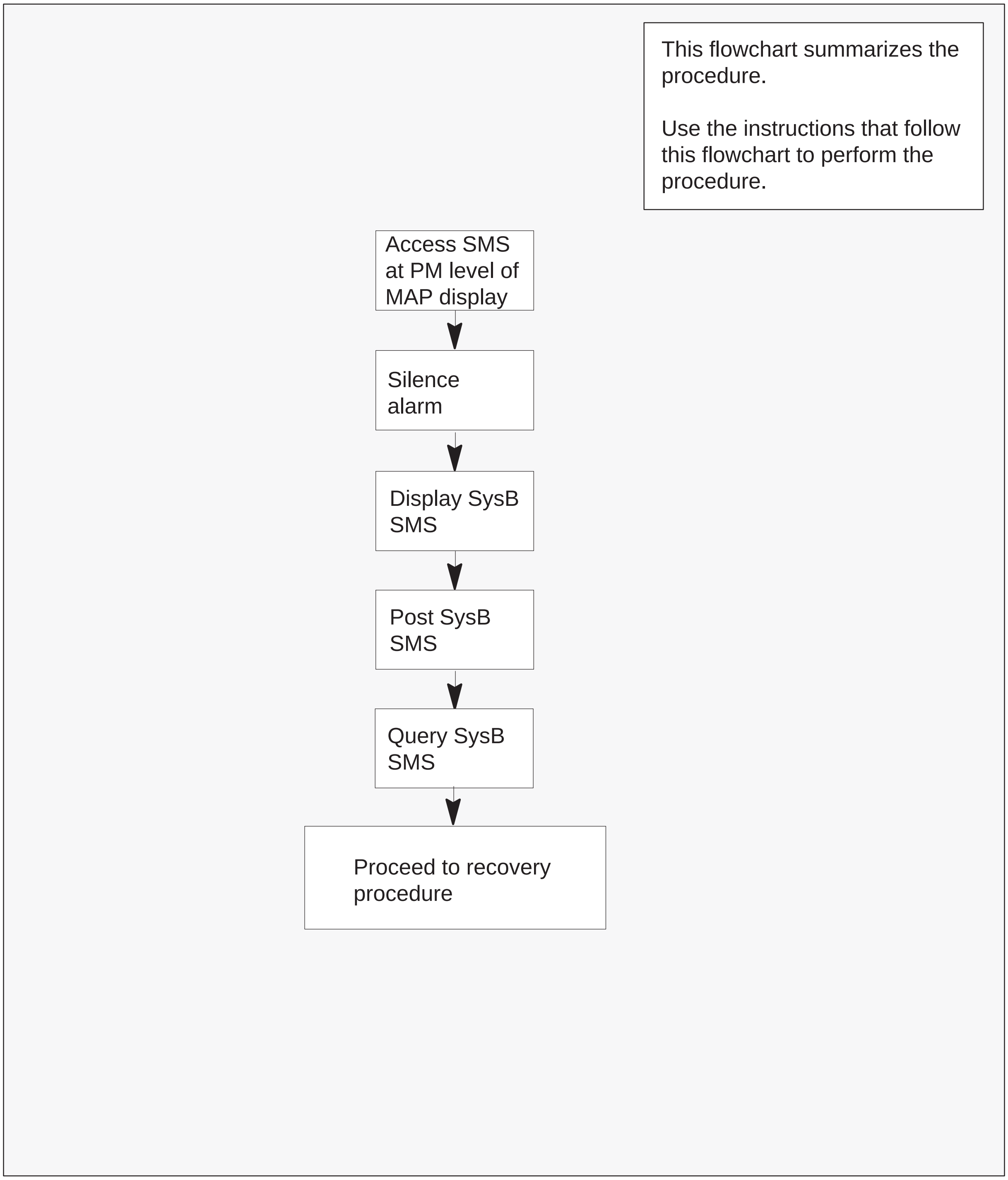
There are no common procedures.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

PM SMS
critical (continued)

Summary of clearing a PM SMS critical alarm



PM SMS
critical (end)

Clearing a PM SMS critical alarm

At the MAP terminal

1 To access the MTC level and silence the alarm, type

>MAPCI;MTC;SIL
and press the Enter key.

2 To access the PM level and identify the SMS module that is in a critical state, type

>PM;DISP STATE SYSB SMS
and press the Enter key.

Example of a MAP response:

SMS 0

3 To post SysB SMS, type

>POST SMS sms_no
and press the Enter key.

where

sms_no is 0–127 for an NT40 and 0–255 for the DMS SuperNode.

Example of a MAP response

```
SMS      SysB        ManB   OffL   CBsy  ISTb      InSv
 PM       1           0      10       0    0         130
 SMS      1           0       0       0    0         4

 SMS  0  SysB  Links_OOS:   CSide  0, PSide 0
 Unit  0: InAct     SysB
 Unit  1: Act       SysB
```

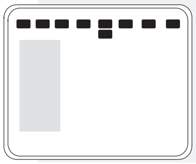
4 To identify the problems with the posted SMS, type

>QUERYPM FLT
and press the Enter key.

5 Proceed immediately to the SMS recovery procedures section in this document.

PM SMS
major

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	EIO
.	.	.	.	**nSMS**	.	.	.	.	.
				M					

Indication

The alarm code SMS under the PM subsystem header indicates a PM alarm. The header appears at the MTC level of the MAP display. The letter M under the alarm code indicates the alarm class is major.

Meaning

The indicated number (*n*) of SMSs are in an in-service trouble state.

Result

An SMS major alarm does not affect call handling capability. Clear this alarm as soon as possible. If a fault occurs in the remaining unit, subscriber service can end.

Common procedures

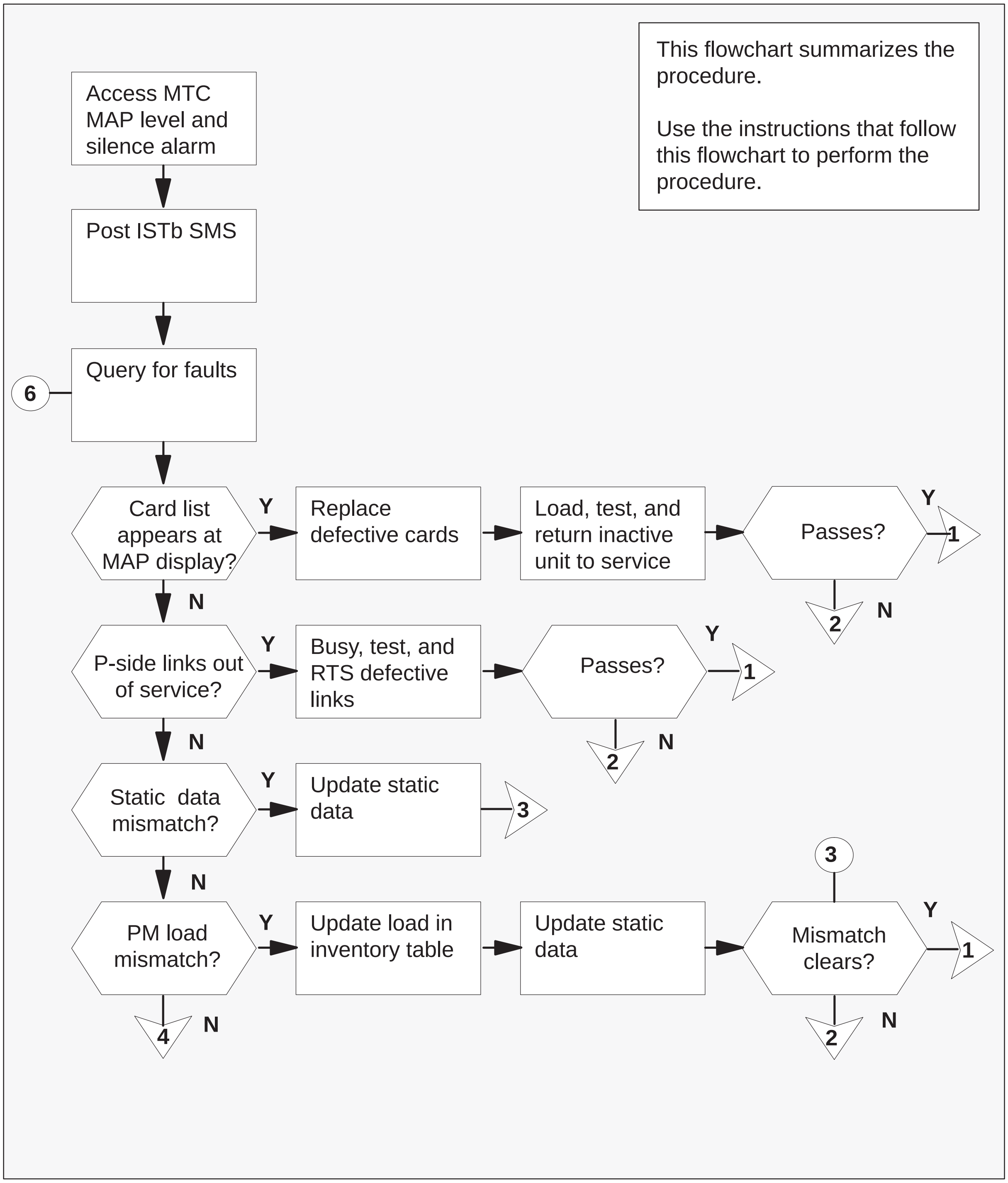
This procedure refers to the common procedure Updating static data.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

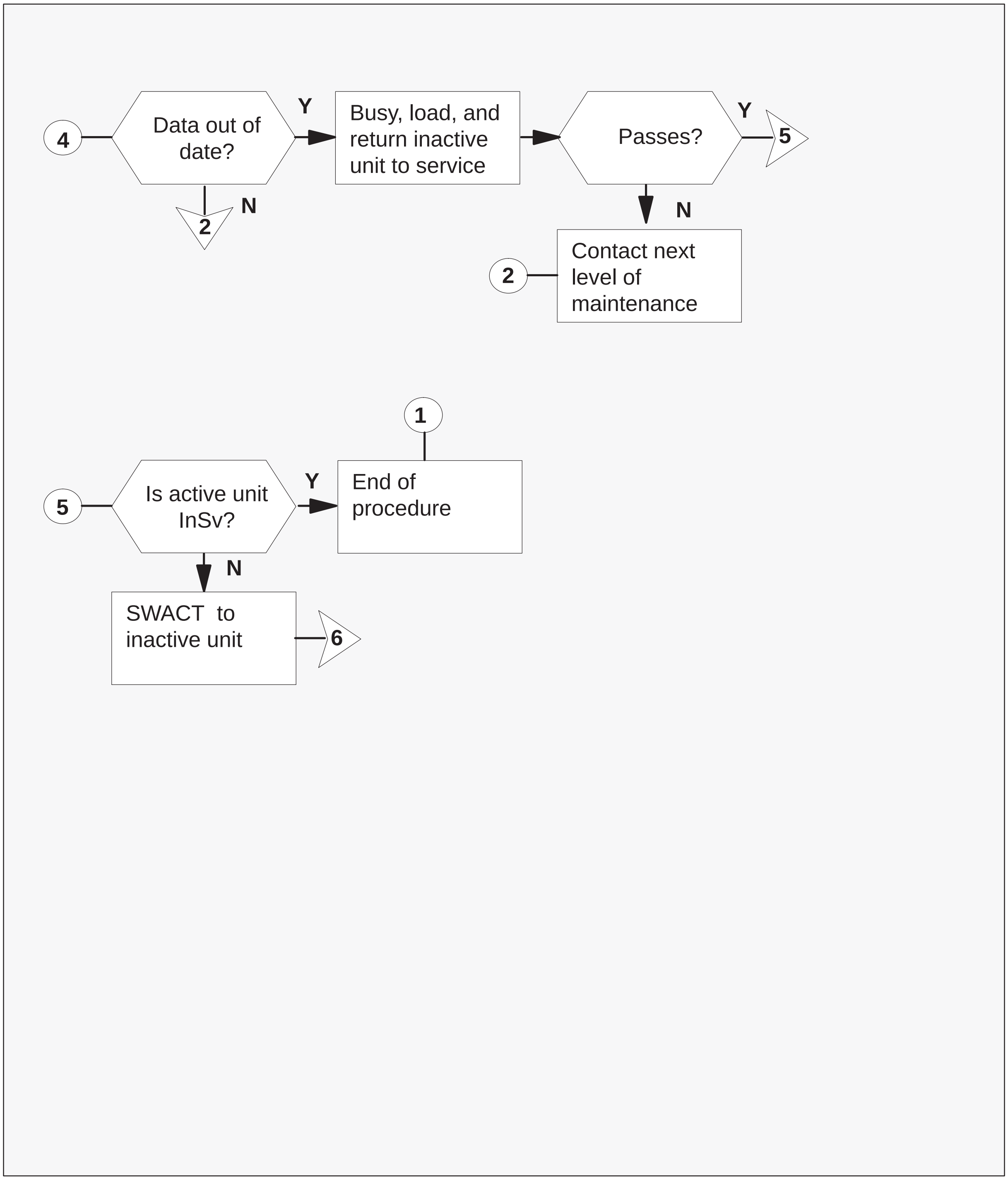
PM SMS
major (continued)

Summary of clearing a PM SMS major alarm



PM SMS
major (continued)

Summary of clearing a PM SMS major alarm (continued)



PM SMS
major (continued)

Clearing a PM SMS major alarm

At the MAP display

1 When the system detects a fault, the system can trigger an audible alarm. To access the MTC level of the MAP display and silence the alarm, type

>MAPCI;MTC;SIL
and press the Enter key.

2 To access the PM level of the MAP screen to locate the SMS that is ISTb, type

>PM;DISP STATE ISTB SMS
and press the Enter key.

Example of a MAP response:

```
ISTb SMS:  1
```

3 To access the ISTb SMS, type

>POST SMS sms_no
and press the Enter key.

where

sms_no   is the number of the SMS that appears in step 2

Example of a MAP response:

```
SMS      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMS     0     0    0     0     1     7
SMS 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   ISTb
Unit1:  Inact InSv
```

If	Do
one unit is SysB	step 26
one unit is CBsy	step 24
one unit is ManB	step 4
both units are InSv	step 10
both units are ISTb	step 10
one unit is ISTb and inactive	step 10
one unit is ISTb and active	step 5

PM SMS
major (continued)

4 To return the inactive unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

If the message	Do
passes	step 38
fails	step 37

5

CAUTION
Service disruption. The PM can drop calls.
If the system prompts you to confirm a cold SWACT, perform this activity in a period of low traffic. The PM will end all calls, including data calls.

To switch the activity of the units, type

>SWACT
and press the Enter key.

The system determines the type of SWACT (warm or cold) that the system can perform. The system displays a confirmation prompt for the selected SWACT.

If the SWACT	Do
cannot continue at this time	step 6
can continue at this time	step 7

6 Do not switch activity of the units. To reject the switch, type

>NO
and press the Enter key.

The system discontinues the switch of activity. Return to step 5 in a period of low traffic.

PM SMS
major (continued)

7 To switch the activity of the unit, type

>YES
and press the Enter key.

The system runs a pre SWACT audit to determine the ability of the inactive unit to accept activity.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before you proceed with the next maintenance action.

Example of a MAP response:

```
SMS 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   ISTb     Mtce
Unit1:  Inact InSv     Mtce
```

If the message	Do
`isSwAct passed`	step 10
`isSwAct failed Reason: SMS SwActback`	step 8
`isSwAct refused by SwAct controller`	step 9

8 The inactive unit was not able to establish two-way communication with the CC. The unit switches the activity back to the unit that was first active. Clear the faults on the inactive unit first. Attempt to clear the alarm condition on the active unit second.

Go to step 10.

9 The SWACT controller does not recommend a SWACT for the reason or reasons stated. Clear all faults on the inactive unit first. Attempt to clear the alarm condition on the active unit second.

Go to step 10.

10 To check for fault indicators on the inactive unit, type

>QUERYPM FLT
and press the Enter key.

PM SMS
major (continued)

Example of a MAP response:

```
Node is ISTb
  One or both units inservice trouble
Unit 0
The following inservice troubles exist:
   Static data mismatch with CC
Unit 1
The following inservice troubles exist:
   Static data mismatch with CC
```

If	Do
card list appears at the MAP display	step 28
P-side links are out of service	step 31
static data does not match with the CC	step 14
PM load mismatch with inventory table	step 16
data is out of date	step 11
the above conditions do not occur	step 26

11 To busy the inactive unit, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

12 To load the inactive unit, type

>LOADPM UNIT unit_no CC DATA
and press the Enter key.

where

unit_no is the number of the inactive unit

If LOADPM	Do
passes	step 13
fails	step 37

PM SMS
major (continued)

13 To return the inactive unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

If RTS	Do
passes	step 38
fails	step 37

14 Perform the procedure “Updating static data.” When you return to this procedure, go to step 15.

15 Determine if the system cleared the ISTb fault.

If the system	Do
cleared the ISTb fault	step 38
did not clear the ISTb fault	step 37

16 To determine the load that the SMS that has faults can use, type

>QUERYPM CNTRS
and press the Enter key.

Example of a MAP response:

```
UNSOLICITED MSG LIMIT = 250, UNIT0 = 0, UNIT1 = 0

UNIT 0:
RAM LOAD:  SU33BF
ROM LOAD:  SMSRFA10

UNIT 1:
RAM LOAD:  SU33BF
ROM LOAD:  SMSRFA10
```

Note: Dashed box highlights the correct SMS load.

17 To access table LTCINV, type

>TABLE LTCINV
and press the Enter key.

18 To position on the tuple for the SMS that has defects, type

>POS SMS sms_no
and press the Enter key.

where

sms_no is the number of the SMS that has defects

19 To change the load name, type

>CHA LOAD
and press the Enter key.

Example of a MAP response:

```
LOAD:  SU33BE
```

20 To enter the correct load name, type

>load_name
and press the Enter key.

where

load_name is the load name from step 16

Example of a MAP response:

```
TUPLE TO BE CHANGED:
   SMS 0
       SME  0  32  0  C  1  6X02AA  SU33BF
                                (POTS POTSEX)$
              ( 0 40) ( 0 42) ( 1 40) ( 0 30)$
              ( MSG6X69 )  (  CMR16 CMRAB02) $
   NORTHAM   MX77AA  MX77AA
                                              $
   6X40AC

ENTER Y TO CONFIRM, N TO REJECT, OR E TO EDIT.
```

For a positive response to the confirmation request, type;

>Y
and press the Enter key.

PM SMS
major (continued)

21 To eave table LTCINV, type

>QUIT
and press the Enter key.

22 Perform the procedure *Updating static data* from *Alarm Clearing Procedures*. When you complete this procedure, go to step 23.

23 To check for fault indicators, type

>QUERYPM FLT
and press the Enter key.

If PM load mismatch with CC	Do
appears again	step 37
does not appear again	step 38

24 To display the C-side link information, type

>TRNSL C
and press the Enter key.

25 For additional help, contact the personnel responsible for network maintenance support.

26 To manually busy the inactive unit, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

27 To test the inactive unit, type

>TST UNIT unit_no
and press the Enter key.

where

PM SMS
major (continued)

unit_no is the number of the inactive unit

If test	Do
passes	step 30
fails, and the system produces a card list	step 28
fails, and the system does not produce a card list	step 37

28 Check the card list that appears at the MAP terminal.

Example of a MAP display:

FW-xxxxx

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  SME 00  51  SMS : 000    08  6X45
HOST  00  M07  SME 00  51  SMS : 000    22  6X40
HOST  00  M07  SME 00  65  SMS : 000    22  6X40
HOST  00  M07  SME 00  51  SMS : 000    12  6X45
```

If you	Do
replaced all the cards on the list	step 37
did not replace all the cards on the list	step 29

29 Go to the *SMS card replacement procedures* section in this document and replace the next card on the list. Return to this procedure, and go to step 27.

30 To return the inactive unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

If RTS	Do
passes	step 38
fails	step 37

PM SMS
major (continued)

31 To display information about the P-side links, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
LINK 1 xxx xxx0 01 0 1;CAP S;STATUS: SysB
LINK 2 xxx xxx0 01 0 2;CAP S;STATUS: OK
LINK 3 xxx xxx0 01 0 3;CAP MS;STATUS: OK MSGCOND: OPN
LINK 4 xxx xxx0 01 0 4;CAP MS;STATUS: OK MSGCOND: OPN
LINK 5 xxx xxx0 01 0 5;CAP S;STATUS: OK
```

32 To busy the SysB link, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of the SysB link displayed in step 31

33 To test the link from step 32, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of the link busied in step 32

If test	Do
passes	step 36
fails	step 34

PM SMS
major (continued)

34 Check the card list that appear at the MAP terminal.

Example of a MAP display:

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  SME 00  51  SMS : 000    01  6X85
HOST  00  M07  SME 00  51  SMS : 000    05  6X85
```

If you	Do
replaced all the cards	step 37
did not replace all the cards	step 35

35 Go to the *SMS card replacement procedures* section in this document for the next card on the list. Return to this step and go to step 32.

36 To return the link to service, type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of the link tested in step 33

If RTS	Do
passes	step 38
fails	step 37

37 For additional help, contact the next level of maintenance.

38 The inactive unit is RTS. Determine if the active unit is in-service.

If active unit	Do
is InSv	step 44
is ISTb	step 39

PM SMS
major (continued)

39

> **CAUTION**
> **Service disruption. The PM can drop calls.**
> If the system prompts you to confirm a cold SWACT, perform this activity in a period of low traffic. The PM will end all calls, including data calls.

To switch the activity of the units, type

>SWACT
and press the Enter key.

The system determines the type of SWACT the system can perform, a warm SWACT or a cold SWACT. The system displays a confirmation prompt for the selected SWACT.

If SWACT	Do
cannot continue	step 40
can continue	step 41

40 Do not switch activity of the units. To reject the switch, type

>NO
and press the Enter key.

The system discontinues the SWACT. Return to step 39 in a period of low traffic.

PM SMS
major (end)

41 To switch the activity of the unit, type

>YES
and press the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity.

Note: A maintenance flag (`Mtce`) appears when maintenance tasks are in progress. Wait until the flag disappears then proceed with the next maintenance action.

If the message	Do
is `SwAct passed`	step 43
is `SwAct failed Reason: SMS SwActback`	step 42
is `SwAct refused by SwAct controller`	step 42

42 To force a switch of activity to the active unit, type

>SWACT FORCE
and press the Enter key.

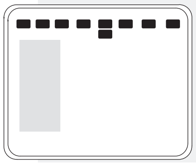
The SWACT controller can use short term history reasons to refuse the SWACT. When the SWACT is complete, the short term history reasons are reset.

43 Go to step 10 to clear the alarm condition on the newly inactive unit.

44 The procedure is complete. If other alarms appear at the MAP display, refer to the appropriate alarm clearing procedures.

PM SMS minor

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	EIO
.	.	.	.	**nSMS**	.	.	.	.	.

Indication

The software management system (SMS) under the peripheral module (PM) subsystem header at the maintenance (MTC) level of the MAP display indicates a PM minor alarm.

Meaning

The value n indicates the number of SMS units in the in-service trouble (ISTb) state.

Result

This alarm does not affect call handling capability.

Common procedures

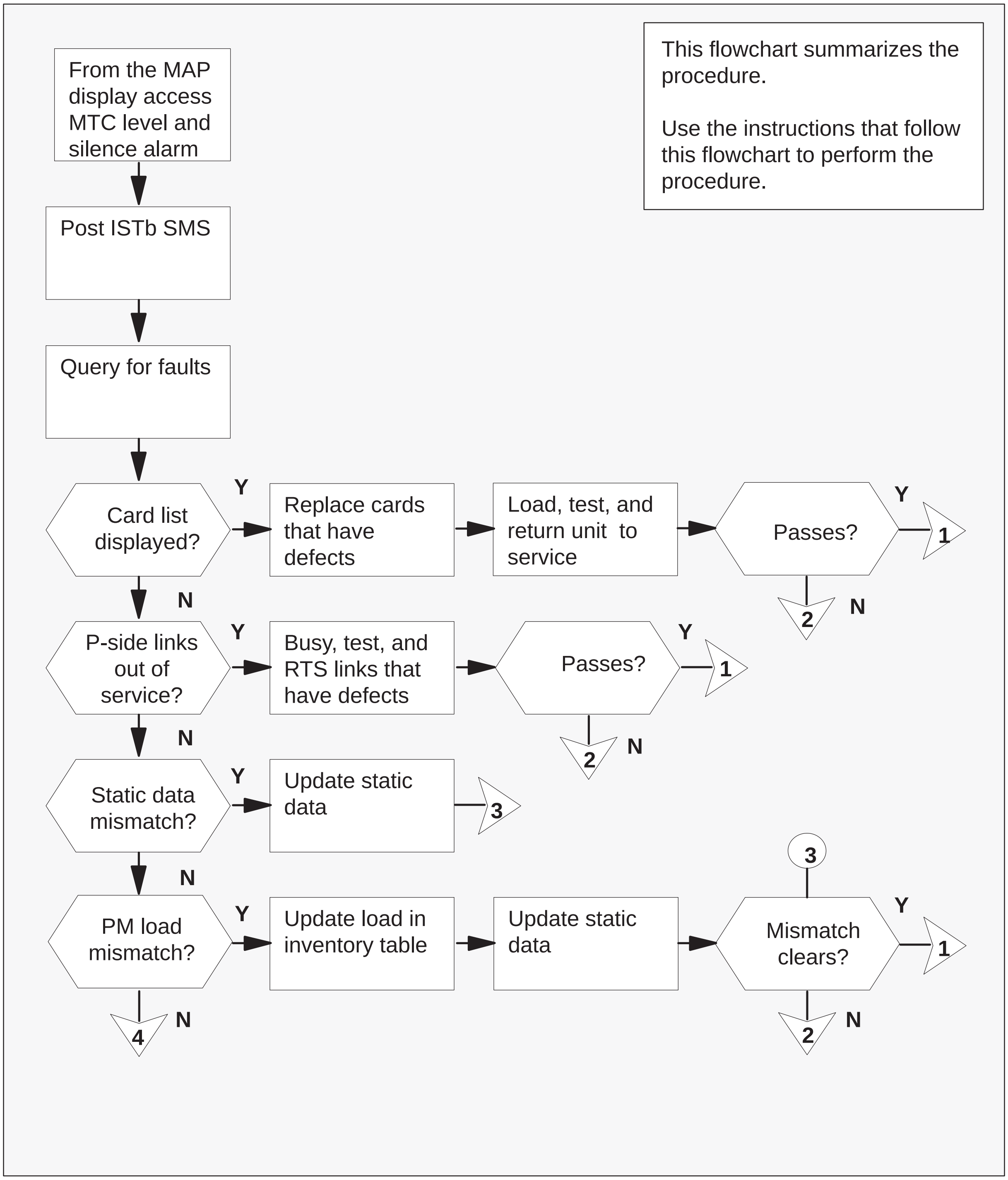
This procedure references the procedure “Updating static data”.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

PM SMS
minor (continued)

Summary of clearing a PM SMS minor alarm

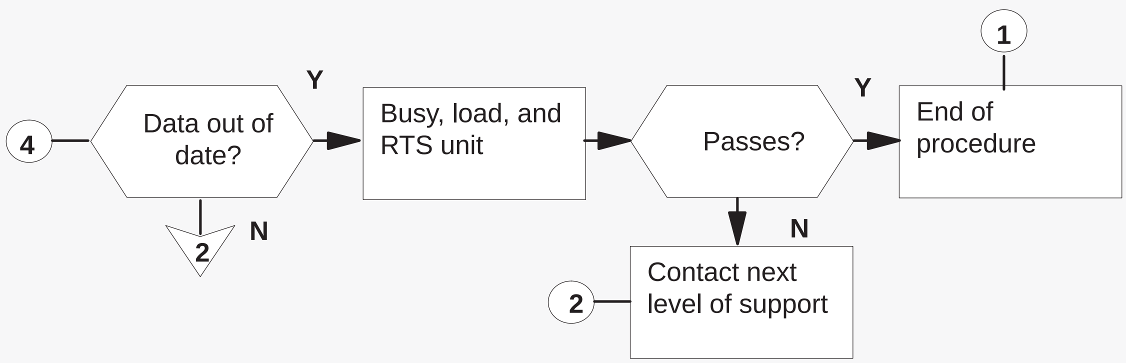


PM SMS
minor (continued)

Summary of clearing a PM SMS minor alarm (continued)

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



PM SMS
minor (continued)

Clearing a PM SMS minor alarm

At the MAP terminal

1 When the system detects a fault, the system can trigger an audible alarm. To access the MTC level of the MAP display and silence the alarm, type

>MAPCI;MTC;SIL
and press the Enter key.

2 To access the PM level of the MAP screen and determine if the SMS is central-side busy (CBsy), type

>PM;DISP STATE CBSY SMS
and press the Enter key.

Example of a MAP response:

```
CBsy SMS:  0
```

If SMS is	Do
CBsy	step 3
not CBsy	step 5

3 To display the SMS C-side links, type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
LINK 0 NET 0 0 41;CAP MS;STATUS SysB, MSGCOND CLS
LINK 1 NET 1 0 41;CAP MS;STATUS OK, MSGCOND OPN
LINK 2 NET 0 0 37;CAP MS;STATUS OK, MSGCOND OPN
LINK 3 NET 1 0 37;CAP MS;STATUS OK, MSGCOND OPN
LINK 4 NET 0 0 20;CAP MS;STATUS OK, MSGCOND OPN
LINK 5 NET 1 0 20;CAP MS;STATUS OK, MSGCOND OPN
```

4 Note the numbers and conditions of the links. Report this information to the personnel responsible for network-level maintenance.

5 To determine the SMS that is ISTb, type

>DISP STATE ISTB SMS
and press the Enter key.

Example of a MAP response:

```
ISTb SMS:  1
```

6 To access the ISTb SMS, type

>POST SMS sms_no
and press the Enter key.

sms_no is the number of the SMS displayed in step 5

Example of a MAP response:

```
SMS      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMS     0     0    0     0     1     7

SMS 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   ISTb
Unit1:  Inact InSv
```

If	Do
one unit is busied by the system (SysB)	step 28
one unit is manually busied (ManB)	step 7
both units are in-service (InSv)	step 13
both units are ISTb	step 13
one unit is ISTb and inactive	step 13
one unit is ISTb and active	step 8

7 To return the inactive unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

If RTS	Do
passes	step 46
fails	step 45

8

CAUTION
Service disruption. Calls can drop!
If the system prompts you to confirm a cold SWACT, perform this activity only during a period of low traffic. The system drops all calls that this PM handles including data calls.

To switch the activity of the units, type

>SWACT
and press the Enter key.

The system determines the type of SWACT (warm or cold) that the system can perform. The system displays a confirmation prompt for the selected SWACT.

If SWACT	Do
cannot continue at this time	step 9
can continue at this time	step 10

9 Do not switch activity of the units. Reject the switch, type

>NO
and press the Enter key.

The system does not continue the switch of activity.

Return to step 8 during a period of low traffic.

10 To switch the activity of the unit, type

>YES
and press the Enter key.

The system runs a pre-SWACT audit to determine if the inactive unit can accept activity correctly.

PM SMS
minor (continued)

Note: A maintenance flag (Mtce in the following example) appears when maintenance tasks are in progress. Wait until the flag disappears before you proceed with the next maintenance action.

Example of a MAP response:

```
SMS 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   ISTb      Mtce
Unit1:  Inact InSv      Mtce
```

If the message is	Do
`SwAct passed`	step 13
`SwAct failed`	step 45
`SwAct failed Reason: XPM SwActback`	step 11
`SwAct refused by SwAct controller`	step 12

11 The inactive unit cannot establish two-way communication with the central control (CC) and switches activity back to the original active unit. You must clear all faults on the inactive unit before you attempt to clear the alarm condition on the active unit.

Go to step 13.

12 The SWACT controller does not recommend a SWACT for the reason(s) stated. You must clear all faults on the inactive unit before you attempt to clear the the alarm condition on the active unit.

Go to step 13.

13 To check for fault indicators on the inactive unit, type

>QUERYPM FLT
and press the Enter key.

Example of a MAP response:

```
Node is ISTb
  One or both units inservice trouble
Unit 0
The following inservice troubles exist:
   Static data mismatch with CC
Unit 1
The following inservice troubles exist:
   Static data mismatch with CC
```

If	Do
the system displays a card list	step 34
P-side links are out of service	step 38
static data mismatch with CC	step 17
PM load mismatch with inventory table	step 19
data is out of date	step 14
none of the above conditions occur	step 28

14 To busy the inactive unit, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

15 To load the inactive unit, type

>LOADPM UNIT unit_no CC DATA
and press the Enter key.

where

unit_no is the number of the inactive unit

If LOADPM	Do
passes	step 16
fails	step 45

PM SMS
minor (continued)

16 To return the inactive unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

unit_no   is the number of the inactive unit

If RTS	Do
passes	step 46
fails	step 45

17 Perform the procedure, “Updating static data”. Refer to common procedures to clear an alarm. When you return to this procedure, go to step 18.

18 Determine if the system cleared ISTb fault.

If ISTb fault	Do
clears	step 46
does not clear	step 45

19 To determine the load that the SMS that has defects must use, type

>QUERYPM CNTRS
and press the Enter key.

Example of a MAP response:

```
UNSOLICITED MSG LIMIT = 250, UNIT0 = 0, UNIT1 = 0

UNIT 0:
RAM LOAD:  SU33BF
ROM LOAD:  SMSRFA10

UNIT 1:
RAM LOAD:  SU33BF
ROM LOAD:  SMSRFA10
```

20 To access Table LTCINV, type

>TABLE LTCINV
and press the Enter key.

21 To position on the tuple for the SMS that has faults, type

>POS SMS sms_no
and press the Enter key.

where

sms_no   is the number of the SMS that has faults

22 To change the load name, type

>CHA LOAD
and press the Enter key.

Example of a MAP response:

```
LOAD:  SU33BE
```

23 To enter the correct load name, type

>load_name
and press the Enter key.

where

load_name   is the load name identified in step 19

Example of a MAP response:

```
TUPLE TO BE CHANGED:
   SMS 0
       SME  0  32  0  C  1  6X02AA  SU33BF
                                (POTS POTSEX)$
              ( 0 40) ( 0 42) ( 1 40) ( 0 30)$
              ( MSG6X69 )  (  CMR16 CMRAB02) $
   NORTHAM   MX77AA MX77AA
                                            $
   6X40AC

ENTER Y TO CONFIRM, N TO REJECT, OR E TO EDIT.
```

To respond to the confirmation request, type

>Y
and press the Enter key.

24 To leave table LTCINV, type

>QUIT
and press the Enter key.

25 Perform the procedure “Updating static data”. Refer to common procedures to clear an alarm. When you return to this procedure, go to step 26.

PM SMS
minor (continued)

26 To check for fault indicators, type

>QUERYPM FLT
and press the Enter key.

If PM load mismatch with CC	Do
continues to appear	step 45
does not appear	step 46

27 Determine if the card replaced is the NT6X78.

If card replaced is	Do
NT6X78	step 29
other	step 30

28 To manually busy the inactive unit, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no   is the number of the inactive unit

Go to step 32.

29 To load the CLASS moduem resource circuit pack (CMR) card, type

>LOADPM UNIT unit_no CC CMR
and press the Enter key.

where

unit_no   is the number of the unit that contains the defective CMR card

If load	Do
passes	step 33
fails	step 45

30 Reload the inactive unit if any of the following cards is replaced:

- NTMX7,

- NT2X70
- NT7X05

If inactive unit	Do
requires reloading	step 31
does not require reloading	step 32

31 To reload the inactive unit, type

>LOADPM UNIT unit_no CC DATA
and press the Enter key.

where

unit_no is the number of the inactive unit

If LOADPM	Do
passes	step 32
fails	step 45

32 To test the inactive unit, type

>TST UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

If test	Do
passes	step 36
fails, and the system generates a card list	step 34
fails, and the system does not generate a card list	step 45

PM SMS
minor (continued)

33 To test the CMR card, type

>TST UNIT unit_no CMR
and press the Enter key.

where

unit_no is the number of the unit that contains the CMR card that has defects

If test	Do
passes	step 37
fails, and card list appears	step 34
fails, but no card list appears	step 45

34 Check the card list that appears at the MAP display. The card with possible defects appears on the list first.

Example of a MAP display:

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  SME 00  51  SMS : 000    08  6X45
HOST  00  M07  SME 00  51  SMS : 000    22  6X40
HOST  00  M07  SME 00  65  SMS : 000    22  6X40
HOST  00  M07  SME 00  51  SMS : 000    12  6X45
```

If all cards in the card list	Do
are replaced	step 45
are not replaced	step 35

35 Go to *Card Replacement Procedures* for the first, or next, card on the list. When you return from the card replacement procedures, go to step 27 of this procedure.

36 To return the inactive unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

If RTS	Do
passes	step 46
fails	step 45

37 To return the CMR card to service, type

>RTS UNIT unit_no CMR
and press the Enter key.

where

unit_no is the number of the unit containing the CMR card that has defects

If RTS	Do
passes	step 46
fails	step 45

38 To display information about the peripheral-side (P-side) links, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
LINK 1 RCS RCS0 01 0 1;CAP MS;STATUS: OK MSGCOND: OPN
LINK 2 RCS RCS0 01 0 2;CAP  S;STATUS: OK
LINK 3 RCS RCS0 01 0 3;CAP  S;STATUS: SysB
LINK 4 RCS RCS0 01 0 4;CAP  S;STATUS: OK
LINK 5 RCS RCS0 01 0 5;CAP  S;STATUS: OK
```

39 To busy the SysB link, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of the SysB link displayed in step 38

PM SMS
minor (continued)

40 To test the link busy in step 39, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of the link busy in step 39

If test	Do
passes	step 43
fails, and the system generates a card list	step 41
fails, and the system does not generate a card list	step 45

41 Check the card list that appears on the MAP screen. The card that can have defects appears first on the list.

Example of a MAP display:

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  SME 00  51  SMS : 000    01  6X85
HOST  00  M07  SME 00  51  SMS : 000    05  6X85
```

If cards	Do
are replaced	step 45
are not replaced	step 42

42 Go to the SMS card replacement procedures section in this document for the next card on the list. When you return from the card replacement procedures, go to step 39 of this procedure.

43 To return the link to service, type

>RTS LINK link_no
and press the Enter key.

PM SMS
minor (continued)

where

link_no is the number of the link tested in step 33.

If RTS	Do
passes	step 44
fails	step 45

44 Determine if additional SysB links are present.

If additional SysB links	Do
are present	step 39
are not present	step 46

45 For additional help to clear this alarm contact the next level support.

46 You returned the inactive unit to service. Determine if the active unit is in-service.

If active unit is	Do
InSv	step 52
ISTb	step 47

47

CAUTION
Service disruption.
If the system prompts you to confirm a cold SWACT, perform this activity only during a period of low traffic. The system drops all calls that this PM handles including data calls.

To switch the activity of the units, type

>SWACT
and press the Enter key.

PM SMS
minor (continued)

The system determines the type of SWACT (warm or cold) the system can perform. The system displays a confirmation prompt for the selected SWACT.

If SWACT	Do
cannot continue at this time	step 48
can continue at this time	step 49

48 Do not switch activity of the units. To reject the switch, type

>NO
and press the Enter key.

The system does not continue the switch of activity. Return to step 47 during a period of low traffic.

49 To switch the activity of the unit, type

>YES
and press the Enter key.

The system runs a pre-SWACT audit to determine if the inactive unit can accept activity correctly.

Note: A maintenance flag (Mtce in the following example) appears when maintenance tasks are in progress. Wait until the flag disappears before you proceed with the next maintenance action.

If the message is	Do
`SwAct passed`	step 51
`SwAct failed`	step 45
`SwAct failed` `Reason: XPM SwActback`	step 50
`Reason: XPM SwActback`	
`SwAct refused by SwAct controller`	step 50

50 To force a switch of activity to the active unit, type

>SWACT FORCE
and press the Enter key.

When the SWACT is complete, the short term history reasons that the SWACT controller uses to refuse the SWACT,are reset.

PM SMS
minor (end)

51 Go to step 13 to clear the alarm condition on the newly inactive unit.

52 The procedure is complete. If other alarms display, refer to the correct how to clear an alarm procedures for the indicated alarms.

Updating static data
XPM

Application

Use this procedure to update static data in the XPM.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

ATTENTION

The following RTS procedure(s) with the NODATASYNC option only apply to XPMs not converted to XPM configuration data table (CDT) management.

The XPMs with software loads that contain this feature synchronize the node and port tables of both units with the CM.

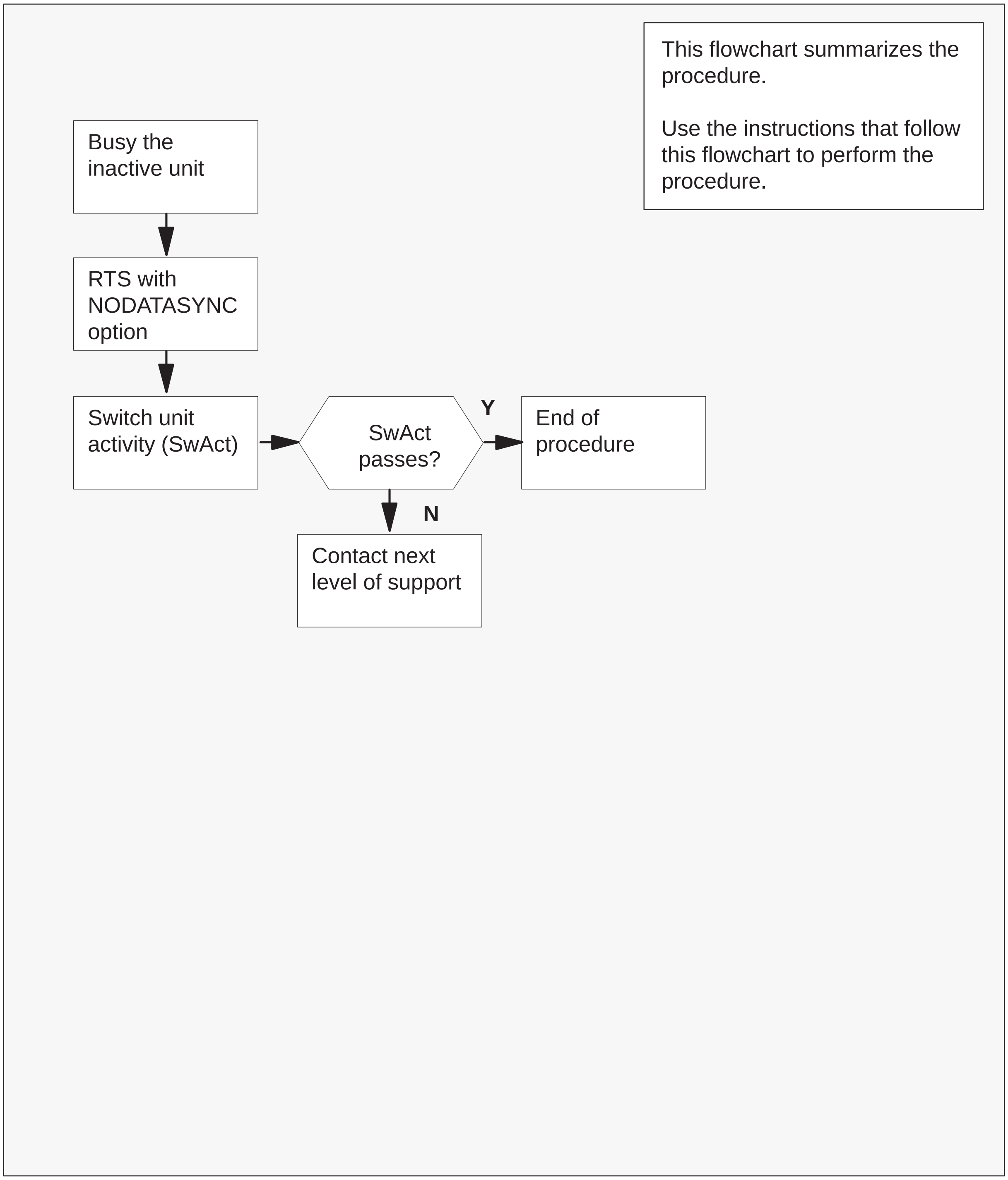
These XPMs do not synchronize unit to unit.

All the XPM must be BSYed and RTSed to clear an ISTb condition with configuration download and to synchronize both units.

This process must occur during periods of low traffic only to minimize out-of-service impact.

Updating static data
XPM (continued)

Summary of updating static data in an XPM



Updating static data
XPM (continued)

Updating static data in an XPM

At the MAP terminal:

1 Proceed only if a step in a maintenance procedure directed you to this procedure. Independent use of this procedure can cause equipment damage or loss of service.

2 To busy the inactive unit, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the number of the inactive unit

3

CAUTION
Loss of service
All calls that this PM handles, including data calls, will be lost. Perform the next step during a period of low traffic only.

To return the inactive unit to service, type

>RTS UNIT unit_no NODATASYNC
and press the Enter key.

where

unit_no is the number of the inactive unit

Updating static data
XPM (end)

4 To perform a SwAct, type

>SWACT UNIT unit_no
and press the Enter key.

MAP prompt:

```
A Cold SwAct will be performed
This action will take this PM and all of
Its Subtending Nodes temporarily out of service
and <n> active terminals may be affected
Please confirm (“YES” or “NO”):
```

To affirm the request, type

>YES
and press the Enter key.

Example of a MAP response:

```
XPM 0    SwAct Passed
```

If SwAct	Do
passes	step 6
fails	step 5

5 For additional help, contact the next level of support.

6 The procedure is complete. Return to the main procedure that sent you to this procedure and continue as directed.

SMS card replacement procedures

This section contains card replacement procedures for the Subscriber Carrier Module-100S Remote within DMS-100/200 offices. These detailed procedures can be used by maintenance personnel to remove and replace a circuit pack.

NT2X70
SMS

Application

Use this procedure to replace an NT2X70 card in an SMS.

PEC	Suffixes	Name
NT2X70	AE	Power convertor (5V/12V)

Common procedures

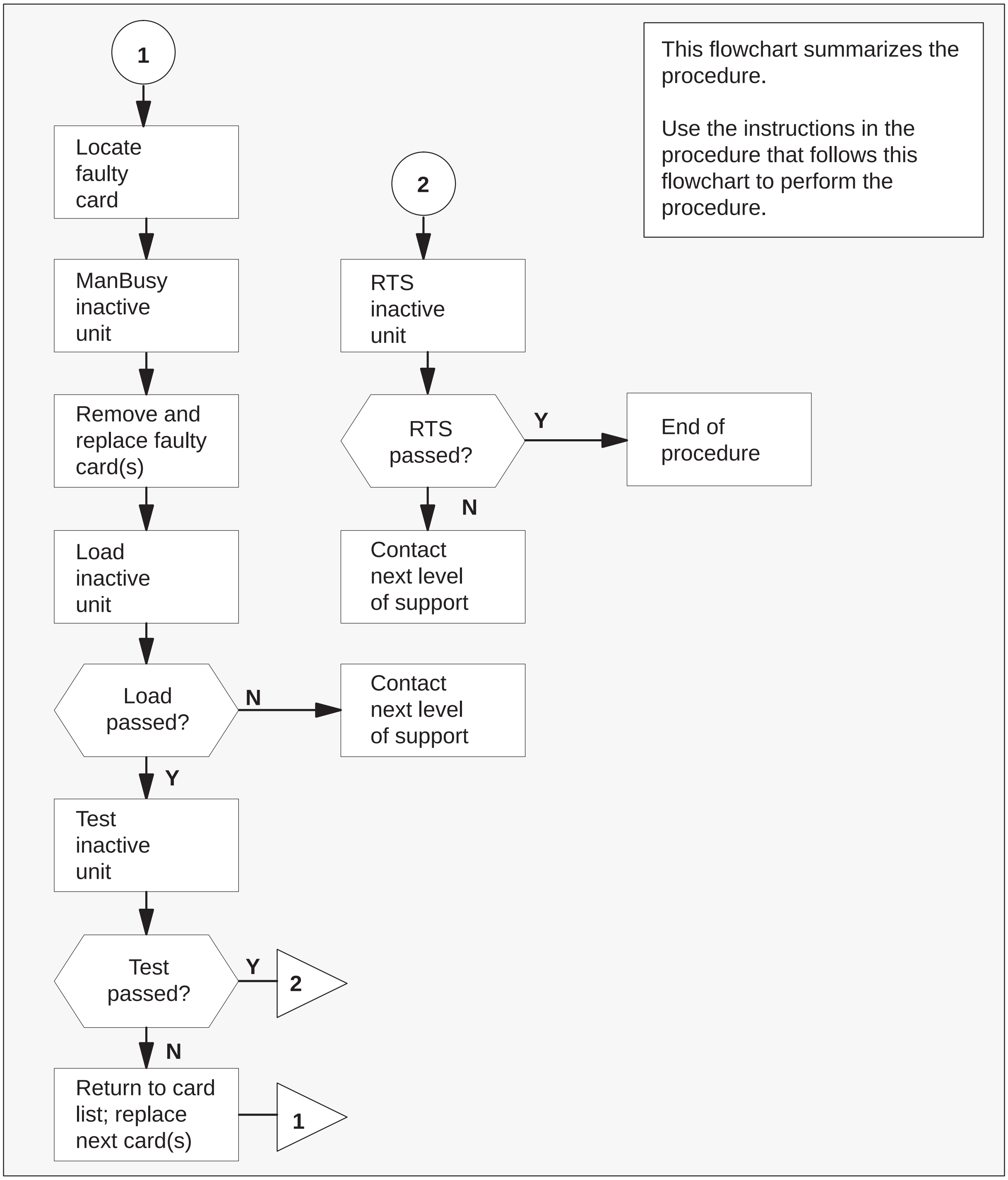
None

Action

The following flowchart is only a summary of this procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT2X70
SMS (continued)

Summary of card replacement procedure for an NT2X70 card in an SMS



NT2X70
SMS (continued)

Replacing an NT2X70 card in an SMS

At the frame

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

At the MAP terminal

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

3 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS  3   INSV    LINKS_OOS    CSIDE 0     PSIDE 0
   Unit0      Act      InSv
   Unit1     Inact     ISTb
```

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

NT2X70
SMS (continued)

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SwACT passed`	step 8
`SwACT failed`	step 7
`SwACT failed Reason: XPM SwActback`	step 7
`SwACT refused by SwAct controller`	step 7

7 Clear the alarm condition on the inactive unit. Refer to the “SMS alarm clearing procedures” section in this document. When the alarm is cleared, return to step 1 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words: **Active unit—Do not touch**. This sign should not be attached by magnets or tape.

At the MAP terminal

9 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

NT2X70
SMS (continued)

At the frame

10

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

Put on a wrist strap.

11 Power down the unit by setting the ON/OFF switch on the power converter faceplate to the OFF position. Both the converter FAIL LED and FRAME FAIL lamp on the frame supervisory panel (FSP) will be ON. An audible alarm may sound. If an alarm does sound, silence it by typing at the MAP terminal

>SIL

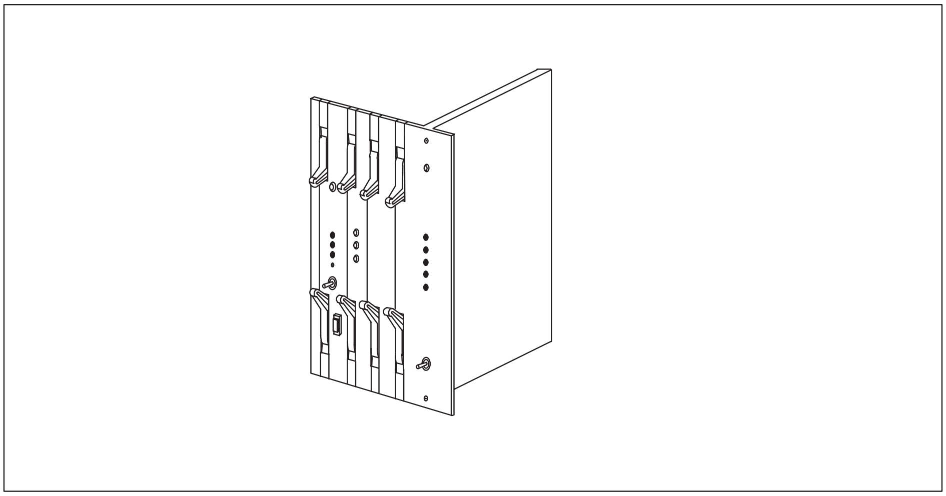
and pressing the Enter key.

12

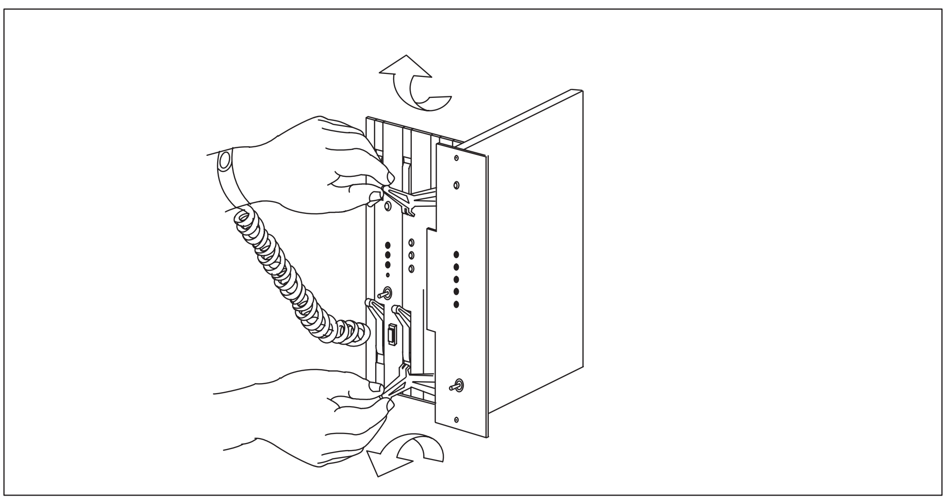
WARNING
Equipment damage
Take these precautions when removing or inserting a card:
1. Do not apply direct pressure to the components.
2. Do not force the cards into the slots.

Remove the NT2X70 card as shown in the following figures.

a. Locate the card to be removed on the appropriate shelf.

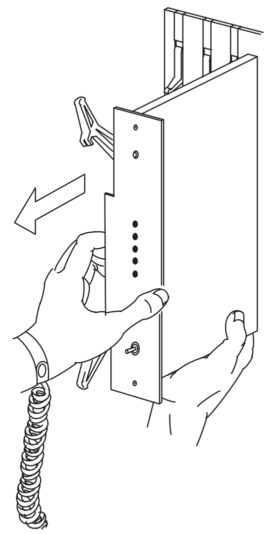


b. Open the locking levers on the card to be replaced. This will move the card 1/2 inch from the shelf backplane.



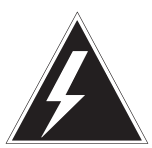
NT2X70
SMS (continued)

c. Holding the card by the face plate, slide the card along the guides until the card is free from the shelf.



d. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

13



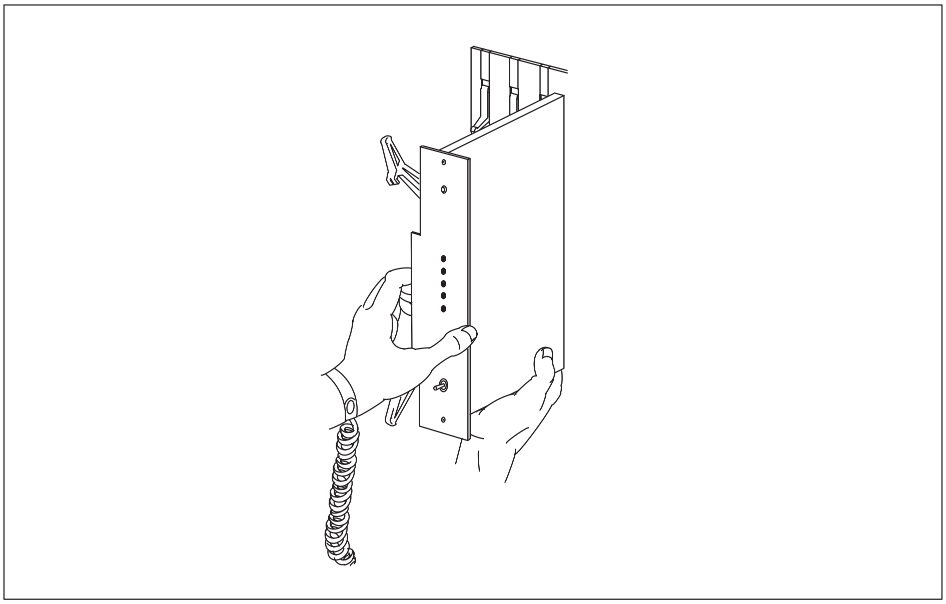
WARNING
Equipment damage
Take these precautions when removing or inserting a card:
1. Do not apply direct pressure to the components.
2. Do not force the cards into the slots.

Insert the NT2X70 power converter replacement card as shown in the following figures.

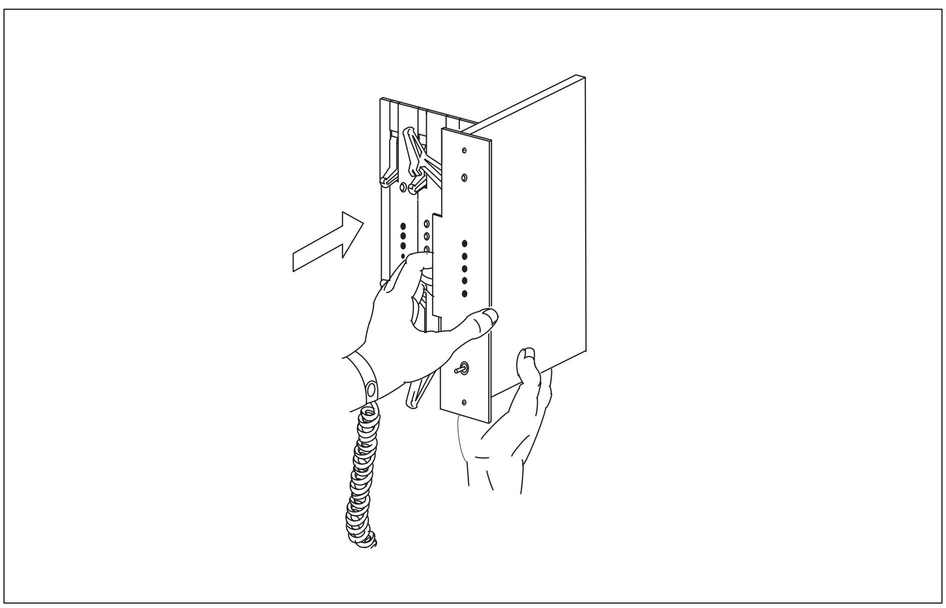
a. Hold the card by the face plate with the components visible on the right-hand side.

NT2X70
SMS (continued)

b. With the locking levers on the replacement card in the open position, place the back edge of the card into the upper and lower guides of the desired slot position on the shelf.



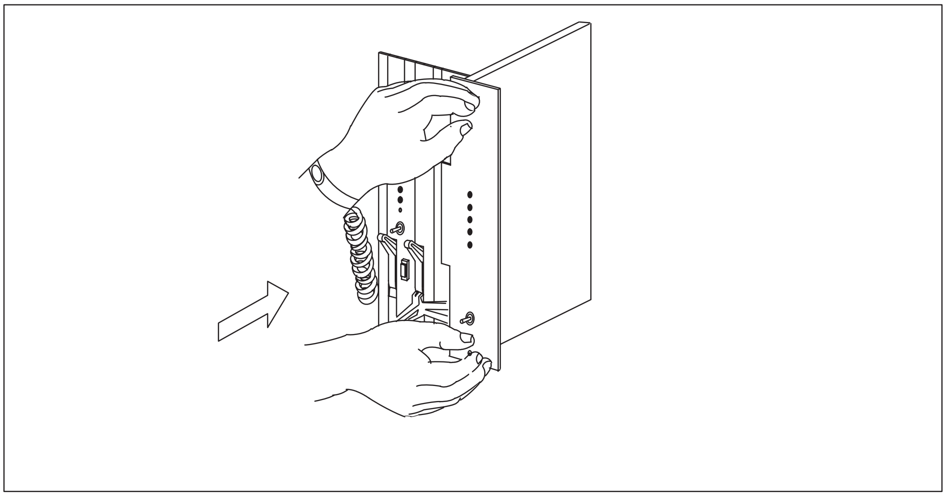
c. Gently slide the card into the shelf.



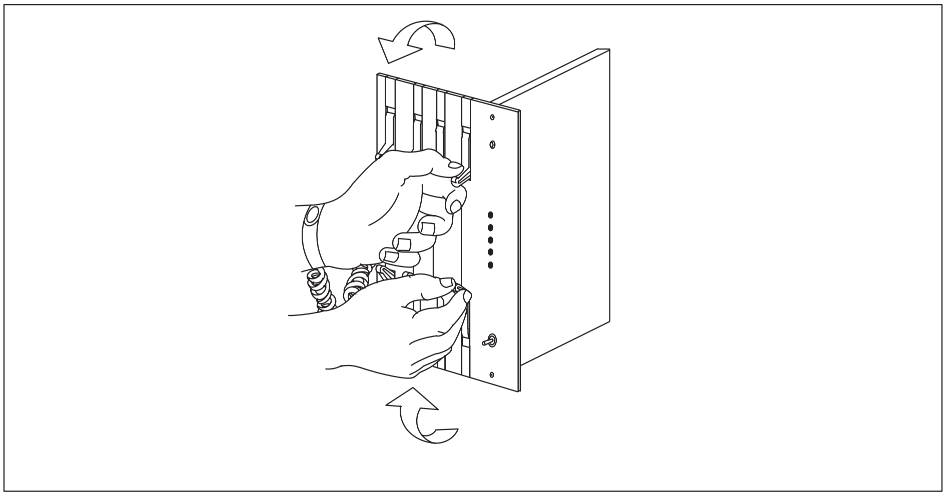
14 Seat and lock the card.

NT2X70
SMS (continued)

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.



b. Simultaneously rotate the top latch downward and the bottom latch upward. The card will lock into position when the lock-latches are flush with the faceplate of the card.



15 Power up the inactive SMS unit as follows:

a. Ensure the power converter (NT2X70) is inserted. A major audible alarm may sound. This alarm is silenced when power is restored to the converter.

NT2X70
SMS (continued)

b. Set the POWER switch to the ON position.

If FSP is equipped with	Do
fuses	step 16
circuit breakers	step 17

16 Press and hold the RESET button for 1 second. Both the converter FAIL LED and FRAME FAIL lamp on the frame supervisory panel (FSP) will be ON.

Go to step 18.

17 Press the RESET button while setting the circuit breaker to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the frame supervisory panel (FSP) will be ON.

At the MAP terminal

18 Load the inactive SMS unit by typing

>LOADPM UNIT unit_no CC
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If LOADPM	Do
passed	step 19
failed	step 26

19 Use the following information to determine what step to go to next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 25
other	step 20

NT2X70
SMS (continued)

20 Test the inactive unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If TST	Do
passed	step 21
failed	step 25

21 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If RTS	Do
passed	step 22
failed	step 26

At the frame

22 Remove the sign from the active SMS unit.

23 Send any faulty cards for repair according to local procedure.

24 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

Go to step 27.

25 Return to the maintenance procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

NT2X70
SMS (end)

26 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

27 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

28 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NT6X40
in a SMS

Application

Use this procedure to replace the following cards in a Subcriber Carrier Module (SMS) as identified in the following table.

ATTENTION

Replacement restrictions apply to certain versions of the NT6X40 card. Carefully read the caution and note following the equipment chart before removing or installing any cards.

PEC	Suffixes	Name
NT6X40	AC, AD	DS30 C-sside interface card
NT6X40	FA, FB, FC	DS512 link controller card
NT6X40	GA	DS512 link paddle board

WARNING

Possible service disruption or loss of diagnostic functionality when installing or replacing NT6X40 cards versions AD, FB, or FC

NT6X40AD, FB, or FC cards must not be mismatched with other versions between the two units of an XPM if table LTCINV is datafilled with interface card types of NT6X40AD or NT6X40FB. A PM777 log is generated citing the mismatch and the XPM is put in an ISTb state. For example, you can not have an AC version of the card in unit 0 and an AD version in unit 1. For more information read the following notes.

Note: The NT6X40AD, NT6X40FB, and NT6X40FC cards provide enhanced diagnostic capabilities. If table LTCINV datafill is set to the NT6X40AC or NT6X40FA version of the card, cards can be mismatched but the new diagnostics capabilities will not be initiated. The CM will treat the interface as NT6X40AC/NT6X40FA regardless of the card installed. For more information see the section on datafilling table LTCINV in the data schema section of the *Translations Guide.*

NT6X40
in a SMS (continued)

Common procedures

The following common procedures are referenced:

- *Manually busying SMS C-side links*
- *Removing and replacing a card*
- *Returning a card for repair or replacement*

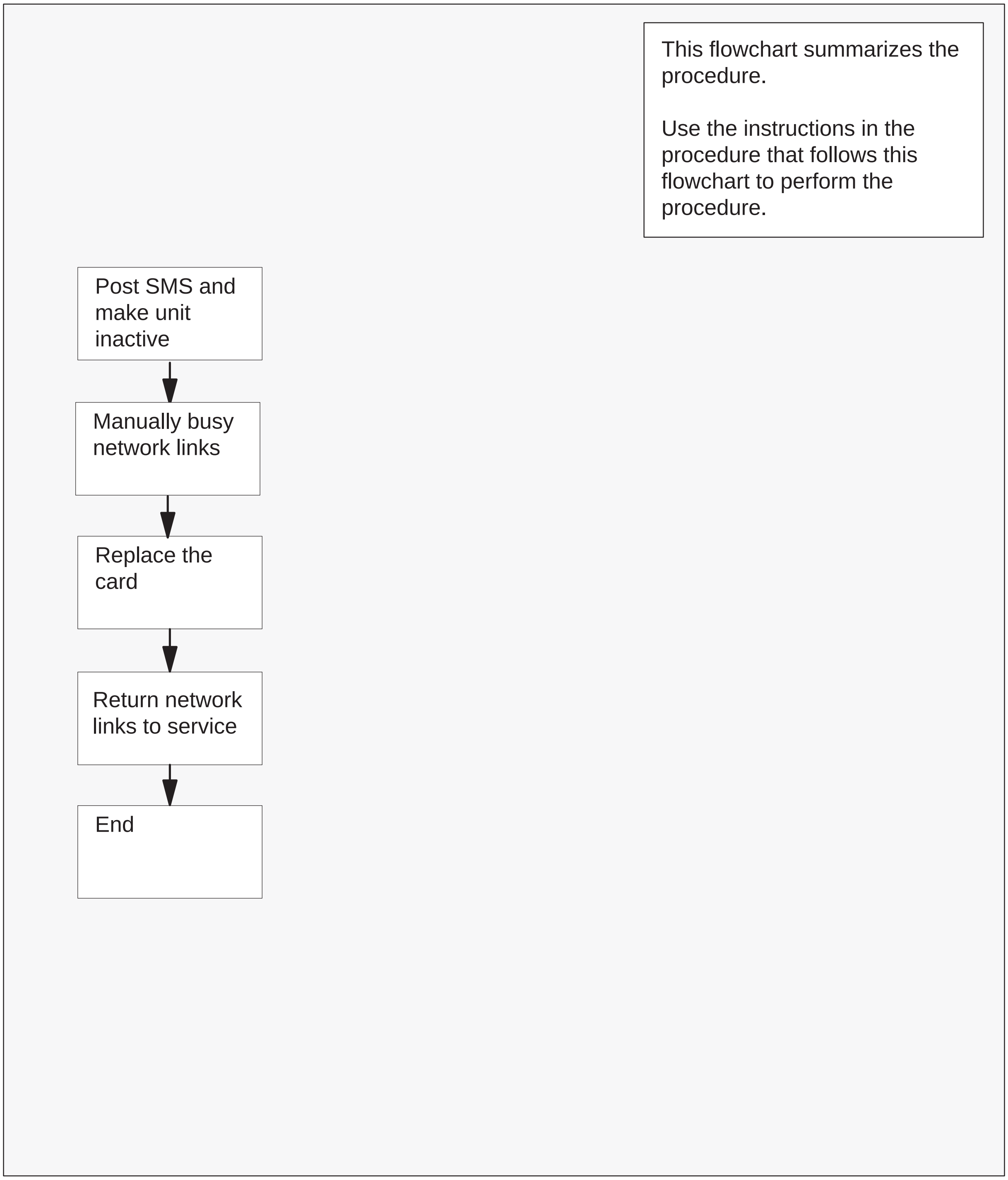
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X40
in a SMS (continued)

Summary of Replacing NT6X40 in a SMS



NT6X40
in a SMS (continued)

Replacing an NT6X40 in a SMS

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

Obtain an NT6X40 replacement circuit card. Ensure the replacement circuit card has the same product engineering code (PEC), including suffix, as the circuit card being removed.

At the MAP terminal

3 Access the peripheral module (PM) level of the MAP display and post the SMS with the faulty card by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is the PM number (0 to 255)

Example of a MAP response:

```
SMS              SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit    PM      0        0        2       0        2          25
 2 Post_   SMS     0        0        0       0        1           1
 3 ListSet
 4         SMS   0 ISTb  Links_OOS:  CSide  1, PSide   1
 5 TRNSL   Unit0:   Inact ISTb
 6 TST     Unit1:   Act InSv
 7 BSY
 8 RTS
 9 OffL
10 LoadPM_
11 Disp_
12 Next_
```

NT6X40
in a SMS (continued)

4 Determine the location of the SMS containing the NT6X40 circuit card you are replacing by typing

>QUERYPM

and pressing the Enter key.

Example of a MAP response:

```
QueryPM
PM Type: SMS  PM No.: 0  PM Int. No.:11 Node_No.: 192
PMs Equipped: 139 Loadname: NSS05BC
WARM SWACT is supported and available.
SMS 0 is included in the REX schedule.
REX on SMS 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0   Act, Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos  Bay_id  Shf Description Slot EqPEC
HOST  01  E31  SME  01  18     SMS :   000  6X02AA
```

5 Determine the state and activity of the XPM unit in which the card you replacing is provisioned.

If the state of the PM unit is	Do
ISTb, InSv, SysB, or CBsy, and active	step 6
ISTb, InSv, SysB, or CBsy, and inactive	step 9
ManB	step 9
OffL	step 33

6 From the MAP display, determine the state of the mate PM unit.

If the SMS unit is	Do
ISTb or InSv	step 7
any other state	step 35

NT6X40
in a SMS (continued)

7 Switch activity by typing

>SWACT
and pressing the Enter key.

Example of a MAP response:

```
SMS 0     A Warm SwAct will be performed after
          data sync of active terminals.
Please confirm (”YES”, ”Y”, ”NO”, or ”N”):
```

If	Do
you are prompted to confirm a warm SWACT	step 8
the system rejects the SWACT	step 34

8 Confirm the command by typing

>YES
and pressing the Enter key.

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act   ISTb

SMS 0     SwAct Passed
```

Note: A maintenance flag (Mtce) may appear, indicating that system-initiated maintenance tasks are in progress. Wait until the flag disappears from the status lines for both PM units before proceeding to the next step.

If the MAP response is	Do
`SWACT passed`	step 9
anything else	step 35

9 A maintenance flag (Mtce) may appear, indicating that system-initiated maintenance tasks are in progress. Wait until the flag disappears from the status lines for both PM units before proceeding to the next step.

NT6X40
in a SMS (continued)

10 Manually busy all C-side links associated with the inactive PM unit you are working on using the procedure *Manually busying Series II PM and CPM C-side links* in this document. When you have completed the procedure, return to this point.

At the cabinet

11 Place a sign on the active unit bearing the words **Active unit–Do not touch.** This sign should not be attached by magnets or tape.

If you are replacing an	Do
NT6X40GA	step 12
NT6X40AC, AD, FA, FB, or FC	step 24

At the front of the shelf

12

WARNING
Static electricity damage
Wear a wrist strap connected to the wrist-strap grounding point of the modular supervisory panel (MSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Unseat the NT6X40 card in the inactive unit.

At the back plane of the shelf

13

DANGER
Risk of electrocution
Voltage is present on the back plane. Remove all jewelry before continuing with this procedure. Do not touch pins or terminals except as instructed.

Locate the circuit card to be replaced.

Note: NT6X40 circuit cards are located in slot 9 of unit 0, and slot 19 of unit 1.

14 Label each connector to the circuit card.

NT6X40
in a SMS (continued)

15

> **WARNING**
> **Avoid contaminating the fiber tip surface**
> Do not touch the tip of the fiber. Dirt or oil from the skin transferred to the fiber tip surface degrades fiber performance.

> **WARNING**
> **Fiber cable may become damaged**
> Take care when handling fiber cables. Do not crimp or bend fiber cables to a radius of less than 25 mm (1 in.).

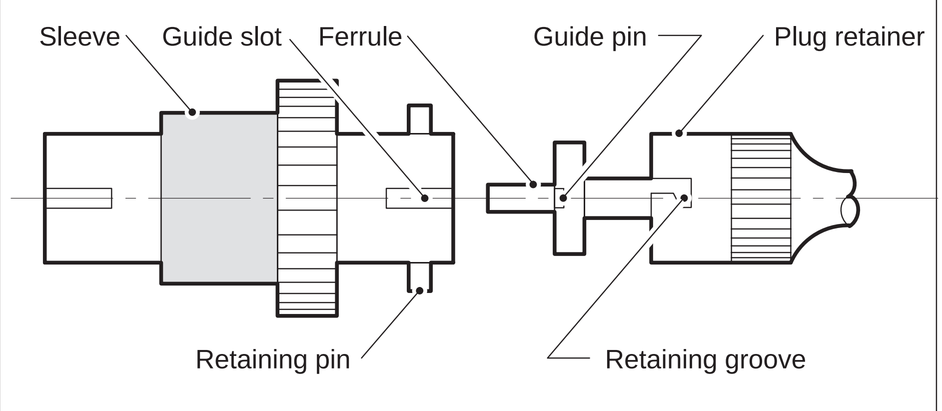
Disconnect the fiber optic cables.

a. Twist the plug retainer to unlock the retaining pin from the retaining groove

b. Rotate the plug retainer so the retaining pin enters the guide slot.

c. Gently pull on the plug retainers, moving the guide pin along the slot to remove the ferrule from the sleeve.

d. Fit dust caps to the open ends of the fiber links.



NT6X40
in a SMS (continued)

16

> **WARNING**
> **Protect back plane pins**
> Do not allow screws to drop onto or touch the back plane pins. When removing and replacing the screws for the card, the back plane pins above and below must be protected to prevent shorting out. Use of a magnetic screw or nut driver is recommended.

Protect exposed back plane pins in one of the following ways:

- Wrap electrical tape around a group of pins. Do not bend the pins.
- Cover the pins with NOMEX paper.

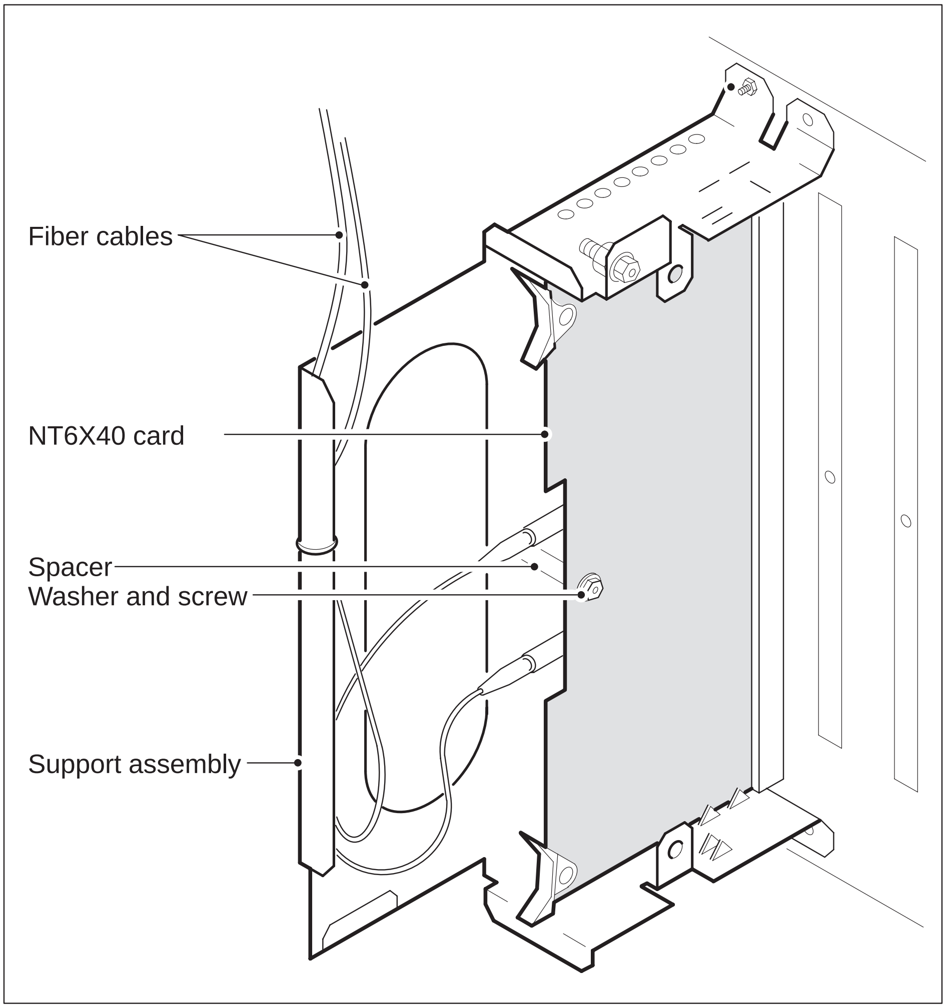
NT6X40
in a SMS (continued)

17 Remove the screw that holds the circuit card to the support assembly.

a. Locate the screw which is positioned half-way down the outer edge of the circuit card.

b. Remove the washer holding the screw in place.

c. Remove the screw and the spacer located between the circuit card and the support assembly.



18 Open the ejection levers on the 6X40 circuit card. Remove the card by firmly pulling horizontally until the connector pin socket on the card has cleared the connector pins on the backplane.

NT6X40
in a SMS (continued)

19 Place the circuit card just removed in an electrostatic discharge protective container.

Note: If the circuit card you are replacing has switches, ensure the switches on the replacement circuit card have the same settings.

20 Using the levers located at the top and bottom of the 6X40 circuit card firmly press the connector pin socket on the card onto the connector pins on the backplane.

21 Secure the circuit card to the support assembly.

a. Locate the screw hole which is positioned half-way down the outer edge of the card.

b. Position the spacer at the screw hole between the circuit card and the support assembly.

c. Insert the screw, moving it in the direction of the support assembly, through the spacer.

d. Fasten the washer to hold the screw in place.

22 Reconnect the fiber optic cables.

a. Remove the dust caps from the ends of the fiber links.

b. Gently insert the ferrule into the sleeve so the guide pin enters the guide slot.

c. Rotate the plug retainer so the retaining pin enters the retaining groove.

d. Push the connectors together and twist the plug retainer to lock the retaining pin into the retaining groove.

NT6X40
in a SMS (continued)

At the front of the shelf

23 Reseat the NT6X40 card unseated in step 12. Go to step 25.

24 Replace the card using the procedure “*Removng and replacing a card*” in this section. When you have completed the procedure, return to this point.

At the MAP terminal

25 The next action depends on the type of network in the office.

If you are working on	Do
JNET	step 26
ENET	step 28

26 Return to service one of the network links by typing

>RTS plane_no link_no
and pressing the Enter key.

where

plane_no   is the number of the plane (0 or 1) for the link
link_no   is the link number (0 to 63)

If the link	Do
returned to service and there are more manual-busy links	step 27
returned to service and there are no more manual-busy links	step 29
did not return to service	step 35

27 Repeat step 26 for each manually busy C-side link. When you have successfully returned all C-side links to service, go to step 29.

NT6X40
in a SMS (continued)

28 Return the network link to service by typing

>RTS plane_no LINK link_no
and pressing the Enter key.

where

plane_no	is the number of the plane (0 or 1) for the link
link_no	is the link number (0 to 3)

Example of a MAP response:

```
Request to RTS ENET Plane:0 Shelf:00 Slot:32 Link:01 submitted.
Request to RTS ENET Plane:0 Shelf:00 Slot:32 Link:01 passed.
```

If the link	Do
returned to service	step 29
did not return to service	step 35

29 Post the XPM you are working on by typing

>PM;POST pm_type pm_no
and pressing the Enter key.

where

pm_type	the PM type (DTC, ILGC, LTCI, PDTC, SMS)
pm_no	is the PM number (0 to 255)

NT6X40
in a SMS (continued)

30 Determine the status of the XPM unit containing the NT6X40 circuit card you replaced by typing

>QUERYPM

and pressing the Enter key.

```
SMS                       SysB    ManB    OffL    CBsy    ISTb    InSv
 0 Quit          PM          1       0      15       0       2     121
 2 Post_         SMS         0       0       0       0       0       3
 3 ListSet
 4            SMS     0 InSv  Links_OOS: CSide  0 , PSide  0
 5 Trnsl_     Unit0:   Inact InSv

 6 Tst_       Unit1:   Act   InSv

 7 Bsy_       QueryPM
 8 RTS_

            PM Type: SMS  PM No.: 0  PM Int. No.:11 Node_No.: 192
            PMs Equipped: 139 Loadname: NSS05BC
            WARM SWACT is supported and available.
            SMS 0 is included in the REX schedule.
            REX on SMS 0 has not been performed.
            Node Status: {OK, FALSE}
            Unit 0   Act, Status: {OK, FALSE}
            Unit 1 Inact, Status: {OK, FALSE}
            Site Flr RPos  Bay_id  Shf Description Slot EqPEC
            HOST  01  E31  SME  01  18     SMS :   000  6X02AA
```

If the inactive unit status is	Do
InSv	step 31
anything else	step 35

31 The next action depends on your reason for performing this procedure.

If you were	Do
directed to this procedure from a maintenance procedure	step 32
not directed to this procedure from a maintenance procedure	step 36

NT6X40 in a SMS (end)

32 Return to the maintenance procedure that sent you to this procedure and continue as directed.

33 Consult office personnel to determine why the component is offline. Continue as directed by office personnel.

34 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

35 For further assistance, contact the personnel responsible for the next level of support.

36 Go to the common procedure “Returning a card for repair or replacement” in this section.

37 You have completed this procedure.

NT6X41
SMS

Application

Use this procedure to replace an NT6X41 card in an SMS.

PEC	Suffixes	Name
NT6X41	AA, AB	Speech bus formatter

Common procedures

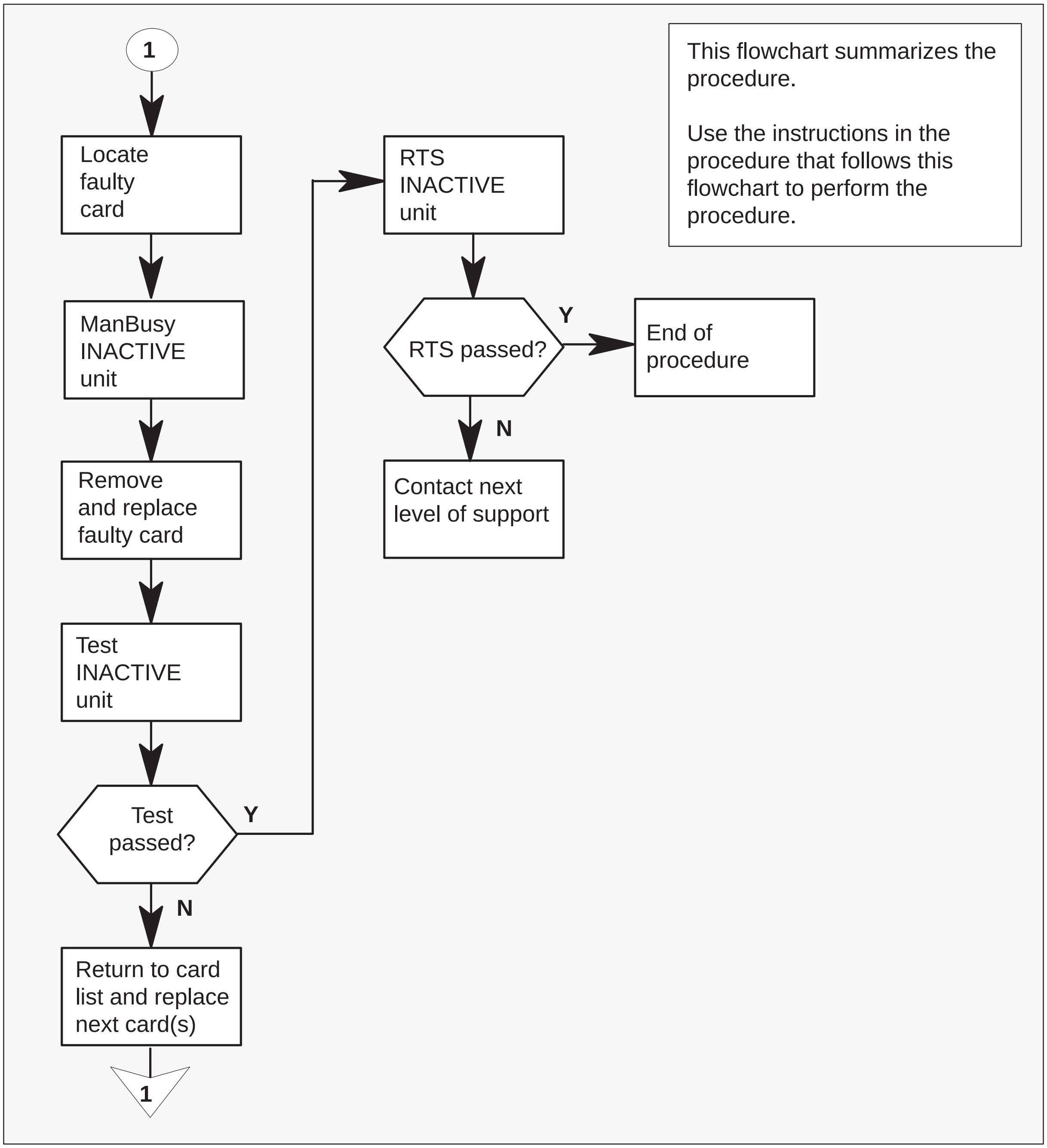
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X41
SMS (continued)

Summary of card replacement procedure for an NT6X41 card in an SMS



Replacing an NT6X41 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS 3 INSV LINKS_OOS CSIDE 0    PSIDE 0
   Unit0   Act   InSv
   Unit1   Inact   ISTb
```

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

NT6X41
SMS (continued)

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SwAct passed`	step 8
`SwAct failed`	step 7
`SwAct failed:Reason: XPM SwActback`	step 7
`SwAct refused by SwAct controller`	step 7

7 Return to the “SMS alarm clearing procedures” section in this document to clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 1 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words: **Active unit—Do not touch**. This sign should not be attached by magnets or tape.

At the MAP terminal

9 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

NT6X41
SMS (continued)

10 Set the PM to the ROM level by typing

>PMRESET UNIT unit_no NORUN
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

At the frame

11

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

Put on a wrist strap.

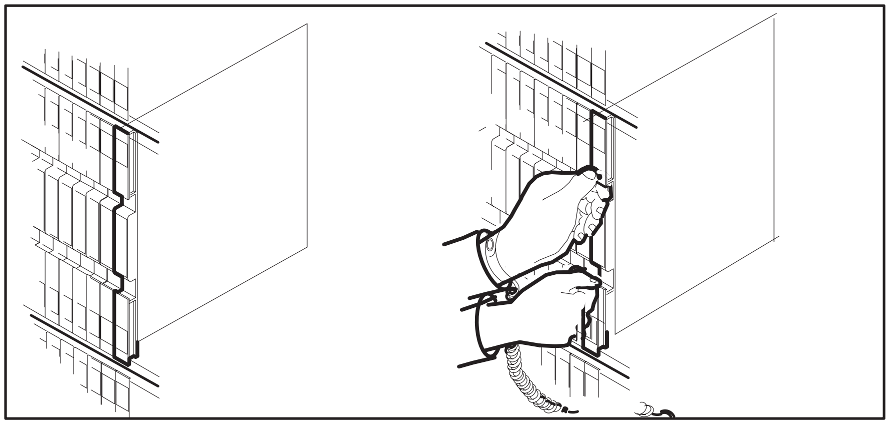
12

WARNING
Equipment damage
When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

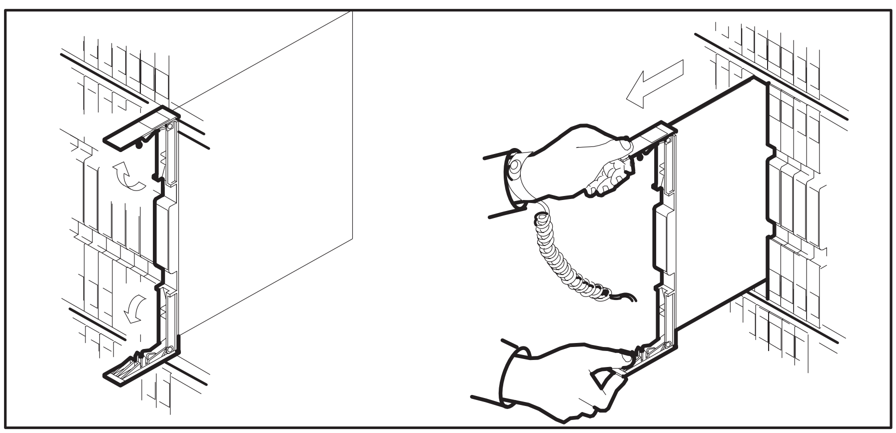
Remove the NT6X41 card as shown in the following figures.

NT6X41
SMS (continued)

a. Locate the card to be removed on the appropriate shelf.

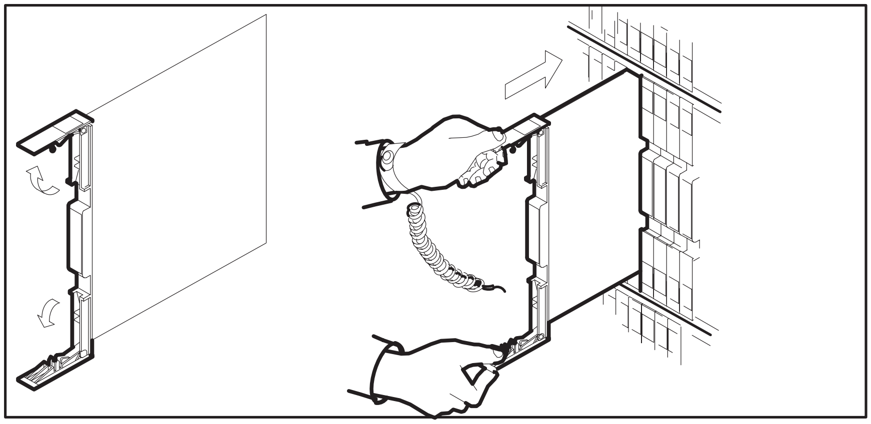


b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

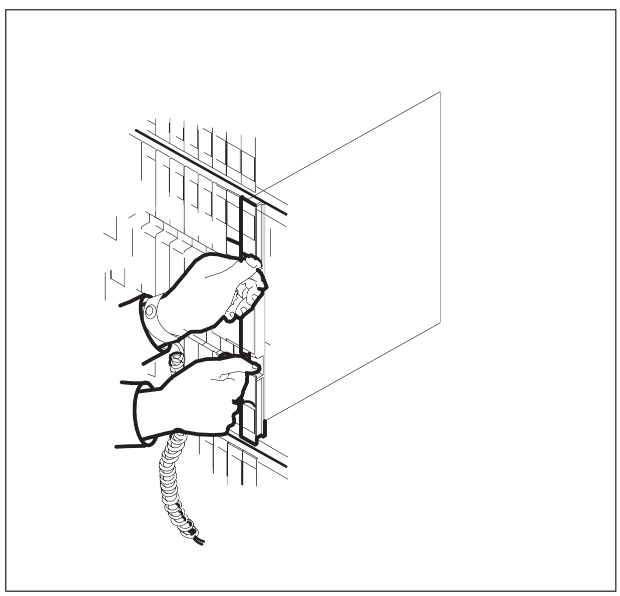
13 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



14 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



NT6X41
SMS (continued)

15 Use the following information to determine where to go next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 18
other	step 16

16 Test the inactive unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the faulty SMS unit

If TST	Do
passed	step 17
failed	step 18

17 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the faulty SMS unit

If RTS	Do
passed	step 20
failed	step 19

18 Return to the maintenance procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

19 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

NT6X41
SMS (end)

At the frame

20 Remove the sign from the active SMS unit.

21 Send any faulty cards for repair using local procedure.

22 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

23 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

24 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NT6X42
SMS

Application

Use this procedure to replace an NT6X42 card in an SMS.

PEC	Suffixes	Name
NT6X42	AA	Channel supervision message

Common procedures

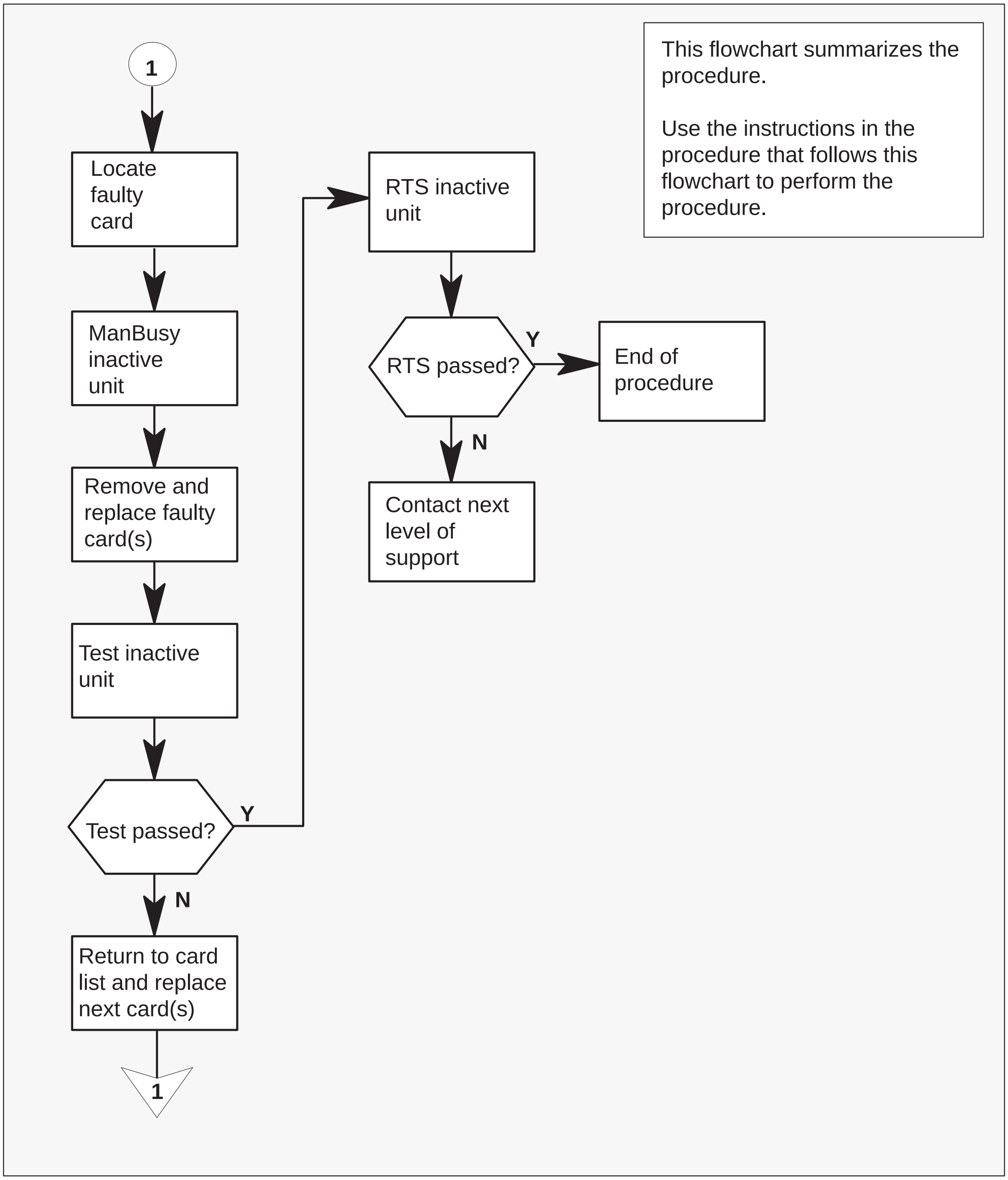
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X42
SMS (continued)

Summary of card replacement procedure for an NT6X42 card in an SMS



NT6X42
SMS (continued)

Replacing an NT6X42 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS  3   INSV    LINKS_OOS    CSIDE 0     PSIDE 0
   Unit0      Act       InSv
   Unit1     Inact      ISTb
```

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 8
`SWACT failed`	step 7
`SWACT failed  Reason: XPM SWACTback`	step 7
`SWACT refused by SWACT controller`	step 7

7 Return to the “SMS alarm clearing procedures” section in this document to clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 1 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words: **Active unit—Do not touch**. This sign should not be attached by magnets or tape.

NT6X42
SMS (continued)

At the MAP terminal

9 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

At the frame

10

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

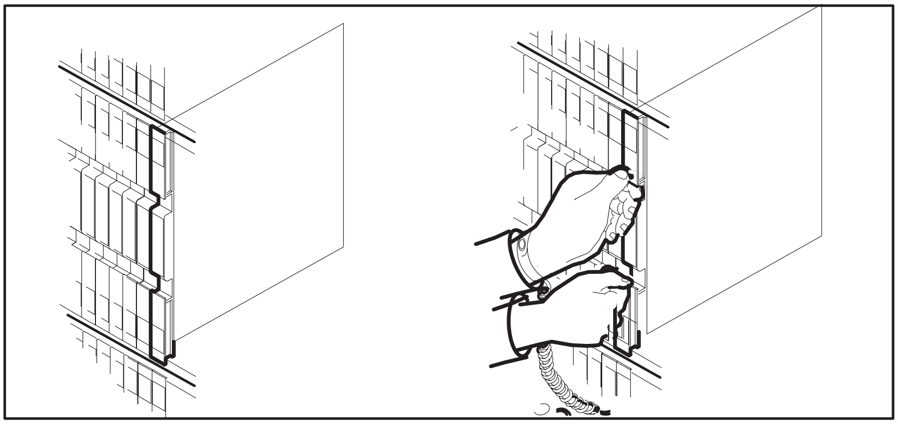
Put on a wrist strap.

11

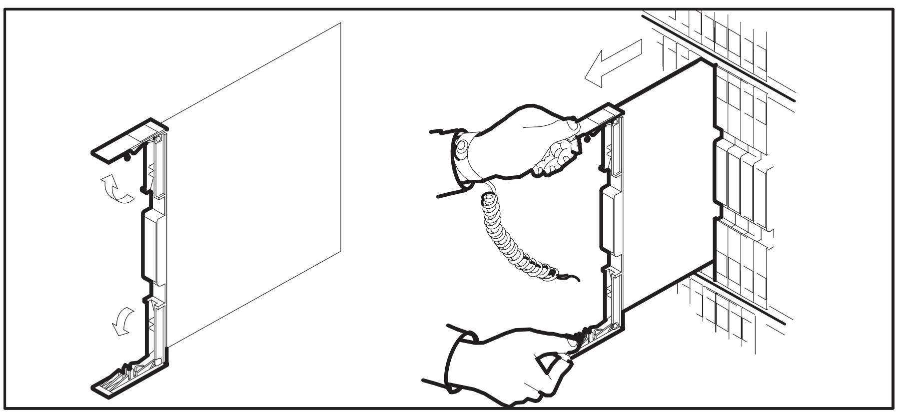
> **WARNING**
> **Equipment damage**
> When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

Remove the NT6X42 card as shown in the following figures.

a. Locate the card to be removed on the appropriate shelf.



b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.

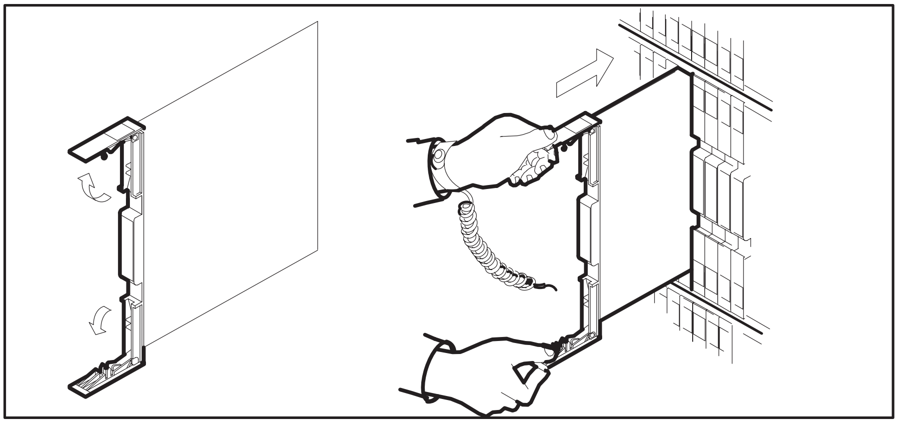


c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

12 Open the locking levers on the replacement card.

NT6X42
SMS (continued)

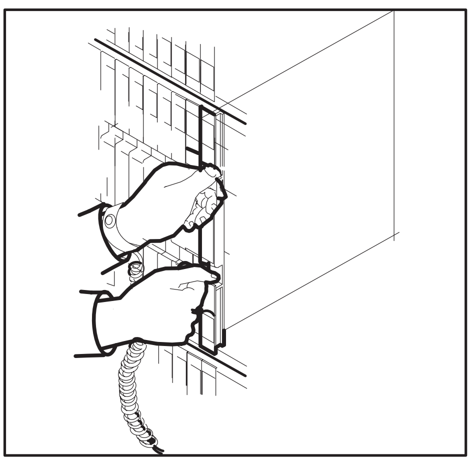
a. Align the card with the slots in the shelf and gently slide the card into the shelf.



13 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



NT6X42
SMS (continued)

14 Use the following information to determine what step to go to next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 17
other	step 15

15 Test the inactive unit by typing

>TST UNIT unit_no

and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If TST	Do
passed	step 16
failed	step 17

16 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If RTS	Do
passed	step 19
failed	step 18

17 Return to the maintenance procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

NT6X42
SMS (end)

18 Obtain further assistance in replacing this card by contacting the personnel responsible for a higher level of support.

At the frame

19 Remove the sign from the active SMS unit.

20 Send any faulty cards for repair according to local procedure.

21 Note in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

22 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

23 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NT6X44
SMS

Application

Use this procedure to replace an NT6X44 card in an SMS.

PEC	Suffixes	Name
NT6X44	AB, CA	Time switch

Common procedures

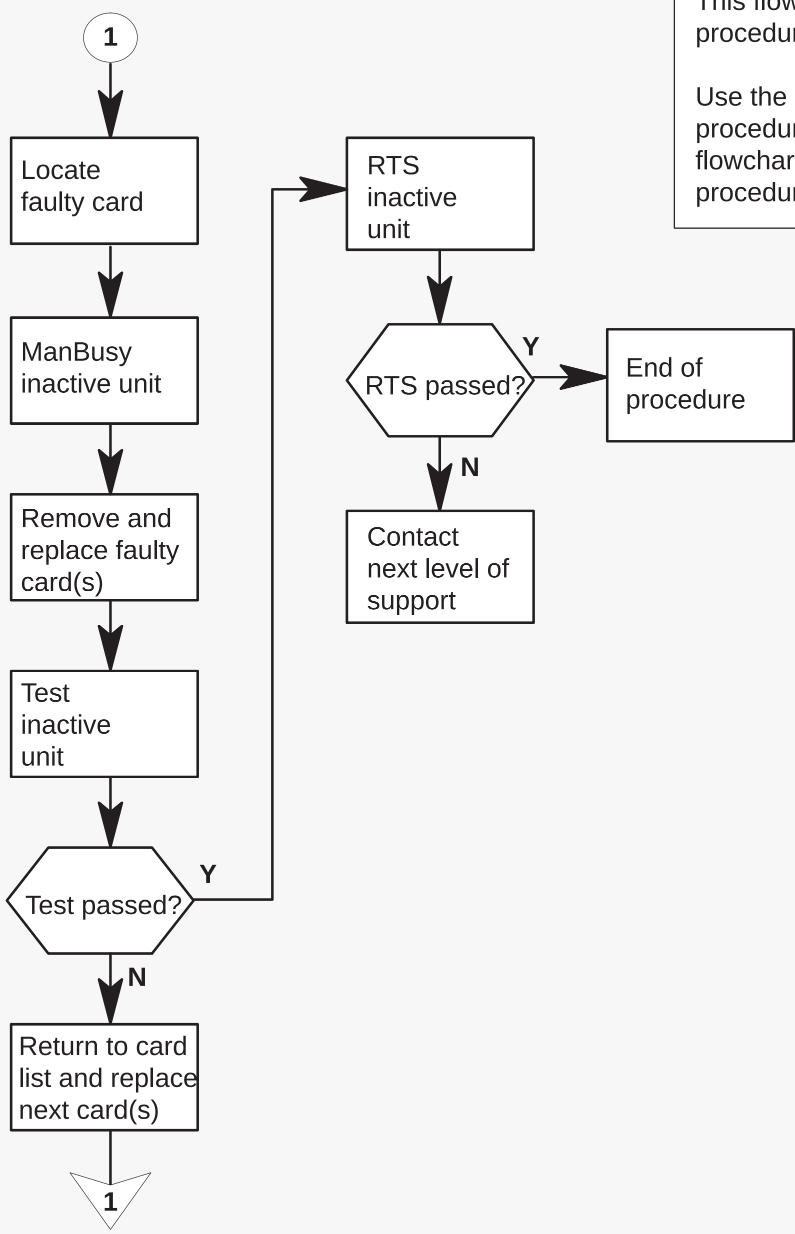
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X44
SMS (continued)

Summary of card replacement procedure for an NT6X44 card in an SMS



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

NT6X44
SMS (continued)

Replacing an NT6X44 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

CAUTION
Loss of service
When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS 3 INSV LINKS_OOS CSIDE 0    PSIDE 0
Unit0   Act   InSv
Unit1   Inact   ISTb
```

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

NT6X44
SMS (continued)

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
cannot continue at this time	step 23
can continue at this time	step 6

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SwAct passed`	step 8
`SwAct failed`	step 7
`SwAct failed Reason: XPM SwActback`	step 7
`SwAct refused by SwAct controller`	step 7

7 Return to “SMS alarm clearing procedures” section in this document to clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 1 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words: **Active unit—Do not touch**. The sign should not be attached by magnets or tape.

At the MAP terminal

9 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

At the frame

10

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

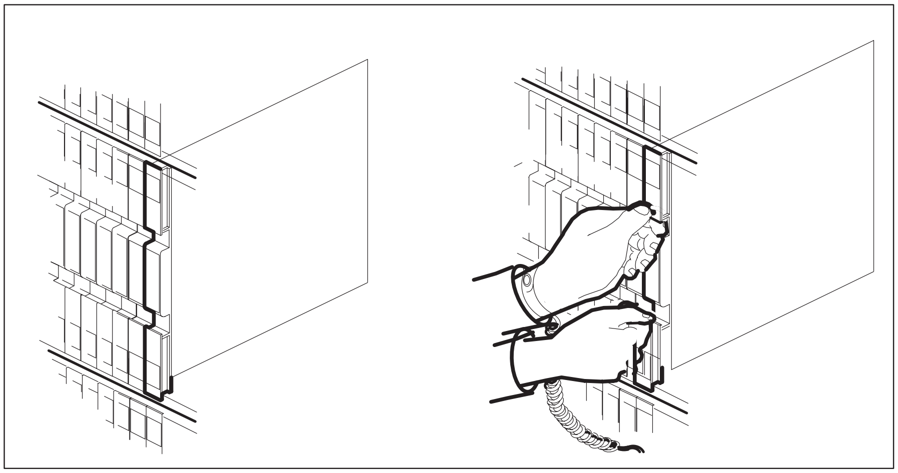
Put on a wrist strap.

11

> **WARNING**
> **Equipment damage**
> When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

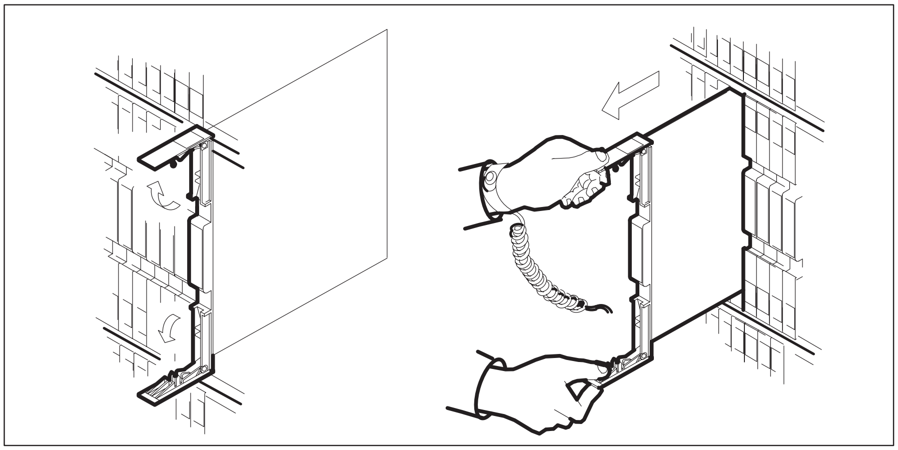
Remove the NT6X44 card as shown in the following figures.

a. Locate the card to be removed on the appropriate shelf.



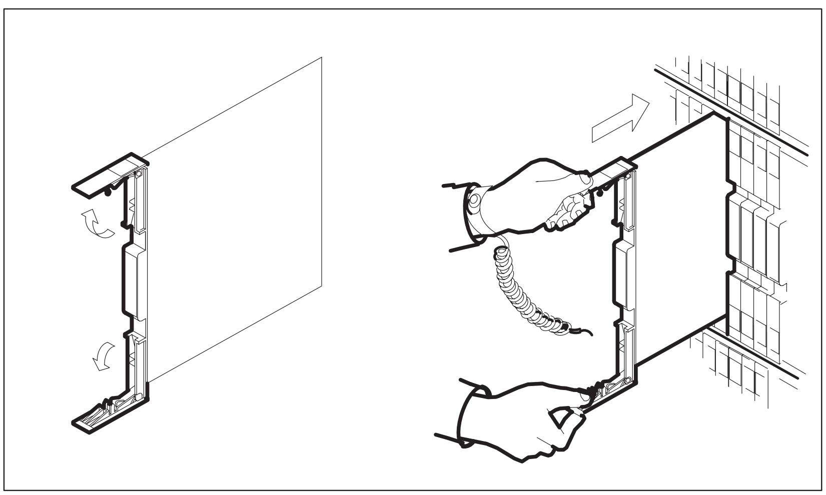
NT6X44
SMS (continued)

b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

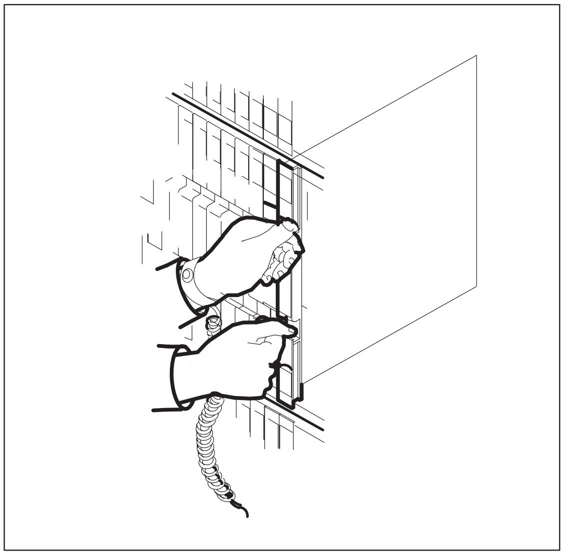
12 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



13 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



14 Use the following information to determine where to go next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 20
other	step 15

15 Test the inactive SMS unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If TST	Do
passed	step 16
failed	step 20

NT6X44
SMS (end)

16 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If RTS	Do
passed	step 17
failed	step 21

At the frame

17 Remove the sign from the active SMS unit.

18 Send any faulty cards for repair according to local procedure.

19 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

Go to step 22.

20 Return to the maintenance procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

21 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

22 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

23 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NT6X69
SMS

Application

Use this procedure to replace an NT6X69 card in an SMS.

PEC	Suffixes	Name
NT6X69	AB, AC, AD, QA	CPP message protocol and tone generator

Common procedures

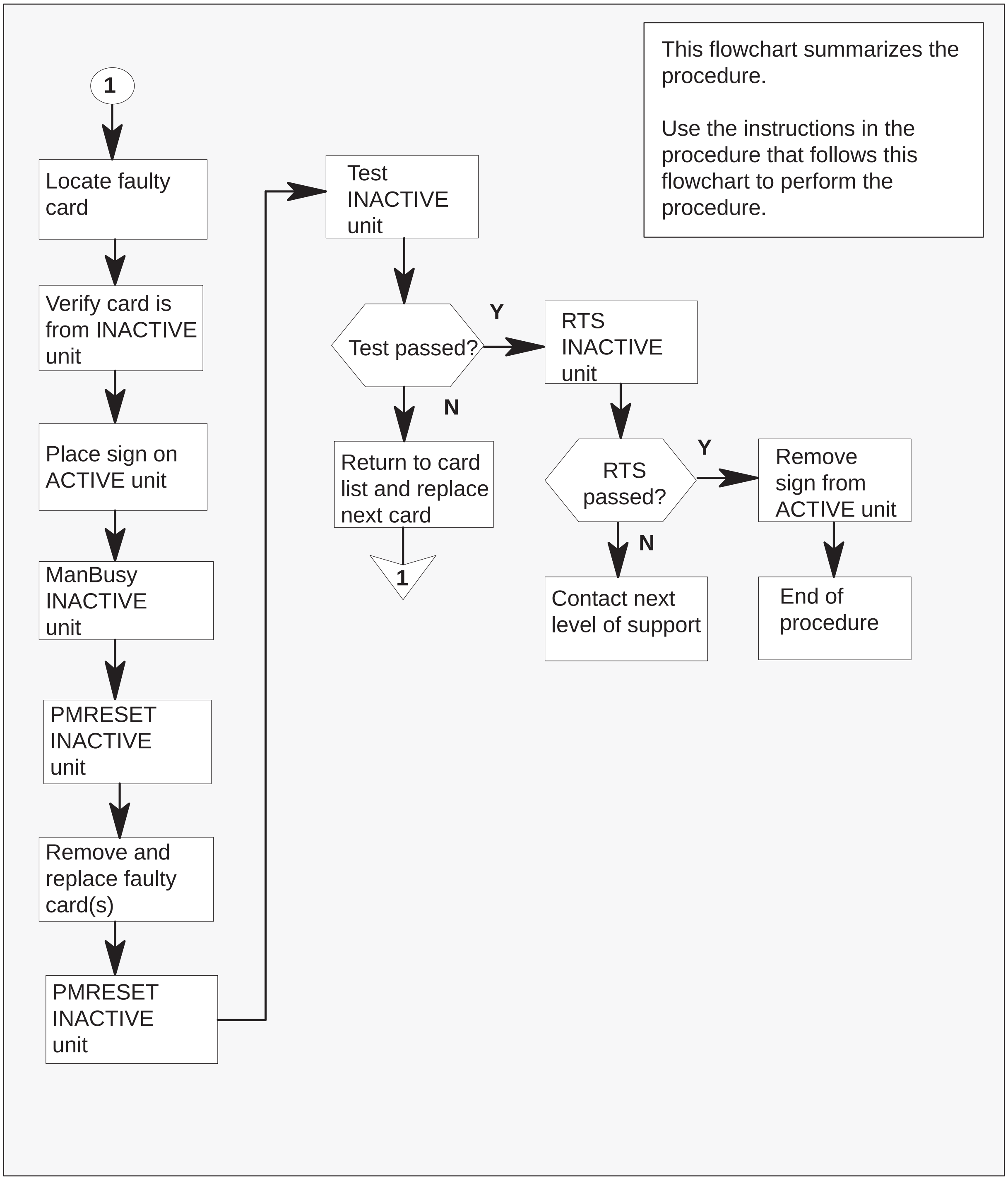
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X69
SMS (continued)

Summary of card replacement procedure for an NT6X69 card in an SMS



Replacing an NT6X69 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where:

sms_no is 0–127 range for NT40 and 0–255 range for DMS SuperNode

Example of a MAP response

```
SMS  3   INSV    LINKS_OOS    CSIDE 0     PSIDE 0
   Unit0      Act       InSv
   Unit1     Inact      ISTb
```

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

NT6X69
SMS (continued)

The system determines the type of SWACT it can perform, and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SwAct passed`	step 8
`SwAct failed`	step 7
`SwAct failed  Reason: XPM SwActback`	step 7
`SwAct refused by SwAct controller`	step 7

7 Return to the “SMS alarm clearing procedures” section in this document to clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 1 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words: **Active unit—Do not touch**. This sign should not be attached by magnets or tape.

At the MAP terminal

9 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the faulty SMS unit

NT6X69
SMS (continued)

10 Set the PM to the ROM level by typing

>PMRESET UNIT unit_no NORUN
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

At the frame

11

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

Put on a wrist strap.

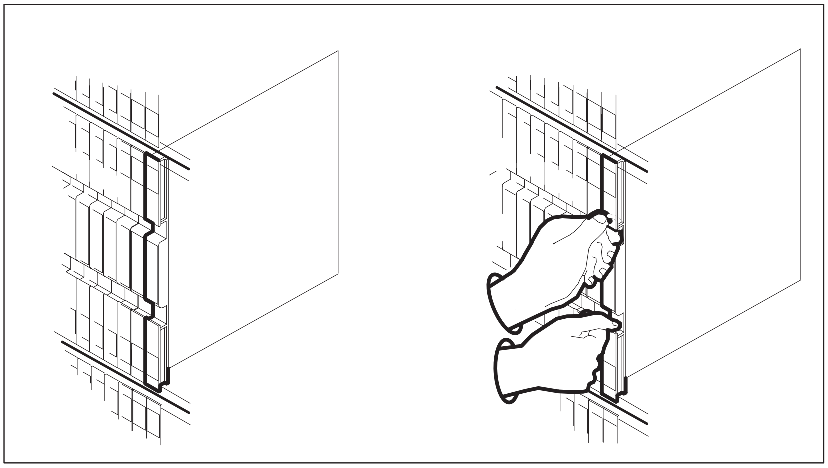
12

WARNING
Equipment damage
When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

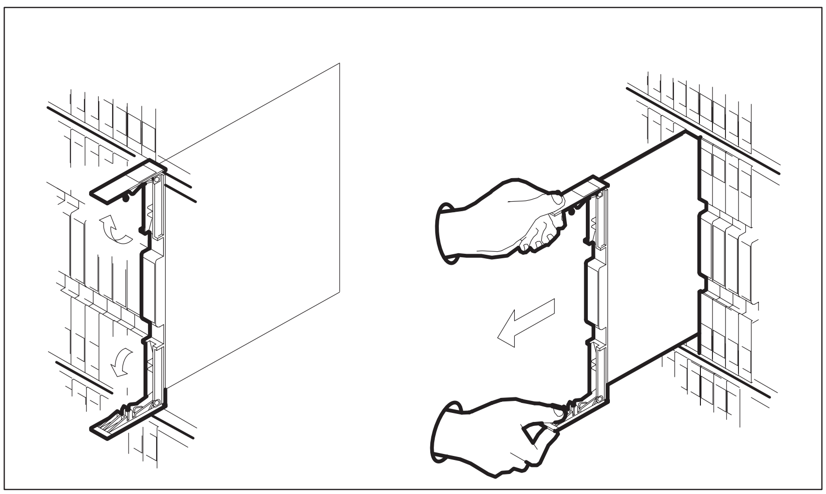
Remove the NT6X69 card as shown in the following figures.

NT6X69
SMS (continued)

a. Locate the card to be removed on the appropriate shelf.



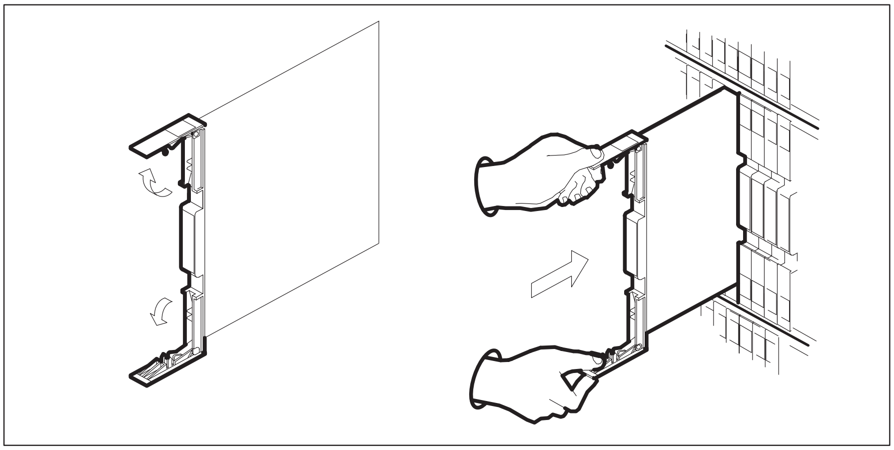
b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

NT6X69
SMS (continued)

13 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



14

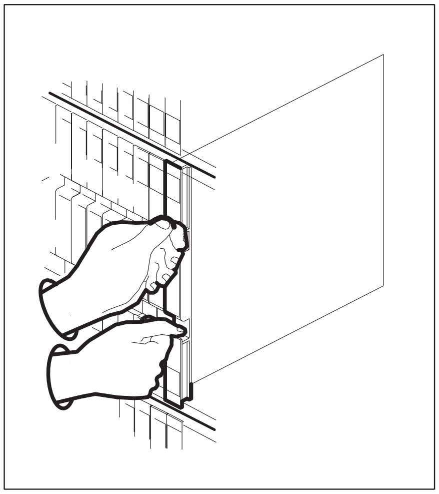
CAUTION
Loss of subscriber service
Subscriber service may be lost in the active unit when reseating the NT6X69 card. It is recommended that this procedure be performed during low-traffic periods.

Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

NT6X69
SMS (continued)

b. Close the locking levers.



15 Perform a full reset of the inactive unit by typing

>PMRESET UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

16 Use the following information to determine what step to go next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 22
other	step 17

17 Test the inactive SMS unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

NT6X69
SMS (continued)

If TST	Do
passed	step 18
failed	step 22

18 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the faulty SMS unit

If RTS	Do
passed	step 19
failed	step 23

At the frame

19 Remove the sign from the active SMS unit.

20 Send any faulty cards for repair according to local procedure.

21 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

Go to step 24.

22 Return to the maintenance procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

23 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

24 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT6X69
SMS (end)

25 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NT6X78
SMS

Application

Use this procedure to replace an NT6X78 card in an SMS.

PEC	Suffixes	Name
NT6X78	AA, AB	CLASS modem resource

Common procedures

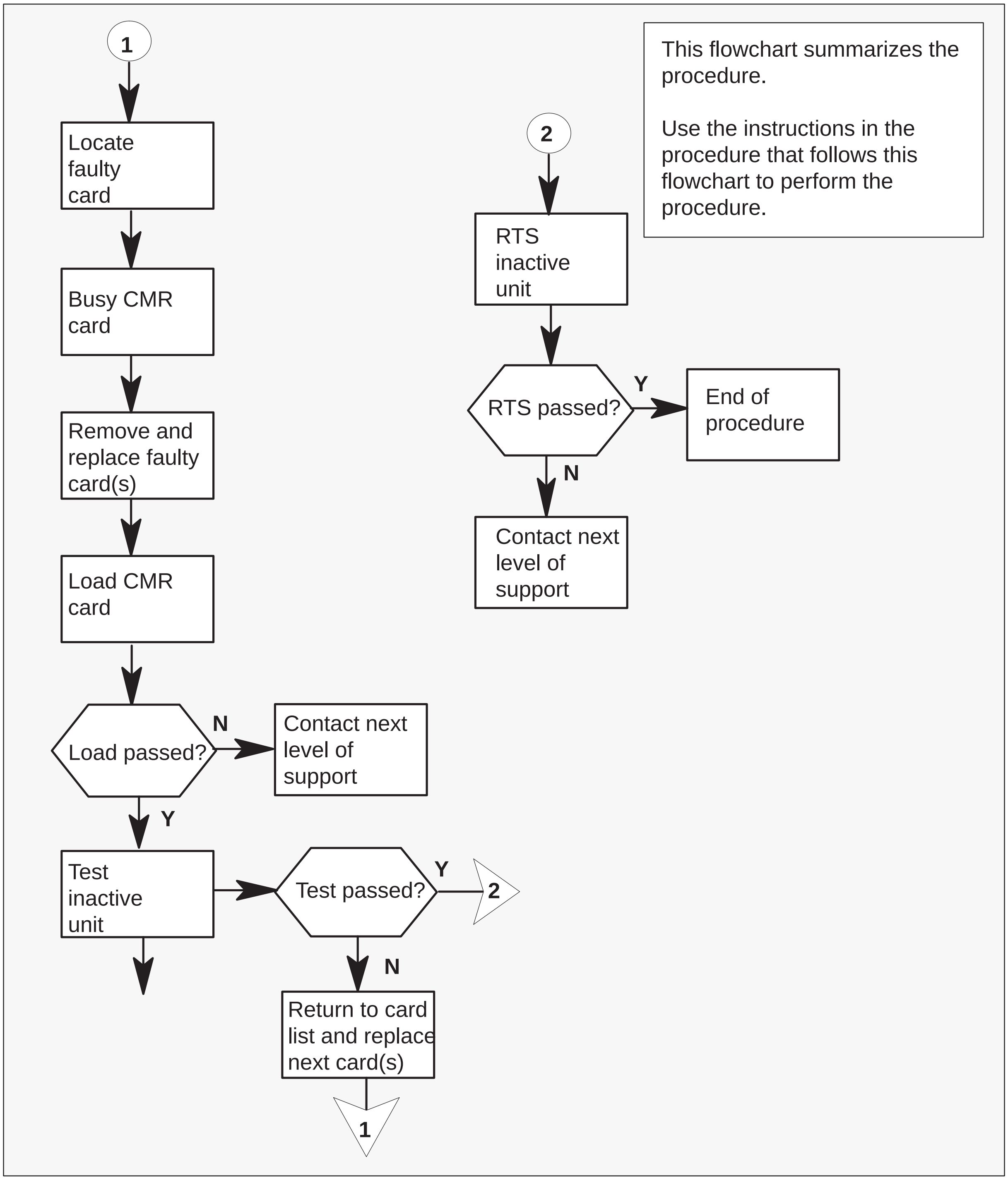
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X78
SMS (continued)

Summary of Card replacement procedure for an NT6X78 card in an SMS



Replacing an NT6X78 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 Access the PM level and find out which SMS is ISTb by typing

>MAPCI;MTC;PM;DISP STATE ISTB SMS
and pressing the Enter key.

Example of a MAP response

```
ISTb SMS: 1
```

4 Access the ISTb SMS by typing

>POST SMS sms_no
and pressing the Enter key.

where

sms_no   is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS 3   INSV    LINKS_OOS    CSIDE 0     PSIDE 0
   Unit0      Act       InSv
   Unit1     Inact      ISTb
```

NT6X78
SMS (continued)

5 Busy the CMR card by typing

>BSY UNIT unit_no CMR
and pressing the Enter key.

where

unit_no   is the number of the unit containing the faulty CMR card

At the frame

6

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

Put on a wrist strap.

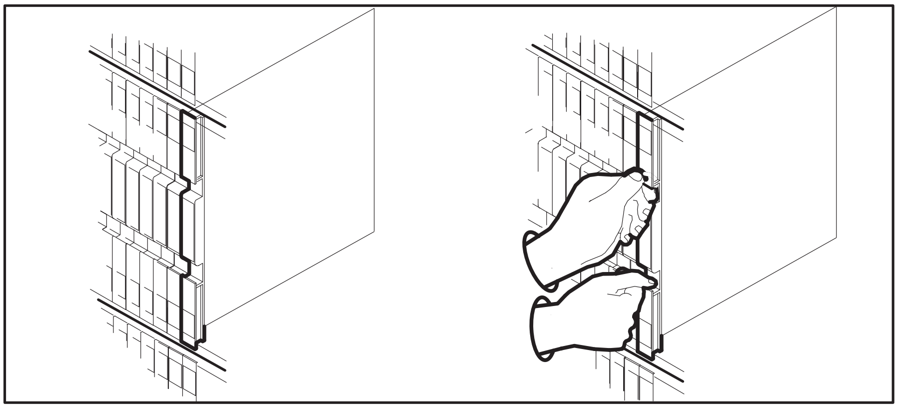
7

> **WARNING**
> **Equipment damage**
> When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

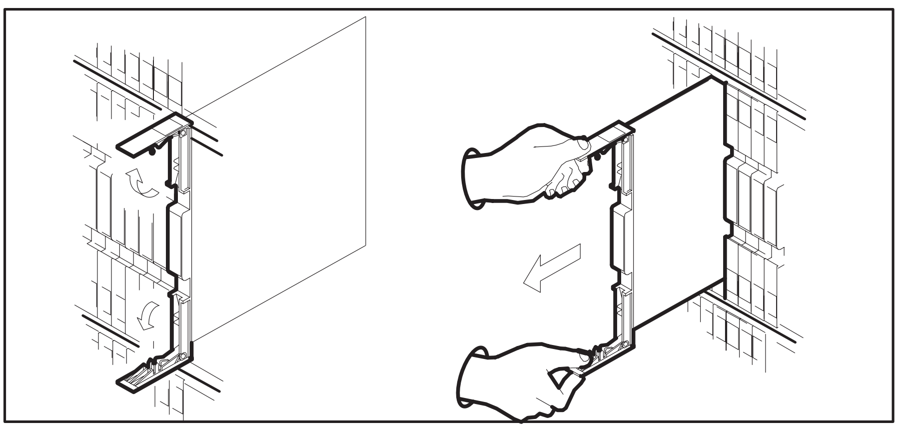
Remove the NT6X78 card as shown in the following figures.

NT6X78
SMS (continued)

a. Locate the card to be removed on the appropriate shelf.



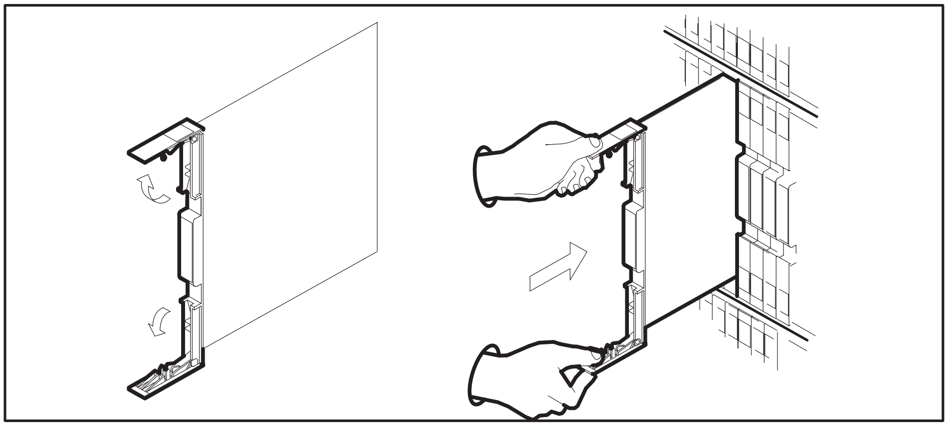
b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

NT6X78
SMS (continued)

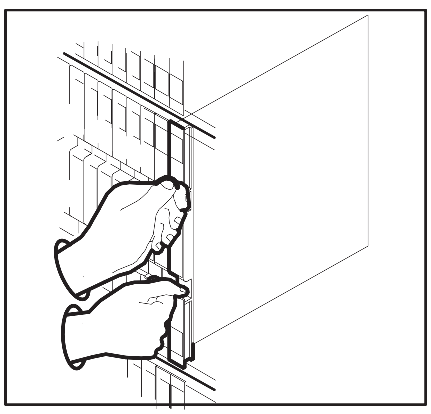
8 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



9 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



At the MAP terminal

10 Load the CMR card by typing

>LOADPM UNIT unit_no CMR
and pressing the Enter key.

where

unit_no   is the number of the unit containing the faulty CMR card

If load	Do
passed	step 11
failed	step 14

11 Test the CMR card by typing

>TST UNIT unit_no CMR
and pressing the Enter key.

where

unit_no is the number of the unit containing the faulty CMR card

If TST	Do
passed	step 12
failed	step 13

12 Return the CMR card to service by typing

>RTS UNIT unit_no CMR
and pressing the Enter key.

where

unit_no is the number of the unit containing the faulty CMR card

If RTS	Do
passed	step 16
failed	step 14

13 Return to the *Alarm Clearing Procedures* that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

14 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

NT6X78
SMS (end)

At the frame

15 Remove the sign from the active SMS unit.

16 Send any faulty cards for repair according to local procedure.

17 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

Go to step 18.

18 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT6X80
SMS

Application

Use this procedure to replace an NT6X80 card in an SMS.

PEC	Suffixes	Name
NT6X80	AA, BB	SCM pad/ring

Common procedures

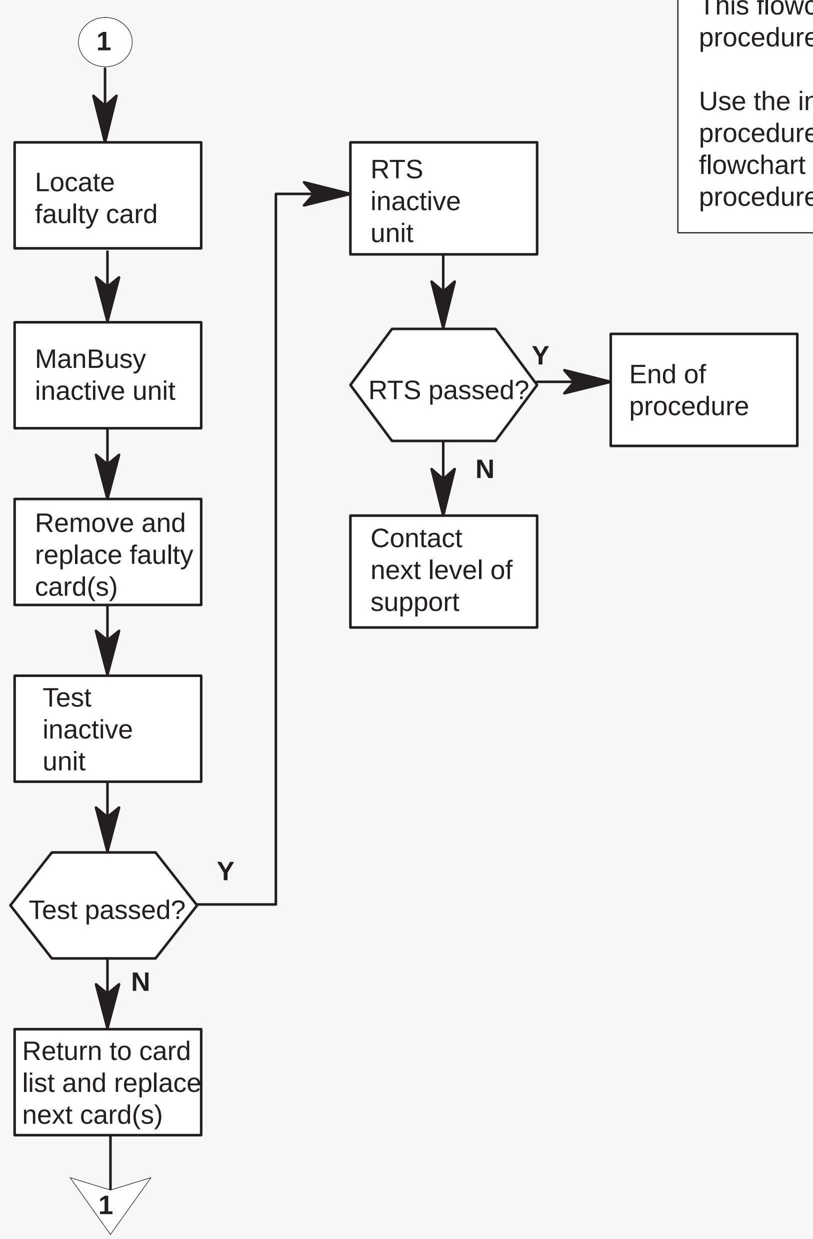
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X80
SMS (continued)

Summary of card replacement procedure for an NT6X80 card in an SMS



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

Replacing an NT6X80 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS  3   INSV    LINKS_OOS    CSIDE 0     PSIDE 0
   Unit0      Act       InSv
   Unit1     Inact      ISTb
```

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

NT6X80
SMS (continued)

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SwAct passed`	step 8
`SwAct failed`	step 7
`SwAct failed Reason: XPM SwActback`	step 7
`SwAct refused by SwAct controller`	step 7

7 Return to the “SMS alarm clearing procedures” section in this document to clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 6 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words: **Active unit—Do not touch.** This sign should not be attached with magnets or tape.

At the MAP terminal

9 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

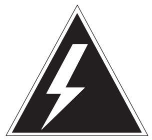
where

NT6X80
SMS (continued)

unit_no is the number of the faulty SMS unit

At the frame

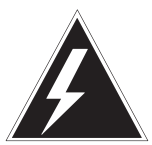
10



WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage by static electricity.

Put on a wrist strap.

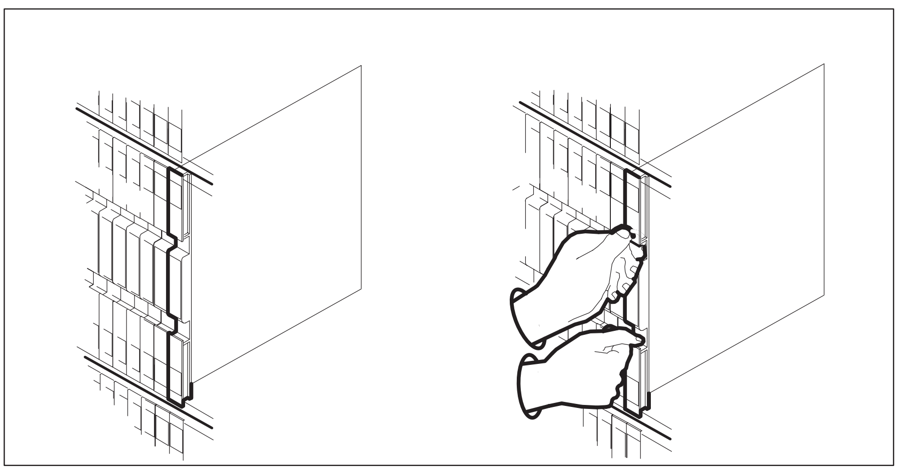
11



WARNING
Equipment damage
When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

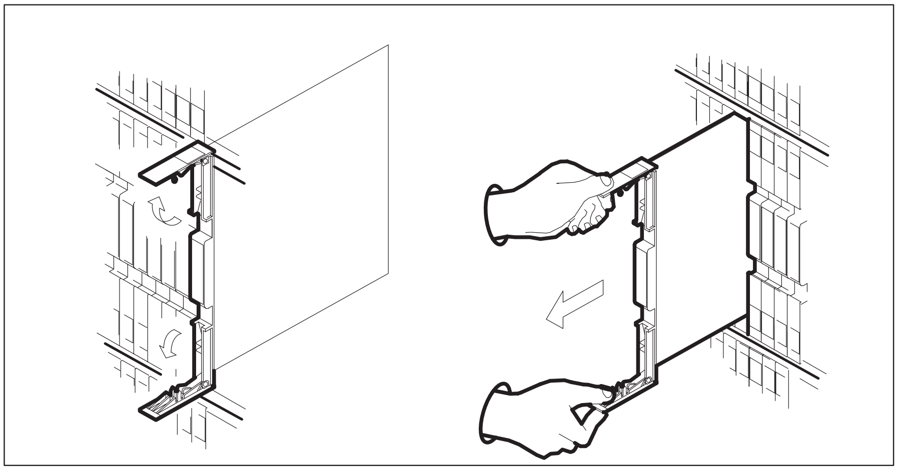
Remove the NT6X80 card as shown in the following figures.

a. Locate the card to be removed on the appropriate shelf.



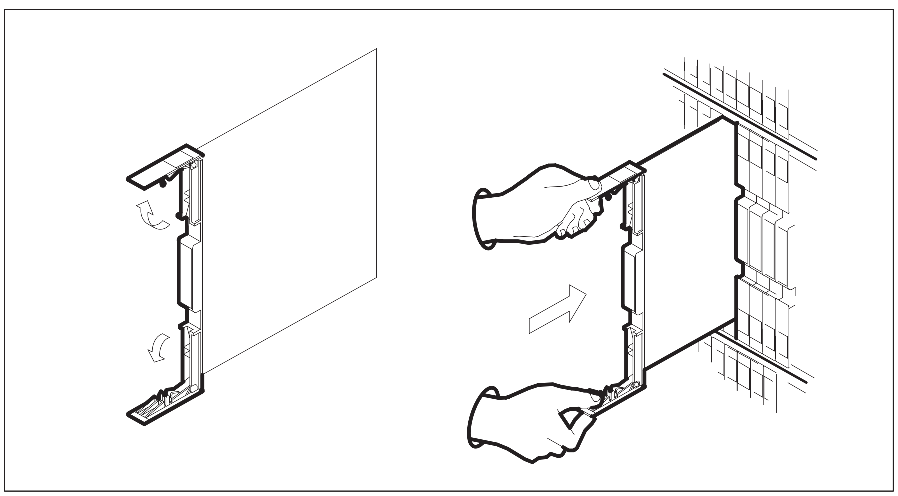
NT6X80
SMS (continued)

b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

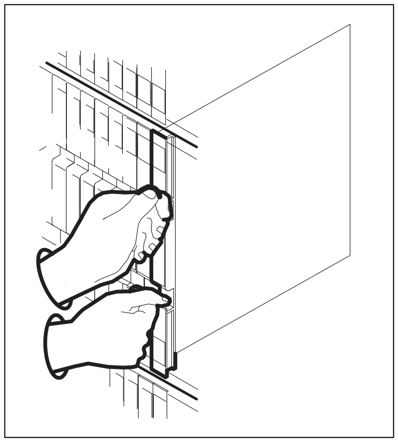
12 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



13 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



14 Use the following information to determine where to go next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 17
other	step 15

15 Test the inactive unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If TST	Do
passed	step 16
failed	step 17

16 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

NT6X80
SMS (end)

unit_no   is the number of the faulty SMS unit

If RTS	Do
passed	step 19
failed	step 18

17 Return to the maintenance procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

18 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

At the frame

19 Remove the sign from the active SMS unit.

20 Send any faulty cards for repair according to local procedure.

21 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

22 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

23 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NT6X85
SMS

Application

Use this procedure to replace an NT6X85 card in an SMS.

PEC	Suffixes	Name
NT6X85	AA, AB, AC	DS-1 interface for SLC-96

Common procedures

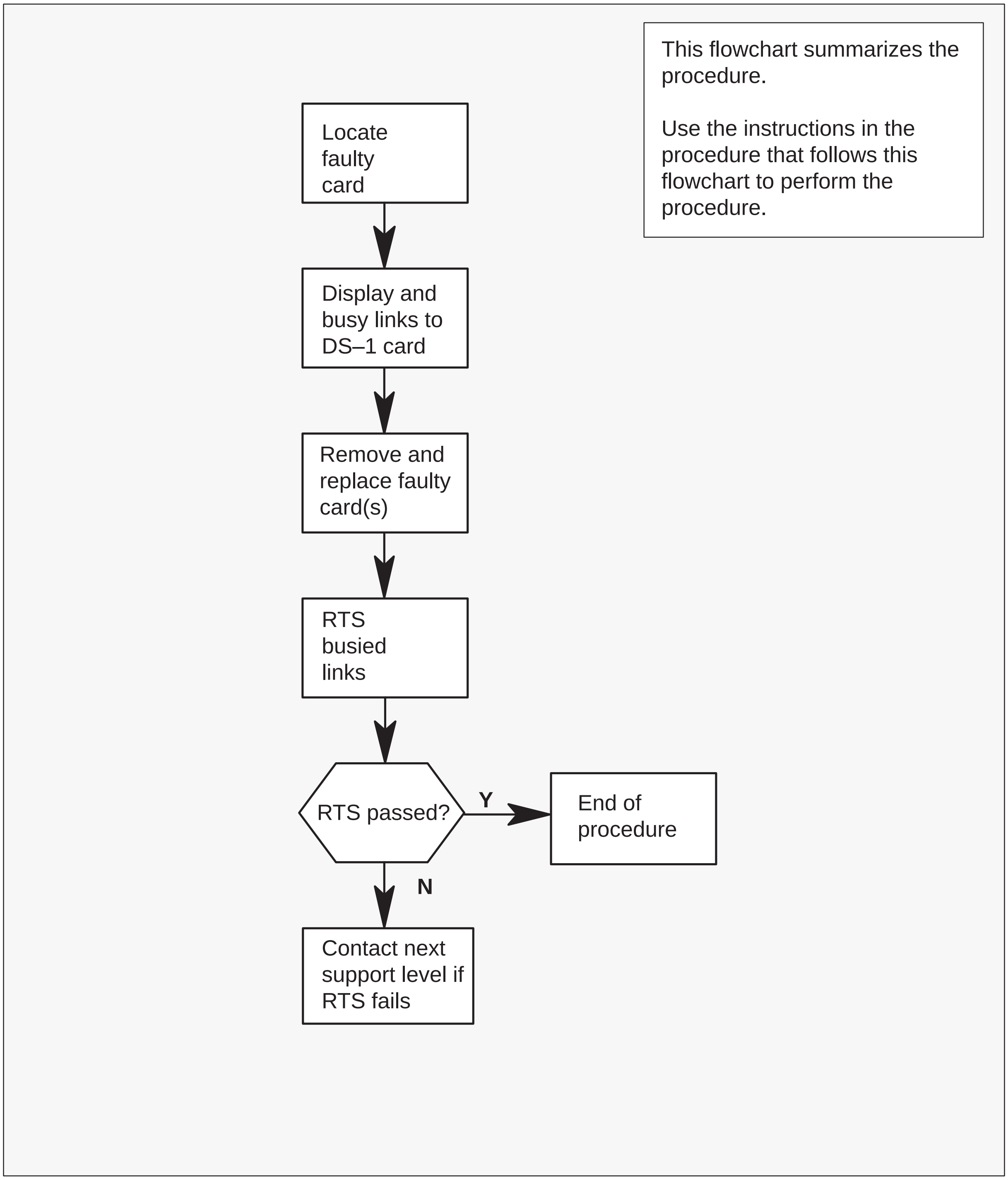
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X85
SMS (continued)

Summary of card replacement procedure for an NT6X85 card in an SMS



Replacing an NT6X85 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed and the dual in-line package (DIP) switch settings are the same as the card being replaced.

At the MAP terminal

3 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key

where

sms_no is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS  3   INSV    LINKS_OOS    CSIDE 0     PSIDE 1
Unit0      Act      InSv
Unit1     Inact     ISTb
```

NT6X85
SMS (continued)

4 Display the DS-1 links associated with the faulty DS-1 interface card by typing

>TRNSL P
and pressing the Enter key.

Record all link numbers, information on faulty links, and any protection line information. Each 6X85 card has 2 ports; for instance, ports 0 and 1 are on one 6X85 card. Look at the link, RCS location, and port numbers in the MAP display. The first line indicates that link 0 is routed to RCS location BRCS 00 0. Link 0 is a protection line.

Example of a MAP response

```
LINK 0: RCS    BRCS 00 0   ;Protline;
LINK 1: RCS    BRCS 00 1   ;Protline;
LINK 2: RCS    BRCS 00 2   0;CAP MS;STATUS:OK   ;MSGCOND:OPN
LINK 3: RCS    BRCS 00 2   1;CAP MS;STATUS:SysB  ;MSGCOND:CLS
```

If	Do
0 protection lines recorded in step 4	step 9
1 protection line recorded in step 4	step 5
2 or more protection lines recorded in step 4	step 7

5 Access the carrier level of the MAP display by typing

>TRKS;CARRIER;POST SMS mod_no link_no
and pressing the Enter key.

where

mod_no is 0–127 with an NT40 and 0–255 with DMS SuperNode
link_no is the number of a protection line connected to the faulty card

This command ensures a protection line will be displayed.

Example of a MAP response

```
CLASS     ML   OS   ALARM     SYSB MANB      UNEQ OFFL CBSY PBSY INSV
TRUNKS    0    0    0         0    0         0    0    0  0 0
REMOTE    0    0    0         5    1         0    0    1  0 10

NO  CLASS  SITE SMS  CKT  D     ALARM SLIP FRAME    BER  SES  STATE
0   REMOTE  BRSC 0   3    C           0    0        <–.7 0    SysB
```

6 Proceed to step 8.

7 Access the carrier level of the MAP display by typing

>TRKS;CARRIER;POST SMS mod_no link_no SMS mod_no link_no ...
and pressing the Enter key.

where

mod_no is 0–127 with an NT40 and 0–255 with DMS SuperNode
link_no is the number of a protection line connected to the faulty card

Note: As many as five SMS mod_no link_no commands can be executed in a string command, with spacing as shown in the command string here. This command ensures a protection line will be displayed.

Example of a MAP response

```
CLASS  ML OS   ALARM     SYSB MANB UNEQ  OFFL CBSY PBSY INSV
TRUNKS 0  0    0         0    0    0     0    0  0 0
REMOTE 0  0    0         5    1    0     0    1  0 10

NO   CLASS     SITE SMS  CKT  D    ALARM     SLIP FRAME BER SES  STATE
0    REMOTE    BRSC 0    2    C              0    0    <-.7 0    SysB
1    REMOTE    BRSC 0    3    C              0    0    <-.7 0    SysB
```

8 Busy the protection line or lines connected to the faulty NT6X85 card by typing

>BSY line_no
and pressing the Enter key.

where

line_no is the number of the protection line connected to the faulty NT6X85 card

Note 1: Protection line numbers are listed in the **NO** column in the MAP display response in step 7.

Note 2: Repeat this busy command for each protection line connected to the faulty card.

If	Do
both protection lines busied on same NT6X85 card	step 11
one protection line on NT6X85 card busied and other line on same card is unprotected	step 9

NT6X85
SMS (continued)

9 Access the PM level of the MAP display by typing

>PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS  3    INSV    LINKS_OOS    CSIDE 0     PSIDE 2
 Unit0      Act      InSv
 Unit1     Inact     ISTb
```

10 Busy all links connected to the faulty NT6X85 card by typing

>BSY LINK link_no
and pressing the Enter key.

where

link no is the number of the link connected to the faulty NT6X85 card

Repeat this command for each link to the faulty card.

At the frame

11

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity. Do not replace more than one NT6X85 card at a time.

Put on a wrist strap.

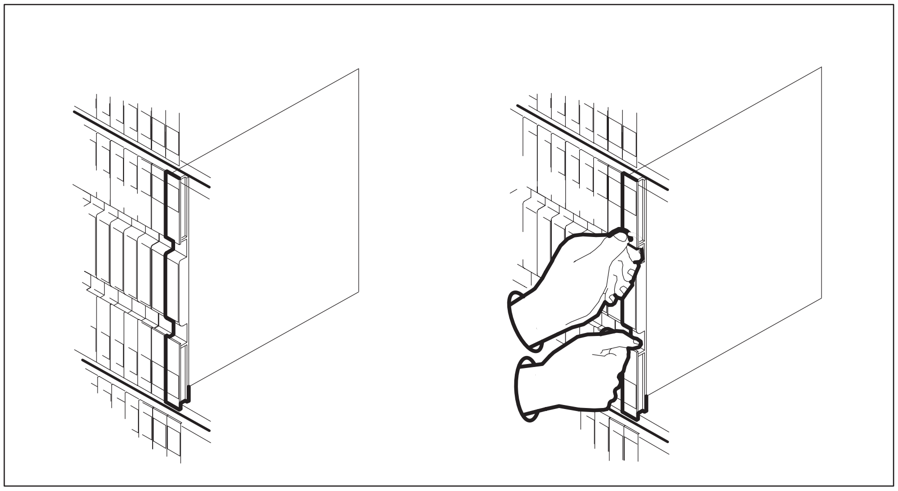
12

> **WARNING**
> **Equipment damage**
> When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

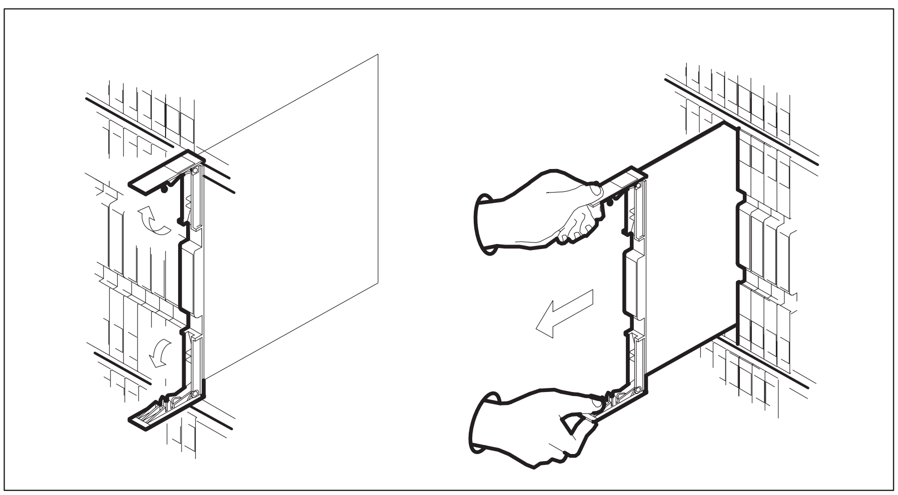
NT6X85
SMS (continued)

Remove the NT6X85 card as shown in the following figures.

a. Locate the card to be removed on the appropriate shelf.



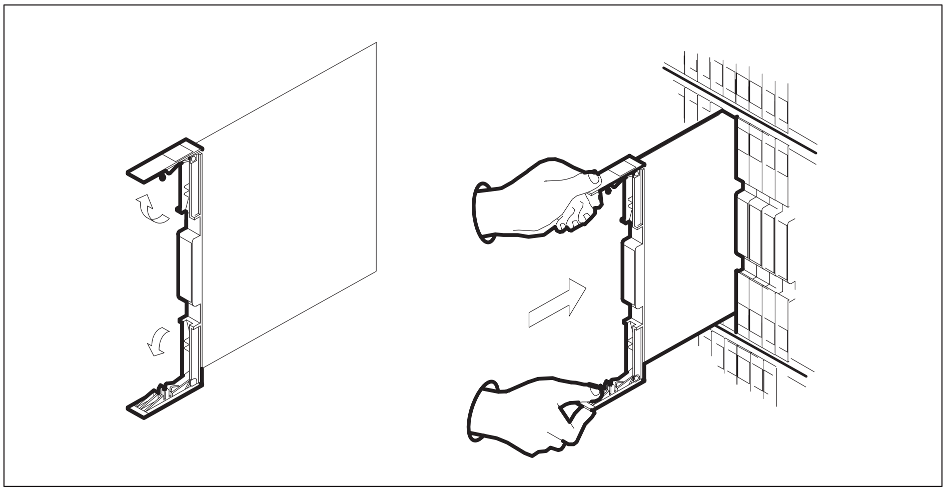
b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

NT6X85
SMS (continued)

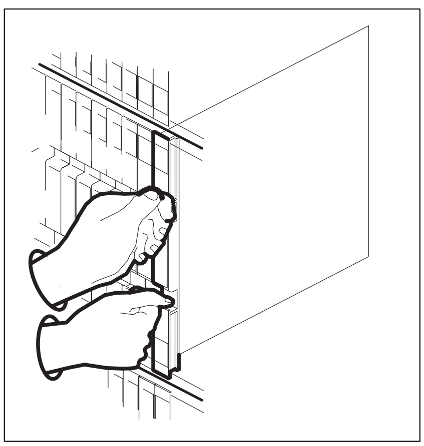
13 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



14 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



NT6X85
SMS (continued)

15 Use the following information to determine what step to go to next in this procedure.

If	Do
one protection line busied in step 8 and you are at the PM level	step 5, then step 16
two protection lines busied in step 8 and you are at carrier level	step 16
no protection lines were busied	step 17

At the MAP terminal

16 Return all busied protection lines to service by typing

>RTS line_no
and pressing the Enter key.

where

line_no is the number of the protection line connected to the new NT6X85 card

Repeat this command for each busied protection line.

If	Do
no protection line returned to service	step 21
one protection line returned to service and another link was busied at the PM level	step 9, then step 17
two protection lines returned to service	step 17

17 Return all busied links to service by typing

>RTS LINK link_no
and pressing the Enter key

where

link_no is the number of the link connected to the faulty NT6X85 card

NT6X85
SMS (end)

Repeat this command for each busied link.

If RTS	Do
passed	step 18
failed	step 21

18 Send any faulty cards for repair according to local procedure.

19 Note in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

20 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

21 Contact the appropriate support personnel if busied links do not return to service.

NT6X86
SMS

Application

Use this procedure to replace an NT6X86 card in an SMS.

PEC	Suffixes	Name
NT6X86	AB	A-bit message card

Common procedures

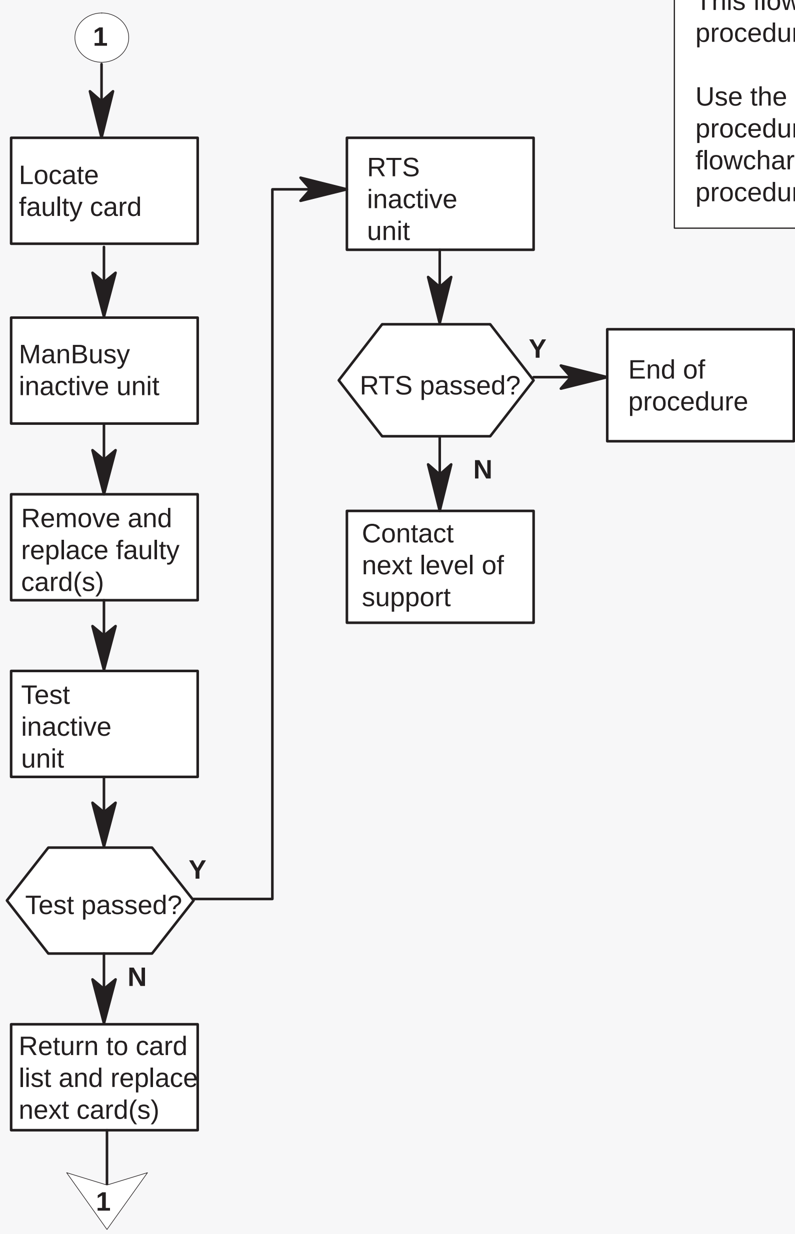
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X86
SMS (continued)

Summary of card replacement procedure for an NT6X86 card in an SMS



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

Replacing an NT6X86 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

CAUTION
Loss of service
When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

Note: When the SMS peripheral is equipped with XPM PLUS (NTMX77AA Unified Processor), the NT6X86AB card is required. The 6X86AB is backward compatible and can be used with the Master Processor/Signal Processor (MP/SP) complex (NT6X45, 6X46, 6X47). The 6X86AA version can be used only in MP/SP SMSs and *cannot* be used in XPM PLUS equipped SMSs. When replacing the NT6X86 card, ensure the correct card is replaced with the appropriate AA or AB version.

At the MAP terminal

3 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is 0–127 for NT40 and 0–255 for DMS SuperNode

Example of a MAP response

```
SMS 3   INSV    LINKS_OOS    CSIDE 0     PSIDE 0
   Unit0      Act      InSv
   Unit1     Inact     ISTb
```

NT6X86
SMS (continued)

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SwAct passed`	step 8
`SwAct failed`	step 7
`SwAct failed Reason: XPM SwActback`	step 7
`SwAct refused by SwAct controller`	step 7

NT6X86
SMS (continued)

7 Return to the “SMS alarm clearing procedures” section in this document to clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 6 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words: **Active unit—Do not touch**. This sign should not be attached by magnets or tape.

At the MAP terminal

9 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

At the frame

10

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

Put on a wrist strap.

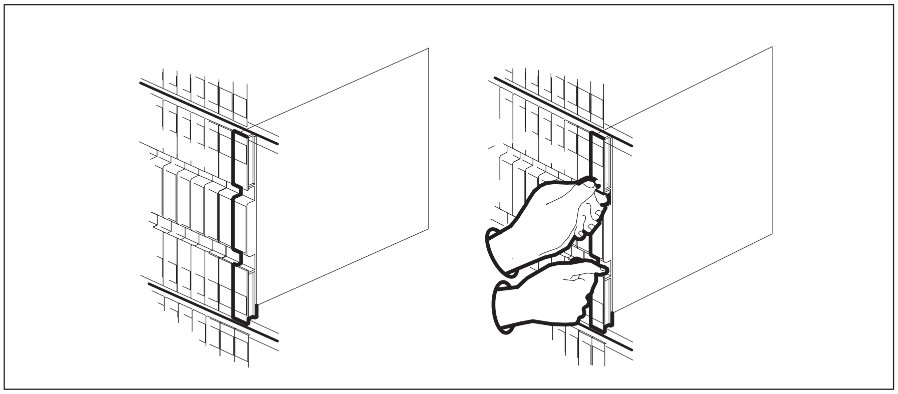
11

WARNING
Equipment damage
When removing or inserting a card, do not apply pressure to the components and do not force the cards into the slots.

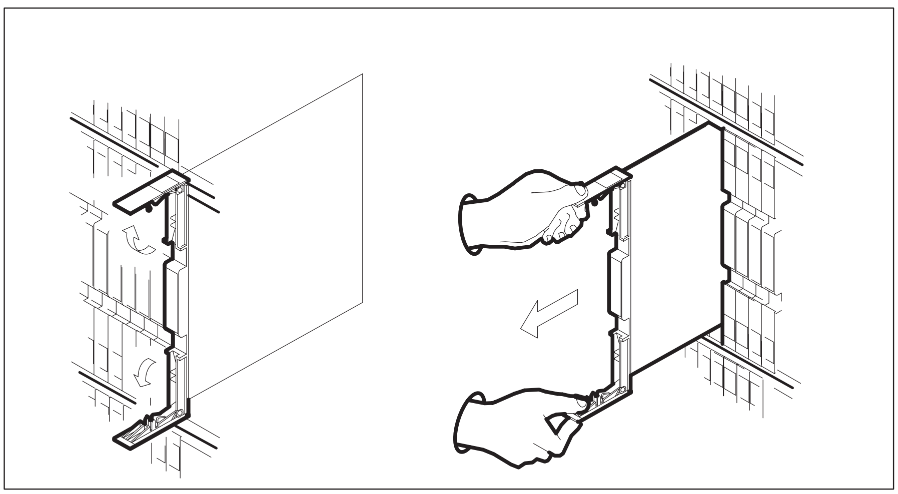
Remove the NT6X86 card as shown in the following figures.

NT6X86
SMS (continued)

a. Locate the card to be removed on the appropriate shelf.



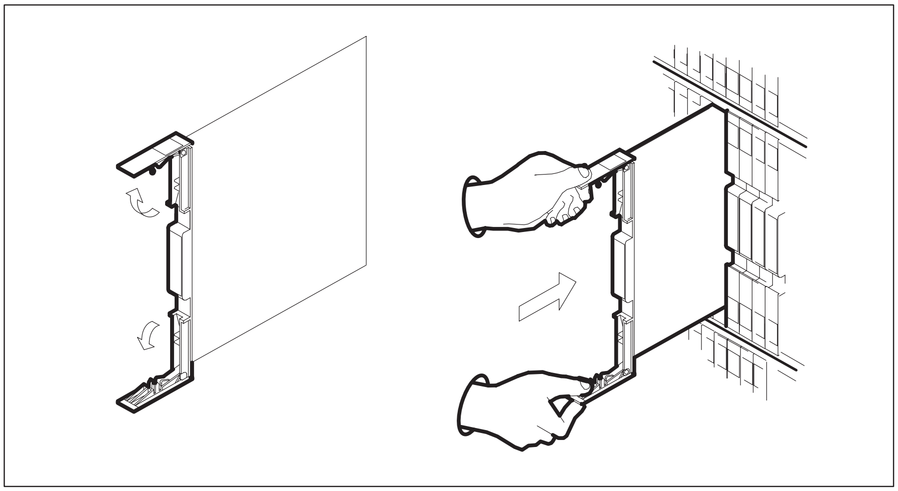
b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

NT6X86
SMS (continued)

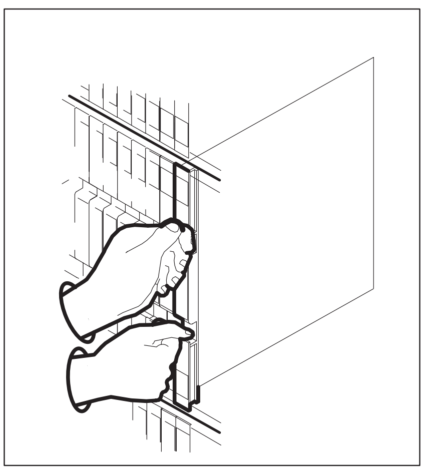
12 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



13 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



NT6X86
SMS (continued)

14 Use the following information to determine what step to go to next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 17
other	step 15

15 Test the inactive unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If TST	Do
passed	step 16
failed	step 17

16 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

If RTS	Do
passed	step 19
failed	step 18

17 Return to the maintenance procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

NT6X86
SMS (end)

18 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

At the frame

19 Remove the sign from the active SMS unit.

20 Send any faulty cards for repair according to local procedure.

21 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

22 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

23 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NT6X92
SMS

Application

Use this procedure to replace an NT6X92 card in an SMS.

ATTENTION
To ensure peak performance, do not install the UTR and GTR on the same SMS. Presently, there is no way of knowing which receiver is used to interpret tones. Some call processing tones may be degraded if designed for use with a GTR.

PEC	Suffixes	Name
NT6X92	BB, BC	Universal tone receiver (UTR)
NT6X92	EA	Global tone receiver (GTR)

Common procedures

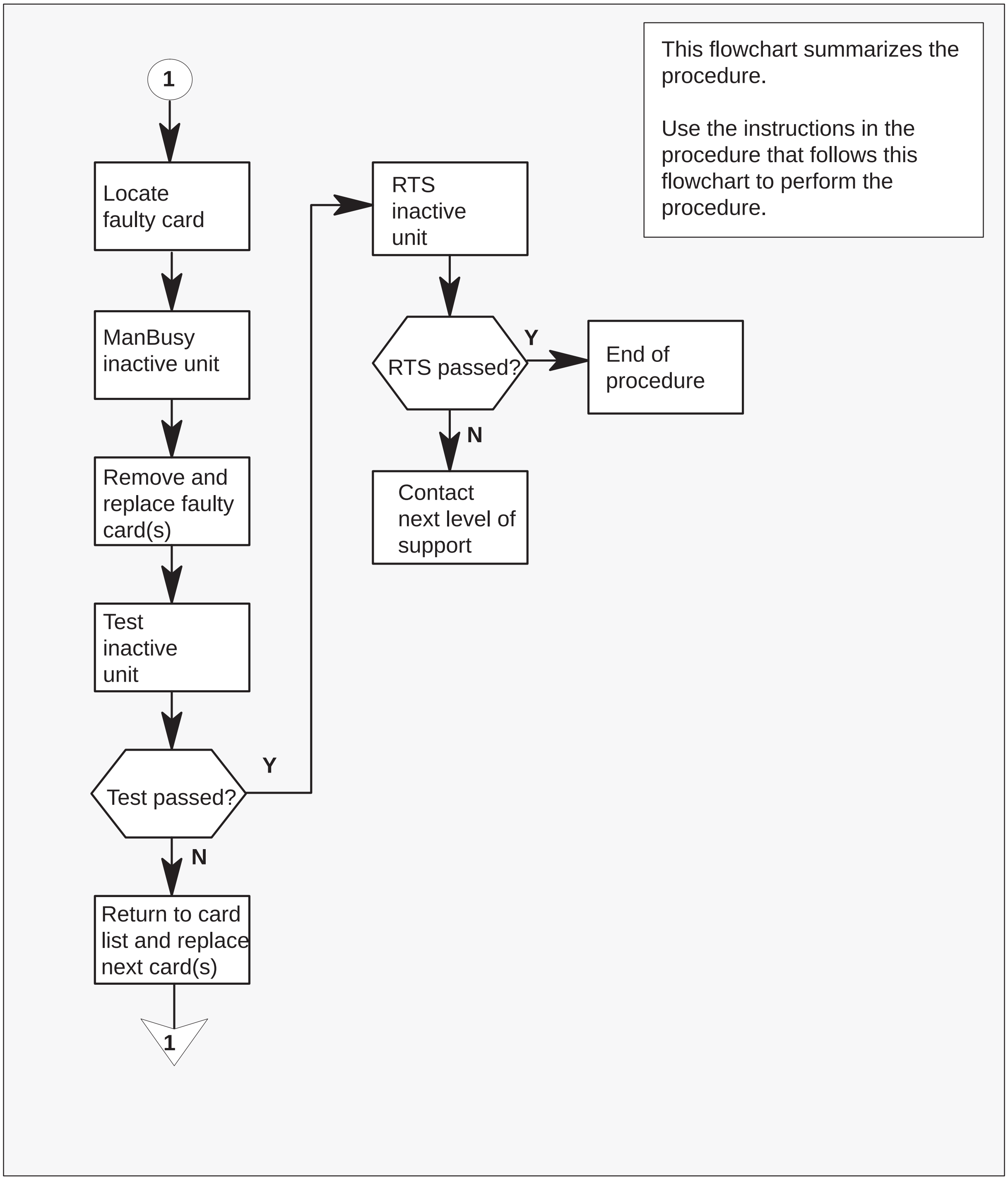
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X92
SMS (continued)

Summary of card replacement procedure for an NT6X92 card in an SMS



NT6X92
SMS (continued)

Replacing an NT6X92 card in an SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 Access the PM level of the MAP display and post the faulty SMS by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is 0–127 range for NT40 and 0–255 range for DMS SuperNode

Example of a MAP response

```
  SMS 3     INSV    LINKS_OOS    CSIDE 0     PSIDE 0
 Unit0      Act      InSv
 Unit1     Inact     ISTb
```

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

NT6X92
SMS (continued)

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SwAct passed`	step 8
`SwAct failed`	step 7
`SwAct failed Reason: XPM SwActback`	step 7
`SwAct refused by SwAct controller`	step 7

7 Return to the *Alarm Clearing Procedures.* Clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 1 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words: **Active unit—Do not touch.** This sign should not be attached with magnets or tape.

At the MAP terminal

9 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

NT6X92
SMS (continued)

At the frame

10

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point at the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

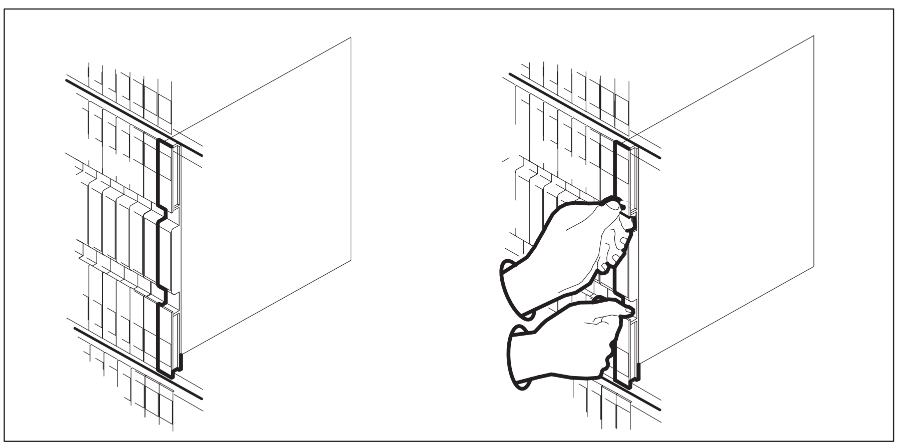
Put on a wrist strap.

11

WARNING
Equipment damage
When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

Remove the NT6X92 card from slot 17 as shown in the following figures.

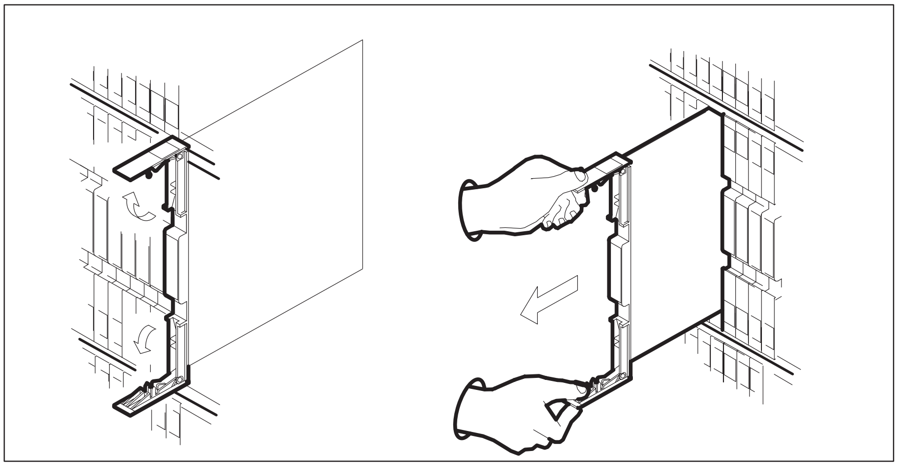
a. Locate the card to be removed on the appropriate shelf.



b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.

c. Verify the replacement card has the same PEC, including suffix, as the card you just removed.

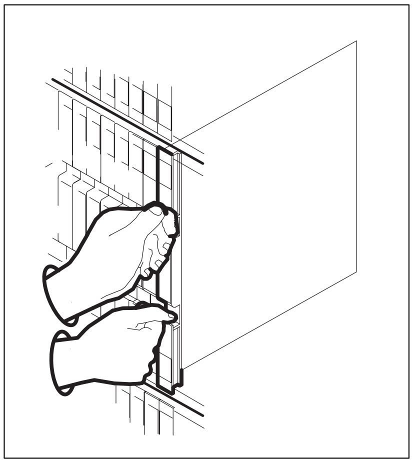
12 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



13 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



NT6X92
SMS (continued)

14 Use the following information to determine where to go next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 17
other	step 15

15 Test the inactive unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the faulty SMS unit

If TST	Do
passed	step 16
failed	step 17

16 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the faulty SMS unit

If RTS	Do
passed	step 19
failed	step 18

17 Return to the *Alarm Clearing Procedures* that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

18 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

NT6X92
SMS (end)

At the frame

19 Remove the sign from the active SMS unit.

20 Send any faulty cards for repair according to local procedure.

21 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

22 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

23 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NT7X05
SMS

Application

Use this procedure to replace the following card in an SMS.

PEC	Suffixes	Name
NT7X05	AA	Peripheral loader

Common procedures

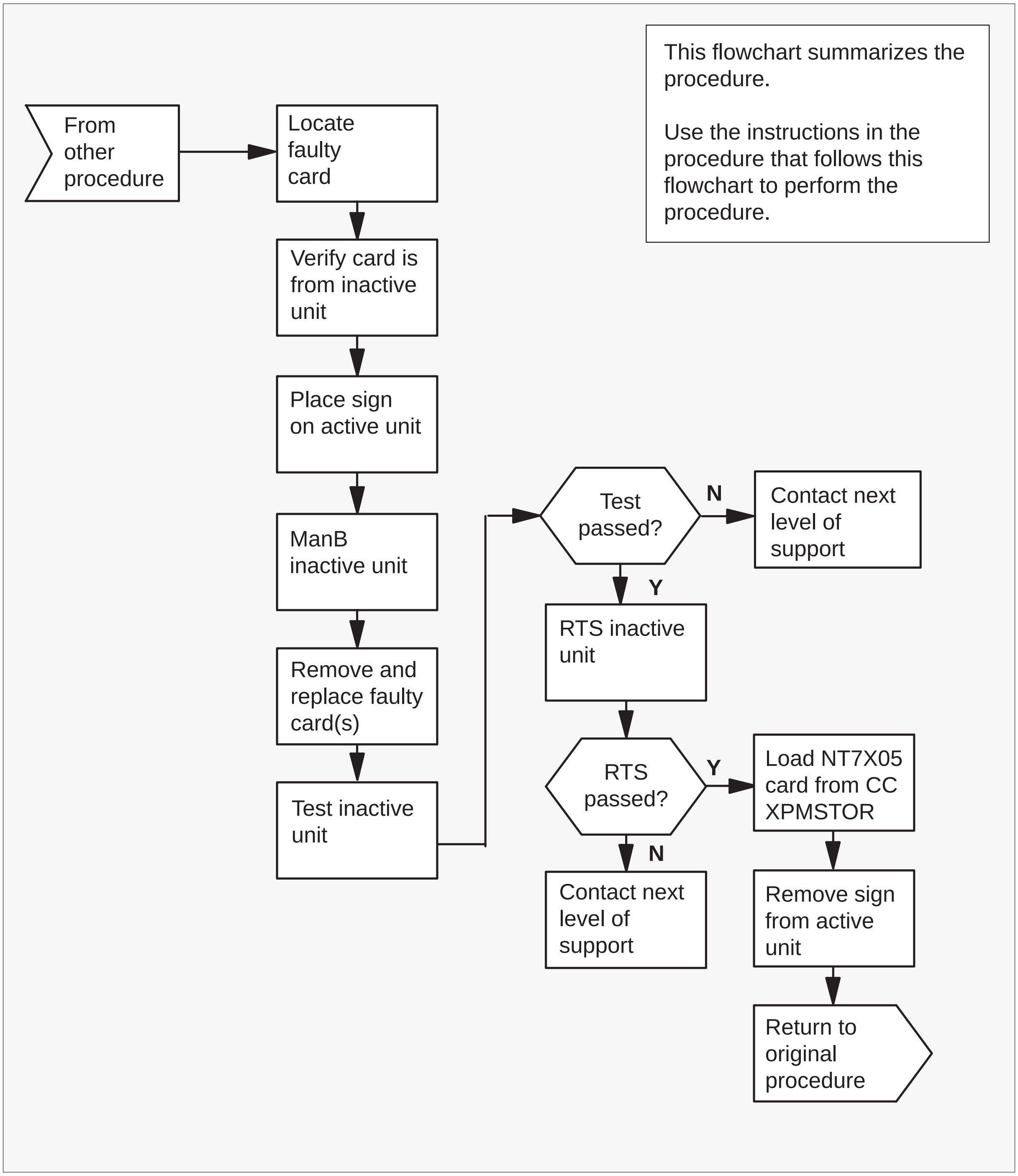
None

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT7X05
SMS (continued)

Summary of card replacement procedure for an NT7X05 card in an RSC SMS



NT7X05
SMS (continued)

Replacing an NT7X05 card in an SMS

At your Current Location

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to verify or accept cards, or were directed to this procedure by your maintenance support group.

2

CAUTION
Loss of service
When replacing a card in the SMS ensure the unit where you are replacing the card is INACTIVE and the mate unit is ACTIVE.

Obtain a replacement card. Ensure the replacement card has the same product equipment code (PEC) including suffix, as the card to be removed.

At the MAP display

3 Access the PM level and post the SMS by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

NT7X05
SMS (continued)

sms_no is the number of the SMS to be busied

Example of a MAP display:

```
   CM    MS    IOD    Net    PM    CCS    LNS    Trks    Ext    APPL
   .     .      .      .    1SMS    .      .       .      .      .

SMS                 SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit    PM        0        0        2        0        2         25
 2 Post_   SMS       0        0        0        0        1          1
 3 ListSet
 4          SMS      0 ISTb  Links_OOS:  CSide  0, PSide   0
 5 TRNSL_   Unit0:   Inact ISTb
 6 TST_     Unit1:   Act   InSv
 7 BSY_
 8 RTS_
 9 OffL
10 LoadPM_
11 Disp_
12 Next
13
14 QueryPM
15
16 IRLINK
17 Perform
18
```

4 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If the faulty card is on an	Do
ACTIVE unit	step 5
INACTIVE unit	step 8

5 Switch the processing activity to the inactive unit by typing

>SWACT
and pressing the Enter key.

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 21

NT7X05
SMS (continued)

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
SWACT passed	step 8
SWACT failed	step 7
SWACT failed Reason: XPM SWACTback	step 7
SWACT refused by SWACT controller	step 7

7 Return to the “SMS alarm clearing procedures section of this document to clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 1 of this procedure.

At the frame

8 Put a sign on the active unit bearing the words **Active unit—Do not touch.**

At the MAP display

9 Busy the inactive SMS unit by typing

>BSY INACTIVE
and pressing the Enter key.

At the frame

10

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

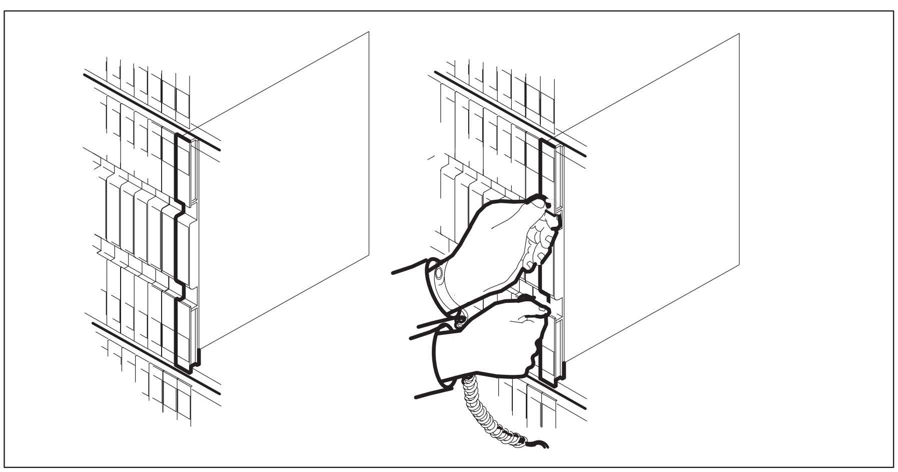
WARNING
Equipment damage
Take the following precautions when removing or inserting a card:
1. Do not apply direct pressure to the components.
2. Do not force the cards into the slots.

Put on a wrist strap.

11 Remove the NT7X05 card as shown in the following figures.

a. Locate the card to be removed on the appropriate shelf.

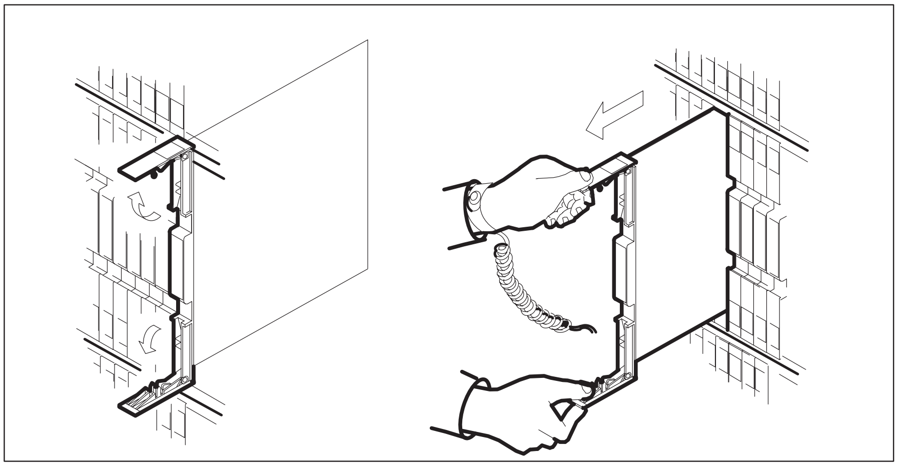
FW-xxxxx



NT7X05
SMS (continued)

b. Open the locking levers on the card to be replaced and gently pull the card towards you until it clears the shelf.

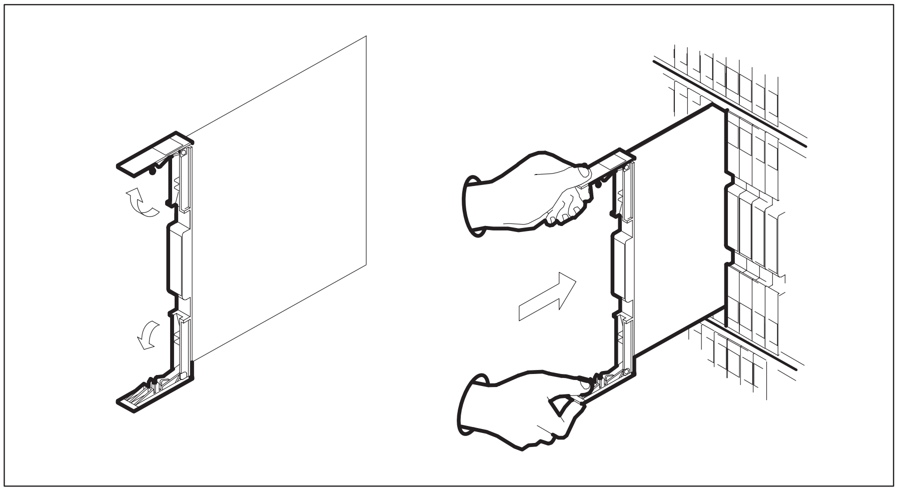
FW-xxxxx



c. Ensure the replacement card has the same PEC, including suffix, as the card you just removed.

12 Open the locking levers on the replacement card.

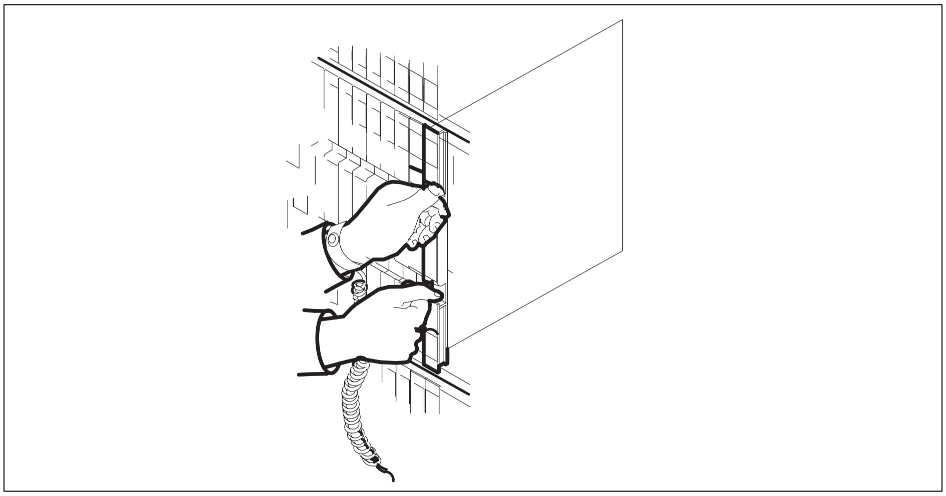
a. Align the card with the slots in the shelf and gently slide the card into the shelf.



13 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



At the MAP display

14 Test the inactive SMS unit by typing

>TST UNIT sms_unit_no
and pressing the Enter key.

where

sms_unit_no is the number of the inactive SMS unit

Example of a MAP response:

`Test Passed`
or

`Test Failed`

If TST	Do
passed	step 15
failed	step 19

NT7X05
SMS (continued)

15 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the SMS unit (0 or 1) tested in step 14

If TST	Do
passed	step 16
failed	step 19

16 Load the 7X05 card in the inactive SMS unit by typing

>XPMSTOR INACTIVE CC [loadfile_name]
and pressing the Enter key.

where

file_name is an optional source file name, if not included the file name in the field LOAD in table LTCINV will be used.

If load	Do
passed	step 17
failed	step 19

17 Send any faulty cards for repair according to local procedure.

18 Record the following items in office records:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

Go to step 20.

19 Obtain further assistance in replacing this card by contacting personnel responsible for higher level of support.

NT7X05
SMS (end)

20 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

21 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NTMX71
SMS

Application

Use this procedure to replace a NTMX71 card in a SMS.

PEC	Suffixes	Name
NTMX71	AA	XPM Plus Terminator Paddleboard

Common procedures

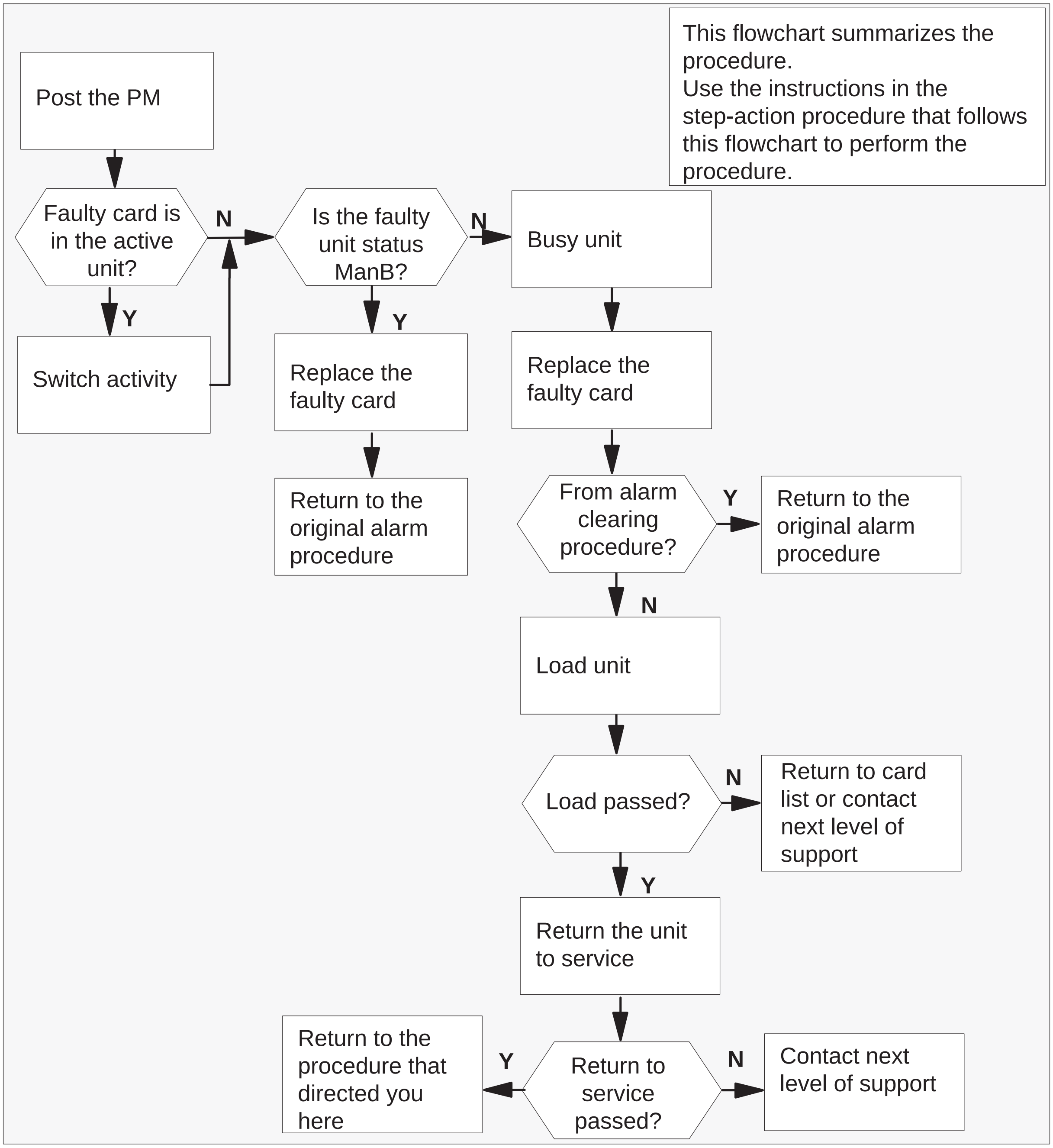
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTMX71
SMS (continued)

Summary of card replacement procedure for a NTMX71 card in a SMS



NTMX71
SMS (continued)

Replacing a NTMX71 card in a SMS

At your Current Location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Obtain a replacement card. Ensure the replacement card has the same product engineering code (PEC), including suffix, as the card being removed.

At the MAP terminal

3 Ensure the current MAP display is at the PM level and post the SMS by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is the number of the SMS being posted

Example of a MAP response

```
SMS     SysB  ManB  Offl  CBsy  ISTb  InSv
PM         3     0     1     0     2    13
SMS        0     0     0     0     1     7

SMS 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact ISTb
```

4 Observe the MAP display and determine if the faulty card is in the active or the inactive unit. The example in step 3 shows the status of the PM as in-service (InSv) on the active unit and in-service trouble (ISTb) on the inactive unit.

If the faulty card is in the	Do
active unit	step 5
inactive unit	step 12

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Confirm the system prompt by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 12
`SWACT failed Reason: XPM SWACTback`	step 7
`SWACT refused by SWACT Controller`	step 8

7 The inactive unit could not establish two-way communication with the central control and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 9.

8 The SWACT controller does not recommend a SWACT for one of the following reasons:

- IMC link failures
- message link failures
- parity audit failures
- superframe sync failures
- inactive unit was unable to keep activity last time
- dropping activity

NTMX71
SMS (continued)

- pre-SWACT query failure
- unit is jammed inactive
- unit is in overload
- pre-SWACT difficulties

You must clear all faults on the inactive unit and switch activity to the inactive unit before attempting to change the faulty card on the active unit.

9 A problem has been detected as a result of your attempt to SWACT to the inactive unit. Check the alarm banner for alarms.

If there is a	Do
new alarm	step 10
no new alarm	step 33

10 Go to the appropriate procedure in the “SMS alarm clearing procedures” section of this document to determine what steps to take to clear the problem on the inactive unit.

Clear the problem then return to this step.

11 When the trouble on the inactive unit is cleared, force a SWACT to the active unit by typing

>SWACT FORCE
and pressing the Enter key.

At the equipment frame

12 Hang a sign on the active unit bearing the words: **Active unit—Do not touch.** This sign should not be attached by magnets or tape.

At the MAP terminal

13 Observe the MAP display and determine the state of the inactive unit. The example in step 3 shows the status of the PM as in-service on the active unit and in-service trouble on the inactive unit.

If state is	Do
`ManB`	step 19
`SysB, CBsy, ISTb, or InSv`	step 14

NTMX71
SMS (continued)

14 Busy the inactive PM unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the inactive SMS unit (0 or 1)

15 Set the PM to the ROM level by typing

>PMRESET UNIT unit_no NORUN
and pressing the Enter key.

where

unit_no   is the number of the faulty SMS unit

At the equipment frame

16

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity.

WARNING
Equipment damage
Take the following precautions when removing or inserting a card:
1. Do not apply direct pressure to the components.
2. Do not force the cards into the slots.

Put on a wrist strap.

17 Unseat the NT6X41 card.

18 Unseat the NTMX77 card.

19 Using a slot screwdriver, loosen the screws from the two brackets that secure the NTMX71 card to the backplane in slot 19. Keep the screws in place on the backplane.

NTMX71
SMS (continued)

20

> **DANGER**
> **Risk of eye or facial injury**
> When removing the NTMX77 card, do not jerk the paddleboard from the backplane pins. Instead, gently rock the paddleboard off the packplane pins.

Remove the NTMX71 card.

21 Place the card you have removed in an electrostatic discharge (ESD) protective container.

22 Line up the holes on the brackets of the replacement card with the holes on the backplane of slot 19.

23 Using a slot screwdriver, secure the card to the backplane with the screws that were loosened in step20. Ensure the fiber washer is between the brackets of the replacement card and the backplane before tightening the screws.

24 Reseat the NTMX77.

25 Reseat the NT6X41 card.

26 Use the following information to determine the next step.

If you were directed here from	Do
alarm and trouble clearing procedures	step 30
other	step 27

At the MAP terminal

27 Load the inactive SMS unit by typing

>LOADPM UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the busied SMS unit (0 or 1)

If load	**Do**
passed	step 28
failed	step 33

28 Test the inactive SMS unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the SMS unit loaded in step 27

If TST	**Do**
passed	step 29
failed	step 33

29 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the SMS unit tested in step 28

If RTS	**Do**
passed	step 30
failed	step 33

At the equipment frame

30 Remove the sign from the active SMS unit.

31 Send any faulty cards for repair according to local procedure.

NTMX71
SMS (end)

32 Note the following in the office records:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

Go to step 34.

33 For further assistance, contact the personnel responsible for the next level of support.

34 You have completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

35 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

NTMX77
SMS

Application

Use this procedure to replace an NTMX77 card in an SMS.

PEC	Suffixes	Name
NTMX77	AA	Unified processor (UP)

Common procedures

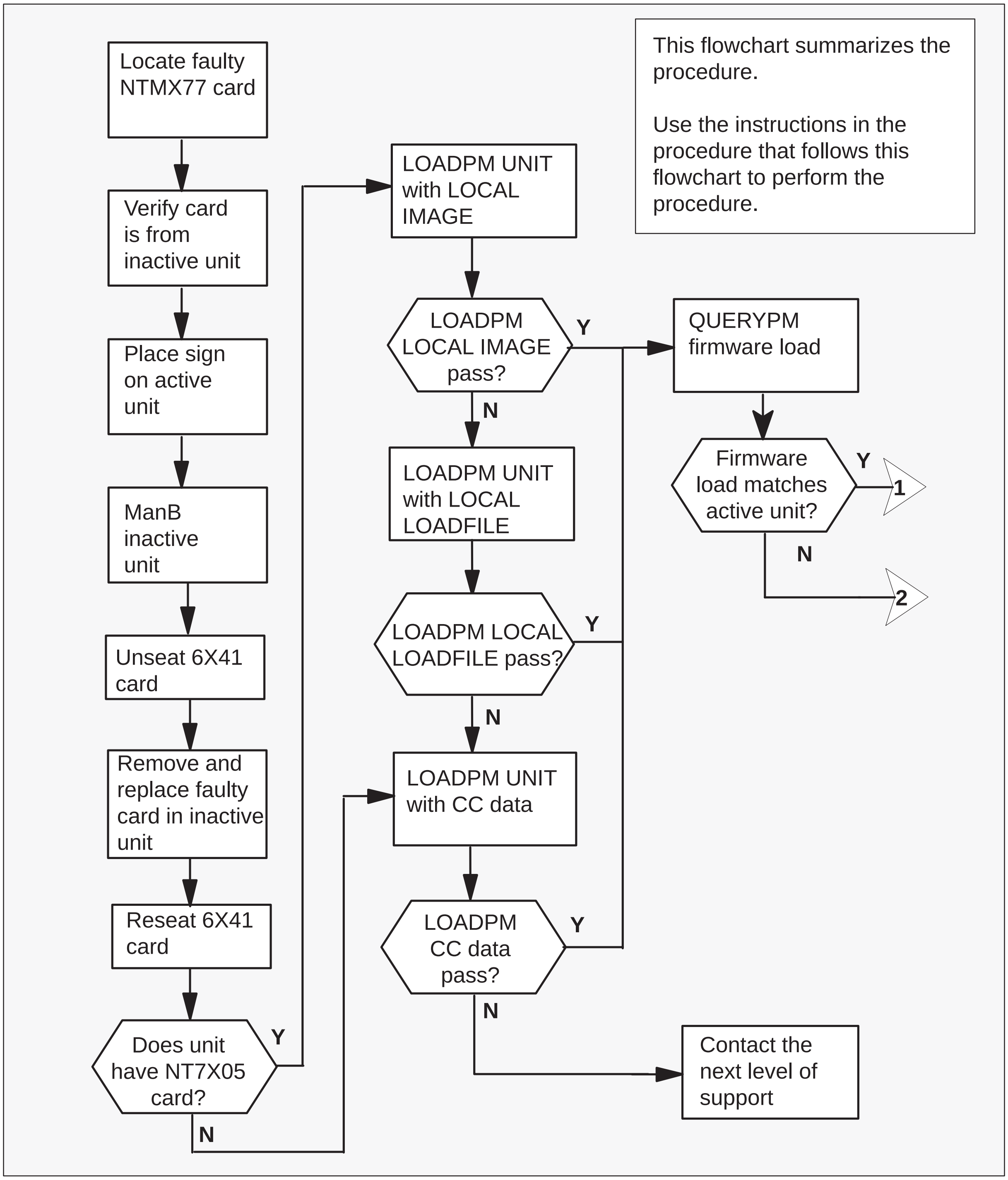
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

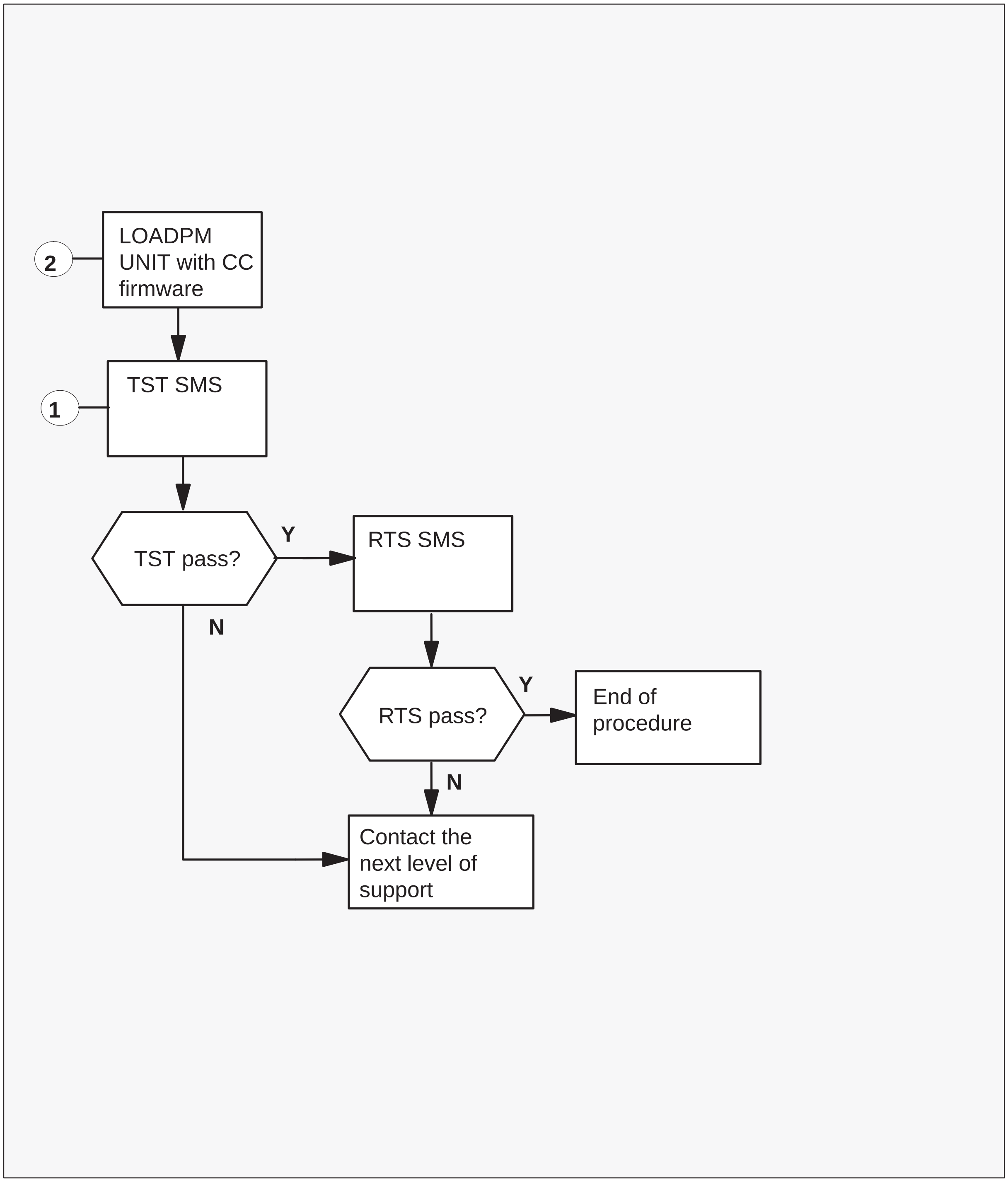
NTMX77
SMS (continued)

Summary of card replacement procedure for an NTMX77 card in an SMS



NTMX77
SMS (continued)

Summary of card replacement procedure for an NTMX77 card in an SMS



NTMX77
SMS (continued)

Replacing an NTMX77 card in an SMS

At your Current Location

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or were directed to this procedure by your maintenance support group.

2

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMS, ensure the unit where you are replacing the card is inactive and the mate unit is active.

Obtain a replacement card. Verify the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

3 Access the PM level of the MAP terminal by typing

>MAPCI;MTC;PM;POST SMS sms_no
and pressing the Enter key.

where

sms_no is the number of the SMS to be posted

Example of a MAP response

```
SMS      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMS     0     0    0     0     1     7

SMS 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   ISTb
Unit1:  Inact InSv
```

4 To verify the faulty NTMX77 card is in the inactive unit, ensure the LED labled *Active* is off or observe the MAP display.

If faulty card is on	Do
active unit	step 5
inactive unit	step 8

5 Switch the activity of the units by typing

>SWACT
and pressing the Enter key.

The system determines the type of SWACT it can perform and displays a confirmation prompt for the selected SWACT.

If SWACT	Do
can continue at this time	step 6
cannot continue at this time	step 23

6 Switch the activity of the unit by typing

>YES
and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SwAct passed`	step 8
`SwAct failed`	step 7
`SwAct failed Reason: XPM SwActback`	step 7
`SwAct refused by SwAct controller`	step 7

7 Return to *Alarm Clearing Procedures* to clear the alarm condition on the inactive unit. When the alarm is cleared, return to step 1 of this procedure.

At the frame

8 Put a sign on the active unit bearing the following words: **Active unit—Do not touch**. This sign should not be attached with magnets or tape.

NTMX77
SMS (continued)

At the MAP terminal

9 Busy the inactive SMS unit by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

10 Set the unit to the ROM level by typing

>PMRESET UNIT unit_no NORUN
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit

At the frame

11

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel of the SMS. This protects the equipment against damage caused by static electricity. When removing or inserting a card, do not apply direct pressure to the components and do not force the cards into the slots.

Put on a wrist strap.

12 Unseat the NT6X41 card.

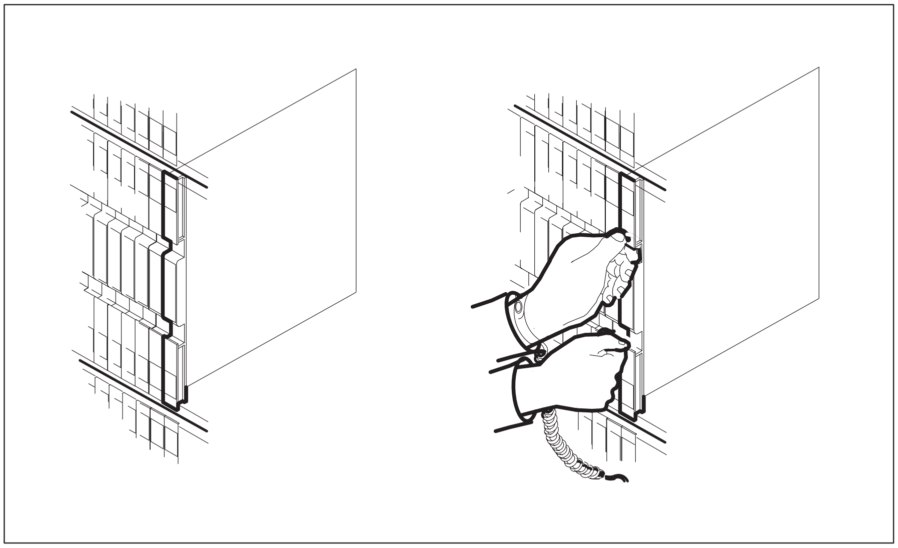
13

CAUTION
Service disruption
If the replacement MX77 card you are installing has dip switch S1, ensure dip switch S1 is in the XPM position. If switch S1 is not in the XPM position, the active unit will go out-of-service, thereby interrupting call processing.

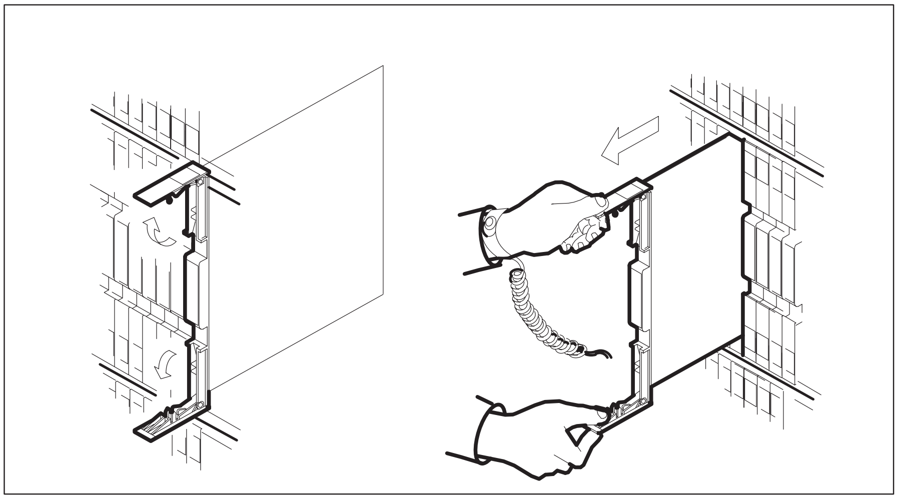
Remove the NTMX77 card as shown in the following figures.

NTMX77
SMS (continued)

a. Locate the card to be removed on the appropriate shelf.



b. Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



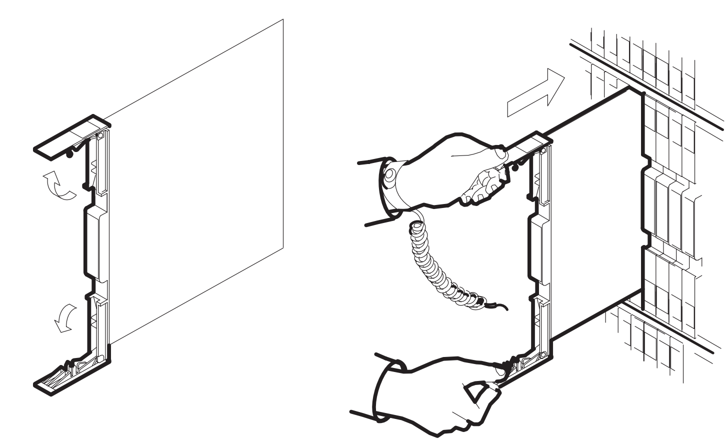
c. Ensure the replacement card has the same PEC, including suffix, as the card you just removed. Also ensure that all replacement card dip switch settings match settings of the card just removed. Ensure that dip switch S1 (if equipped) is in the XPM position.

NTMX77
SMS (continued)

14

> **WARNING**
> **Possible loss of P-side nodes**
> Monitor the LEDs on the faceplate of the replacement NTMX77 when installing.
>
> 1. The INSV and ESA LEDs may come ON and must go OFF in less than 4 seconds.
>
> 2. The ACT LCD may come ON and light for less than 1 second. If the ACT LED remains ON for more than 1 second, immediately remove the NTMX77 card and return to step 13 c. with a new NTMX77 card. If the NTMX77 card is allowed to remain with both units having an active processor, this is a condition of dual activity, which will result in the loss of P-side nodes. If the switches are set correctly reject the faulty card.

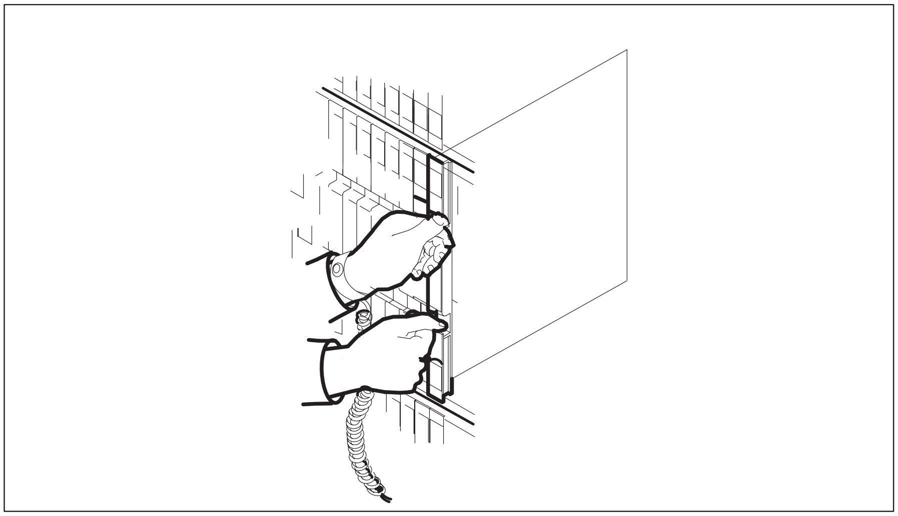
Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



15 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b. Close the locking levers.



16 Reseat the NT6X41 card.

NTMX77
SMS (continued)

At the MAP terminal

17 The peripheral loader card (NT7X05) allows local loading of the NTMX77 data. Local data loading reduces recovery time. Check if the NT7X05 card is provisioned by typing:

>QUERYPM FILES

and pressing the Enter key.

Example of a MAP display:

```
  CM   MS   IOD   Net    PM    CCS    LNS    Trks    Ext    APPL
   .    .     .    .    1RCC    .      .       .      .      .
                        *C*
 SMS             SysB     ManB     OffL     CBsy     ISTb     InSv
 0 Quit     PM     2        0        2        0        2        25
 2 Post     SMS    1        0        0        0        1         1
 3 ListSet
 4          SMS      0 ISTb  Links_OOS:  CSide  0,  PSide   0
 5 TRNSL_   Unit 0:  Inact ManB
 6 TST_     Unit 1:  Act   InSv
 7 BSY_
 8 RTS_     QUERYPM files
 9 OffL     Unit 0:
10 LoadPM_     NT7X05 load File: ESS05AW
11 Disp_       NT7X05 Image File:ESS05AW
12 Next_    Unit 1:
13 SwAct       NT7X05 load File: ESS05AW
14 QueryPM     NT7X05 Image File:ESS05AW
15
16 IRLINK
17 Perform
18
```

Note: If the NT7X05 card is not provisioned the MAP response is:
`Nt7X05 not datafilled,  QueryPm files invalid`

If the NT7X05 card is	Do
provisioned	step 18
not provisioned	step 20

NTMX77
SMS (continued)

18

> **CAUTION**
> **ISDN units can not be loaded by LOCAL IMAGE**
> Do not LOADPM from the LOCAL IMAGE on units with ISDN capability. The NT7X05 card does not support ISDN, use LOCAL LOADFILE or load from the CC on units with ISDN.

Load the SMS from the local image by typing

>LOADPM UNIT unit_no LOCAL IMAGE
and pressing the Enter key.

where

rcc_unit_no is the number of the inactive RCC unit

If the load	Do
passed	step 22
failed	step 19

19 Load the SMS from the local loadfile by typing

>LOADPM UNIT unit_no LOCAL LOADFILE
and pressing the Enter key.

where

rcc_unit_no is the number of the inactive RCC unit

If the load	Do
passed	step 22
failed	step 20

20 Load the SMS from the CC by typing

>LOADPM UNIT unit_no CC
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit busied in step 9

NTMX77
SMS (continued)

If load	Do
passes	step 22
fails	step 29

21 Query the XPM countrs for the firmware load on the NTMX77 by typing:

>QUERYPM CNTRS
and pressing the Enter key.

Example of a MAP display:

```
Unsolicitited MSG limit = 250, Unit 0 = 0, Unit 1 = 0
Unit 0:
Ram Load: ESS05AW
EPRom Version: AB02
EEPRom Load: Loadable: MX77NG03, Executable: MX77NG03
CMR LOAD: CMR33A15
UP:MX77AA

Unit 1:
Ram Load: ESS05AW
EPRom Version: AB02
EEPRom Load: Loadable: MX77NG03, Executable: MX77NG03
CMR LOAD: CMR33A15
UP:MX77AA
```

If firmware is	Do
valid	step 23
invalid	step 22

NTMX77
SMS (continued)

22 Load the firmware in the inactive SMS unit by typing

>LOADPM UNIT unit_no CC FIRMWARE
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit busied in step 9

If load	Do
passes	step 23
fails	step 29

23 Test the inactive SMS unit by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit loaded in step 20

Example of a MAP response

```
Test Passed
     or
Test Failed
```

If TST	Do
passes	step 24
fails	step 29

NTMX77
SMS (end)

24 Return the inactive SMS unit to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the faulty SMS unit tested in step 23

If RTS	Do
passes	step 25
fails	step 29

25 Send any faulty cards for repair according to local procedure.

26 Remove the sign from the active SMS unit.

27 Record the following items in office records according to local policy:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

28 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

29 Obtain further assistance in replacing this card by contacting personnel responsible for a higher level of support.

30 For further assistance with switch of activity, contact the personnel responsible for the next level of support.

Note: If the system recommends using the SWACT command with the FORCE option, consult office personnel to determine if use of the FORCE option is advisable.

Manually busying SMS C-side links

Application

Use this procedure to remove from service C-side links between an XMS–based peripheral module (XPM) and the network. Use this procedure for both junctored networks (JNET) and enhanced networks (ENET).

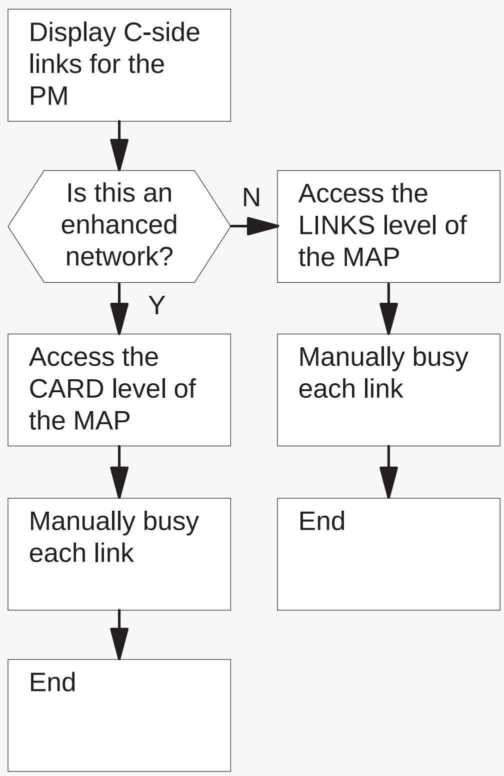
This procedure assumes that the user posted the peripheral module (PM) and the PM is available for query. Instructions in the main procedure direct the user to post the PM again after the user completes this common procedure.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Manually busying SMS C-side links (continued)

Summary of Manually busying SMS C-side links



This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Manually busying SMS C-side links (continued)

Manually busying SMS C-side links

CAUTION
Loss of service
Proceed only if you have been directed here from a step in a maintenance procedure. This procedure removes from service C-side links between the Series II PM and the network. This procedure can cause the system to drop calls.

At the MAP terminal

1 To display a list of C-side links, type

>TRNSL C
and press the Enter key.

Example #1 of a MAP response:

```
Link  0: NET 0  1 18;Cap MS;Status:OK      ;MsgCond:OPN,Unrestrict
Link  1: NET 1  1 18;Cap MS;Status:OK      ;MsgCond:OPN,Unrestrict
Link  2: NET 0  1 22;Cap  S;Status:OK
Link  3: NET 1  1 22;Cap  S;Status:OK
Link  4: NET 0  1 26;Cap MS;Status:OK      ;MsgCond:OPN,Restrict
Link  5: NET 1  1 26;Cap MS;Status:OK      ;MsgCond:OPN,Restrict
Link  6: NET 0  1 30;Cap  S;Status:OK
Link  7: NET 1  1 30;Cap  S;Status:OK
```

Example #2 of a MAP response:

```
Link  0: ENET 0  0 32 01  0;Cap MS;Status:OK    ;MsgCond:OPN,Restrict
Link  1: ENET 1  0 32 01  0;Cap MS;Status:OK    ;MsgCond:OPN,Restrict
Link  2: ENET 0  0 32 01  1;Cap  S;Status:OK
Link  3: ENET 1  0 32 01  1;Cap  S;Status:OK
Link  4: ENET 0  0 32 01  2;Cap MS;Status:OK    ;MsgCond:OPN,Unrestrict
Link  5: ENET 1  0 32 01  2;Cap MS;Status:OK    ;MsgCond:OPN,Unrestrict
Link  6: ENET 0  0 32 01  3;Cap  S;Status:OK
Link  7: ENET 1  0 32 01  3;Cap  S;Status:OK
```

If the network	Do
is a junctor network (JNET)	step 2
is an enhanced network (ENET)	step 7

Manually busying SMS C-side links (continued)

2 Record the network plane, pair, and link for each C-side link for the XPM shelf associated with the card you replace.

Note 1: The NT6X40AA DS-30 C-side interface card supports eight C-side links per card, with two cards provisioned for each PM unit. All other NT6X40 versions support 16 ports. To manually busy links to a single NT6X40AA use the table on page eight. This table will help you identify which links to record and manually busy. The single NT6X40AA cards are located in slots 22 or 23 for XPMs and slots 23 or 24 for message switch and buffers (MSB).

Note 2: The C-side links for network plane 0 connect to the shelf for PM unit 0. The C-side links for network plane 1 connect to the shelf for PM unit 1. All C-side links interface to the active PM unit.

Note 3: Columns 4, 5, and 6 of the response to a TRNSL command at the PM level list the network plane, pair, and link. In *Example #1 of a MAP response:* in step 1, C-side link 7 is on network plane 1, pair 1, link 30.

3 To access the NET level of the MAP display, type

>NET

and press the Enter key.

Example of a MAP display:

```
Net                   11111  11111  22222  22222  33
Plane  01234  56789  01234  56789  01234  56789  01
   0    L..
   1    ...
```

4 To access the LINKS level of the MAP display, type

>LINKS pair_no

and press the Enter key.

where

pair_no is the number of the pair (0 to 31) to which the XPM C-side links are connected

Example of a MAP display:

```
Net                   11111  11111  22222  22222  33
 Plane  01234  56789  01234  56789  01234  56789  01
   0    L..
   1    ...
Net   1  Links             11  1111  1111  2222  2222  2233
       Plane   0123  4567  8901  2345  6789  0123  4567  8901
         0     ....  ....  ..P.  ....  .P..  .P..  .P..  .P..
         1     ....  ....  ..P.  ....  .P..  .P..  .P..  .P..
        Links  3333  3333  4444  4444  4455  5555  5555  6666
       Plane   2345  6789  0123  4567  8901  2345  6789  0123
         0     .P..  .P..  .P..  .P..  ..P.  ..-.  ..-.  ..-.
         1     .P..  .P..  .P..  .P..  ..P.  ..-.  ..-.  ..-.
```

Manually busying SMS C-side links (continued)

5 To busy one of the links you recorded in step 2, type

>BSY plane_no link_no
and press the Enter key.

where

plane_no	is the number of the plane for the link (0 or 1)
link_no	is the link number (0 to 63)

Example of a MAP response:

```
BSY 0 30
OK
```

6 Repeat step 5 for all C-side links for the XPM unit on which you are working.

Go to step 13.

7 Record the network plane, shelf, card, and link for the C-side links for the XPM shelf associated with the card you are replacing.

Note 4: The NT6X40AA DS-30 C-side interface card supports eight C-side links per card, with two cards provisioned for each PM unit. All other NT6X40 versions support 16 ports. If you manually busy links to a single NT6X40AA use the table on page eight. This table will help you identify which links to record and manually busy. The single NT6X40AAcards are located in either of slots 22 or 23 for XPMs and slots 23 or 24 for MSBs.

Note 5: The C-side links for network plane 0 connect to the shelf for PM unit 0. The C-side links for network plane 1 connect to the shelf for PM unit 1. All C-side links interface to the active PM unit.

Note 6: Columns 4, 5, 6, and 7 of the response to a TRNSL command at the PM level list the network plane, shelf, and link. In *Example #2 of a MAP response:* in step 1, C-side link 7 is on network plane 1, shelf 0, card 32, and link 1.

8 To access the NET level of the MAP display, type

>NET
and press the Enter key.

Example of a MAP display:

```
ENET     System   Matrix  Shelf 0 1 2 3
 Plane 0 CSLink     .           F – – –
 Plane 1 CSLink     .           F – – –

ENET:
```

9 To access the SHELF level of the MAP display, type

>SHELF shelf_no
and press the Enter key.

where

Manually busying SMS C-side links (continued)

shelf_no   is the number of the shelf (0 to 7) to which the XPM C-side links are connected

Example of a MAP display:

```
ENET     System   Matrix  Shelf 0 1 2 3
 Plane 0 CSLink     .           F – – –
 Plane 1 CSLink     .           F – – –

SHELF 00  Slot         1111111 11122222 22222333 333333
            123456 78 90123456 78901234 56789012 345678
Plane 0    .  .   IF ....---- -------- ----.... .  .
Plane 1    .  .   IF ....---- -------- ----.... .  .
```

10 To access the CARD level of the MAP display, type

>CARD card_no
and press the Enter key.

where

card_no   is the number of the card (1 to 38) to which the XPM C-side links are connected

Example of a MAP display:

```
ENET     System   Matrix  Shelf 0 1 2 3
 Plane 0 CSLink     .           F – – –
 Plane 1 CSLink     .           F – – –

SHELF 00  Slot         1111111 11122222 22222333 333333
            123456 78 90123456 78901234 56789012 345678
Plane 0    .  .   IF ....---- -------- ----.... .  .
Plane 1    .  .   IF ....---- -------- ----.... .  .

 CARD 32   Front:     Back:   DS–512 Links
           Xpt        I/F    0 1 2 3
 Plane 0    .          .     . . . –
 Plane 1    .          .     . . . –
```

11 To busy the link you recorded in step 7, type

>BSY plane_no LINK link_no
and press the Enter key.

where

plane_no   is the number of the plane (0 or 1) for the link
link_no   is the link number (0 to 18 for DS512) or (0 to 15 for DS30)

Example of a MAP response:

```
Request to MAN BUSY ENET Plane:0 Shelf:00 Slot:32 Link:01 submitted.
Request to MAN BUSY ENET Plane:0 Shelf:00 Slot:32 Link:01 passed.
```

Manually busying SMS C-side links (continued)

If	Do
the links are DS-30s and you have not manually busied all links	step 12
the links are DS-30s and you have manually busied all links	step 13
the link is a DS-512	step 13

12 Repeat step 11 for each DS-30 link recorded in step 7.

13 The procedure is complete. Return to the main procedure that directed you to this procedure and continue as directed.

Manually busying SMS C-side links (end)

Table 1
Port to link correlation for NT6X40AA cards in XPM

6X40 port	XPM slot	trnsl link	Net plane	6X40 port	XPM slot	trnsl link	Net plane
0	22	0	0	8	22	16	0
0	22	1	1	8	22	17	1
1	22	2	0	9	22	18	0
1	22	3	1	9	22	19	1
2	23	4	0	10	23	20	0
2	23	5	1	10	23	21	1
3	23	6	0	11	23	22	0
3	23	7	1	11	23	23	1
4	22	8	0	12	22	24	0
4	22	9	1	12	22	25	1
5	22	10	0	13	22	26	0
5	22	11	1	13	22	27	1
6	23	12	0	14	23	28	0
6	23	13	1	14	23	29	1
7	23	14	0	15	23	30	0
7	23	15	1	15	23	31	1

Note: The trnsl link corresponds to the list obtained through the TRNSL C command. The network plane number corresponds to the PM unit number.

Returning a card for repair or replacement

Application

Use this procedure to return a circuit card for repair or replacement. An example of a circuit card you might return is a power converter. Operating companies return the cards to different addresses that depend on the location of the company (Canada or the United States). Also, the documents personnel must fill out differ in both countries.

Interval

Perform this procedure as needed.

Common procedures

Does not apply

Action

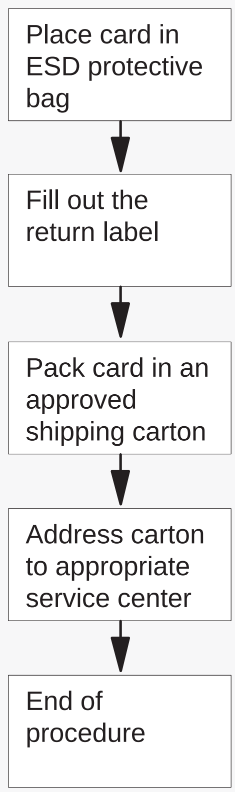
This procedure contains a summary flowchart and a list of steps. Use the procedure. Follow the steps to perform the procedure.

Returning a card for repair or replacement
(continued)

Summary of returning a card for repair or replacement

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



Returning a card for repair or replacement
(continued)

Returning a card for repair or replacement

At your current location

1 Place the circuit card in an electrostatic discharge (ESD) protective bag.

If your location	Do
is in Canada	step 6
is in the United States of America	step 2

2 Fill in the return label for each card you return. If you require help to fill out the tag, call 1-800-347-4850.

Make sure to include the following information:

- return authorization number from customer service
- NT product engineering code (PEC)
- serial number
- release number
- BCS release software used at the time of replacement
- peripheral module load name
- description of the failure and action taken to repair
- fault code that describes the defect (see the bottom of the tag)
- name of your company
- office identifier code
- your name
- site name

3 Pack the card or assembly in a Northern Telecom card shipping carton and seal the carton.

If a Northern Telecom shipping carton is not available, use another carton. Make sure that you:

- enclose each card or assembly in packing paper
- surround each card or assembly in bubble pack or foam
- secure each card or assembly in the carton so that the card or assembly cannot shift around

4 Address the carton to: Nortel Customer Service Center, 4600 Emperor Blvd., Morrisville, North Carolina, 27560

5 Go to step 11.

6 Fill in one return tag (form 24–115) for each card or assembly you return.

Returning a card for repair or replacement
(end)

Make sure to include the following information:

- return authorization number from customer service
- NT product engineering code (PEC)
- serial number
- release number
- BCS release software used at the time of replacement
- peripheral module load name
- description of the failure and action taken to repair
- fault code that describes the defect (see the bottom of the tag)
- name of your company
- office identifier code
- your name
- site name

If you require help to fill out the tag, call 905-454-2808. In the event of an emergency, call 905-457-9555.

7 Attach one copy of the card tag to a latch on the card.

8 Keep the other copies of the tag for your records.

9 Pack the card or assembly in a Northern Telecom shipping carton and seal the carton.

If a Northern Telecom shipping carton is not available, use another carton. Make sure that you

- enclose each card or assembly in packing paper
- surround each card or assembly in bubble pack or foam
- secure each card or assembly in the carton so that the card or assembly cannot shift around

10 Address the carton to: Nortel Customer Operations, c/o Wesbell Transport, 1630 Trinity Road, Unit #3 Door #4, Mississauga, Ontario, L5T 1L6

11 This procedure is complete.

Removing and replacing a card

Application

Use this procedure when you remove a circuit card and insert a replacement circuit card.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Summary of card replacement procedure for Removing and replacing a card

Removing and replacing a card
(continued)

Removing and replacing a card in a shelf

At the cabinet

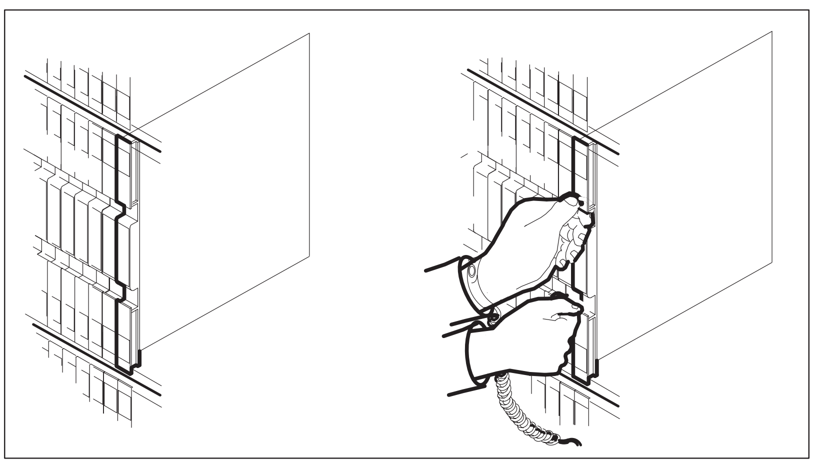
1

CAUTION
Equipment damage
Take the following precautions when you remove or insert a card:
1. Make sure you do not apply direct pressure to the components.
2. Make sure you do not force the cards into the slots.

WARNING
Static electricity damage
Make sure to wear a wrist strap that connects to the wrist strap grounding modular supervisory panel (MSP) or frame to handle cards. The wrist strap protects the cards against static electricity damage.

Put on a wrist strap.

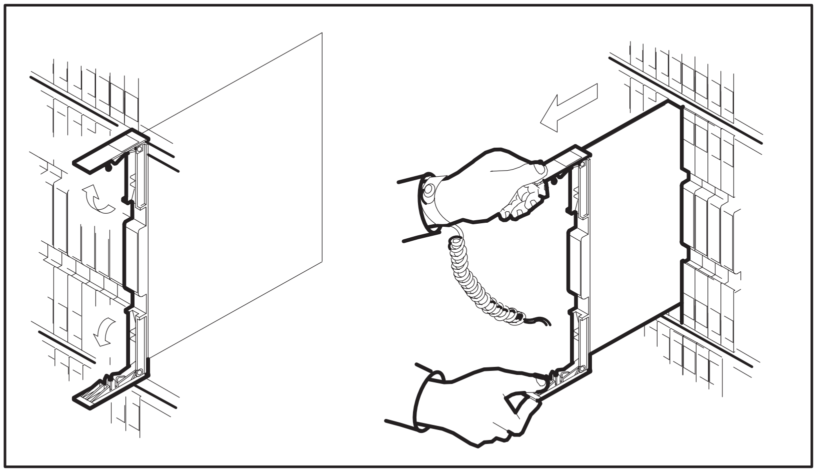
2 Locate the card to be removed on the appropriate shelf.



Removing and replacing a card
(continued)

3 Open the locking levers on the defective circuit card. The top locking lever opens up and the bottom locking lever opens down.

Gently pull the circuit card toward you until the circuit card clears the shelf.



4 Place the circuit card you have removed in an electrostatic discharge (ESD) protective container.

If the card	Do
is NTMX77	step 5
is other than listed here	step 6

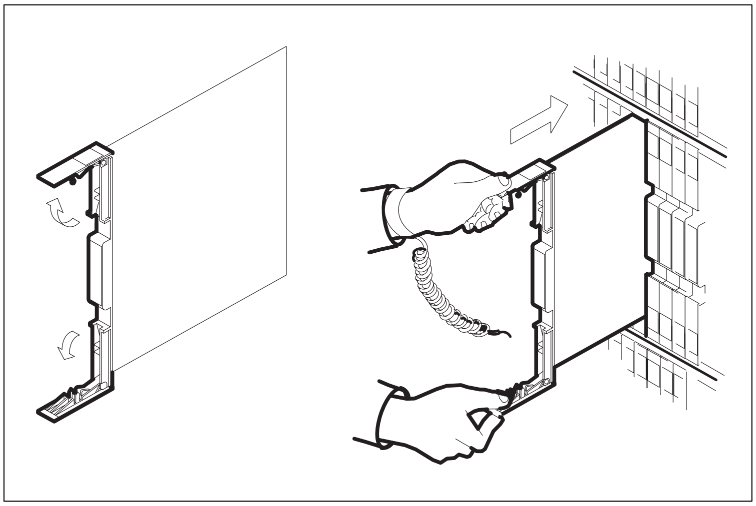
5 Return to the NTMX77 circuit card replacement procedures for switch setting information.

6 Make sure that the replacement circuit card has the same product engineering code (PEC), including suffix, as the circuit card removed.

7 Make sure that all the DIP switch settings are the same as those on the circuit card removed.

Removing and replacing a card
(end)

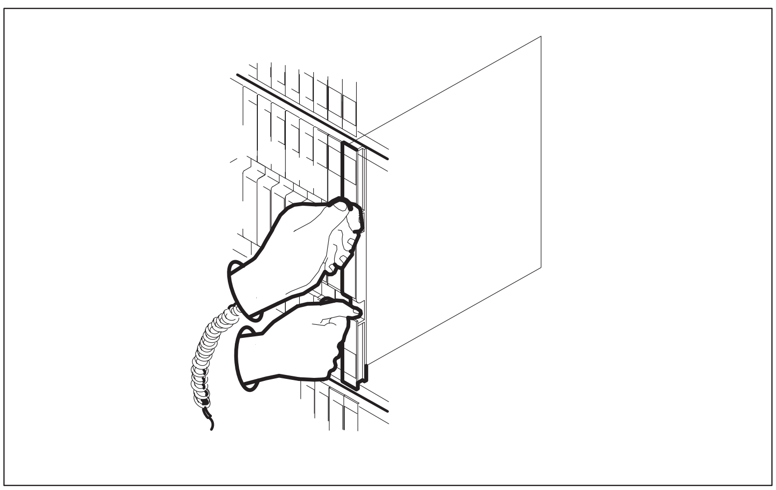
8 Open the locking levers on the replacement circuit card. Align the circuit card with the slots in the shelf and carefully slide the circuit card into the shelf.



9 Seat and lock the circuit card.

a. Use your fingers or thumbs to push on the upper and lower edges of the faceplate. Make sure that the circuit card is fully seated in the shelf.

b. Close the locking levers.



10 This procedure is complete. Return to the procedure that directed you to this procedure and continue as directed.

Locating and clearing SMS trouble

Maintenance engineering and field maintenance personnel use this section. Maintenance personnel must have knowledge of the following:

- the Subscriber Carrier Module-100S (SMS) interface to the remote-concentrator SLC-96 (RCS) and the DS-1 links between the SMS and the RCS
- the subscriber loop.

This section does not provide detailed step-by-step procedures to perform maintenance tasks.

Trouble isolation and correction

Locating and clearing faults

Problem condition indicators

Problem conditions can include the following:

- operational measurements (OM)
- log reports
- alarms

Operational measurements

The OMs monitor and count events in the system. The OMs are the best means for detecting both current and potential system troubles. The OM thresholding feature monitors and reports key Subscriber Carrier Module 100–S (SMS) activity. The system makes these reports daily or weekly. The reports are the primary method of problem detection.

Log reports

Logs are an analysis tool and provide detailed information on call errors, diagnostic results, and system status. Logs indicate trouble conditions, when the following conditions are present:

- a sudden increase in the volume of logs
- message not printed reports
- a large number of logs that are the same.

Alarms

Audible and visual alarms indicate that problem requires correction. Correct routine system maintenance and use of OMs and logs minimize the occurrence of alarms.

The level of the alarm indicates alarm seriousness and corresponding urgency for correction. Alarm levels are minor, major, or critical. The following table describes alarm conditions.

Alarm description

Alarm	MAP display	Description
Minor	blank	Indicates does *not* affect service.
Major	M	Indicates a service degradation, threatening condition.
Critical	*C*	Indicates a current service outage or potential service outage.

Accessing alarms

The different MAP subsystems for the SMS configuration produce alarms.

Clearing alarms

Follow the following guidelines when you respond to alarms:

- More than one alarm of the same seriousness can appear on the screen of the MAP. When more than one alarm occurs, clear the alarms from the left of the screen to the right.
- If an alarm of greater seriousness occurs while you fix another alarm, respond to the new alarm. Do not continue attempts to clear the less important alarm.

For alarm clearing procedures, refer to

- *Alarm Clearing Procedures*
- *Card Replacement Procedures*

Standard problem solving steps

Perform the following standard troubleshooting steps to locate and clear faults:

1. Silence audible alarms that occur when the system detects alarm conditions.
2. Isolate the fault. Read status displays and trace fault codes to the menu level required to clear the fault.
3. Busy (BSY) the hardware to remove the system access to the defective component. This allows you to perform maintenance activity without system interference.
4. Test the defective component and identify the card to replace. Replace the defective card and test the component again.
5. Return the hardware to service.

Fault isolation tests for the SMS

When the system detects a fault condition in the SMS, the fault requires a maintenance action. The fault can occur with the SMS components. Operating company maintenance personnel use fault isolation tests to determine which component causes the fault. Operating company personnel use these tests to remove the fault condition or report the fault condition to maintenance support. Operating company personnel access the SMS level of the MAP display and enter the command string **QUERYPM FLT**. to troubleshoot the SMS. The following paragraphs provide methods to handle exact conditions.

Handling a SysB SMS unit

When the system busies an SMS unit, the SMS unit is not in service (InSv) any longer. If the unit is active, a warm Switch of Activity (SWACT) occurs. Operating company personnel access the SMS level of the MAP display and enter the command string **>QUERYPM FLT**. to troubleshoot the SMS. The following table lists possible reasons for a system busy (SysB) SMS alarm. In most events, the log report mirrors the **>QUERYPM FLT** response.

Accessing SysB alarms for the SMS

Message at SMS level	Possible conditions
`All C-side Links are Down`	The central-side (C-side) peripheral module (PM) cannot communicate with the SMS.
`Audit Detected Inconsistent PM Activity`	The computing module (CM) detects that unit 0 is active, but unit 1 is inactive. This means that the CM has not detected the occurrence of a SWACT. The CM busies and returns-to-service (RTS) both units. The CM has the units return with the active/inactive unit configuration of the original CM.
`Audit Detected Inconsistent PM State`	The internal state of the active unit is not ready. The state is busy, restart, or synchronize. This condition identifies a software error. The CM BSYs and RTSs both the SMS and the C-side links. The CM tries to return the SMS and C-side links to service.
`Autonomous Activity Drop`	A system-generated SWACT occurred, normally because of a trap or facility audit.
`Diagnostics Failed`	Unit failed test (TST) or RTS.
`Inact Unit Lost Data Synch`	Unit-to-unit communication failed. The system cannot perform a warm SWACT.
`PM Audit Detect Fault`	One of the background hardware audits detects a fault.
`PM SWACT`	A warm SWACT occurred.
`Require Data Load`	An error occurred on a DS-1 link to the unit. The unit waits for a maintenance system reset.
`Reset While INSV`	An error occurred on a DS-1 link to the unit. The unit waits for a maintenance system reset.

—continued—

Accessing SysB alarms for the SMS (continued)

Message at SMS level	Possible conditions
`REX Incomplete`	Terminated The routine exercise (REX) test cannot complete the series of tests because of a condition that is not normal. At least one unit is: • InSv trouble (ISTb) • Inactive unit is BSY.
`REX Failed`	A failure occurred during a test. The following messages occur when the system action to compensate for the failure: • Achieve superframe/data synch • Inactive out–of–service (OOS) tests • Inactive RTS • Warm SWACT • Inactive OOS tests after SWACT.
`Self Test Failed`	A background hardware audit detects a fault.
`Trap Message Received From PM`	Unit sent an `initiation complete` message to the CM following an automatic start a.
`Unsolicited Message Limit Exceeded`	Unit sent more than 100 messages that were not solicited to the CM within 1 min.

—end—

The C-side link problems fall outside the range of PM-level maintenance.

Standard troubleshooting methods require a test of an exact unit of a SysB SMS. If the unit passes the tests and can RTS, the system clears the SysB fault. A list of suspected defective SMS cards can accompany test failures. The following is an example of a card list.

```
SMS 60 Unit 0 Tst Failed
Failed to open link
Site Flr RPos Bay_id Shf  Description   Slot   EqPEC
HOST 00  C05  SME 00 51    SMS : 60      :22    6X40
HOST 00  C05  SME 00 65    SMS : 60      :22    6X40
HOST 00  C05  SME 00 51    SMS : 60      :21    6X41
HOST 00  C05  SME 00 51    SMS : 60      :18    6X69
HOST 00  C05  SME 00 51    SMS : 60      :12    MX77
```

Replace one card at a time, in the order of the list. Test the unit until the fault clears.

If the test fails, a message like `No Reply From PM` accompanies the failure. Use the **>PMRESET** command to reset the SMS. This action can clear the fault. If the reset fails, a list of suspected defective cards accompanies the failure. This list is like the card list for test failures. Replace the cards one at a time. Replacement of a defective card can clear the SysB problem.

Fault clearance in a SysB SMS can require you to reload software to the SMS. The system indicates a software problem if reset, reload and replacement of a suspect card failed to a clear a SysB fault.

Contact your maintenance support group.

Handling an ISTb SMS unit

When an SMS goes ISTb, the unit has a fault but can continue to process calls. The following table lists normal responses and descriptions when you enter command string **>QUERYPM FLT** at the SMS MAP level. The table lists reasons for the ISTb SMS alarm. In most events, the log report mirrors the **>QUERYPM FLT** response.

Assessing ISTb alarms for the SMS

Message at SMS level	Alarm	Possible conditions
`One/Both Unit (s) ISTb`	Minor	One or both units are ISTb.
`PM Overloaded`	Minor	Traffic load exceeds the ability of the PM to process calls.

—continued—

Assessing ISTb alarms for the SMS (continued)

Message at SMS level	Alarm	Possible conditions
`CSLinks Out of Service`	Minor	The C-side message links fail the periodic InSv C-side links test, one each minute.
`PSLinks Out of Service`	Minor	A P-side link became SysB. The system requires DS-1 link maintenance.
`Node Redundancy Lost`	Major	A unit is OOS. The SMS cannot perform a SWACT.
`Major CSLink Failure`	Major	A C-side link failure caused a major alarm.
`Critical CSLink Failure`	Critical	A C-side link failure caused a critical alarm.
`Bad 6X69 IMC link`	Minor	An intermodule communication link is bad.
`PM node table mismatch`	Minor	The node table data in the SMS and the CM do not match.
`Dynamic data sync`	Minor	The SMS has not achieved dynamic data sync.
`Static data mismatch with CM`	Minor	The SMS static data does not match the CM static data. The SMS requires a download of static data. You must BSY and RTS the SMS or use the NODATASYNC parameter to BSY and RTS the inactive unit. Perform a SWACT. Refer to Handling data mismatch in this document.
`Data mismatch with inventory table`	Minor	The load data entered in Table LTCINV does not match the load name according to the CM. The SMS load appears when you issue the **>QUERYPM CNTRS** command.
`Data out of date`	Minor	The PM requires that you load the SMS again.

—end—

A unit of the SMS requires testing. Like a SysB SMS, you can clear a fault in an ISTb SMS if you perform the following actions:

- replace defective cards

- reset the SMS
- load the SMS again

Handling an IMC link fault

When the intermodule communication (IMC) link audit detects data loss or damage to the messages over IMC links, the SMS becomes ISTb. The system generates a PM128 log. Enter the command string **>QUERYPM FLT**, the response includes the following statement:

```
NON-CRITICAL HARDWARE FAULT
```

Operating company personnel must perform the following steps:

1. Test both units to confirm the audit result.
2. BSY and offline the inactive unit and replace the defective cards on the list, NT6X69 or MX77.
3. RTS inactive unit.

The fault is in the active unit if:

- the node remains ISTb for more than 5 min
- the response to the **>QUERYPM FLT** command does not change

If the RTS of the inactive unit is successful, perform the following steps:

1. SWACT of the units.
2. BSY the new inactive unit.
3. Test the inactive unit.
4. Offline (OFFL) the unit with the defective cards. Replace the defective cards with good cards.
5. RTS inactive unit.

The problem is in the backplane if card replacement does not remove the fault.

Handling a parity error fault

The parity audit was introduced in BCS28. If the parity audit detects a parity fault, the system places the defective unit OOS. Operating company personnel manually test and RTS the unit. In BCS31, the SMS reports a parity fault to the CM and the CM decides the action to take. This decision depends on the type of parity error and the state of the SMS units. In most occurrences, user can correct the fault without a loss of service.

The following sections provide background on types of parity faults and a summary of types of actions that the CM takes. The last sections highlight problem indicators for each type of fault. Actions that the CM and the operating company personnel must take appear under each trouble indicator.

The three types of parity faults are as follows:

- An intermittent fault. This fault occurs when the SMS detects a parity error and does not find an error during the read over of the location.
- A soft fault. This fault occurs when the SMS detects a parity error and finds an error during the read over of the location. The SMS does not find an error when the SMS tries to write to the location. The error can occur in the program store or the memory store.
- A hard fault. This fault occurs when the SMS detects a fault and cannot read or write to the memory location. In this event, the hardware is defective. To correct the fault, replace the associated memory card.

Types of actions that the CM takes

When the SMS detects a parity fault, the CM takes action to correct the fault. These actions depend on the type of parity fault and the state of the SMS. The CM can set the defective unit as SysB and trigger the correct recovery action. The CM can set the defective unit as ISTb. A defective active unit or the inactive INSV unit affect the course of CM action. The CM actions control the steps the operating company personnel must take.

The CM informs operating company personnel through the PM181 log that the system found a parity fault. This log is the primary problem indicator. Operating company personnel can check for associated logs like PM128 to understand the actions that the CM takes.

The header of the following sections is the PM181 log. The header includes the message that informs the maintenance personnel of the parity fault type. Associated log reports and problem indicators appear under each header. The response to the **>QUERYPM FLT** command informs operating company personnel of the action the CM performs to correct the fault. The actions that the operating company personnel must take appear after each subset of indicators.

The following two conditions control the actions that the CM performs:

- Both units are *in-service*.
- Only the active unit is *in-service*.

The following examples describe the reasons that these conditions control the action that the CM performs.

PM181—Hard parity fault, both units INSV

The following is an example of a PM181:

```
PM181 JUL23 23:29:16 5561 INFO SMS 0 UNIT 0
Node:  ISTb, Unit 0 Act: InSv, Unit 1, Inact:  InSv
Parity audit detected hard parity fault
Site Flr   RPos   Bay_id    Shf   Description   Slot  EqPEC
SMS 00    C05     SME 00    18     SMR:  000    12    MX77AA
```

Other problem indicators include the following:

- PM128—The SMS is set ISTb, with the inactive unit OOS.

```
PM128 JUL23 23:29:16 5561 TBL  ISTb SMS 0
Node:  ISTb, (Inact OOS) From InSv
Unit 0 Inact:  SysB (Parity errors detected) from InSv
Unit 1   Act:  InSv
```

- PM189—The inactive unit of the SMS has a hard fault.

```
PM189 JUL23 23:29:17 5561 INFO PM SW INFORMATION REPORT
SMS 0 Unit 0:  Inact
TASKID:  00370037 PARAUDT, TIME:  22: 29:16.68
COMID:  FF NILCID
TEXT:  hard_flt 00 00 57 F6 00 00
```

- **>QUERYPM FLT**—SysB reason: the system detected a hard parity fault.

The SysB means that the system removed the inactive unit from service and cannot process calls. Both units were InSv and the system removed the inactive unit from service. The system performed a warm SWACT on the active unit and removed the active unit from service.

CM action

The CM sets the inactive unit to SysB. If the the active unit is defective, the CM performs a warm SWACT and busies the new inactive unit.

User action

Replace the card in the list of the PM181 log. Manually busy (ManB) the inactive unit with the command BSY UNIT n. Test the ROM with the command TST UNIT n ROM to make sure that the correct card is chosen. After you replace the card, use the LOADPM UNIT n CM DATA load the PM again. Use the RTS UNIT n command to RTS the PM. The unit is correctly RTS.

PM181—Hard parity fault, the inactive unit OOS

The following is an example of a PM181 log:

```
PM181 JUL23 23:29:16 5561 INFO SMS 0 Unit 0
Node:  ISTb, Unit 0 Act:  InSv, Unit 1, Inact:  OOS
Parity audit detected hard parity fault
Site  Flr RPos   Bay_id   Shf   Description   Slot   EqPEC
SMS   00  C05    SME 00   18    SMS:  000     12     MX77AA
```

Other problem indicators include the following:

- PM128—The SMS is set to ISTb, with the active unit as ISTb from InSv.

```
PM128 JUL23 23:29:16 5561 TBL ISTb SMS 0
Node:  ISTb, (Inact OOS) From InSv
Unit 0 Act:  IsTb (Parity errors detected) from InSv
Unit 1 Inact:  OOS
```

- PM 189—The active unit of the SMS has a hard fault.

```
PM189 JUL 23 23:29:17 5561 INFO PM SW INFORMATION REPORT
SMS 0 Unit 0:  Act
TASKID:  00370037 PARAUDT, TIME:  22:29:16.68
COMID:  FF NILCID
TEXT:  hard_flt 00 00 57 F6 00 00
```

- **>QUERYPM FLT**

The following ISTb is present: the system detected a hard parity fault in memory.

Action by the CM

In this example, the inactive unit is not InSv. The CM cannot take the defective unit OOS because this action BSYs the SMS. The SMS in the BSY state is not able to process calls. The CM sets the active unit as ISTb.

User action

Operating company personnel follow the same procedure as the first example, but when the unit is busied, the SMS drops all call processing. To avoid the busy unit, the user can try to force the inactive unit to and process calls. To force the inactive unit the user returns the inactive unit to service.

PM181—Soft parity fault program store, both units INSV

The following is an example of a PM181 log:

```
PM181 JUL23 23:29:16 5561 INFO SMS 0 Unit 0
Node:  ISTb, Unit 0 Act:  InSv, Unit 1, Inact:  InSv
Parity audit detected soft parity fault in program store
```

Other problem indicators include the following:

- PM128—The SMS is set ISTb, with the inactive unit OOS.

```
PM128 JUL23 23:29:16 5561 TBL ISTb SMS 0
Node: ISTb, (Inact OOS) From InSv
Unit 0 Inact :  SysB (Parity errors detected) from InSv
Unit 1 Act:  InSv
```

- PM189—The inactive unit of the SMS has a fault in program store.

  ```
  PM189 JUL23 23:29:17 5561 INFO PM SW INFORMATION REPORT
  SMS 0 Unit 0:  Inact
  TASKID:  00370037 PARAUDT, TIME:  22:29:16.68
  COMID:  FF NILCID
  TEXT:  softpgm 00 00 57 F6 00 00
  ```

- >**>QUERYPM FLT**—SysB reason: a soft parity fault was detected in program store of memory.

The SysB means that the CM takes the inactive unit OOS. The SysB also can means that the CM performed a SWACT on the SMS and made the new inactive unit OOS.

Action by the CM

The CM sets the inactive unit to SysB. If the defective unit was the active unit, the CM performs a SWACT and busies the new inactive unit. At this point, the CM tries to recover the BSY unit without user interruption. The CM initiates automatic loading and assumes that the correct loads are in tables PMLOADS and LTCINV. The CM loads the complete load, and returns the unit to service.

User action

The CM brings the unit back to service and interruption is required if the SMS does not RTS. Check the load tables and other problem indicators that can mean the defective unit cannot be returned to service.

PM181—Soft parity fault program store, inactive unit OOS

The following is an example of a PM181 log:

```
PM181 JUL 23  23:29:16 5561 INFO SMS 0 Unit 0
Node:  ISTb, Unit 0 Act:  InSv, Unit 1, Inact:  OOS
Parity audit detected soft parity fault in program store
```

Other problem indicators include the following:

- PM128—The SMS is set to ISTb, with the inactive unit already OOS.

  ```
  PM128 JUL23  23:29:16 5561 TBL ISTb SMS 0
  Node:  ISTb, (Inact OOS) From InSv
  Unit 0 Act:  ISTb (Parity errors detected) from InSv
  Unit 1 Inact:  Manb
  ```

- PM189—The active unit of the SMS has a fault in program store.

  ```
  PM189 JUL23  23:29:17 5561 INFO PM SW INFORMATION REPORT
  SMS 0 Unit 0:  Act
  TASKID:  00370037 PARAUDT, TIME: 22:29:16.68
  COMID:  FF NILCID
  TEXT:  softpgm 00 00 57 F6 00 00
  ```

- **>QUERYPM FLT**–The following ISTb is present: a soft parity fault was detected in program store of memory.

Action by the CM

In this example the inactive unit is not InSv. The CM cannot take the defective unit OOS because this action busies the SMS. The SMS in the BSY state cannot process calls. The CM sets the active unit as ISTb.

User action

If the inactive unit is OOS, or cannot take over call processing, the SMS drops all call processing. The SMS drops call processing when the user busies the unit. To get the inactive unit to process calls, the user can attempt to return the unit to service.

PM181—Soft parity fault data store, both units INSV

The following is an example of a PM181 log:

```
PM181 JUL23  23:29:16 5561 INFO SMS 0 Unit 0
Node:  ISTb, Unit 0 Act:   InSv, Unit 1, Inact:  InSv
Parity audit detected soft parity fault in data store
```

Other problem indicators include the following:

- PM128—The SMS is set ISTb, with the inactive unit set as SysB.

  ```
  PM128 JUL23  23:29:16 5561 TBL ISTb SMS 0
  Node:  ISTb, (Inact OOS) From InSv
  Unit 0 Inact:  SysB (Parity errors detected) from InSv
  Unit 1 Act:  InSv
  ```

- PM189—The inactive unit of the SMS has a fault in program store.

  ```
  PM189 JUL23  23:29:17 5561 INFO PM SW INFORMATION REPORT
  SMS 0 Unit 0:  Inact
  TASKID:  00370037 PARAUDT, TIME:  22:29:16.68
  COMID:  FF NILCID
  TEXT:  softdat 00 00 57 F6 00 00
  ```

- >**>QUERYPM FLT**–SysB reason: a soft parity fault was detected in data store of memory.

The SysB means that either the CM takes the inactive unit OOS, or the CM performed a SWACT on the SMS. If the CM performed a SWACT the CM set the new inactive unit OOS.

Action by the CM

The CM sets the inactive unit as SysB. If the defective unit was the active unit, the CM will perform a SWACT and BSY the new inactive unit. At this point, the CM will try to recover the BSY unit without user interruption.

The CM returns the unit to service. The CM can also download new static data and run full diagnostics if necessary.

User action

The CM brings the unit back to service and interruption is required if the SMS does not RTS. The user checks for other problem indicators that can mean the CM cannot return the defective unit to service.

PM181—Soft parity fault data store, inactive unit OOS

The following is an example of a PM181 log:

```
PM181 JUL23  23:29:16 5561 INFO SMS 0 Unit 0
Node: ISTb, Unit 0 Act: InSv, Unit 1, Inact: OOS
Parity audit detected soft parity fault in data store
```

Other problem indicators include the following:

- PM128—The SMS is set ISTb, with the active unit set at ISTb.

  ```
  PM128 JUL23  23:29:16 5561 TBL  ISTb SMS 0
  Node:  ISTb, (Inact OOS) From InSv
  Unit 1 Inact:  ManB
  ```

- PM189—The active unit of the SMS has a fault in program store.

  ```
  PM189 JUL23  23:29:17 5561 INFO PM SW INFORMATION REPORT
  SMS 0 Unit 0:  Act
  TASKID:  00370037 PARAUDT, TIME:  22:29:16.68
  COMID:  FF NILCID
  TEXT:  softdat 00 00 57 F6 00 00
  ```

- >**>QUERYPM FLT**–The following ISTb is present: a soft parity fault was detected in data store of memory.

Action by the CM

In this example the inactive unit is not InSv. The CM cannot take the defective unit OOS because this action busies the SMS. The SMS in the BSY state cannot process calls. The CM sets the active unit as ISTb.

User action

If the inactive unit is OOS, the SMS drops all call processing when the user busies the unit. Return the inactive unit to service to try to get the unit to process calls. The user busies the active unit and returns the defective unit to service. The user sends static data as part of the RTS.

PM181—Intermittent parity fault, both units INSV

The following is an example of a PM181 log:

```
PM181 JUL23  23:29:16 5561 INFO SMS 0 Unit 0
```

```
Node:  ISTb, Unit 0 Act:  InSv, Unit 1, Inact:  InSv
Parity audit detected intermittent parity fault.
```

Other problem indicators include the following:

- PM128—The SMS is set ISTb, with the inactive unit as OOS.

  ```
  PM128 JUL23  23:29:16 5561 TBL ISTb SMS 0
  Node:  ISTb, (Inact OOS) From InSv
  Unit 0 Inact:  SysB (Parity errors detected) from InSv
  Unit 1 Act:  InSv
  ```

- PM189—The inactive unit of the SMS has a parity fault at intervals.

  ```
  PM189 JUL23  23:29:17 5561 INFO PM SW INFORMATION REPORT
  SMS 0 Unit 0:  Inact
  TASKID: 00370037 PARAUDT, TIME:  22:29:16.68
  COMID:  FF NILCID
  TEXT: intflt 00 00 57 F6 00 00
  ```

- >**>QUERYPM FLT**–SysB reason: an intermittent parity fault was detected in program store or data store of memory.

The SysB means that the CM takes the inactive unit OOS. The SysB also means that the CM performed a SWACT on the SMS and set the new inactive unit OOS.

Action by the CM

The CM sets the inactive unit as SysB. If the defective unit was the active unit, the CM performs a SWACT and busies the new inactive unit. The CM tries to recover the BSY unit *without operating company personnel intervention*. The CM returns the unit to service and makes sure that full unit diagnostics are run.

User action

The CM brings the unit back to service and interruption is required if the SMS does not RTS. The user checks for other problem indicators that can mean the CM cannot return the defective unit to service.

PM181—Intermittent parity fault, inactive unit OOS

The following is an example of a PM181 log:

```
PM181 JUL23  23:29:16 5561 INFO SMS 0 Unit 0
Node:  ISTb, Unit 0 Act:  InSv, Unit 1, Inact:  OOS
Parity audit detected intermittent parity fault
```

Other problem indicators include the following:

- PM128—The SMS is set ISTb, with the active unit as ISTb.

  ```
  PM128 JUL23  23:29:16 5561 TBL  ISTb SMS 0
  ```

```
Node:  ISTb, (Inact OOS) From InSv
Unit 0 Act:  ISTb (Parity errors detected) from InSv
Unit 1 Inact:  SysB
```

- PM189—The active unit of the SMS has a parity fault that is not continuous.

```
PM189 JUL23  23:29:17 5561 INFO PM SW INFORMATION REPORT
SMS 0 Unit 0:  Act
TASKID:  00370037 PARAUDT, TIME:  22:29:16.68
COMID:  FF NILCID
TEXT:  intflt 00 00 57  F6  00 00
```

- **>QUERYPM FLT**—The following ISTb is present: an intermittent parity fault was detected in memory.

The ISTb means that the CM set the active unit as ISTb, because the inactive unit is OOS.

Action by the CM

The CM sets the active unit as ISTb. The CM cannot perform recovery action at this point. If the audit runs twice in approximately 2 min and a parity audit is not found, the CM returns the active unit to InSv. If a warm SWACT continues to be not available, the unit remains as ISTb. There is no PM106 log that indicates that the PM returned to service.

User action

If the inactive unit is OOS or cannot takeover call processing, the SMS drops all call processing when the user busies the unit. Return the inactive unit to service to try to get the unit to process calls. The static data is sent as part of the RTS.

Fault isolation tests for the RCS

When a fault condition is detected in the remote concentrator SLC-96 (RCS), alarms are generated and maintenance is required. The fault could occur with the RCS components. Operating company maintenance personnel can use the fault isolation tests in this section to determine which component caused the fault. Operating company maintenance personnel can use the tests to remove the fault condition or report it to the appropriate maintenance support organization. When troubleshooting the RCS, operating company personnel can access the RCS level of the MAP display and enter the command string **>QUERYPM FLT**.

RCS alarms

The following types of RCS alarm messages are sent to the CM along with a description of the required actions:

- major

- minor
- power/miscellaneous
- shelf.

These alarms appear as PM128 log reports at the MAP terminal. In addition to the description provided in the following paragraphs, information and instructions for actions are provided in the alarm description table in this document.

Major alarm

A major alarm indicates a fault occurred that affects service to subscribers. If a major alarm occurs without a shelf alarm, the RCS is system busied. If a major alarm occurs with a shelf alarm, the RCS is placed in ISTb.

When system busied, a CM audit attempts to RTS the RCS. This audit runs in 10 min intervals. If this audit correctly returns the RCS to service or if the RCS is manually returned to service, the alarm clears.

When the RCS is ISTb, operating company personnel must enter the command string **>QUERYPM FLT** to determine the cause of the alarm. Normally, it is a defective line interface unit (LIU) or transmit receive unit (TRU) card.

An example of a failure that causes a major alarm and a shelf alarm is the failure of the derived data link (DDL) looping test. The DDL tests messaging capability between the SMS and RCS. Another example occurs when the SMS detects a failure of a DS-1 link for a shelf local carrier group alarm (LCGA).

Minor alarm

A minor alarm indicates a fault occurred that does not affect subscribers. This alarm means that the RCS is placed in ISTb.

Disabling protection switching is an event of a non-fault condition that causes a minor alarm.

Failure of the pulse code modulation (PCM) looping test used to check transmission over an assigned DS-1 channel in Mode II is an example of a fault condition. This fault condition causes a minor alarm.

Power/miscellaneous alarm

A power/miscellaneous alarm indicates a power failure or an optional miscellaneous fault. The RCS is set to ISTb for this alarm.

Shelf alarm

A shelf alarm indicates a failure on a specified RCS shelf. This failure is major and sets the RCS to ISTb. A LCGA, where the SMS detects a fault on a DS-1 link, is an example of a fault that causes a shelf alarm. The types of shelf alarms include A SHELF, B SHELF, C SHELF, and D SHELF.

> ***Note:*** Alarm light emitting diodes (LEDs) light on the alarm control unit (ACU) card when alarms occur on an RCS shelf. When faults are corrected with the replacement of defective common equipment cards, the LED turns OFF. Subscribers do not receive a dial tone immediately. Dial tone occurs in 1 min after an audit that clears the alarm in the DMS switch.

RCS fault isolation tests

The following types of looping tests are supported:

- PCM looping test
- Data description language (DDL) looping test
- far-end loop (FELP) test.

PCM looping test

This test can run when a DS-1 channel is assigned to a subscriber in Mode II. The SMS runs this test alone and checks the integrity of the assigned DS-1 channel. For the PCM looping test the SMS sends three test words on the DS-1 channel to the RCS. The SMS checks the looped return of these test words from the RCS. If the test fails, the DS-1 channel is disabled and the RCS is set to ISTb.

DDL looping test

The SMS runs this test alone, which tests the DDL link. In order to test the DDL you must check the C field of the DDL. The SMS sends a message to the RCS in the DDL and checks for a responding RCS message.

If either the DDL looping test or A-link fails, a major alarm occurs. The RCS can continue to run because the other links continue to operate correctly.

FELP command

The **>FELP** command is a CARRIER-level command that enables all DS-1 channels on a DS-1 link to be looped at the RCS. During FELP, the system loops all 24 channels on a DS-1 link from the SMS over the DS-1 link. From the DS-1 link the 24 channels loop to the RCS and back to the SMS.

When the user issues the **>FELP** command for a carrier, the user must enter one option from a set of four options. The option TEST is one of these four options. When the user issues the FELP TEST, all 24 DS-1 channels on the specified link are looped, and the system sends PCM on DS-1 channel 4. The PCM is looped, and the PCM sent and received are compared.

The user can perform the FELP command on InSv, protection, and BSY DS-1 links. Protection links must be manually busied before the user issues the FELP command. The following must have a protection link available:

- InSv
- ManB
- SysB.

The protection links must be available to allow the links to be protection switched during execution of the **>FELP** command. This means the RCS where the links attach must be data entered for protection switching.

If a protection link is not available for an InSv, ManB, or SysB link the user can issue a FELP command. If the user does not issue a FELP command is not issued the loop back is not enabled.

When PCM samples are looped on DS-1 links, the samples are used to check the DS-1 link. You can use the samples to check some RCS control cards for correct operation.

If the A-link fails and cannot be protection switched, a loss of DDL messaging occurs. A condition that does not allow the A–link to be protection switched is if protection switching is disabled. The DDL messaging includes alarm and protection switching messaging. Failure of the A-link means that a loss of FELP capability occurs for all other DS-1 links on the RCS.

Fault isolation tests for DS-1 link faults

A fault condition detected on DS-1 links, requires maintenance action. Operating company maintenance personnel use fault isolation tests to determine which component caused the fault. Operating company maintenance personnel remove the fault condition or report it to the appropriate maintenance support organization. When troubleshooting DS-1 links, operating company personnel post the link at the CARRIER level of the MAP display. Operating company personnel enter the **>DETAIL** command to obtain information on the link in question. The following paragraphs provide methods for handling exact conditions.

Summary of carrier maintenance

Operating company personnel can perform the following operations on DS-1 carrier links at the CARRIER level of the MAP display:

- detail information about an exact carrier

- display carriers in an exact state
- post a carrier or group of carriers
- protection switch a carrier.

The following commands *cannot* be executed on a remote carrier, but the commands appear on the CARRIER menu display:

- **>TST**
- **>BSY**
- **>RTS**
- **>OFFL**.

The DMS–100 switch automatically performs audits of DS–1 links.

Alarms

System problems can cause signals transmitted between an SMS and an RCS to not meet specifications. These problems can include:

- frame losses
- slips
- bipolar violations (BpV)
- other faults

The DMS-100 switch monitors these signals. When the signals do not meet specifications, OMs are pegged and the maintenance limit (ML) and OOS limit (OL) are increased. Steady or excessive frame losses, slips, or BpV normally cause a carrier to be set to OOS.

Note: Operating company personnel use the **>SETACTION** command at the MAP terminal to allow a carrier to be put OOS when it exceeds the OL. Excessive BpV causes a carrier to be put OOS, regardless of how the operating company personnel use the **>SETACTION** command.

The LCGA and remote carrier group alarm (RCGA) are the two DS-1 carrier alarms. The LCGA associates with signals from the RCS to the SMS. The RCGA associates with signals from the SMS to the RCS. Steady-state frame loss for a time specified in table CARRMTC causes an LCGA. The LCGA is cleared when the frame is regained for a time data entered in table CARRMTC.

Isolated or intermittent faults, like frame losses, slips, or BpV, accumulate. When the faults reach the ML, the system updates a field marked ML on the MAP display. The appearance of the field warns operating company personnel that faults have occurred or occur on the carrier.

A carrier is placed temporarily system busy (SysB-T) or permanently system busy (SysB-P). The state depends on the number of times the system returned the carrier to service.

The carrier is set SysB-T if the carrier meets the following requirements:

- A steady state alarm was raised for a carrier, excess bipolar violations occurred, or the carrier exceeded the OL for frame losses or slips.
- The **>SETACTION** command is in use with the carrier, but the carrier has not exceeded the OL for RTS.

If the same carrier exceeds its OL for RTS, it is set SysB-P and must be manually returned to service.

The DMS-100 switch places a carrier OOS when the system raises an LCGA. The DMS-100 switch RTSs the carrier when the alarm clears and the frame is regained. Operating company personnel can place a limit on the number of times a carrier is RTS. This limit prevents a carrier from bouncing between SysB and InSv states for an amount of time that is not limited. The default for the consecutive number of times the system can return the carrier to service is 255.

A carrier remains in the SysB-T state until one of two events occur.

- Operating company personnel can take manual action to return the carrier to service. In this event, RTS sequence tests pass and indicate that faults do not persist in the carrier.
- The system also can take action to return the carrier to service. The system returns the carrier to service when the carrier audit cannot find alarms that persist in the carrier.

Operating company personnel must return a carrier in the SysB–P state to service manually.

The ML, OS, and audit interval defaults for frame losses, BpV, slips, and RTS appear in the following table.

Maintenance limit, OOS limit, and audit interval carrier defaults

Item	ML	OS	Audit interval
Frame Loss	17	511	10.0 min
Slip	4	255	10.0 min
BpV (BER)	1 in 10^6	1 in 10^3	4.8 s
RTS	255	255	10.0 min

The DMS-100 switch counts frame losses, slips, BpV, and RTS for either specified time or audit intervals. At the end of an accumulative audit interval normally midnight to midnight, the counters are reset to zero.

A count below 1 in 10^6 bits clears BpV ML. A calculated long-term count below 1 in 10^5 bits clears the OL.

Frame losses, slips, and RTS operations are also counted. If enough occurrences accumulate, the ML and OL limits are reached.

Four classes of carriers are present:

- trunks
- timing
- remote
- protection line.

The DS-1 links that connect SMS and RCS modules belong to classes *remote* and *protection line*. Trunk indicates that the carrier is used as a trunk to another central office. Timing indicates that the carrier is used as a timing trunk to another central office.

> ***Note:*** The **>BSY**, **>OFFL**, **>RTS**, and **>TST** commands cannot be performed on lines that belong to the class *remote*.

Up to five carriers are posted in a MAP display. These carriers have numbers zero through four. If the posted set contains more than five carriers, the prompt `MORE...` appears. The menu command **>NEXT** produces a second display. The next five carriers appear on this second display. The operating company personnel can issue the **>NEXT** command again to display additional carriers in the posted set.

The MAP display that appears in the following figure is a result of the **>DETAIL 0 REM** command. Carrier zero, circuit zero, is connected to SMS 0. Data for this carrier is near the bottom of the MAP display.

DETAIL MAP display that shows carrier information

```
   CM    CMC    IOD     Net     PM     CMS     Lns    Trks    Ext   APPL
                   .      .      .      .       .      .       .      .

   DETAIL  CLASS   ML  OS  Alarm   SysB  ManB  Uneq  Offl  CBsy PBsy InSv

0  Quit_   TRUNKS   0   0   1        1      0   0     16    0     0   6
2  Post_   REMOTE   0   0   4        0      9   0     0     0     1  28
3          PROTLN   0   0   1        0      1   0     1     0     0   3
4
5  Loop_   N CLASS SITE SMS CK  D ALRM SLIP FRME BER ES SES STATE PROT
6  Tst_    0 REMOTE HOST 0  0   C  ES    0   1 –5.2 OS  0   INSV
7  Bsy_    1 REMOTE HOST 0  1   C LCGA  11    0   ML  2  0   SYSB–T
8  RTS_    SIZE OF POSTED SET  :  2
9  Offl_
10 DispOpt_
11 Disp_
12 Next    N CLASS SITE RCS CK  D ALRM SLIP FRME BER ES SES STATE
13         0 REMOTE KRCS 0–1 0  P   0    0  <–7  0   0  PBSY
14 Detail_ DETAIL:ZZZZZZZZZ
15
16 ProtSw
17 Felp_
18



    userid
 TIME hh:mm>
```

The field *CK* refers to the carrier circuit in use. The field *D* indicates the direction of the carrier in relation to the carrier span. The *P* indicates the peripheral-side (P-side) or away from the switch. The *C* indicates C-side or toward the switch. The complete *ALRM* field shows which error or maintenance limit is exceeded. Refer to table maintenance limit, out-of-service limit, and audit interval carrier defaults in this document.

The next two fields *SLIP* and *FRAME* track the number of minor frame slips or complete frame losses that occurred. *The BER* field has an exponential number that indicates the bit error rate that occurs during the audit cycle. In this example –5.2 is less than 1 error in $10^{5.2}$ bits or <–7 would mean less than 1 BpV in a stream of 107 bits. The fields *ES* and *SES* accumulate errored seconds (ES) and severely errored seconds (SES) counts. All of the fault fields can show the over limit flags, ML or OL instead of the correct problem counts. The *STATE* field represents the status of the link.

Fault isolation for subscriber lines

Subscriber lines maintenance

Lines maintenance for the RCS consists of the following areas:

- commands issued from the LTP and automatic line testing (ALT) levels
- line diagnostic initiated by a system diagnostic scheduler, a DMS-100 software process that occurs when a call fails twice
- subscriber station tests
- line tests executed through a mechanized loop tester (MLT) or test desk facility.

Line circuits, subscriber loops, and stations are tested under the lines maintenance subsystem. Both the system and operating company personnel test line circuits and subscriber loops in this subsystem.

Line testing helps determine if a line circuit, loop, or line circuit and loop group function correctly. If the line proves defective, line tests determine if the fault lies in the line circuit or in the attached loop. When a fault is in the loop, the fault is referred to another department like plant maintenance. When the fault is in the line circuit, operating company personnel must replace the line card. You must test the line again to verify that the fault cleared.

Line maintenance occurs under the following conditions:

- the user enters a command from the LTP level
- tests are scheduled from the ALT level
- digit reception is defective. This defect causes the DMS switch to test a line automatically for foreign potential
- a call fails twice. This condition causes the system to place the call in the *shower queue* for full diagnostic testing
- the subscriber telephone set initiates tests
- a test desk initiates tests

Manual lines testing

The switch operator on line circuits, loops, and stations performs manual line tests. Line circuits and loops are tested separately and the results appear to the switch operator at a visual display unit (VDU).

Note: Manual lines are tested as part of routine maintenance or when the system generates a customer report or an ALT failure occurs.

Maintenance scenarios

Errors can arise during lines diagnostics. Error messages can arise during use of the **>DIAG**, **>VDC**, **>VAC**, **>RES**, **>CAP**, and **>LNTST** commands. The error messages appear as part of ALT101 or LINE101 logs.

Tests can be aborted when the following conditions occur:

- connection fail
- PM not ready
- no SMS P-side channel
- check CTU/line card
- PM reply time-out
- PM reply that is not planned
- software error
- test alarm return code.

When a test is aborted because of the conditions mentioned earlier, Nortel recommends the following actions:

1 Check the RCS for PM reply time-out and a PM reply that is not planned. Post the RCS at the MAP terminal and enter the command string **>QUERYPM FLT**. All faults present at the RCS appear. Replace the defective equipment.

2 Try the test again for a PM not ready and no SMS P-side channel is available. The following messages result from temporary conditions:

   `PM Not Ready`
   Another **>MAP** command was entered for the line. This command was being processed when the line diagnostic was requested.

   `No SMS P-side Channel`
   All DS-1 channels are BSY.

   If, during this condition, repeated attempts cause the test to be repeatedly aborted, you must make sure to insert the line card correctly.

3 A check CTU/line card message arises when the system cannot establish communication between the DMS switch and the tested line card. The possible causes for this problem are a lost line card or a defective CTU card.

4 Check log reports for a software error. The DMS-100 switch must generate PM180 and SWERR logs when software errors occur. The logs indicate possible areas of defective software.

5 Test link A for a failed connection.

6 Replace the line card for failure messages.

Several error messages that apply to diagnostics appear on the following table:

Diagnostic error messages and failed tests

Failed test	Error message
Negative tip party ringing	Tip ringing, ANI ground
Positive tip party ringing	Positive tip party
Positive ring party ringing	Positive ring party
Positive coin control voltage	Coin collect or positive coin off-hook
Positive coin control ground	Positive coin presence
Negative coin control voltage	Coin return or negative coin off-hook
Negative coin control ground	Negative coin presence

Tests for the **>DIAG** command can fail for the following reasons:

- off-hook
- on-hook
- tip ringing
- Automatic number identification (ANI) ground
- positive ring party
- positive tip party
- idle channel noise
- echo return loss
- carrier channel loss
- coin collect
- positive coin off-hook
- positive coin presence
- negative coin presence
- coin return
- negative coin off-hook
- talk battery.

Run lines tests

To access subscriber lines from the LTP or the ALT level, a metallic test access (MTA) minibar switch is used with a metallic test pair.

Up to 32 RCS modules can share a metallic test pair. A maximum of 2000 subscriber lines are recommended for support off one test pair. This recommendation is to make sure that the system rejects the least possible subscriber line test requests. This event occurs because another line has the test pair in use.

The RCT, RCS, and RCS modules can share a metallic test pair. All modules that share a test pair must be of the same type. If an RCS uses a test pair, additional RCS modules can share the test pair. The RCT and RCS modules cannot share the pair with the RCS modules.

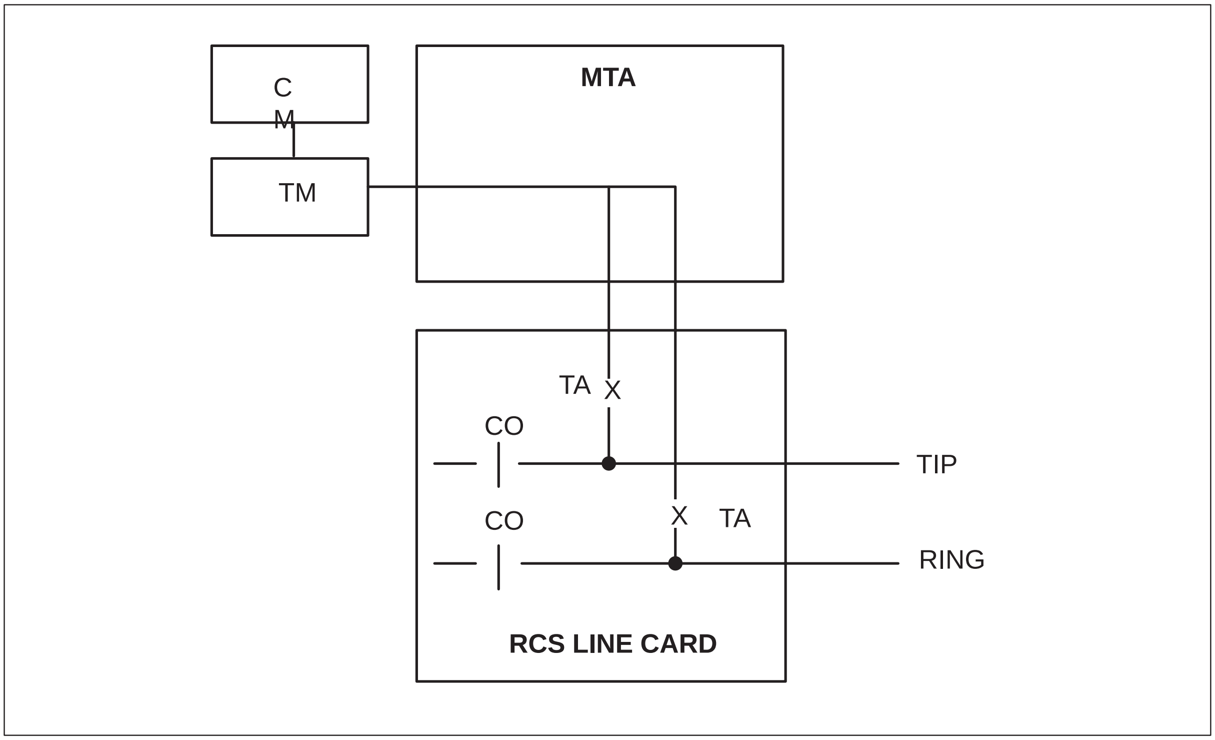
The following limits apply to subscriber lines diagnostics:

- LTP-level tests on special-service lines are not supported.
- Only one line on an RCS can be tested at one time.
- More than one RCS in a group of RCS modules at the same site, with the same frame number can share a MTA vertical test pair. If this event occurs, one line on that group of RCS modules can be tested at a time.

  Note: The SPOTS card, S9CD271A, can be used as a special-service or single-party plain old telephone service (POTS) card. The same diagnostics can be run on the SPOTS card as are run on single-party cards.

The following figure shows how MTA is used with an RCS line card:

MTA for the RCS line card



When a subscriber loop connects to the MTA, it can be tested from the LTP or the ALT levels.

The RCS line cards have test access (TA) and cutoff (CO) functions on the same relay. When this relay operates, the line card is cut off from the MTA and metallic testing is restricted to subscriber lines. The name of this process is the OUT testing configuration.

While the subscriber loop connects to a metallic test pair for testing, the associated line card connects to a passive termination for testing. The RCS must place the correct termination across the tip and ring of the RCS line circuit. The termination is in response to A- and B-bit patterns the SMS sends to the RCS. The Bellcore document *Digital Interface Between the SLC-96 Digital Loop Carrier System and a Local Digital Switch* describes these patterns.

Along with line circuit and subscriber loop tests, the system supports the station ringer test.

The silent switchman test is not supported. Supporting the silent switchman test places the subscriber loop in cutoff. The MTA testing to subscriber loops has limits. The placement of the subscriber loop in cutoff interferes with the ringing. The RCS has a single relay that connects ringing and TA pathways to the loop. The attempt to run the silent switchman test causes a of the reorder tone to return to the RCS line.

The same relay cuts the line card off from the subscriber loop. The test pair that comes from the MTA switch accesses the subscriber loop.

Four types of passive termination are provided in the RCS:

- Absorb—A 900 Ω resistor connects between the tip and ring of the line card circuit. This termination causes the absorption of an incoming signal.

  The termination is set up when the SMS sends the RCS the A- and B-bit pattern to ring a ring party. The ring party must have positive dc voltage in a superimposed ringing, multi-party line circuit.

- Reflect—A loop connects between the tip and ring of the line card circuit. The tip and ring are shorted together. This termination causes the reflection of an incoming signal.

  The termination is set up when the SMS sends the RCS an A- and B-bit pattern to ring in the following condition. The A- and B-bit pattern rings a ring party with negative dc voltage in superimposed ringing, multi-party line circuit. The termination is set up in the following condition also. The SMS sends the A- and B-bit pattern to ring a single-party or coin line.

- Absorb-PTPG—This termination is the same as the absorb termination, except that a positive tip party ground (PTPG) is provided. Detection of a dc path to ground occurs if the RCS provides a positive dc voltage to the tip or ring.

  The termination is set up when the SMS sends the RCS the A- and B-bit pattern. The bit pattern causes the ringing of a tip party with positive dc voltage in a superimposed ringing, multi-party line circuit. This termination is set up in the following condition also. The SMS sends the A- and B-bit pattern to execute coin collect for a coin card.

- Reflect-NTPG—This termination is the same as the reflect termination, except that a negative tip party ground (NTPG) is provided. This is a dc path to ground detected if the RCS provides a negative dc voltage to the tip or ring.

  The termination is set up when the SMS sends the RCS the A- and B-bit pattern. The bit pattern causes ringing of a tip party with negative dc voltage in a superimposed ringing, multi-party line circuit. This termination is set up in the following condition also. The SMS sends the A- and B-bit pattern to execute coin return for a coin card.

To remove a termination, the SMS sends an on-hook message to the RCS in the M-field of the DDL.

The following sequence of events occurs during test setup of an RCS line card:

1 The CM sends a test request to the SMS.

2 To initiate test setup in the RCS, the SMS sends an A- and B-bit pattern to the RCS. The bit pattern name is the per-channel signaling bit test pattern or channel test pattern.

3 Within 100 ms, the RCS returns a seize RC message to the SMS in the M-field of the DDL. This message indicates that RCS hardware needed to set up a test configuration functions correctly.

4 To respond, the SMS sends a proceed RC message to the RCS in the M-field of the DDL.

5 Within 800 ms, the RCS returns a proceed RC message to the SMS using the M-field of the DDL. This message indicates that a metal test pair connected to the subscriber loop. The message indicates that an absorb-PTPG termination was set up to the associated line circuit in the line card.

After test setup, the SMS sends the RCS exact A- and B-bit patterns to select correct test terminations for specified tests. The test sequences for single-party, multi-party, and coin cards, appear in the following examples.

Single-party test sequence

The test sequence for a single-party card follows:

1 The SMS sends the RCS channel test setup request sequence.

2 The RCS connects the absorb-PTPG termination.

3 The SMS sends idle A-B bits and scans for an off-hook message. The RCS detects the absorb termination as off-hook and sends the SMS an off-hook pattern of A-B bits.

4 The echo return loss test uses the transmission test unit (TTU).

5 The SMS sends the RCS an on-hook message to remove termination, sends idle A-B bits, and scans for on-hook.

6 The SMS sends an on-hook message to the RCS to remove termination.

7 The RCS detects termination removal as on-hook and sends the SMS an on-hook A-B pattern.

8 The SMS requests a single-party ringing test and scans for off-hook. The RCS connects the reflect termination. The RCS detects the termination as off-hook, if ringing, and signals off-hook to the SMS.

9 The channel loss test uses the TTU.

10 The noise test uses the TTU.

11 The SMS sends the RCS a message to terminate the channel test and sends idle A-B bits.

12 The diagnostic is complete.

Multi-party test sequence

The test sequence for a multi-party card follows:

1 The SMS sends the RCS a channel test setup request.

2 The RCS connects the absorb-PTPG termination.

3 The SMS sends idle A-B bits and scans for off-hook. The RCS detects the absorb termination as off-hook and sends the SMS an off-hook pattern. This pattern consists of A- and B-bits.

4 The echo return loss test uses the TTU.

5 The SMS sends the RCS an on-hook message to remove termination, idle A-B bits, and scan for an on-hook condition.

6 The RCS detects termination removal as on-hook and sends the SMS an on-hook A- and B-bit pattern.

7 The SMS signals the RCS to test ringing. The RCS connects the reflect termination. The RCS detects termination as off-hook, if ringing and signals off-hook to the SMS.

8 The loss test uses the TTU.

9 The noise test uses the TTU.

10 The SMS sends the RCS a message to remove termination.

11 The SMS signals the RCS to test –T party. The RCS connects the reflect-NTPG termination. The RCS detects termination if the –T ringing and signals tip party ground to the SMS.

12 The channel loss test uses the TTU to determine if reflect termination made.

13 The SMS requests ANI test that must indicate tip ground. The RCS signals tip party ground. The SMS sends A-B bits for reflect termination.

14 The SMS sends the RCS a message to remove termination.

15 The SMS signals the RCS to test +R ringing. The RCS connects absorb termination, detects the termination as off-hook if +R ringing occurs, and signals off-hook to the SMS.

16 The echo return loss test uses TTU to determine if absorb termination made.

17 The SMS sends the RCS a message to remove termination.

18 The SMS signals the RCS to test +T ringing and scans for off-hook. The RCS connects absorb-PTPG termination, detects termination as off-hook if +T ringing is present, and signals off-hook to the SMS.

19 The echo return loss test uses TTU to determines if absorb termination made.

20 The SMS sends the RCS message to terminate channel test and sends idle A-B bits.

21 The diagnostic is complete.

Coin test sequence

The test sequence for a coin card follows:

1 The SMS sends the RCS a channel test setup request.

2 The RCS connects the absorb-PTPG termination.

3 The SMS sends negative loop mode A-B bits and scans for off-hook.

4 The RCS detects termination as off-hook and sends off-hook A-B bits.

5 The echo return loss test uses TTU.

6 The SMS sends on-hook message to the RCS to remove termination, sends negative loop mode A-B bits, and scans for on-hook.

7 The RCS detects termination removal as on-hook and sends the SMS an on-hook A/B pattern.

8 The SMS signals the RCS to test –R ringing and scans for off-hook. The RCS connects the reflect termination if the –R ringing is present and detects termination as off-hook, signals off-hook. The SMS sends negative loop mode A-B bits.

9 The channel loss test uses the TTU.

10 The noise test uses the TTU.

11 The SMS sends an on-hook message to the RCS to remove termination.

12 The SMS signals the RCS to test coin collect. The RCS connects the absorb-PTPG termination and sends coin ground A-B bits.

13 The SMS sends negative loop mode A-B bits and scans for off-hook. The RCS detects termination off-hook if channel unit provides positive coin control voltage and sends off-hook A-B bits.

14 The SMS signals the RCS to run a positive coin check. The RCS sends coin ground A-B bits.

15 The SMS sends negative loop mode A-B bits, while echo return loss test uses the TTU. The test determines if the correct termination occurs.

16 The SMS sends a request to the RCS for a reverse battery test and scans for off-hook. If there a positive talk battery is present, the following actions occur. The RCS detects off-hook and sends off-hook A-B bits to the SMS.

17 The channel loss test uses the TTU to determine if the correct termination occurs.

18 The SMS sends the RCS a message to remove termination.

19 The SMS signals the RCS to test coin return. The RCS connects the reflect-NTPG termination and sends coin ground A-B bits as off-hook. The RCS sends bits as off-hook if the channel unit provides negative coin control voltage.

20 The SMS requests the RCS to run negative coin check. The RCS sends coin ground A-B bits.

21 The SMS sends negative loop mode A-B bits while the TTU conducts channel loss test.

22 The SMS sends the RCS a message to terminate the channel test.

23 The diagnostic is terminated.

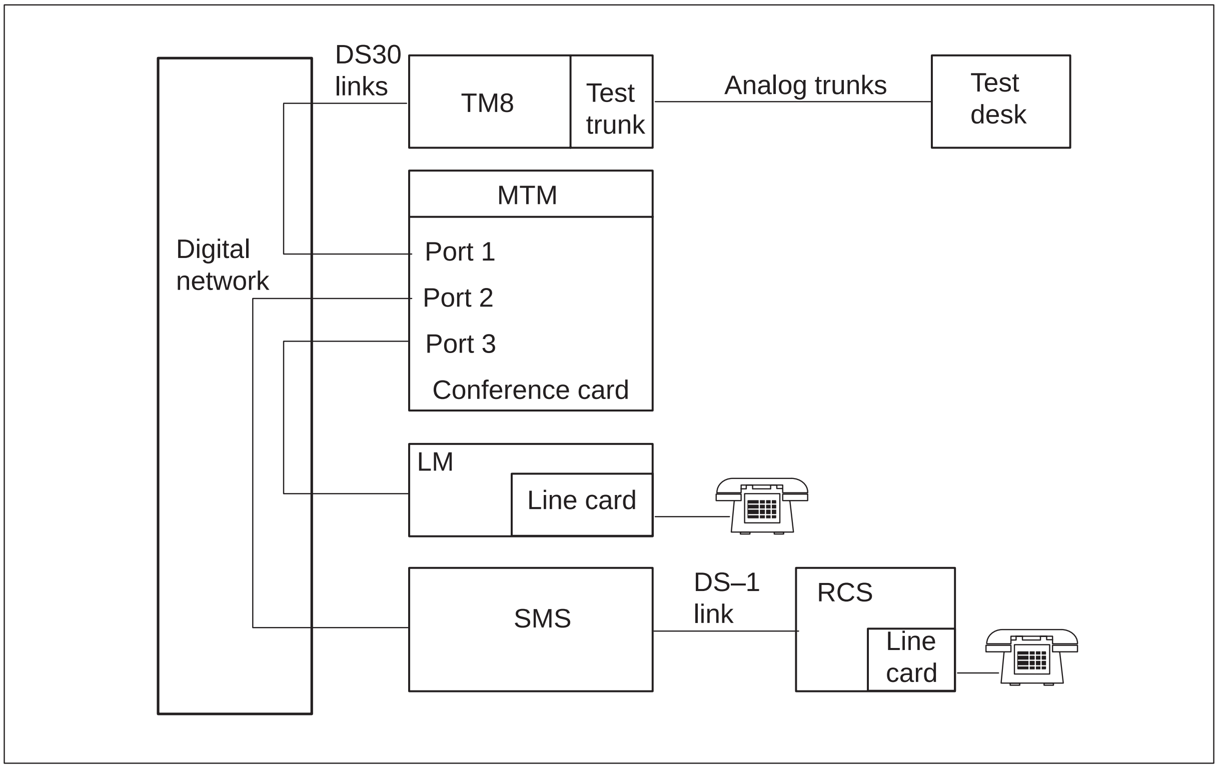
To remove a test termination, the SMS sends the RCS an on-hook message in the M-field of the DDL. To halt a continuous test, the SMS or RCS can send test alarm message in the M-field of the DDL.

Using external test equipment

When you use external test equipment to test a line, a bridge connection to the line is set up. The bridge is set up with a conference circuit when the line is in the talking state. If the line is idle, test equipment connects to the line through the MTA network. This bridge connection enables operating company personnel to verify that the line is in use.

The following figure shows an example of bridged access to a subscriber line that extends from an RCS:

Bridged access that uses a conference card



Operating company personnel can dial the subscriber line directory number (DN) or line equipment number (LEN) to test from the test desk. When this event occurs, the DMS switch collects and translates the digits. If the line is a valid destination and is idle, the test desk connects to the line through an MTA network. If the line is in the talking state, a conference card sets up a bridged connection.

If, during the conference, the RCS line checked goes on-hook and originates again, a BSY tone returns to the test desk. If the RCS line goes on-hook and does not originate again, the following condition occurs. The test desk connects through the MTA network to the line.

The other party is the party connected in call processing to the RCS line. If this other party goes on-hook, monitor access is not gained while the RCS line remains off-hook. If the RCS line goes on-hook and remains on-hook, monitor access occurs.

If the RCS line goes on-hook and originates again, a BSY tone returns to the test desk.

If the conference call is set up and the test desk disconnects, the two original lines remain connected. The original lines remain connected without the use of a conference card.

The following list is a list of events that lead to a conference call that fails to be set up. The first list contains conditions that cause the sending of a BSY tone to the test desk. The second list contains conditions that cause the sending of a reorder tone to the test desk.

- Test desk receives BSY tone 60 ipm
  - line has an activated custom calling feature
  - line connects to an operator, a private branch exchange (PBX), or another test trunk
  - line does not have a double connection option
  - line has plug-up option
  - line has suspended service option
  - line has requested suspended service option
  - line has random make BSY option
  - line does not have line insulation test option
  - line connects to an attendant console
  - line is in ringing or digit collection states
  - line receives a station test at this time, like the station ringer or silent switchman test
  - line has three-way calling option and engages in a three-way call at this time
  - the test trunk is data entered as type TSTDK and version normal in table TRKGRP
  - the BARGE field of table TRKGRP is set to N (no) instead of Y (yes)

- Test desk receives reorder tone 120 ipm
  - — the MTA network is not available
  - — the line is hardware not assigned
  - — the line is ManB
  - — the line is line module BSY
  - — the line is in the PLO state
  - — the line is call processing BSY, but the state is not the talking state
  - — the line is installation BSY
  - — all conference circuits are BSY

Limits

Monitor access through a conference card has the following limits:

- The use of custom calling features cannot occur during the bridging of a line.
- If a custom calling feature is active on a line, bridging of that line cannot occur with a conference card.

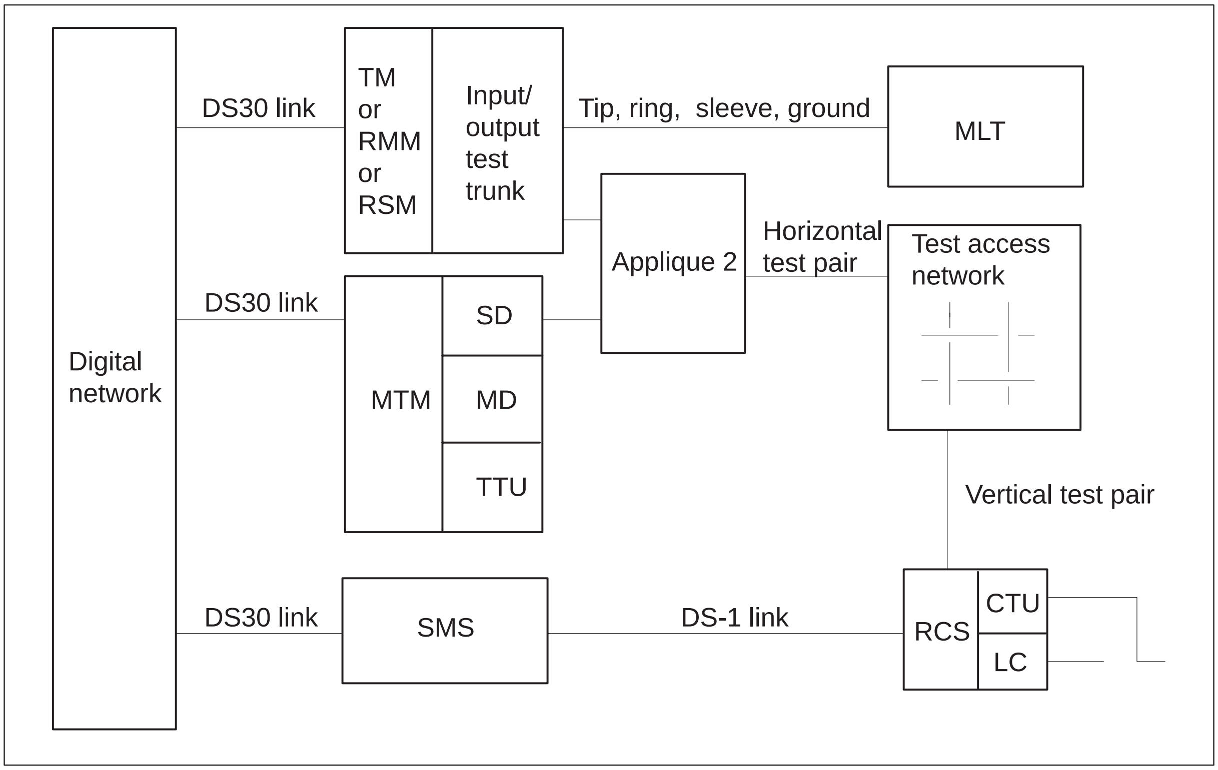
Test desk tests

A test desk is a special piece of test equipment that can test the line circuit or the subscriber loop. The following types of test desks perform different tests on the line circuit or the subscriber loop:

- #14 local test desk (LTD)
- #3 local test cabinet (LTC)
- Centralized Automatic Loop Reporting System (CALRS)

A test desk configuration appears in the following figure. Some of the hardware that appears is optional. This optional hardware depends on the test desk tests to perform.

Test desk configuration



Station testing

Station testing helps to determine if a station functions correctly while the station connects to a loop and a line circuit group. Station testing occurs under the line maintenance subsystem (LNS) at the MAP terminal or from a station. The testing occurs from a station in the events of the station ringer and short circuit tests that you can dial. Stations tests are manual. Results from station tests must return to the station.

The system does not support the silent switchman test because a subscriber loop in cutoff interferes with the ringing.

The following is a list of information that appears in log reports ALT101 or LINE101 or at the MAP display. The information is for station ringer and dialable short circuit tests that the system aborts:

- connection failure
- PM is not ready
- check the channel test unit, the line card, or both
- no SMS P-side channel
- PM reply time-out
- PM reply not expected
- software error.

Diagnostic tests for the SMS

Diagnostic tests must find hardware faults in levels down to a card level where replacement can occur. Initiation of the tests can be system or manual. System initiated diagnostics generate when internal counters exceed fixed levels. Operating company personnel must use manually initiated diagnostics in the following conditions:

- log reports indicate a common equipment problem
- system generates system detected alarms
- the OMs show high error counts.

ROM diagnostic

The read-only memory (ROM) diagnostic detects faults in the unified processor and memory card. The SMS unit can be in the who-am-I (WAI) state. This condition initiates the ROM diagnostic.

The ROM diagnostic tests the following memory card circuits:

- memory circuits
- parity circuits
- direct memory access (DMA) circuitry
- activity circuits
- holding registers

The ROM diagnostic tests the following processor card circuits:

- memory mapper unit
- universal synchronous/asynchronous receive/transmit integrated circuits

- timers/integrated circuits that you can program.

  Note: After the system runs the ROM diagnostic, operating company personnel must load the unit again.

A- and B-bit diagnostic

The A- and B-bit diagnostic tests the A- and B-bit circuits on the NT6X44 time switch card. The A- and B-bit test the global loop-around of the time switch card. The A- and B-bit test the channel supervision message (CSM) loop-around of the NT6X41 formatter card.

The diagnostic performs the following tests:

- random access memory (RAM) on the A/B transmit and receive memories
- time switching function of the time switch
- generation and reception of A- and B-bits
- enable-disable function of the A/B-bit receive memory.

The diagnostic involves the following SMS hardware components:

- NT6X85 DS-1 interface card
- NT6X44 time switch card
- NT6X69 message card NT6X69AD ASIC version if the universal tone receiver (UTR) is present
- NT6X41 formatter card
- speech bus

CSM diagnostic

The CSM diagnostic tests the hardware involved in the transmission, reception, and use of the CSM. Most of this hardware resides on the NT6X42 CSM card. The diagnostic tests all of the memories on the NT6X42 card and the memory on the NT6X41 formatter card.

The CSM diagnostic tests the following:

- integrity match-mismatch logic
- channel data byte (CDB) transmission and reception logic
- speech bus parity error generation NT6X41 formatter card and detection, NT6X42 CSM card, logic.

The diagnostic checks for:

- actions between bits of the parity error RAM

- correct action between the integrity match-mismatch and CDB update logic
- correct operation of the CSM loop on the NT6X41 formatter card.

This diagnostic involves the following hardware components:

- the NT6X42 CSM card
- the NT6X41 formatter card
- the speech bus

Formatter diagnostic

The formatter diagnostic tests the NT6X41 formatter card. The diagnostic tests the control RAM and the C-side loop enable-disable function. This diagnostic checks for correct functioning of the network framing interrupts, C-side messaging, and P-side messaging. The diagnostic checks the integrity of the speech bus connection and message memories, both located on the NT6X69 message card.

This diagnostic involves the following hardware components:

- the NT6X41 formatter card
- the NT6X69 message card
- the NT6X44 time switch card
- the speech bus

Message diagnostic

The message diagnostic tests the hardware of the NT6X69 message card. The message diagnostic validates the integrity of the message buffer memory and P- and C-side messaging.

The diagnostic checks for correct functioning of the following:

- the time slice processes of the on-board processor
- the speech bus interface
- the intermodule communication (IMC) link
- the cyclic redundancy check (CRC) ROM.

This diagnostic involves the following hardware components:

- the NT6X69 message card (NT6X69AD ASIC version if UTR is present)
- the NT6X44 time switch card
- the NT6X41 formatter card

- the NT6X85 DS-1 interface cards
- the speech bus

Tones diagnostic

The tones diagnostic runs PCM checksums on the tones of ports 16 and 17 phantom ports. The tones diagnostic runs the checksum to make sure that these checksums agree with the checksums in the tone ROM. The tone ROM is on the NT6X69 message card. This diagnostic also checks the speech bus connection memory for all channels. The diagnostic performs this check to make sure that the tones are allowed on the speech bus. The diagnostic does not check the connection for 0 and 16 of ports 16 and 17.

This diagnostic involves the following hardware components:

- the NT6X69 message and tone card (NT6X69AD ASIC version if UTR is present)
- the speech bus

Speech path diagnostic

The speech path diagnostic performs a complete check for data integrity on all the XMS-based peripheral module (XPM) speech channels. This diagnostic checks all C-side and P-side loop-arounds and all time slots of the speech bus. This diagnostic also tests the highway, multiplex and the PCM enable-disable gates.

This diagnostic involves the following hardware components:

- the NT6X41 formatter card
- the NT6X69 message and tones card (NT6X69AD ASIC version if UTR is present)
- the NT6X44 time switch card
- the NT6X85 DS-1 interface cards
- speech bus

Time switch card diagnostic

The SMS time switch card switches the speech, control, and supervisory signals from the C-side to the P-side of the SMS. The time switch card diagnostic tests the time switching of the time switch NT6X44 card. This diagnostic runs if the SMS is OOS. The diagnostic tests for the time switch card test the incoming and outgoing connection memories. These tests perform a test of the time switching function of the card. The time switch diagnostic tests the NT6X44 phase comparators in both InSv and OOS states. This diagnostic checks the values of the office-sync phase comparators to detect defective comparators that office synchronization uses.

This diagnostic involves the following hardware components:

- the NT6X44
- the NT6X69 (NT6X69AD ASIC version if UTR is present)

Ring/pad card diagnostic

The ring/pad diagnostic tests the hardware and functionality of the NT6X80 ring/pad card. This diagnostic tests the card reset and memory, and verifies ring/pad interrupt. The diagnostic performs the tests on the pad ROM and dc voltages. The hardware the ring/pad diagnostic tests is restricted to the NT6X80 card.

DS-1 card diagnostic

The DS-1 card diagnostic verifies that DS-1 cards operate correctly. The diagnostics can check the DS-1 link. This event depends on the type of activation of the diagnostics. The DS-1 card diagnostic runs during CM link audits. The diagnostic test runs when the SMS or a DS-1 link RTS from the MAP terminal. The diagnostic test runs when a user tests the DS-1 link from the MAP terminal. The PCM looping tests occur during the test of the DS-1 link from the MAP terminal.

The InSv audit tests all InSv DS-1 links. The OOS audit tests all SysB DS-1 links.

DS-1 DDL diagnostic

The DS-1 DDL diagnostic tests the derived data link circuits of the SLC-96 DS-1 interface card. This diagnostic checks for:

- correct functioning of DDL synchronization
- correct insertion of the DDL supervisory message bits into the outgoing DS-1 framing bit time slots
- removal of the corresponding bits from the incoming frames.

The diagnostic tests the DDL messaging capability of the card. To test this capability, the diagnostic has the A/B-DDL message card transmit a known message on the DDL. The time switch card sends the message to the SLC-96 DS-1 interface card. The message is looped around in the card and returned to the time switch.

A relay in the SLC-96 DS-1 enables this loop-around. When this relay is open, the system sends data on DS-1 links.

The signaling processor (SP) checks the received message against the transmitted message. If the two messages are not identical, the mismatch indicates a fault in the SLC-96 card.

The DS-1 board diagnostic is part of the **>TST** command. Operating company personnel issue this command from the MAP terminal. For this diagnostic to run correctly, the following diagnostics must first pass:

1 DS-1 diagnostic
2 time switch diagnostic
3 A/B-DDL message card diagnostic
4 message-tones card diagnostic

This test command is important because operating company personnel can issue the subtest command at the MAP terminal. Operating company personnel can run the DS-1 board diagnostic alone.

If the diagnostic fails, a failure message like the one in the following example appears:

```
SMS 0  Unit 1  Tst  Failed,  SMS DS1 Test
Fail message received from PM
Site  Flr  RPos  Bay_Id    Shf  Description  Slot  EqPEC
HOST  00   A00   SME  000  14   SMS:00       :13   6X85
```

The diagnostic involves the following hardware components:

- the NT6X85 DS-1 interface card
- the NT6X86 A/B-DDL message card
- the NT6X44 time switch card
- the NT6X69 message card.

Testing the DDL card

To run a test on the DDL card with the SMS A/B-board diagnostics feature, operating company personnel perform the following actions. Operating company personnel post an SMS and issue the **>TST** command. The **>TST** command includes SMS A/B-DDL diagnostics as part of the routine of the command. A standard failure message for the A/B-DDL message card diagnostic failure appears in the following example:

```
SMS 0  Unit 1  TST Failed,  SMS MSG Test: 51
Fail Message received from PM
Site  Flr  Rpos  Bay_Id   Shf  Description  Slot  EqPEC
HOST  00   00    SME 000  14   SMS:000      :13   6X86
```

The location of the failure in the DMS office appears in the failure message. The message identifies the production engineering code (PEC) of the card suspected of the failure.

The parts of the A/B-DDL card tested depend on the SMS mode of operation. When the SMS is OOS, a complete diagnostic occurs. When the SMS is InSv, testing is limited to hardware and functions that do not interfere with the InSv operation. The InSv tests are a subset of OOS tests.

The following sections of the A/B-DDL card are tested:

- the 8085 microprocessor sanity
- the ROM
- the RAM
- the control, messaging, and timing circuits
- the transmit and receive interface circuits.

When the SMS is OOS, all sections of the A/B-DDL card are tested. When the SMS is InSv, the ROM, control, messaging, and timing circuits, and spare memory locations of the RAM are tested. The RAM is tested completely when the SMS is OOS.

P-side link diagnostic

To test a DS-1 link at the PM level, post the associated SMS. Make sure the SMS and the associated RCS are InSv. Enter the command string **>TST LINK <number>**.

With an InSv link, the **>TST** command causes the SMS to perform a PCM loopback test on the link. The SMS sends a PCM pattern over the DS-1 link to the RCS. The RCS loops the pattern in the time switch card and returns the pattern to the SMS. The SMS compares the sent and received samples.

If the PCM loopback test fails, the DMS-100 generates PM181, PM183, and PM128 logs. The system busies the link that fails and places the associated SMS and RCS in an ISTb state. Refer to the following examples:

```
PM181 MAY16 09:22:12 4588 INFO SMS 60
Node:  ISTb, Unit0 Inact: InSv,  Unit1 Act:  ISTb
PCM Loopback test failed on P-side link 5
```

```
PM183 MAY16 09:23:00 4677 SYSB SMS 60  P-side LINK: 2, FROM:
InSv
```

```
PM128 MAY16 09:23:33 4877 TBL ISTb SMS 60
Node       : ISTb (PSLink OOS) From InSv
Unit0 Inact: InSv
Unit1   Act: InSv
```

When a system audit detects a SysB link, the DMS-100 generates the following PM110 log:

```
PM110 MAY16 09:27:33 4899 INFO CARRIER SMS 60
CARRIER–NO: 8, REASON: REMOTE LINK SYSBSY
```

When a link is RTS, the SMS and RCS leave the ISTb state and enter the InSv state. The SMS and RCS can leave the ISTb state if there are no other faults present. The DMS-100 switch generates a PM106 log if there are no other faults present. The DMS-100 switch generates a PM184 log when a link is RTS. Refer to the examples that follow:

```
PM106 MAY16 11:23:33 4877 RTS SMS 60
Node       : InSv From ISTb
           : ISTb Cleared (PSLink OOS)
Unit0   Act: InSv
Unit1 Inact: InSv

PM184 MAY16 09:33:00 7677 RTS SMS 60  P-side LINK: 2,
              FROM: SysB
```

With an OOS link, the **>TST** command causes the RCS to perform a common equipment digroup loopback test. This test checks the ability of the RCS to assign channels on a link through the time switch card. The test checks all RCS common equipment involved in the PCM path. This equipment includes:

- maintenance
- supervisory
- switch
- digroup cards

The SMS A/B-board diagnostics firmware implements a diagnostic for the A/B-derived data link message card (A/B-DDL). The diagnostic runs a series of tests on the card and returns a pass or fail message. The message depends on the test results.

The SMS SP and the A/B-DDL 8085 microprocessor execute tests on the A/B-DDL card. The SP issues commands to the 8085 microprocessor to execute tests. The SP monitors the test results.

CMR diagnostic

The CLASS modem resource (CMR) card is self diagnosing. The card contains on-board firmware that provides the current card level diagnostic. The primary function of the diagnostic is to detect faults that affect service.

This diagnostic provides the SMS with both InSv and OOS diagnostics. This diagnostic also provides the SMS with a CMR audit. The CMR audit activates the InSv diagnostic on a normal base. The feature provides a diagnostic interface to report CMR failures.

- The InSv diagnostic provides an interface with and controls the on-board firmware diagnostics. These diagnostics continuously test different critical components of the CMR card. This diagnostic runs one time each minute as an InSv request audit. Operating company personnel can request the InSv diagnostic. To request the InSv diagnostic, the operating company personnel enter the command string **>TST UNIT # CMR**. The diagnostic triggers methods that result in thorough InSv coverage of the CMR card.
- The OOS diagnostic is a more complete test of the functionality of required CMR hardware. This diagnostic uses some of the same on-board firmware diagnostics as the InSv tests. The diagnostic allows a more complete testing of all resources where time limits or normal InSv traffic normally limit testing.
- The CMR audit helps to run this audit on a normal base. The facility audit normally used for this purpose runs on intervals of 7.5 min. The interval is too low to provide detection time for the CMR card. This feature has a new audit.

The system logs results of the CMR diagnostic test as a PM181 audit exception report. The PM181 audit exception report lists the failed card list. The PM181 audit indicates that the CMR diagnostics detect the fault.

To run the CMR diagnostic, enter the command string

>TST UNIT # CMR.

UTR diagnostic

The UTR diagnostic tests the 6X92 UTR card. The diagnostic tests the following:

- the dual port RAM interface between the signaling processor and the UTR main processor
- the service capability of the UTR main processor
- the checksum of ROM and of the UTR main processor
- the code map RAM
- the RAM of the UTR main processor
- the service capability of the sorter processor
- the tone detection

- the continuity circuit.

The diagnostic uses the following components for the SMS hardware:

- the NT6X92 UTR card
- the NT6X44 time switch card
- the NT6X69 message card
- the NT6X85 DS-1 interface card
- the speech bus

XPM diagnostic history

The Extended Peripheral Module diagnostics history, feature number AF5006, provides a resident database to record selected diagnostic results of XPMs. This feature records diagnostic results that indicate XPM sanity. The data in this database can affect DMS maintenance activities. This database provides operating company personnel with MAP command access to data on the accumulated results of diagnostics. The system retains data in the history database over warm, cold, and reload restarts. This feature is part of software package New Peripheral Maintenance NTX270AA, and is not an optional feature.

This feature is one of a group of three related features. The two remaining features include the XPM PreSWACT/Post SWACT Audit, feature number AF5007. The other feature is the XPM REX Control and Trouble Notification Improvements, feature number AF5008. Feature AF5007 uses a subset of diagnostic results with past REX tests and SWACT results to determine if a SWACT must occur. This text refers to the functionality that feature AF5007 introduces as the SWACT controller. Feature AF5008 modifies the XPM REX test to use the SWACT controller and provide log improvements.

An XPM can run diagnostics to test the function of the XPM hardware. Diagnostics can run as a result of CM or XPM requests. Diagnostics the XPM performs are part of XPM audits. The SWACT controller and operating company personnel use diagnostic results that feature AF5006 provides for system analysis.

SWACT controller

This feature provides short term diagnostic performance data to the SWACT controller. A set of query procedures are provided for applications that require the information. The SWACT controller determines if a SWACT is authorized. Short term data for a specified unit means diagnostic and audit failure counts, measured from the last time a unit gained activity.

Operating company personnel analysis

Feature AF5006 provides data on the failure history of diagnostics. This data is in the form of the number of failures that occur and the cards that are at fault. The MAP commands display data for an XPM or for all XPMs that this feature supports. Failure counts are available through the use of MAP commands; short-term failure counts and long term.

Short term failure counts

Short-term failure counts accumulate from the last time a unit gained activity. The data can help operating company personnel to guide maintenance activities and support groups for outage analysis. If an outage occurs, the XPM diagnostic history data for that peripheral must be included with other important data.

Long term failure counts

Long-term failure counts accumulate from the last time long term failure counts are reset. Manual action or batch change supplement (BCS) application reset these counts. Long term failure counts must last for the life of the BCS. This data must return to the design groups to provide data for additional diagnostic system improvements.

The function described in this feature is implemented on SuperNode and Bell Northern Research (BNR) Reduced Instruction Set Computing (BRISC) platforms. The NT–40 platforms only support the diagnostics and associated cards required for the SWACT controller. The NT-40 data store requirements cause this limit. For the NT-40 platform the diagnostic results and suspect cards recorded is smaller than SuperNode or BRISC platforms.

Description of diagnostics

Different diagnostics are run on each type of PM because different PMs have different hardware. Approximately 75 diagnostics can test XPMs. A subset of the 75 diagnostics is run on a PM. This feature captures failures for the following types of diagnostics:

- in service
- out of service
- single diagnostic
- facility audit
- other audits

Each diagnostic implicates zero or more cards that the XPM determines. In some events, the CM generates card lists at the MAP terminal or in logs. A list of card failures includes cards an XPM diagnostic or audit implicates.

Note: Feature AF5006 records cards an XPM implicates and not cards that the CM generates.

Diagnostics can be grouped together and run as a set of diagnostics or run as a single test. The following list is a list of defined sets:

- the InSv tests
- the OOS tests
- facility audit tests
- mate diagnostics
- ROM diagnostics

InSv and OOS tests

The InSv and OOS tests are solicited tests. Any CM requests cause the test to run. When CM requests to test an XPM unit with the manual **>TST** command, manual or system **>RTS**, **>SWACT**, **>BSY** or **>REX** commands, the XPM runs a set of diagnostics. The diagnostics in the set differ according to the PM type of the XPM, the state of the XPM unit, and the activity of the XPM unit. If the unit is InSv, the XPM runs a set of InSv diagnostics. If the unit is OOS, the XPM runs a set of OOS diagnostics.

The results of separate diagnostics return to the CM with a final result for the complete set. If a card is defective, the system generates a card list. The system transfers the list to the CM at the termination of the set of tests.

Facility audit

The facility audit is a set of automatic diagnostics the XPM runs. If the audit encounters problems, the system sends a message to CM. This message indicates the problem along with a list of defective cards.

Mate diagnostics

If communications are lost with one unit, the mate unit can diagnose the defective unit. The mate unit sends the results to the CM.

ROM diagnostics

If the XPM is at ROM level, a set of ROM diagnostics occur.

This feature does not record failures or cards that mate and ROM diagnostics implicate. For each diagnostic, the system generates a card list or log at the MAP terminal. Diagnostic history does not include card list or diagnostic failures.

The following table lists and describes diagnostics that this feature supports. The diagnostics are classified as solicited, audit, or solicited and audit (both). The table also identifies diagnostics that the SWACT controller requires.

Diagnostics supported

Diagnostic name	Description	Type	Required by SWACT controller
AB DIAG	A/B bits	solicited	no
CMRDIAG	CMR card	both	no
CSMDIAG	CSM diag	solicited	no
CS SPCH	Network links	solicited	no
DS1DIAG	P-side DS-1	solicited	no
FAC AUD	Facility audit	audit	no
FORMATR	Local formatter	solicited	no
MSGDIAG	6X69 messaging card	solicited	yes
MSG IMC	IMC link	both	yes
PADRING	6X80 pad/ring	solicited	no
PARITY	Parity audit	audit	yes
PS LOOP	P-Side loops	solicited	no
PS SPCH	P-side speech links	solicited	no
SCM MSG	SCM A/B DDL msg	solicited	no
SPCH DG	Speech path	solicited	no
SYNC DG	Sync diag	both	yes
TONES DG	Tone diag	both	no
TS DIAG	Time switch diag	solicited	no
UTRDIAG	UTR card	solicited	no

The following table lists the cards that this feature supports:

Supported cards

Card name	Description
NT6X40	Indicates Net interface link
NT6X41	Indicates Speech bus formatter and clock
NT6X42	Indicates CSM
NT6X44	Indicates Time switch and A/B bit logic
NTMX77	Indicates UP processor
NT6X50	Indicates DS-1 interface
NT6X69	Indicates Messaging card
NT6X78	Indicates CMR
NT6X80	Indicates SCM pad/padring
NT6X81	Indicates SCM A/B bit
NT6X85	Indicates SCM DS-1
NT6X86	Indicates SCM MSG
NT6X92	Indicates UTR

How diagnostics are stored

This feature stores diagnostic results in the form of counters. This feature supports each unit of each peripheral. Each unit has a set of counters. Counters are kept for diagnostic failures and for cards that are defective. Three types of counters are kept:

- diag – counts the number of times a diagnostic fails
- card – counts the number of times a card is reported as defective
- diag and card combination – counts the number of times a diagnostic and card combination occurs.

Two subcounters are kept for each of the three counters. These subcounters are a short term failure counter and a long term failure counter. Feature AF5007 uses the short term failure counters to determine if a SWACT is authorized. Short term failure counters are reset in the BCS cycle. Long term failure counters record the diagnostic history of a peripheral or office over a extended period of time. To reset long term failure counters, enter the command string **>QUERYPM DIAGHIST RESET**. or use a BCS application.

A single test failure can report one or more diagnostic failures and zero or more cards that are defective. A diagnostic can run in one unit to report cards in that unit and the mate unit. When a diagnostic fails, the separate diagnostic routine sends the failure information to the history database. The following table is a summary of how each type of counter increases and the differences necessary on NT-40 platforms.

Counter increments

Counter	SuperNode, BRISC	NT–40
Diag	Increases short and long term failure counts for all diagnostics on the unit in which the diagnostic runs.	Increases short and long term failure counts for diagnostics that the SWACT controller requires.
Card	Increases short and long term failure counts for all cards in the unit or units that contains the card.	Increases short and long term failure counts for cards associated with diagnostics the SWACT controller requires.
Diag and card	Increases short and long-term failure counts for all combinations of diagnostics and cards. This counter is for cards in the same unit in which the diagnostic runs.	The NT-40 does not store diagnostic and card combinations because of data store limits.

Resets and timestamps

The history database stores five timestamps for every peripheral. These timestamps are:

- for the node for the time when
  - — long term failure counters are last reset
- for unit 0 for the time when
  - — short term failure counters for unit 0 are last reset
  - — the last diagnostic failure occurred on unit 0
- for unit 1
  - — the time when short term failure counters for unit 1 are last reset

— the time when the last diagnostic failure occurred on unit 1

Short term counters are reset (set to zero) inside on a unit base when a unit correctly gains activity. This gain of activity can happen as a result of an **>RTS** or **>SWACT** command. Long term counters are reset on a node basis from an XPM posted at the MAP terminal. When long term counters are reset, the system generates a log with a summary of the data collected for that node before the reset.

A BCS application resets all diagnostic history data that includes short and long term failure counts. The system does not generate a log with long term failure counts.

Diagnostic tests for lines

When the RCS line card is set up for testing, the following diagnostics can occur.. These diagnostics occur as part of the **>DIAG** command entered at the LTP level.

Channel loss

The channel loss test is the same as the transhybrid loss test. The test checks the PCM and analog path on a line card circuit. A TTU sends four ac signals to a line card that has a reflect or reflect-NTPG termination connected. These signals reflect to the TTU and the DMS-100 switch analyzes the signals.

The channel loss test can occur with the ringing and coin return and collect tests to determine if a correct termination is set up for these tests. For example, if the absorb termination must be set up in the RCS line card, the following condition occurs. The system must absorb the ac signals of the channel test, with no signals returned to the DMS-100 switch.

Noise

Noise uses the TTU and a reflect or reflect-NTPG termination.

Echo return loss

The echo return loss test is the same as the flux cancellation test performed on line module lines. The test checks the flux cancellation circuits of a line card. The test uses the TTU and an absorb or absorb PTPG termination.

Loop detector

The loop detector test checks the capability of the line circuit to detect off-hook or on-hook conditions. The loop detector test runs as part of test setup. The SMS sends an A- and B-bit pattern that causes the RCS to apply an absorb termination. This termination simulates an off-hook at the RCS. The RCS must detect this termination as an off-hook. The RCS must send the SMS the A- and B-bit pattern associated with off-hook. Idle A- and B-bits must be sent before the RCS detects termination as off-hook.

To remove the termination, the SMS sends the RCS an on-hook message in the M-field of the DDL. The RCS must detect removal of the termination as a simulated on-hook. The RCS must send the SMS the on-hook A- and B-bit pattern associated with on-hook subscriber lines.

ANI and coin presence

The ANI test and the coin presence test check the ability of the line card to simulate tip party off-hook and coin presence. The ANI test detects the termination that simulates tip party off-hook or coin presence. Then the ANI returns an A- and B-bit signaling pattern to the SMS. This pattern indicates tip party off-hook or coin presence.

The SMS sends A- and B-bit patterns associated with different polarities of ringing on multi-party lines. These patterns cause the RCS to setup terminations with and without NTPG/PTPG. For example, the A- and B-bit pattern associated with negative superimposed ringing on the tip –T causes the setup of a reflect-NTPG termination.

When the termination is a reflect-NTPG or absorb-NTPG, the ANI test indicates a tip party off-hook. Other terminations indicate ring party off-hook. A reflect-NTPG or absorb-NTPG termination simulates coin presence. Other terminations simulate lack of coin presence. The test fails if the SMS does not receive a correct reply.

Ringing

The ringing test checks the ability of an RCS line card to ring a subscriber line. The SMS sends a specified A- and B-bit pattern for –R ringing and other A- and B-bit patterns for +R, –T, and +T ringing on multi-party lines.

The SMS can send the RCS an A- and B-bit pattern that requests the RCS to ring a subscriber line. When this event occurs, the RCS sets up a specified termination. This termination simulates a subscriber off-hook. This termination causes RCS to return an off-hook A- and B-bit pattern to the SMS.

With multi-party ringing, the SMS sends the RCS signals to execute a loss and ANI/coin test after the ringing test. These tests determine if the correct termination connected at the RCS.

Coin collect and coin return

The coin collect and coin return test checks the ability of RCS coin cards to provide coin collect and coin return functions. The SMS sends the RCS an A- and B-bit pattern to execute a coin return or coin collect function.

For coin collect, the RCS provides an absorb-PTPG termination. For coin return, the RCS provides a reflect-NTPG termination. When a reflect-NTPG is present, the RCS must perform the following actions. The RCS must detect coin presence and send the SMS an A- and B-bit that indicates coin presence. The loss and coin presence tests can determine if the correct terminations occurred in the RCS.

Product specified test tools

Many tools can test components from peripheral modules and remote terminals. There are no product-specified test tools that test the SMS-RCS configuration.

Troubleshooting chart

Clearing a SMS alarm

The following troubleshooting chart provides operating company personnel with troubleshooting procedures for Subscriber Carrier Module-100S (SMS) alarms. More complete troubleshooting methods for the SMS are in the "Clearing an SMS alarm" section in this document.

Clearing an SMS alarm

Alarm condition	Possible cause	Action
Critical	Both C-side cards have faults.	Proceed as follows: 1 Identify the SMS module in the critical state. 2 Post the SMS module in the critical state. 3 Identify problems with the posted SMS. 4 Proceed to SMS recovery procedures in this document
	Both C-side (DS30) links have faults.	Proceed as follows: 1 Identify the SMS module in the critical state. 2 Post the SMS module in the critical state. 3 Identify problems with the posted SMS. 4 Proceed to SMS recovery procedures in this document
	Both power converter cards have faults.	Proceed as follows: 1 Identify the SMS module in the critical state. 2 Post the SMS module in the critical state. 3 Identify problems with the posted SMS. 4 Proceed to SMS recovery procedures in this document

—continued—

Clearing an SMS alarm (continued)

Alarm condition	Possible cause	Action
Major	A C-side card has faults.	Proceed as follows: 1 Silence the alarm. 2 Identify the SMS unit in the ISTb condition. 3 Post the SMS unit in the ISTb condition. 4 Identify the problems with the posted SMS unit. 5 Busy and test the posted SMS unit. 6 Return to service the posted SMS unit.
	Power converter card has faults.	Proceed as follows: 1 Silence the alarm. 2 Identify the SMS unit in the ISTb condition. 3 Post the SMS unit in the ISTb condition. 4 Identify the problems with the posted SMS unit. 5 Busy and test the posted SMS unit. 6 Return to service the posted SMS unit.

—continued—

Clearing an SMS alarm (continued)

Alarm condition	Possible cause	Action
Major (continued)	DS30 link has faults.	Proceed as follows: 1 Silence the alarm. 2 Identify the SMS unit in the ISTb condition. 3 Post the SMS unit in the ISTb condition. 4 Identify the problems with the posted SMS unit. 5 Busy and test the posted SMS unit. 6 Return to service the posted SMS unit.
	Master or signaling processor has faults	Proceed as follows: 1 Silence the alarm. 2 Identify the SMS unit in the ISTb condition. 3 Post the SMS unit in the ISTb condition. 4 Identify the problems with the posted SMS unit 5 Busy and test the posted SMS unit 6 Return to service the posted SMS unit.

—continued—

Clearing an SMS alarm (continued)

Alarm condition	Possible cause	Action
Minor	Non-software cards have faults.	Proceed as follows: 1 Silence the alarm. 2 Identify the SMS unit in the ISTb condition. 3 Post the SMS unit in the ISTb condition. 4 Identify the problems with the posted SMS unit. 5 Busy and test the posted SMS unit. 6 Return to service the posted SMS unit.
—end—		

Clearing an RCS alarm

Faults that occur in a remote concentrator SLC-96 (RCS) raise an alarm. The system sends these alarms to the log subsystem as PM128 logs at the MAP terminal. The PM128 logs contain the reasons for the alarms and actions to follow to clear the alarm. The Clearing an SMS alarm table contains this information.

Advanced troubleshooting procedures

Advanced trouble locating procedures

Normally you busy and test a defective component. As a result of this test, a list of cards appears in the MAP terminal. The card at the top of the list is the cause of the component problem. Replace the problem card and test the component that was defective again. If the component passes this test, return the component to service. This action completes the troubleshooting procedure.

If normal troubleshooting procedures do not restore a component to service, the component requires advanced troubleshooting procedures. Operating company personnel use MAP responses from troubleshooting attempts that failed, to formulate a maintenance plan. Use more advanced step action procedures to repair a component problem. This section describes the XPM footprint tool. The XPM footprint tool collects data when key events occur in order to provide information on sync problems. The XPM footprint tool aids troubleshooting.

Using the XPM footprint tool

The footprint tool collects data when key events occur in the Subscriber Carrier Module–100S (SMS) to help the system determine the cause of failures. The system stores the data in buffers that maintain all SMS restarts and resets. The data buffers maintain SMS program reloads. You can retrieve the data after an SMS outage. The memory buffers are a circular queue of events that contain information about SMS operations and the results of these operations. The system produces these buffers in either hexadecimal or a readable format.

The XMS-based peripheral module (XPM) footprint tool contains two event storage buffers. One store buffer is the active buffer, and the other is the holding buffer. These buffers prevent overwriting of data saved from the previous outage. When an outage occurs, the system swaps the active and holding buffers. The system locks the buffer that was active before the outage. This lock prevents overwriting of the buffer if the SMS goes through multiple initializations.

> ***Note:*** The system does not lock the buffers for planned SMS outages like manual warm activity switches (SWACT) or routine exercise (REX) tests. The system does not lock the buffers for Busy (BSY) operations. The system does not lock buffers if a holding buffer is locked.

The system records critical events in the SMS with the associated data during the normal operation of the SMS. When the active buffer is full, the buffer wraps around to the beginning of the data area. The full active buffer overwrites data events recorded before. This feature makes sure that the latest events are present in the footprint area. This wrap can result in the loss of important data. To avoid loss of data, the system groups events in classes. The type of events that the footprint tool stores occur in the following SMS classes:

- maintenance
- sync
- activity
- diagnostics
- audits
- messaging
- patcher
- call processing
- PMDEBUG
- static data

Select or omit these classes of events to fine tune the data the system collects. Select or omit these classes of events to make sure the data does not overflow the buffers. For example, the suspected cause of an outage is a specified diagnostic. You can enable this class, and omit all other classes to focus the data collection on the diagnostics.

The system records an additional set of events and system variables before the SMS unit reinitializes. Before the system reinitializes the SMS unit, the system decides if the system must lock the active buffer. The following conditions determine this decision:

- If the drop request came from the central control (CC), the system does not lock. Buffers can lock after a system request.
- If an internal SMS decision caused the drop request, the system locks the buffers.

A footprint information area is available. This footprint information area points to a wraparound. The footprint information area indicates the size of the footprint area and the address of the last used buffer. Maintenance personnel can use this data if the SMS cannot return to task level. If the SMS cannot return to service, the read-only memory (ROM) firmware dumps the data.

An audit unlocks a buffer after 24 hours to prevent the loss of data from additional SMS outages. The system produces a PM189 log when the active buffer locks or frees.

The following examples show the type of information that the system collects:

1 The system stores every command that enters from PMDEBUG. The stored commands determine if a dangerous command that the user entered causes an SMS outage.

2 The system records the start and completion of a patch applied or removed. This record determines if the incorrect application or removal of a patch causes an SMS outage.

Accessing the data collected

To select the classes of data to collect, use PMDEBUG. To access the data that the tool collected, use PMDEBUG. At the top level, the BIGFOOT command allows access to commands to select and display data. Refer to *PMDEBUG User Guide, Technical Assistance Manual*, TAM-1001-004.

The Bigfoot utility stores information on diagnostics that passed and failed. The system implements feature AF5008, XPM REX Control and Trouble Notification Improvements. The Bigfoot utility maintains information on error logs that occurred as a result of diagnostics that failed. The maintenance of failed diagnostics enhances debugging attempts. The diagnostics code maintains results graphs for each set of diagnostics that runs. The results graph contains data on each diagnostic test in a diagnostics run. The results graph identifies a diagnostic as passed, failed, not run, or test not defined. Page 8–8 presents an example of the diagnostics graph.

The three main sublevels for these functions follow:

1 A selection menu is available to select, delete, and query the classes of events to capture.

2 A HEX DUMP command displays the collected data in hexadecimal format. The system does not interprete the data. The hexadecimal format displays the data or helps loads that do not have the decoding routines.

3 A dump routine displays formatted data. The system displays the hexadecimal format if a formatting routine is not present.

Data can appear if the SMS is at the ROM level. To display the data, use the command string `DISPLAY MEMORY`.

The commands the system provides as part of the PMDEBUG user interface to the SMS footprint tool appear in the following table.

SMS footprint commands

Command	Use
DISPLAY DATA	Displays formatted data. If the system binds a display routine in, the data saved is formatted.
DUMP DATA	Displays unformatted data. Data displays in hexadecimal format (16 bytes).
QUERY STATUS	This command retrieves the state of the active and holding data areas. The SMS footprint ID area contains the type of information provided.
CLASS	Enables, disables or queries event classes. The state (enabled/disabled) appears for the queried (or ALL) classes.
SURVIVE	Enables, disables or queries the ability of class settings to maintain a restart.
CLEAR	This command clears the data areas to the first states. Resets the SMS footprint ID area to the first state.
LOCK	This command locks the active or holding data area. This command provides for field personnel and programmers who want to save data collected. The command activates when the tool does not lock the buffers automatically.
UNLOCK	This tool unlocks the active or holding data area. Use this command if the data collected is no longer needed. Use this command when the data display ends.
HELP	This command provides the syntax for the preceding commands.

The standardized header for the output routines is:

```
<nnn>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#xx)    #yy        01:13:19:12.52
```

where

nnn	is the buffer number
xx	is the hex value for the specified class
yy	is the event number of the specified class

Maintenance class output

Examples of stored maintenance data follow:

- activity drop

```
<000>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#00)    #00        01:13:19:12.52

Dropped Activity.
Parml = SWACT_when_ready.
Drop source = cc_manual.
```

- jam

```
<000>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#00)    #03        01:13:19:12.52

Unit Has Received A Jam Inactive Message.
Jam Source = #CC.
Jam Result = mrs_ok.

Unit Is Jammed Inactive.
```

- pre-SWACT audit failed

```
<000>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#00)    #04        01:13:19:12.52

Pre–SWACT Audit Failed.

Failure Reasons Are:
The unit needs to be reloaded.
The unit is jammed inactive.
```

- pre-SWACT audit fail message received

```
<000>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#00)    #04        01:13:19:12.52

Pre–SWACT Audit Fail Message Received
```

- operational faults

  Examples of stored operational fault data follow:

```
<003>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#00)    #08        01:13:19:12.52

Operational Fault Data Continued.
Rec_data 0 through 6”:  #00 #00 #00 #00 #00 #00


<002>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#00)    #07        01:13:19:12.52

Operational Fault Data Continued.
R_list  4 through 7”:  #0000 #0000 #0000 #0000


<001>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#00)    #06        01:13:19:12.52

Operational Fault Data Continued.
R_list  0 through 3”:  #0000  #0000 #0000 #0000


<000>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#00)    #05        01:13:19:12.52

An Operational Fault Message Has Been Received.
Source = #D6.
R_action = rr_localize – will only try to localize
the fault.
R_component = #D6.
R_count = #00.
```

Activity class output

Examples of stored activity data follow:

```
<000>       CLASS       EVENT   CC TIME OF EVENT
    MAINTENANCE (#01)    #00        01:13:19:12.52

Dropped Activity.
Drop reason = dr request.
Drop cid = #CC
Drop source = cc manual.
```

Diagnostic class output

An example of stored diagnostic data follows:

```
<000>        CLASS        EVENT   CC TIME OF EVENT
    MAINTENANCE (#02)    #00        00:00:03:20.84

Diag_id = did_tone_diag{#B5} – Tone Diagnostic.
Loc_msw = #0011.
Loc_lsw = #001F.
Expected = #48.
Received = #41.
Qualifier = #12.
```

Patcher class output

An example of stored patcher data follows:

```
<000>        CLASS        EVENT   CC TIME OF EVENT
    MAINTENANCE (#08)    #00        01:12:03:20.84

Patch Action Started.
Patchid = XAN13X31
Patch action = remove.
Patch result = mrs_ok.
```

PMDEBUG class output

An example of stored PMDEBUG data follows:

```
<000>        CLASS        EVENT   CC TIME OF EVENT
    MAINTENANCE (#0B)    #00        01:12:03:20.84

Directory:  bigfoot Command:  class
```

Static data class output

An example of stored static data follows:

```
<000>        CLASS        EVENT   CC TIME OF EVENT
    MAINTENANCE (#0C)    #00        01:12:03:20.84

Number of data bytes = 4.
Fiat byte = #02.
Oper byte = updtuple.
Sol byte = #08.
Tblid byte = #1F.
Data bytes 0 to 4 are:  F0 03 07 00 01
```

Diagnostics results graph output

An example of the diagnostics results graph display output follows:

```
<001>       CLASS       EVENT   CC TIME OF EVENT
    DIAG GRAPH (#0F)  #00   00:00:06:34:58

Diag_id =did_cmr_diag(#7) – CMR Card Diagnostics.
res_num=FF(P=Pass,F=Fail,N=Not Run|Test Undefined,O=Other)
Diag Results Graph: PFNNNNNNNNNNNNNNNNNN
```

Limits

The system loses the data the SMS footprint facility collects under the following conditions:

1 Power loss causes outages in the SMS. These power outages result in data loss.

2 The data is not accessed in a maximum of 24 hours after the buffer locks.

3 The SMS restart is a result of a system action. Examples of system actions include: a REX test, a manual SWACT, or a BSY operation.

4 The size of the footprint tool data area changes. The user can reload the SMS unit with a different load then the load that captured the data. This action causes the size of the data area to change. A BCSn load can drop activity after only a few seconds in service. To retrieve the data, the system can load the BCSn–1 load in the SMS. The data area in the BCSn–1 load must be as large or larger than the data area in the BCSn load. If the operating system overwrites the load, the load is smaller than the data area in the BCSn–1 load. An overwrite occurs when the SMS reloads. The system cannot read the data when an overwrite occurs.

5 Do not pull a card from the shelf of the SMS unit that dropped. The card can cause data loss.

Powering up the SMS

The SMS is part of the host office. The SMS powers up in the general host office power up procedure. The following steps are required to power up the SMS alone:

1 **>POST SMS**

2 Set the switch on the power converter up to the ON position.

3 Hold the reset button on the power converter in and flip the correct circuit breaker up at the same time. Release the circuit breaker. If the SMS receives power, the circuit breaker stays in the ON position. If a problem occurs with the power, the circuit breaker trips down to the OFF position.

a. Repeat steps 2 and 3 for the other SMS unit.

b. Busy both SMS units.

4 List the PM LOADS at the input-output device. List the specified PM LOADS in use to RTS the units. Normally, you complete this step during the power-up procedure.

>DSKUT;LISTVOL volume name ALL

where

volume name is the volume on which the PMLOADS are found

For example:

>DSKUT;LISTVOL DOOOXPM ALL

Note: List the PMLOADS once.

5 **>LOADPM UNIT unit no CC**

6 **>TST UNIT unit no**

7 **>RTS UNIT unit no**

8 Perform a cold SWACT.

9 Use the NEXT command to post the next SMS to return to service until you restore all the SMSs.

Note: The SLC-96 is an AT&T product. Refer to AT&T documentation for SLC-96 power-up procedures.

Powering down SMS

The SMS is part of the host office. The SMS uses the general host office power-down procedure to power down. Complete the following steps to power down the SMS alone.

1 Enter the PM level at the MAP terminal.

2 **>POST SMS**

3 **>BSY PM**

4 **>TRNSL C**

5 Make the unit inactive and power the unit down. In step 2, post the SMS unit. Busy one or more C-side links. Busy the same SMS unit.

6 Enter the network level and busy the port assigned to the link or links. Step 4 notes this port.

   a. **>NET**

   b. **>LINKS pair**

      where

      pair   is the network #)

   c. **>BSY plane link**

7 Reenter the PM level and POST the SMS that step 2 notes.

   >TRNSL C

   Note the state of the busy link.

8 Busy the SMS unit that step 2 notes.

9 To remove the power from the busy SMS unit, set the switch on the power converter to OFF. Now power the SMS unit down. Repeat this procedure for all correct SMS units.

   Note: When the SMS-R powers down, the system loses subscriber service for the associated SLC-96. The SLC-96 is an AT&T product. Refer to AT&T documentation for SLC-96 powering-down procedures.

SMS routine maintenance procedures

This section contains routine procedures for the Subscriber Carrier Module-100S (SMS). These procedures cover preventive tasks that maintenance engineering and field maintenance personnel must perform at normal intervals.

Inspecting cooling unit filters
SMS

Application

Use this procedure to inspect cooling unit filters in frame cooling units.

Interval

Perform this procedure in two week intervals.

Common procedures

There are no common procedures.

Action

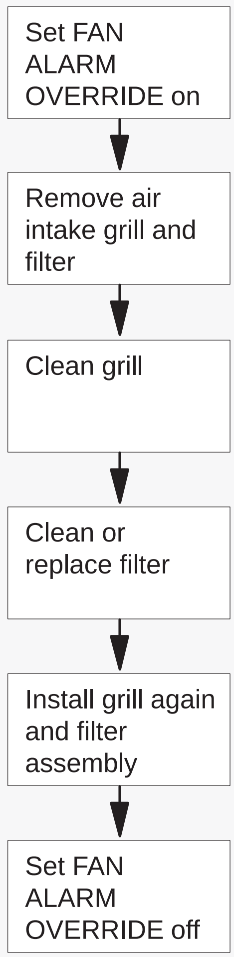
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Inspecting cooling unit filters
SMS (continued)

Summary of Inspecting cooling unit filters

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



Inspecting cooling unit filters
SMS (continued)

Inspecting cooling unit filters

At your current location

1

DANGER
Rotating fan blades
Do not reach in more than 6 in. beyond the upper lip of the air-intake grill. If you reach in more than 6 in., your fingers can touch the rotating blades of the cooling unit fans.

On the frame supervisory panel (FSP), set the FAN ALARM OVERRIDE switch to ON.

If frame trim panels	Do
overlap side edges of intake grill	step 2
do not overlap side edges of intake grill	step 4

2 Remove the frame trim panels.

3 Grip both sides of the grill. Pull the grill towards you to detach the grill from the magnetic catches.

Go to step 5.

4 Gently pry upper half of the grill away from the frame to remove the grill.

5 Go to a work area outside the room that holds the switching system. Clean the grill with a dust cloth or vacuum cleaner.

If filter surfaces	Do
appear dirty	step 9
appear clean	step 6

Inspecting cooling unit filters
SMS (continued)

6 Shine a trouble light through the filter.

If light	Do
is visible through the filter	step 7
is not visible through the filter	step 9

7 Install the filter in the grill again.

8 Install the filter again and grill assembly in the frame.

Go to Step 19.

9 Use the following information to determine your next action.

If filter part number	Do
is A0344437	step 10
is P0558302	step 13
is P0623539	step 16

10 Get replacement filter material.

11 Trim a new filter to fit around the magnetic latches. Use the old filter as a guide.

12 Install the filter and grill on the frame.

Go to step 19.

13 At an area outside the room that contains the switching system, vacuum the filter.

14 Install the filter and grill on the frame.

Go to step 19.

15 At an area outside the room that holds the switching system, remove excess dirt and lint. Rap dirty side down, or vacuum to remove excess dirt and lint.

16 Wash the filter in soap and water.

17 Rinse the filter. Allow the filter to dry.

Inspecting cooling unit filters
SMS (end)

18 Install the filter and grill on the frame.

Go to step 19.

19 On the front of the FSP, set the FAN ALARM OVERRIDE switch to OFF.

20 The procedure is complete.

Replacing cooling unit filters
SMS

Application

Use this procedure to replace cooling unit filters in frame cooling units.

Interval

Perform this procedure at intervals of three months.

Common procedures

There are no common procedures.

Action

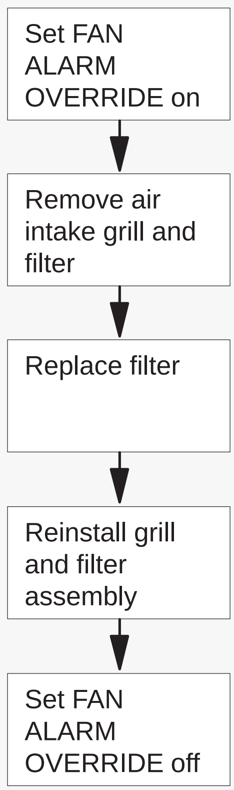
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Replacing cooling unit filters
SMS (continued)

Summary of Replacing cooling unit filters

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



Replacing cooling unit filters
SMS (end)

Replacing cooling unit filters

At your Current Location

1

DANGER
Rotating fan blades
Do not reach in more than 6 in. beyond the upper lip of the air-intake grill. If you reach beyond 6 in., your fingers can contact the rotating blades of the cooling unit fans.

On the frame supervisory panel (FSP), set the FAN ALARM OVERRIDE switch to ON.

If frame trim panels	Do
overlap side edges of intake grill	step 2
do not overlap side edges of intake grill	step 4

2 Remove the frame trim panels.

3 Grip both sides of the grill. Pull the grill toward you to remove the grill from the magnetic catches.

Go to step 5.

4 Carefully pry the upper half of the grill away from the frame to remove the grill.

5 Go to a work area outside the room that contains the switching system. Remove the filter from the grill.

6 Use the old filter as a pattern to trim the new filter to fit around the magnetic latches.

7 Install the grill and new filter onto the cooling unit.

8 On the front of the FSP, set the FAN ALARM OVERRIDE switch to OFF.

9 The procedure is complete.

Testing the dead system alarm SMS

Application

Use this procedure to verify that the dead system alarm is operating correctly.

Interval

Perform this procedure monthly.

Common procedures

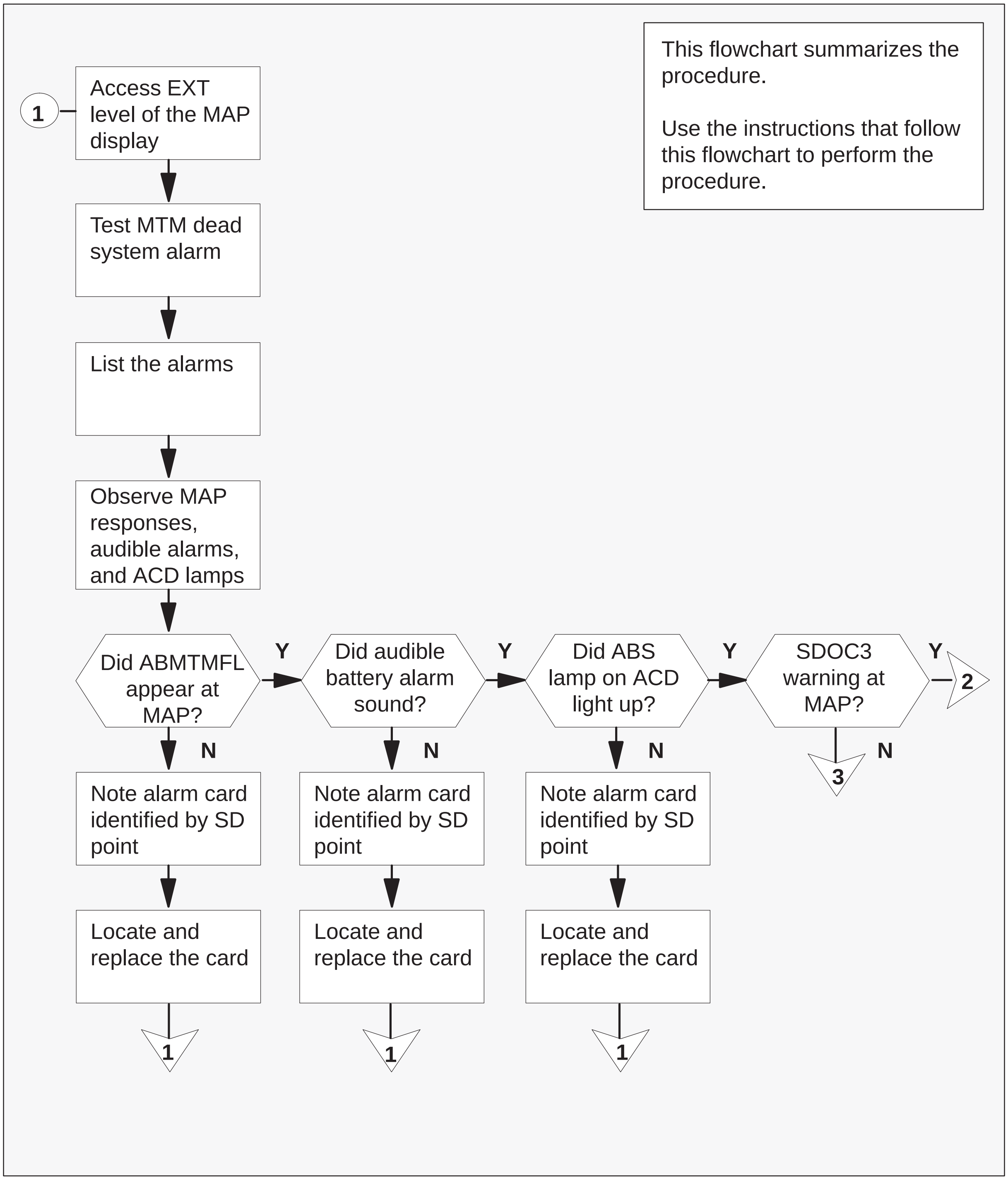
There are no common procedures

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

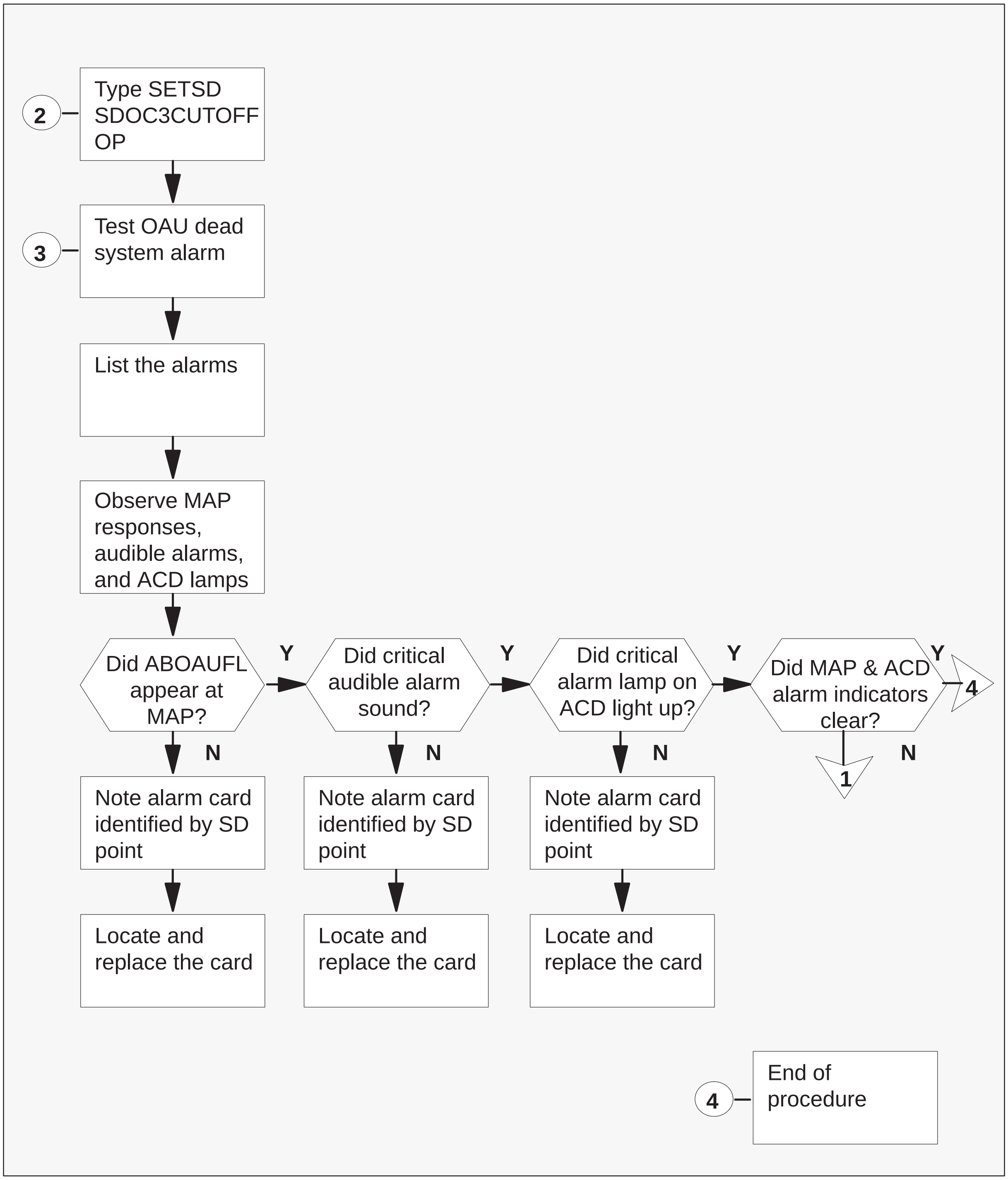
Testing the dead system alarm
SMS (continued)

Summary of Testing the dead system



Testing the dead system alarm
SMS (continued)

Summary Testing the dead system alarm



Testing the dead system alarm
SMS (continued)

Testing the dead system alarm

At your Current Location

1 In offices equipped with NT0X63 alarm control and display panels (ACD), ensure that the AUDIBLE ALARM DISABLE switch is set downward.

2 To access the EXT level of the MAP screen, type

>MAPCI;MTC;EXT
and press the Enter key.

3 To test the dead system alarm, type

>TSTDSALM MTMFAIL 12
and press the Enter key.

4 Wait 15 seconds. To get a list of alarms, type

>LIST MAJ;LIST MIN
and press the Enter key.

5 Observe the responses on the MAP screen, listen for audible alarms, and examine the lamps on alarm and control display panel.

If	Do
ABMTMFL was *not* displayed at MAP screen	step 6
audible battery alarm did *not* sound	step 6
ABS lamp on ACD panel did *not* activate	step 6
the system displays WARNING —SDOC3 SENT ON DEAD SYSTEM at MAP screen	step 18
you observe none of the above indications	step 19

6 Note the alarm card identified by one of the following SD points:

- MTMFAIL
- OAUFAIL
- CRALMAUD
- CRALMVIS

Proceed to step 7 to locate the card.

Testing the dead system alarm
SMS (continued)

7 To access system table ALMSD, type

>TABLE ALMSD
and press the Enter key.

8 To position on the field bearing the name of the SD group, type

>POS sd_group
and press the Enter key.

where

sd_group is the SD group name identified in step 5

9 To list the table, type

>LIST
and press the Enter key.

10 Note the entry under SDGROUP.

11 To exit from the table, type

>QUIT
and press the Enter key.

12 To access system table ALMSDGRP, type

>TABLE ALMSDGRP
and press the Enter key.

13 To position on the field noted in step 10, type

>POS sd_group
and press the Enter key.

where

sd_group is the SD group noted in step 10.

14 To list the entries, type

>LIST
and press the Enter key.

15 Note the entries under TMTYPE, TMNO and CARDCODE. This information identifies the location of the card.

16 To exit the table, type

>QUIT
and press the Enter key.

Testing the dead system alarm
SMS (continued)

17 Replace the card. Return to step 1 of this procedure.

18 To respond to the warning, type

>SETSD SDOC3CUTOFF OP
and press the Enter key.

19 To test the dead system alarm, type

>TSTDSALM OAUFAIL 12
and press the Enter key.

20 Wait 15 seconds. To get a list of alarms, type

>LIST MAJ;LIST MIN
and press the Enter key.

21 Observe the responses on the MAP screen, listen for audible alarms, and examine the lamps on alarm and control display panel.

If	Do
ABOAUFL was not displayed at MAP terminal	step 6
critical audible alarm did not sound	step 6
critical alarm lamp on ACD panel did not activate	step 6
you observed none of the above indications	step 22

22 Wait 60 seconds. Note any changes on the MAP display and the ACD panel. The following changes should occur:

- On the MAP display, the alarm under the Ext header disappears.
- On the ACD panel, the critical alarm lamp turns OFF.
- On the MAP screen, the ACD lamp turns OFF.

If above changes	Do
occur	step 24
do not occur	step 23

Testing the dead system alarm
SMS (end)

23 It is possible that you missed an indication. Return to step 1 and repeat this procedure.

24 The dead system alarm is correct. The procedure is complete.

Testing power converter voltages
SMS

Application

Use this procedure to test power converter voltages for all power converters in the subscriber carrier equipment (SME) frame.

Interval

Perform this procedure every six months.

Common procedures

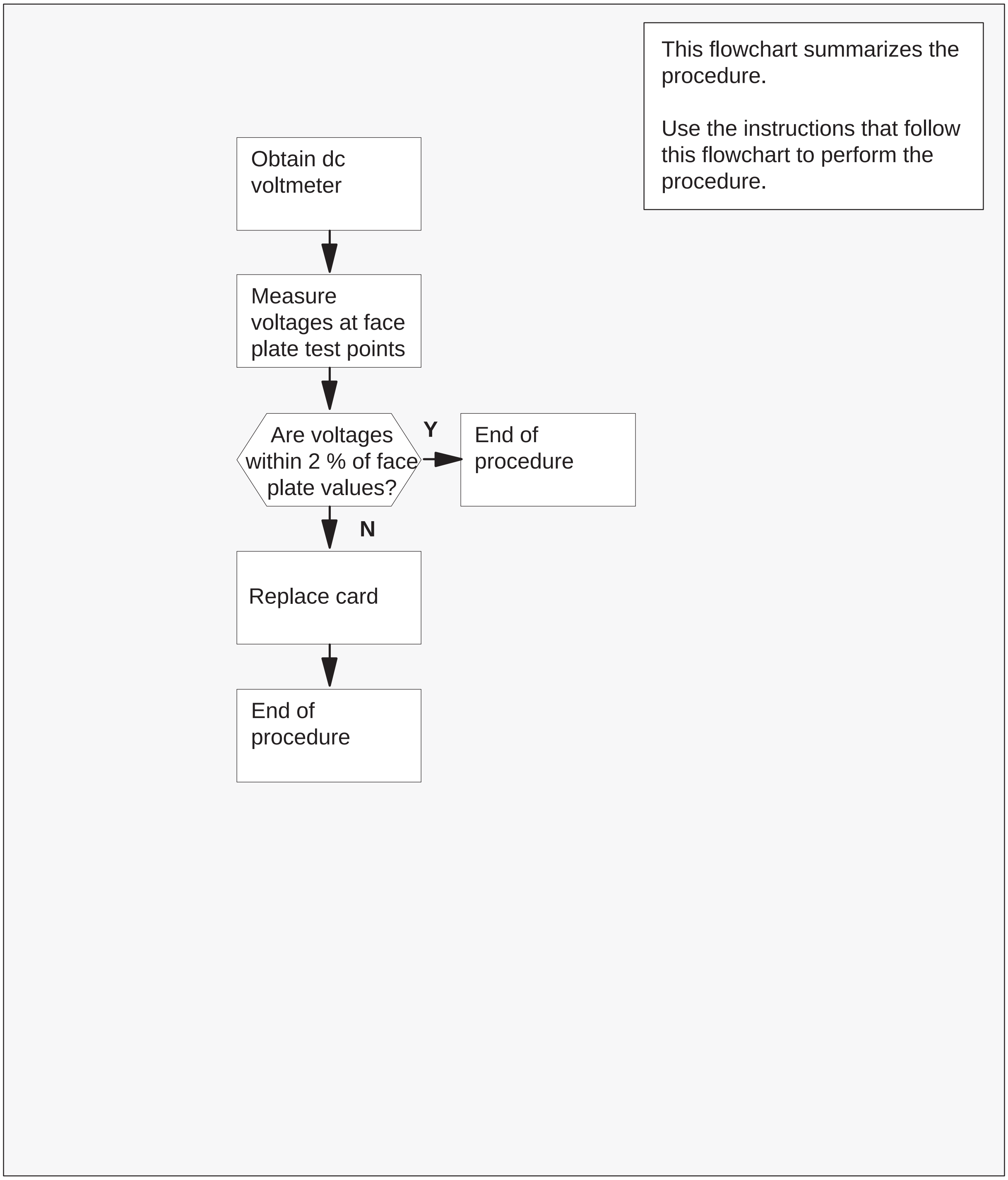
There are no common procedures

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Testing power converter voltages
SMS (continued)

Summary of Testing power converter voltages



Testing power converter voltages
SMS (end)

Testing power converter voltages

At your Current Location

1 Obtain a dc voltmeter.

2 Measure the voltage at the test points on the faceplates of all NT2X70 power converters in the SME frame.

3 The voltages must be within 2 percent of the nominal values printed on the NT2X70 faceplate. Compare the voltages measured with the acceptable voltage ranges given below.

Test point voltage	Acceptable range
+12 V	+11.76 V to +12.24 V
–12 V	–12.24 V to –11.76 V
+ 5 V	+4.9 V to +5.1 V
– 5 V	–5.1 V to –4.9 V

If test point voltages are	Do
within acceptable range	step 5
not within acceptable range	step 4

4 Replace the NT2X70 power converter as directed in *Card Replacement Procedures*.

On returning to this procedure, go to step 5.

5 The procedure is complete

Returning a card for repair or replacement SMS

Application

Use this procedure to return a circuit card, like a power converter, to Nortel for repair or replacement. Your location, Canada or the United States, determines the documents you must complete. Your location determines to which address you must return the card.

Interval

Perform this procedure as required.

Common procedures

There are no common procedures.

Action

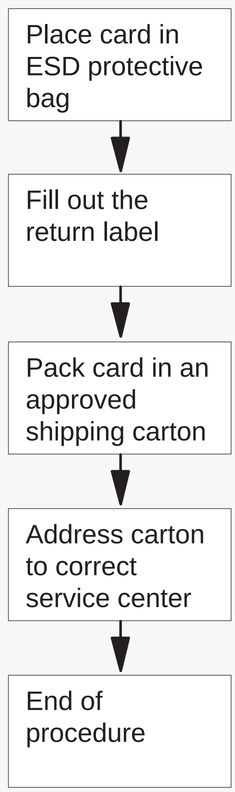
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Returning a card for repair or replacement
SMS (continued)

Summary of Returning a card for repair or replacement

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



Returning a card for repair or replacement
SMS (continued)

Returning a card for repair or replacement

At your current location

1 Place the card in an electrostatic-discharge protective bag.

If your location	Do
is in Canada	step 6
is in the United States	step 2

2 Fill in the return label for each card that you return. For additional help to fill out the label, call 1-800-347-4850.

3 Pack the card or assembly in a Nortel card shipping carton and seal the carton.

If a Nortel shipping carton is not available, use another carton. Make sure you that you perform the following actions:

- enclose the card or assembly in packing paper
- surround the card or assembly in bubble pack or foam
- secure the card or assembly in the carton so that no card or assembly can shift

4 Address the carton to: Nortel Customer Service Center, 4600 Emperor Blvd., Morrisville, North Carolina, 27560.

5 Go to step 11.

6 Fill in one return label (form 24-115) for each card or assembly that you return.

Make sure you include the following information:

- return authorization number from customer service
- NT product engineering code (PEC)
- serial number
- release number
- BCS release software in use at the time of replacement
- peripheral module load name
- description of the failure and action taken to repair
- fault code that describes the fault best (see the bottom of the label)
- name of your company
- office identifier code
- your name
- site name

Returning a card for repair or replacement
SMS (end)

For help to fill out the label, call 905-454-2808. In the event of an emergency, call 905-457-9555.

7 Attach one copy of the card label of to a card latch.

8 Keep the other copies of the label for your records.

9 Pack the card or assembly in a Nortel shipping carton and seal the carton.

If a Nortel shipping carton is not available, use another carton. Make sure that you perform the following actions:

- enclose each card or assembly in packing paper
- surround each card or assembly in bubble pack or foam
- secure each card or assembly tight in the carton so that no card or assembly can shift

10 Address the carton to: Nortel Customer Operations, c/o Wesbell Transport, 1630 Trinity Road, Unit #3 Door #4, Mississauga, Ontario, L5T 1L6.

11 This procedure is complete.

Testing wrist strap grounding cords SMS

Application

Use this procedure to verify wrist strap grounding cord resistance. The resistance must be low enough to allow static electricity to discharge from the person. Resistance must be high enough to prevent electrocution if the equipment develops a short-circuit while the person wears the wrist strap.

Interval

Perform this procedure in one month intervals.

Common procedures

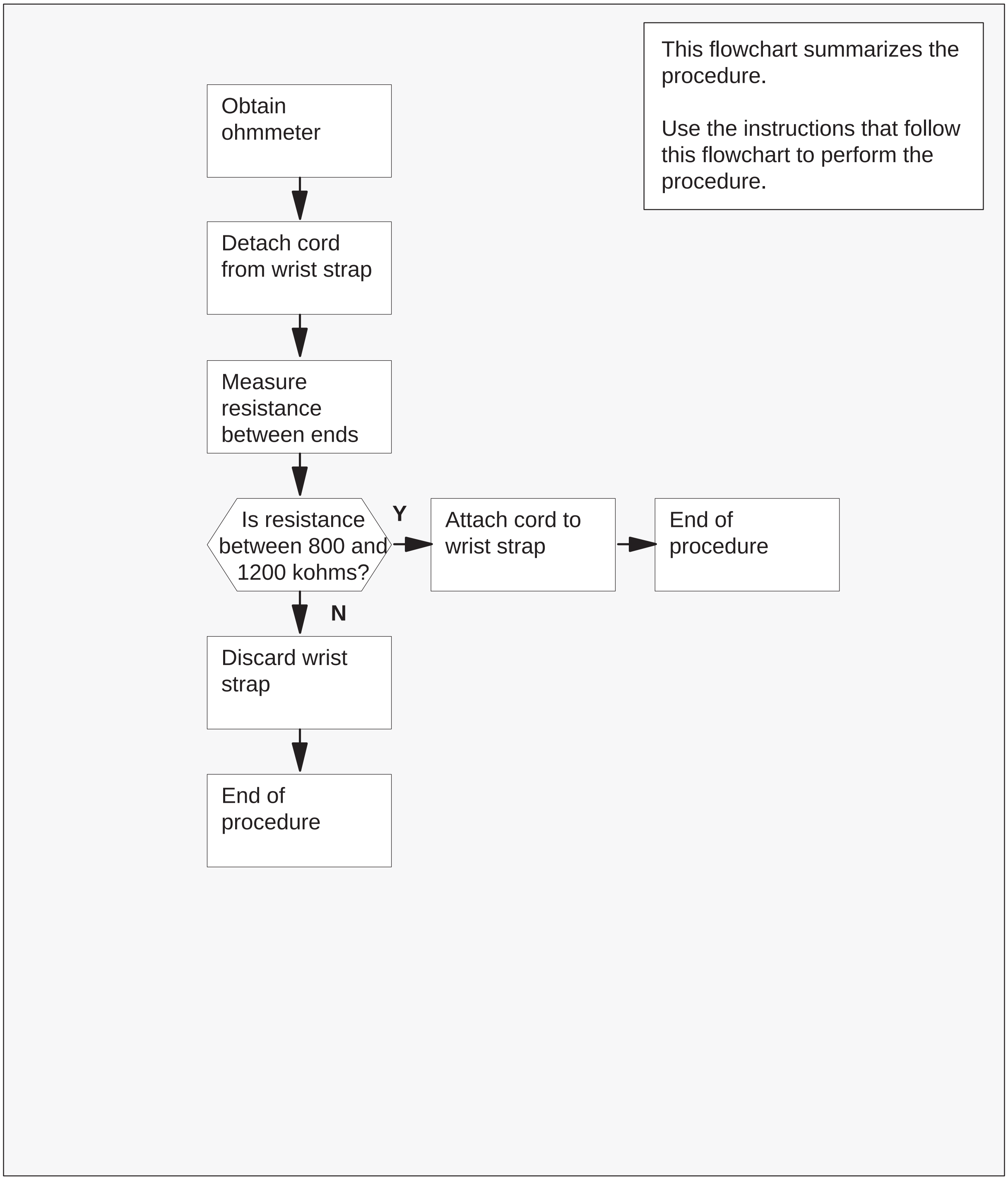
There are no common procedures.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Testing wrist strap grounding cords
SMS (continued)

Summary of Testing wrist strap grounding cords



Testing wrist strap grounding cords
SMS (continued)

Testing wrist strap grounding cords

At your current location

1 Obtain an ohmmeter.

2 Detach the grounding cord from the wrist strap.

3 Measure the resistance between opposite ends of the grounding cord with the ohmmeter.

If resistance	Do
is between 800 kohms and 1200 kohms	step 4
is not between 800 kohms and 1200 kohms	step 5

4 Use the grounding cord and wrist strap assembly. Assemble the wrist strap to the grounding cord.

Go to step 6.

5

DANGER
Risk of electrocution
The grounding cord is safe to use if the resistance measures higher than 800 kohms. A lower resistance exposes the user to the risk of electrocution if equipment short-circuits while the person wears the wrist strap.

WARNING
Damage to electronic equipment
A grounding cord that has a resistance higher than 1200 kohms cannot conduct enough static charges to ground. A grounding cord with this high resistance will not protect sensitive electronic equipment against build-ups of static charges that can damage.

Discard the complete assembly. DO NOT ATTEMPT TO USE IT.

Testing wrist strap grounding cords
SMS (end)

6 The procedure is complete.

A - Appendix

SMS unequipped lines troubleshooting

This section provides the user with the necessary information and tools to verify if the SMS lines in the Line Maintenance Busy (LMB) state are in that state because of a valid unequipped line condition in the Mode 1 SLC-96.

Note: In order to use the troubleshooting steps provided in this document, the user must have access to the PMDEBUG utility. Access to the PMDEBUG utility is enabled through password activation at the TOOLSUP level.

In order to effectively troubleshoot an unequipped line condition in the SMS, it is necessary to understand how the Unequipped Line Detection feature works in the SMS. The Unequipped Line Detection feature runs only on SLC-96 remote terminals (RT) that are configured in the MODE 1 configuration. The SMS interfaces to the SLC-96 RT through DS-1 links that are connected to the Line Interface Units (LIU) in the SLC-96 RT. Each DS-1 link connects to an LIU card on each shelf of the RT. These shelves are referred to as the A, B, C, and D shelves.

Each shelf in the RT can have a maximum of 24 lines installed. Since the DS-1 link has 24 DS0 timeslots, there is a one-to-one association between physical line location and a DS0 timeslot. This association between line association and DS0 timeslot is as follows:

Table 1 DS0 to SLC Line Circuit Translation

SLC-96 Line Circuit to DMS LEN and DS0 Timeslot Translation																								
Line (DMS LEN)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
DS0 Channel	0	2	4	6	8	10	12	14	16	18	20	22	1	3	5	7	9	11	13	15	17	19	21	23
SLC Circuit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
SLC Card Slot	1		2		3		4		5		6		7		8		9		10		11		12	

When there is no physical line card installed in the SLC-96 RT, the SLC-96 RT sends an unequipped AB-bit pattern (A-bit = 1, B-bit = 1) to the SMS in the DS0 timeslot associated with that line. If a line is inserted into the SLC-96, then the appropriate AB-bit pattern is sent with the associated DS0 timeslot for that specific line location; for a POTS line, this is usually IDLE code (A-bit = 0, B-bit = 0). The SMS makes use of this behaviour to scan each DS0 channel for the unequipped AB-bit pattern. If it detects the unequipped AB-bit pattern in any DS0 channel that is associated to a datafilled line in the DMS (directory number assigned), then the SMS reports this line as unequipped to the Control Module (CM) of the DMS. This results in the line being placed in the LMB state. The line remains in the LMB state until the SMS detects the appropriate IDLE AB-bit patter in the associated DS0 timeslot. Once the IDLE pattern is received, the SMS notifies the CM that the line is now equipped, and the line state changes to idle (IDL).

The SMS uses an internal software audit to report the unequipped line condition. This audit runs every 15 seconds and sequences through each possible RT on the SMS. Since each SMS can support a maximum configuration of six RTs, it takes 90 seconds (6 x 15) for the SMS to sequence through all the RTs. This results in a maximum delay of 90 seconds for an unequipped/equipped line to change states in the CM from the instant that it is removed or inserted into the RT.

Troubleshooting Walk-through

This section is made up of a walk-through of the process for determining the status of unequipped SMS lines.

Post up the line in question. This procedure uses the first two lines off the SLC-96. The following displays shows the data for a line in the IDLE state.

> mapci nodisp;mtc;lns;ltp

```
>mapci nodisp;mtc;lns;ltp
MAPCI:
MTC:
LNS:
LTP:

> post l ercs 0 0 0 0 print
CKT TYPE          LEN              DN        STATE  FAIL   EqPEC

==============================================================
1MR        ERCS 00 0 00 00      619 351 1234 IDL         SCD203
Number of entities in the posted set: 1
>
> post l ercs 0 0 0 1 print
CKT TYPE            LEN DN STATE  FAIL   EqPEC
==============================================================
OWT         ERCS 00 0 00 01 619 516 1212      IDL SCD203

 Number of entities in the posted set: 1
```

The next step is to query the Line Equipment Number (LEN) in order to obtain the code number and line number. Note that the line number is the terminal number minus 1 (ERCS 0 0 0 0 is terminal 1 but line number 0).

> qlen ercs 0 0 0 0

```
--------------------------------------------------------------
LEN:     ERCS  00 0 00 00
TYPE: SINGLE PARTY LINE
SNPA: 619


DIRECTORY NUMBER:     3511234
LINE CLASS CODE:      1MR
SIGNALLING TYPE:  DIGITONE
LINE TREATMENT GROUP:     0
LINE ATTRIBUTE INDEX:     1
CARDCODE:  SCD203    GND: N  PADGRP: STDLN  BNV: NL MNO: N
PM NODE NUMBER     :    235
PM TERMINAL NUMBER :    1
OPTIONS:
DGT
--------------------------------------------------------------
```

> qlen ercs 0 0 0 1

```
---------------------------------------------------------------
LEN:     ERCS  00 0 00 01
TYPE: SINGLE PARTY LINE
SNPA: 619
DIRECTORY NUMBER:     5161212
LINE CLASS CODE:  OWT **
SIGNALLING TYPE:  DIGITONE
LINE TREATMENT GROUP:     0
LINE ATTRIBUTE INDEX:     7
CARDCODE:  SCD203    GND: N  PADGRP: STDLN  BNV: NL MNO: N
PM NODE NUMBER     :    235
PM TERMINAL NUMBER :    2
OPTIONS:
DGT
---------------------------------------------------------------
```

The next step is to post up the RCS at the PM level of the MAP in order to verify which SMS links are associated with which SLC-96 shelf.

>pm;post rcs ercs 0 0

```
MTC:
PM:
POST:
```

> querypm

```
 PM Type: RCS  Int. No.: 22  Node_No: 235
  Site Flr RPos  Bay_id   Shf  Description   Slot    EqPEC
  ERCS  01  G03  RTS 000   65  RCS  00 0
 >
```

From the following translation information, we can determine that the A shelf of the RT is connected to SMS 0 link 0, the B shelf of the RT is connected to SMS 0 link 1, the C shelf of the RT is connected to SMS 0 link 6, and the D shelf of the RT is connected to SMS 0 link 7.

>trnsl

```
Link 0: SMS    0  0;Cap:MS;Status:OK      ;MsgCond:OPN
Link 1: SMS    0  1;Cap:MS;Status:OK      ;MsgCond:OPN
Link 2: SMS    0  6;Cap:MS;Status:OK      ;MsgCond:OPN
Link 3: SMS    0  7;Cap:MS;Status:OK      ;MsgCond:OPN
>
```

Now we can go into PMDEBUG on the active unit of the SMS and check the status.

>pmdebug sms 0

```
PMDEBUG MODE - CONNECTING TO SMS 0 UNIT 1
WARNING: You now have access to the PM monitor...proceed with
caution
```

We now go through the CHNLS, PROT, and NODE levels and dump out the node table information in the SMS. This is required in order to get the internal RT number that the SMS associates with the particular SLC-96 with which we are working.

```
LTCUP>

c

UP:Chnls>

Prot, Unprot, Rlcm_intra

UP:Chnls> p

Node,Port,Spec,H_l_mux,Utr,NX,PRt_ps,Audt,Xlat,Msgnode,ND_hash
,MCh,Cs_map, PS_map,Iu_map,Ring,ST_cd,RCc_ltc.

UP:Prot> n

--------------------------------------------------------------
NODE TABLE

--------------------------------------------------------------
Node     | Description |  Msg |  Port   | Trmnl  |  Info

--------------------------------------------------------------

|              |        |           |          | R I M     NT

|              |        |           |          | C P o Netl oh

Int External Host|  Node     PM|Protocol|# Start End|Start   #|
T M d Thrd dr

dec hex    #|  Type    Type|Relation| | |   L e Type ed
--------------------------------------------------------------

1  143 08F 1 LTC:0B  SMS:17 ds30:1 S 16 0  15 1  641  0 F P  cc  1

2  235 0EB 1 RCS:13  RCS:20  nil:0 M  4 16  19 642 98  0 F P  rcs  6

3  236 0EC 1 RCS:13  RCS:20  nil:0 M  4 20  23 740 98  1 F P  rcs  6

4  249 0F9 1 RCS:13  RCS:20  nil:0 M  4 24  27 838 98  2 F P  rcs  6

--------------------------------------------------------------

UP:Prot>
```

If we look under the “Info” heading of the node table, we see that the first entry in this field is the RCT heading. This heading is read vertically and has been bolded to make identification easier in this document. This RCT is the RT index number that we require. The qlen information that we obtained on the line indicated that our line was on node number 235. If we find the entry for Node 235, we see that it is Internal code number 2 in the table, external code number 235, and its RCT number is 0. In order to get the RT index number for this SMS, we must add 1 to the RCT number. Therefore our RT index for the SLC-96 is 1 (0 + 1) for this SMS.

```
Node,Port,Spec,H_l_mux,Utr,NX,PRt_ps,Audt,Xlat,Msgnode,ND_hash
,MCh,Cs_map,PS_map,Iu_map,Ring,ST_cd,RCc_ltc.
```

```
UP:Prot> *
UP:Chnls> *
LTCUP> *
```

```
TIme,TAsk,Load,Xprompt,CHEaptmr,DAtadump,Uspace,Debug,BPMonito
r,Swerr,C++monitor,Ipc,Verreg,Patches,Flq,Msg6x69,UArtimc,Newm
sging,NWmsgtrc,MSGTr,Chnls,CDm,DYnamic,MTc,Rcvrmon,SChnls,CSm,
DS1,CMr,UTr,OMUnsol,DIagnose,IMage,
Audit,MAtediag,CAudit,PRfm,PErcall,Bigfoot,PARaudt,CP,CNd,Trmt
rc,SMsm,SMSS,LTst.
```

```
LTCUP> sm
```

```
Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config
Disp ln config status, disp ln config Image
cHnl aud, send Cfield msg, Line, sMsr, *
```

Now we dump the config status. This information is used to determine if the SLS thinks the line is unequipped or equipped. We are looking at the first two lines on the SLC-96. They show up in the location for Shelf A, Slot 1. Each line has a value of 1, which means equipped. This is the expected state for a line in the IDL state.

```
UP:SMsm> d 1

SHELF      SLOTS: 1| 2| 3| 4| 5| 6| 7| 8| 9| A| B| C|

A              11|11|11|11|11|11|11|11|11|11|11|11|
B              11|11|11|11|11|11|11|11|11|11|11|11|
C              11|11|11|11|11|11|11|11|11|11|11|11|
D              11|11|11|11|11|11|11|11|11|11|11|11|

Value of 0 = unequipped line, Value of 1 = equipped line

Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config

Disp ln config status, disp ln config Image

cHnl aud, send Cfield msg, Line, sMsr, *

UP:SMsm>
```

Now we check what the SMS is receiving from the SLC-96. We do this by reading the AB-bit information from the SMS timeswitch. We know from the data dumped earlier that the A shelf of this SLC-96 is connected to SMS 0 link

0. We also know from our line to DS0 associated that line 0 signaling information should be in timeslot (chnl) 0 and that line 1 signaling information should be in chnl 2 location. Reference Table 1). Both lines are reporting onhook, which is expected for an IDLE equipped line. Note: Be very careful here in that the port number entered ranges from 0 to 19 and is entered as a HEX value (port 19 would be entered as 13).

```
LTCUP> smss

A/bdata, Ddldata, Tsw, Psport, Rtstat, psW, Cmb, Mtc, aLms, *

UP:SMSS> a

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *

UP:SMSS> b 0

Chnl 00  on hook              Chnl 0C  on hook
Chnl 01  on hook              Chnl 0D  unequipped
Chnl 02  on hook              Chnl 0E  on hook
Chnl 03  on hook              Chnl 0F  unequipped
Chnl 04  on hook              Chnl 10  on hook
Chnl 05  on hook              Chnl 11  on hook
Chnl 06  on hook              Chnl 12  on hook
Chnl 07  on hook              Chnl 13  unequipped
Chnl 08  unequiped            Chnl 14  on hook
Chnl 09  on hook              Chnl 15  on hook
Chnl 0A  unequiped            Chnl 16  on hook
Chnl 0B  on hook              Chnl 17  on hook
Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *

UP:SMSS>
```

Now we check to see what the SMS is expecting to see from the SLC-96. For an IDLE line, we are scanning for an offhook signaling pattern. Note: The port number ranges from 0 to 19 and the port number ranges from 0 to 23. Both values are entered as the HEX equivalent values.

```
Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *

UP:SMSS c 0 0

mode: scan off-hook       flash option: false

timer blk not attached

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *

UP:SMSS c 0 2
```

```
mode: scan off-hook       flash option: false

timer blk not attached

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *
```

UP:SMSS> *

```
A/bdata, Ddldata, Tsw, Psport, Rtstat, psW, Cmb, Mtc, aLms, *
```

UP:SMSS> *
LTCUP> quit

```
NOTE: PMDEBUG will terminate when last request is complete
PMDEBUG TERMINATES
```

We have now removed the first line card in the A shelf of the SLC-96. If we post the lines at the MAP, we see that these lines are now in the LMB state.

>lns;ltc

```
MTC:
LNS:
LTP:
```

>post l ercs 0 0 0 0 print

```
CKT TYPE          LEN              DN        STATE  FAIL   EqPEC


==============================================================

 1MR       ERCS 00 0 00 00      619 351 1234 LMB         SCD203

 Number of entities in the posted set: 1
```

> post l ercs 0 0 0 1 print

```
CKT TYPE          LEN              DN        STATE  FAIL   EqPEC


==============================================================
OWT        ERCS 00 0 00 01      619 516 1212 LMB         SCD203

 Number of entities in the posted set: 1
```

>pmdebug sms 0

```
PMDEBUG MODE - CONNECTING TO SMS 0 UNIT 1
```

```
 WARNING: You now have access to the PM monitor...proceed with
caution
LTCUP>
TIme,TAsk,Load,Xprompt,CHEaptmr,DAtadump,Uspace,Debug,BPMonito
r,Swerr,C++monitor,Ipc,Verreg,Patches,Flq,Msg6x69,UArtimc,Newm
sging,NWmsgtrc,MSGTr,Chnls,CDm,DYnamic,MTc,Rcvrmon,SChnls,CSm,
DS1,CMr,UTr,OMUnsol,DIagnose,IMage,Audit,MAtediag,CAudit,PRfm,
PErcall,Bigfoot,PARaudt,CP,CNd,Trmtrc,SMsm,SMSS,LTst.
```

From the SMsm level, we now dump the line config status. We now see that the first two lines of the A shelf are set to a value of 0. This indicates that the lines are not equipped in the SLC-96.

LTCUP> sm

```
Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config
Disp ln config status, disp ln config Image
cHnl aud, send Cfield msg, Line, sMsr, *
```

UP:SMsm> d 1

```
SHELF      SLOTS: 1| 2| 3| 4| 5| 6| 7| 8| 9| A| B| C|
A                00|11|11|11|11|11|11|11|11|11|11|11|

B                11|11|11|11|11|11|11|11|11|11|11|11|

C                11|11|11|11|11|11|11|11|11|11|11|11|

D                11|11|11|11|11|11|11|11|11|11|11|11|

Value of 0 = unequipped line, Value of 1 = equipped line

Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config

Disp ln config status, disp ln config Image

cHnl aud, send Cfield msg, Line, sMsr, *
```

UP:SMsm> *

```
LTCUP>
```

We can now go to the SMSS level and dump the AB-bit information that is being received from the SLC-96. This verifies that we are actually receiving the unequipped AB-bit pattern in the appropriate channels. Once again, we check PORT 0 CHNL 0 and CHNL 2 for line 0 and line 1 respectively. We now see that both Chnl 0 and Chnl 2 contain the unequipped AB-bit pattern.

```
TIme,TAsk,Load,Xprompt,CHEaptmr,DAtadump,Uspace,Debug,BPMonito
r,Swerr,C++monitor,Ipc,Verreg,Patches,Flq,Msg6x69,UArtimc,Newm
sging,NWmsgtrc,MSGTr,Chnls,CDm,DYnamic,MTc,Rcvrmon,SChnls,CSm,
DS1,CMr,UTr,OMUnsol,DIagnose,IMage,Audit,MAtediag,CAudit,PRfm,
PErcall,Bigfoot,PARaudt,CP,CNd,Trmtrc,SMsm,SMSS,LTst.
```

>LTCUP> smss

```
A/bdata, Ddldata, Tsw, Psport, Rtstat, psW, Cmb, Mtc, aLms, *
```

UP:SMSS> a

```
Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *
```

UP:SMSS> b 0

```
Chnl 00  unequiped            Chnl 0C  on hook
Chnl 01  on hook              Chnl 0D  unequipped
Chnl 02  unequiped            Chnl 0E  on hook
Chnl 03  on hook              Chnl 0F  unequipped
Chnl 04  on hook              Chnl 10  on hook
Chnl 05  on hook              Chnl 11  on hook
Chnl 06  on hook              Chnl 12  on hook
Chnl 07  on hook              Chnl 13  unequipped
Chnl 08  unequiped            Chnl 14  on hook
Chnl 09  on hook              Chnl 15  on hook
Chnl 0A  unequiped            Chnl 16  on hook
Chnl 0B  on hook              Chnl 17  on hook

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *

 UP:SMSS>
```

If we now check to see what the SMS is looking for, we see that it is looking for the onhook pattern to occur, in order to progress out of the unequipped state. Remember that when the card is plugged in, it sends the onhook pattern first.

```
Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *
```

UP:SMSS> c 0 0

```
mode: scan onhook from unequip       flash option: false

timer blk not attached

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *
```

UP:SMSS> c 0 2

```
mode: scan onhook from unequip       flash option: false

timer blk not attached

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *
```

It is important to note that although CHNL 0D in the bits display on page 9 is reporting the unequipped AB-bit patter that the SMS indicates that it is not scanning this line at the channel block level.The Bits level reports what the incoming AB-bits are for all 24 DS0 timeslots. Even though the SLC-96 reports appropriate AB-bit information to the SMS, the SMS does not evaluate that information unless the line is datafilled in the DMS (has a directory number). The SMS does not tie up resources scanning lines that cannot make telephone calls.

```
UP:SMSS> c 0 d

 mode: no scan       flash option: false

timer blk not attached

LTCUP> quit

NOTE: PMDEBUG will terminate when last request is complete
PMDEBUG TERMINATES
```

We now insert the first line card into the A-shelf of the SLC-96. The line state now changes to IDL.

```
> post l ercs 0 0 0 0 print

CKT TYPE          LEN              DN       STATE  FAIL   EqPEC


==============================================================
1MR        ERCS 00 0 00 00      619 351 1234 IDL         SCD203

 Number of entities in the posted set: 1

> post l ercs 0 0 0 1 print

CKT TYPE          LEN              DN       STATE  FAIL   EqPEC

=============================================================
OWT        ERCS 00 0 00 01      619 516 1212 IDL         SCD203

 Number of entities in the posted set: 1
```

We have forced a mismatch between the CM and the SMS to show the state information that occurs when the SMS is incorrectly reporting an unequipped line. This is a condition that does not normally occur, but can be used for reference in gaining troubleshooting knowledge.

This first thing to note is that the lines in question are datafilled as an SCD203 card type. This card type has two line circuits per line card. As both lines that we are positing are on the same physical line card, it is very unlikely that one circuit would be IDL and the other circuit LMB. This condition raises suspicion that further evaluation is necessary.

```
> post l ercs 0 0 0 0 print
```

```
CKT TYPE          LEN              DN        STATE  FAIL   EqPEC


================================================================
1MR        ERCS 00 0 00 00      619 351 1234 IDL          SCD203

Number of entities in the posted set: 1
```

> post l ercs 0 0 0 1 print

```
CKT TYPE          LEN              DN        STATE  FAIL   EqPEC


================================================================

OWT        ERCS 00 0 00 01      619 516 1212 LMB          SCD203

Number of entities in the posted set: 1
```

> pmdebug sms 0

```
PMDEBUG MODE - CONNECTING TO SMS 0 UNIT 1

 WARNING: You now have access to the PM monitor...proceed with
caution
LTCUP>
TIme,TAsk,Load,Xprompt,CHEaptmr,DAtadump,Uspace,Debug,BPMonito
r,Swerr,C++monitor,Ipc,Verreg,Patches,Flq,Msg6x69,UArtimc,Newm
sging,NWmsgtrc,MSGTr,Chnls,CDm,DYnamic,MTc,Rcvrmon,SChnls,CSm,
DS1,CMr,UTr,OMUnsol,DIagnose,IMage,Audit,MAtediag,CAudit,PRfm,
PErcall,Bigfoot,PARaudt,CP,CNd,Trmtrc,SMsm,SMSS,LTst.
```

We can now dump the line config status from PMDEBUG for RT 1. This is ERCS0 0 which is the same SLC on which we have been working. This can be verified by matching the node number of 235. We see that the SMS is reporting that line 0 on the A shelf is equipped and line 1 on the A shelf is unequipped. This agrees with what the CM shows when posting the line.

LTCUP> sm

```
Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config

Disp ln config status, disp ln config Image

cHnl aud, send Cfield msg, Line, sMsr, *
```

UP:SMsm> d 1

```
SHELF      SLOTS: 1| 2| 3| 4| 5| 6| 7| 8| 9| A| B| C|

A              10|11|11|11|11|11|11|11|11|11|11|11|

B              11|11|11|11|11|11|11|11|11|11|11|11|

C              11|11|11|11|11|11|11|11|11|11|11|11|

D              11|11|11|11|11|11|11|11|11|11|11|11|

Value of 0 = unequipped line, Value of 1 = equipped line

Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config

Disp ln config status, disp ln config Image

cHnl aud, send Cfield msg, Line, sMsr, *
```

UP:SMsm> *

```
LTCUP>
TIme,TAsk,Load,Xprompt,CHEaptmr,DAtadump,Uspace,Debug,BPMonito
r,Swerr,C++monitor,Ipc,Verreg,Patches,Flq,Msg6x69,UArtimc,Newm
sging,NWmsgtrc,MSGTr,Chnls,CDm,DYnamic,MTc,Rcvrmon,SChnls,CSm,
DS1,CMr,UTr,OMUnsol,DIagnose,IMage,Audit,MAtediag,CAudit,PRfm,
PErcall,Bigfoot,PARaudt,CP,CNd,Trmtrc,SMsm,SMSS,LTst.
```

We can verify if the line is equipped or not by looking at the AB-bit information being received from the SLC-96. Dumping the AB-bit information for link 0 indicates that we are receiving the onhook patter for line 0 (Chnl 0) and for line 1 (Chnl 2). This would indicate that the SMS is reporting an unequipped line that is actually installed in the SLC-96.

LTCUP> smss

```
A/bdata, Ddldata, Tsw, Psport, Rtstat, psW, Cmb, Mtc, aLms, *
```

UP:SMSS> a

```
Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *
```

UP:SMSS> b 0

```
Chnl 00  on hook              Chnl 0C  on hook
Chnl 01  on hook              Chnl 0D  unequipped
Chnl 02  on hook              Chnl 0E  on hook
Chnl 03  on hook              Chnl 0F  unequipped
Chnl 04  on hook              Chnl 10  on hook
Chnl 05  on hook              Chnl 11  on hook
Chnl 06  on hook              Chnl 12  on hook
Chnl 07  on hook              Chnl 13  unequipped
Chnl 08  unequiped            Chnl 14  on hook
Chnl 09  on hook              Chnl 15  on hook
Chnl 0A  unequiped            Chnl 16  on hook
Chnl 0B  on hook              Chnl 17  on hook

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *
```

Dumping the scan information for both lines now indicates that we are scanning for the offhook condition.l If the line were actually unequipped, then we would be scanning for the “onhook from unequip” condition. This condition would definitely indicate that the SMS is not reporting a valid unequipped line. This is because the SMS should never be scanning for the offhook condition when the card is unplugged. When the card is removed, the SLC sends the unequipped AB bit pattern to the SMS. The SMS would detect the unequipped pattern and change the scan state to “onhook from unequipped” instead of “offhook. In order for the SMS state machine to change to scanning for “offhook” from the unequipped state, it must first receive the onhook AB bit pattern from the SLC. This could happen only if the line card was installed in the SLC system.

```
UP:SMSS> c 0 0

mode: scan off-hook       flash option: false

timer blk not attached

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *

UP:SMSS>

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *

UP:SMSS> c 0 2

mode: scan off-hook       flash option: false

timer blk not attached

Chnl blk, Image, port Map, Bits, sAn, Digit, Outg, Uneq scan, *

UP:SMSS> *

A/bdata, Ddldata, Tsw, Psport, Rtstat, psW, Cmb, Mtc, aLms, *
```

We now look at the line config status information again to verify that the SMS is still reporting the line as unequipped. Remember that it takes the SMS up to 1.5 minutes after the line is inserted in the SLC-96 to update the information is this table. We will see that line 1 is still marked as unequipped even after 1.5 minutes have passed, so we definitely have an invalid unequipped line.

```
LTCUP> sm

Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config

Disp ln config status, disp ln config Image

cHnl aud, send Cfield msg, Line, sMsr, *

UP:SMsm> d 1
```

```
SHELF      SLOTS: 1| 2| 3| 4| 5| 6| 7| 8| 9| A| B| C|
A                10|11|11|11|11|11|11|11|11|11|11|11|
B                11|11|11|11|11|11|11|11|11|11|11|11|
C                11|11|11|11|11|11|11|11|11|11|11|11|
D                11|11|11|11|11|11|11|11|11|11|11|11|
Value of 0 = unequipped line, Value of 1 = equipped line
Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config
Disp ln config status, disp ln config Image
cHnl aud, send Cfield msg, Line, sMsr, *
```

Since we know that the SMS is not receiving the unequipped AB-bit information from the SLC-96, and the SMS is actually scanning for offhook, we need to get the line config status to report the line as equipped. Changing the line config status from the “Set in Config” level of PMDEBUG can do this. This level asks us for the RT number on which we are working (our RT index is 1). This PMDEBUG level also prompts us for the line number on which to take action. From the qlen information, we know that our line number is 1. It finally prompts us for the value that we want to change to “0” or “1” - we want to change to equipped so we enter a value of 1.

UP:SMsm> s

`rt #:`

UP:SMsm> 1

`line # (0..95):`

UP:SMsm> 1

`change to 0 or 1`

UP:SMsm> 1

```
Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config
Disp ln config status, disp ln config Image
cHnl aud, send Cfield msg, Line, sMsr, *
```

The line config information after the change now indicates that the line is equipped. It takes up to 1.5 minutes after the change for the CM to be notified of the new line status. Once this occurs, the line changes back to the IDL state.

UP:SMsm> d 1

```
SHELF      SLOTS: 1| 2| 3| 4| 5| 6| 7| 8| 9| A| B| C|
A                11|11|11|11|11|11|11|11|11|11|11|11|
B                11|11|11|11|11|11|11|11|11|11|11|11|
C                11|11|11|11|11|11|11|11|11|11|11|11|
D                11|11|11|11|11|11|11|11|11|11|11|11|

Value of 0 = unequipped line, Value of 1 = equipped line
Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config
Disp ln config status, disp ln config Image
cHnl aud, send Cfield msg, Line, sMsr, *
```

We can verify if the audit has detected the change and sent the information to the CM by dumping the "line config image" information. The image information is the status of the line the last time that the audit ran. If the information in the "image" does not match the information in the "status", then the audit has not yet detected the change. Once the "image" and "status" tables match, we know that the audit has run on that RT.

```
Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config
Disp ln config status, disp ln config Image
cHnl aud, send Cfield msg, Line, sMsr, *
```

UP:SMsm> i 1

```
SHELF      SLOTS: 1| 2| 3| 4| 5| 6| 7| 8| 9| A| B| C|
A                10|11|11|11|11|11|11|11|11|11|11|11|
B                11|11|11|11|11|11|11|11|11|11|11|11|
C                11|11|11|11|11|11|11|11|11|11|11|11|

   D                11|11|11|11|11|11|11|11|11|11|11|11|
Value of 0 = unequipped line, Value of 1 = equipped line
Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config
Disp ln config status, disp ln config Image
cHnl aud, send Cfield msg, Line, sMsr, *
```

UP:SMsm> i 1

```
SHELF      SLOTS: 1| 2| 3| 4| 5| 6| 7| 8| 9| A| B| C|

A              11|11|11|11|11|11|11|11|11|11|11|11|

B              11|11|11|11|11|11|11|11|11|11|11|11|

C              11|11|11|11|11|11|11|11|11|11|11|11|

D              11|11|11|11|11|11|11|11|11|11|11|11|

Value of 0 = unequipped line, Value of 1 = equipped line

Rt config, All chnl bsy, pWrk trc, aBbt, Set ln config

Disp ln config status, disp ln config Image

cHnl aud, send Cfield msg, Line, sMsr, *
```

UP:SMsm> *
LTCUP: quit

```
NOTE: PMDEBUG will terminate when last request is complete
PMDEBUG TERMINATES
```

> post l ercs 0 0 0 0 print

```
CKT TYPE          LEN               DN        STATE  FAIL   EqPEC


==============================================================
1MR        ERCS 00 0 00 00      619 351 1234 IDL         SCD203

 Number of entities in the posted set: 1
```

> post l ercs 0 0 0 1 print

```
post l ercs 0 0 0 1 print

  CKT TYPE         LEN             DN        STATE  FAIL   EqPEC


==============================================================

OWT        ERCS 00 0 00 01      619 516 1212 IDL         SCD203
Number of entities in the posted set: 1
```

We can get a history of what the unequipped line detection feature has reported by dumping the AUDT202 logs out of the DMS. This shows us when the line state changed from IDL to LMB and from LMB back to IDL.

```
>
> logutil
Current MODE setting is: EXTENDED

LOGUTIL:

> open audt
Done.
RTPE13BH     AUDT202 JAN31 14:57:45 2600 INFO LINE AUDIT
LINE_EQUIPMENT_NUMBER ERCS  00 0 00 01
FROM        LINE_LM_BUSY TO           LINE_IDLE

 > back

RTPE13BH     AUDT202 JAN31 14:54:45 7100 INFO LINE AUDIT
LINE_EQUIPMENT_NUMBER ERCS  00 0 00 00
FROM        LINE_LM_BUSY TO           LINE_IDLE
> ?
>back
RTPE13BH     AUDT202 JAN31 14:53:15 5400 INFO LINE AUDIT
LINE_EQUIPMENT_NUMBER ERCS  00 0 00 01
FROM           LINE_IDLE TO        LINE_LM_BUSY
> ?
>back
RTPE13BH     AUDT202 JAN31 14:53:15 5300 INFO LINE AUDIT
LINE_EQUIPMENT_NUMBER ERCS  00 0 00 00
FROM           LINE_IDLE TO        LINE_LM_BUSY
> ?
>back
RTPE13BH     AUDT202 JAN31 14:50:15 8700 INFO LINE AUDIT
LINE_EQUIPMENT_NUMBER ERCS  00 0 00 01
FROM        LINE_LM_BUSY TO           LINE_IDLE
> ?
>back
RTPE13BH     AUDT202 JAN31 14:50:15 8600 INFO LINE AUDIT
LINE_EQUIPMENT_NUMBER ERCS  00 0 00 00
FROM        LINE_LM_BUSY TO           LINE_IDLE
>
```

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DMS-100 Family

Subscriber Carrier Module-100S

Maintenance Manual

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