Critical Release Notice

Publication number: 297-8351-550
Publication release: Standard 04.02

The content of this customer NTP supports the SN06 (DMS) and ISN06 (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.

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

Publication History

March 2004

Standard release 04.02 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.

297–8351–550

DMS-100 Family

Remote Line Concentrating Module

Maintenance Manual

XPM12 and up   Standard 04.01   August 1999

NORTEL NETWORKS™

How the world shares ideas.

DMS-100 Family

Remote Line Concentrating Module

Maintenance Manual

Publication number: 297–8351–550
Product release: XPM12 and up
Document release: Standard 04.01
Date: August 1999

Printed in the United States of America

Contents

About this document

When to use this document

This Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC) maintenance reference manual provides: overview, signaling, and hardware information for understanding the RLCM-EDC product and operation; recovery procedure for returning to service an RLCM-EDC from a completely out-of-service condition; alarm clearing procedures for clearing an RLCM-EDC alarm condition at the MAP display terminal; card replacement procedures for removing and replacing hardware modules in the RLCM-EDC as part of maintenance, verification, or acceptance procedures; trouble locating and clearing information for locating and clearing problems beyond the scope of other maintenance procedures; routine maintenance procedures for performing scheduled routine and preventive maintenance tasks. The information in this maintenance manual is intended for operating company personnel engaged in RLCM-EDC maintenance.

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:

- *Operational Measurements Reference Manual*
- *Input/Output System Reference Manual*, 297-1001-129
- *Extended Peripheral Module Translations Reference Manual*
- *Provisioning Guide*, PLN-8991-104
- *1-Meg Modem Network Implementation Manual*, 297-8063-200

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 overview

The Remote Line Concentrating Module (RLCM) is a remote peripheral that provides extended geographic coverage for the Digital Multiplex System-100 (DMS-100) switch. The RLCM operates at a maximum of 160.9 km (100 mi) from the host office.

The RLCM contains hardware and software maintenance components that perform routine audits and identify failures in the following:

- RLCM
- DS-1 links that connect the RLCM to the host controller
- subscriber lines

Functional overview

The RLCM provides an interface for two to six DS-1 links from

- a line group controller (LGC)
- a line trunk controller (LTC)
- a remote cluster controller (RCC)
- a remote cluster controller2 (RCC2)
- a maximum of 640 subscriber lines that connect locally

Note: When interfacing an RCC or RCC2 in the remote-off-remote configuration, use software package NTX381AA.

This chapter contains a hardware and software summary of the RLCM configuration.

Hardware description

This section can help the maintenance engineer understand how the different hardware components of the RLCM interact for maintenance troubleshooting. The following paragraphs describe the hardware required for the Remote Line Concentrating Module, NTX146AA, feature package.

General configuration

A standard DMS-100 switch single-bay equipment frame houses the RLCM. The RLCM frame contains the following main components:

- standard two-shelf line concentrating module (LCM)
- single-shelf remote maintenance module (RMM)
- host interface equipment (HIE) shelf
- frame supervisory panel (FSP)

The lower part of the frame contains the LCM. The LCM consists of two line concentrating arrays (LCA). Cooling baffles and fuse panels accompany the LCAs. The upper part of the RLCM frame contains the HIE shelf, the RMM shelf, and the FSP. The FSP provides power control and alarm circuits for the LCM, HIE, and RMM shelves. The FSP also provides power for the ringing generators (RG) in the HIE shelf. Refer to the RLCM frame, shelf, and panel arrangement figure for the layout of the RLCM equipment frame.

Line concentrating module

The LCM occupies shelf positions 04 and 21 of the RLCM frame. The dual unit LCM contains two LCA shelves. The LCA-0 is always the bottom array or shelf and LCA-1 is the top array of the LCM.

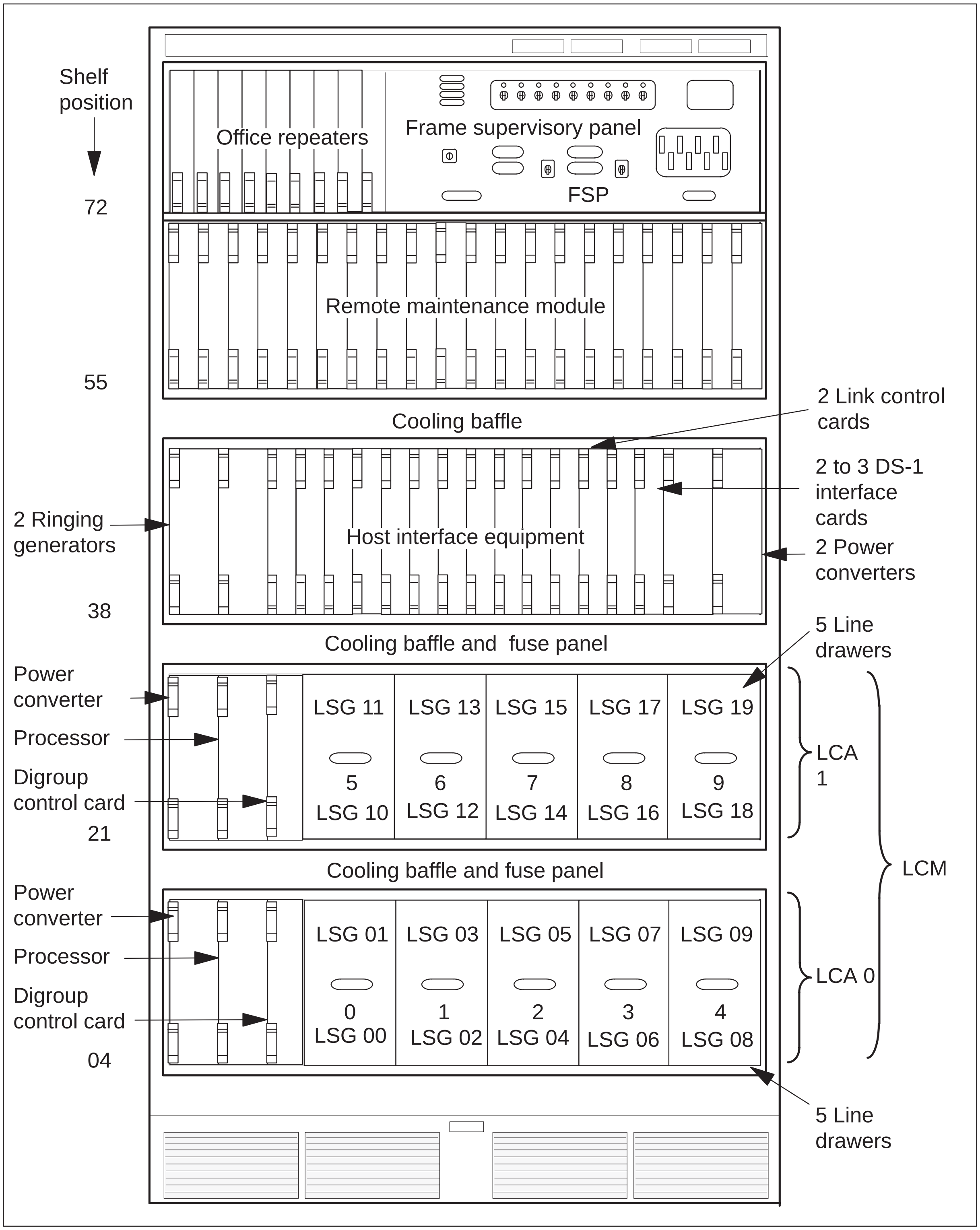
Baffle and fuse panels above each LCA allow air circulation for convectional cooling and carry sets of five +5V, +15 and –48V fuses for the line drawers. These panels also carry a pair of fuses for the ringing voltage outputs (RA, RB). Each LCA shelf has a processor, digroup controller, power converter, and five line drawers.

Each line drawer connects a maximum of 64 line cards, one for each analog subscriber line that the RLCM services. The 64 line cards consist of two groups of 32. Each group of 32 line cards is a line subgroup (LSG).

The figure “RLCM Frame, Shelf, and Panel Arrangement” identifies the 10 line drawers and the 20 LSGs in the 2 LCA shelves.

The number of line drawers times the number of line cards for each drawer determines the maximum number of lines that can connect to an RLCM. The number of line drawers is 10. The number of line cards for each drawer is 64. The maximum number of lines is 640.

RLCM frame, shelf, and panel arrangement



In the RLCM, the LCM connects from two to six DS-1 C-side links to the 640 subscriber lines of the LCM. This interface consists of the following LCM components:

- 2 power converters
- 2 control complexes (LCM processor and digroup control card)
- 20 LSGs

The RLCM has a minimum of two DS-1 links because each primary link carries one message channel to the LGC or LTC. Each DS-1 link carries 24 speech channels to allow for 48 to 144 available channels. Two of these channels are always nailed up to the host controller. A DS-1 link can accommodate a maximum of six other ports. The traffic capacity and the concentration ratio required determines if the link can accommodate the ports.

LCA shelf configuration

The layout of the LCA shelves and line drawers of the RLCM appear in figure “Line concentrating array (LCA) shelf layout.”

An LCA shelf contains the following parts:

- one power converter
- one control complex
- five line drawers

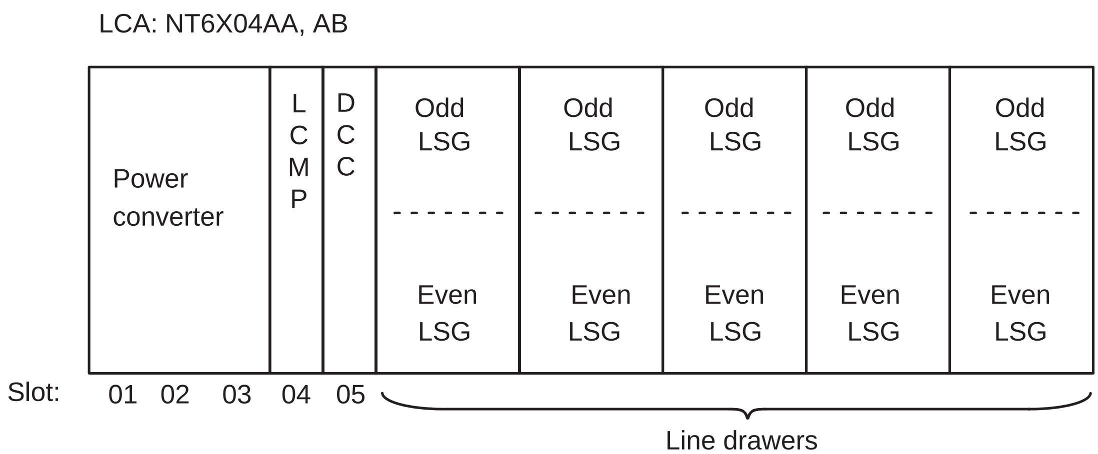
The power converter card is at the far left of the LCA shelf (slots 01–03). The control complex cards are next to the card (slots 04, 05), and the five line drawers fill the remainder of the shelf.

Power converter card

The power converter card (NT6X53) contains circuits for the conversion of –48V office battery to regulated +5V and +15V outputs for the shelf circuitry. The NT6X53 is in slots 01–03 of the LCA. The power converter also contains relay circuits which control the application of ringing, and automatic number identification (ANI). The relay circuits also control the application of coin voltages from the ringing generator to the LCM line circuits.

The arrangement of power connections to the two shelves of an LCM allows one converter to supply power. One converter supplies power to the two shelves if the mate converter fails.

Line concentrating array (LCA) shelf layout



Slot	Abbr	NT PEC	Remarks
01–03		6X53AA	Power converter. Also contains ringing and ANI voltage switching circuits.
04	LCMP	6X51AA, AB	LCM processor card (see note)
05	DCC	6X52AA	Digroup control card
–	–	6X05AA	Line drawer
–	LSG	–	Line subgroup

Note: The NT6X04AA contains the NT6X51AA 64 kB processor card, which requires the LCM software load. The NT6X04AB contains the NT6X51AB 256 kB processor card, which requires the XLCM software load.

LCM control complex cards

The LCM processor (LCMP) card and digroup control card (DCC) are often referred to as common cards in the LCA. The common cards in each LCA function in the same way. The common cards are always available. The following paragraphs describe the functions of these cards.

XLCM processor card

The extended-memory line concentrating module (XLCM) processor card (NT6X51AB/AC) is in slot 04 of each LCA shelf (NT6X04AB). The XLCM connects with the DCC to form the control complex for the LCA. The XLCM checks sanity and monitors activity in the LCA. The XLCM processor also monitors the power and ringing generator functions of the RLCM.

The XLCM contains 256 kB of RAM storage. The XLCM collects dial pulse digits from subscriber lines and handles messages to and from the host LTC or LGC. This action occurs for a maximum of 640 lines. The NT6X51AB/AC requires XLCM software loads.

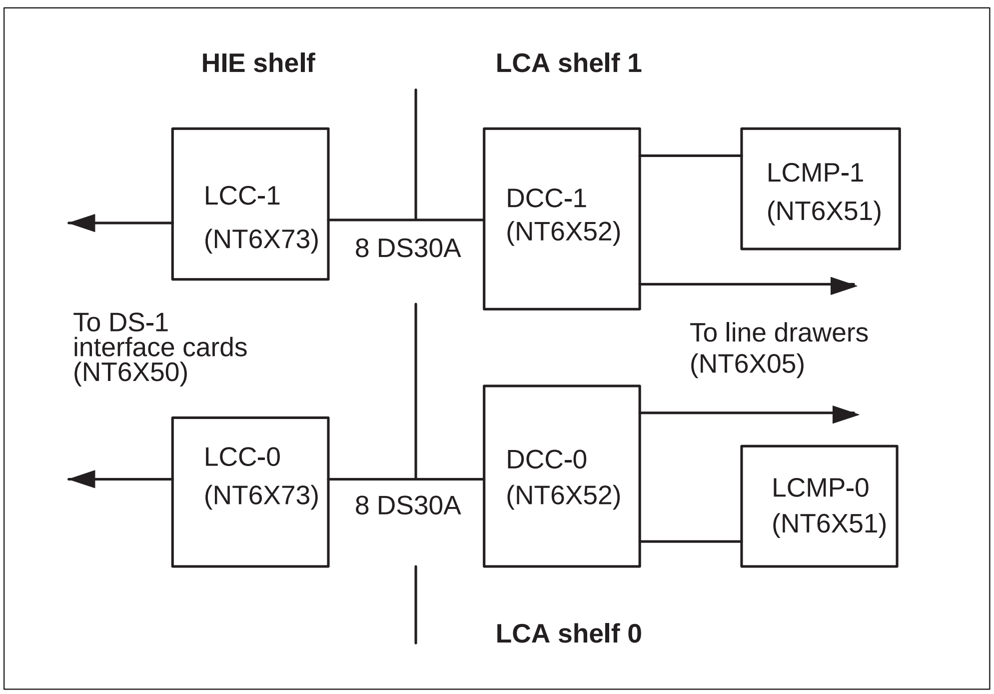
Before BCS28, LCMs had the NT6X51AA LCM processor card with 64 kB of RAM storage capacity. The NT6X51AA requires LCM software loads. The LCA shelf with these cards is NT6X04AA.

Digroup control card

The DCC (NT6X52) is in slot 05 of the LCA shelf. The DCC allows the LCA and HIE shelves to communicate. The DCC provides an interface between the corresponding LCM processor in the LCA and one link control card (LCC). The LCC is in the HIE by way of eight DS30A links. The following figure displays the actions of the DCC.

The DCC provides time switching to associate a line card to a given channel on a DS30A link. The DCC also provides digital loop-around paths for fault isolation.

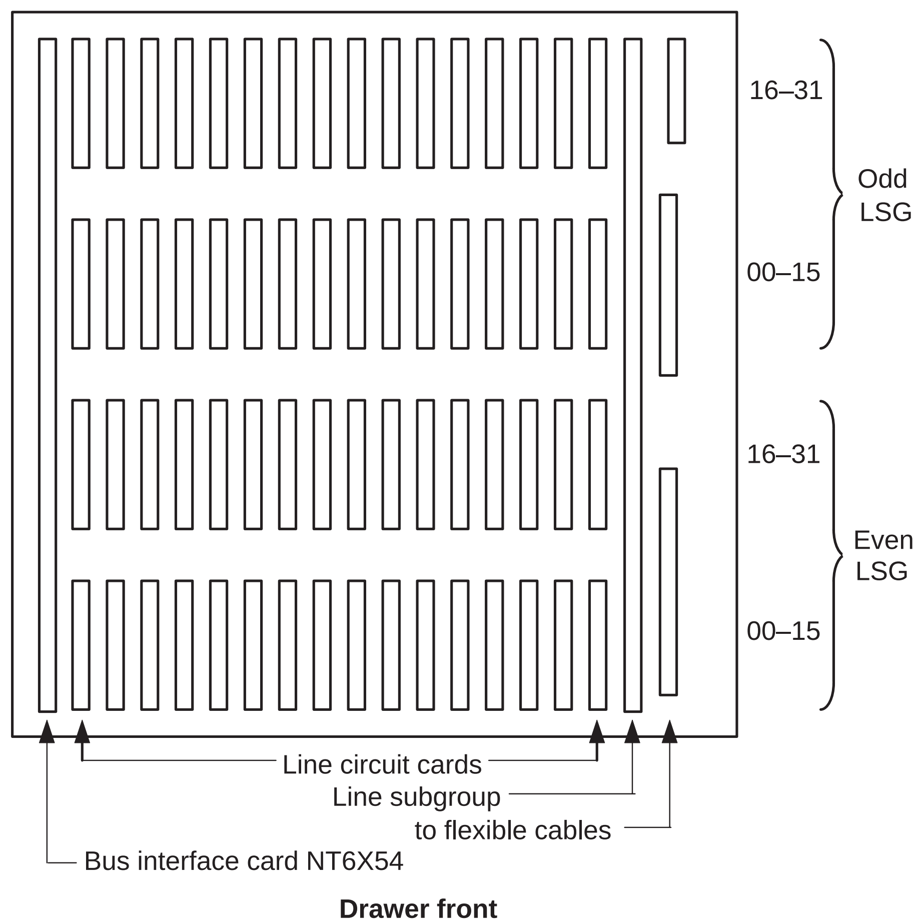
RLCM DS30A to DS-1 interface



Line drawers

Each line drawer (NT6X05) in the LCA shelf has one bus interface card (BIC) and a maximum of 64 line cards of different types. The side view of a normal LCA line drawer appears in the following figure. You can remove the line drawer from the frame to access line circuit cards. The line drawer remains operating because of flexible cables that connect to the back receptacles.

LCA line drawer NT6X05AA, circuit card location



Drawer state display

The status of the drawers appears below the status of the LCM units. The drawers are numbered from 0 through 19 and grouped in pairs. The drawers are grouped in pairs to show that the groups share the same BIC card and normally interface a different processor. The processor can be odd or even. An example of drawer status appears in the following display:

Example of a MAP response:

```
                              11 11  11  11  11
DRWR:  01  23  45  67  89  01  23  45  67  89
       ..  S.  ..  MM  .M  OO  ..  --  SS  I.
```

When the state of a drawer changes, the system updates the status display. The system or the user can change the state.

The codes to display line drawer states at the MAP terminal appear in table “LCM drawer states.” This text uses standard abbreviations. This text does not use code to describe line drawer states.

LCM drawer states

Code	Definition (abbreviation)
• (dot)	In service (InSv)
I	In-service trouble (ISTb)
M	Manual busy (ManB)
O	Offline (OffL)
S	System busy (SysB)
–	Unequipped

Bus interface card

The BIC (NT6X54) is at the front of the line drawer, behind the front faceplate. The BIC connects to the two LSGs (64 line cards) in the drawer that contains the BIC. The BIC connects the two 32-channel LSGs to the two LCAs and performs the following functions:

- Scans line circuits for occurrence of a hook switch change or message (description of dialed digits).
- Sends signals through a ringing multiplexer to control the relays in the power converter to select ringing and ANI/coin voltages.
- Monitors line drawer activity for maintenance.

- Performs digital looparound on command from the maintenance system.

Communication between LCA-0 and LCA-1, or between two LSGs occurs through the single BIC in each drawer.

Line cards

The line cards are behind the BIC in 4 rows of a maximum of 16 line cards. The top two rows of line cards form the odd-numbered LSG. The bottom two rows form the even-numbered LSG. The LCA-1 control complex controls the odd LSG of the two arrays and LCA-0 control complex controls the even LSGs of the two arrays. This control occurs through the use of the ten 32-channel P-side ports available on the DCC of each array.

The LSGs and the separate line cards in the LSGs are numbered. The LSG numbers in an RLCM range from LSG-00 through LSG-19. Line card numbers range from 00 through 31. These numbers identify and inventory each line card in the DMS switch central control (CC) by line equipment number (LEN). Refer to the following table.

Parts of LEN for RLCM

Part	Description
Site	Four-character alphanumeric name that identifies the remote site location of the RLCM. The LEN for a line configured in the host office has a site name of HOST.
Frame	Number (00–99) that identifies the RLCM frame that contains the line card.
LCM	Number (0) that identifies the LCM in the frame that contains the line card. The RLCM contains one LCM: LCM 0.
LSG	Number (00–19) that identifies the line subgroup of the LCM that contains the line card.
Circuit	Number (00–31) that identifies the position of the line card in the LSG. The example below describes how line cards are numbered for identification in an LSG.

A complete LEN for an RLCM line card consists of five units of information. Example LENs appear in the following table. This example illustrates LENs for line cards in a normal office. The first two LENs are for RLCM-supported lines.

Example LENs for line cards

Site	Frame	LCM	LSG	LC
HOST	01	0	14	6
REM1	00	0	07	30
REM2	00	0	18	26

Line cards are available in several types so the RLCM can support different types of analog or digital telephone equipment. The RLCM supports the following line cards:

- Standard line card type A (NT6X17AA, AB, AC, AD) or plain old telephone service (POTS) card. The type A card supports single-party, two-party, and private branch exchange (PBX) analog telephone sets. The analog telephone sets can be type 500 or 2500. The type A card supports loop start, superimposed ringing, and frequency selective ringing with bridged ringers. The RLCM also supports cutover control circuit. Refer to line card type B, coin.

  Note: The position for LSG 0 LC-00 is assigned to a type A line circuit and used for analog ringing tests. Circuit LSG 0 LC-00 is not available for assignment to a subscriber line.

- Line card type B, coin, (NT6X18AA, AB, BA). Provides the features of type A, and multiparty lines. Supports coded ringing, PBX, ground start, hotel/motel, and analog pay telephone sets that require coin control.

  When the suffix of the NT6X18 card is -AA or -AB, and the identification of the line is ground start (GND=Y in table LNINV), run the diagnostics again. Run the diagnostics again if the initial diagnostics fail. This action is possible through the addition of the Service order (Servord) option NPGD, Negate Partial Ground Start Diagnostics. This option allows the line to be tested against a smaller subset of ground start diagnostics. When option NPGD is set in table LENLINES, tests do not occur on loop detector, reversal relay, and ground start relay tests.

- Message-waiting line circuit (NT6X19AA). Provides the features of the type A line circuit, plus a message-waiting lamp driver circuit. When activated, this circuit causes the message waiting lamp on the associated telephone set to flash at 1 Hz. This action informs the subscriber that the subscriber has a message.
- Message-waiting converter (NT6X20AA). Provides –150V synchronized pulse for the message-waiting lamp circuit. Synchronizes from the 2.56-MHz clock pulse in the RLCM. This card must be in slot positions 0 and 16 of the odd LSG to function correctly.
- Line card type C Meridian Digital Centrex (MDC) (NT6X21AA, AB, AC, and AD). Supports MDC-related electronic multiline telephone sets and operator consoles.

The NT6X21AD line card provides a voice and signaling interface. The interface is between a 2-wire, analog subscriber line and one channel of the 4-wire, 32-channel, 2.56 Mb/s bit stream of the DMS-100 Family of DMS Systems. The card occupies one slot in the line drawer of the LCM for use with a P-phone telephone set. This telephone set connects to the line card with an ordinary non-loaded (NL) pair of metallic conductors. Voice and extended signaling services that run at the same time are available on the same loop. The transmission bandwidth on the loop consists of two frequency bands:

1 Voice channel, 300–3400Hz

2 Signaling channel 6–10kHz. Low level signals replace normal high-voltage signaling (ringing).

The NT6X21AD is a single line circuit line card that, with correct DIP switch settings, is hardware backward compatible with the NT6X21AC line card. The NT6X21AD provides enhanced features like

- reduced messaging noise
- Dual in-line package (DIP) switch selectable balance impedance
- UDLC (universal digital loop carrier) optimized operation
- DIP switch selectable (0 or –3.5dB) gain in the D/A (digital to analog) direction
- DIP switch selectable short-loop/long-loop (slp/llp), signaling levels

Feature AE1516 allows entry of the NT6X21AD cardcode, and maintenance and diagnostics. Entry of the cardcode, and maintenance and diagnostics occurs on the new, selectable signaling level, voice receive D/A level, and balance impedance. The recommended DIP switch settings appear in the following table.

Recommended NT6X21AD S1 DIP switch settings

Recommended application	D/A voice S1		Balance S2		Signaling level S3 and S4			
	Switch position ON	OFF	Switch position ON	OFF	Both ON	Only S4 ON	Only S3 ON	Both OFF
	0dB	**–3.5dB**	**NL**	**9+2**	**1.3Vpp**	**0.8Vpp**	**0.6Vpp**	**0.14Vpp**
P-phone sets long loop: 19–24dB EML	X		X		X			
P-phone sets medium loop: 17–19dB EML	X		X			X		
P-phone sets medium loop: 4–17dB EML		X		X			X	
P-phone sets short loops: 0–4dB EML		X		X				X
Northern Telecom UDLCs		X	X					X
Other vendors UDLCs	X			X			X	
6X21AC equivalent mode		X	X		X			

Note: dB=decibel
NL = non-loaded
9+2=loaded (900 ohm + 2.16 micro-farads) network
Vpp=voltage peak to peak
EML= estimated measured loss

The two acceptable limits for transhybrid loss (THL) that depend on the selected D/A level appear in the following two tables. The NT6X21AD uses the same diagnostics as the NT6X21AC. The THL limits are modified for diagnostics purposes. The first table is for the NT6X21AC line card, the next table is for the NT6X21AD line card.

NT6X21AC THL Limits

Frequency	304	704	1505	3204
Minimum	–6.2	–6.2	–6.2	–7.2
Maximum	+1.3	+0.8	+0.8	+0.7

NT6X21AD THL Limits

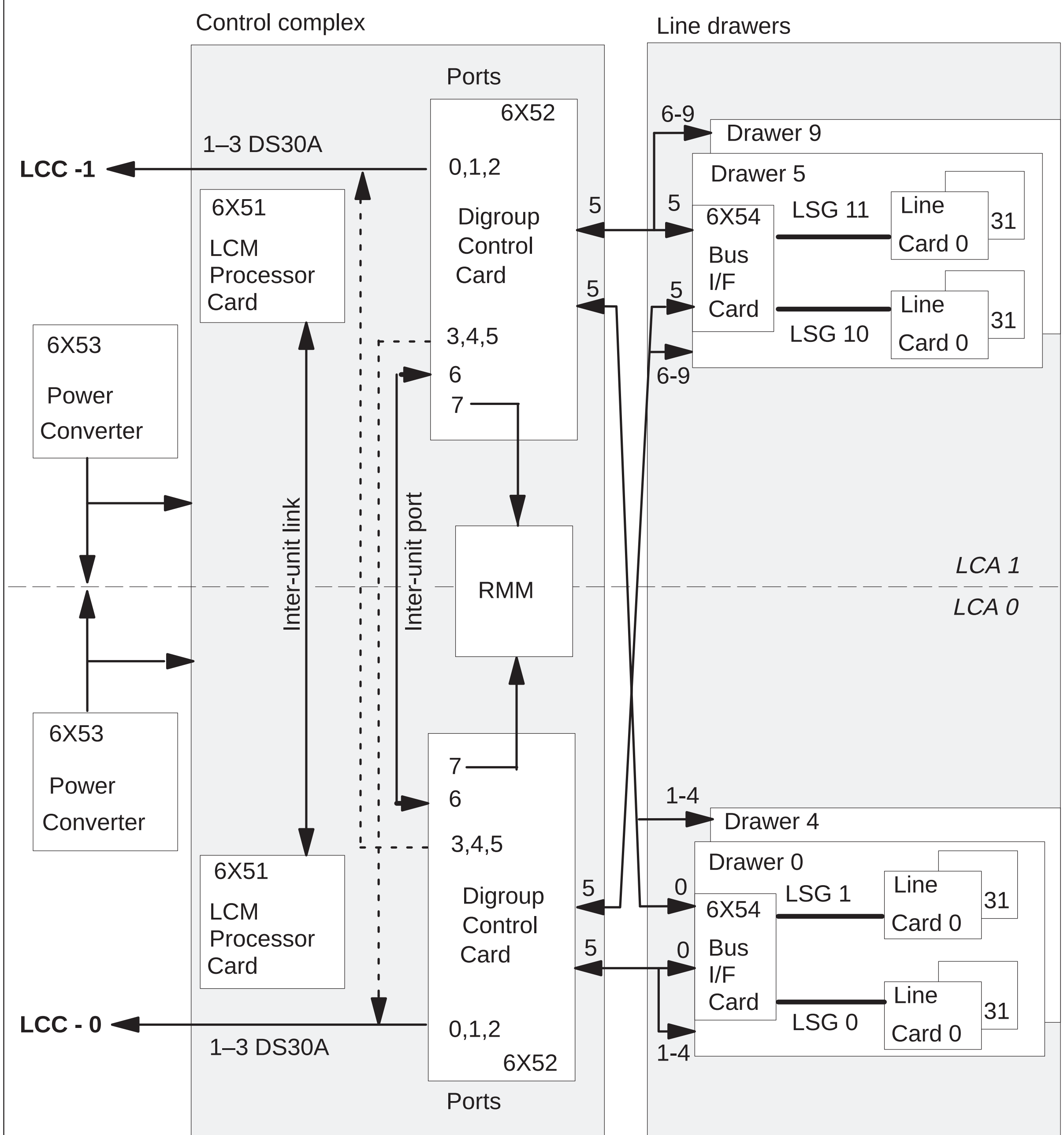
Frequency	304	704	1505	3204
Minimum	–2.7	–2.7	–2.7	–3.7
Maximum	+4.8	+4.3	+4.3	+4.2

The two limits are required so the system software can determine the selected digital to analog (D/A) gain on the line card. The system software compares THL test results against the two possible limits.

- Data line card (DLC) (NT6X71AA, AB, AC). Provides data transmission interfaces for operation with computer terminals.
- Integrated bit error rate test (IBERT) line card (NT6X99AA). The IBERT line card provides bit error rate performance (BERP). The line card tests transmission paths to assess bit error performance of RLCM hardware components.

Refer to the following figure for a functional block diagram of the RLCM LCA shelves. This chapter describes the components in this figure.

LCA block diagram



Note: Image ports 3, 4, and 5, normally inactive, become active through the backplane wiring in the takeover mode.

HIE description

The HIE occupies a single shelf at position 38 in the RLCM frame. The HIE allows the LCA shelves of the RLCM to connect to the RMM and to the host office. The HIE shelf contains the following components:

- two ringing generators
- two LCCs
- two to three DS-1 interface cards
- two power converters
- one emergency stand-alone (ESA) control complex

The following sections describe these components.

HIE shelf configuration

Like in figure “HIE shelf layout,” the two ringing generators occupy slots 01–08 in the HIE. Each generator is four slots wide. The ESA control complex, when provisioned, occupies slots 09–16.

The LCCs occupy slots 17 and 18 of the HIE shelf.

Two power converters occupy the far right of the HIE shelf in slots 22–24 and 25, in that order. Slot 25 is the slot on the shelf to the far right.

Ringing generators

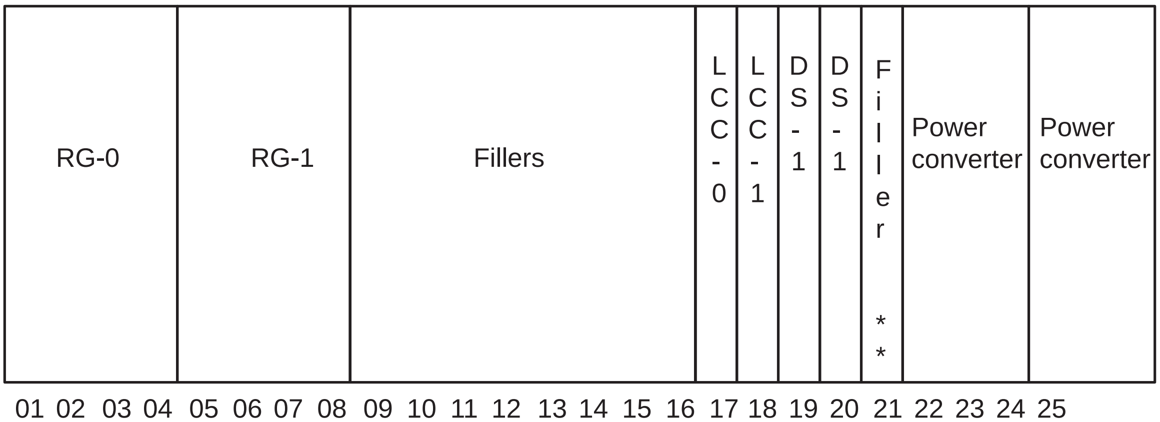
The ringing generators (NT6X60) contain the frequency circuits that generate ringing signals to subscriber line cards on the LCA shelves. Ringing patterns meet requirements set by Bell Canada and Telcordia Technologies. The system supports coded, superimposed, and frequency selective ringing.

The ringing generators also contain ANI and coin generator circuits that check for two- or four-party ANI. These generator circuits also check for coin presence in prepay coin telephones.

The ringing generators also produce voltages for ANI and coin control. These voltages are 48 Vdc and 130 Vdc. The generators monitor ANI and coin voltages and ring bus outputs for failure.

HIE shelf layout

HIE: NT6X11AA



Slot	Abbr	NT PEC	Remarks
01–04	RG-0	6X60AA	Ringing generator (RG)
05–08	RG-1	6X60AA	Ringing generator (RG)
09–13	–	0X50AG	Filler panel
14–16	ESA	(note)	(note)
17, 18	LCC	6X73AA	Link control card (LCC-0, LCC-1)
19, 20	DS-1	6X50AA	DS-1 interface (2 DS-1 links per card)
21	–		Filler panel If additional DS-1 links are required (for a total of six DS-1 links), filler panel is replaced by NT6X50AA.
22–24	–	2X70AA	Power converter
25	–	2X70AA	Power converter

Note: When the user does not select the ESA option, these slots have filler panels (NT0X50AA). When the user selects the ESA option, two options are possible. Refer to section “ESA control complex” and chapter “ESA maintenance overvew” in this document.

Link control cards

The two LCCs (NT6X73) fill slots 17 and 18 of the HIE. Each LCC provides an interface between eight DS30A ports from an RLCM LCA shelf and the DS-1 links to the host office. The LCCs also provide an interface between the ESA processor, if provisioned, and the LCM. The following figure describes how the DS-1 links terminate on the LCC and in the LCA.

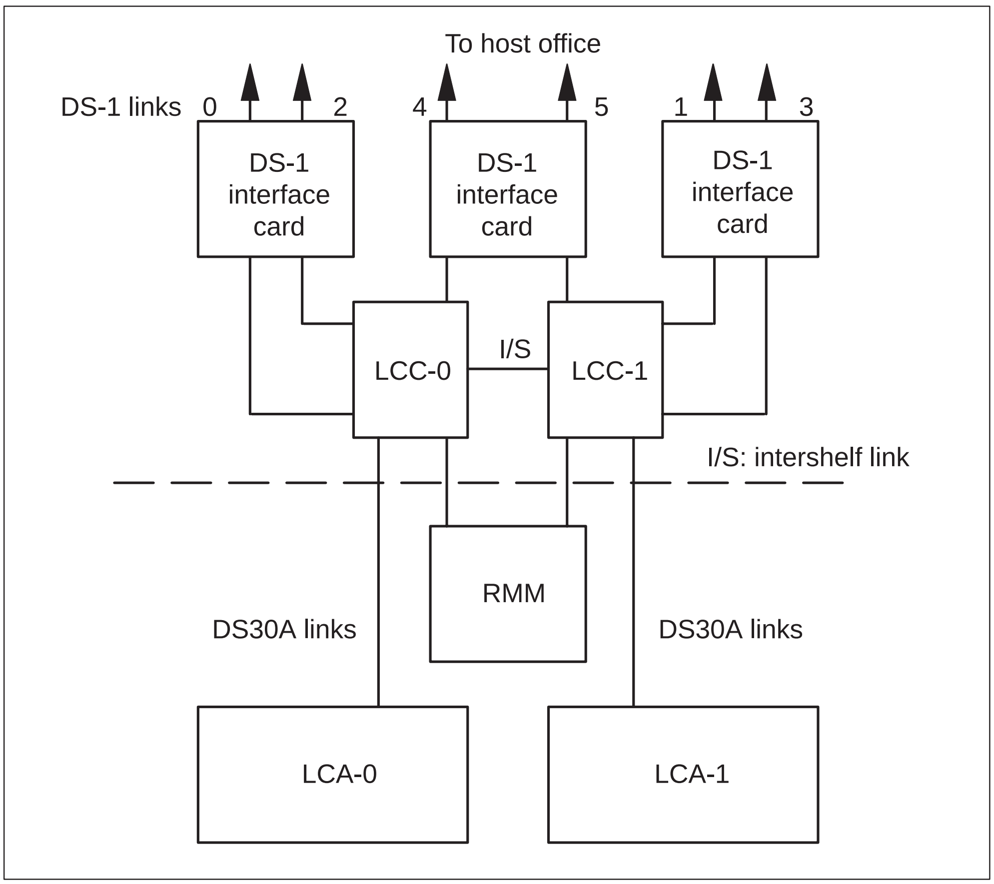
Under normal conditions, when both LCCs are active, LCC-0 connects LCA-0, and LCC-1 connects LCA-1. The LCC-0 serves even numbered DS-1 links (0, 2, and 4) from the DS-1 interface cards. The LCC-1 serves odd numbered DS-1 links (1, 3, and 5). The following figure describes how the LCCs are configured in the RLCM.

The 24 channels of a DS-1 link can come out of one 32-channel DS30A port. This event occurs when one-to-one mapping of LCA primary ports with DS-1 links occurs. Additional channels are used for control and signaling, from the host, and for intra- and interspeech channels.

As illustrated in figure RLCM link, port and channel structure. The LCC accepts eight DS30A links from the associated LCA. Through the LCC, these links provide the following:

- message and speech paths to the host
- connection to the RMM
- link-sharing resources for each LCA

LCC interface to DS-1 interface cards



The LCC also provides system clocks for the DCC, RMM, and LCM. When each unit of the LCM is active, LCC-0 is frequency-locked to the associated primary DS-1 link. The LCC-1 clock is locked to LCC-0. The two LCC clocks derive timing from the host LTC.

The DS30A ports in the LCA are numbered 0–7. The functions of the DS30A ports appear in the following table.

LCA port assignments and use

Number	Port type	Functions
0,1, 2	Primary	Carries three message channels for the LCA shelf. The system maps message channels to channels 1, 2, and 3 of each of the two primary DS-1 links to the host office. The system maps channels that carry speech to channels 4 through 24 of the primary DS-1 links.
3, 4, 5	Image	These ports are normally inactive. These ports become active if the mate LCA and LCC are inactive and takeover occurs. Port 3 takes over mate port 0. Port 4 takes over mate port 1. Port 5 takes over mate port 2 of the mate LCA. The system continues to map each channel to the DS-1 links. The active LCC takes control of the DS-1 links.
6	Interlink	Provides a DS30A link for intershelf connections. During call processing, the channels on this port allow a subscriber line on one LCA to connect to a subscriber line in the mate LCA. This action leaves DS-1 channels to the host office free.
7	Maintenance	Provides the LCA access to the RMM through the LCCs. Through the RMM ports, separate line circuits can be selected and metallic test access (MTA) can connect to the tip and ring leads for testing.

DS-1 interface cards

The DS-1 interface cards (NT6X50) are in slots 19 and 20 of the HIE shelf. An additional card can be provisioned in slot 21 in place of the filler panel. Each DS-1 interface card accepts two DS-1 links from the host office LGC/LTC. Each DS-1 interface card also connects the links on a maximum of six links to the LCC.

A minimum of two DS-1 cards are required. Different cards must carry the two primary message channels from the LCM for reliability. A third DS-1 card is added if the system requires six DS-1 links to the host to handle the traffic load of the RLCM.

The DS-1 ports do not duplicate. Each processor in the LCA shelves of the RLCM can control the six DS-1 ports.

Primary ports that map one to one with DS-1 links are called equipped ports. The number of equipped ports in an LCA depends on the number of DS-1 interface cards in the HIE. If three DS-1 cards are provisioned, the three primary ports (0, 1, 2) for each LCA are equipped ports. If a port is not equipped, the associated ports are not used or are used for features from additional RLCM feature packages, if provisioned.

Note: Links 0 and 1 are message-supporting links with special maintenance protection. On each DS-1 message-supporting link, a channel 12 looparound connects the outgoing side of channel 12 to the incoming side of channel 12. This looparound is called extended DS-1 maintenance. The looparound does not allow the link to become manually busy where the looparound is applied when the unit the link supports remains in service. When the unit this link supports becomes manually busy, the looparound is disabled. The looparound is extended DS-1 maintenance. The link can be busied and the looparound is enabled again as NT6X50 card diagnostics for maintenance of the DS-1 link.

Intracalling channel availability

With feature package NTX156AA, RLCM Intracalling, the RLCM/OPM can connect calls within the RLCM without using the host network except for the initial call setup. The level of intracalling supported varies inversely with the number of DS-1 links to the host office, thus allowing for a wide range of traffic mix.

During RLCM intracalling, each link has a maximum of 8 calls per second (CPS). The total number of intracalled RLCM calls on one RLCM is limited to the number of designated intraswitching and interswitching channels on that RLCM. The following table displays channel and connection availability.

RLCM channel and connection availability

Host DS-1 links	Host channels A	Host channels B	Host channels C	Interchannels A	Interchannels B	Interchannels C	Total intra-calls	Total active calls
2	48	46	44	108	54	27	84	140
3	72	70	68	84	42	21	84	152
4	96	94	92	84	42	21	60	164
5	120	118	116	60	30	15	60	176
6	144	142	140	60	30	15	36	188

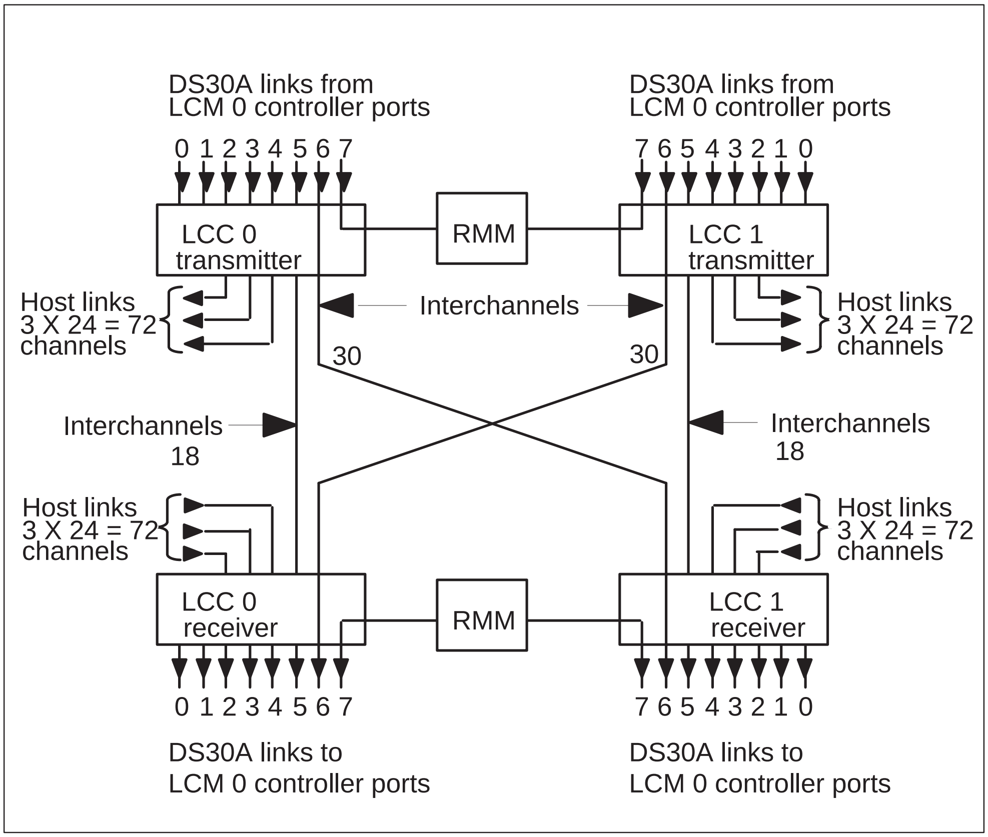
Note 1: Host channels column A: The total host speech channels available.
Note 2: Host channels column B: The total host speech channels minus two channel supervision messaging channels.
Note 3: Host channels column C: The total host speech channels minus two CSM channels and two RMM channels.
Note 4: Inter channels column A: The total interchannel speech channels available.
Note 5: Inter channels column B: The total interspeech channels available minus image channels.
Note 6: Inter channels column C: The total interchannels available between controllers.
Note 7: With three or five DS-1 host links, the RLCM has unbalanced traffic capacities.

The following sections describe the various link configurations that can occur between an RLCM and the host XPM and how the link configurations affect intracalling resources.

Six-host-links configuration

The figure below shows the channel availability for an RLCM with six DS-1 host links balanced evenly between LCC 0 and LCC 1. Each primary port of an LCM provides an interface between 30 DS30A channels making 120 channels available for each LCM. Port 6 is used for intershelf connections or interswitched calls. Port 6 of each LCM provides an interface between 30 interchannels.

Channel availability with six host DS-1 links



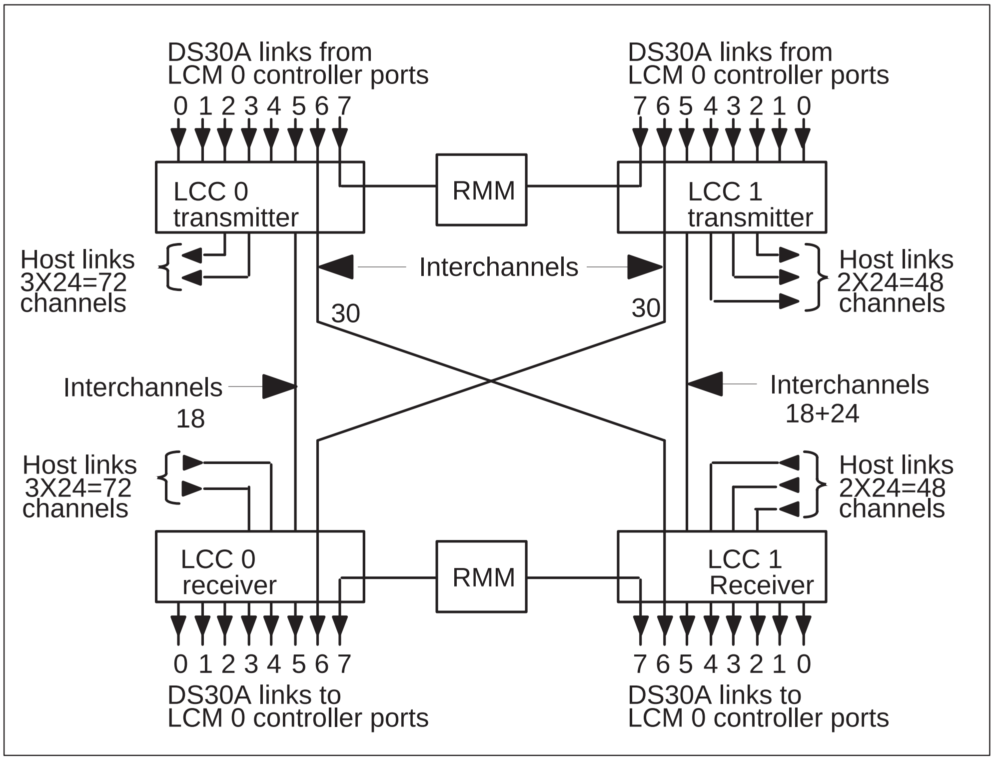
In this configuration, the channel distribution is as follows:

- 144 host channels: 24 host channels are provided for each equipped port of the LCM. An equipped port of an LCM has a corresponding DS-1 link that provides an interface with the LCC.
- 36 intrachannels: Six intrachannels are provided at the LCM for each equipped LCM port, or 18 interchannels for each LCM.
- 60 interchannels: 30 interchannels are provided from port 6 of each LCM. Fifteen channels of each port are for intercalling and 15 channels are image channels.

Five-host-links configuration

With five host links, the number of intraswitching channels for LCC 0 increases by 24. The 24 channels are from the unequipped DS-1 port, which causes unbalanced traffic capacities in the RLCM. Because the number of channels for each LCC is unbalanced, blocking may occur if subscribers are evenly distributed on the LCM units. LCC 1 has a greater capacity to switch intrachannel calls than LCC 0. The following figure shows the available channels for an RLCM with five host links.

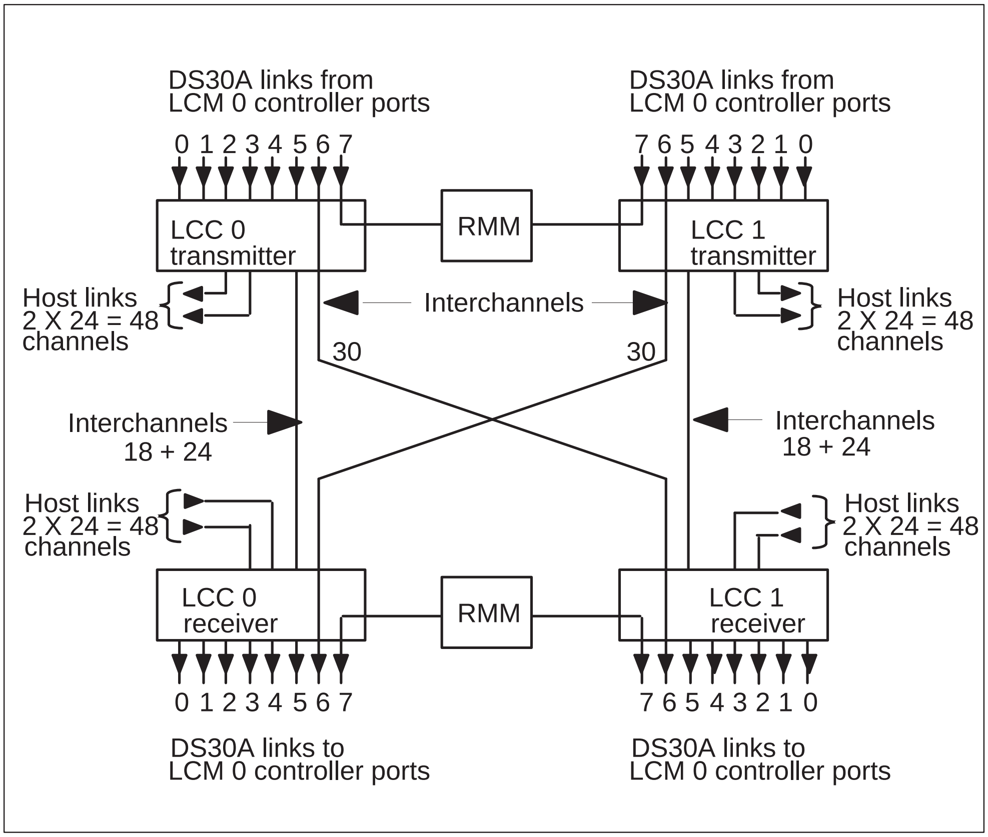
Channel availability with five host DS-1 links



Four-host-links configuration

With four host links, the RLCM is balanced. The figure below shows the configuration of available channels for an RLCM with four host links.

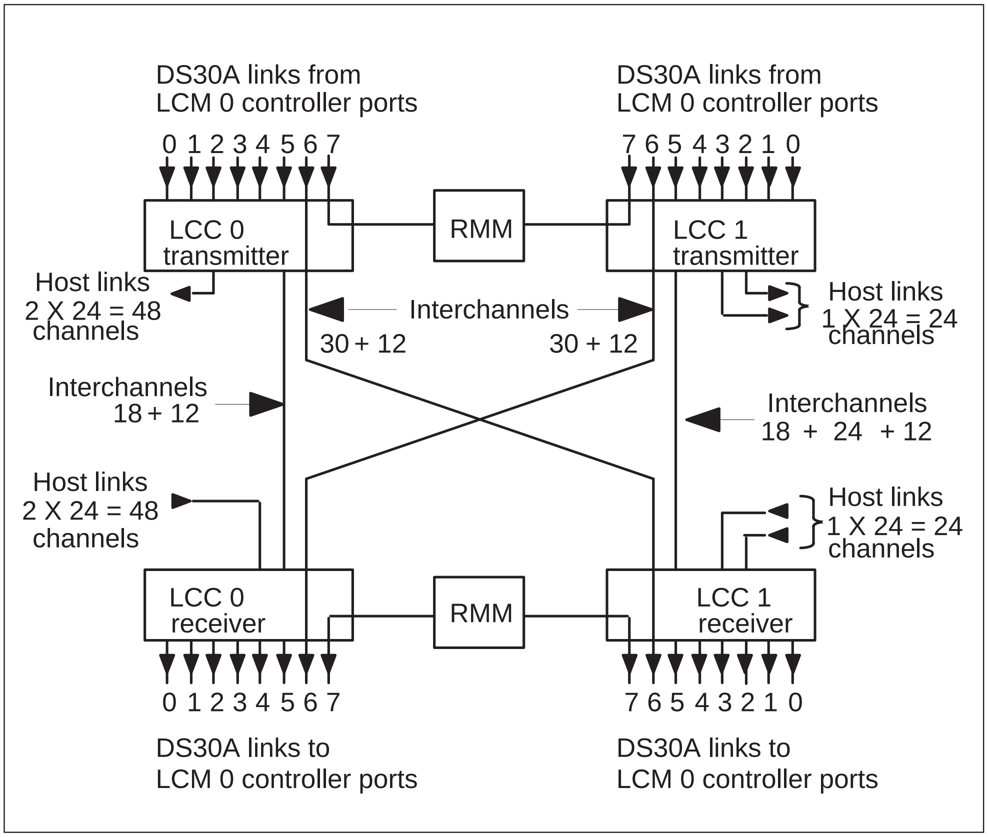
Channel availability with four host DS-1 links



Three-host-links configuration

With three host links, the number of intraswitching channels for LCC 1 increases by 24. The 24 channels are from the unequipped DS-1 port. This causes unbalanced traffic capacities in the RLCM. Because the number of channels for each LCC is unbalanced, blocking may occur if subscribers are evenly distributed on the LCM units. LCC 1 has a greater capacity to switch intrachannel calls than LCC 0. The figure below shows the configuration of available channels an RLCM with three host links.

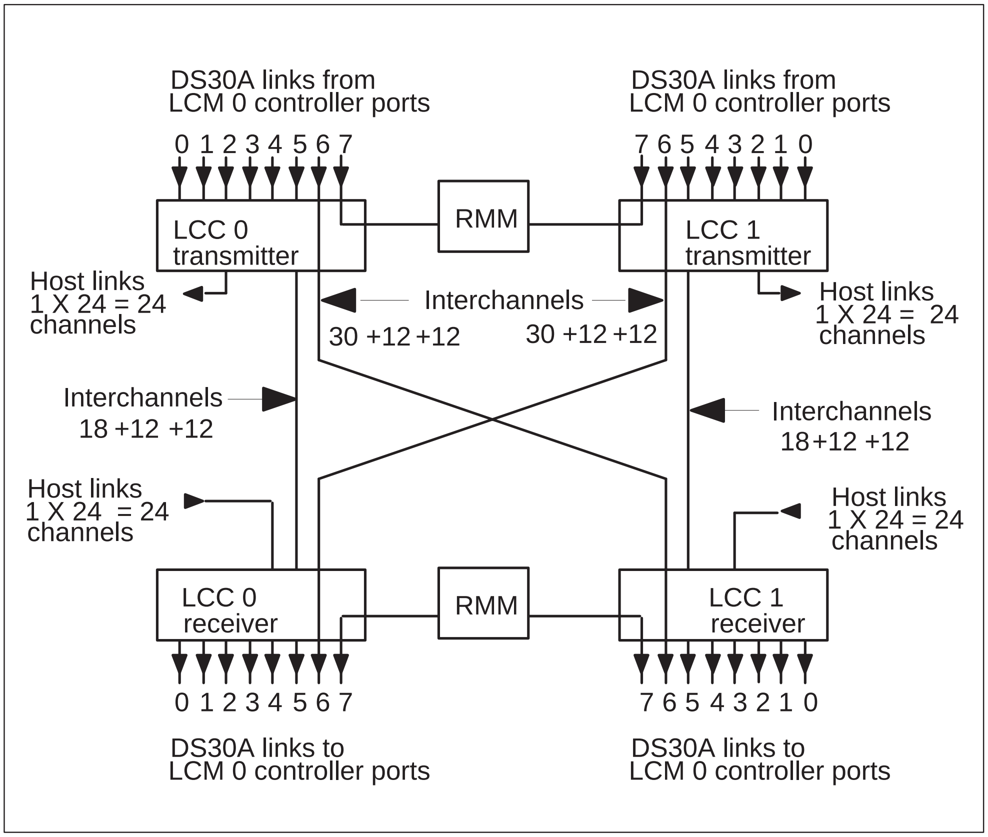
Channel availability with three host DS-1 links



Two-host-links configuration

The figure below shows the available channels with a two host DS-1 links configuration.

Channel availability with two host DS-1 links



ESA channel availability

The RLCM with feature package NTX154AA has ESA capability for limited call processing should the DS-1 links to the host fail. During ESA, the RLCM has a maximum capacity of 0.8 calls per second (CPS) with both LCM units operating. With one LCM unit operating, the maximum capacity of the RLCM is also 0.8 CPS. This rate is set for an RLCM with a 99.99% completion rate.

The RLCM in ESA mode relies on intracalling to connect local calls. Therefore, the maximum number of calls that can be handled during ESA depends on the host link configuration. The following table shows the maximum number of ESA calls for each host link.

Refer to *NT8603 DMS-100 Family Remote Order Capture Document* for more information about provisioning and RLCM traffic capacities.

Maximum number of calls during ESA

Number of host links	Intercalls	Intracalls	Total number of possible ESA calls
6	15	18	33
5	21	24	45
4	27	30	57
3	33	36	69

Power converter card

The two HIE power converters, in slots 22 and 25, supply the necessary shelf voltages (5 V, 12 V) for the HIE shelf.

ESA control complex

If the user selects the ESA feature package, two configurations are possible.

The NT6X45AF based ESA package consists of three pieces of equipment:

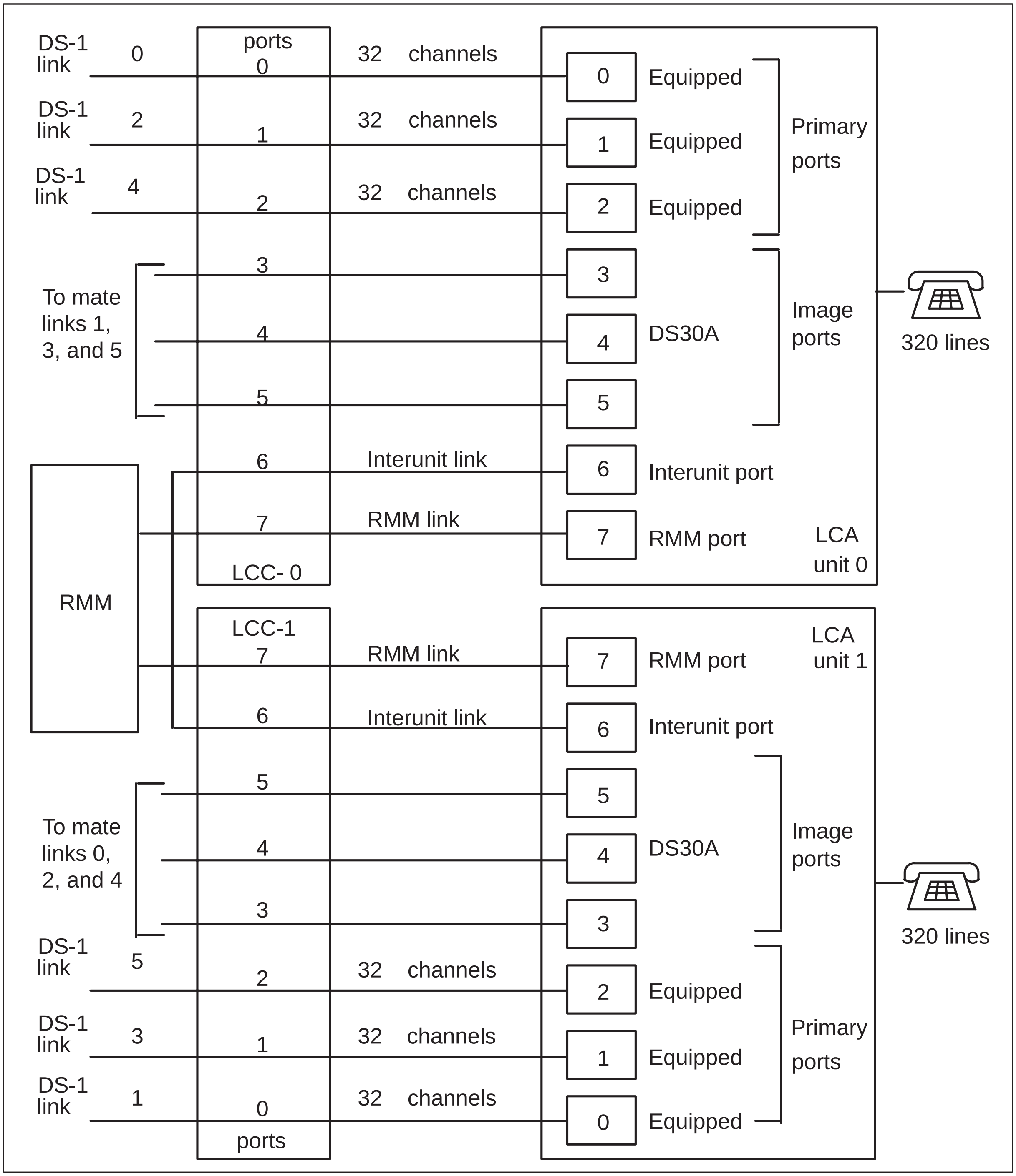
- one ESA memory card (NT6X47AC), slot 14
- one ESA processor card (NT6X45AF), slot 15
- one ESA clock and tone card (NT6X75AA), slot 16

The NTMX45AA based ESA package consists of two pieces of equipment. This package includes an ESA processor that enables duplicate Nxx in ESA mode and provides firmware downloads. This card has 8 Mbytes of on-card memory. With this package, the ESA memory card is not needed and slot 14 has a filler plate.

- one ESA processor card (NTMX45AA), slot 15
- one ESA clock and tone card (NT6X75AA), slot 16

The RLCM link, port, and channel structure appear in the following figure.

RLCM link, port and channel structure



1-Meg Modem Service

The RLCM supports the 1-Meg Modem Service. The 1-Meg Modem Service provides high-speed, data-over-voice communications over standard telephone lines to the home or small-office subscriber. The service provides the following functionality:

- high bandwidth with line transport rates up to 1280 kilobits per second (kbit/s) downstream and 320 kbit/s upstream
- simultaneous data and voice connection
- continuous data connection
- data traffic routed to data networks, which reduces congestion on the voice switch

The 1-Meg Modem Service uses a digital subscriber line (DSL) technology to provide the increased bandwidth with current office equipment and the subscriber loop. In this document, the term xDSL refers to all the different DSL technologies.

Components

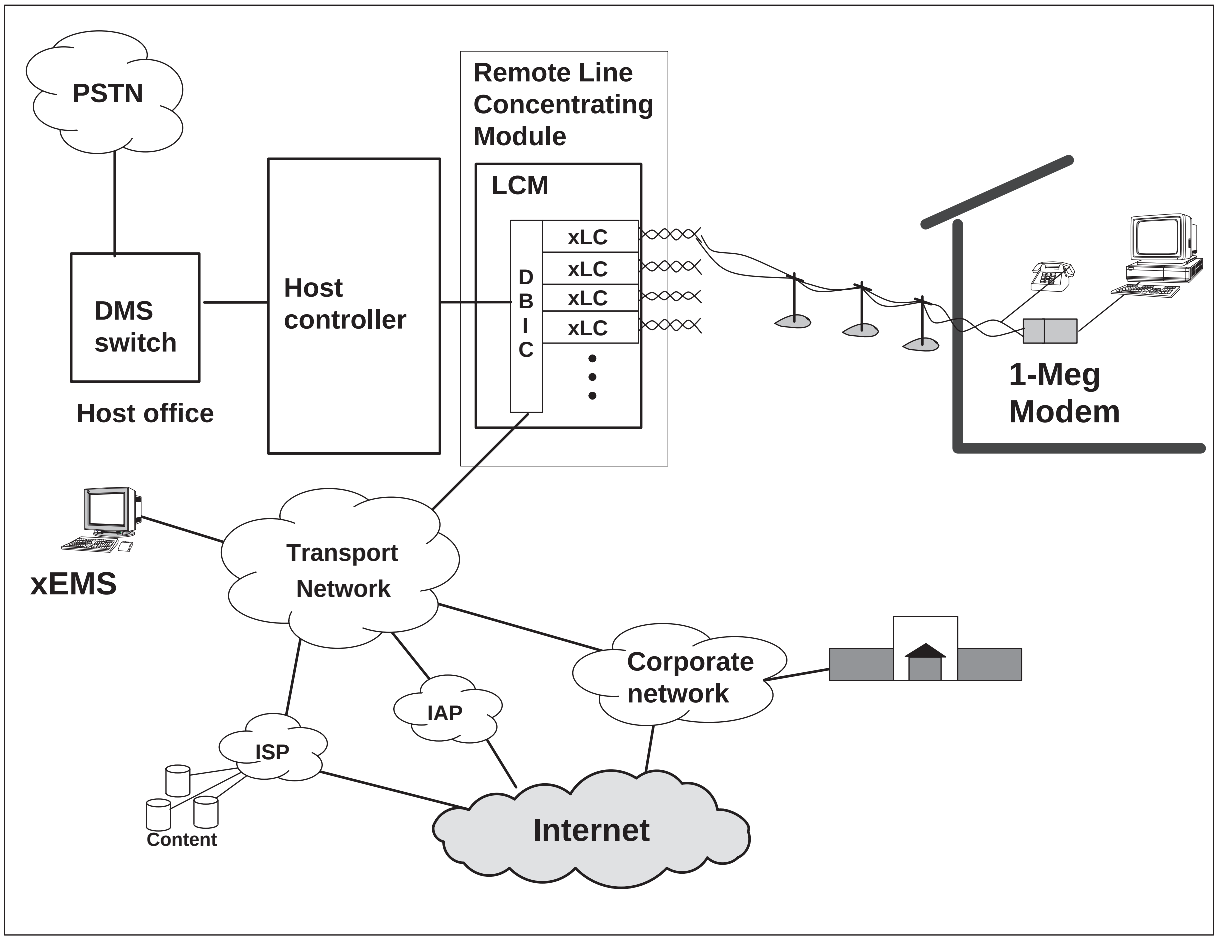
The 1-Meg Modem Service includes the following components:

- The 1-Meg Modem is customer premises equipment (CPE) that connects the telephone line, extension telephone, and computer. To the subscriber, the modem installs like a regular voice band modem, except the modem uses a 10BaseT Ethernet connection to the computer. Voice and data circuits are kept separate on the loop. This separation allows simultaneous voice and data traffic with no impact to other telephony features.
- The xDSL line card (xLC) replaces the subscriber's line card in an existing line concentrating module (LCM) drawer. The card provides full voice service in parallel with high speed data communication with the 1-Meg Modem.
- The data-enhanced bus interface card (DBIC) replaces the existing bus interface card (BIC) in the existing LCM drawer. The card is as a concentrator for the voice and data connections within a single LCM drawer. The card also separates the voice and data traffic for routing to the correct networks.
- The xDSL Element Management System (xEMS) provides operations, administration, maintenance, and provisioning (OAM&P) functions from a Hewlett-Packard (HP) or Sun workstation. Based on HP OpenView, the xEMS is a graphical user interface (GUI) that uses icons and pull-down menus. Refer to *1-Meg Modem Service Network Implementation Manual,* 297-8063-200, for more information on xEMS.

- The transport network provides the connection to the service providers. Refer to *1-Meg Modem Service Network Implementation Manual*, 297-8063-200, for more information on transport networks.

The following figure illustrates a network with the 1-Meg Modem Service.

Telephone network with 1-Meg Modem Service



The LCM line drawer contains the DBIC and xLCs. One LCM can hold up to 10 line drawers. Each line drawer can hold one DBIC and up to 31 xLCs. The line cards can be a mix of xLCs and plain old telephone service (POTS) line cards. Each 1-Meg Modem Service subscriber has an xLC. Each line drawer with xLCs must have a DBIC to provide data service. Each DBIC provides an Ethernet connection to the transport network for all subscribers in the LCM line drawer.

An LCM can have a maximum of ten Ethernet connections for all its 1-Meg Modem Service subscribers. The configuration of the transport network can require these Ethernet interfaces to connect to a mix of network components.

The flexibility of the 1-Meg Modem Service allows you to change the interface to public and private wide area networks (WAN) to meet your requirements. Examples of WANs are Internet access providers (IAP), Internet service providers (ISP), and corporate networks.

Potential applications

Potential applications of the 1-Meg Modem Service include the following:

- work-at-home

  The subscriber uses the 1-Meg Modem Service, including the transport network, to connect to their corporate network.

- Internet access

  The subscriber uses the 1-Meg Modem Service, including the transport network, to connect to their ISP.

- small office communications

  The subscriber uses the 1-Meg Modem Service, including the transport network, to connect to their corporate network. Two small offices can communicate through the 1-Meg Modem Service and depend on on the transport network for interconnection.

Compatibility

This section describes compatibility between the 1-Meg Modem Service and other services.

Voice services The 1-Meg Modem Service shares many components with the existing voice service. Some of these components are the following:

- LCE hardware, including power supplies and distribution
- the line drawer and the cards in the line drawer
- the subscriber’s copper loop

Other data services The 1-Meg Modem Service can function with the following data services in the same binder group:

- integrated services digital network (ISDN) basic rate interface (BRI)
- asymmetric digital subscriber line (ADSL)
- high bit rate digital subscriber line (HDSL) services

The 1-Meg Modem Service can function with T1 services in adjacent binder groups.

Ethernet The Ethernet interfaces at the 1-Meg Modem and the DBIC meet standard *ANSI/IEEE Standard 802.3* with one exception. The 1-Meg Modem does not support the truncated binary exponential backoff algorithm described in section 4.2.3.2.5 of the IEEE802.3 specification. This exception allows the best use of the bandwidth on the link. This exception also confirms a standard allocation between multiple users.

1-Meg Modem Service components

The following section describes some of the components in the 1-Meg Modem Service.

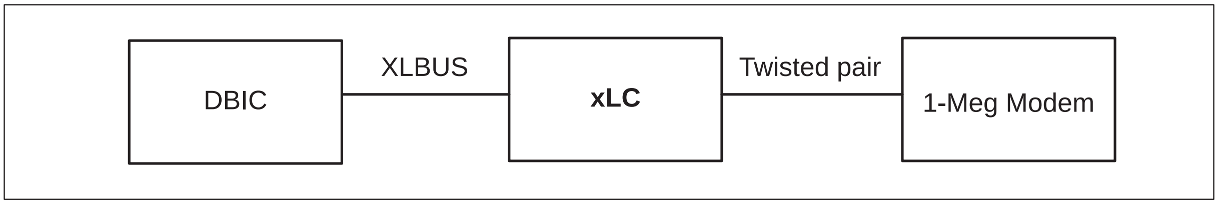
xDSL line card The xDSL line card (xLC) provides full voice service and high speed data communication with a subscriber's 1-Meg Modem.

The xLC has the following features:

- located in a standard LCM line drawer with 1-Meg Modem Service capability
- provides standard voice service using the world line card (WLC)
- provides xDSL modem function over loops up to 18,000 feet on 26 American wire gauge (AWG) wire and 24,000 feet on 24 AWG
- rate-adaptable in both downstream (DS) and upstream (US) directions
- QAM modulation in both DS and US directions
- supports both narrowband and wideband DS spectra low and high transmission levels
- raw transport downstream data rates of 1280 kbit/s to 80 kbit/s
- raw transport upstream transport data rates of 320 kbit/s to 40 kbit/s
- provides an XLBUS interface to backplane
- -48 V power to data part of card
- self-identifying to DBIC on installation
- out-of-service data loopback capability for OAM
- low power design
- occupies a two-slot form factor

The xLC terminates the subscriber's line and transmits the call to the DBIC for multiplexing. The following figure illustrates the xLC in the 1-Meg Modem Service.

xLC in 1-Meg Modem Service



The 1-Meg Modem Service supports three types of xLCs. Each xLC supports different transmission rates and LCM drawer fill requirements. The following table lists the xLCs supported by the 1-Meg Modem Service.

Types of xLCs in 1-Meg Modem Service

PEC	Maximum US/DS rates (kbit/s)	Maximum LCM drawer fill	PMs
NTEX17AA	960/120	16	All
NTEX17BA	1280/320	16	All
NTEX17CA	1280/320	31	All
NTEX17DA	1280/320	31	• RLCM • Star Remote Hub

An LCM line drawer can contain a mix of POTS line cards and different types of xLCs. However, thermal constraints and power distribution determine the location and maximum number of each type of card. Refer to *1-Meg Modem Service Network Implementation Guide*, 297-8063-200, for more information.

Data-enhanced bus interface card The DBIC replaces the existing BIC in each LCM drawer with an xLC. The DBIC separates the voice and data traffic. The card multiplexes the voice traffic to standard DS-30A interfaces to the existing circuit switched voice network. The card multiplexes the data traffic to one 10BaseT Ethernet connection to the transport network.

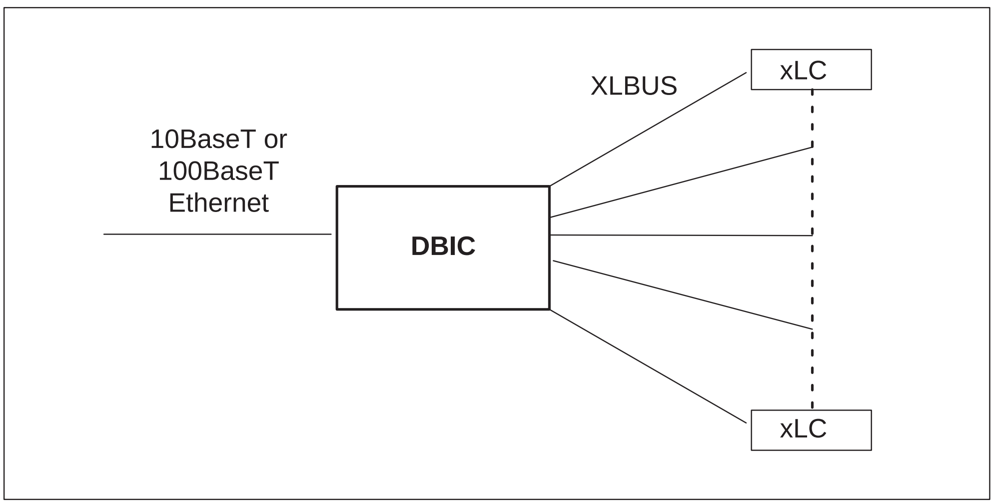
The DBIC has the following features:

- half duplex, standard compliant 10BaseT interface
- auto-sensing feature allows DBIC to connect at 10BaseT or 100BaseT
- maximum of 31 xLCs in a drawer
- connected to all line card slots through XLBUS

- backwards compatible with all POTS line cards compatible with the NT6X54AA
- different media access control (MAC) addresses for each xLC and DBIC
- demultiplex 64 voice channels from receive data (RD) links to XLBUS links
- multiplex 64 voice channels from XLBUS links to transmit data (TD) links
- +12.7v CODEC reference to all 64 line positions
- controls ring bus and automatic number ID (ANI)/COIN voltages using relays

Any LCM line drawer that contains xLCs must have a DBIC. The following figure illustrates the DBIC in the 1-Meg Modem Service.

DBIC in 1-Meg Modem Service



The 1-Meg Modem Service supports four types of DBICs. Each DBIC supports different transmission rates, Ethernet interfaces, and PMs. The following table lists the DBICs supported by the 1-Meg Modem Service.

Types of DBICs in 1-Meg Modem Service

PEC	Maximum US/DS rates (kbit/s)	Ethernet interface	PMs
NTEX54AA	960/120	10BaseT	All
NTEX54AB	1280/320	10BaseT	All
NTEX54BA	1280/320	10Base T or 100BaseT	All
NTEX54CA	1280/320	10Base T or 100BaseT	• RLCM • Star Remote Hub

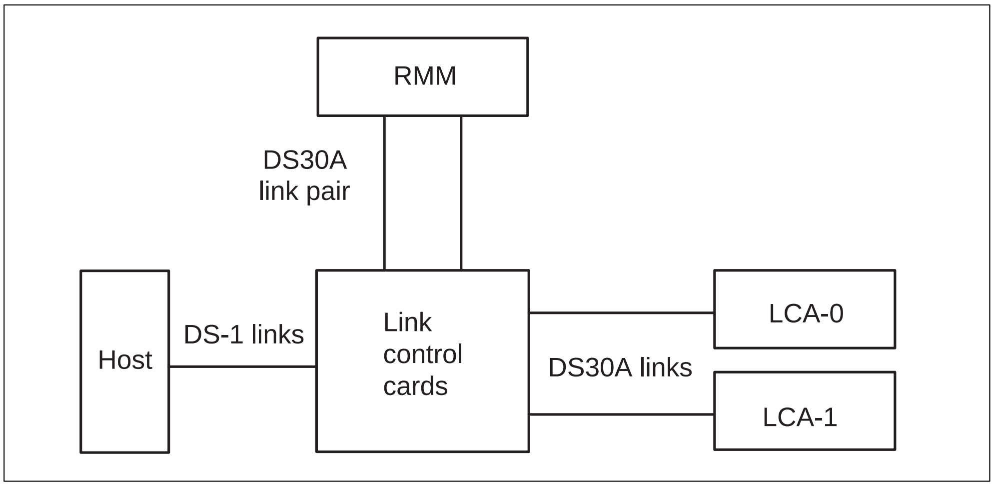
Remote maintenance module (RMM)

RMM description

The RMM occupies shelf position 56 in the RLCM frame. The RMM is a modified, cost-reduced form of the maintenance trunk module (MTM). The RMM contains a processor, which scans the service circuits and digit collection during ESA.

The RMM C-side interface uses a pair of DS30A links. One link to each LCC in the HIE shelf is present. The DS30A links make sure the RMM is operable. Different LCCs can be active. The activity of a given LCC does not determine if the DS30A can perform this function. The LCC passes maintenance requests from the host to the RMM. The LCC provides a link between the RMM and line circuits in the LCA. At the host office, the user directs RLCM maintenance to the RMM through the MAP terminal. The following figure describes how the RMM communicates with the host and the LCA through the LCC.

RMM connection with host and LCA through LCC



The RMM uses DMS-X protocol to communicate with the host, through the LCC interface to the DS-1 links.

The RMM can accommodate a maximum of 14 maintenance and service circuit cards. These cards vary in type and are selected to meet provisioning requirements.

RMM shelf configuration

The RMM shelf has 20 slots. The two slots of the RMM (01, 02) at the top left are assigned to the DS30 interface and control cards. Slots 17–18 and 20 on the far right of the shelf contain two types of power converters for the RMM. The remainder of the shelf (slots 3–16) are assigned to service circuit cards that must meet office engineering requirements. Figure “Remote maintenance module shelf design” contains an example of card selections for a normal RMM.

RMM control card

The RMM also requires the RMM control card (NT6X74AB), in slot 02. The RMM control card acts as an interface between the line concentrating array shelves and the test trunks, service circuits, and alarm circuits of the RMM. The RMM control card processes DMS-X messages, trunk messages, and pulse code modulation (PCM) data.

Power converters

Two types of power converters are required in the RMM shelf:

- multi-output power converter (NT2X09)
- 5-V/40-A power converter (NT2X06)

The multi-output power converter, that occupies slots 17 and 18 of the RMM, provides a regulated, common-ground dc power supply. This power supply has five different outputs (+24 V, +12 V, +5 V, -15 V, and –5 V). The other power converter, in slot 20, the rightmost slot of the RMM, provides a regulated 5-V/40-A power supply to the RMM shelf.

The group codec (NT2X59AA), at the far left of the RMM shelf in slot 01, is a required card. This card codes analog samples from the RMM trunk circuits. The analog samples become PCM code words. This card decodes the PCM words from the host or RLCM lines. The PCM words become analog samples.

Provisionable maintenance and service cards

Slots 03–16 of the RMM can be provisioned with various maintenance, test, and service circuits. The number and types of these cards depend on engineering needs. These provisionable cards are:

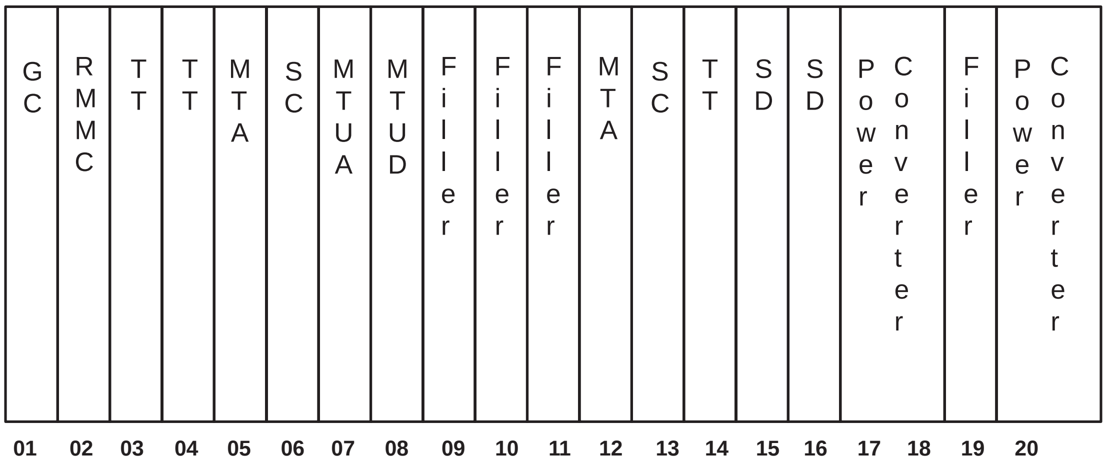
- Remote metallic test access, remote (MTA) (NT3X09AA). The remote MTA provides metallic connections between test access points in the line circuits and testing equipment. The connection consists of a two-wire metallic matrix with four horizontal buses and eight vertical. One horizontal bus connects to the MTA bus for the 320 line circuits in LCA-0 and the other to an MTA bus in LCA-1. Two horizontals are not used. The verticals connect to service circuits or spare line circuits. Host office circuits provide MTA functions during normal RLCM operation.
- Metallic test access (MTA) (NT3X09BA). The MTA performs the same functions as the 3X09AA and has eight horizontal buses and eight vertical buses.
- Scan detector card (NT0X10). The scan detector (SC) card provides an interface where the DMS-100 Switch Alarm System software can monitor the state of the RLCM hardware. The DMS-100 Switch Alarm System software monitors the state of the RLCM hardware to detect alarm conditions or manually controlled operations. The SC card consists of two circuits, each is an SC group. Each SC group comprises seven SC points. Each SC point connects one circuit that the system monitors for a change in state.
- Signal distribution card (NT2X57). The signal distribution (SD) card provides an interface between DMS-100 Switch Alarm System software and relay-controlled equipment. The interface enables the activation of visual and audible alarms. The SC card serves as a monitor, and the SD card serves as an alarm driver. The SD card consists of two circuits, each is an SD group. Each SD group consists of seven SD points. Each SD point connects one visual or audible alarm.

- Digitone receiver card (DTR) (NT2X48AB). The DTR contains four Digitone receivers to collect digits during RLCM ESA.
- Line test unit (NT2X10AA, AB, AC, NT2X11AA, AB, AC, AD). The line test unit (LTU) is a testing facility that can connect to a selected line circuit through the remote MTA. The LTU contains two cards: an analog test and measurement card (NT2X10) and a control card (NT2X11). The two cards must be side by side, the NT2X10AB in an odd-numbered slot, the NT2X11AA in the next even numbered slot. The LTU analog test card performs tests and measurements on a subscriber loop or line card circuit. The NT2X11 control card serves as an interface between the LTU analog card and the RMM. The LTU contains one internal test unit.
- Multiline test unit (NT2X10BA, NT2X11BA). The multiline test unit (MTU) is an enhanced LTU that can replace the present LTU. The MTU contains two cards, an analog test and measurement card (NT2X10BA), and a control card (NT2X11BA). The two cards must be side by side, and the NT2X10BA must be in an odd numbered slot. The MTU performs the functions of the LTU with greater speed and accuracy. The MTU also can be used to test Meridian Business Set lines and OPM battery maintenance. The NT2X11BA control card serves as an interface between the MTU analog card and the RMM. The MTU contains two internal test units.
- Incoming/outgoing test trunk (NT2X90). The test trunk card provides an interface between external test equipment, like the number 14 line test desk, and the RMM. The test trunk card provides monitoring and speech circuits to subscriber lines. The test trunk allows operator verification calls through a VER90 trunk.

The RMM shelf design appears in figure “Remote maintenance module shelf layout”.

Remote maintenance module shelf design

RMM: 6X13AA



Slot	Abbr	NT PEC	Remarks
01	GC	2X59AA	Group codec and tone card
02	RMMC	6X74AB	RMM control card
03	TT	2X90AD	Test trunk circuit
04	TT	2X90AD	Test trunk circuit
05	MTA	3X09BA	Remote metallic test access (8x8)
06	SC	0X10AA	Scan detector card
07	MTUA	2X10BA	Metallic test unit, analog
08	MTUD	2X11BA	Metallic test unit, digital
09–11	-	0X50AC	Filler panels
12	MTA	3X09AA	Remote metallic test access (4X8)
13	SC	0X10AA	Scan detector card
14	TT	2X90AD	Test trunk circuit
15	SD	2X57AA	Signal distribution card type 1
16	SD	2X57AA	Signal distribution card type 1
17, 18	-	2X09AA	Power converter
19	-	0X50AC	Filler panel
20	-	2X06BA	Power converter

Note: Slots 03 through 16 display a standard complement of RMM test and service circuits. This complement varies according to office requirements.

Frame supervisory panel (FSP)

The FSP (NT6X25) occupies shelf position 72 of the RLCE frame. The FSP provides talk jacks, fuse alarm features and power control for the RLCM. The FSP contains 48-V distribution breakers to the ring generators (RG-0, RG-1) in the HIE. The FSP also contains three circuit packs that control the alarm facilities and power converters in the RLCE frame. The following paragraphs describe circuit packs and associated functions:

- NT6X36AA Alarm card

  This card is used to monitor the power converters in the RLCE frame. This card is also used to generate an alarm when an undervoltage condition occurs in one of the power converters.

- NT0X91AA Alarm and Converter Drive

  This circuit pack controls the alarms and power for the NT6X53AA power converter for unit 1 of the LCM. This circuit pack also controls the alarms and power for the NT2X70AA in slot position 22 of the HIE.

- NT0X91AE Converter Drive and Protection Circuit

  This circuit pack controls the alarms and power for the NT6X53AA power converter for unit 0 of the LCM. This circuit pack also controls the alarms and power for the NT2X70AA in slot position 25 of the HIE. This circuit pack also controls the alarms and power for the NT2X09AA/NT2X06BA in slot positions 17 and 20 of the RMM, in that order.

The FSP also contains additional circuit breakers (CB) for distribution of –48-V power to the various shelves in the RLCE frame. Refer to the table “FSP circuit breaker assignments”, for CB power distribution, assignments, shelf type and slot position, PEC code and supported equipment.

FSP circuit breaker assignments

CB	Shelf type	Shelf pos.	Slot pos.	PEC code	Equipment
CB1	HIE	38	25	NT2X70	LCA 0
CB2	HIE	38	01	NT6X60	RG 0
CB3	HIE	38	05	NT6X60	RG 1
CB4	HIE	38	22	NT2X70	LCA 1
CB5	RMM	56	17	NT2X09/NT2X06	RMM
CB6	LCA	04	05	NT6X53	LCM unit 0
CB7	LCA	21	05	NT6X53	LCM unit 1
CB8	FSP	72	1-4	T-1 repeaters	T-1 repeaters
CB9	FSP	72	5-7	T-1 repeaters	T-1 repeaters

Software description

The following sections describe the software operation of the NTX146AA feature package.

Interface to DS-1 links

The RLCM provides an interface between the host controller and a maximum of 640 subscriber lines through the DS-1 links. The LCCs reassign data that travel over the 32 channels of a DS30A link to the 24 channels of a corresponding DS-1 link. The six additional channels are used for intraswitching and signaling.

LCC control data

When a unit of the RLCM goes in service (INSV), the LCC for this unit receives control data from the LCM. This data indicates the number of DS-1 cards equipped and which clock source must be used for the RLCM. The LCM receives this data, in turn, from the host LTC/LGC. The host sends messages to the LCM unit when the host returns to service (RTS). The host also sends messages to the LCM when the CC attempts to switch the LCM clock source from one LCC to the other.

The RLCM software controls the LCC clock source, which is frequency-locked to the primary DS-1 links. The RLCM software does not control the LCC clock source when the two units of the LCM are inactive. The LCM hardware forces each LCM unit to take the clock source from the associated LCC.

Other host office functions

Software resident in the host DMS-100 Family office controls the following software:

- class of service
- code interpretation
- screening
- routing
- billing

Signaling and supervision

Signaling allows the DMS-100 switch to communicate with switch stations or other switching offices. The RLCM uses DMS-X protocol to communicate over RCLM DS-1 links with the host office. The DMS-X transmits and receives message data over full-duplex media like the DS-1 links. The DMX-X is a half-duplex, byte-oriented protocol that is like DS30. The DMS-X is a state-driven code, that requires handshake-messaging between the RLCM and host at each stage of data transfer.

The byte transfer rate over DS-1 channels is 125 bytes for each s.

Subscriber tones

The host LTC/LGC provides properly cadenced tones, which the RLCM applies to subscriber lines. The tones that the host LTC/LGC supports and the RLCM applies are:

- dial tone
- audible ringing
- warble (MDC Meridian business set ringing)
- busy tone
- reorder tone
- receiver off-hook (ROH) tone

The RLCM depends on the DMS-100 switch CC. The RLCM does not take part signaling between the host office and other systems.

Intraswitching capability

The system provides the intraswitching capability to the RLCM with feature package NTX156AA. The intraswitching feature distributes the traffic load again in the RLCM so that the DS-1 links to the host can handle external calls. The intraswitching feature allows calls to connect. These calls can occur between subscribers that the same LCM unit of the RLCM serves. This connection is called intraswitching. The interswitching feature allows calls between subscribers on different LCM units of the RLCM to connect. This connection is called interswitching. Intraswitched and interswitched calls occur through the LCCs in the HIE shelf. These LCCs connect in sequence to the DS30A ports of the LCM.

For additional information on intraswitching, refer to the data schema section of the *Extended Peripheral Module Translations Referenance Manual*, NTP 297-8321-815

Functional limits

For feature package NTX146AA to work correctly, specified conditions must be observed. Hardware or software can determine these limits.

Hardware restrictions

The following hardware limits apply to the NTX146AA:

- One RLCM can serve a maximum of 640 lines.
- The RLCM has a traffic-carrying capacity of a maximum of eight CCS/lines, or a maximum of 1.5 calls every s.
- A minimum of two and a maximum of six DS-1 (T-span) links connect the RLCM with the host office.
- All DS-1 links to the RLCM must terminate on the same host LGC or LTC, and on different DS-1 interface cards.
- The maximum power input to the RLCM bay is 35 A at –48 V.

Software restrictions

Feature package NTX146AA requires the following software packages in order to operate:

- NTX000AA**:** Bilge
- NTX001AA: Common Basic
- NTX270AA: New Peripheral Maintenance Package
- NTX901AA: Local Features I

In addition, the RLCM requires feature package NTX156AA, RLCM Intracalling to have intraswitching capability. The RLCM requires feature package NTX154AA, Emergency Stand-Alone Operation to have ESA capability.

Fault conditions

Several types of faults can occur in the components of the RLCM. In the host office, the C-side links from the RLCM to the host LTC/LGC can go down. If these network links have faults, a loss of messaging from the CC and a loss of subscriber service can occur.

A circuit card in the RLCM, like the power converter card, can have faults and can adversely affect subscriber service. The RLCM equipment, other than circuit cards, can also have faults.

The RLCM P-side links toward the subscriber carry messages that are important to the maintenance of subscriber service. A peripheral side link that has faults can also impact subscriber service.

The following sections discuss the specified fault conditions which occur in RLCM components and the interfaces between RLCM components.

LCA shelf failure

A fault condition can cause one of the LCA units in the LCM to go out of service. When this problem occurs, the in-service unit assumes control of the mate unit lines in addition to the in-service unit lines. This function is a takeover and is an automatic maintenance feature of the LCM configuration. Refer to “Takeover capability”. If one of the following fails, the LCA shelf goes to takeover:

- mate processor
- digroup control card in the mate unit
- power converter in the mate unit
- ANI and coin voltages in the mate ringing generator
- mate LCC in the HIE shelf

Line drawer faults

A BIC or line card with faults causes a fault condition in a line drawer. This fault is not severe enough to cause a takeover.

Link failure

Link failures include the following:

DS-1 links

Link failures are normally associated with the DS-1 interface cards in the host controller, DS-1 link, or DS-1 interface cards in the RLCM.

Monitoring occurs through operational measurements (OM). The OMs indicate when maintenance or out-of-service thresholds exceed the limit.

The host controller maintains and tests the DS-1 links, generates alarms for link faults, and assigns different channels when faults occur on these links. Operating company personnel can obtain the bipolar violation (BpV) count at the RLCM through the following actions. Operating company personnel can post the host XPM with the REMOTE parameter at the carrier level of the MAP display or by post the host XPM. The personnel also can issue the DETAIL command with the REMOTE parameter. The BpVs are not severe enough to raise an alarm, but can signal wear of a DS1 link.

The signals on a DS-1 link travel in two directions and the host controller or the RLCM can detect faults like BpVs. The RLCM notifies the host controller when the BpV count exceeds the threshold of 1 BpV per 10^3 bits. The RLCM also monitors the loss of frame indicator for the DS-1 links. The RLCM turns on an outgoing alarm for a frame loss of more than 2.5s. The system removes the outgoing alarm when the frame is restored for 10s.

If the RLCM detects loss of the framing pattern for 2.5s or more, or if the host XPM detects loss of the framing pattern for 220ms, frame loss at the out-of-service limit occurs. A local carrier group alarm (LCGA) occurs at the carrier level of the MAP display if the host XPM detects loss of frame. A remote carrier group alarm (RCGA) appears if the RLCM detects the loss of frame. For information on standard troubleshooting procedures to clear these faults, refer to the chapter Troubleshooting chart.

DS30A links

The DS30A links on the P-side of the RLCM can fail. These links connect to an RMM or ESA module. Faults on these links can affect the associated modules.

Load file mismatch

A load file mismatch fault condition is present when a load in the LCM does not match the load specified in table LCMINV.

Automatic maintenance

The DMS-100 Family switch of peripheral modules (PM) must be reliable for different fault conditions. The PMs contain several hardware redundancies that serve as backup operations for module, card, and link failures. Fault conditions that do not require interruption can be present.

When fault conditions occur, the host switch and the RLCM initiate audits or other system actions. The audits and system action attempt to locate and correct the fault.

The following sections describe the following types of automatic maintenance:

- RLCM audits
- checksums
- LCM LTC speech path diagnostics
- overload resources
- takeover capability
- ESA capability
- RMM maintenance
- drawer testing
- BIC relay testing (BRT)
- subscriber line automatic maintenance
- LCM routine exercise (REX) tests

RLCM audits

Audits run in the RLCM every 5 s to refresh the control data for DS-1 and LCC circuits and to monitor the LCC for faults. A second audit runs every 500 ms to monitor the DS-1 interface cards for faults. The following paragraphs describe the functions of these system audits. These system audits affect LCC and DS-1 circuits.

Link control card maintenance

The RLCM monitors the status of the associated LCC to make sure the system transmits control data correctly to the LCC. The RLCM also monitors the status of the LCC to make sure the inactive LCC clock runs fault-free. Control data are rewritten to the LCC periodically.

DS-1 interface card maintenance

For each of the RLCM DS-1 interface cards, the RLCM monitors the BpV counter. The RLCM notifies the CC when the count exceeds the threshold of 1 BpV for 10^3 bits (10 kb). The RLCM also monitors the loss-of-frame indicator for the DS-1 links. The RLCM turns on an outgoing alarm for a frame loss of more than 2.5 s. The system removes the outgoing alarm when frame is restored for 10 s.

When the RLCM detects DS-1 slips, the RLCM increases a slip counter. The RLCM provides a message-driven interface to allow the system to query the counter from the carrier MAP display level of the host office. Control data are rewritten to the DS-1 cards periodically.

LCM drawer maintenance

A system audit runs every 10 min for each LCM. The system audit attempts to return to service drawers in the SysB state. If the audit detects faults, the system tests and handles drawers in the ISTb state.

The LCM unit states, and the corresponding tests, appear in the following table.

Full in-service tests

State	In-service tests	Busy
InSv	In-service tests	Out-of-service tests
Bsy, sane	In-service tests	Full (all) tests
Bsy, insane	Stand-alone in-service tests	Stand-alone out-of-service tests

Checksums

For the DMS-100 Family of peripheral modules, a number calculates the checksum (CHKSUM) for each software load. After the PM is loaded and tested, the checksum total is compared with the expected checksum total. If the totals match, the load is correct. If a mismatch occurs, the load must be loaded again through the LOADPM command. Each PM type has a different checksum value for each load. The QUERYPM command displays a checksum value for the load of the PM.

LCM LTC speech path diagnostics enhancements

The LTC diagnostic tests consist of the following two parts:

- Speech path diagnostic (SPCHDIAG). Tests the internal components of the LTC (or LGC) speech path for data integrity, like C-side and P-side loop-arounds and speech bus timeslots.
- P-side link diagnostic (PLNKDIAG). Test links between the LTC and auxiliary peripherals, like the RLCM. Tests occur on each link or on selected links.

Speech path diagnostic for the LTC

The speech path diagnostic consists of four separate tests:

- hardware presence test
- P-side interface presence test
- P-side loop test

- internal loop test

The system performs each test if previous tests pass. The following paragraphs describe the four tests.

Hardware presence test This test makes sure the formatter (6X41), message (6X69), and timeswitch (6X44) cards are present in the LTC. This hardware is necessary for the remainder of the tests. If one of these cards is not present, the diagnostic returns a `No Resources` error message and generates a PM181 log report.

P-side interface presence test This test makes sure that DS-1 interface (6X50) cards entered for the LGC/LTC are present. This test is used to set up the next P-side loop test. The P-side interface test terminates when the audit detects a failed 6X50 card or the user removes the failed card. The test also terminates when the diagnostic returns a `No Resources` error and generates a PM181 log report.

P-side loop test After the P-side interface test checks for the occurrence of all 6X50 cards, the P-side loop test verifies the correct operation of these and other dedicated P-side loop-around circuits for the LTC. The following paragraphs describe the P-side interface cards that the system supports in the LTC P-side loop test.

The LTC can be in inactive mode where one unit is inactive and the other manual busy (ManB), system busy (SysB), or INSV. If the other unit is in one of these states, the P-side loop test checks the 6X48 P-side loops. If the LTC is in active mode one unit is active and the other unit is in SysB, ManB, or INSV. When this event occurs tests run on the 6X48 and 6X50 P-side loops. The P-side interface test also checks the LTC multiplexer.

Internal loop test This test checks the integrity of LTC speech channels. If the LTC is out of service (OOS), a full test runs on every channel. If the LTC is INSV, the test checks two speech channels selected at random. The internal loop test also checks the operation of LTC PCM enable/disable gates.

LTC P-side link diagnostic

The P-side link diagnostic consists of three separate tests:

- hardware presence test
- P-side interface presence test (DS30A and DS-1 link interfaces)
- full peripheral test

Hardware presence test This test checks for the message (6X69) and timeswitch (6X44) cards in the LTC or LGC. These cards are necessary for the other P-side link diagnostic tests to run. If one of these cards is not present, the diagnostic returns a `No Resources` error message and produces a PM181 log report.

P-side interface presence test This test is the same as the test in the speech path diagnostic. This test makes sure that the LTC P-side links to be tested are present. This test flags missing or failed 6X48 or 6X50 cards in the LTC.

Full peripheral test After the first two tests in the P-side link diagnostic, this test makes sure that necessary hardware is present. The full peripheral test checks one speech channel on each specified LTC P-side link to the RLCM. This test runs if the LTC is in active mode.

RLCM facility maintenance

When the system calls for line diagnostics for RLCM-supported lines, the RLCM does not always have a serving LTU or MTU. In this event, the RLCM starts the no-LTU diagnostic. This software establishes a connection to a transmission test unit (TTU) in the host office. The host office uses this circuit for limited line testing instead of the LTU or MTU.

Overload resources

The traffic load on the RLCM can mean that the amount of call processing is greater than the LCM processor cards can handle. If the LCM processor cannot handle the traffic load, the RLCM accepts calls at a slower rate until the overload is cleared. Normally, in processing calls, the RLCM queues the call requests and assigns the requests priorities in the data store. As the data store fills to near capacity, the RLCM overload controls react. The RLCM slows the rate of load acceptance or halts the call process until store is available.

Overload control in the RLCM occurs for

- C-side communication
- line scanning

When the RLCM slows or stops C-side communication, the LCM processor cards decrease the rate the cards scan for messages on the C-side. When the RLCM slows the incoming workload, the demand for data store decreases. The MAP display queries of RLCM status slow down. The C-side responses to RLCM-supported terminals also slow down.

During overload, the LCM processor cards also stop scans of the BIC until enough data store is available. If the LCM processor cards do not scan the

BIC, queries of the BIC prevent incoming work from the P-side. The queries of the BIC are in the output buffers of the BIC. When the buffers are full, work is not accepted, and the results are partial dials or ignored keys on business sets.

Display of overload state

When the RLCM overloads, the LCM status display of the RLCM changes to in-service trouble (ISTb) while the two units indicate INSV. When a user enters the QUERYPM FLT command at the LCM level, the response includes the phrase `LCM Overloaded`.

Log reports PM128 and PM181 indicate the overload condition in the RLCM. When call processing resumes, the system generates log PM128 with the phrase `LCM out of Overload`.

Current extended memory LCM (XLCM) overload controls

The XLCM has 256 kbytes of memory and a specified number of small, medium, and large memory blocks of a fixed size. Domestic LCMs and XLCMs use small and large memory blocks to receive external messages and to send messages. Small memory blocks (SMB) are also used for utility purposes like timer control blocks. Medium memory blocks (MMB) are used for call data blocks (CDB) which hold data for active lines.

In the current XLCM application, overload is reported when the XLCM cannot receive an external message, DMSX or Inter-Unit Communication (IUC). The XLCM cannot receive an external message because of a lack of small or large memory blocks. Some service degradation is clear before overload is entered.

Currently, the XLCM has four levels of throttling to prevent overload. The number of available SMBs determines three of these levels. These levels conserve SMBs. The levels are weighted to give terminating calls priority over originations.

The following paragraphs describe the four levels of throttling.

1 The XPM throttles messages to the XLCM a maximum of two every 50 ms. This limit helps control small peaks of heavy traffic. Sustained messaging at this rate can drive the XLCM to overload.

2 The XLCM appends the number of SMBs the XLCM has available. The XLCM requires SMBs for external messages to each POTS origination message. The XLCM also requires messages that originate from P-phones. This number equals total available SMBs minus the number of SMB in reserve. When this number is less than 20, the XPM delays processing the origination until this number returns to 20 or higher.

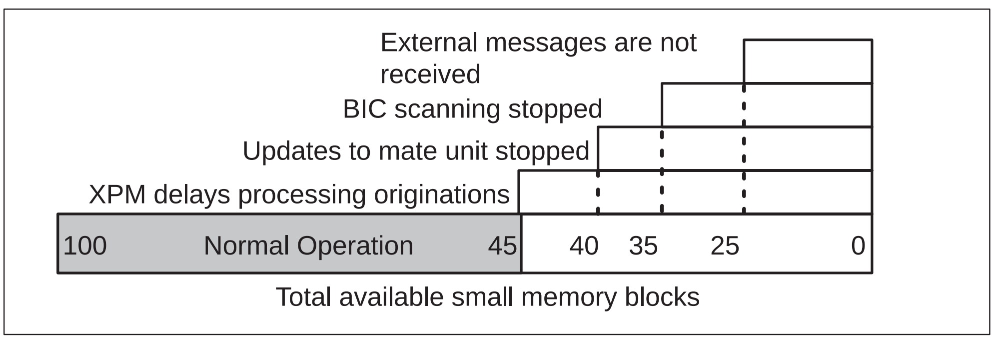
3 If the total number of SMBs available for external messages is less than 15, the XLCM stops the transmission of call processing updates to the mate.

4 If the total number of SMBs available for external messages is less than 10, the XLCM does not continue to scan the bus interface cards (BIC) for line scan changes.

For overload protection, the XLCM holds a reserve of small memory blocks which are not used to receive external messages. The XLCM holds the memory blocks to make sure that internal processes have enough small memory blocks to finish tasks. The XLCM holds the memory blocks even if the XLCM enters extremely heavy overload. The total number of SMBs available can be less than or equal to the size of the SMB reserve. In this event, the system rejects external messages that require SMBs. The system does not reject maintenance or monitor messages. The XLCM sends an overload report to the computing module (CM).

The present overload protection system is static because the throttle levels are constant and not-reactive. The overload protection system also can be called distributed. The overload protection system is distributed because the system cannot monitor the overload and initiate and control protective measures. One place from which these functions can occur is not available.

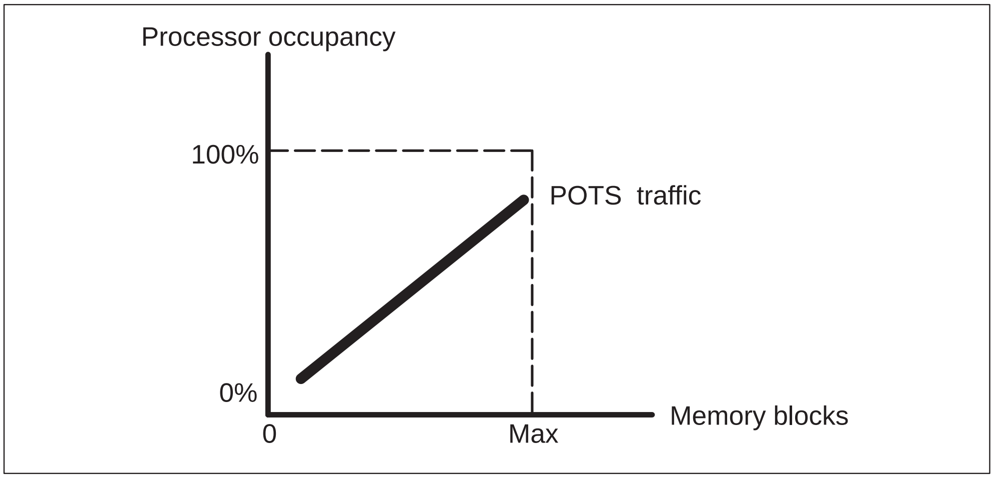
XLCM Overload Protection System



Early POTS models of the small memory LCM (64k) display the capacity to be memory block limited. The small memory LCM has 64k. The LCM runs out of small memory blocks before the LCM runs out of real-time use. The overall design of the LCM depends on this action. Memory block limited is an LCM characteristic that carries over to the XLCMs.

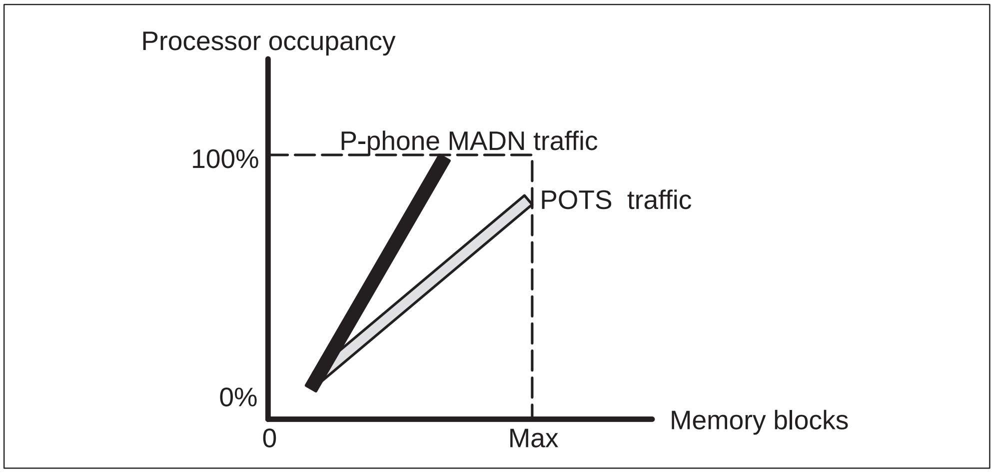
The XLCM overload system works well with POTS traffic. For the present selection for the number of SMBs (100) and the size of the SMB reserve (25), the processor remains memory block limited with POTS traffic. The processor runs out of SMBs before the processor runs out of real-time use. A rough graph of processor occupancy or real-time use instead of memory block use demonstrates this concept. The graph appears in the following figure:

Processor occupancy (real-time use) versus memory blocks

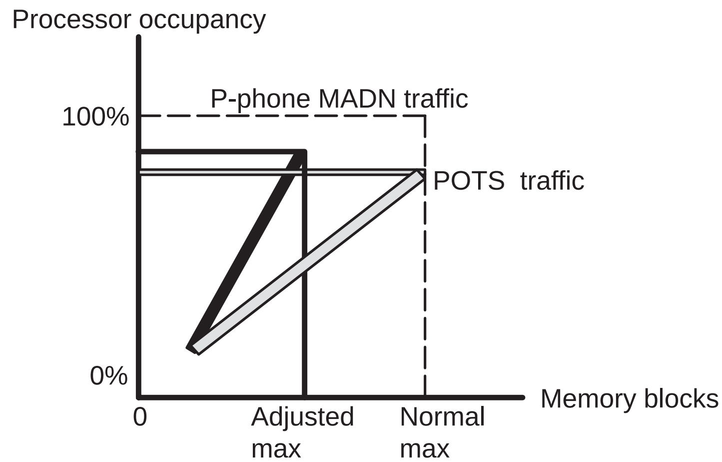


The XLCMs have more memory blocks than small-memory LCMs. Extra messaging requirements can accommodate P-phones provisioned with features like displays and MADN. The XLCM can run out of real-time before the XLCM runs out of memory blocks. This condition is a real-time overload condition. The following figure represents the condition:

Processor occupancy—real-time overload



Processor occupancy—memory block reduction after real-time overload detection



The XLCM is memory block limited and cannot handle real-time overload. This state can result in outages because of the following

- the system does not transmit an overload report because XLCMs do not currently detect real-time overload. The CM does not suspend functions that require a response from the XLCM. The CM suspends functions when the system transmit an overload report. If the XLCM does not respond in time, the CM system busies the XLCM.
- the system cannot handle starvation, when lower priority tasks cannot run. This problem can lead to traps or important software errors which cause the CM to system busy the XLCM.

Enhancements to the overload protection system

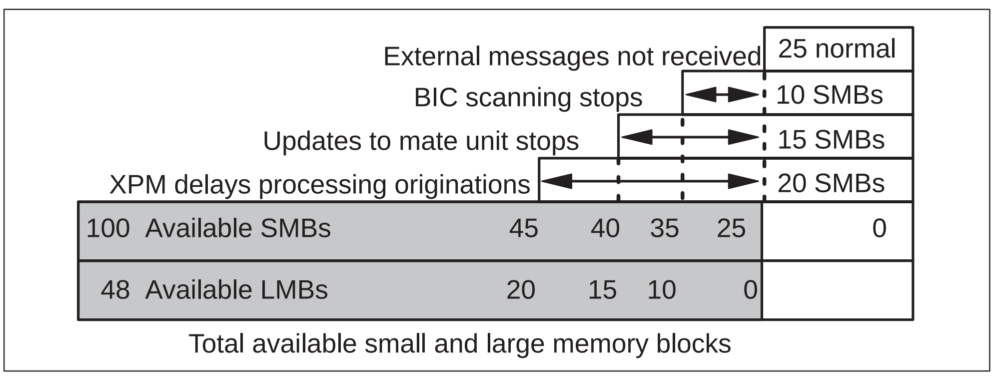
The enhanced XLCM overload protection system detects when the XLCM is in real-time overload, reports overload to the CM. The enhanced XLCM also takes protective measures to assure XLCM sanity. These protective measures are active for as short a time as possible to retain the XLCMs call processing capacity.

This enhancement adds three new components to the current Overload Protection System:

- Processor occupancy data collection component is distributed over key areas of the XLCM code to collect raw data. This data is used to detect real-time overload. The processor occupancy data collection component leaves the raw data in a depository for the data analysis component. The priority of this component matches the priority of the segment of the system in which the component resides.

- The real-time data analysis component analyzes the data in the depository and produces an easy-to-read processor occupancy status. This status is not a percentage. The status is a distress rating. Percentages are not used. Percentages are too complex to work on when real-time is not common. Percentages supply a small part of the information the control component requires. The control component uses the distress rating. The data analysis component reports the distress rating to the CM when the XLCM reports overload. The data analysis component provides indication of activity if the component runs normally. This component runs at a high priority.
- The real-time overload control component looks at the distress rating that the data analysis component outputs. If the output indicates real-time overload, the control component adjusts parameters in the Overload Protection System. The control component adjusts parameters to recover some real-time and keep the memory block limits ahead of the real-time limits of the XLCM. Refer to the following diagram. If the data does not indicate trouble, the control component begins to restore the Overload Protection System parameters. The control component restores the parameters to allow maximum call processing. This component runs at a very high priority.

Overload protection system variable thresholds



Changes to the real-time subsystem

The real-time subsystem changes memory block system parameters to keep the memory block limits ahead of the real-time limits.

Enhancements to the real-time subsystem include the following:

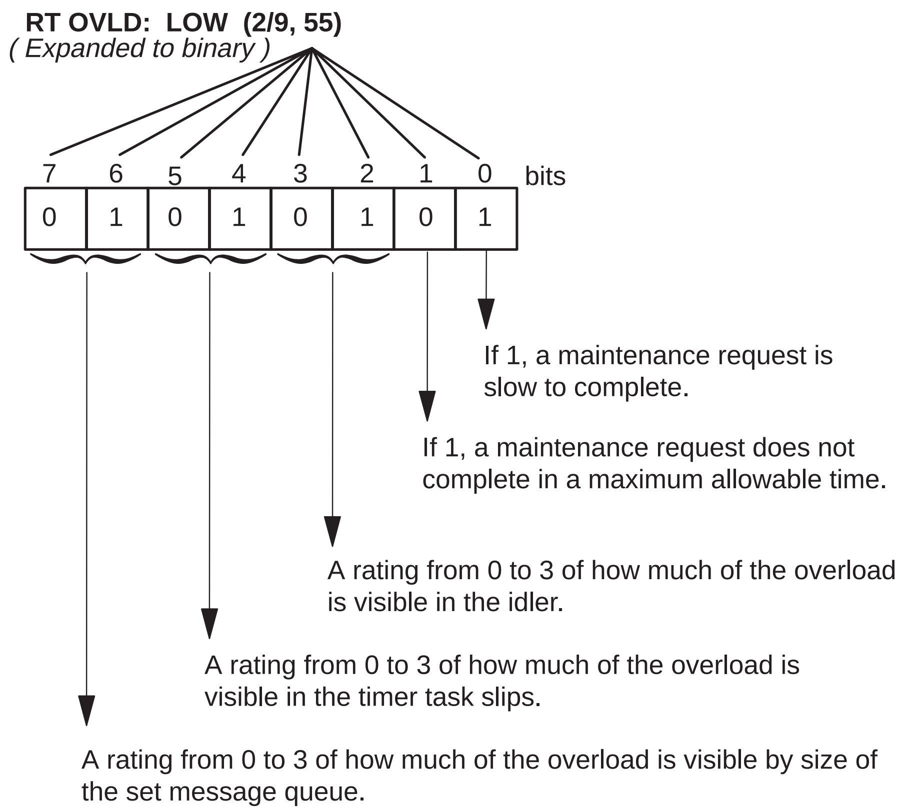
- Reducing memory blocks to preserve real-time. This process continues until some real-time use is recovered.

- Define real-time overload as a processor occupancy rate of 75% or higher for a minimum amount of time. Calculation of percentages in the XLCM is very real-time intensive. This method is not flexible. This enhancement can result in premature reaction if the XLCM is not in severe real-time trouble.
- Monitor the amount of time the system takes to process specified key maintenance requests at high levels. The amount cannot exceed 100% occupancy because the XLCM must respond to these requests before the CM times out, or enters overload. Benchmark the average time to process these key requests. If this process takes longer than the benchmarked average, assume real-time overload.
- Monitor idle task activity and enter real-time overload if an idle task does not run for a specified period of time.
- Characterize the timer task slip counter at a high occupancy, but not at 100% occupancy. If the timer task slips at more than the normal high occupancy rate, enter real-time overload.
- Monitor the size of the set message queue. If the queue is a minimum of 40, the XLCM is near real-time overload.
- Include large memory blocks (LMB) in the reduction of memory blocks component to be effective for the recovery of real-time.

XLCM log report appendages

The XLCM appends a new field to the current overload messages that the XLCM sends to the CM. The XLCM sends the messages to the CM to reflect the limit of the real-time overload. If the CM is at CCM04 or later, this new information appears in the modified PM180 LCM Enters Overload log. The new field contains a ratio of the maximum real-time distress reached before the system generates the overload report. The overload report can have values 0–9. The system generates overload reports to the maximum possible level of real-time distress (values 5–9). A real-time overload symptoms summary byte in hexadecimal output is available. Refer to the following diagram.

Summary of real-time overload symptoms



The XLCM maintains data about overload that allows the XLCM to provide a summary about the overload period. The summary that appears in the previous figure appends to the current overload exit message to the CM. If the CM is at CCM04 or later, a modified PM180 LCM out of Overload log contains this information.

This feature is active in XLCMs, and International XLCMs with extended memory and XPM04 or later loads. The new logs apply automatically when CCM04 is in the CM.

This feature detects real-time overload, to allow the system to report the overload status to the CM. The system must preserve enough real-time to make sure the XLCM can function according to the operating model of the XLCM, memory block limited.

The real-time Overload Detection and Protection subsystem integrates with the current Memory Block Overload System. When the system is in real-time trouble, the system begins to shed work. The system changes memory block overload system parameters to reduce the amount of memory blocks available for new work. This aspect of the design makes the new overload system dynamic. The overload system becomes dynamic where the system changes to allow very high processor occupancy under different traffic configurations.

Takeover capability

Power connections are present between the two shelves of the LCM and the LCM can operate in a load-sharing mode. If one power converter goes out, the mate converter supplies power to the two shelves. This process is called takeover. In the takeover state, the in-service unit assumes control of the lines associated with the out-of-service mate unit. The in-service unit also assumes control of the in-service unit lines. The in-service unit has access to the DS30A C-side ports. The DCC of the in-service unit accesses the 20 line subgroups.

In addition, the mate converter distributes ringing, ANI, and coin control voltages. One of the two ringing generators in the HIE supplies ringing, ANI and coin control voltages to the 20 LSGs of the two LCAs.

Takeover also occurs when one LCA control complex and the LCM processor and digroup card fails. The control complex that remains can support each DS-1 link and the LSGs of the two LCAs.

The system terminates calls in process at the time of takeover. The subscriber must redial the calls. The system maintains connected calls and calls that are in progress.

LCC takeover

The LCC provides an interface between the LCA and the DS-1 interface cards in the HIE shelf. Each LCA associates with an LCC in the HIE shelf. If an LCA shelf fails, the system determines that the shelf is not active. The shelf takes down the associated LCC.

If an LCC fails, the LCC takes down the associated LCA shelf. An LCC or an LCA shelf can fail. In this event, the active LCC and LCA perform a takeover and support the DS-1 links of the inactive LCC and LCA. Takeover can occur because of duplicated paths between the LCA shelves. A takeback occurs when the inactive LCC and LCA become active again.

Takeback

When the failed unit returns to service, the subscriber lines in takeover are distributed back to the normal processor. Calls in the talking or ringing state are not lost when the calls return to the normal mode of operation.

LCM talk battery audit

Before, loss of talk battery to an LCM shelf was not reported unless the talk battery fuse blew. This condition meant that the operating company personnel was not alerted that LCM subscriber lines cannot draw dial tone.

The Talk Battery Alarm feature adds new CM and LCM maintenance software that periodically audits each LCM shelf for the occurrence of talk battery. If the audit fails to detect talk battery, the technician is alerted with a critical alarm log report. This log report is PM179

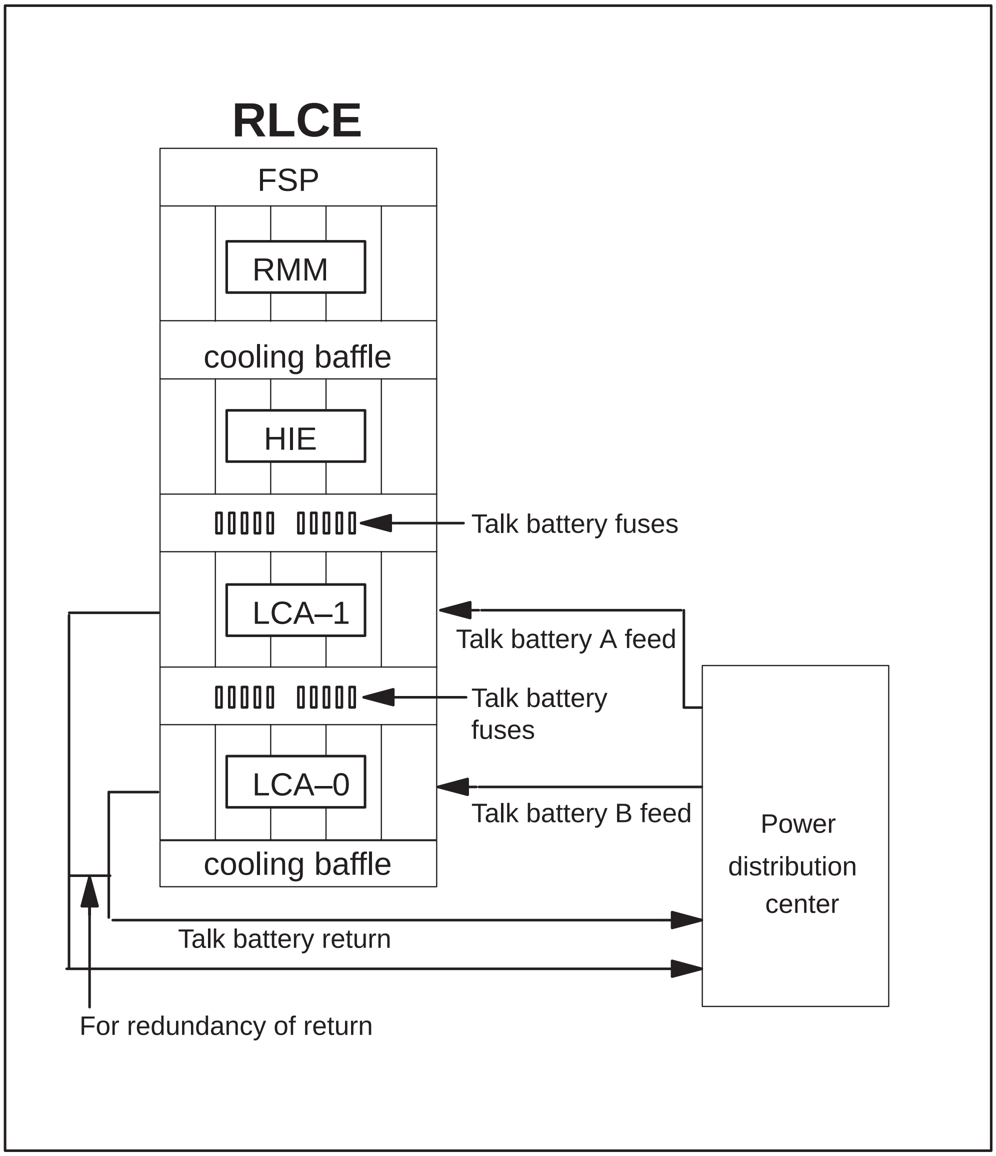
To support this feature, each LCM shelf must be provisioned with a minimum of one world line card (WLC). A subscriber can use the same WLC used for the talk battery audit, for call processing. The system generates a minor alarm log report PM179 if WLCs are not available to perform the audit when the feature is ON.

Note: This feature supports every WLC type. The WLC can reside in any position in the LCM shelf.

Loss of talk battery

The following figure describes how talk battery is distributed in a remote line concentrating equipment (RLCE) frame with LCA shelves.

Talk battery distribution on RLCE frame



The A feed provides talk battery for the second shelf of the RLCE frame, while the B feed provides talk battery for the first shelf. The feeds are not redundant. Redundancy can affect a maximum of 320 subscriber lines. Note that some redundancy is present with the talk battery returns. A single fault does not cause an outage.

Before, when a loss of talk battery occurred, operating company personnel did not receive an indication that a problem was present. A blown talk battery indicated a problem.

Currently, the LCM indicates `InSv` (in service) on the MAP display to indicate a blown fuse. The LCM performs a line card audit. This audit cannot check for loss of talk battery. The loss of talk battery affects one or two LCM shelves. The location of the fault determines the number of affected shelves.

After the loss of talk battery, the LCM line cards cannot signal an off-hook condition. The LCM detects an off-hook line as on-hook. The system forces an LCM call to the on-hook state when talk battery feed is lost. The LCM lines cannot originate and terminate calls while talk battery is absent.

Feature activation

A change in the value of office parameter TALK_BATTERY_ALARM in table OFCENG controls the activation of the Talk Battery Alarm feature. The Default disables the Talk Battery Alarm feature . A WLC must be provisioned in each LCM shelf in the office before this feature is enabled. A minor alarm occurs for each LCM shelf that does not contain a WLC.

While the Talk Battery Alarm feature is enabled, talk battery testing occurs through diagnostics and background audits.

When the Talk Battery Alarm feature is disabled, the system clears talk battery alarms and ISTb reasons that this feature introduces.

Background audit

Each LCM can audit the LCM shelves for loss of talk battery. When the Talk Battery Alarm feature is disabled, audits do not check for the loss of talk battery on LCMs in the office.

When the Talk Battery Alarm feature is enabled, a search occurs to find an available WLC on each LCM shelf. To be available, a WLC must be in one of the following states:

- hardware assigned, software unassigned (HASU)
- INSV and assigned to a subscriber

If the audit does not locate an available WLC, the system generates a minor alarm log report (PM179). This log report indicates that audits cannot test the talk battery and the LCM becomes ISTb. The audit can locate an available WLC. In this event, a special audit checks for loss of talk battery feed a minimum of one time every minute. The audit tests the LCM shelves at the same time so that the audit checks each LCM shelf a minimum of one time every minute. Audits do not run talk battery tests on an OOS LCM.

If the available WLC used for audit testing is suddenly not available, the audit first searches to find another available WLC. If the audit finds another available WLC audit testing continues with the new WLC. This condition can occur when the WLC goes OOS. The audit does not always find available WLC and the system generates a minor alarm log report (PM179) that indicates the audit cannot test talk battery. Log report PM179 also indicates that the LCM shelf is ISTb.

To test for loss of talk battery feed, the WLC must verify the occurrence of talk battery feed to the WLC. The test passes if talk battery feed is present and fails if talk battery is not present.

If off-hook, call processing busy (CPB), or off-hook and CPB, occupy an InSv WLC, the audit does not perform the talk battery test. The test is assumed to pass. Examples of occupied states include talking, ringing, and maintenance lockout. For ringing, the WLC is on-hook and in a CPB state.

When the audit finds a failure of the talk battery test, the system generates a critical alarm log report (PM179). The LCM shelf goes to the ISTb state. The audit does not report the failure again until diagnostics clear the alarm and ISTb state.

Diagnostics

The talk battery test becomes part of the INSV and OOS diagnostics for an LCM unit. The affected diagnostics include the following commands:

- Tst Unit unit_no
- Tst PM
- Tst REX NOW
- Rts Unit unit_no
- Rts PM

Diagnostics report talk battery failures, even if the audit tests the same LCM in repetition. If the talk battery test passes, the diagnostics clear the alarm and ISTb reason. This action impacts the manual and automatic versions of these commands. The diagnostics only run talk battery tests while the talk battery alarm feature is enabled.

To support the talk battery alarm feature, each LCM shelf must be provisioned with a WLC. Special provisioning rules are not available, with regard to this feature, to dictate where the WLC can reside in the shelf. If the maintenance line card in LSG 0 Card 0 for the LCM shelf is assigned as a WLC, the feature can use this card. This line card tests the ringing generators.

The MAP commands that can Bsy the last available WLC on an LCM shelf are modified to issue a warning message if this condition occurs. Three commands can cause this situation. The first condition is the Bsy command at the LTP MAP level when a WLC is posted. The second condition is the Diag command at the LTP MAP level when a WLC is posted. Diagnostics ManB the WLC for a short time. The third condition is the Bsy Drwr command at the PM MAP level when an LCM is posted. If one of these commands causes the last available WLC on the LCM shelf to Bsy, a warning message appears. Refer to the following example.

Example of a MAP response:

```
Busying the last available WLC on LCM shelf.  This
prevents testing for talk battery failure on the LCM
shelf.  Minor alarm will be raised within one minute
unless WLC becomes available.
```

The Querypm Flt command is modified to display the new ISTb reasons by shelf and line equipment number (LEN) for the two alarm conditions. Refer to the following examples.

Example of a MAP response:

```
Node inservice trouble exist:
One or both units Inservice Trouble:
LCM UNIT 0 Inservice Trouble Exist:
Talk Battery failure detected on shelf <shelf #> by <LEN>
LCM UNIT 1 No Faults Exist

                         or

Node inservice trouble exist:
One or both units Inservice Trouble:
LCM UNIT 0 Inservice Trouble Exist:
Cannot test Talk Battery on shelf <shelf #> by <LEN>
LCM UNIT 1 No Faults Exist
```

The MAP commands that can RTS the first available WLC on an LCM shelf are modified to issue the following notification messages. This notification message informs operating company personnel that the minor alarm and ISTb reason for the LCM shelf is cleared. The LCM shelf is cleared now that a WLC can test for talk battery failures. Two commands can cause this condition. The first is the RTS command at the LTP MAP level when a WLC is posted and RTS. The following response to the RTS command appears at the MAP display.

Example of a MAP response:

```
RTSing the first available WLC on the LCM shelf.  Loss of
talk battery can now be detected on LCM shelf.  The minor
alarm and ISTb reason will be cleared for the LCM shelf
within ten minutes (unless the last WLC becomes
unavailable again).
```

The second response is the RTS Drwr command at the PM level when an LCM is posted. When the RTS Drwr command is entered, the following MAP response appears at the MAP display.

Example of a MAP response:

```
RTSing DRWR of the first available WLC on the LCM shelf.
Loss of talk battery can now be detected on LCM shelf.
The minor alarm and ISTb reason will be cleared for the
LCM shelf within ten minutes (unless the last WLC becomes
unavailable again).
```

Emergency Stand Alone (ESA) operation is not impacted on RCC (in remote-off-remote configuration) or RLCM/OPM. Talk battery alarm conditions are ignored during ESA operation. For an exit of ESA mode, the CM diagnoses the LCM to determine if talk battery failures are present.

Limits

The following limits apply to the Talk Battery Alarm feature:

- The system supports the Talk Battery Alarm feature on the following LCM types:
  - extended LCM (XLCM) (256-Kbyte capacity)
  - enhanced LCM with ISDN (LCME)
  - cabinetized XLCM (ELCM) (Meridian cabinetized LCM)
  - RLCM
  - outside plant module (OPM)
  - outside plant access cabinet (OPAC)

- The same WLC used for talk battery testing can also be used as a subscriber line. The talk battery test can be in progress on a WLC. In this event, an additional delay of up to 90 ms can occur before the subscriber receives dial tone. The delay occurs if the WLC goes on-hook to request a call origination, and the subscriber goes off-hook while a talk battery test is in progress. The talk battery test can be in progress on a WLC and the WLC can receive a call termination request (to ring the line). In this event, an additional delay of up to 90 ms can occur before ringing begins. For originations and terminations, the only impact on call processing is this negligible delay.
- The Talk Battery Alarm feature can only detect the loss of talk battery *feed* to an LCM shelf. Because of WLC limits, the feature cannot detect the loss of talk battery return. Talk battery returns are duplicated, and return failures are less likely to occur and this limit is not serious. For information of return copy, refer to the previous figure Talk battery distribution on LCE frame.
- The CM does not perform talk battery tests while the LCM, or a C-side node, is in the overload condition.
- The Talk Battery Alarm feature can only isolate shelf-level failures of talk battery feed. The WLC only reports talk battery feed failures that affect talk battery for every line on the LCM shelf. The WLC can detect failures. The drawer in which the WLC resides and the drawer in which the failure occurs determine if the WLC detects failures.
- Specified faults local to the WLC (or WLC drawer) can prevent correct WLC detection of talk battery failures. These faults include faults that cause the WLC to fail line card diagnostics. The WLC can report talk battery failure and cause the critical alarm, in error. The WLC performs these actions even though talk battery can be present for other lines on the shelf. These occurrences are not common. The critical alarm log report (PM179) gives the location of the WLC to help troubleshoot these instances.
- The Talk Battery Alarm feature does not affect ESA operation on an RCC, RLCM, or OPM. The system ignores talk battery alarm conditions or reports during ESA operation. The WLC does not report talk battery failures while an LCM is in ESA mode. During an exit of ESA mode, the CM diagnoses the LCM to determine if talk battery failures are present.
- A maximum of 10 min can pass before every LCM in the office initiates audits for talk battery failures. This delay occurs during the activation of the Talk Battery Alarm feature for an office. This delay time depends on how long the LCM audit takes to cycle through every LCM in the office. An office with heavy traffic and a large number of LCMs can take longer than 10 min.

- If the SERVORD OUT command deletes the directory number (DN) assigned to the last WLC on an LCM shelf, a minor `Cannot test Talk Battery` alarm occurs. The WLC for which the last assigned DN is deleted appears in the alarm message. The WLC is HASU but in a not normal maintenance state that does not allow the LCM to use the WLC to detect talk battery failures. You have three ways to work around this condition:
  - — BSY/RTS the LCM Do not perform this action because of the service outage. The WLC must be in the correct HASU maintenance state so the LCM can use the WLC for talk battery testing.
  - — Assign a DN to the WLC so the LCM can use the WLC again for talk battery testing.
  - — Assign a second WLC on the same LCM shelf. This WLC can remain as HASU and does not have a DN assigned.

  The second option provides the easiest answer. The third option requires additional hardware (an additional WLC), but provides redundancy for the Talk Battery Alarm feature.

ESA capability

If communication with the host is lost because of a link or DS-1 card failure, an RLCM with feature package NTX154AA operates separately. The RLCM enters the ESA mode. The ESA operation continues until communications are restored over a minimum of one of the DS-1 links. During entry and exit from ESA, the system drops all calls.

Refer to the chapter “ESA maintenance overview” for an overview of ESA operation for the RLCM/OPM.

RMM maintenance

The RMM performs the following maintenance functions:

- bootstrap-level (direct monitor) functions
- RMM table control and MAP workstation maintenance
- scan monitoring processes
- interface with line test equipment
- self testing

Drawer testing

Make sure that the system can transmit message and speech data to and from the BIC. To make sure this action occurs, the RLCM conducts a BIC looparound test to detect line drawer faults. If the BIC test fails, the CC implements a full in-service test on both BICs. The CC implements a full in-service test to make sure the fault is not transient or from the DCC or processor card.

If one of the BIC or DCC tests fail, the LCM is not forced to takeover mode.

If a drawer state changes to ISTb or SysB, the state of the RLCM also changes to ISTb or SysB.

The system can detect some drawer ISTb conditions when the drawer or the PM is OOS. These conditions include BIC scan, BIC inhibit, BIC CM, and BIC activity. If drawers with these conditions are RTS with an ISTb condition, the system clears the ISTb state when the InSv unit or drawer tests occur. The sequence of events is as follows:

- The BIC looparound sets the drawer to the SysB state so the drawer cannot receive messages. The lines to the drawer are set to line maintenance busy (LMB) because the call processing is disabled.
- The BIC scan sends a scan message to the BIC to make sure the scan chip can detect supervision changes on each line that holds data. The path through the DCC is like the BIC looparound because this step involves a message.
- The DCC looparound tests a loop in the DCC. The looparound does not test the DCC hardware for the DCC/BIC communication. If a fault is present with this hardware, the DCC looparound passes while the next BIC looparound tests fail, even though a drawer fault is not present.
- The DCC/BIC looparound sets the drawer to the ISTb state. A failure on the speech path hardware to the drawer occurs. A channel can fail the test. Call processing can occur. The drawer state updates to ISTb at the MAP display and continues to handle call processing. The DCC/BIC looparound sends test patterns to the BIC to test the PCM path. The patterns that the transmit time switch receives must be the same in a timeout period.

The list of full INSV tests follows:

- ACTIVITY_READ
- MSG_LOOPAROUND
- ANI_COIN_FAIL
- PARITY_TRAP_FAIL
- BIC_ACT_TEST
- POWER_CONVERTER_FAIL
- BIC_CM_TEST

- RINGING_FAIL
- BIC_INHIBIT_TEST
- RTM_CM_TEST
- BIC_LA_TEST
- RTTS_CM_TEST
- BIC_LOOPAROUND
- SANITY_TIMEOUT_FAIL
- BIC_SCAN_TEST
- SET_MSG_LOOPAROUND
- DCC_LA_TEST
- SUBCYCLE_LENGTH_FAIL
- DS1_LOOPAROUND
- SUBCYCLE_ORDER_FAIL
- IUC_LA_TEST
- TIMING_TEST
- LC_COM_TEST
- WRITE_PROTECT_FAIL
- LCC_FAIL
- ZERO_CROSSING_INT_FAST_FAIL
- LCC_LOOPAROUND
- ZERO_CROSSING_INT_SLOW_FAIL
- MEMORY_TEST

Faults that occur on a BIC drawer can affect call processing. The unit that is in service and controls that drawer does not determine if the faults affect call processing. Because the full in-service tests use the DCC, determine if the fault is not in the DCC, when takeover must occur. If takeover occurs as a result of a reported drawer fault, the DCC is at fault even though the LCM fails the BIC tests.

In the takeover mode, the inactive unit DCC cannot access drawers for call processing. The inactive unit DCC can access drawers for testing. The active LCM unit continues to have access to drawers through the DCC of the LCM.

Valid drawer faults do not take an LCM unit out-of-service. The status of the unit is ISTb. The ISTb reason is Self Test or Diag Fail. The test that fails and causes the ISTb condition determines the ISTb reason. Additional diagnostic information is available for LCM shelves that have the NT6X51AB expanded memory board. After the CC detects an LCM unit that has ISTb, the unit can go SysB if too many unsolicited messages are received.

BIC relay test (BRT)

The BRT tests the tip and ring reversal relay on each BIC of a given LCM. The BRT allows for the manual testing of a single drawer of a specified LCM and the scheduled testing of each LCM in an office. The QUERYPM FLT command is improved to indicate the drawers that fail the manual or system BIC relay test. This test generates a PM181 log and a new log, PM132, to indicate test results. Refer to the chapter RLCM/OPM related logs for detailed information on BRT-related logs.

The following paragraphs describe the levels of BRT testing.

Office level

The schedule includes loops over each LCM. A single BRT runs on each drawer of the given LCM. The results of the tests appear in a logutil report that combines the results of each drawer test.

LCM level

This test runs from the scheduled BRT. The scheduled test selects an LCM that does not have drawers tested during the BRT window that the office parameters define. A BRT runs on each drawer of this LCM.

Drawer level

This test runs from the LCM-level scheduled test. This test also can run manually from the LCM MAP display level. This test is a single LCM drawer test.

The office-level test loops over the LCMs in an office and performs the LCM-level test. The LCM-level test loops over each drawer of a given LCM and performs the drawer-level test. The drawer-level test constitutes a BRT.

Office parameters for test schedule creation

Schedule creation for the BRT uses the information from two new office parameters in table OFCVAR: BICRELAY_XLCM_TEST_SCHEDULE and BICRELAY_NUM_SIMUL_TESTS. These parameters allow the user the flexibility to schedule the BRT from one to seven days a week. These parameters also allow the user to define the window size and define how many tests (LCM-level) run at the same time, as follows:

- BICRELAY_XLCM_TEST_SCHEDULE
  - This parameter defines the start time (BRTST_START_TIME) and stop time (BRTST_STOP_TIME) for the office-level test. These times cannot be the same and the test window must be a minimum of 10 min in length. The last field of this parameter (BRTST_DAYS_OF_TST) specifies the day or days of the week that the office-level test runs (MON, TUE, WED, THU, FRI, SAT, SUN). The user can enter a maximum of seven days in different groups. The user cannot enter the same day more than one time.
  - If the start and stop times are the same or if the test window is less than 10 min, an error message appears.
  - If the user attempts to make a change during the defined test window or while the test is in progress, a message appears. This message indicates that you can use the BICRELAY OFF command to stop the BRT. You can make the necessary changes and restart the BRT. The user can use the BICRELAY ON command to restart the BRT.
- BICRELAY_NUM_SIMUL_TESTS
  - This parameter indicates the number of LCM-level tests to run at the same time.
  - The start and stop times of BICRELAY_XLCM_TEST_SCHEDULE, plus this parameter, configure the number of LCMs that are tested.
  - If the user tries to make a change during the defined test window or while the test is in progress, a message appears. This message indicates that the user must wait until the test stops. If the change is needed immediately, you can stop the BRT, make the necessary changes, and restart the BRT. You can use the BICRELAY OFF command at the command interpreter (CI) level to stop the BRT. You can use the BICRELAY ON command to restart the BRT.

Out of service unit tests

The BIC tests run during out-of-service LCM unit tests. Drawer tests test drawers that have the ISTb or SysB state. Out-of-service unit tests treat previously defective drawers in the following method:

- With the two units out-of-service, drawers with the SysB state change to the ISTb state so that the out-of-service test can test the drawers. If the fault persists, the drawer is reset to SysB. If drawers do not have in-service trouble, the state changes to INSV.

- With one unit out of service, only drawers with the ISTb and the INSV states are tested. Drawers with the ISTb and InSv states are tested because the mate unit is INSV and currently in control of the drawers. Drawers with a SysB state are not changed or tested.

Changes in table LCMINV

The BICTST is a new field in table LCMINV. The BICTST is a boolean that indicates if a specified LCM is included in the test schedule.

Table control for table LCMINV allows you to change the MEMSIZE of a given tuple from 64 kB to 256 kB when the LCM is INSV. If this change occurs and the load in the LCM does not change to an XLCM load, the BRT does not test the LCM. You must busy the LCM, reload the LCM with an XLCM load, and RTS the LCM to include the LCM in the test schedule.

If you attempt an office-level test or manual LCM-level test on an LCM where the load is not changed, the test is not run. The system generates a log that indicates the LCM does not contain an XLCM load.

If you change the MEMSIZE field from 256 kB to 64 kB, the BICTST field must be set to NO. If this field is not set to NO, a message appears which indicates that the BICTST field is set to YES. A YES value is valid for XLCMs. The change is rejected. If the MEMSIZE field is set to 256k, to indicate XLCM, the user can set the BICTST field to YES or NO. An LCM entry in table LCMINV, with the MEMSIZE field set to YES, is included in the test schedule.

BICRELAY command

The BICRELAY command allows the user to enable, disable, reset, allow or not allow the PM181 drawer state to change logs. This event can occur when the system BRT tests a given LCM. Operating company personnel can query the ON or OFF state of the BRT, or determine if the PM181 drawer-state change logs are allowed or suppressed. Operating company personnel also can query the number of BRTs in progress, or query the next LCM that the system BRT tests.

Note: Only the PM181 logs associated with the LCM that undergoes the BRT are suppressed. Other PM181 logs associated with other LCMs or XPMs are allowed.

The following paragraphs describe the BICRELAY command parameters.

ON The ON parameter allows the test to begin at the scheduled window. A message appears which indicates that the test is ON. If the current data and time falls in the scheduled window, the office-level test begins. If tests are in progress when you issue this command, a message appears. This message indicates that you must wait until the tests are complete before a BRT restart. This option does not affect the operation of the manual TST command at the LCM MAP display level.

OFF The OFF parameter does not allow the office-level test to resume. A message appears which indicates that the test is OFF. System BRTs currently in progress can complete. This state is the default.

After the test is disabled, the test does not begin again until the ON option enables the test. When the test is enabled, the office-level test resumes at the point where the test turns OFF. This option does not affect the operation of the manual TST command at the LCM MAP display level.

SUPPRESS When an LCM undergoes a system-initiated BRT, each drawer is busied, tested, and returned to service. When these state changes occur, the system generates a PM181 log to indicate the change. This parameter allows you to suppress PM181 logs for an LCM that undergoes a system BRT. The PM181 logs for an LCM that does not currently undergo a system BRT are not suppressed. Also, SUPPRESS does not affect a manual BRT run on a single drawer. This parameter can be issued at any time. A message appears to indicate that the logs are suppressed.

ALLOW The ALLOW parameter allows the PM181 drawer to change logs that the system BRT causes.

RESET The RESET parameter allows the user to restart an office-level test as if LCMs are not tested. You must turn the test OFF before this parameter is used. If you attempt to reset the BRT while the BRT is ON, a message appears. This message indicates that the BRT must be OFF before RESET can occur. This message also indicates that test that currently run must be complete. This option can be used at any time and does not affect the operation of a manual TST command at the LCM MAP display level.

QUERY

The QUERY parameter displays

- the current ON/OFF status of the office-level test
- the number of LCM-level tests currently in progress
- the next LCM to be tested in the scheduled BRT in the format of HOST 00 0 0
- the status of the SUPPRESS/ALLOW commands

Test operation

The system performs a BRT for each LCM. If the test is performed manually, the system performs a BRT for each drawer. For each LCM, the system performs a BRT on every drawer of the LCM. You use the TST DRWR *drwr_no* RELAY command at the LCM MAP display level to call up the single drawer test.

Office-level test The system test performs the following steps:

- loops over each LCM in the test schedule
- loops over each drawer for each LCM
- runs one tip and ring reversal relay test for each drawer
- generates one logutil report with the results of the 20 drawers
- sets the drawer and node ISTb status

LCM-level test The office-level automated test runs when the scheduling is entered in the office parameter. After an LCM is tested, the LCM is not tested again until each LCM in the office is tested. When every LCM in the schedule is tested in the window, the BRT stops. Tests resume when the next window arrives. If an LCM is not tested, the LCM is skipped in the current window. The system generates a PM181 information log which indicates the reason the test does not occur. If an LCM test continues to run when the stop time arrives, the current LCM-level test can complete.

The BRT knows which LCM was the first to be tested in the given window. Each following LCM to be tested is compared to the first LCM. If the LCMs are the same and the current date and time fall in the window, the BRT stops. If the LCMs are not tested in the window, the BRT begins where the BRT left off during the last scheduled window.

The BRT can be scheduled to run at the same time as the automatic line test (ALT) or the LCM REX test. Do not run the BRT and the ALT at the same time for the following reasons:

- The use of necessary test equipment by these tests reduces the number of LCMs that can be tested in the window.
- The completion of the ALT slows.

None of these tests run at the same time on the same LCM. You must define a window that does not coincide with the scheduled ALT or REX test.

The LCM audit, the manual REX, and the system REX cannot run on the same LCM that runs the system BRT. Also, the LCM PM/UNIT cannot occur ManB during the system BRT.

Simultaneous tests (for each LCM) Simultaneous LCM tests run if test equipment is available up to the number indicated in the BICRELAY_NUM_SIMUL_TESTS parameter. There must be LTUs or MTUs provisioned to allow the number of simultaneous tests (LCM-level) to run. Because of real-time considerations, the BICRELAY_NUM_SIMUL_TEST parameter has a range of 1 through 3. A higher number in this field allows more LCMs to be tested in a given window.

Drawer-level test The BRT drawer-level test requires the metallic test equipment and a single NT6X17 line card in each drawer that is tested. The line card is used to test the BIC relay and must be in a working state. The card must not indicate a diagnostics failure at the MAP terminal and cannot be missing (M).

Each drawer is placed in a ManB state before the drawer-level test. Each drawer is out of service for approximately 10s. Call processing is suspended. When the tip and ring reversal relay test on each drawer is complete, a single new logutil report (PM132) displays the results. This report includes the results of each drawer test of a given LCM. If a drawer was previously out of service or call processing is currently in progress, the drawer is skipped and tested on later passes of the BRT.

Single-drawer test The single-drawer test is for retest purposes if a failure occurs during the system test. This test is run from the LCM MAP display level and is part of the TST DRWR command. The RELAY option allows the BRT to run and not run the main DRWR test. The BRT is not run unless the RELAY option is specified. The drawer must be ManB by the user before this test is run. The system prompts you if the drawer is INSV, ISTb, or SysB. The manual BRT cannot run on a drawer where the LCM node is ManB, SysB, C-side busy (CBsy), or offline (OffL). A message appears which indicates the request is invalid and gives the current state of the node.

The single-drawer test displays a PM181 log with the results of the test. A response also appears at the MAP terminal. A card list appears which indicates the drawer that fails. If a single-drawer test cannot run, the drawer is not set ISTb and can be returned to service to a previous state.

Office-level test The system BRT displays the results of each LCM-level test in the form of a new logutil information report, PM132.

The PM132 displays a combined report of each drawer-level test in a given LCM, to indicate the following:

- test passes

- reversal test fails
- test not run because of line card that is not available
- test not run because of problems encountered through the MTE
- test not run because test is aborted
- test not run because drawer earlier out-of-service
- test not run because of call processing currently in progress
- test not run because of bad hardware
- test not run because of message link problems
- test not run because of resources that are not available
- test not run because of an invalid load in the LCM
- test not run because of an error condition that was not planned
- test ran but drawer fails to RTS after test
- test not run because of conflicts in maintenance software

Refer to the chapter RLCM/OPM related logs for the exact syntax of test result reasons.

If an LCM-level test does not run because of equipment that is not available before the separate drawer tests, the LCM is not tested. In this event, the system generates a PM181 log, and the LCM node state is not changed.

If a drawer test fails to run, the drawer remains in the current state and is retested in a later window.

QUERYPM FLT command

Additional information to the QUERYPM FLT command at the MAP display level of the LCM lists the drawers that fail the BRT and are set ISTb. The node ISTb reason is reset to DRAWER FAULT.

Restarts The following information applies to manual and system-level restarts:

- warm or cold
  - — the system aborts drawer-level tests.
  - — the system saves ISTb reasons.
  - — the system aborts LCM-level tests. These tests are system level if the tests are in the window. The test resumes after the restart. The LCMs already tested are not tested again.
- reload

— The BRT is reset as if you issue the RESET option of the BICRELAY command.

— The system retains the ON/OFF settings of the BICRELAY command.

— The system retains the state of the SUPPRESS/ALLOW commands.

— The system clears the ISTb reasons.

Interactions This feature uses the test access bus, the metallic test equipment (MTE), and a single NT6X17 card in each drawer to complete testing. If you run ALTs at the same time, a BRT can delay the two tests. A BRT can delay the two tests because the tests compete for the same test equipment.

If REx runs on a given LCM, the BRT does not run on that LCM. The LCM remains in the current state. The system outputs a PM181 log which indicates the BRT does not run because of the REx in progress.

Limits

The following limits apply to this feature:

- The system test manually busies the logical drawer before the RELAY test runs. If lines are present in a call processing busy state, the drawer is skipped for this test cycle.
- Before a manual BRT runs on a single drawer, the drawer must be ManB.
- If a minimum of one NT6X17 line card is not entered in each logical drawer, the drawer is not tested.
- If the line card selected for testing is removed during the test, the drawer fails.
- If a drawer fails to RTS when the system BRT is complete, the drawer is placed SysB. This event occurs so the system audit can attempt to return the drawer to service.
- This test does not run on an LCM at the same time as an LCM audit and a REX test.
- The BRTST_START_TIME and BRTST_STOP_TIME fields of the BICRELAY_XLCM_TEST_SCHEDULE office parameter cannot be entered with the same value. These fields must have a minimum 10 min time span between each other.

Subscriber lines automatic maintenance

Automatic subscriber line tests are performed on line circuits and loops, normally at normal scheduled intervals. These tests occur without switch operator involvement, except for first scheduling. In a DMS-100 switch office, the lines maintenance subsystem (LNS) performs these tests.

LCM REXTEST

For the LCM REXTEST, out-of-service diagnostics run for each LCM unit. In-service diagnostics also run for each unit in normal and takeover modes. The NODEREXCONTROL office parameter in table OFCVAR controls this test.

The REx is performed during the specified interval for one LCM at a time, in the order the LCMs are entered in the inventory table. Every LCM in the office cannot be tested during the REx interval. When the next interval starts, REx continues where the REx stopped during the previous interval. A REx test on an LCM can take a maximum of 15 min to complete.

LCMREX test flow

A REX test for an LCM includes the following procedure:

1. If the two units of the LCM are in service, the following events occur. Unit 0 becomes SysB, the system generates a PM128 state change log with the reason `REX in progress`, and the LCM node status becomes ISTb. The system also generates a minor alarm.
2. In-service diagnostics run on unit 1, which is in takeover. If diagnostics fail, the unit is placed ISTb and the system generates a PM181 log.
3. Unit 0 is RTS. Out-of-service and in-service diagnostics run. If out-of-service diagnostics fail, the unit remains SysB, the system raises a major alarm, and generates log PM106. If the unit is RTS and the in-service diagnostic fails, the unit is placed ISTb and the system generates a PM181 log.
4. If unit 0 is RTS, these steps repeat for unit 1.

If a REX test fails, the system generates a PM600 log. The PM600 log initiates a major alarm for the expanded peripheral module (XPM) that fails the REX test. The major alarm appears at the MAP terminal under the PM banner at the top of the display. The system generates a PM181 log after a successful REX test.

If an INSV or OOS diagnostic test fails, the REx test failure reason includes the mnemonic. A mnemonic is an easy-to-remember abbreviation. The failure reason includes a mnemonic of the diagnostic that fails and the unit that fails (0 or 1).

The PM600 log contains the start time of each step the REx test executes, the unit that the REx test step affects, and the failure reason. The REx test steps included in the log after the failed step are recovery actions the REX test initiates as a result of the failure. The unit number is included if the REX test action is for the unit and not an action that affects the node. The units include the BSY unit, RTS unit, TST unit, and synchronization. The nodes include SWACT, BSY the two units. The log additional data consists of a card list and a mnemonic of the failed diagnostic.

The QUERYPM, QUERYPM FLT, TST REX QUERY, and TST REXCOV Query commands contain information about the last REX test. Manually and system-initiated REX tests store and display a new date, time, and status in the REX test maintenance record. The state can be passed or failed. The *Passed* status means the REX test completes without errors. The *Failed* status means the REX test cannot complete because of an error. This information is available through the QUERY PM and TST REX QUERY commands. If the REX test fails, perform a manual REX test, or an automated REX test to return the XPM to service from ISTb.

A REX test maintenance record is stored for each XPM that contains the following information:

- REX test scheduler, if the XPM is in the system
- date, time, and result (passes or fails) of the last REX test
- failure reason, diagnostics failures, and a list of defective cards if applicable, if the last REX test fails
- date and time of previous failed REX test
- date and time of first passed REX test following previous failure

The following limits apply to REX tests:

- The system REX test controller runs a REX test on only one XPM at a time if the office uses the NT-40 processor. SuperNode supports concurrent REX testing for a maximum of ten XPMs with the same REX test class.
- A maximum of four LCM_REX_TESTs can run at the same time if the HOST XPM the tests associate with is not REX tested.
- The system routine exercise (SREX) scheduler schedules LCM_REXCOV test for converter and ringing voltages in LCM separately.
- For a REX test to run, the node must be INSV or ISTb because of a REX test failure.
- If a restart occurs while a REX test is in progress, the system does not generate the PM600 log. The system does not generate this log because the restart deallocates the temporary data store used to build the PM600 log.

System REX controller: XPM maintenance

Feature AF3771, System REX Controller: XPM Maintenance, provides the SuperNode switch with a SREX controller. This controller coordinates every system REX test under a common REX test scheduler. This feature allows LCM REX tests to be scheduled while other REX tests are in progress. The SREX test controller allows a REX test to run on the whole switch, which includes peripherals like the RLCM, in less time. The REX tests provide early indications of faults that can impact service. The REX tests also allow operating company personnel to take corrective measures.

Feature AF3771 allows REX test failures to be found and resolved in less time. These actions reduce outages in the field. The SREX test controller also allows operating company personnel to

- change the order in which peripherals are tested
- coordinate between REX tests the system initiates and manually initiated REX tests
- receive alarms for the RLCM that are not REX tested in a time limit set through table REXSCHED.

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

- SUSPEND suspends REX testing for one maintenance window. A maintenance window is the time period between the REXSTART and REXSTOP time entered in table OFCVAR. The time is entered under the NODEREXCONTROL parameter.

- RESUME resumes REX testing after the interruption of REX testing.
- QUERY returns the status of the REX test (active or suspended).
- HELP returns a brief description of the REX test.

The REX test order for feature AF3771 is:

- critical nodes first, like the CM and message switch (MS)
- the number of days from the last system or manual REX test
- the order of internal PM number

Table REXSCHED must contain data to establish the REX test schedule for the RLCM/OPM. This table contains the information that the REX test coordinator requires to schedule the tests according to operating company specifications. The entry of data in table REXSCHED can disable the test. For additional information about table REXSCHED, refer to the data schema section of the *Translations Guide*.

The system generates the IOAU112 log report for LCMs if the following events occur:

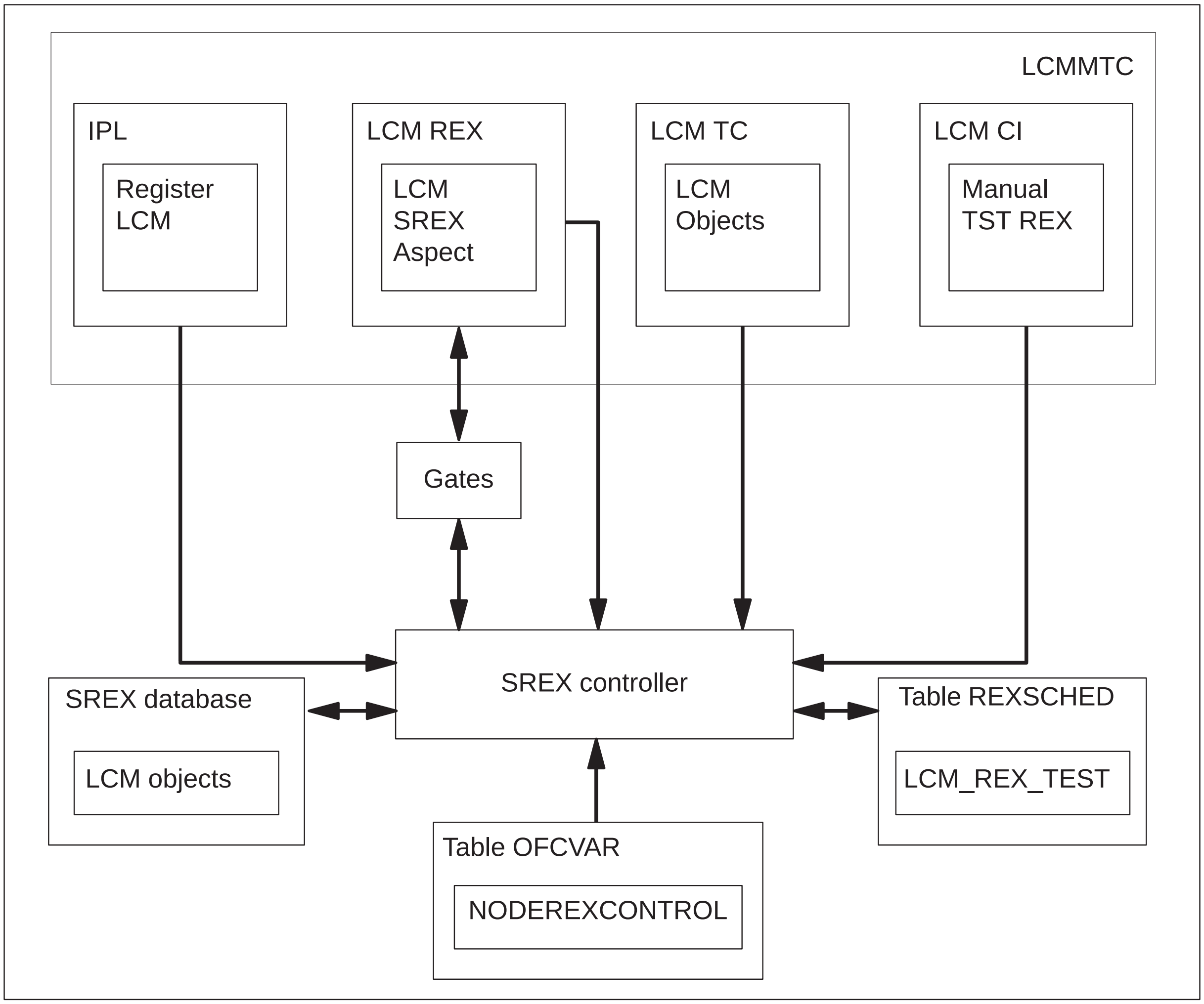
- the LCM is not REX tested for more than 7 days
- REX test takes longer than specified
- REX test cannot start after a defined number of attempts

Expanded LCM REX test results

Table REXSCHED controls scheduling of system REX (SREX) tests for LCMs. The LCM_REX_TEST task SREX can perform at the same time in multiples of four. The SREX task also can be performed at the same time as REX tests of XPMs. The LGC, LTC, and the RCC XPMs can be hosts to LCMs. Conflicts arise when an XPM scheduled for REX testing is the host of an LCM scheduled for REX testing.

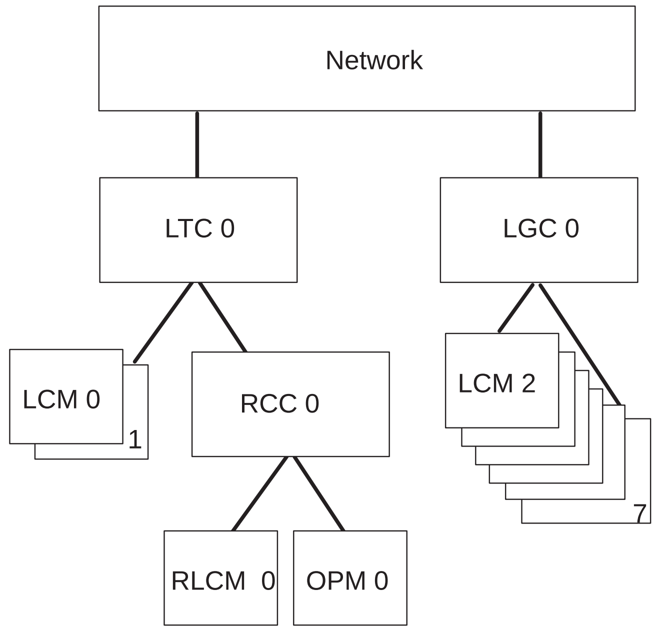
To avoid conflicts, the SREX controller schedules REX tests of XPMs and LCMs that occur at the same time. Refer to the following figure SREX system dependencies. The LCM SREX subsystem registers the LCM_REX_TEST class. This subsystem also identifies dependencies with other REX_TEST types during initial program load (IPL). As LCM nodes are added to the SREX database, the controller enters data with defaults in table REXSCHED.

SREX system dependencies



The converter voltage and ring test parts of LCM_REX_TEST require wait states and different test resources. These states and test resources cause delays that are not acceptable in SREX main task execution. The LCMCOV_REX_TEST that runs at a lower priority implements these tests separately from the LCM_REX_TEST. The LCMCOV_REX_TEST requires logical test unit (LTU) connections in the maintenance line card. An LCM unit can only access the single LTU when the other unit is out of service. This resource limit does not allow the execution of several LCMCOV_REX_TESTs at the same time. The entry of data in the PARALLEL execution field for LCMCOV_REX_TEST in table REXSCHED allows a maximum of one.

SREX scheduling



Note 1: The REX tests can run on LCM 0 and LCM 1 at the same time with REX tests that run on RCC 0 and LGC 0.
Note 2: The REX tests cannot run on LCM 2 through LCM 7 if a REX test runs on LGC 0.

Separation of the LCM_REX_TEST and the LCMCOV_REX_TEST allows site REX_TEST information to complete faster. The LCM_REX_TESTs, without restrictions of the converter voltage and ring tests, run at the same time. These tests can be scheduled separately for optimum execution periods.

> ***Note:*** The LCMCOV_REX_TEST is performed on LCMs, XLCMs, OPMs, and RLCMs.

Feature AF3234 provides the following REX test improvements for LCM peripherals and variants:

- ESA REX test
- LCM and ESA-independent REX test
- MAP command for manual REX test
- fault indicators
- REX test maintenance record

- MAP commands to access REX test failures

ESA REX test

The ESA REX tests the ability of RLCM units to enter and exit ESA. The ESA REX also tests the ability of the units to message the ESA processor while the units are in ESA. The ESA REX test begins after the LCM REX test is complete.

MAP commands for manual REX tests

The XLCM diagnostics provide the capability to implement a manual LCM REX test. A manual REX test occurs through the addition of a REX or REXCOV parameter to the TST command at the PM level of the MAP display. Examples of this command are:

>MAPCI;MTC;PM;POST LCM <site><frame><unit>

Note: Post the LCM

>QUERYPM

Note: Displays information about the LCM node. Feature AF5898 adds information about the LCMCOV REX test.

When the LCM is posted, manual control of scheduled LCM or LCMCOV REX tests is set. To set the manual control of these tests, type:

>TST REX [ON] [OFF]

Note: The REX test of the posted LCM is enabled or disabled.

or

>TST COVREX [ON] [OFF]

Note: The COVREX test of the posted LCM is enabled or disabled.

To set the LCM REX tests for immediate execution, type

>TST REX NOW

Note: Performs LCM_REX_TEST on the posted LCM.

or

>TST COVREX NOW

Note: Performs LCMCOV_REX_TEST on the posted LCM.

The following message appears when you enter the TST COVREX NOW command.

Example of a MAP response:

```
LCM REM1 00 0 will be put into takeover mode during the
COV REX
Do you want to continue with the COV REX test
Please confirm (“YES”, “Y”, “NO”, or “N”)
```

Line concentrating module and ESA-independent REX test

The scheduler initiates REX tests on an LCM. When the tests complete, the scheduler initiates the ESA REX test. A manually implemented LCM REX test does not implement an ESA REX test. As a result of a REX test that is not successful, the LCM is set ISTb if INSV diagnostics fail. The LCM is set SysB if OOS diagnostics fail.

Fault indicators

A REX test that is not successful sets the LCM unit to ISTb or SysB with a reason of REX failed. Audits on LCMs are performed every 10 min and run INSV tests. The ISTb flag remains with a REX failed reason. If the audit is not successful and the audit detects additional failure conditions, the audit contributes to the ISTb list. If the LCM is SysB and a successful system RTS is performed, the unit is returned to ISTb. The system is not returned INSV with the REX failed reason. To remove the ISTb state, the LCM must complete a successful manual or scheduled REX test.

The system generates the node assessment graph log (NAG400) every hour. The system also generates this log in response to the NAG command, to list nodes that are not INSV. The REX_INFO field of log NAG400 displays the results of the latest REX test. For LCMs, the LCM_REX_TEST result appears in the list first. A colon separates this result from the LCMCOV_REX_TEST result. For additional information about NAG400 logs, refer to the *RLCM Related Logs* section of this document.

The CI level NAG command allows operating company personnel to display every OOS node. The MAP response to the NAG command is like the response presented in the NAG400 log report. The command and log report are part of the node assessment graph (NAG) feature. This feature provides a snapshot of nodes in the system that are OOS or have a REX issue. Operating company personnel can include the offline nodes in the output through the entry of the command string NAG ALL. You can turn on and off the log report function, which runs every hour when you enter the command string NAG ON or NAG OFF.

For the output or log report to include a node, the node must be in one of the following states. These states are SysB, CBsy, ISTb, or ManB. The output or log report can include a node if the node fails, is aborted or does not complete the last REX test. If a node does not have a REX problem, the string “ATP” appears in the REX column. This string indicates that every test passes.

The following output depicts an abbreviated report in response to the NAG command.

Example of a MAP response:

```
Front End Load: FSL37AO
Level   Node        Status  REX INFO        UNTI 0  UNIT 1
   CPU      1         ACT
CM                  NORMAL
MS                  NORMAL
MS                  NORMAL
IOD                 NORMAL
NET                 NORMAL
PM RCC      0        SYSB   ATP             SYSB    SYSB
   LCM  KOPM 12 0    SYSB   PASS:   PASS    SYSB    SYSB
   RMM      1        SYSB   ----             --      --
   ESA      4        SYSB   ----             --      --
    :       :         :       :               :       :
    :       :         :       :               :       :
   SMSR     5        SYSB   ATP             SYSB    SYSB
   LTC      0        ISTB   ATP             ISTB    ISTB
   LTC      1        ISTB   ATP             ISTB    ISTB
   SMA      1        ISTB   ATP             ISTB    ISTB
   IDT      37       ISTB   ---              --      --
   IDT      38       ISTB   ---              --      --
   SMA2     0        ISTB   ATP             ISTB      .
   RCC2     1        ISTB   ATP             ISTB    ISTB
    :       :         :       :               :       :
    :       :         :       :               :       :
   LCM KRCM 03  0     .     PASS:   ----      .       .
Offline Node count:  3
```

REX maintenance records

The system generates a maintenance record from a REX test to indicate results of recent REX tests for each LCM entered. This information is available at the PM level of the MAP display for a posted LCM.

> ***Note:*** After a reload restart, the system erases the maintenance record for each LCM.

Increase to manual maintenance

When automatic maintenance does not correct a fault in the DMS switch, the DMS switch provides trouble indicators that reveal a fault condition remains. Alarms are examples of trouble indicators. Some OMs and logs also indicate a fault condition and a failure of automatic maintenance. User action becomes necessary as maintenance personnel attempt to clear the fault at the MAP terminal. Refer to the chapter Troubleshooting chart for a procedure on how to clear alarms. Refer to the chapter “RLCM related logs” for log information. Refer to the chapter “RLCM related operational measurements” for operational measurements information.

Alarm conditions

The maintenance system status header on the MAP display screen indicates alarm conditions for the DMS-100 switch subsystems. The alarm conditions and meanings appear in the following table.

Alarm description

Alarm	MAP display	Description
Minor	(blank)	Normally does not affect service
Major	(M)	Normally indicates a condition that degrades and threatens service
Critical	(*C*)	Normally indicates a service outage or possible service outage

The type of alarm present and alarm severity appears under the header. If several alarms are present, the most serious alarm appears. When this alarm is cleared, the next most serious alarm appears. When an alarm condition is not present when the PM system is completely in service, a dot (.) appears under the header PM.

The following table displays the alarms for the RLCM that appear under the PM subsystem header of the MAP display.

Note: If nn is greater than 99, two asterisks (**) appear in place of numbers.

Alarm class codes, displays, and conditions

PM header display	Condition
PM	Every PM is in service. Alarm conditions are not in effect.
PM nnSysB *C*	More than 10% of the PMs are SysB–critical alarm.
PM nnLCM *C*	The two units of one or more LCMs are not in-service critical alarm.
PM LCMRG M	The two RGs of an RLCM have ISTb and a critical or major alarm is not present.
PM nnSysB M	10% or less of the PMs are SysB major alarm.
PM LCMRG (blank)	One RG of an RLCM has ISTb, and a critical or major alarm is not present.
PM nnISTb (blank)	The indicated number of PMs are ISTb.
PM nnCBsy (blank)	The indicated number of PMs are CBsy.
PM nn ManB (blank)	The indicated number of PMs are ManB minor alarm.

In addition to the above alarm conditions, ESA module faults can generate alarms at the MAP display PM level. These alarms are like alarms that current peripheral modules raise. The alarms that the ESA module can generate are the following:

- MINOR PM alarm. An ESA module generates this alarm in a ManB state
- MINOR PM alarm. An ESA module generates this alarm in a CBsy state
- MINOR PM alarm. An ESA module generates this alarm in an ISTb state
- MAJOR PM alarm. An ESA module generates this alarm in a SysB state
- CRITICAL PM alarm. An ESA module generates when a maximum of 10% of the peripheral modules are in a SysB state

Subscriber lines manual maintenance

Subscriber lines that fail to meet specified quality standards are identified to the switch operator. The output reports that the ACT log system generates can identify the failures. The failures are posted at the line test position (LTP). Refer to the *Input/Output System Reference Manual*, 297-1001-129. The user tests and corrects the identified automatic maintenance failures.

Drawer maintenance

The system can monitor and the user can change drawer states from the LCM level of the MAP display. You can also run drawer tests by manually testing a unit at the MAP display.

When the system detects a defective card, the user can remove a card drawer from service for testing and for card replacement. These actions do not affect other call processing or LCM maintenance.

PRLCM overview

The PCM30 remote line concentrating module (PRLCM) is a remote peripheral module that provides extended geographic coverage for the DMS-100 switch. The PRLCM operates at a distance of up to 160.9 km (100 mi) from the host office.

The PRLCM contains hardware and software maintenance components that perform routine audits and identify failures in the following:

- PRLCMs
- PCM30 links that connect the PRLCM to the host controller
- subscriber lines

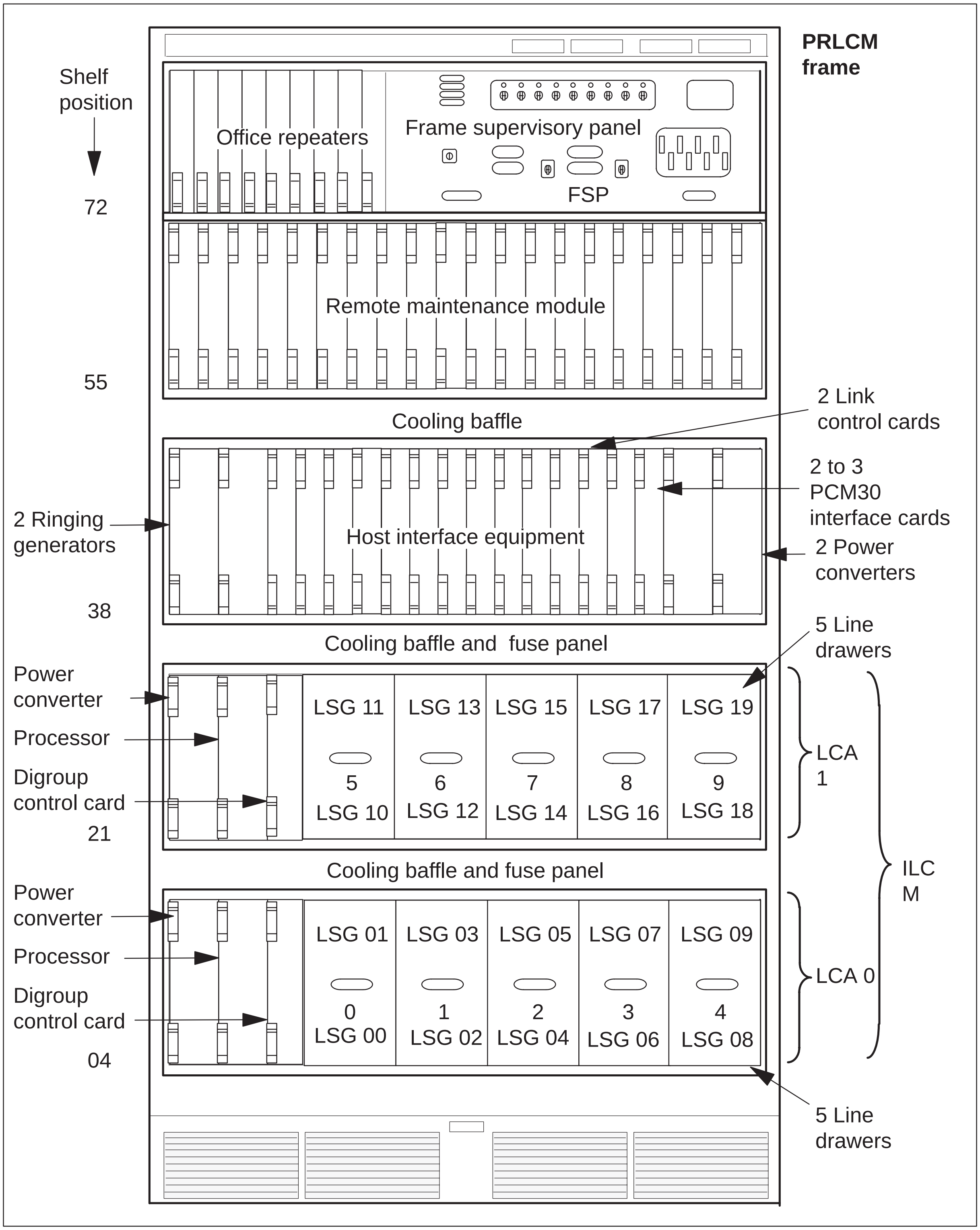
PRLCM configuration

A standard DMS-100 switch single-bay equipment frame contains the PRLCM. The PRLCM frame contains the following components:

- standard dual-shelf international line concentrating module (ILCM)
- host interface equipment (HIE) shelf
- single-shelf remote maintenance module (RMM)
- frame supervisory panel (FSP)

The lower part of the frame contains the ILCM that consists of two line concentrating arrays (LCA). Cooling baffles and fuse panels accompany the LCAs. The upper part of the PRLCM frame contains the HIE shelf, the RMM shelf, and the FSP. The FSP provides power control and alarm circuits for the LCM, HIE, and RMM shelves. The FSP provides power control and alarm circuits for the ringing generators (RG) in the HIE shelf. The layout of the PRLCM equipment frame appears in the following figure.

PRLCM frame, shelf, and panel arrangement



International line concentrating module

The LCM occupies shelf positions 04 and 21 of the PRLCM frame. The dual unit LCM contains two LCA shelves. The LCA-0 is always the bottom array or shelf and LCA-1 is the top array of the LCM.

Baffle and fuse panels above each LCA allow the air to circulate for convectional cooling. These panels carry sets of five +5V, +15V and –48V fuses for the line drawers. These panels carry a pair of fuses for the ringing voltage outputs (RA and RB). Each LCA shelf contains a processor, digroup controller, power converter, and five line drawers.

Each line drawer connects a maximum of 64 line cards. Each line drawer connects one line card for each analog subscriber line the PRLCM services. The 64 line cards divide into two groups of 32. A line subgroup (LSG) is the term for each group of 32 line cards.

The previous figure identifies the 10 line drawers and the 20 LSGs in the 2 LCA shelves.

The maximum number of lines connected to a PRLCM is the number of line drawers (10) times the number of line cards in a drawer (64). The maximum number of lines is 640.

Host interface equipment shelf

The HIE occupies a single shelf at position 38 in the PRLCM frame. The HIE allows the LCA shelves of the PRLCM to connect to both the RMM and the host office. The HIE shelf contains the following components:

- two ringing generators
- two line control cards (LCC)
- two to three PCM30 interface cards
- two power converters
- one emergency stand-alone (ESA) control complex

Ringing generators

The two ringing generators occupy slots 01 to 08 in the HIE. Each generator is four slots wide.

The ringing generators contain the frequency circuits that generate ringing signals to subscriber line cards on the LCA shelves.

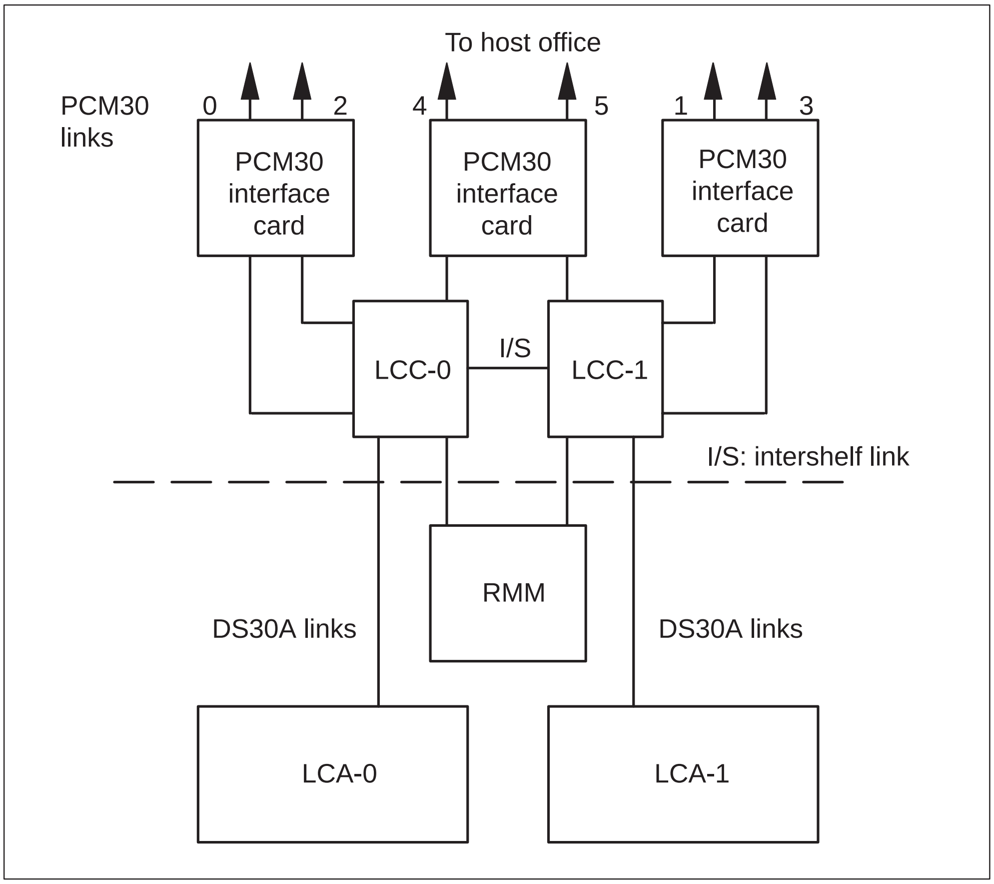
The ringing generators contain automatic number identification (ANI). The ringing generators contain coin generator circuits that check for two- or four-party ANI. The coin generator circuits check for coin presence in prepay coin telephones.

The ringing generators produce voltages required for ANI and coin control (48 V dc and 130 V dc). The ringing generators monitor ANI and coin voltages and ring bus outputs for failure.

Link control cards

The two LCCs fill slots 17 and 18 of the HIE. Each LCC provides an interface between eight DS30A ports from a PRLCM LCA shelf and the PCM30 links to the host office. The LCCs also provide an interface between the ESA processor, if the ESA processor is provisioned, and the ILCM. The following diagram describes how the PCM30 links terminate on the LCC and in the LCA.

LCC interface to PCM30 interface cards



When both LCCs are active under normal conditions, LCC-0 connects LCA-0, and LCC-1 connects LCA-1. The LCC-0 serves even numbered PCM30 links (0, 2, and 4) from the PCM30 interface cards. The LCC-1 serves odd numbered PCM30 links (1, 3, and 5). The following diagram describes how the LCCs configure in the PRLCM.

In one-to-one mapping of LCA primary ports with PCM30 links, all 32 channels of a PCM30 link come from one 32-channel DS30A port. Control and signaling from the host requires additional channels. Intra- and interspeech channels require additional channels.

The LCC accepts eight DS30A links from the LCA. The LCC allows these links to provide the following:

- message and speech paths to the host
- connection to the RMM
- link-sharing resources for each LCA

The LCC provides system clocks for the digroup controller card (DCC), RMM, and LCM. The active units of the LCM cause the LCC-0 to become frequency-locked to the primary PCM30 link. When both units of the LCM are active, the LCC-1 clock locks to LCC-0. Both LCC clocks derive timing from the same source. The source is the host line trunk controller (LTC).

The DS30A ports in the LCA are numbered 0 to 7. The following table lists the functions of the DS30A ports.

LCA port assignments and use

Number	Port type	Functions
0,1, 2	Primary	Carries three message channels for the LCA shelf. Message channels map onto channels 1, 2, and 3 of each of the two primary PCM30 links to the host office. Channels that carry speech are mapped to channels 4 through 24 of the primary PCM30 links.
3, 4, 5	Image	These ports become active if the mate LCA and LCC are inactive and takeover occurs. Port 3 takes over mate port 0 of the mate LCA. Port 4 takes over mate port 1 of the mate LCA. Port 5 takes over mate port 2 of the mate LCA. The mapping of all channels on the PCM30 links continues, and the active LCC takes control of all PCM30 links.

—continued—

LCA port assignments and use (continued)

Number	Port type	Functions
6	Interlink	Provides a DS30A link for intershelf connections. The channels on this port allow a subscriber line on one LCA to connect to a subscriber line in the mate LCA. This action occurs during call processing. The connection of the subscriber lines leaves the PCM30 channels to the host office free.
7	Maintenance	Provides the LCA with access to the RMM through the LCCs. The RMM ports allow the selection of each line circuit. The RMM ports allow the metallic test access (MTA) connections on the tip and ring leads for testing.
		—end—

PCM30 interface cards

Slots 19 and 20 of the HIE shelf hold the PCM30 interface cards (NT6X50). Provision an additional card in slot 21 to replace the filler panel. Each PCM30 interface card accepts two PCM30 links from the host office LGC/LTC. The PCM30 connects the two PCM30 links to a maximum of six links to the LCC.

A minimum of two PCM30 cards must carry the two primary message channels from the LCM. Provision a third PCM30 card only if the traffic load of the PRLCM requires six PCM30 links to the host.

The PCM30 ports are not duplicated. Each processor in the LCA shelves of the PRLCM can control all six PCM30 ports.

Primary ports that map one to one with PCM30 links are known as equipped ports. The number of equipped ports in an LCA depends on the number of PCM30 interface cards in the HIE. If the HIE has three PCM30 cards, all three primary ports (0, 1, 2) for each LCA are equipped. If a port is unequipped, the port is not in use or used for features contained in other PRLCM feature packages.

Note: Links 0 and 1 are message-supporting links that have special maintenance protection. Each PCM30 message supporting link has a channel 12 looparound known as extended PCM30 maintenance. A channel 12 looparound connects the outgoing side of channel 12 to the incoming side. The looparound makes sure the user does not busy the link where the looparound applies. The looparound makes sure the user does not busy the link when the unit the link supports is in service. When the user busies the unit this link supports, the extended PCM30 maintenance looparound is disabled. The user can busy the link, and the looparound is reenabled as NT6X50 card diagnostics for maintenance of the PCM30 link.

Power converter card

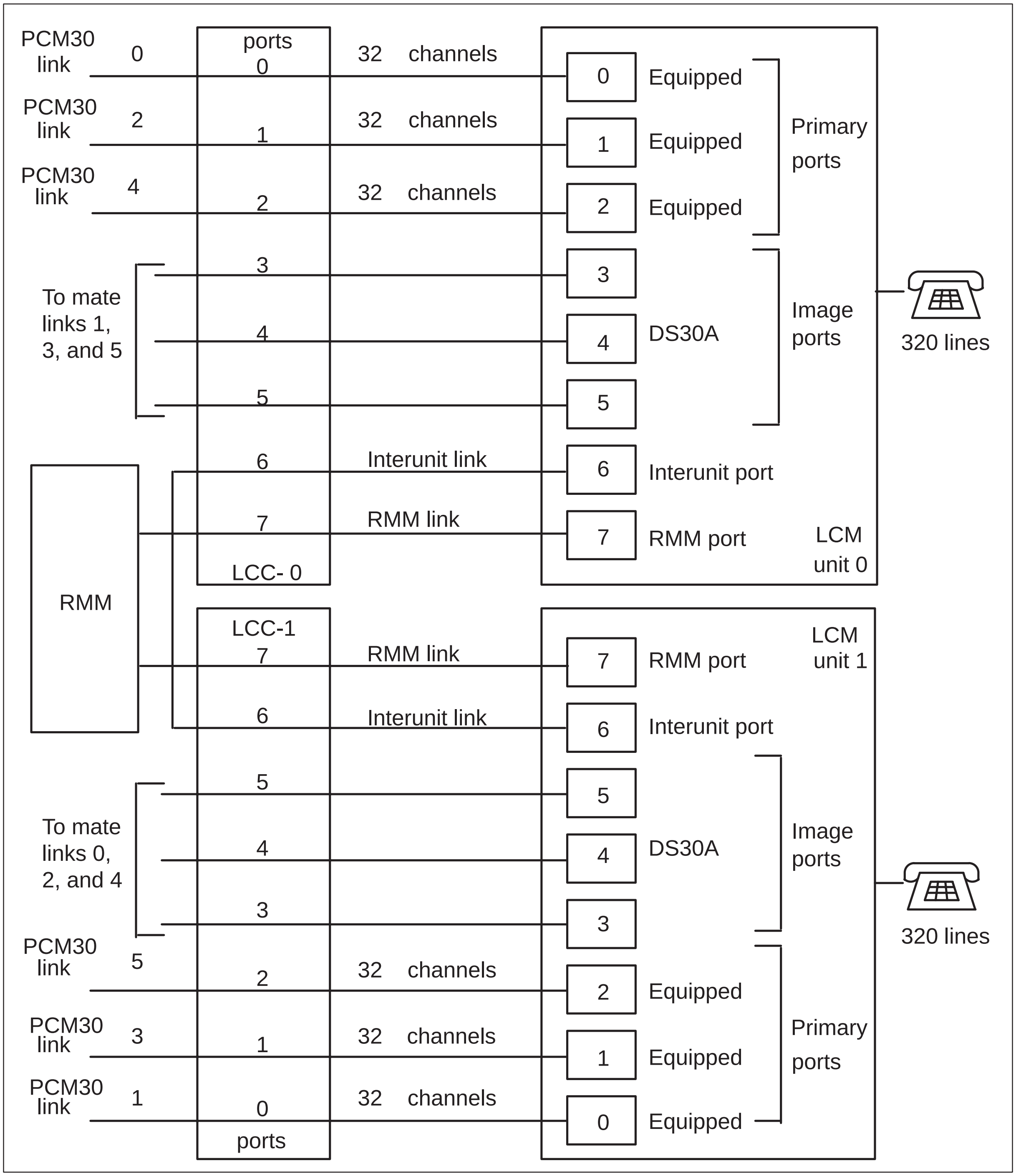
Two power converters occupy the far right of the HIE shelf in slots 22 to 24 and 25 in the sequence provided. Slot 25 is the slot on the right side in the shelf.

ESA control complex

The HIE shelf contains two additional circuit cards if the ESA feature package is present. Two configurations are possible. The NT6X45AF configuration occupies slots 14 through 16. An ESA memory card, a processor cards, and a clock and tone card fill those slots. The second configuration uses the NTMX45AA ESA processor card. This configuration does not use slot 14, but slot 15 holds the processor card and slot 16 holds the clock and tone card. Chapter “ESA maintenance overview” discusses the ESA configuration and operation.

The following diagram describes the PRLCM link, port, and channel structure.

PRLCM link, port and channel structure

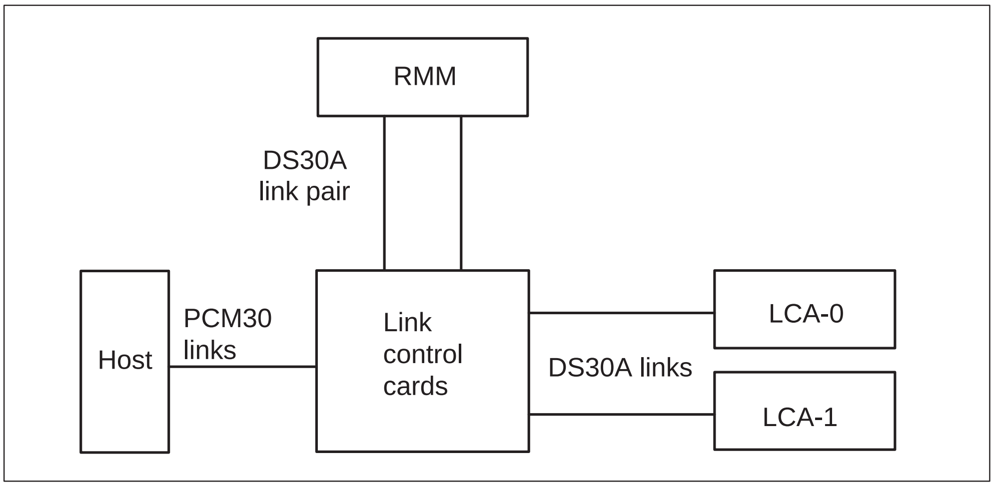


Remote maintenance module

The RMM, occupies shelf position 56 in the PRLCM frame. The RMM is a modified, cost-reduced form of the maintenance trunk module (MTM). The RMM contains a processor that scans the service circuits and digit collection during ESA.

The RMM C-side interface uses a pair of DS30A links. Each link connects to each LCC in the HIE shelf. The DS30A links make sure the RMM operates when either LCC is active. The LCC passes maintenance requests from the host to the RMM. The LCC provides a link between the RMM and line circuits in the LCA. At the host office, the MAP terminal directs PRLCM maintenance to the RMM. The following diagram describes how the RMM communicates with the host and the LCA through the LCC.

RMM connection with host and LCA through LCC



Frame supervisory panel

The FSP occupies shelf position 60 of the RLCC cabinet. The FSP provides talk jacks, fuse alarm features, and power control for the RLCM. The FSP contains 48-V distribution breakers. These breakers are for the four cards that control the alarm facilities and power converters in the RLCC cabinet. The following describes these cards and the functions of these cards:

- NT6X36AA Alarm card

  This card monitors the power converters in the RLCC cabinet. This card generates an alarm when an undervoltage condition occurs in any of the power converters.

- NT6X36AC Fan Alarm card

This card monitors the power in the RLCC cabinet. The RLCC cabinet is associated with the fan cooling units located below shelf 05. The fan cooling units provide cooling for the RLCM-EDC cabinet. The units generate an alarm when an undervoltage or fan failure condition occurs in the cabinet.

- NT0X91AA Alarm and Converter Drive

  This card controls the alarms and power for the NT6X53AA power converter for unit 1 of the LCM. This card controls the alarms and power for the NT2X70AA in slot position 22 of the HIE.

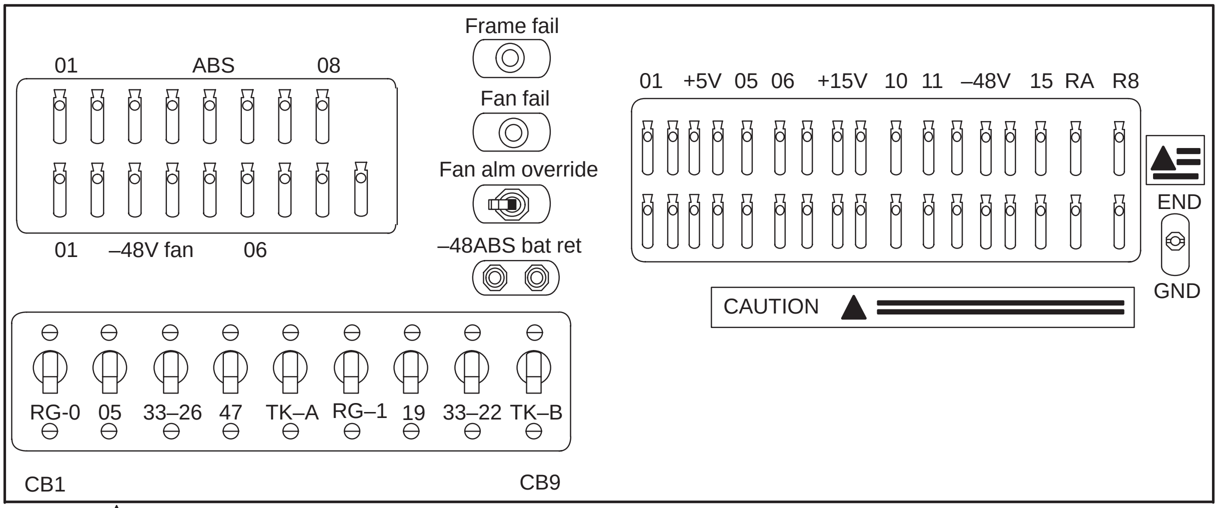
- NT0X91AE Converter Drive and Protection Circuit

  This card controls the alarms and power for the NT6X53AA power converter for unit 0 of the LCM. This card controls the alarms and power for the NT2X70AA in slot position 25 of the HIE. This card controls the alarms and power for the NT2X09AA/NT2X06BA in slot positions 17 and 20 of the RMM.

The FSP has circuit breakers (CB) to distribute –48V power to shelves in the RLCC cabinet. Refer to the following figure, FSP shelf layout, and table FSP circuit breaker assignments, for information on the following:

- CB power distribution
- assignments
- shelf type and slot position
- product engineering code (PEC)
- equipment supported

FSP shelf layout



Not to scale

Emergency stand alone description

The PRLCM with the ESA is a different configuration than the standard PRLCM. The PRLCM with ESA requires ESA software and special hardware components. This chapter describes the ESA configuration separately.

The PRLCM is a remote configuration. Defective or severed communication links between the PRLCM and the host site can interrupt service. The ESA feature package allows the PRLCM to provide stand-alone call-processing ability when loss of communication with the host occurs. The ESA feature package allows the PRLCM to take over the call processing functions of the LTC and the central control (CC).

ESA hardware model

Figure “PRLCM hardware representation” describes the ESA hardware configuration from the view of the MAP terminal. This figure describes the PRLCM as a C-side node to the ESA processor and the remote maintenance module (RMM). The PRLCM is not in the ESA mode in this figure.

PRLCM hardware representation

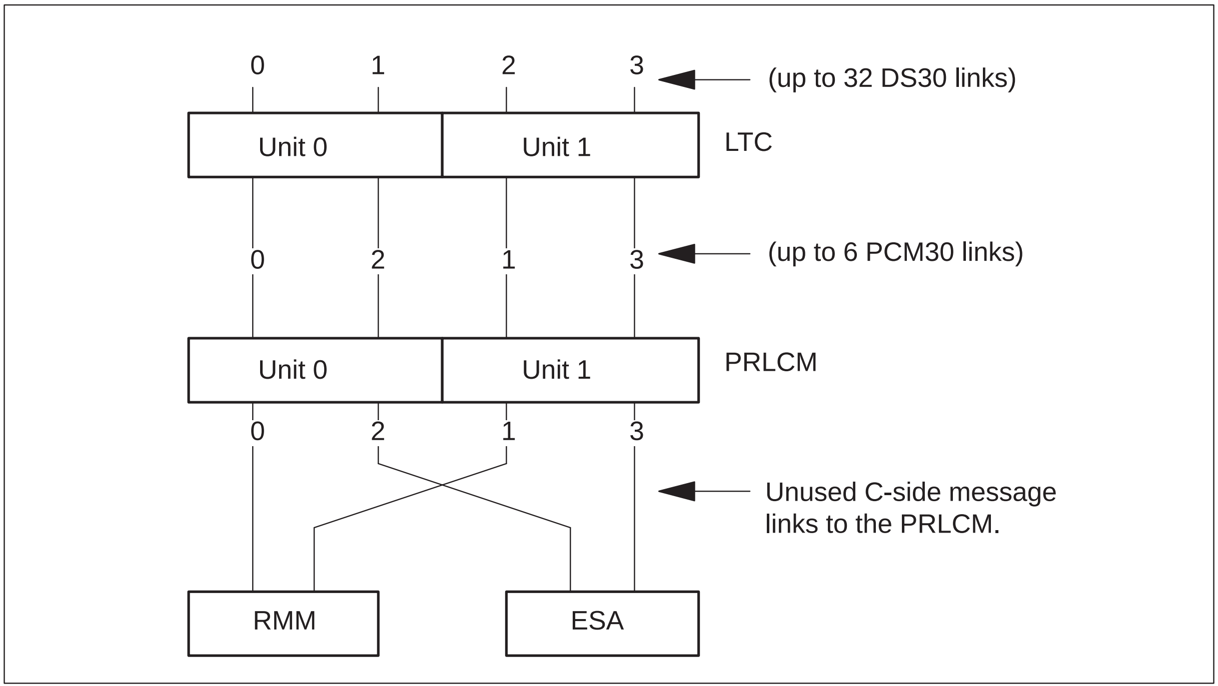
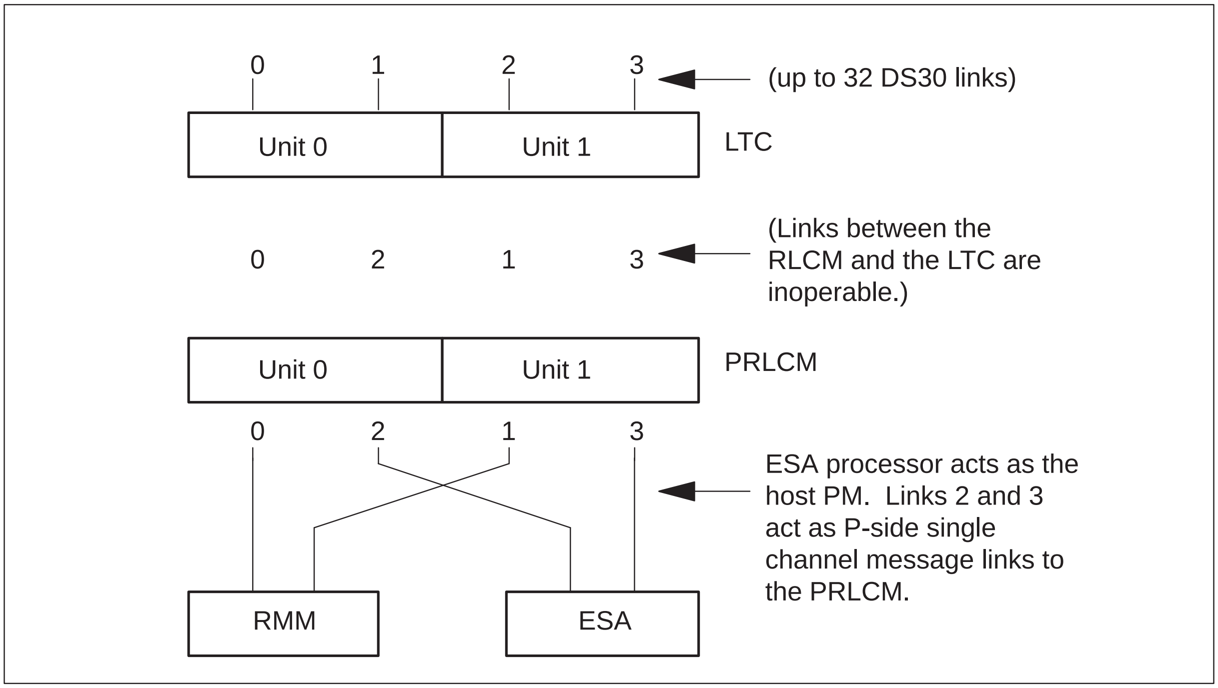


Figure “PRLCM hardware representation in ESA operation” describes the PRLCM when the PRLCM goes to ESA mode. In ESA mode, the ESA processor takes over the functions of the host peripheral module (PM). The peripheral module is the LTC. The MAP terminal does display this hardware configuration because the PRLCM functions separately from the host.

PRLCM hardware representation in ESA operation



ESA operation

The PRLCM enters ESA mode when the PRLCM detects loss of communication with the host site. The two conditions that cause entry in ESA mode at the PRLCM are as follows:

- communication links that cannot be used
- looparound message audit failure

When the PRLCM enters ESA mode, the system removes all active calls. This condition is a cold enter.

The ILCM detects the loss of communication with the host. The ILCM determines that the ESA mode is necessary. If the ESA mode is necessary, the ILCM switches the C-side links from the host to the ESA processor. The ESA processor detects the switch of links through the clock and tone card.

When the ESA processor detects the switching of links, the processor initiates the ESA-enter. The time between loss of communication and ESA mode depends on the type of failure condition.

During ESA mode, the ESA processor handles call processing. The ESA processor contains software known as the ESA CC. The ESA CC takes over the functions of the DMS CC and handles line-to-line call processing. The ESA CC contains a subset of the translation data in DMS CC.

This subset is a snapshot of the DMS CC data required for ESA call processing. The translation data in the snapshot data is known as static data. The system does not enter PRLCM ESA mode until the ESA processor is loaded with static data.

The download of the static data to the ESA CC from the DMS CC truncates specified translation data. Static data are not true parts of the DMS CC. The ESA mode supports only basic calls. The PRLCM ESA mode supports plain old telephone service (POTS) and Meridian Digital Centrex (MDC) subscriber lines.

The ESA processor has a nailed-up direct communication link with the DMS CC when the PRLCM is not in ESA operation. The link is not available during ESA operation. The ESA processor establishes the nailed-up connection with the DMS CC after the links are restored. The DMS CC must instruct the ESA processor to exit ESA. The ESA processor is the only processor at the PRLCM that can communicate with the DMS CC during ESA exit.

ESA hardware

The additional hardware for the PRLCM equipment frame has two possible configurations.

1. The NT6X45AF based ESA package consists of three pieces of equipment.

- one ESA memory card (NT6X47AC)
- one ESA processor card (NT6X45AF)
- one ESA clock and tone card (NT6X75AA)

2. The NTMX45AA based ESA package consists of two pieces of equipment. This package includes an ESA processor that enables duplicate Nxx in ESA mode and provides firmware downloads. This card has 8 Mbytes of on-card memory. With this package, the ESA memory card is not needed and slot 14 has a filler plate.

- one ESA processor card (NTMX45AA)
- one ESA clock and tone card (NT6X75AA)

NT6X45AF – ESA processor card

This card is the same processor card used in the LTC. The LTC processor card, when used in the RLCM equipment frame, is called the ESA processor.

NT6X47AC – 4 Mbyte memory card

This card is the same memory card used in the LTC. This card contains 4 Mbyte of memory. The system uses 3 Mbyte for call processing when the RLCM enters ESA. The 6X47AC is required for ESA loads for BCS33 and higher.

NT6X75AA – ESA clock and tone card

This card provides the following functions:

- a frame pulse for clock generation during ESA mode to replace the lost PCM30 frame pulse from the host
- tones to an LCM during ESA
- an interface to allow the ESA processor to send and receive messages to and from the host during normal operations. During ESA mode, this card communicates with both units of the LCM and the RMM.

NTMX45AA – ESA processor card

This card is an improvement over the NT6X45AF ESA processor. 8 Mbytes of on-card memory enable duplicate Nxx numbers in ESA mode. This card also supports in-service firmware downloads. With this ESA processor, the NT6X47AC ESA memory card is not needed and slot 14 of the HIE shelf has a filler plate.

NT2X48AB – Digitone receiver card

The RMM requires the Digitone receiver (DTR) card for ESA operation. The ESA processor places the DTRs in service when in ESA. The ESA processor turns the DTRs off when the ESA processor exits ESA. The RMM uses a single card four-channel DTR, NT2X48BB for ESA Digitone calls. The RMM provides diagnostics for the ESA processor.

Additional LTC hardware

The additional hardware in feature package NTX154AA for the host LTC is the messaging card, NT6X69. This card allows communications with the ESA processor.

Intracalling during ESA mode

Intracalling allows the system to switch calls at the remote location during ESA mode.

The number of designated intracalling channels on the PRLCM determines the number of intraswitched and interswitched calls that ESAs support. The number of channels depends on the number of equipped PCM30 ports available. The number of channels also depends on the number of PCM30 links used for host communication.

During ESA mode, the ESA processor handles all intracalling. The ESA processor contains parts of the translation data detected in the DMS CC.

ESA call processing

When the PRLCM is in ESA mode, the ESA CC handles line-to-line call processing. Refer to the figure ESA CC Basic Call Processing Structure.

The ESA CC has only one queue. The server sends all messages to this first-in first-out queue for call processing. Call processing requires terminal data. The static data downloaded from the DMS CC and the dynamic data stored in the terminal status table (TST) gather the terminal data.

Channel configuration

When the PRLCM enters ESA mode, the C-side channel map of the PRLCM is reconfigured to provide additional interswitch channels for ESA call processing.

Interswitch and intraswitch channels make call connections through the PRLCM. Call connections through the PRLCM do not involve a host connection. The interswitch and intraswitch functionality allows call processing to continue in ESA operation.

When the PRLCM enters ESA mode, the PRLCM channels are configured as when all PCM30 ports except 0 and 1 are equipped. Primary ports 0 and 1 must be equipped in PRLCM ESA.

The reconfiguration of C-side channels on ESA entry makes additional interswitch channels available for unit-to-unit calls. Refer to the following table for a list of the channel breakdown in PRLCM ESA.

Channel availability after ESA entry

Port number	Number of intra channels	Intra channels	Number of inter channels	Inter channels
0	6	2, 7, 12, 18, 23, 28	0	none
1	6	2, 7, 12, 18, 23, 28	0	none
2	18	2, 3, 5, 7, 8, 10, 12, 13, 15, 18, 19, 21, 23, 24, 26, 28, 29, 31	12	1, 4, 6, 9, 11, 14, 17, 20, 22, 25, 27, 30
3	18	2, 3, 5, 7, 8, 10, 12, 13, 15, 18, 19, 21, 23, 24, 26, 28, 29, 31	12	1, 4, 6, 9, 11, 14, 17, 20, 22, 25, 27, 30
4	18	2, 3, 5, 7, 8, 10, 12, 13, 15, 18, 19, 21, 23, 24, 26, 28, 29, 31	12	1, 4, 6, 9, 11, 14, 17, 20, 22, 25, 27, 30
5	18	2, 3, 5, 7, 8, 10, 12, 13, 15, 18, 19, 21, 23, 24, 26, 28, 29, 31	12	1, 4, 6, 9, 11, 14, 17, 20, 22, 25, 27, 30
—end—				

The reconfiguration of C-side channels on PRLCM ESA entry does not allow the PRLCM to gain channels. The PRLCM can gain the number of interswitch channels offset by a decrease in the number of intraswitch channels.

Exiting PRLCM ESA mode

After communication resumes, the DMS CC recovers the PRLCM from the ESA mode. When the PRLCM exits ESA mode, the system removes all active calls. This process is a cold exit.

When C-side communication resumes between the PRLCM and the DMS CC, the DMS CC initiates the ESA exit sequence. Before the ESA exit sequence begins, the DMS CC communicates with the ESA processor over the nailed-up connection. The DMSCC determines if the PRLCM is in ESA mode. The DMSCC determines if the system can recover the PRLCM immediately. Recovery of the PRLCM occurs through a system exit or a manual exit.

ESA system exit

A system exit is an automatic exit from ESA mode that the DMS CC starts without an operator. A system exit can start if the following conditions occur:

- At least one LCM unit of the PRLCM is SysB or C-side busy (CBsy).
- The PRLCM_XPMESAEXIT office parameter time-out value is not zero.

The following sequence is the system exit sequence:

1. The C-side communication continues between the DMS CC and the PRLCM.
2. The DMS CC discovers that the PRLCM is in ESA mode.
3. The DMS CC enters ESA time-out mode.
4. When the DMS CC times out, the DMS CC sends a request to the ESA processor to exit ESA.
5. The PRLCM and the ESA processor perform exit operations.
6. The ESA processor tells the LCM to return the LCC to normal operations.
7. The ESA processor sends operational measurements, peg counts, and the reason for the ESA mode back to the DMS CC. The PM171 log displays this information. The system generates the PM181 log if the ESA exit has problems.
8. The DMS CC returns the PRLCM to service.
9. Return to service the ESA processor and RMM nodes.

ESA manual exit

A manual exit is an exit from ESA mode that operating company personnel initiate at the LCM MAP level. Operating company personnel enter the RTS command to initiate a manual exit. The following conditions require a manual exit:

- Both LCM units of the PRLCM are ManB.

- The PRLCM_XPMESAEXIT office parameter time-out value is zero.

A manual exit starts with the manual override of a time-out value other than zero. Manually busy the LCM units of the PRLCM at the LCM MAP level. This action overrides the time-out value. Use the FORCE option with the BSY command.

The following steps describe the manual exit sequence:

1. The C-side communications between the DMS CC and the PRLCM continue.
2. The DMS CC determines that the PRLCM is in ESA mode.
3. The DMS CC queries the PRLCM for the number of active calls.
4. The DMS CC displays the number of active calls on the MAP display and queries if operating company personnel require an ESA-exit.
5. The DMS CC sends the ESA-exit to the ESA processor if operating company personnel confirm that an ESA–exit is necessary.
6. If operating company personnel do not want to continue with the ESA-exit, the PRLCM remains ManB. The PRLCM remains in ESA mode.
7. The PRLCM and the ESA processor perform exit operations.
8. The ESA processor tells the LCM to return the LCC card to normal operations.
9. The ESA processor sends operational measurements, peg counts, and the reason that the PRLCM entered ESA mode to the DMS CC. The PM171 and PM181 log display this information.
10. The DMS CC returns the PRLCM to service.
11. Return the ESA processor and RMM nodes to service.
12. Receiver off-hook

ESA maintenance overview

Functional description

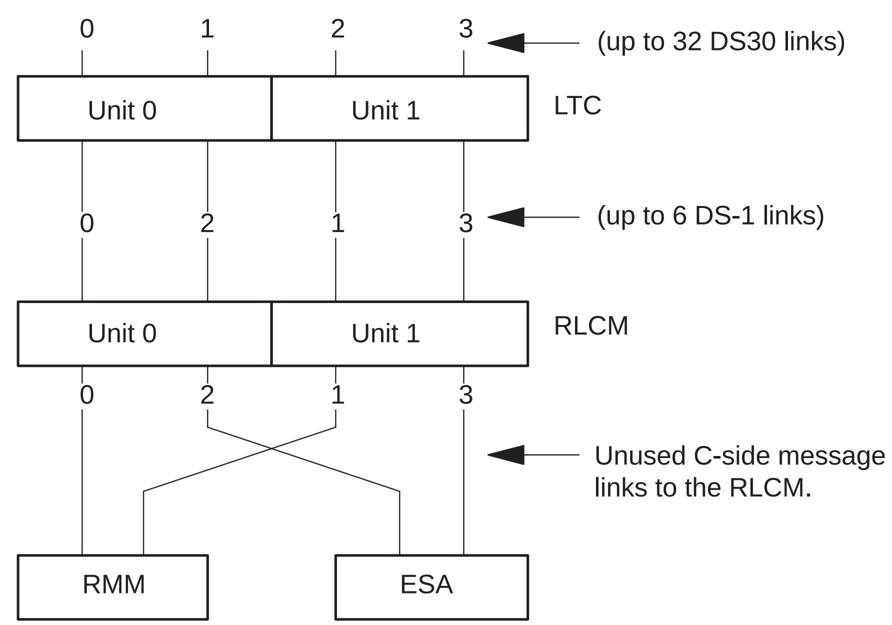
The Remote Line Concentrating Module (RLCM) with the Emergency Stand-Alone (ESA) feature package NTX154AA is a different configuration than the standard RLCM. Special hardware components are required in addition to the ESA software. The ESA configuration receives separate treatment in this chapter.

The RLCM is a remote configuration. The communication links between the RLCM and the host site can be defective or severed. Service can be interrupted. The ESA feature package was designed for the RLCM to provide stand-alone call-processing ability. The RLCM must provide this call processing ability if loss of communication with the host occurs. With the ESA feature package, the RLCM emulates the call processing functions of the line trunk controller (LTC) and the central control (CC).

ESA hardware representation

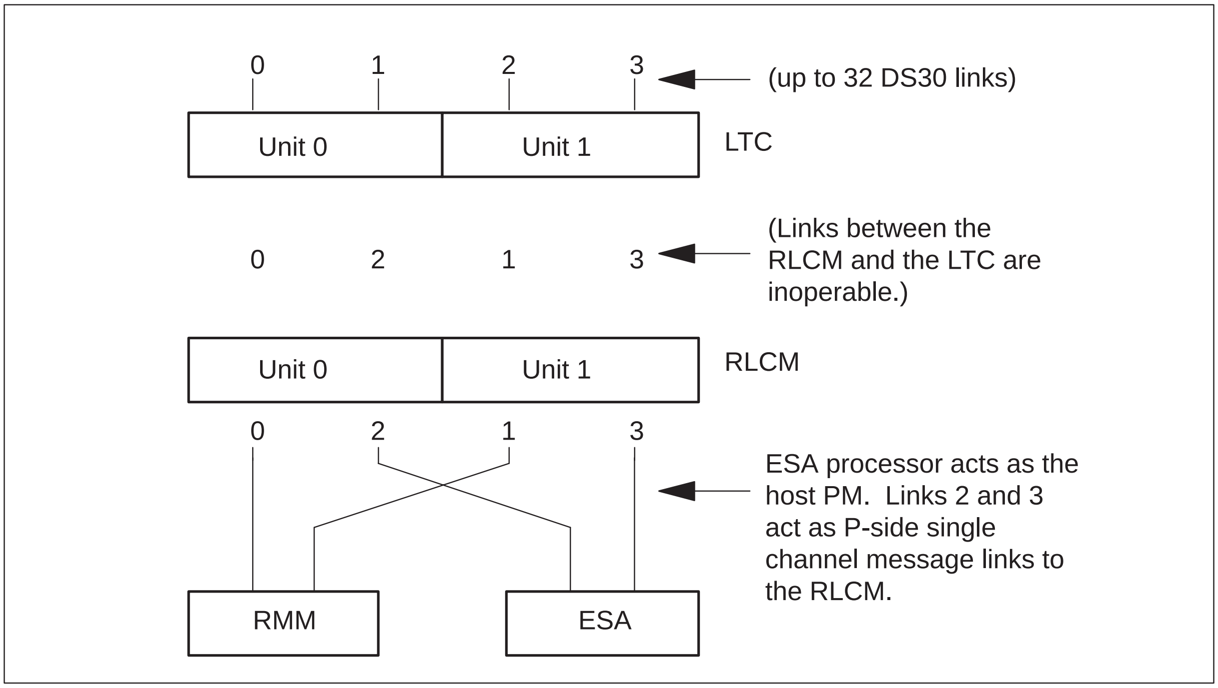
A diagram of the ESA hardware configuration, from the angle of the MAP terminal, appears in the figure “RLCM hardware representation.” This diagram describes the RLCM as a C-side node to the ESA processor and the remote maintenance module (RMM). The RLCM is not in the ESA mode.

RLCM hardware representation



When the RLCM is in ESA mode, figure “RLCM hardware representation in ESA operation” represents the hardware interactions. In ESA mode, the ESA processor acts as the host peripheral module (PM). In this description, the host PM is the LTC. This figure does not describe the hardware configuration from the angle of the MAP terminal. The RLCM functions separately from the host.

RLCM hardware representation in ESA operation



ESA operation

The RLCM enters ESA mode when the RLCM determines that communication with the host site cannot occur. The two conditions that cause entry to ESA mode at the RLCM are:

- communication links that cannot be used
- looparound message audit failure

When the RLCM enters ESA mode, active calls go out of service. This action is a cold enter.

The Line Concentrating Module (LCM) detects the loss of communication with the host. When the LCM determines the ESA mode is required, the LCM switches the C-side links from the host to the ESA processor. The ESA processor detects the switch of links through the clock and tone card.

When the ESA processor detects the switching of links, the system initiates ESA-enter. The type of failure condition determines the time between loss of communication and ESA mode.

During ESA mode, call processing occurs through the ESA processor. The ESA processor contains a module of software, the ESA CC, which emulates the DMS CC and handles line-to-line call processing. The ESA CC contains part of the translations data from the DMS CC.

This part of the DMS CC data is a snapshot required for ESA call processing. The translations data in the snapshot are static data. The RLCM ESA mode is not entered until the ESA processor receives static data.

The download of the static data to the ESA CC from the DMS CC truncates some translation data. Static data are not true parts of the DMS CC and the system only supports basic calls. During RLCM ESA mode, the system supports plain old telephone service (POTS) and Meridian Digital Centrex (MDC) subscriber lines.

The ESA processor has a nailed-up direct communication link with the DMS CC when the RLCM is not in ESA operation. The link is not available during ESA operation. The ESA processor establishes the nailed-up connection with the DMS CC after the links are restored. The DMS CC must instruct the ESA processor to exit ESA. The ESA processor is the only processor at the RLCM that can communicate with the DMS CC during ESA exit.

ESA hardware

Feature package NTX154AA for the RLCM equipment frame has two possible configurations.

1. The NT6X45AF based ESA package consists of three pieces of equipment:

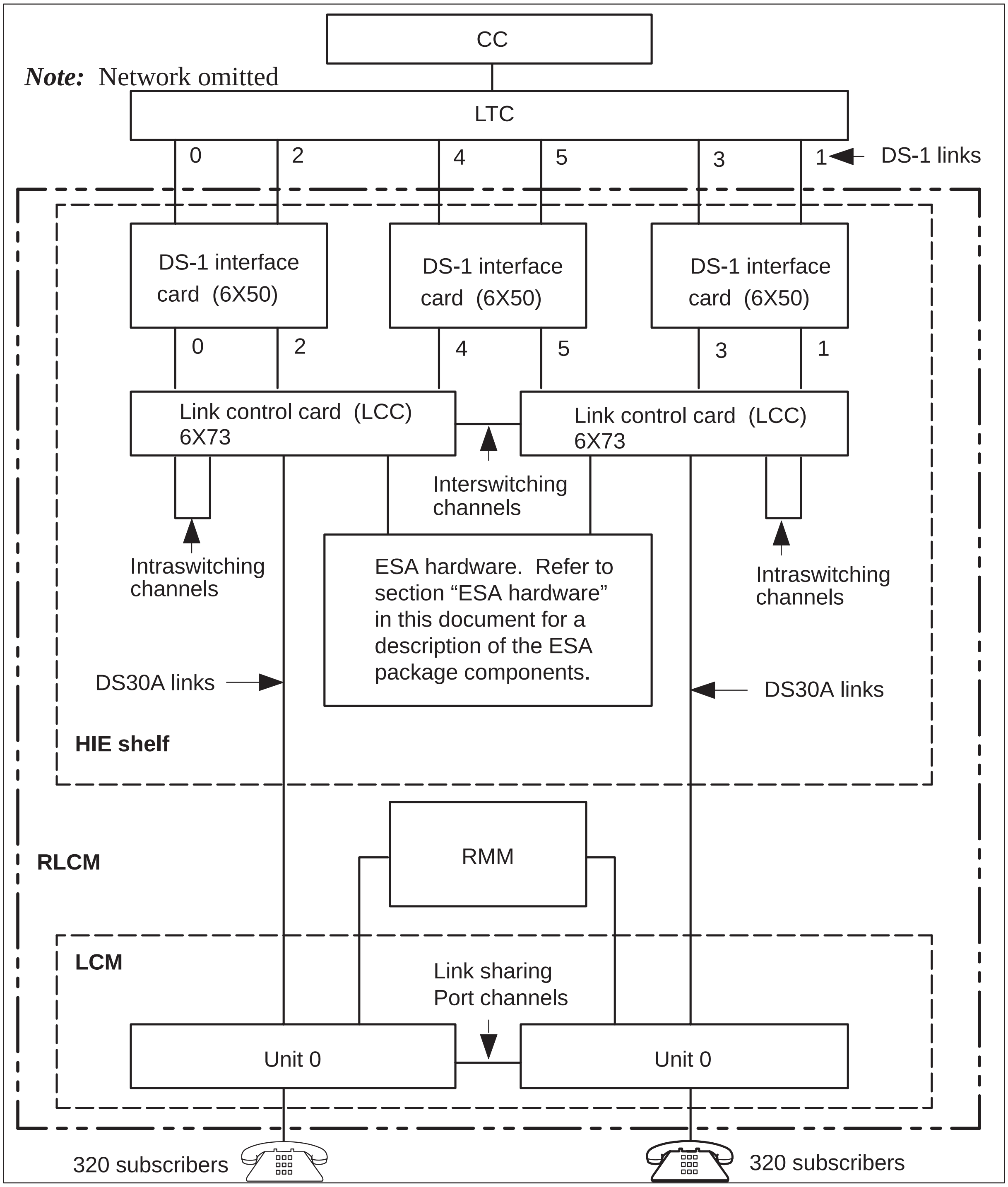
- one ESA memory card (NT6X47AC), slot 14
- one ESA processor card (NT6X45AF), slot 15
- one ESA clock and tone card (NT6X75AA), slot 16

2. The NTMX45AA based ESA package consists of two pieces of equipment. This package includes an ESA processor that enables duplicate Nxx in ESA mode and provides firmware downloads. This card has 8 Mbyte of on-card memory. With this package, the ESA memory card is not needed and slot 14 has a filler plate.

- one ESA processor card (NTMX45AA), slot 15
- one ESA clock and tone card (NT6X75AA), slot 16

For a block diagram of an RLCM with the ESA hardware, refer to the figure “RLCM with ESA hardware block diagram.”

RLCM with ESA hardware block diagram



NT6X45AF – ESA processor card

This card is the same processor card used in the LTC. The LTC processor card, when used in the RLCM equipment frame, is called the ESA processor.

NT6X47AC – 4 Mbyte memory card

This card is the same memory card used in the LTC. This card contains 4 Mbyte of memory. The system uses 3 Mbyte of memory for call processing when the RLCM enters ESA. The 6X47AC is required for ESA loads for BCS33 and higher.

NT6X75AA – ESA clock and tone card

This card provides the following:

- a frame pulse for clock generation during ESA mode to replace the lost DS-1 frame pulse from the host
- tones to an LCM during ESA
- an interface for the ESA processor to send and receive messages to and from the host during normal operations. During ESA mode this card communicates with the two units of the LCM and the RMM.

NTMX45AA – ESA processor card

This card is an improvement over the NT6X45AF ESA processor. Eight megabytes of on-card memory enable duplicate Nxx numbers in ESA mode. This card also supports in-service firmware downloads. With this ESA processor, the NT6X47AC ESA memory card is not needed and slot 14 of the HIE shelf has a filler plate.

NT2X48AB – Digitone receiver card

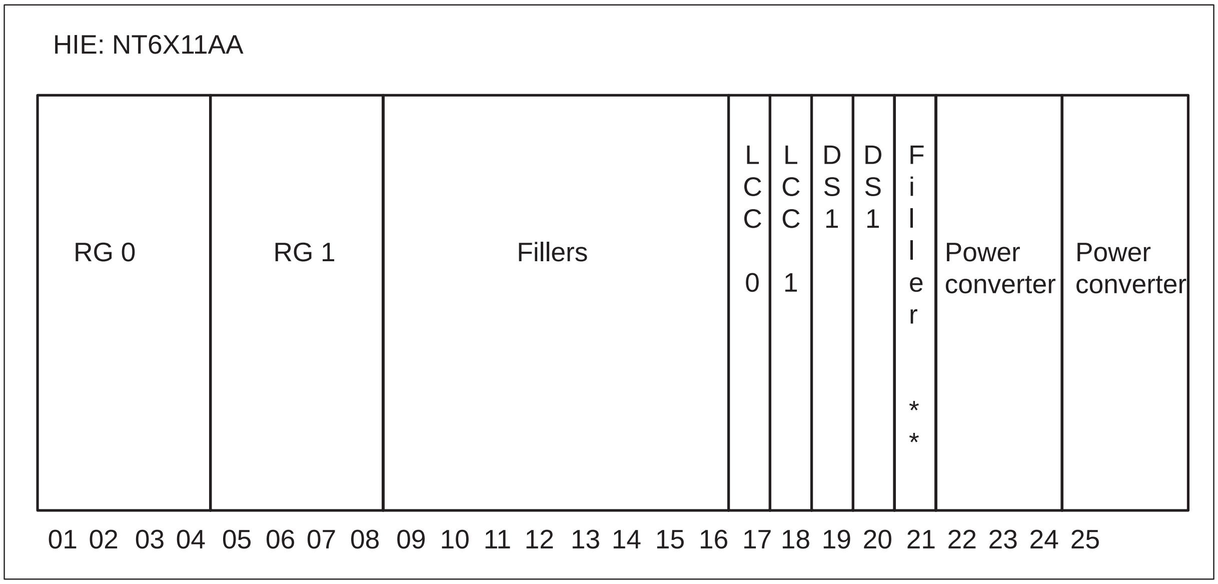
The Digitone receiver (DTR) card is required in the RMM for ESA operation. The ESA processor puts the DTRs in service when in ESA and turns the DTRs off when the DTRs come out of ESA. A single card 4-channel DTR (NT2X48BB) is also used in the RMM for ESA Digitone calls. In addition to Digitone reception, the RMM provides diagnostics for the ESA processor. For the location of the DTR cards, refer to the figure “Remote Maintenance Module Shelf” and the table “Remote Maintenance Module Cards.”

Additional LTC hardware

The additional hardware in feature package NTX154AA for the host LTC is the messaging card, (NT6X69). This card allows communication with the ESA processor.

The following figure shows the layout of the cards in the host interface equipment shelf.

Host interface equipment shelf



The following table describes the cards in the host interface equipment shelf.

Host interface equipment cards

Slot	ABBR	NT PEC	Remarks
01–04	RG 0	NT6X60AA	RLCM ringing generator
05–08	RG 1	NT6X60AA	RLCM ringing generator
09–13		NT0X50AG	Filler panel
14–16	ESA	(Note 1)	Emergency stand-alone (ESA) package (Note 1)
17,18	LCC	NT6X73AA	Link control card (LCC-0, LCC-1)

Note 1: When ESA is not provisioned, these card slots have filler panels (NT0X50AA). When selected, the ESA package has two possible configurations. Refer to sections “ESA hardware” and “ESA control complex” in this document.
Note 2: For six DS-1 links, slot 21 is provisioned with a DS-1 interface card.

—continued—

Host interface equipment cards (continued)

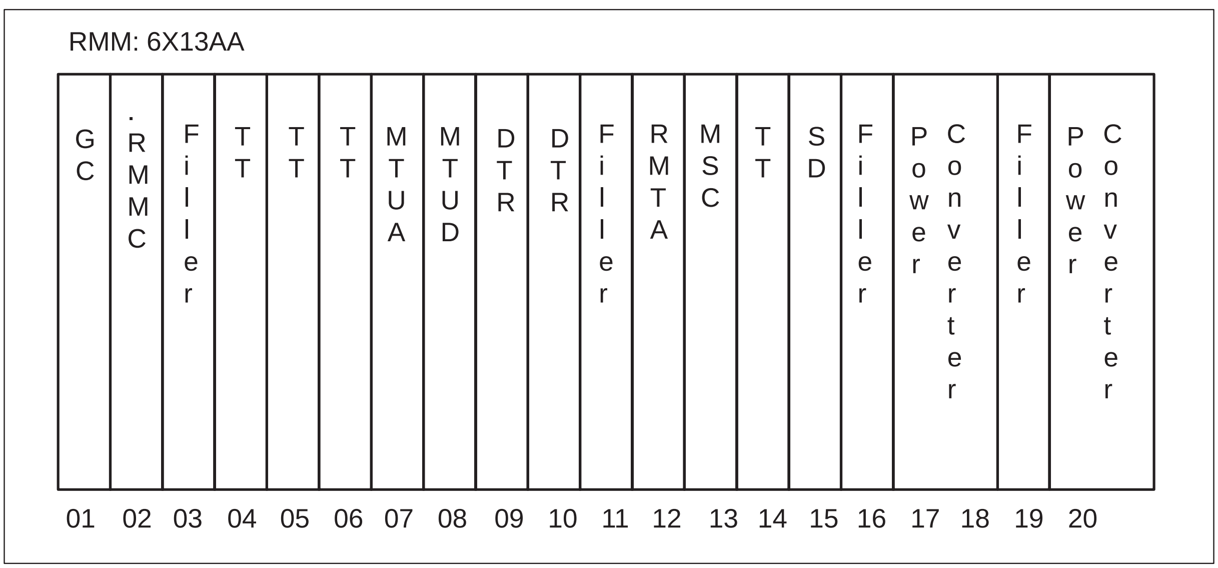
Slot	ABBR	NT PEC	Remarks
19,20	DS-1	NT6X50AA	DS-1 interface (2 DS-1 links per card)
21		NT0X50AA	Filler panel (Note 2)
22-24		NT2X70AA	Power converter
25		NT2X70AA	Power converter

Note 1: When ESA is not provisioned, these card slots have filler panels (NT0X50AA). When selected, the ESA package has two possible configurations. Refer to sections “ESA hardware” and “ESA control complex” in this document.
Note 2: For six DS-1 links, slot 21 is provisioned with a DS-1 interface card.

—end—

The following figure describes a standard setup of RMM test and service circuit cards. For additional information on how to provision, refer to *DMS-100 Provisioning Manual* and *Operational Measurements Reference Manual*.

Remote maintenance module shelf



Remote maintenance module cards

Slot	ABBR	NT PEC	Remarks
01	GC	NT2X59AA	Group codec
02	RMMC	NT6X74AB	RMM control card
03	.	NT0X50AC	Filler panel
04–06	TT	NT2X90AD	Test trunk circuit
07	MTUA	NT2X10BA	Multi-line test unit, analog
08	MTUD	NT2X11BA	Multi-line test unit, digital
09,10	DTR	NT2X48AB	Digital 4-channel Digitone receiver (DTR) (Note)
11,16	.	NT0X50AC	Filler panel
12	RMTA	NT3X09AA	Remote metallic test access
13	MSC	NT0X10AA	Miscellaneous scan card
14	TT	NT2X90AD	Test trunk circuit
15	SD	NT2X57AA	Signal distribution card 1
17,18	.	NT2X09AA	Power converter
19	.	NT0X50AA	Filler panel
20	.	NT2X06AB	Power converter

Note: The common location language identifier. The (CLLI) name for the Digitone receiver card is ESA digit tone receiver (ESADGTR) for use in table CLLI.

In-service firmware downloading

In-service firmware downloading permits ESA processor firmware loading in an XPM unit while the unit is in service (InSv). This feature reduces the amount of time one unit of the XPM is out-of-service (OOS). In-service firmware downloading supports the NTMX45AA ESA processor.

Note: In-service firmware downloading refers to the loading of the firmware while the unit is InSv. The upgrade of the firmware occurs with the XPM unit out of service (OOS).

LOADFW command syntax determines the firmware load application from the firmware upgrade application. The command syntax for the LOADFW command is:

```
LOADFW: Load Firmware onto ESA.
        ALL parameter will execute LOADFW on
        all ESAs in the post set.
        LOADFW UPGRADE must be used to activate
        the new firmware.
Parms:  [<FILE> STRING]
        [UPGRADE {UPGRADE}]
        [NOWAIT {NOWAIT}]
        [ALL {ALL}]
```

To download firmware to the ESA, execute one of the following commands. The following are examples of the LOADFW command.

>LOADFW

or

>LOADFW <file_name>

Note 1: If the firmware file name is not specified with the LOADFW command, the command applies the firmware file name provisioned in table XESAINV, field E2LOAD.

Note 2: By using the LOADFW command without the UPGRADE option, the firmware downloads to the ESA.

Loadfile verification

The system performs integrity checks on the firmware for loadfile accuracy. A loadfile record length check makes sure the file is a firmware file before the XPM uses the file. If the record length is not 54, a message is output to the user and the LOADFW command fails.

Another accuracy check is a 32-bit cyclic redundancy check (CRC) with a 16-bit checksum. The CM sends a validation message to the XPM to check the accuracy of the firmware load. The XPM extracts the CRC and checksum that is in the firmware load. The XPM calculates the CRC value and the checksum. The XPM compares the computed and extracted values to see if the values are the same. The XPM sends the result of the comparison to the CM.

To verify the firmware load enter the following command at the MAP display terminal:

>QUERYPM CNTRS

Firmware upgrade

After loadfile verification, the XPM is ready for the firmware upgrade. To upgrade the firmware use one of the following command string sets:

>LOADFW UPGRADE

Note: By using the LOADFW command with the UPGRADE option, the firmware is upgraded to the new firmware load.

The next table lists parameters used with the LOADFW command.

LOADFW parameters

Parameter	Value	Definition
filename	n/a	Name of firmware file. If the firmware file is not specified, the firmware load found in table XESAINV, field E2LOAD is used.
UPGRADE	n/a	Upgrades the PM to the new firmware load. UPGRADE is an optional parameter.
ALL	n/a	Permits the use of the LOADFW command on a posted set of PMs. ALL is an optional parameter.
NOWAIT	n/a	Returns the prompt before the command is finished, on-screen status is not visible. NOWAIT is an optional parameter.

Note: In this table N/A is an abbreviation for not applicable.

Software operation

For a summary of the software operation of the ESA feature package and a list of the specified features, refer to *Extended Peripheral Module Translations Reference Manual*, 297-8321-815.

Intracalling during ESA mode

Intracalling provides the capability of switching calls at the remote location during ESA mode.

The number of designated intracalling channels on the RLCM determines the number of intra- and interswitched calls that the system supports during ESA. The number of channels depends on the number of equipped DS-1 ports available and the number of DS-1 links the system uses for host communication.

During ESA mode, the system handles intracalling through the ESA processor. The ESA processor contains part of the translation data in the DMS CC.

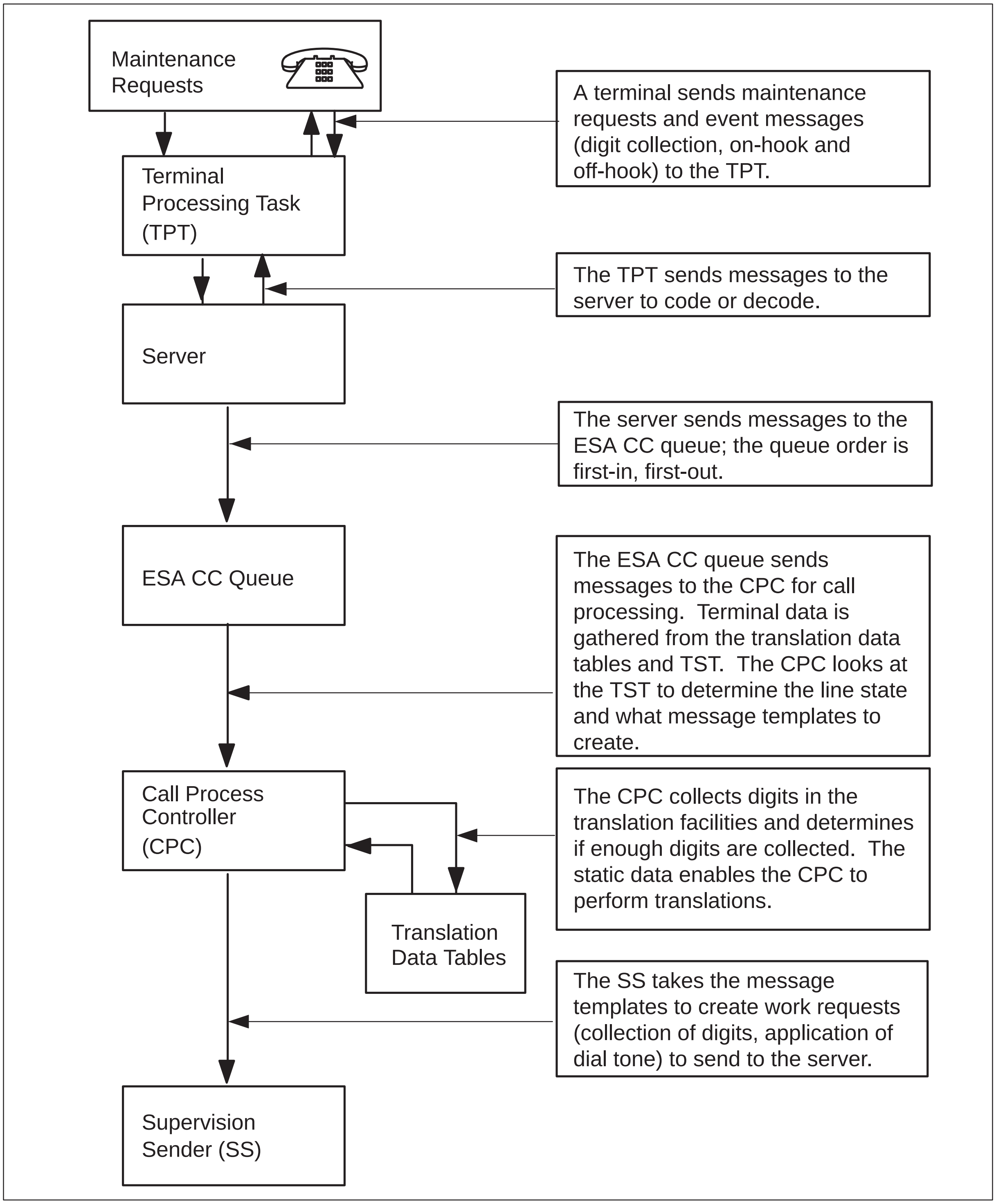
ESA call processing

When the RLCM is in ESA mode, the ESA CC handles line-to-line call processing. Refer to the figure ESA CC Basic Call Processing Structure.

The ESA CC has one queue. The system sends the messages from the server to this first-in first-out queue for call processing. Before call processing begins, terminal data are required. Terminal data are gathered from the static data downloaded from the DMS CC and the dynamic data from the terminal status table (TST).

Refer to the figure “ESA CC basic call processing structure” for a diagram of the queues.

ESA CC basic call processing structure



Terminal status table

The TST has an entry for each line appearance the ESA processor can handle. Each entry has 2 bytes and each byte contains a data structure. The two data structures are:

- Unprotected line data (ULD): The ULD helps the ESA CC decide what action to take when an event message arrives from a terminal. An event message establishes or changes a line state. The ULD also keeps track of errors that a line generates during call processing.
- ESA call process block (CPB): The ESA CPB stores the number of re-origination attempts for a line. After the completion of an origination, the TST stores the index of the call in a CPB.

Every line can have several call processing line states. The call processing line states determine what the system does with a specific message. The ESA CC first screens the line states of the messages. The call process controller (CPC) handles the lines in the idle, originate, abandon, or lockout states. The CPC also handles the lines in the call-processing-busy state. These lines are processed based on the call processing state in the CPBs of each line. The CPC ignores the lines in the system busy (SysB) or manual busy (ManB) states.

Refer to the following figure for a diagram of the TST.

Terminal status table

Line	Byte 1								Byte 0							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
0	Error count/cause				Line state				CPB index/origination count							
•	•				•				•							
•	•				•				•							
•	•				•				•							
•	•				•				•							
640	Error count/cause				Line state				CPB index/origination count							

The first byte (unprotected line data) in the TST is divided as follows:

- Error count/cause: The first 4 bits contain the count of the errors that line software detects. Each error increases the count. If the error count reaches a preset threshold, the system takes the line out of service. The last cause of the error is recorded in place of the error count.
- Line state: The last 4 bits contain the current state of the line. The line states are:

— ManB: The line is ManB. Service is suspended to the line. The system ignores messages from the line. Calls cannot terminate to this line.

— Idle: The line is equipped. The line is call-processing idle. The line looks for an off-hook condition. Origination messages from the line are treated as a call origination, and calls can terminate to this line.

— Originated: The line originates a call, but resources are not available to service the line. If the line remains off-hook, the line originates the call again after a 1 s delay. If an on-hook message is received before the 1 s timer expires, the line goes to the abandon state. The line can originate again three times before the line goes to the lockout state. Calls cannot terminate to this line.

— Abandon: The line waits for another origination attempt. Off-hook or on-hook messages put the line in the idle state. When in the idle state, idle scan for an off-hook condition starts. Calls cannot terminate to this line.

— Call processing busy: The line is in a call-processing-busy state. In this state, a CPB associates with the line. The associated CPB index is in the second byte of the TST. The system directs messages, that the line generates, to the associated CPB index. Calls cannot terminate to this line.

— Lockout: The line is not involved with an active call. A CPB does not associate with the line, but the line is monitored for an on-hook condition. An on-hook message causes the line to return to an idle state. When in the idle state, the idle scan for an off-hook condition starts. Calls cannot terminate to this line.

— SysB: The system detects too many errors on the line. The line is put out of service. The last cause of the error is stored in the error count/cause byte of the TST. The system ignores messages from the line.

The ESA line-audit process returns the line to service.

The second byte in the TST contains the CPB index/origination count. A CPB is the data base that associates with an active call process. An adequate number CPBs are available to handle the maximum number of intra- and interswitched calls. The number of ESA calls that the system supports is less than the number of lines that the system supports. This state results in not enough available CPBs for the available channels. The signaling states and call processing data that comprise the CPB are:

- CPB states:

— Call processing idle (CP_Idle): The start-up state before call processing. The line resources (DTR and connection) are requested.

- — Dialing: The SERVER receives the digits. Digit translation occurs when the system receives a digit report.
- — Routing: This is a changing state from Dialing or CP_Idle to another state.
- — Revertive wait for on-hook: This call is revertive. The system waits for the call originator to go on-hook before the system applies ringing.
- — Ringing: The system applies ringing to the call terminator. The system supplies audible ringing to the call originator. If the call is a revertive call and the office is equipped for coded ringing, the system applies a ring splash to the opposite side of the terminator.
- — Talking: a voice connection between the call originator and terminator. The tip and ring return relay are restored for semipost-paid coin line.
- — Originator disconnected: The originator goes on-hook first. The originating line is idled. Supervision continues on the terminating line.
- — Terminator disconnected: The terminator goes on-hook first. The terminating line is idled. Supervision continues on the originating line. Lines with cutoff on disconnect feature have the cutoff relay operated.
- — Release originator: A changing state in which the originator is released from call processing.
- — Busy: The system applies a busy tone to the originating line. Supervision and timing occur on the terminal.
- — Reorder: The system applies a reorder tone to the terminal. Supervision and timing occur on the terminal.
- — Coin disconnect supervise: The originating coin line goes on-hook first. The system implements the coin release function. Call processing waits for the result of the coin function. Supervision continues on the terminating line.
- — Coin disconnect: The terminating coin line goes on-hook first. The system implements the coin release function . Call processing waits for the result of the coin function.

- call-processing data:
  - — Digit count/digit registers: The registers contain digits that the system collects. Digit count indicates the number of collected digits.
  - — Routing information: This byte contains the results of digit translation. The possible results include the following types of termination:

  - regular
  - automatic line
  - revertive
  - hunt group
  - reorder termination
  - busy
- Terminator line character: The byte is the result of the digit translation.
- Terminator ring character: The byte contains the ringing characteristics as a result of digit translation.
- Originator revertive ring character: The byte contains the ringing characteristics of digit translation.
- Originator, terminator, DTR: the channel numbers of the three types of terminals that use channels in an active call.
- Translation and audit-specific data: the data that translations use as flags for audits on a CPB during the digit collection phase.

Call channel management

The calls at an RLCM in ESA mode are intra- or interswitched. An intra- or interswitched channel is required to complete a call. If an intra- or interswitched channel is not available, the TPT sends a channel-blocking message to the ESA CC. The originator of the call receives a reorder tone.

Digitone receiver management

The ESA processor must have the location of DTRs in the RMM. The system downloads the DTR data with the static data. Because digitone receivers are allocated in a round fashion, receivers get equal distribution. The following steps explain the use of a receiver.

1. When a line goes off-hook to originate a call, a receiver is requested.
2. If the system finds an unassigned receiver, the receiver is marked, not free, and is assigned to the call.

   If every receiver is assigned, the system waits 3 s to locate a free receiver. If after 3 s the system cannot locate a free receiver, the line goes to the abandon state.

3. After the subscriber dials the digits, the receiver is marked free. The receiver is unassigned and ready for use by another call.

The system also frees a receiver when the system receives a dial pulse (DP) digit. The system can receive a DP digit when a DP phone is used on a line entered as Digitone. When the system frees the receiver, DTR use is maximized.

ESA CC supervision sender

The ESA CC uses a streamlined set of execs to handle call processing. The system loads the definition of execs in the ESA exec lineup at the exec download time of the RTS sequence. The supervision sender uses the execs to create work requests for the server.

ESA translation data

When the RLCM is in ESA mode, the ESA CC uses part of the translation data from the DMS CC to perform translations. The DMS CC downloads this part of the DMS CC data, required for ESA call processing, to the ESA CC. This type of translation data is static data. The system generates ESA logs when the downloaded data exceeds the RLCM ESA maximum. Refer to *Translations Guide* for additional information about ESA translations.

The ESA CC requires two types of static data:

- general XPM-type
- ESA translations

The user downloads the general static data when the ESA CC is ManB. The system can download the general static data when the ESA CC returns to service. The system loads ESA static translations data when the ESA CC is in service (InSv).

Downloading the ESA processor

Translation data is downloaded to the ESA processor as follows:

- manually: The LOADPM command downloads data to the ESA processor.
- during return to service (RTS): The RTS command downloads data to the ESA processor if the processor cannot perform call processing with current data.
- automatically: The data are loaded during daily updates of the ESA processor as specified in the RLCM_ESADUPD_HOUR office parameter.

Supported subscriber line types

During RLCM ESA mode, the supported subscriber line types are POTS and MDC.

POTS line types

Supported POTS line types include the following:

- 1FR - single party flat rate
- 1MR - single message rate. The lines are treated the same as single party flat rate lines.
- 2FR - two parties flat rate
- 4FR - four parties flat rate selective. Does not include ANI
- 8FR - eight parties flat rate semi-selective. Does not include ANI
- 10FR - multi-party flat rate. Does not include ANI
- CCF - coin coin first service. The unit returns the coin to the caller.
- CDF - coin dial tone first service. The unit returns the coin to the caller. The CDF telephones cannot make *911* or *0* calls while in ESA mode if the caller does not deposit the coin first.
- CSP - coin semi-postpay service. The unit does not return the coin to the caller. A coin is not required to enable a speech path.
- PBX lines - private branch exchange (PBX) message rate lines are treated as PBX flat rate lines.

MDC lines

Supported MDC line types include the following:

- loop and ground start lines
- 500 and 2500 set
- Meridian business set (MBS). The MBS is treated as a 2500 set. The primary directory number (PDN), HOLD and RELEASE keys are supported.
- digital data unit (DDU). The PDN, HOLD and RELEASE keys are supported. Modem pooling does not occur.
- lines with cutoff on disconnect option (Cutoff relay operates for 300 ms).

Supported subscriber services

During RLCM ESA mode, the supported subscriber services are POTS and MDC.

POTS subscriber services

The POTS services provided include the following:

- one home numbering plan area (HNPA) code for each RLCM
- services for single party, multiparty, coin and PBX lines

- three to seven digits local dialing plan
- a maximum of 16 prefix or special numbers per RLCM with a maximum of 15 digits each for special termination (for example, 0-, 0+, 411, and 911.)
- invalid or vacant terminations that the system routes to reorder or announcement termination

MDC customer group services

The MDC services include the following:

- maximum 640 members in a customer group
- maximum 32 customer groups for each RLCM
- a maximum of eight prefix or special numbers per RLCM with a maximum of 15 digits each for each customer group (for example, 0+, 411, 9+ that has or does not have second dial tone, prefix fence, and ambiguous numbers)
- station-to-station dialing for one- through six-digit extension numbers
- denied incoming call for a station
- direct outward dialing that has or does not have second dial tone for termination to another customer group or POTS lines in the same RLCM
- inter-customer group calling by the same dialing plan (except lines with the denied incoming option)
- primary numbers of the multiple appearance directory number (MADN) groups are treated as standard MDC lines
- multiple centrex customer dialing plans

Channel configuration

On ESA entry, the C-side channel map of the RLCM is configured again to provide more interswitch channels for ESA call processing.

Inter- and intraswitch channels make call connections through the RLCM. These connections do not involve a host connection. The inter- and intraswitch capability allows call processing to continue in ESA operation.

On RLCM ESA entry, the RLCM channels are configured as if the DS-1 ports are not equipped except for primary ports 0 and 1. Ports 0 and 1 must be equipped in RLCM ESA.

Through reconfiguration of the C-side channels on ESA entry, more interswitch channels are available for unit-to-unit calls. Refer to the following table for a list of the channel breakdown in RLCM ESA.

Channel availability after ESA entry

Port number	Number of intra channels	Intra channels	Number of inter channels	Inter channels
0	6	2, 7, 12, 18, 23, 28	0	none
1	6	2, 7, 12, 18, 23, 28	0	none
2	18	2, 3, 5, 7, 8, 10, 12, 13, 15, 18, 19, 21, 23, 24, 26, 28, 29, 31	12	1, 4, 6, 9, 11, 14, 17, 20, 22, 25, 27, 30
3	18	2, 3, 5, 7, 8, 10, 12, 13, 15, 18, 19, 21, 23, 24, 26, 28, 29, 31	12	1, 4, 6, 9, 11, 14, 17, 20, 22, 25, 27, 30
4	18	2, 3, 5, 7, 8, 10, 12, 13, 15, 18, 19, 21, 23, 24, 26, 28, 29, 31	12	1, 4, 6, 9, 11, 14, 17, 20, 22, 25, 27, 30
5	18	2, 3, 5, 7, 8, 10, 12, 13, 15, 18, 19, 21, 23, 24, 26, 28, 29, 31	12	1, 4, 6, 9, 11, 14, 17, 20, 22, 25, 27, 30

Through reconfiguration of the C-side channels on RLCM ESA entry, the RLCM does not gain channels. The RLCM does gain in the number of interswitch channels offset by a decrease in the number of intraswitch channels.

Exiting RLCM ESA mode

After communications restore, the DMS CC recovers the RLCM from the ESA mode. When the RLCM exits ESA mode, the active calls go out of service. This action is a cold exit.

When C-side communications restore between the RLCM and the DMS CC, the DMS CC initiates the ESA exit sequence. Before the ESA exit sequence begins, the DMS CC communicates with the ESA processor over the nailed-up connection. This communication determines if the RLCM is in ESA mode and if recovery of the RLCM can occur immediately. The two possibilities for the recovery of the RLCM are a system exit or a manual exit.

ESA system exit

A system exit is an automatic exit from ESA mode that the DMS CC requests. This exit does not require operator interference. The DMS CC starts a system exit if the following conditions are present:

- A minimum of one LCM unit of the RLCM is SysB or C-side busy (CBsy).
- The RLCM_XPMESAEXIT office parameter time-out value is not zero.

The following list of steps is the system exit sequence.

1 The C-side communications restore between the DMS CC and the RLCM.

2 The DMS CC discovers the RLCM is in ESA mode.

3 The DMS CC enters ESA time-out mode.

4 When the DMS CC times out, the DMS CC sends an ESA-exit request to the ESA processor.

5 The RLCM and the ESA processor perform exit operations.

6 The ESA processor tells the LCM to return the LCC to normal operations.

7 The ESA processor sends operational measurements, peg counts, and the reason for the entry of ESA mode back to the DMS CC. This information appears in the PM171 log. The system generates the PM181 log if the ESA exit has problems.

8 The DMS CC RTS the RLCM.

9 Return to service the ESA processor and RMM nodes.

ESA manual exit

A manual exit is an exit from ESA mode that operating company personnel start at the LCM MAP level through the RTS command. A manual exit is required if one of the following conditions are present:

- The two LCM units of the RLCM are in a ManB state.
- The RLCM_XPMESAEXIT office parameter time-out value is zero.

Operating company personnel override a time-out value other than zero to start a manual exit. Operating company personnel busy the LCM units of the RLCM at the LCM MAP level to override the time-out value. Personnel must use the FORCE option with the BSY command.

The following steps describe the manual exit sequence:

1. The C-side communications between the DMS CC and the RLCM restore.
2. The DMS CC discovers that the RLCM is in ESA mode.
3. The DMS CC queries the RLCM for the number of active calls.
4. The DMS CC displays the number of active calls on the MAP display and queries the operating company personnel if ESA-exit is desired.
5. If operating company personnel confirms to the DMS CC that ESA-exit is desired, the DMS CC sends the ESA-exit request to the ESA processor.
6. If operating company personnel does not want to continue with the ESA-exit, the RLCM is left ManB. The RLCM stays in ESA mode.
7. The RLCM and the ESA processor perform exit operations.
8. The ESA processor tells the LCM to return the LCC card to normal operations.
9. The ESA processor sends operational measurements, peg counts, and the reason that the RLCM dropped into ESA mode to the DMS CC. This information appears in the PM171 and PM181 logs.
10. The DMS CC RTS the RLCM.
11. RTS the ESA processor and RMM nodes.
12. Receiver off-hook

Tones during ESA mode

The ESA clock and tone card (NT6X75AA) provide five continuous tones when an RLCM is in ESA mode. The LCM interrupts these tones to give specified types of tones as the system requests. The tones appear on channel 16 on the incoming C-side ports of the RLCM. The following table shows the RLCM ESA tones, channel appearance, and cadence.

RLCM ESA tones

Tone type	Tone ID	Channel appearance		Cadence (in seconds)	
	(HEX)	Port	Channel	On	Off
Busy	81	1	16	0.5	0.5
Reorder	82	1	16	0.25	0.25
ROH*	83	2	16	0.1	0.1
Audible	80	4	16	2.0	4.0
Warble	8D	5	16	2.0	4.0
Dial	06	7	16	N/A	N/A

Note: Idle tone uses a start-cadence message, but the RLCM connects the receive path to a port that provides idle tone.

Providing tones

The following steps provide tone to a subscriber:

1 The ESA processor sends a start-cadence message to the ESA clock and tone card. This message specifies the tone required, the terminal identification and the cadence times.

2 On receipt of the start cadence message, the ESA clock and tone card perform the following:

   a. If necessary, the current receive path connection of the terminal is broken.

   b. The receive path of the terminal connects to the appropriate port.

   c. The specified cadence for that tone is set up.

The following steps clear the tone:

1 The ESA processor sends a stop-cadence message to the ESA clock and tone card. This message specifies the terminal identification.

2 On receipt of the stop cadence message, the ESA clock and tone card send stop-cadence messages to the LCM. The LCM must disconnect the terminal connection to the correct port and channel 16.

Ringing during ESA mode

The RLCM requires duplicate ringing generators. The ringing types supported during RLCM ESA mode are:

- coded ringing
- frequency ringing
- superimposed ringing
- immediate ringing

Treatments during ESA mode

The treatments supported during RLCM ESA mode are:

- busy tone
- reorder tone
- receiver off-hook (ROH) tone

ESA limits

The following limits apply to the RLCM in ESA mode.

Limits during the ESA mode

Limits during the ESA mode for POTS lines and features are:

- The system supports the three to seven digit POTS dialing plan.
- The system supports one home number plan area (HNPA) code for each RLCM.

Limits during the ESA mode for MDC lines and features are:

- The system supports the MDCXLA translation selector (number of digits in the extension number) for station-to-station calling. If the selector does not receive data, the system uses POTS translation.
- The system does not support network class of service (NCOS) for MDC lines. Customer groups or lines are restricted to a dialing plan that is common to every customer group.
- For support during the ESA mode, the primary number of a MADN group must be an MDC business set PDN key or a 500/2500 Set directory number.

  Note: The system does not support every MDC and POTS feature or line.

Restrictions during ESA mode

Global restrictions during ESA mode are:

- The system does not support line diagnostics while the RLCM is in ESA mode.
- The system does not provide ESA mode for a convertible RLCM.
- The system does not support MADN group operation.
- The system does not support recorded announcements.

Restrictions during ESA mode for POTS lines and features are:

- The system does not support local call detail recording (LCDR).
- The system does not support local automatic message accounting (LAMA).
- The system does not support centralized automatic message accounting (CAMA).
- The system does not support remote register signal distributor point lines.
- The system does not support dial tone speed operational measurements (OM).
- The system does not support teletypewriter exchange service (TWX).
- The system does not support foreign exchange calls.
- The system does not support equal access features.

Restrictions during ESA mode for MDC lines and features are:

- The system does not support station message detail recording (SMDR).
- The system does not support attendant consoles.
- The system does not support custom calling features. These features include:
  - flashing
  - conference calls
  - digital data unit (DDU) feature keys. Action does not occur when the caller presses feature keys.
- The system does not support remote meter pulsing lines.
- The system does not support MDC electronic business set feature keys. Action does not occur when the caller presses feature keys.
- The system does not support party line circle digits.

- The system does not support automatic number identification (ANI).

Fault conditions

The fault condition of unusable communication links triggers the ESA mode of operation. The possible reasons for this fault condition appear in the following paragraph.

Unusable communication links

Communication links from the RLCM to the DMS CC become unusable because of the following conditions:

- The links are severed between the RLCM and the host.
- The peripheral side (P-side) message link (DS-1 cards) of the LTC are pulled out.
- The C-side message link (DS-1 cards) of the RLCM are pulled out.

The RLCM_ESAENTRY_BADLINK office parameter determines the desired delay time between failure of the C-side message link and the entry of ESA mode.

Looparound message audit failure

The RLCM enters ESA mode when the looparound message audit detects the failure of messaging between the RLCM and the DMS CC. The failure occurs because of the following conditions:

- An extended loss of communication occurs with the DMS CC for longer than the time-out period specified in the RLCM_ESAENTRY_BADCSIDE office parameter.
- The two LTC units (C-side peripherals) are ManB.
- Network planes of the LTC or LGC are ManB.

The RLCM_ESAENTRY_BADCSIDE office parameter determines the desired delay time between the failure of RLCM communication with the C-side peripheral and entry of ESA mode. The delay time does not allow the RLCM to enter the ESA mode while the system performs a restart. A restart causes the looparound message to fail. The RLCM enters ESA mode if the looparound messages in the time-out period fail.

Fault conditions that can occur during ESA operation are as follows:

- line errors
  - too many originations
  - confusion message received
  - line translation error

  - dial pulse error (bad digits)
  - Digitone error (bad digits)
  - ringing error
  - coin error
- faulty Digitone receivers
- static data failure

Audits correct these fault conditions. The following section on automatic maintenance describes these conditions.

Automatic ESA maintenance

When fault conditions occur, the host switch and the RLCM initiate audits and other system processes to clear the fault. For ESA maintenance, the automatic features are:

- line audits
- DTR audits
- downloading static data
- routine exercise (REX) tests
  - read only memory (ROM) diagnostics
  - read access memory (RAM) diagnostics

ESA line audits

The ESA line audit process returns SysB lines to service after a specified period of time. In ESA mode, a line is SysB when excessive errors occur.

Each time an error occurs on a line, the error count for that line increases. If the error count reaches a preset threshold, the line becomes SysB. The last cause of error is in the TST.

A line in a SysB state cannot originate or terminate a call. The ESA resources are not tied up. The line audit process returns the SysB lines to service. This process makes sure that service is available to a line with a transient fault.

Digitone receiver audit

The DTR audit monitors the status of the Digitone receivers. If a call process possesses a DTR for longer than two audits, the audit terminates the process. A cleanup process starts for the CPB. The audit also marks the DTR as free, which make the DTR ready for use.

Error tracking detects receivers that are defective. Before a receiver is unassigned, an error count check occurs. When a preset error threshold is reached, the audit takes the receiver out of service. An audit returns the receiver to service and sets the error count to zero.

Automatic static data downloading and system maintenance

The system loads the ESA CC with static translations data. The system or operating company personnel can download this data after ESA RTS when the ESA CC is InSv.

At a time that the office parameter RLCM_ESADUPD_HOUR determines, the system updates the static translations data in the ESA CC. The system performs the equivalent to the LoadPM CC ESADATA command in sequence on each RLCM with the ESA option. This ESA option is set in table LCMINV.

> ***Note:*** The RLCM must not be on the same static update hour as a host Remote Switching Center (RSC). The static data becomes corrupted.

If the RLCM runs another maintenance function at the automatic update time, the automatic update process waits 30 s for the function that now runs, to finish. If the function runs after 30 s, the RLCM goes to in-service trouble (ISTb) status. The reason for the ISTb is ESA STATIC DATA.

If the automatic update process fails during the loading of the static data, the RLCM goes to SysB status. If a failure occurs when the system downloads a table, the system generates an ESA log, ESA101 through ESA107. Each log identifies and describes the table that fails to download. The system does not download the remainder of the tables. The RLCM goes to SysB status and receives a reason of ESA DATA.

> ***Note 1:*** The RLCM cannot enter ESA while the system loads the static data.
>
> ***Note 2:*** If the RLCM is out of service during the daily update, the system updates the data as part of the normal RTS sequence.

Routine exercise test

The REX tests are a series of tests performed on the ESA hardware. This hardware is not in use while the ESA processor provides normal service. These tests can occur at regular intervals or through the test (TST) command with the REX option. These tests require that the LCM units of the RLCM, RMM and ESA processor are InSv.

The REX test tests the ability of the LCM units to enter and exit ESA mode. The REX tests also test the ability of the LCM unit to send messages to the ESA processor while in ESA mode. An REX test tests one LCM unit at a time. Tests of the two units at one time can result in a loss of service for connected calls. While the REX test tests one unit, the other unit continues call processing in the takeover mode.

The system tries to prevent accidental attempts to perform maintenance on an LCM unit that is in ESA mode. To prevent maintenance on an LCM, the system runs a lockout task on the LCM unit that the REX tests. The lockout task is the same task used in an ESA exit. Lockout does not perform maintenance.

Takeover and takeback on an LCM unit affects calls that the system starts to connect. These processes do not affect connected calls. The LCM unit returns to service before a REX test tests the other unit.

The following actions occur during a REX test:

1 An REX test tests the messaging ability of the peripherals, ESA module, LCM units, and RMM. If one of these preliminary tests fails, REX tests are not run.

2 If the preliminary tests pass, one LCM unit goes to the ESA mode and the other unit goes to the takeover mode. The unit in the ESA mode has messaging links switched from the host to the ESA module.

3 The ESA processor tests the ability of the LCM units to message to the ESA module under ESA conditions.

4 The system performs other diagnostics on the ESA module. Other diagnostics are the tones test, and a comparison of LCC control and 6X75 status bytes.

5 After the tests are complete, the unit goes out of the ESA mode and returns to service.

6 If the REX tests pass, the system tests the ESA module that use the other LCM unit.

ESA ROM diagnostics

The ESA processor is provided with a ROM diagnostic test. Operating company personnel can use the LOADPM command to implement this test.

This test consists of the standard XPM ROM tests, which test the processor and memory complex, and basic messaging functions. The messaging functions are the DMS CC to ESA processor messaging capabilities.

ESA RAM diagnostics

The ESA processor is provided with a RAM diagnostic test. Operating company personnel can use the TST command to implement this test. The system can also implement this test during an RTS. The ESA RAM diagnostic test consists of the following tests:

- a message test
- a 6X75 card test, which tests the following functions:
  - — 6X75 status to ESA processor
  - — ESA processor to 6X75 control
  - — A-bus interface to ESA processor and memory
  - — frame interrupt generator
  - — clock synchronization hardware
  - — tone generator
  - — ESA messaging hardware
- the 6X75 card test, which includes the following:
  - — status and control test
  - — RAM test
  - — frame pulse interrupt test
  - — 10.24 Mhertz voltage controlled crystal oscillator (VCXO) clock test

Escalation to manual maintenance

Manual maintenance can be required for certain testing conditions. The following paragraph describes these conditions.

Loading ESA static translations data

This section describes how to manually load the ESA processor with static translations data. Static translations data are part of DMS CC translation data that the system downloads to the ESA processor.

The steps to manually download static data are:

1. Display the ESA MAP level for the desired RLCM.
2. Make sure the ESA processor is InSv or ISTb
3. Type: **>LOADPM CC ESADATA**
4. Press: ENTER

If this process fails, the ESA processor becomes SysB.

ESA manual exit

Operating company personnel can use the RTS command to perform a manual exit from the ESA mode at the LCM MAP level. A manual exit is required under the following conditions:

- The two LCM units of the RLCM are in a ManB state.
- The time-out value for the RLCM_XPMESAEXIT office parameter is set to zero.

  Note: To manually override a time-out value other than zero, manual-busy the LCM units of the RLCM at the LCM MAP level. This process starts a manual exit. Use the FORCE option with the BSY command.

The manual exit sequence is described in the “ESA manual exit” section of this document.

LTC maintenance to prevent ESA mode

When the two LTC (C-side peripheral) units are ManB, communication between the RLCM and DMS CC is interrupted. When communication between the RLCM and the DMS CC is interrupted, the RLCM enters ESA mode. The RLCM enters this mode after the time-out period in the RLCM_ESAENTRY_BADCSIDE office parameter expires. The warning message that occurs during attempts to manually busy an LTC is as follows:

```
This action will take this PM and its subtending nodes out of
service.
```

Busy the RLCM or ESA CC before you place the LTC in a ManB state. This action does not allow the RLCM to go to ESA mode.

Signaling for RLCM

Signaling for RLCM

This section describes the signaling protocols that the Remote Line Concentrating Module (RLCM) uses to communicate with the DMS-100 switch and provide subscriber services. The following sections discuss RLCM signaling and the types of subscriber services the signaling provides.

RLCM signaling links

The DS-1 interface cards (NT6X50AA) are in the host interface equipment shelf. The interface cards are the signaling interfaces between the RLCM and the host XMS-based peripheral module (XPM).

The XPM can be any of the following:

- line group controller (LGC)
- line trunk controller (LTC)
- remote cluster controller (RCC) of a Remote Switching Center (RSC)

Each DS-1 interface card can accept a maximum of two DS-1 links from the host XPM. The RLCM and the host XPM exchange information over the DS-1 links through dedicated message channels. This signaling information allows the RLCM and the host XPM to perform tasks.

The RLCM and the host XPM perform the following tasks:

- communicate the states of subscriber lines
- execute call processing
- set up test configurations
- pass test results

The RLCM depends on the DMS-100 switch (host office). The host office handles all intersystem signaling and operator signaling. Intersystem signaling occurs between the host and the other systems. Operator signaling occurs between the host and the subscriber.

Message channels

The RLCM requires a minimum of two DS-1 links to the host. These links are the primary links. The LCM part of the RLCM requires two message channels to the host XPM.

The LCM message channels occupy channel 1 on each of the primary DS-1 links to the host. The remote maintenance module (RMM) requires two message channels to the host XPM. These channels occupy channel 2 on the primary links.

The emergency stand-alone (ESA) processor requires two message channels to the host. These channels occupy channel 3 on the primary links. If the ESA processor is not provisioned, channel 3 is available for speech traffic.

Signaling protocol

The message channels on the primary DS-1 links have nailed-up connections to the DMS central control (CC). The message channels use the DMS-X protocol to communicate with the host.

The DMS-X is a half-duplex, byte-oriented protocol implemented with a full duplex message channel like the DS-1 links. The LCM processor handles the DMS-X message protocol on message channels to the host.

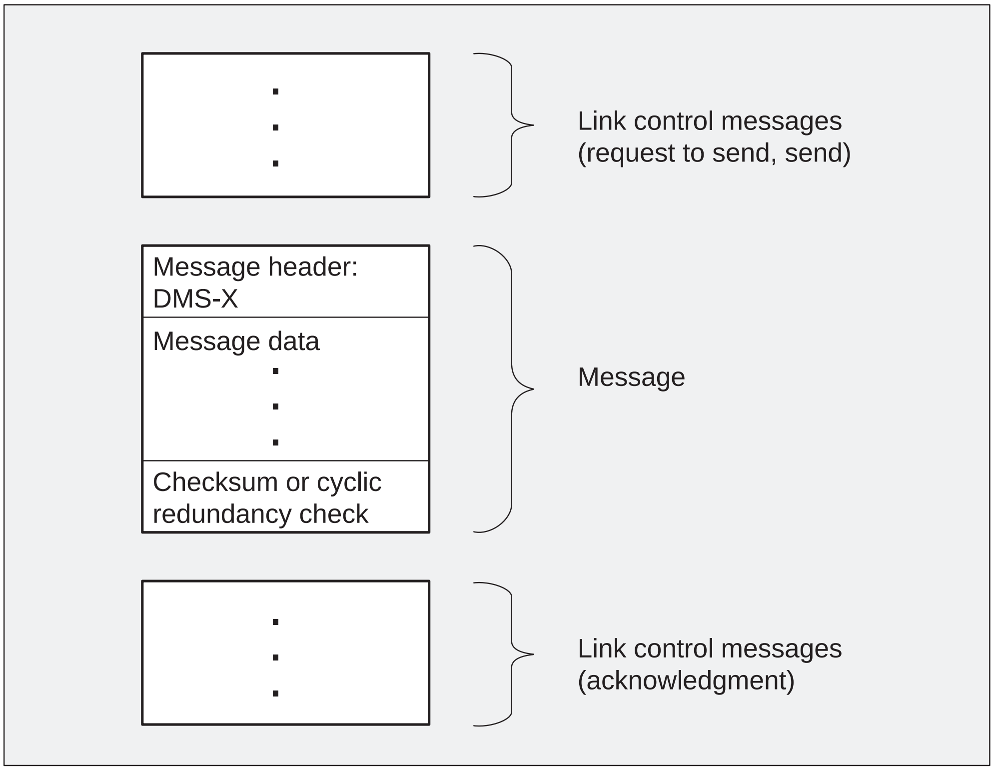
The RMM control card processes DMS-X messages, trunk messages and pulse code modulation (PCM) data. The ESA processor is the interface that communicates with the host XPM. The ESA processor communicates through DMS-X protocol when the RLCM is in ESA mode.

DMS-X protocol

The DMS-X protocol is a state-driven code. This code requires handshake messaging between the RLCM and host at each stage of data transfer. This handshake messaging allows the communicating terminals to delay the message transfer if a terminal is not ready.

The following figure shows a general form of handshaking protocol that makes up DMS-X protocol.

DMS-X handshaking protocol

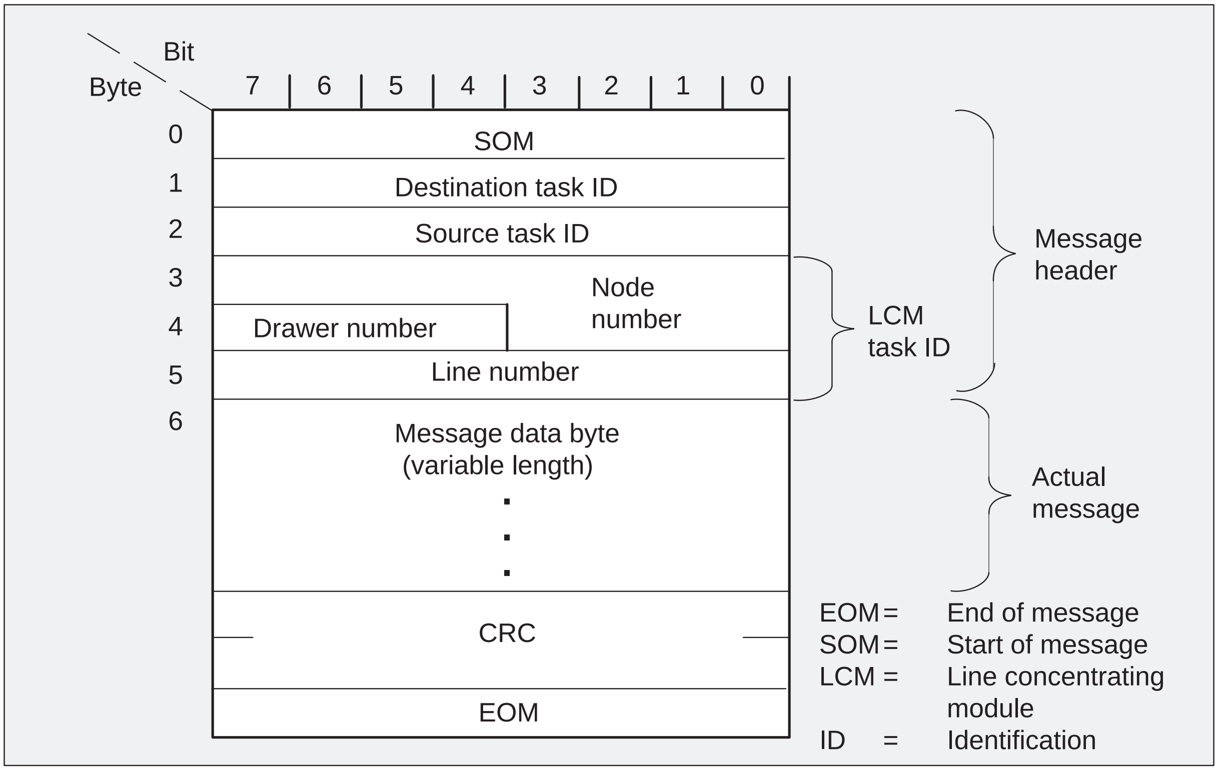


The DMS-X protocol includes a cyclic redundancy check (CRC) code for error detection. Message time-out and message checksum or CRC calculation perform message error detection.

If protocol, checksum or CRC failure occurs on an outgoing message, the sending node attempts the send sequence again. On an incoming message failure, the sending node routes the message over an alternate central-side (C-side) link. Hardware redundancies provide for at least one alternative path to and from a node.

The format of DMS-X messages appear in the following figure.

DMS-X message format



The DMS-X message header is in the first six bytes:

- The first byte specifies the start of message (SOM).
- The second byte specifies the destination task identification (ID) of the message. This ID identifies the process that receives the message in an outgoing message. The process is the task in the LCM.
- The third byte specifies the source task ID. This ID identifies the LCM task that sent the message in an incoming message.
- The next three bytes specify the task ID number.

The number of bytes in the message or data can change. The CRC detects transmission errors. The DRD occupies two bytes. The end of message occupies one byte.

Signaling functions

Signaling supports call processing activities. Signaling allows the functions of call origination, tone generation, digit collection and ringing to occur.

Call origination

Signaling transmits the on-hook and off-hook signals that allow the host XPM to identify subscribers requesting service.

When a subscriber lifts the handset from the cradle, a voltage source provides a steady flow of current through the transmitter. This voltage source is in the RLCM. The LCM processor detects this current and sends an off-hook message to the central office (CO).

The CO interprets the off-hook signal as a request for service. The CO allocates a channel on a DS-1 link to serve the subscriber line. The CO applies dial tone to the line.

The subscriber line transmits open pulses or dual tone multifrequency signals through the RLCM to the CO. The type of telephone determines the type of transmission. The CO analyzes the digits and determines an interoffice call was placed. The system seizes the calling end of the trunk and transmits a connect signal. The system forwards this signal to the called end of the trunk. The signal is a sustained off-hook signal. This signal indicates a request for service and continues as long as the connection holds.

Tone generation

The host XPM provides all correctly cadenced tones that the RLCM applies to subscriber lines. The RLCM only applies these tones to lines if necessary. The tones that the host supports and that the RLCM applies are as follows:

- dial tone
- audible ringing
- warble ringing
- busy tone
- reorder tone
- receiver off-hook (ROH) tone

Digit collection

The RLCM performs the digit collection function of subscriber dialing. The dial pulse or dual tone multifrequency (DTMF) support the types of dialing.

Dial pulsing or multifrequency signaling can transmit the address of a called party. These pulses or signals are used for digit transmission only. These signals must combine with other signals to provide the DS-1 links with complete signaling capability.

Dial pulse signaling The LCM of the RLCM performs dial pulse digit collection. With dial pulsing, the number of on-hook intervals in a train of pulses represents the numeric value of the digits.

Short off-hook intervals separate the on-hook intervals of the digits. Long off-hook intervals separate the digits. The break time expressed as a percent of the pulse period (break + make duration) is the percent break.

The three important characteristics of dial pulsing are speed, percent break and interdigital time. The host XPM analyzes these characteristics and assigns a channel or time slot in the digital line.

DTMF signaling Digitone phones send dial pulse or dual-tone multifrequency signals to transmit address information over a line. During normal operation, the remote maintenance module (RMM) forwards this signal to the host. The ESA operation sends this information to a Digitone receiver in an RMM.

The DTMF signals are specified groups of tones that represent digits (0-9) and many other special units. Special trunk interface circuits decode the tones to digits. The DT and MF receivers are special trunk interface circuits.

The RMM of the RLCM examines the output of these receivers to determine when a digit is received. The RMM relays the digits from the MF receiver to the host XPM. The host XPM analyzes the digits and applies a ringing signal to the called line.

End-to-end signaling

End-to-end signaling allows a subscriber to send DTMF signals to the far end. The subscriber uses the keypad of a Meridian Digital Centrex (MDC) Meridian business set (MBS) to send these signals. The subscriber can outpulse DTMF signals to the machine that start, stop, rewind and playback the recordings on tape at the machine. The subscriber presses fixed keys at the MBS. After each 130 ms DTMF signal, the PCM signal reconnects.

Ringing

The CO determines the type of ringing to employ. The CO sends a ringing signal to the RLCM over the DS-1 channel associated with the line that the subscriber calls. This signal directs the RLCM to connect the ringing generator to the line. The ringing types that the CO provides and that the RLCM applies are as follows:

- bridged ringing (single-party)
- superimposed ringing (multi-party)
- coded ringing (cadencing)
- frequency selective ringing (FSR)

ESA signaling

The ESA feature is an emergency service that provides a subset of call-processing capabilities. The ESA provides these capabilties when a loss of communications to the host occurs. This emergency service includes call processing for basic station-to-station calls in the RLCM for plain-old-telephone-service (POTS) and MDC lines.

The RLCM with the ESA feature package provides the same tones as a functioning RLCM. The tones appear on channel 16 of the incoming C-side ports of the RLCM. The RLCM software provides tone cadence that interrupts the tone. The tone cadence controls the time switch in the link control card (LCC) to interrupt the tone.

To provide a tone in ESA mode, the ESA processor sends a start cadence message to the RLCM. This message specifies the tone required, the terminal identification, and the cadence times.

When a make cadence message is received, the RLCM performs the following steps:

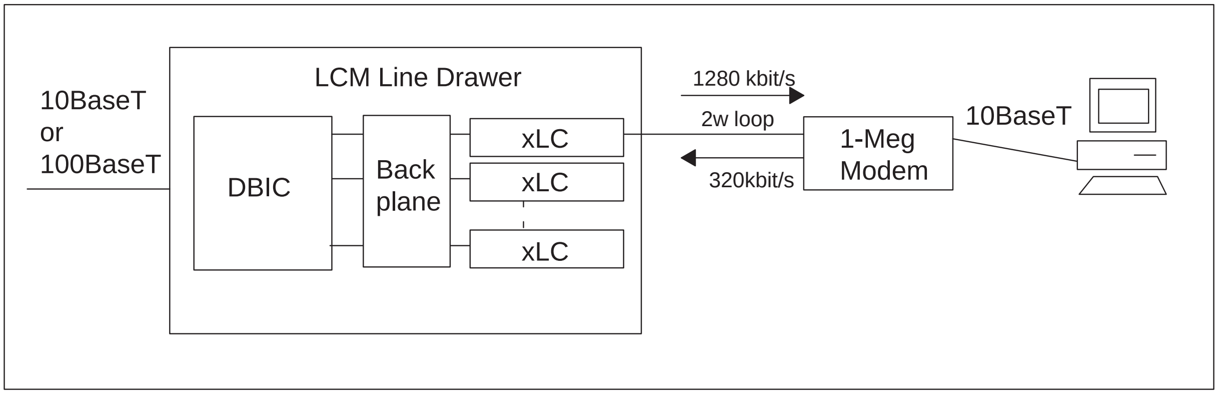
1. Break terminal current receive path connection, if necessary.
2. Connect the receive path of the terminal to the correct port.
3. Set up the specified cadence for the tone.

The idle tone uses the start cadence message. The RLCM connects the receive path to a port that provides idle tone.

1-Meg Modem Service supported protocols

The 1-Meg Modem Service uses several protocols to carry data from the subscriber to the service provider. The following figure illustrates the 1-Meg Modem Service architecture.

1-Meg Modem Service architecture



DBIC

The following section describes the protocols used by the DBIC, xLC, subscriber loop, and 1-Meg Modem.

Ethernet

The DBIC has a half-duplex Ethernet interface on the network side. The DBIC stores downstream frames and transmits the frames to the user. The DBIC only sends frames with MAC addresses that match the MAC addresses of the active users. Similarly, the DBIC stores frames from the user side. The DBIC sends these frames to the network when it receives the whole frame.

The DBIC sends all user traffic out at the Ethernet port. The DBIC does not route traffic between users. This method has the following advantages.

- makes sure that all traffic goes to the correct service provider
- reduces the bandwidth overhead for broadcasts
- improves network security

The 1-Meg Modem Service does not process data above Layer 2. The 1-Meg Modem Service remains at the MAC layer and only uses the Ethernet address. Since the DBIC does not look at the payload carried in the Ethernet frames, except for ARP and BOOTP messages, the DBIC can carry Layer 3 data, such as internet protocol (IP), Internet Packet Exchange (IPX), and Appletalk. However, 1-Meg Modem Service only supports TCP/IP. The 1-Meg Modem Service can support other protocols, such as IPX, if MAC translation is turned off. When you turn MAC translation off, you reduce security and increase the configuration work for the transport network. However, this setup can be acceptable in a campus environment. The maximum transfer unit (MTU) size for the 1-Meg Modem Service is 1500 bytes, the same size that is defined in the ANSI 802.3 standard.

XLBUS

The DBIC uses a point-to-point connection to each line card to exchange voice and data with the xLCs. The extended LBUS (XLBUS) is bidirectional with a total capacity of approximately 1.5 Mbit/s for data traffic. Upstream data, downstream data, and control data share this capacity. The XLBUS carries user data, synchronization and xLC control and status information. The control data carried over the XLBUS allows the DBIC processor to access registers in the xLC. User frames passed by the XLBUS have special Start Of Frame (SOF) and End Of Frame (EOF) control bytes.

xLC and loop

The xLC and subscriber loop use the following protocols.

XDLC

The user data in the xLC is encapsulated into the XDLC protocol, which is based on HDLC.

XLINK

The XLINK frame has a fixed length for robust framing.

XLOOP

The XLOOP includes the details that relate to the modulation used to carry data over the copper loop. In the downstream direction, 256/64/16/4-QAM can be used over narrowband or wideband spectrums providing 1280, 960, 640, 320, 240, 160 or 80 kbit/s of raw data throughput. In the upstream direction, 256/64/16/4-QAM are also used providing 320, 240, 160, 120, 80 or 40 kbit/s of raw data throughput.

1-Meg Modem

The Ethernet interface at the 1-Meg Modem provides a half-duplex 10BaseT or 100BaseT connection. The interface does not filter local traffic and passes all traffic upstream. Only one Ethernet device can connect to the 1-Meg Modem.

RLCM hardware

This chapter describes the Remote Line Concentrating Module (RLCM) hardware components that provide subscribers with the full resources of the digital switching system. The following sections describe the hardware components that comprise the RLCM and include additional components.

RLCM hardware components

A standard DMS frame with four shelves contains the RCLM. The RCLM contains the following components:

- line concentrating module (LCM)
- host interface equipment (HIE)
- frame supervisory panel (FSP)
- remote maintenance module (RMM)

Hardware configuration

The figure “RLCM frame, shelf, and panel arrangement” shows the layout of the RLCM equipment, in a single DMS-100 equipment bay. The external dimensions of the bay are 2208 mm by 685 mm by 457 mm. These dimensions equal 87 in. by 27 in. by 18 in.

Line concentrating module

The LCM is the basic design building block of the remote peripheral group. The central side (C-side) of an LCM interfaces with the host network over DS30A links. The RLCM connects to the host network over two to six DS-1 links through a controller peripheral. Examples of these controller peripherals are a line group controller (LGC), line trunk controller (LTC), or remote cluster controller (RCC).

When the LCM connects to DS-1 links, the LCM can function as an RLCM. In the RLCM, the DS30A ports of the LCM are mapped to DS-1 interface cards that connect to the host office. These DS30A ports are on the digroup control cards (DCC) of the LCM.

The LCM contains two shelves known as line concentrating arrays (LCA). Each LCA contains five line drawers. A fully equipped LCM contains ten line drawers. An LCM supports 640 subscriber lines when fully equipped. Each LCA also has its own control complex, processor and digroup control, and power converter. The control units operate in a load sharing mode. If one of the processors fails, the mate processor takes over complete control of the LCM. If a power converter fails, the power converter that remains supplies power to all line cards of the LCM.

The RLCM contains a two-unit LCM (NT6X04AA or NT6X04AB), mounted in an LCM shelf assembly (NT6X0401). The NT6X04AA contains NT6X51AA processor cards with 64 kbyte of memory and requires the LCM software load. The NT6X04AB contains NT6X51AB processor cards with 256 kbyte of memory that requires the extended memory LCM (XLCM) software load. The circuits contained in the LCM are as follows:

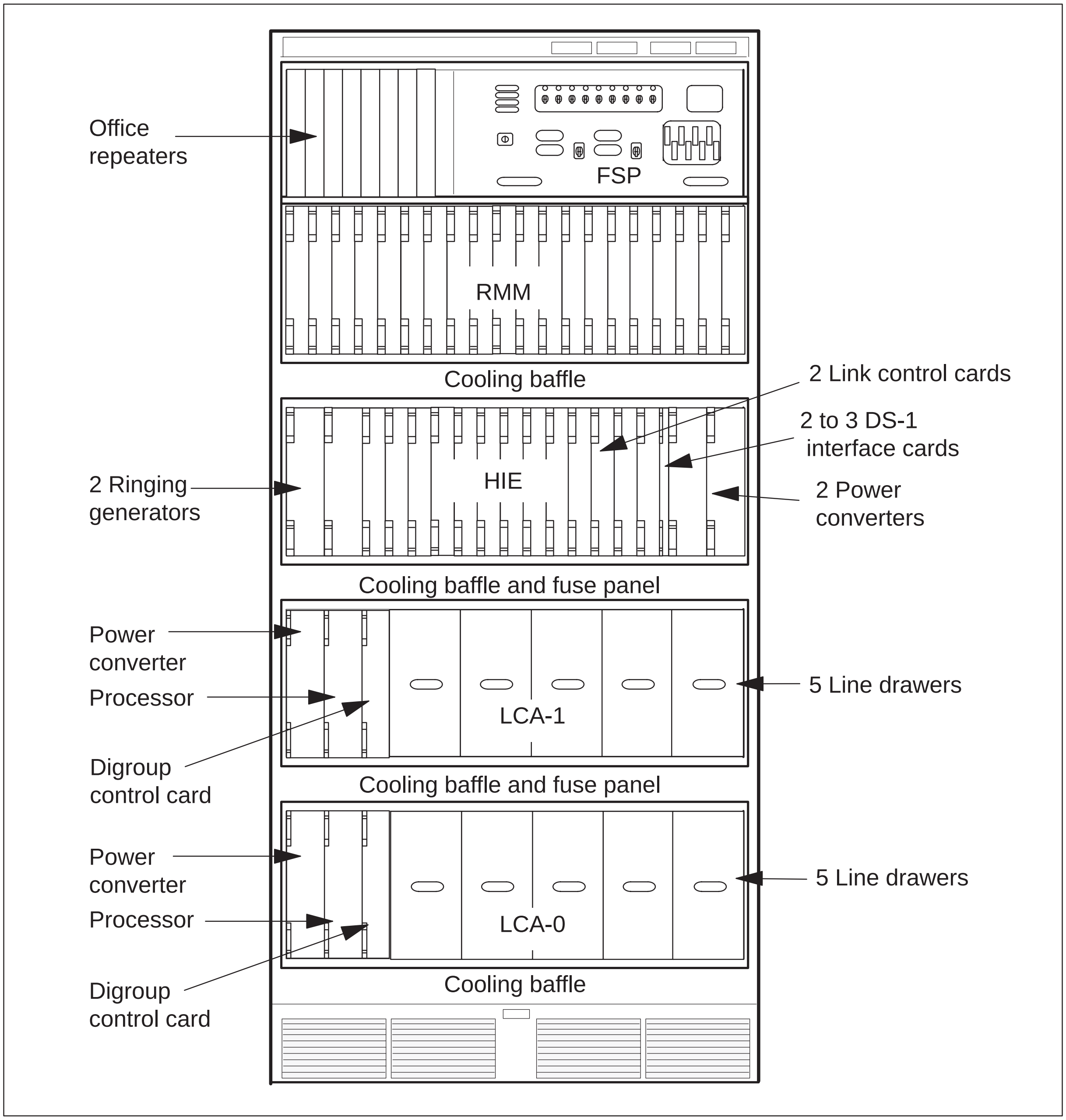
- NT6X53AA—Power converter 5V/15V
- NT6X51AA, AB—LCM processor and extended LCM processor
- NT6X52AA—Digroup controller
- NT6X54AA—Bus interface card (BIC) (up to ten)
- Up to 640 line cards

Line cards

Each one of the ten line drawers of the LCM contains a pair of line subgroups (LSG). Each drawer also contains a single BIC. Each LSG contains 32 line cards that support a maximum of 640 subscriber lines. The subscriber line card types that the RLCM supports are as follows:

- NT6X17AA, AB, AC—Standard line card type A or NT6X17BA—World line card
- NT6X18AA, AB—Line card type B with and without +48 V (coin, PBX, and ground-start)
- NT6X19AA—Message waiting line card
- NT6X20AA—Message waiting power converter
- NT6X21AA, AB, AC—Standard line card type C and Meridian business set line card
- NT6X71AA, AB, AC—Data line card (DLC) DMS-100/SC-100
- NT6X99AA Integrated bit error rate test (IBERT) line card

RLCM frame, shelf, and panel arrangement



Host interface equipment

The HIE shelf (NT6X1101) contains the DS-1 interface cards (NTX650AA) that connect the DS-1 links to the host controller. The HIE shelf also contains the following common circuit cards:

- NT6X60AA—RLCM ringing generator (two)
- NT6X73AA—Link control card (two)
- NT2X70AE—Power converter, ± 5 V, ± 12 V (two)

Link control cards

The link control cards (LCC) in the HIE shelf convert data between DS-1 format to and from the host office. The LCCs also convert data between DS30A format to and from the LCM. The DS30A ports of the LCM are mapped to the DS-1 interface cards in the HIE. The system sends data through the DS-1 links to the host.

The HIE contains one LCC for each LCM unit (LCA shelf). In normal operation, the two LCCs are connected in a different way to even and odd LCAs. If an LCC fails in the HIE, the mate LCA can handle all the DS-1 links.

Each LCC locks the frequency to the primary DS-1 link and functions as a clock. The host LTC/LGC powers both LCC clocks. One of the LCCs is the primary LCC, as directed by the host LTC/LGC. The primary LCC frequency locks to the C-side primary link of the central control (CC). The primary LCC locks to synchronize to the timing downloaded by the host peripheral of the LCC. The other LCC frequency locks to the primary LCC for timing. The LCC clock functions can serve both the DCCs and the RMM.

Frame supervisory panel

The RLCM can have an FSP (NT6X25AA) or a remote FSP (NT6X25BA). The FSP provides interface between the power distribution center in the FSP and the power converters in the LCM. The FSP also contains alarm circuits to monitor under-voltage conditions from the power converters.

Additional RLCM components

HIE components

For the RLCM to function with emergency stand-alone (ESA) capability, the HIE shelf must contain the following cards:

- NT6X45AF—XPM processor card
- NT6X47AC—4Mb master processor memory plus card

- NT6X75AA—ESA clock and tone card

Remote maintenance module

The RMM (NT6X13AB) of the RLCM is an optional component. The RMM is in the RMM shelf assembly (NT6X1301). The RMM is a single-shelf module based on the maintenance trunk module (MTM). The RMM provides maintenance and service capabilities for the RLCM. The RMM consists of two power converters, an RMM control card, a codec and tone card. The RMM also contains space for a maximum of 14 service cards.

The RMM contains one set of common cards (NT6X13AB). The common cards in the RMM are as follows:

- NT2X59AA—Group codec
- NT6X74AB—RMM control
- NT2X06AB—Power converter common feature
- NT2X09AA—Multi-output power cards

The RMM also contains the following cards:

- NT2X90AD—Incoming/outgoing test trunk
- NT2X10AC—Line test unit analog
- NT2X11AD—Line test unit digital
- NT2X10BA—Multi-line test unit analog
- NT2X11BA—Multi-line test unit digital
- NT3X09AA, BA—Remote metallic test access
- NT0X10AA—Scan card
- NT2X57AA—Signal distribution

If the RLCM has ESA the RMM shelf also must contain the ESA Digitone receivers (NT2X48).

Convertible RLCM

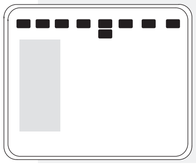
The Convertible RLCM is a temporary configuration that allows later conversion of an RLCM site into a Remote Switching Center (RSC). The feature package NTX622AA supports the Convertible RLCM.

RLCM recovery procedures

This chapter contains a recovery procedure. Use this procedure to restore a Remote Line Concentrating Module (RLCM) to service from a completely out of service condition. Maintenance personnel in a DMS-100/200 office can use this procedure.

RLCM recovery procedure

Application



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nLCM**	.	.	.	.	.
				C					

Application

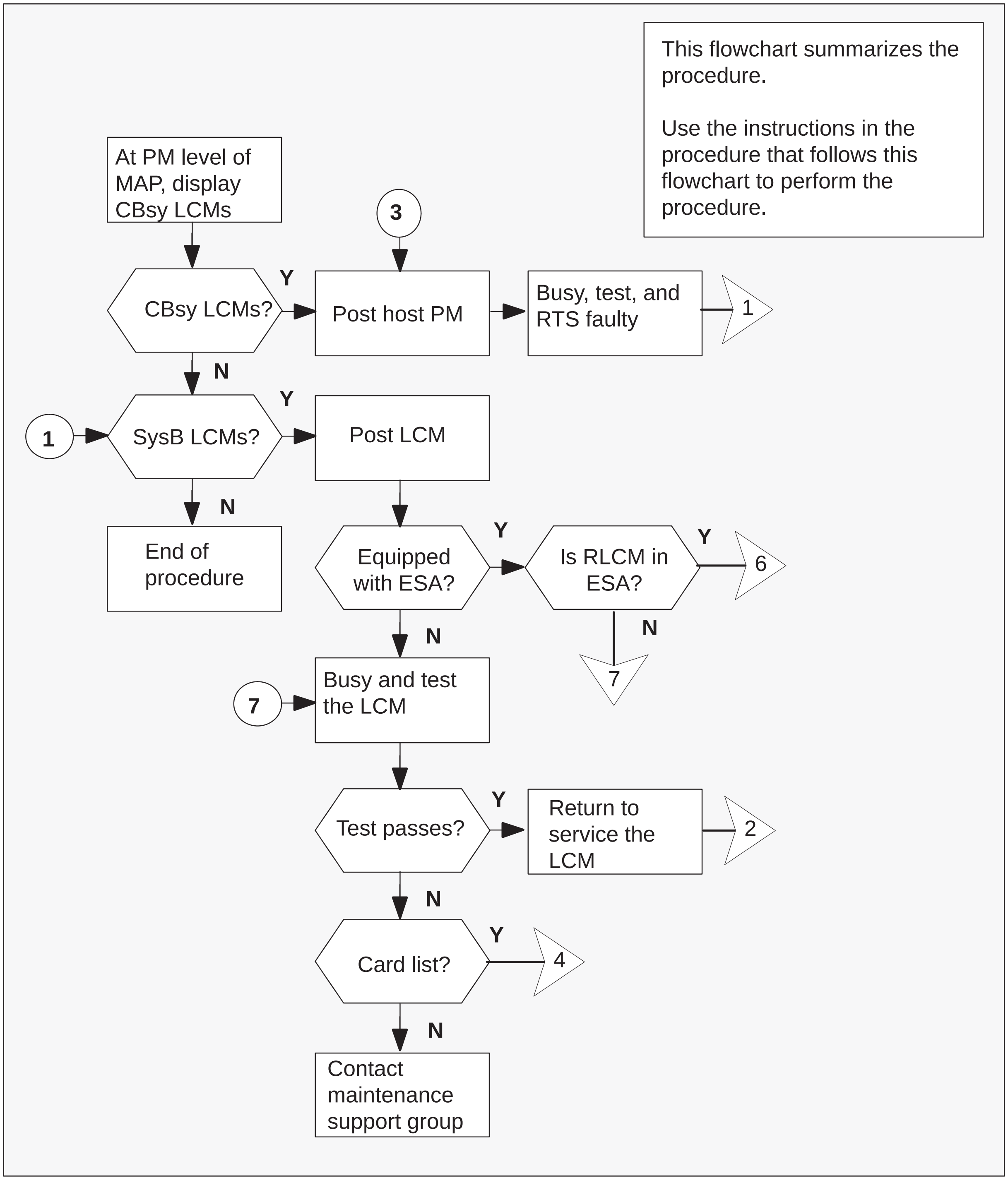
Use this procedure to recover service in an RLCM when both units of the RLCM are out of service (OOS). This condition always produces a central-side busy (CBsy) alarm. Use this procedure only when an alarm clearing procedure refers you to the procedure.

Action

The following flowchart provides an overview of the procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the recovery task.

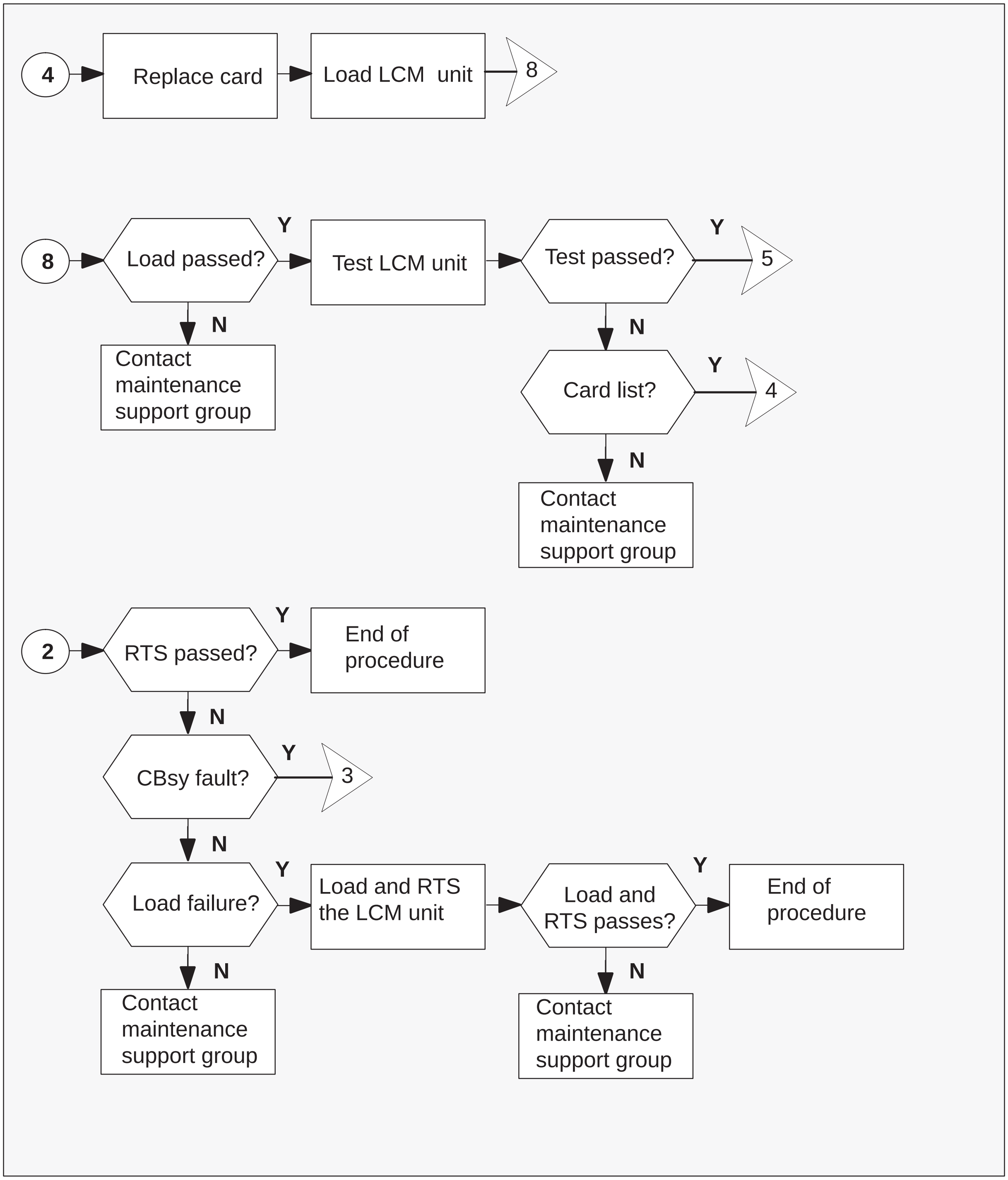
RLCM recovery procedure (continued)

Summary of an RLCM recovery procedure



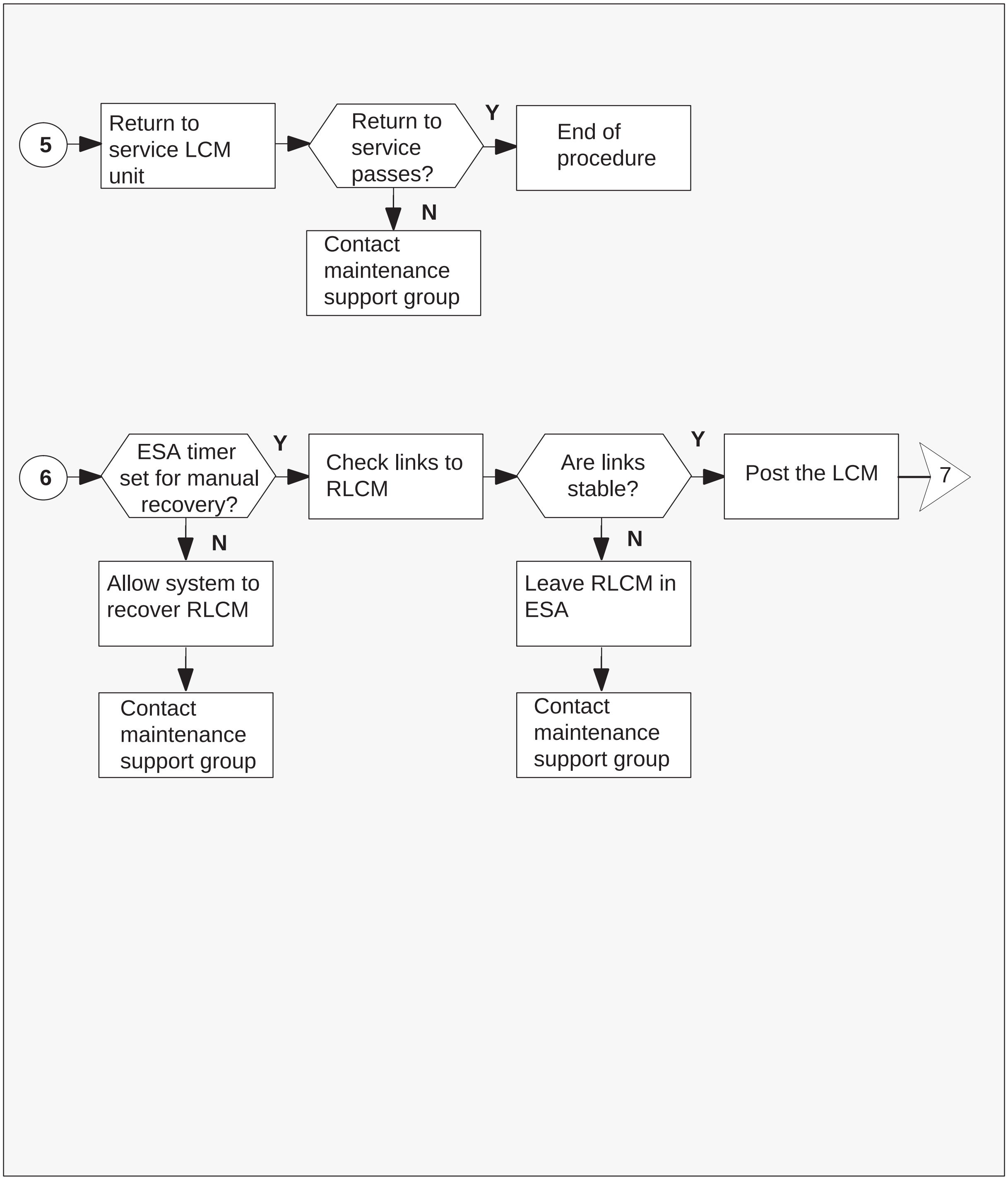
RLCM recovery procedure (continued)

Summary of an RLCM recovery procedure (continued)



RLCM recovery procedure (continued)

Summary of an RLCM recovery procedure (continued)



RLCM recovery procedure (continued)

RLCM recovery procedure

At the MAP terminal

1 To silence an alarm that is still audible, type

>MAPCI;MTC;SIL
and press the Enter key.

2 To access the PM level of the MAP display, type

>PM
and press the Enter key.

3 To identify the defective RLCM, type

>DISP STATE CBSY LCM
and press the Enter key.

If response	Do
shows CBsy LCMs are not present	step 11
shows CBsy LCMs	step 4

4 To post the RLCM with the alarm condition, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0–511)
lcm	is the number of the LCM (0 or 1)

5 To identify central -side (C-side) links to the host peripheral module (PM), type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
0  2; Cap MS; Status: SysB  ;MsgCond: CLS
ink 1: LTC 0  6; Cap MS; Status: SysB  ;MsgCond: CLS
```

RLCM recovery procedure (continued)

6 To post the host peripheral, one of a line group controller (LGC), line trunk controller (LTC) , or remote cluster controller (RCC), type

>POST pm pm_no
and press the Enter key.

where

pm	is the name of the PM (LGC, LTC, or RCC)
pm_no	is the number of the PM

7 To display the P-side links, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
REM1 00 0  0; Cap MS; Status:SysB;MsgCond:CLS
ink 6: LCM REM1 00 0  1; Cap MS; Status:SysB;MsgCond:CLS
```

Record information for the links that have a status other than OK.

8 To busy the link that has defects, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of a peripheral-side (P-side) link with defects identified in step 7

9 To test the busied link, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link that has defects busied in step 8

If test	Do
passes	step 10
fails	step 27

RLCM recovery procedure (continued)

10 To return the busied link to service, type

>RTS LINK link_no
and press the Enter key.

where

link_no	is the number of P-side links with defects tested in step 9

If test	Do
passes and no other links are SysB	step 11
passes but other links are SysB	step 8
fails	step 27

11 To identify the RLCM with defects, type

>DISP STATE SYSB LCM
and press the Enter key.

If response	Do
shows SysB LCMs are not present	step 32
shows SysB LCMs	step 12

12 To post the RLCM with the alarm condition, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0–511)
lcm	is the number of the LCM (0 or 1)

RLCM recovery procedure (continued)

13 To determine if the RLCM is equipped with emergency stand-alone (ESA), type

>QUERYPM
and press the Enter key.

Example of a MAP response:

```
PM Type: LCM  Int. No.: 20  Status index: 9  Node_No: 165
 Memory Size: 256K
 ESA equipped: Yes, Intraswitching is On
 Loadnames:LCMINV XLCM08AX, Unit0:XLCM08AX
 ,Unit1:XLCM08AX
 Node Status: (MACHINE_BUSY, FALSE)
 Unit 0 Status: (MACHINE_BUSY, FALSE)
 Unit 1 Status: (MACHINE_BUSY, FALSE)
 Site Flr RPos Bay_id   Shf  Description   Slot   EqPEC
 TRLC  01 D04  RLCE 00  04    LCM  40  0         6X04AA
```

If RLCM is	Do
equipped with ESA	step 14
not equipped with ESA	step 21

14 To determine if the RLCM is in ESA, check for dial tone at the remote:

- A PM alarm appears on the MAP screen. This alarm indicates the RLCM is in ESA.
- The system generates PM106 logs when the PM goes SysB.
- The system generates PM110 logs for DS1 link alarms.
- A change of state in the PM causes the system to generate the PM128 log.

If the RLCM	Do
has dial tone	step 15
does not have dial tone	step 21

15 Determine if the RLCM has the ESA timer set for manual recovery from ESA. To access table OFCENG, type

>TABLE OFCENG
and press the Enter key.

RLCM recovery procedure (continued)

16 To check the RLCM exit time, type

>POS RLCM_XPMESAEXIT
and press the Enter key.

Example of a MAP response:

```
NAME                          PARMVAL
----------------------------------------------------------
  RLCM_XPMESAEXIT                             3
```

If	Do
PARMVAL is set to zero	step 17
PARMVAL is greater than zero	Allow the system to recover the RLCM. Go to step 27.

17 Before you manually restore the RLCM from ESA, check to see if links to the RLCM are stable. To find the link numbers for this RLCM, type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
            Host XPM P-side link number
                       ▼
LTC 1       0;Cap MS;Status:OK    ;MsgCon:OPN
Link  1:    LTC 1       2;Cap MS;Status:OK    ;MsgCon:OPN
Link  2:    LTC 1       3;Cap  S;Status:OK
Link  3:    LTC 1       4;Cap  S;Status:OK
```

18 To access the CARRIER level of the MAP, type

>TRKS;CARRIER
and press the Enter key.

RLCM recovery procedure (continued)

19 To post the host XPM links and check link conditions for slips and framing errors, type

>POST pm pm_no link_no
and press the Enter key.

where

pm	is a line group controller (LGC), line trunk controller (LTC), or remote cluster controller (RCC)
pm_no	is the number of the peripheral (0 to 127)
link_no	is the number of the link associated with the host XPM (refer to step 17 display)

Repeat the POST command for each link.

Example of a MAP response:

```
       Host XPM P-side link number

 N CLASS SITE LTC CK D ALRM SLIP FRME BER ES SES STATE
 0 REMOTE HOST  1  0  C       0    0   1   0   0  INSV
```

Note: The display shows carrier facilities from the host XMS-based PM (XPM) to the RLCM. You must check the carrier facilities from the remote site back to the host XPM.

If link conditions	Do
show a high number of `SLIP and FRME`	Leave the RLCM in ESA. Go to step 27.
show a very low number of `SLIP and FRME`	step 20

20 To post the RLCM with the alarm condition, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0–511)
lcm	is the number of the LCM (0 or 1)

RLCM recovery procedure (continued)

21 To busy both units of the RLCM, type

>BSY PM
and press the Enter key.

The system requests verification. to respond, type

>YES
and press the Enter key.

22 To test both units of the RLCM, type

>TST PM
and press the Enter key.

If test	Do
passes	step 24
fails, and the system produces a card list	step 23
fails, but the system did not produce a card list	step 27

23 The card list identifies the cards that can be defective. Replace the cards one at a time in the order that this procedure lists.

If last card on list	Do
is not replaced	step 28
is replaced	step 27

24 To attempt to return the RLCM to service, type

>RTS PM
and press the Enter key.

If MAP prompt	Do
shows RTS is successful	step 32
shows CBsy	step 5
shows load failure	step 25
shows any other message	step 27

RLCM recovery procedure (continued)

25 To attempt to reload the RLCM, type

>LOADPM PM CC
and press the Enter key.

If load	**Do**
is successful	step 26
is not successful in one unit	step 29
is not successful	step 27

26 To attempt again to return the RLCM to service, type

>RTS PM
and press the Enter key.

If return to service for either unit	**Do**
is successful	step 32
is not successful	step 27

27 Contact maintenance personnel for additional instructions when you clear this defect.

28 Go to the *Card Replacement Procedures* to replace the first or next card on the card list. Notify outside plant personnel of the card to change. Go to step 25 when you replace the card.

29 To attempt to load the LCM unit, type

>LOADPM UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit (0 or 1) that failed to load in step 25

If load	**Do**
is successful	step 30
is not successful	step 27

RLCM recovery procedure (end)

30 To test the LCM unit, type

>TST UNIT lcm_unit
and press the Enter key.

where

lcm_unit   is the LCM unit to test (0 or 1)

If test	Do
passes	step 31
fails, and the system produces a card list	step 23
fails, but system did not produce a card list	step 27

31 To attempt to return the LCM unit to service, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit   is the LCM unit to be returned to service (0 or 1)

If RTS	Do
passes	step 32
fails	step 27

32 This procedure is complete. If additional alarms display, proceed to the appropriate *Alarm and Clearing Procedure*.

RLCM alarm clearing procedures

This chapter contains the alarm clearing procedures for the Remote Line Concentrating Module (RLCM). The alarm indicates the procedure required to clear the trouble.

Maintenance personnel use these procedures to clear alarms as the alarms appear at the MAP display.

Procedures in this section correspond with the alarms. The system names the alarms as the alarms appear at the MAP display. These procedures appear in alphabetical order.

RLCM critical

Alarm display

CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nLCM** ***C***	.	.	.	.	.

Indication

At the MAP subsystem display, the LCM alarm appears under the PM header. This alarm indicates an alarm condition in the RLCM. The *n* indicates the number of RLCMs with alarms. The **C** that appears under the alarm indicates the alarm class is critical.

Use this procedure to recover service in an RLCM when both units of the line concentrating module (LCM) are out of service. This condition always produces a central side busy (CBsy) alarm.

Meaning

The LCM is system busy (SysB) or C-side busy (CBsy). An LCM is SysB if both units are SysB or if one unit is SysB and the other unit is manual busy (ManB). An LCM is CBsy when both units of the LCM are CBsy.

Result

When an LCM is SysB or CBsy, call processing ceases. This condition results in a critical alarm indication.

Common procedures

There are no common procedures.

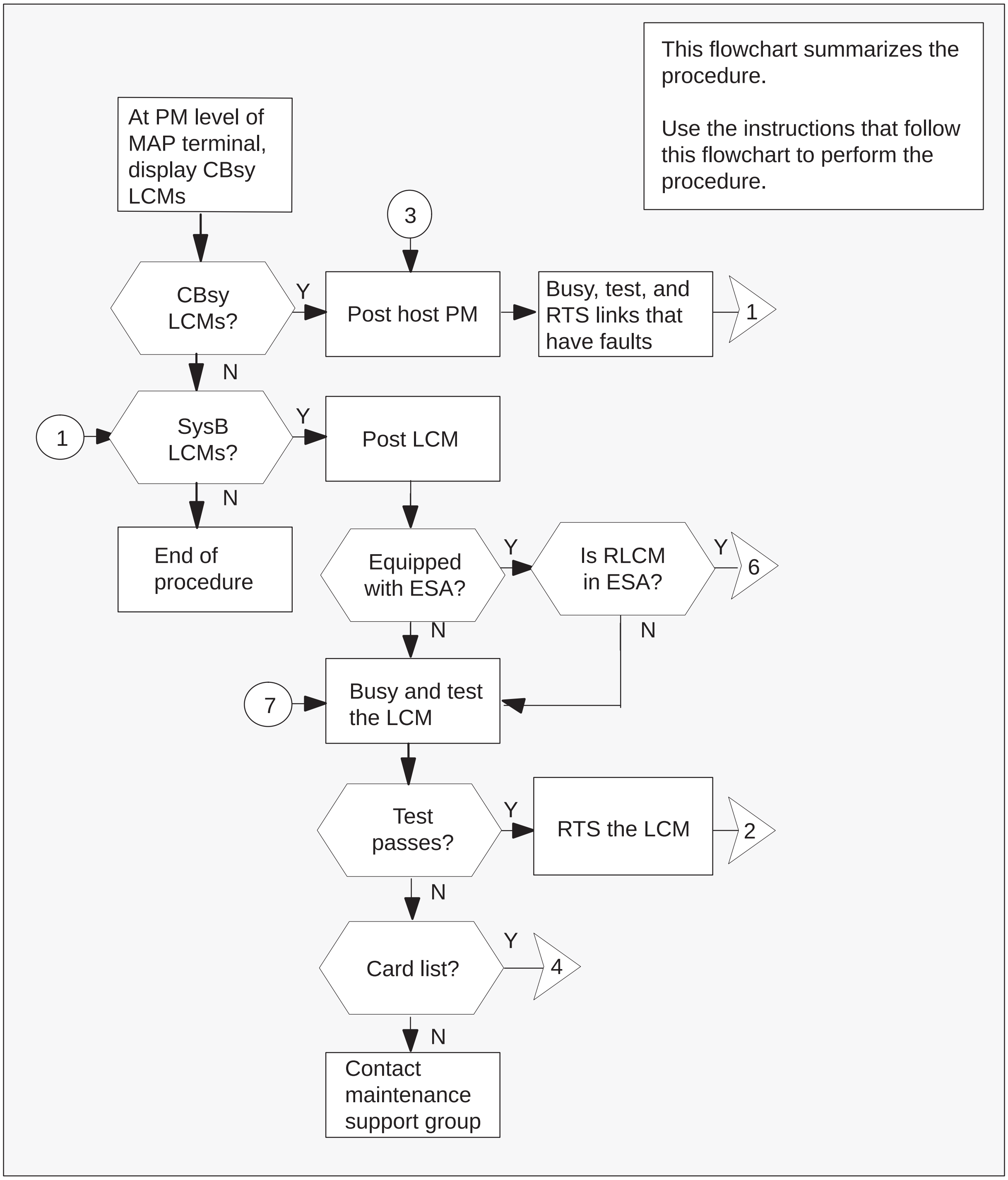
Action

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.

Note: The numbers represented in the flowchart do not coincide with the step-action numbers. The numbers indicate movement in the flowchart.

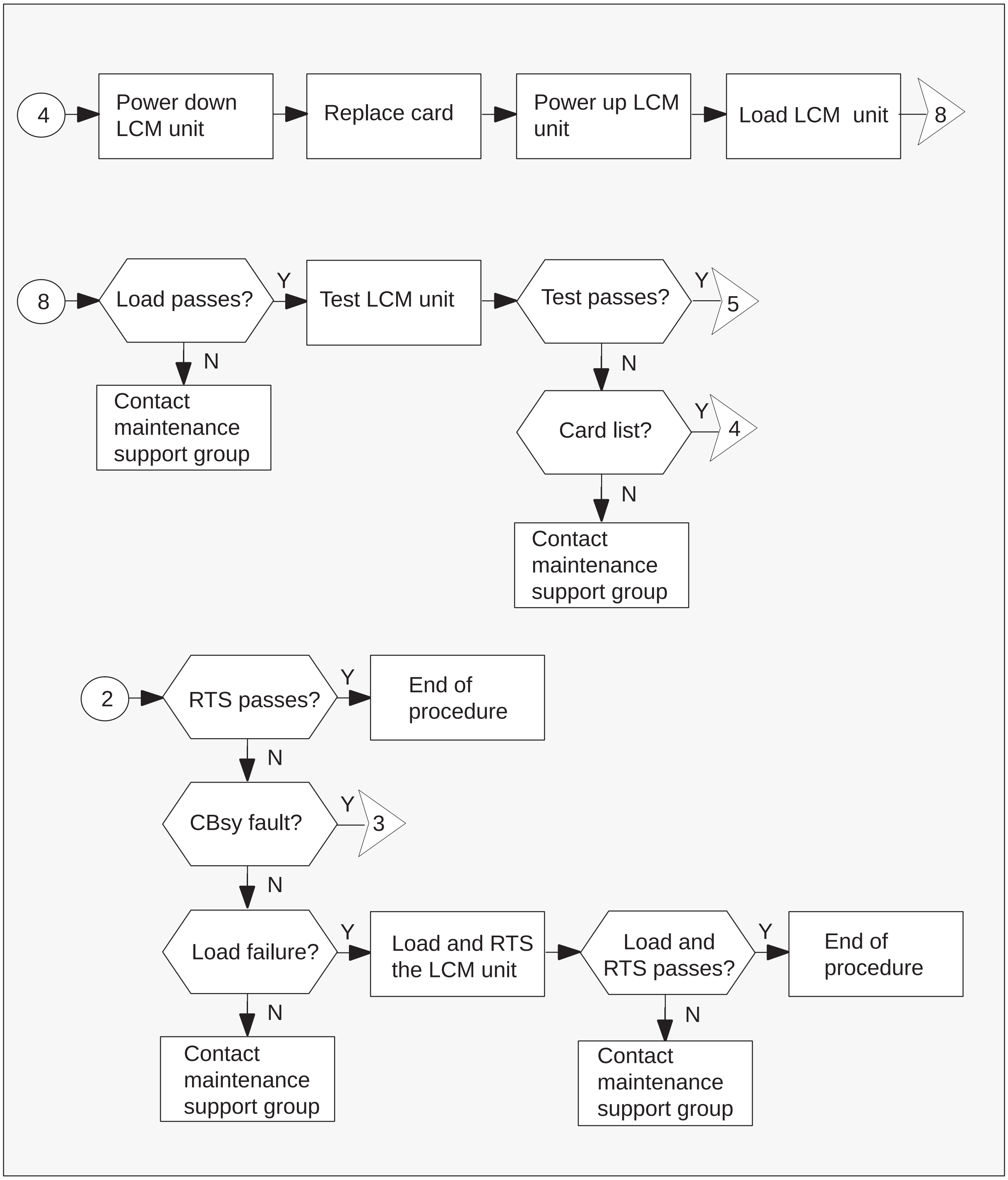
RLCM
critical (continued)

Summary of Recovering an out-of-service RLCM

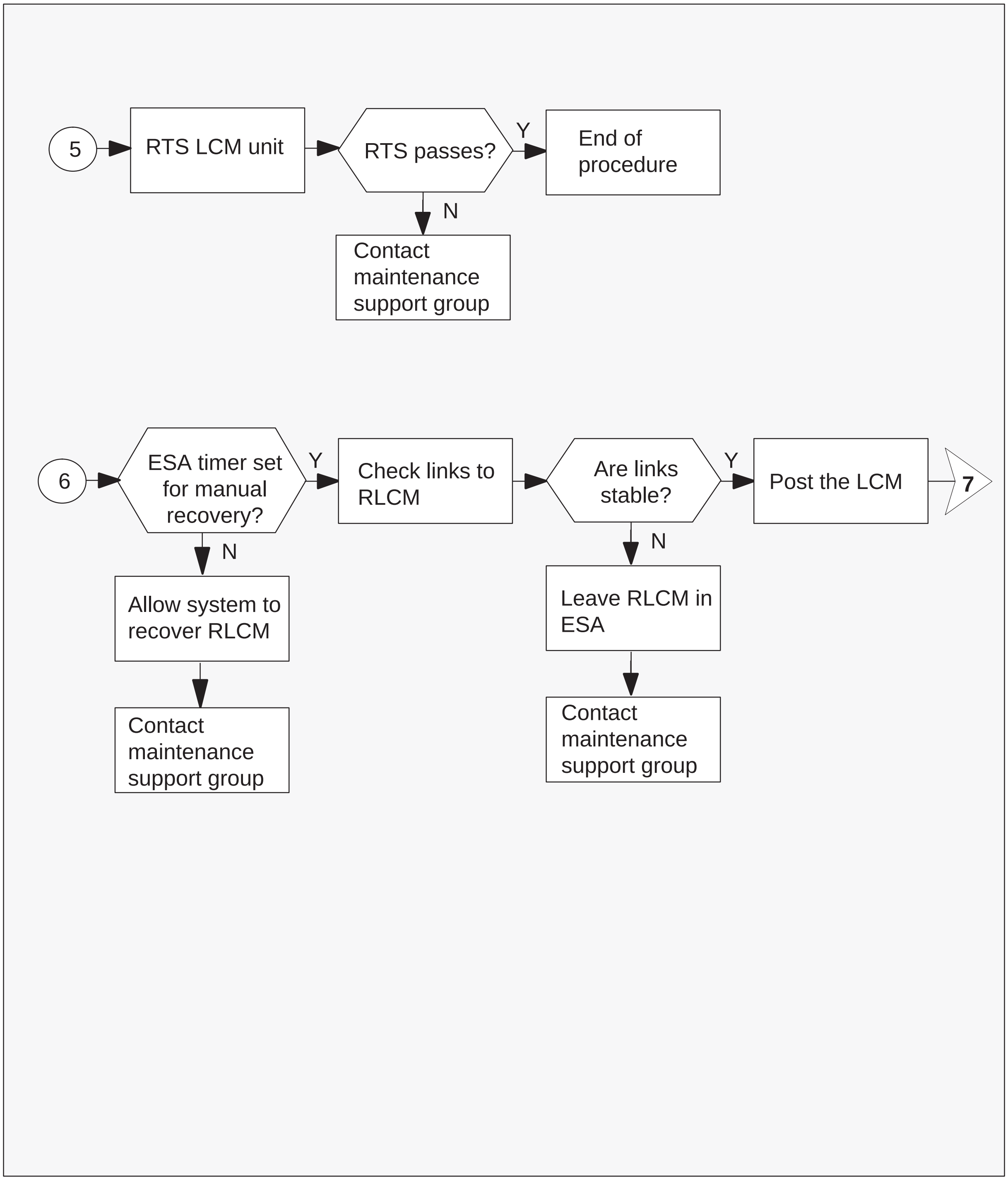


RLCM
critical (continued)

Summary of Recovering an out-of-service RLCM (continued)



Summary of Recovering an out-of-service RLCM (continued)



RLCM
critical (continued)

Recovering an out-of-service RLCM

At the MAP terminal

1 Make sure that the RLCM is receiving power.

2 To silence an audible alarm, type

>MAPCI;MTC;SIL;PM
and press the Enter key.

3 To identify the RLCM that has faults, type

>DISP STATE CBSY LCM
and press the Enter key.

If response	Do
indicates CBsy LCMs are not present	step 14
indicates CBsy LCMs are present	step 4

4 To post the RLCM with the alarm condition, type

>POST LCM CBSY
and press the Enter key.

Note: Note the name and number of this RLCM.

5 To identify central side (C-side) links to the host PM, type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
Link 0: LTC 0   2; Cap MS; Status: SysB  ;MsgCond: CLS
Link 1: LTC 0   6; Cap MS; Status: SysB  ;MsgCond: CLS
```

6 To post the host PM, type

>POST pm pm_no
and press the Enter key.

where

pm — is a line group controller (LGC), line trunk controller (LTC), or remote cluster controller (RCC)
pm_no — is the number of the PM

7 To display the peripheral side (P-side) links, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
Link 2: LCM REM1 00 0    2; Cap MS; Status: SysB ;MsgCond: CLS
Link 6: LCM REM1 00 0    1; Cap MS; Status: SysB ;MsgCond: CLS
```

Record information for the links that have a status other than OK.

8 To busy the link that has faults, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link identified in step 7

9 To test the busied link, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of the P-side link busied in step 8

If test	Do
passes	step 10
fails	step 30

RLCM
critical (continued)

10 To return to service (RTS) the busied link, type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of the P-side link tested in step 9

If RTS	Do
passes and other links that are system busy (SysB) are not present	step 11
passes but other links are SysB	step 8
fails	step 30

11 To post the RLCM noted in step 4 with the alarm condition, type

>POST LCM site frame lcm
and press the Enter key.

where

site is the site name of the RLCM (alphanumeric)
frame is the frame number of the RLCM (0 to 511)
lcm is the number of the LCM unit of the RLCM

12 To busy both LCM units of the RLCM, type

>BSY PM
and press the Enter key.

13 To return to service (RTS) the PM, type

>RTS PM
and press the Enter key.

If RTS	Do
passes	step 37
fails	step 30

RLCM
critical (continued)

14 To identify the RLCM that has faults and display the LCM by site, type

>DISP STATE SYSB LCM
and press the Enter key.

If response	Do
indicates SysB LCMs are not present	step 37
indicates SysB LCMs are present	step 15

15 To post the RLCM with the alarm condition, type

>POST LCM SYSB
and press the Enter key.

RLCM
critical (continued)

16

> **CAUTION**
> **If you do not allow the time required for the system to clear the alarm, a false alarm indication occurs.**
> Allow 3-5 min for the system to clear the alarm before you proceed to the next step.

To determine if the RLCM has emergency stand-alone (ESA), type

>QUERYPM

Example of a MAP response:

and press the Enter key.

```
PM Type: LCM  Int. No.: 20  Status index: 9  Node_No: 165
Memory Size: 256K
ESA equipped: Yes, Intraswitching is On
Loadnames:LCMINV–XLCM08AX ,Unit0:XLCM08AX ,Unit1:XLCM08AX
Node Status: (OK, FALSE)
Unit 0 Status: (OK, FALSE)
Unit 1 Status: (OK, FALSE)
 Site Flr RPos Bay_id  Shf  Description   Slot   EqPEC
 REM1  01 D04  RLCM 40  04  LCM  40       0:0    6X04AA
```

If RLCM	Do
has ESA	step 17
does not have ESA	step 24

17 To determine if the RLCM is in ESA, manually check for a dial tone at the remote. A PM alarm that appears on the MAP screen indicates the RLCM is in ESA.

If the RLCM	Do
has dial tone	step 18
does not have dial tone	step 24

RLCM
critical (continued)

18 Determine if the RLCM has the ESA timer set for manual recovery from ESA. To access table OFCENG, type

>TABLE OFCENG
and press the Enter key.

19 To check the RLCM exit time, type

>POS RLCM_XPMESAEXIT
and press the Enter key.

Example of a MAP response:

```
        PARMNAME            PARMVAL
---------------
RLCM_XPMESAEXIT               3
```

If PARMVAL is	Do
set to zero	step 20
greater than zero	Allow the system to recover the RLCM. Go to step 30.

20 Before you manually restore the RLCM from ESA, determine if links to the RLCM are steady. To find the link numbers for this RLCM , type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
Link  0:    LTC 1       0;Cap MS;Status:OK     ;MsgCon:OPN
Link  1:    LTC 1       2;Cap MS;Status:OK     ;MsgCon:OPN
Link  2:    LTC 1       3;Cap  S;Status:OK
Link  3:    LTC 1       4;Cap  S;Status:OK
```

21 To access the CARRIER level of the MAP terminal, type

>TRKS;CARRIER
and press the Enter key.

RLCM
critical (continued)

22 To post the host XMS-based peripheral module (XPM) links and check link conditions for slips and framing errors, type

>POST pm_type pm_no link_no
and press the Enter key.

where

pm_type	is an LGC, LTC, or RCC
pm_no	is the number of the PM (0 to 255)
link_no	is the number of the link that associates with the host XPM. Refer to the step 20 display.

Repeat the POST command for each link.

Example MAP response:

```
 N CLASS  SITE LTC CK D ALRM SLIP FRME  BER   ES SES STATE
 0 REMOTE HOST   1  0 C        0   0     1     0  0   INSV
```

where

The number that appears under the CK (circuit) header is the host XPM link number.

Note: This display shows carrier facilities from the host XPM to the RLCM. Use the Detail REM option to check the carrier facilities from the remote site back to the host XPM.

If link conditions	Do
display a high number of SLIP and FRME	Leave the RLCM in ESA. Go to step 29.
display a low number of SLIP and FRME	step 23

23 To post the RLCM with the alarm condition, type

>PM; POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0 to 511)
lcm	is the number of the LCM unit of the RLCM

RLCM
critical (continued)

24 To busy both LCM units of the RLCM, type

>BSY PM
and press the Enter key.

25 To test both LCM units of the RLCM, type

>TST PM
and press the Enter key.

If test	**Do**
passes	step 27
fails, and the system generated a card list	step 26
fails, and the system does not generate a card list	step 30

26 The card list identifies the cards that have possible faults. Follow this procedure to replace the cards one at a time in the order listed.

If you	**Do**
have not replaced the last card on the list	step 31
have replaced the last card on the list	step 30

27 To attempt to return the RLCM to service, type

>RTS PM
and press the Enter key.

If MAP prompt indicates	**Do**
RTS is successful	step 37
CBsy	step 5
load failure	step 28
any other condition	step 30

RLCM
critical (continued)

28 To attempt to reload the RLCM, type

>LOADPM PM CC
and press the Enter key.

If load	Do
is successful	step 27
fails	step 30

29 Contact the carrier maintenance support group for maintenance on the open links or unstable links. Restore the carriers. Go to step 22.

30 For additional help to clear this fault, contact your maintenance support group.

31 To power down the converter in the LCM unit of the RLCM, switch OFF the circuit breaker.

Use the table below to determine the frame supervisory panel (FSP) circuit breaker that serves the unit.

Circuit breaker	Unit
CB01	LCA 0
CB03	LCA 1

32 Go to the *Card Replacement Procedures.* Replace the first (or next) card on the card list. Notify outside plant personnel that you are changing the card. Replace the card. Go to step 28.

RLCM
critical (continued)

33 To power up the converter in the LCM unit of the RLCM, switch ON the circuit breaker that you turned OFF in step 31.

34 To attempt to load the LCM unit, type

>LOADPM UNIT lcm_unit
and press the Enter key.

where

lcm_unit   is the LCM unit of the RLCM that you are loading (0 or 1)

If load	Do
is successful	step 35
fails	step 30

35 To test the LCM unit, type

>TST UNIT lcm_unit
and press the Enter key.

where

lcm_unit   is the LCM unit of the RLCM that you are testing (0 or 1)

If test	Do
passes	step 36
fails, and the system generates a card list	step 26
fails, and the system does not generate a card list	step 30

36 To attempt to return the LCM unit to service, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit   is the LCM unit of the RLCM you are returning to service (0 or 1)

If RTS	Do
passes	step 37
failes	step 30

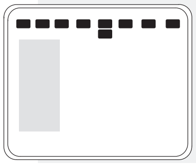
RLCM critical (end)

37 The procedure is complete.

If additional alarms appear, proceed to the correct alarm clearing procedure .

RLCM RG critical

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nLCM**	.	.	.	.	.
				C					

Indication

An *n*LCM indicates a critical alarm that involves a Remote Line Concentrating Module (RLCM) ringing generator. This *n*LCM appears under the PM subsystem header with a *C* under the nLCM at the MTC level of the MAP display.

Meaning

Both of the ringing generator units are in the in-service trouble (ISTb) state.

Result

If both ringing generator units fail, automatic switching to an active ringing generator (SwRG) unit does not occur. The system cannot generate ringing. The condition affects subscriber service.

Common procedures

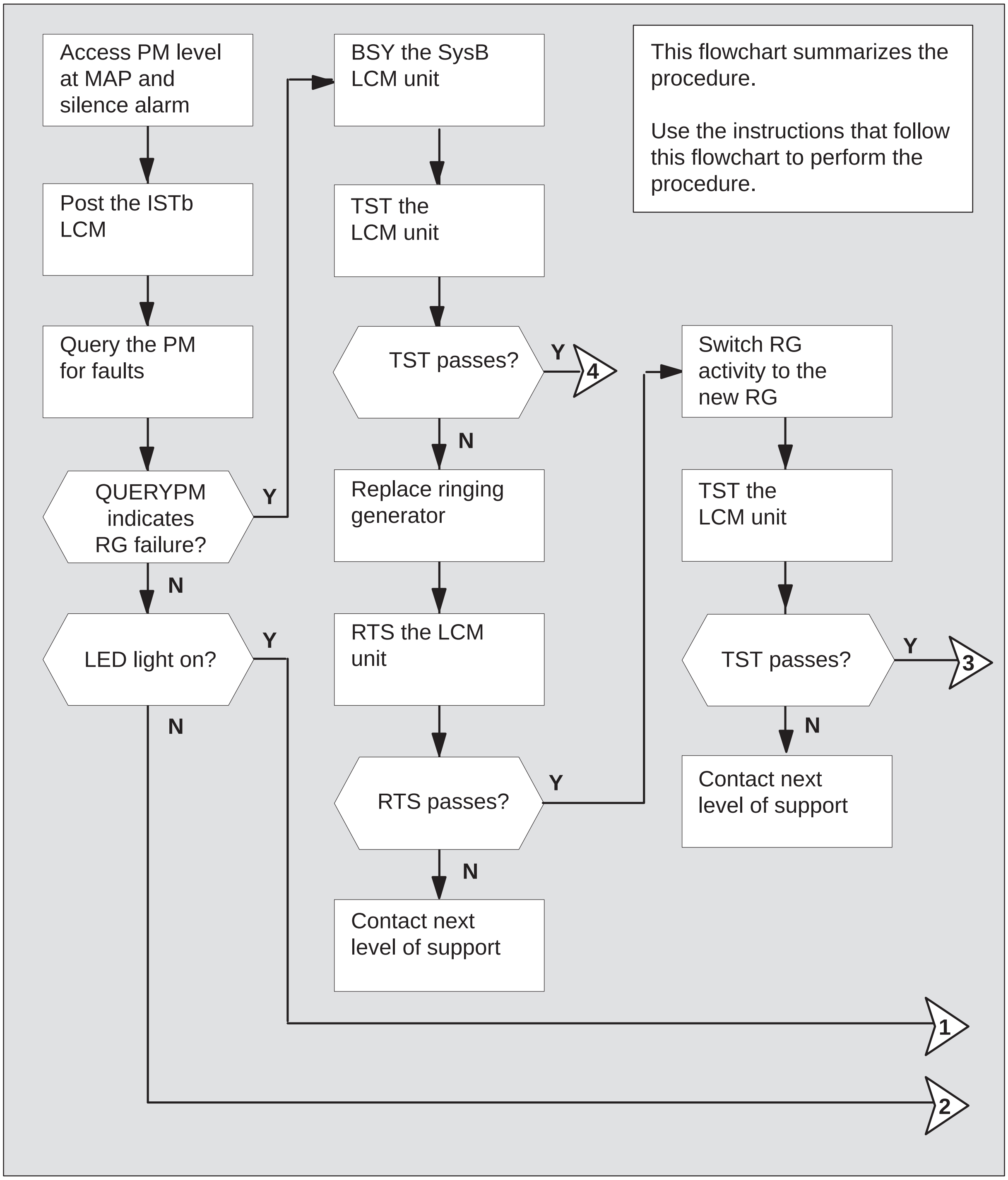
There are no common procedures.

Action

This procedure contains a summary flowchart and a list of steps to clear an alarm. A detailed step-action procedure follows the flowchart.

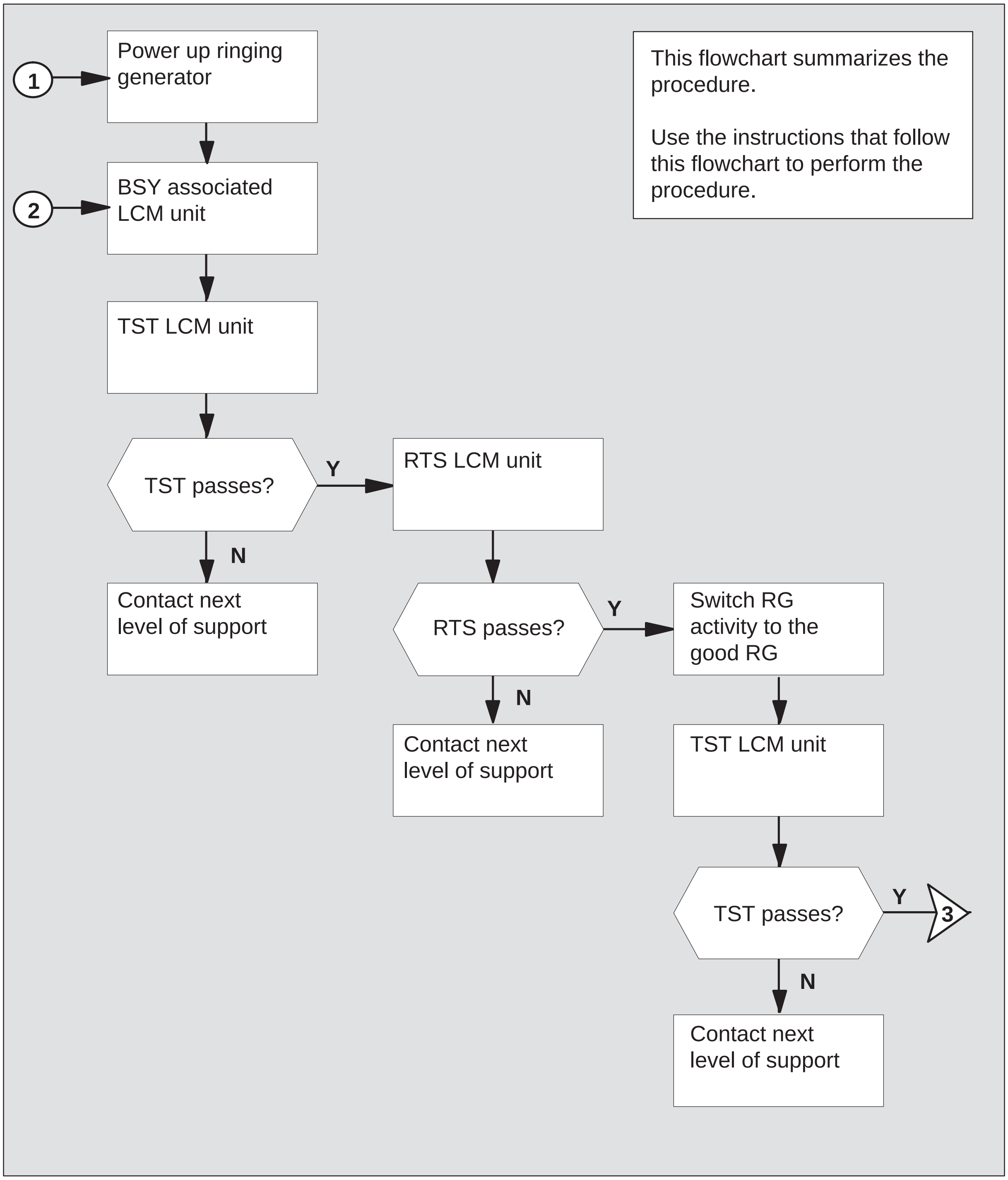
RLCM RG
critical (continued)

Summary of clearing an RLCM RG critical alarm



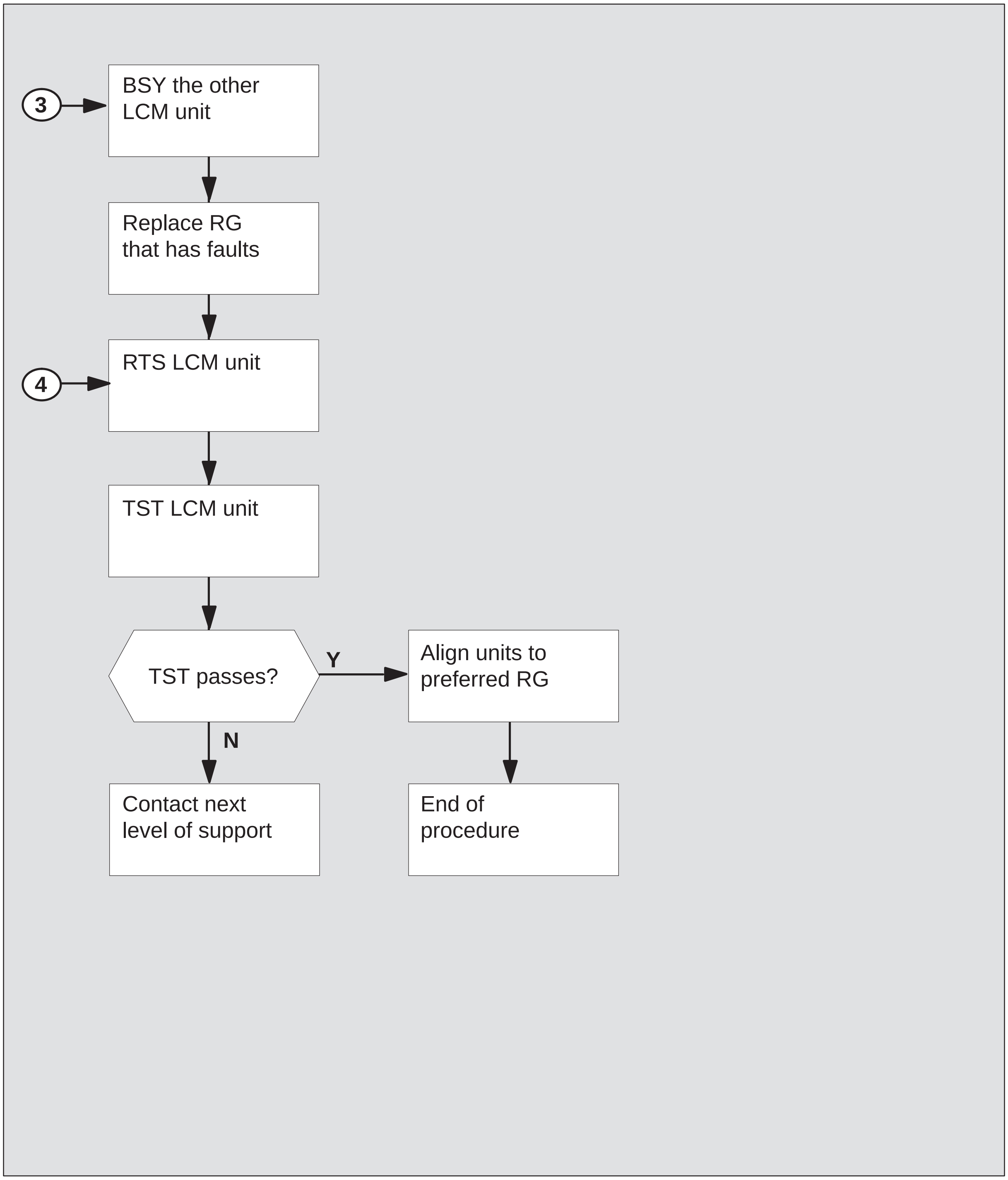
RLCM RG
critical (continued)

Summary of clearing an RLCM RG critical alarm (continued)



RLCM RG
critical (continued)

Summary of a RLCM RG critical alarm (continued)



RLCM RG
critical (continued)

Clearing an RLCM RG critical alarm with a ringing generator

> **ATTENTION**
> Enter this procedure from the PM system level alarm clearing procedures step that identifies an LCM associated fault.

At the MAP terminal

1 To silence the alarm, type

>MAPCI;MTC;PM;SIL
and press the Enter key.

2 To identify the RLCM that has faults, type

>DISP STATE ISTB LCM
and press the Enter key.

Example of a MAP response:

```
ISTb  REM1 00 0
```

3 To post the ISTb RLCM identified in step 3, type

>POST LCM site frame_no lcm_no
and press the Enter key.

where

site is the name of the site of the LCM location
frame_no is the number of the frame (00 to 511)
lcm_no is the number of the LCM (0 or 1) in the frame

Example of a MAP display:

```
       SysB     ManB     OffL     CBsy     ISTb      InSv
PM      0        0        2        0        1          12
LCM     0        0        2        0        1           9

LCM   REM1  00 0 ISTb  Links_OOS:  CSide  0   PSide   0
Unit0:   SysB                 /RG: 0
Unit1:   ISTb                 /RG: 0
                            11  11  11  11  11  RG:Pref 0 ISTb
 Drwr:  01  23  45  67  89  01  23  45  67  89     Stby 1 ISTb
        ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
```

RLCM RG
critical (continued)

4 To check for fault indicators, type

>QUERYPM FLT
and press the Enter key.

Example of a MAP display:

```
 LCM   UNIT 0  Inservice troubles Exist:
Ringing Generator Failure:Ring Generator ANI/COIN Fault
 LCM   UNIT 1  Inservice Troubles Exist:
Ringing Generator Failure:Ring Generator in Excess load
```

If QUERYPM	Do
indicates RG failure	step 6
does not indicate RG failure	step 5

At the RLCM site

5 Perform a visual inspection of the ringing generator. Check to see if the LED is lit.

If the LED	Do
is lit	step 6
is not lit	step 7

6 To power up the ringing generator, move the power switch to the ON position. (The LED must go off.) These switches follow:

- RG 0 circuit breaker CB2
- RG 1 circuit breaker CB3

If power	Do
is restored	step 19
is not restored	step 7

RLCM RG
critical (continued)

At the MAP terminal

7 To manually busy the SysB LCM unit identified in step 3, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the number of the SysB LCM unit (0 or 1)

8 To test the ManB LCM unit, type

>TST UNIT unit_no
and press the Enter key.

where

unit_no is the number of the ManB LCM unit (0 or 1)

If the system	Do
generates a card list	step 9
does not generate a card list	step 18

9 Check the card list that appears on MAP display.

Example of a MAP response:

```
SITE   FLR  RPOS   BAY_ID  SHF DESCRIPTION SLOT   EQPEC
REM1    01   A00   LCM 00  38    LCM   000  01     6X60
REM1    01   A00   LCM 00  04    LCM   000  04     6X51
REM1    01   A00   LCM 00  38    LCM   000  05     6X60
REM1    01   A00   LCM 00  21    LCM   000  04     6X51
```

10 Determine if an NT6X60 card replacement occurred.

If replacement of the NT6X60 card	Do
occurred	step 18
did not occur	step 17

RLCM RG
critical (continued)

11 To return the LCM unit to service, type

>RTS UNIT unit_no
and press the Enter key.

unit_no is the number of the ManB LCM unit (0 or 1)

If RTS	Do
passes	step 19
fails	step 12

12 To align RG activity to the new RG, type

>SWRG UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) associated with the new RG

Example of a MAP display:

```
LCM REM1 14 1 Unit 1 SWRG Passed
```

If the SWRG command	Do
passes, and a switch of RG activity must occur for the other unit	step 13
passes, and RG activity is acceptable for both units	step 13
fails	step 18

13 Repeat step 12 for the other LCM unit.

RLCM RG
critical (continued)

14 To test the new RG, type

>TST UNIT unit_no
and press the Enter key.

where

unit_no	is the number of the LCM unit (0 or 1) associated with the new RG.

Example of a MAP response:

```
LCM REM1 00 0 Unit 1  InSvce Tests Initiated
LCM REM1 00 0 Unit 1  Tst Passed
```

If TST	Do
passes	step 15
fails	step 18

15 Repeat steps 7 through step 14 for the other LCM unit.

16 To align RG activity to the preferred RG, type

>SWRG UNIT unit_no
and press the Enter key.

where

unit_no	is the LCM unit (0 or 1) associated with the new RG

Example of a MAP display:

```
LCM REM1 00 0 InSv Links  OOS: Cside 0 Pside 0
Unit 0: InSv      /RG:0
Unit 1: InSv      /RG:0
                           11  11  11  11  11  RG: Pref 0 InSv
Drwr:  01  23  45  67  89  01  23  45  67  89      Stby 1 InSv
       ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
```

Note: Repeat this step until both units of the LCM are on the preferred RG.

If the SWRG command	Do
passes	step 19
fails	step 18

17 Go to *Card Replacement Procedures*. Replace the first card on the list. When the card replacement procedures are complete, go to step 11 of this procedure.

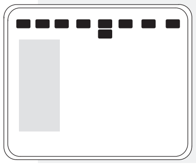
RLCM RG
critical (end)

18 For additional help to clear this alarm, contact the next level of support.

19 This procedure is complete. If the system displays other alarms, refer to the correct clearing an alarm procedures for the indicated alarms.

RLCM talk battery alarm critical

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nLCM**	.	.	.	.	.
				C					

Indication

An *n*LCM indicates a critical alarm that involves an RLCM. This *n*LCM appears under the PM subsystem header with a *C* under the nLCM at the MTC level of the MAP display.

Meaning

One or both units of the RLCM does not have a talk battery.

Result

If this condition affects CB8, call processing ends without an alarm indication If this condition affects circuit breaker CB9, call processing ends and a critical alarm occurs.

Common procedures

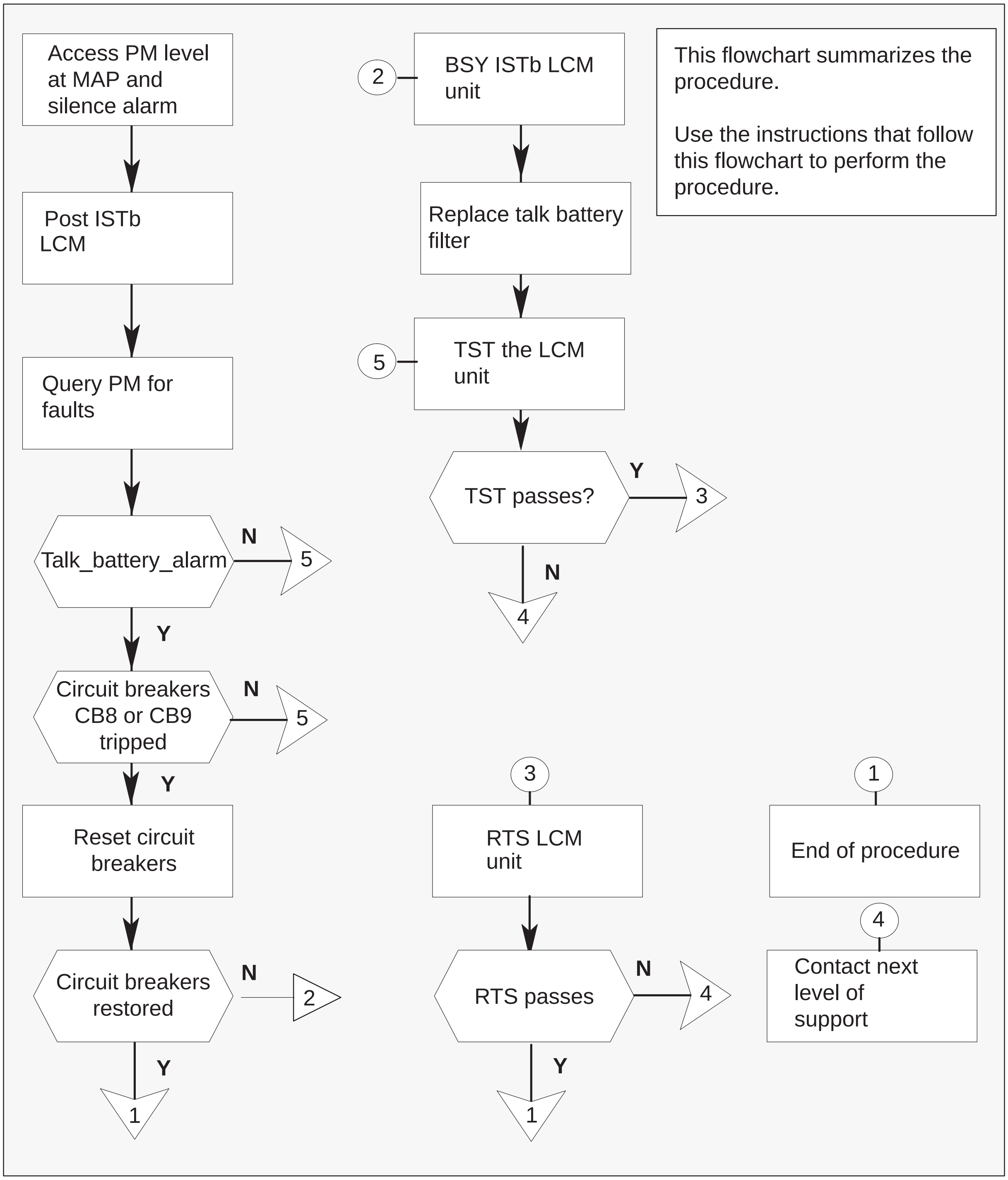
There are no common procedures.

Action

This procedure contains a summary flowchart and a list of steps to clear an alarm. A detailed step-action procedure follows the flowchart.

RLCM talk battery alarm critical (continued)

Summary clearing an RLCM talk battery alarm critical alarm



RLCM talk battery alarm critical (continued)

Clearing an RLCM talk battery alarm critical alarm

At the MAP terminal

1 To silence an audible alarm, type

>MAPCI;MTC;SIL
and press the Enter key.

2 To access the PM level of the MAP display, type

>PM
and press the Enter key.

3 To identify the RLCM that has faults, type

>DISP STATE ISTB LCM
and press the Enter key.

RLCM talk battery alarm critical (continued)

4 To post the RLCM that lost talk battery, type

>POST LCM site frame lcm
and press the Enter key.

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0-511)
lcm	is the number of the LCM (0-1)

Example of a MAP display:

```
 CM    MS     IOD     Net     PM     CCS     Lns     Trks     Ext  APPL
  .     .      .       .     1LCM     .       .        .        .     .
                              *C*

LCM             SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit     PM    0         0        2        0        2         42
 2 Post_    LCM   0         0        0        0        2          9
 3 ListSet
 4 SwRG     LCM   REM04     ISTB     Links_OOS:  CSide  0   PSide   0
 5 Trnsl_   Unit0:   InsV                 /RG: 1
 6 Tst_     Unit1:   InsV                 /RG: 1
 7 Bsy_                                 11  11  11  11  11  RG:Pref 1 InsV
 8 RTS_     Drwr:  01  23  45  67  89  01  23  45  67  89     Stby 0 Insv
 9 OffL            ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
10 LoadPM_
11 Disp_
12 Next
13
14 QueryPM
15
16
17
18
```

At the RLCM site

5 Check the fuses in each LCA baffle.

If fuses	Do
are blown (indicator protrudes)	step 6
are not blown	step 11

RLCM talk battery alarm critical (continued)

6 Determine which fuse has blown.

Note: Fuses 01 to 05 each supply +5 V, fuses 06 to 10 each supply +15 V, and fuses 11 to 15 each supply –48 V.

If the blown fuse	Do
is one of 01 to 05	Remove the blown fuse and go to step 9
is one of 06 to 15	step 7

7 Use the following table to determine which +15V fuse (06 through 10) associates with which –48V fuse (11 through 15).

–48V fuse number	+15V fuse number
11	06
12	07
13	08
14	09
15	10

8 Remove the blown fuse and the associated fuse. For example, if the blown fuse is 11, remove fuse 06 also.

9 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

RLCM talk battery alarm critical (continued)

10

DANGER
Risk of fire
For continued protection against risk of fire, replace the blown fuse. Replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Insert the +15V fuse. Next, insert the –48V fuse.

If the fuse	Do
blows again	step 56
does not blow	step 11

11 Perform a visual inspection of the FSP. Check circuit breakers CB8 and CB9.

If circuit breakers	Do
are tripped	step 21
are not tripped	step 12

At the PDC frame

12 Locate the fuses that power the RLCM talk battery circuits.

13 Determine if the fuse has blown.

If the fuse	Do
has blown	step 14
has not blown	step 57

14 Remove the fuse holder that contains the blown fuse.

RLCM talk battery alarm critical (continued)

At the RLCM site

15 Trip the circuit breaker CB8 or CB9. This action removes the talk battery filter from the circuit. This action also ensures that the cartridge fuse does not blow.

If affected unit	Trip circuit breaker
is Unit 0	CB8
is Unit 1	CB9

At the PDC frame

16 Replace the cartridge fuse in the fuse holder.

17

DANGER
Risk of fire
For continued protection against risk of fire, replace the blown fuse. Replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Replace the blown fuse.

18 Install the fuse holder on the PDC frame.

At the RLCM site

19 To reset circuit breaker CB8 or CB9, move the switch to the ON/OFF and back to the ON position in quick sequence. The LED must go OFF.

If circuit breaker	Do
trips again	step 20
remains ON, LED goes off	step 57

20 Determine if the fuse has blown again.

If the fuse	Do
has blown again	step 56
has not blown again	step 57

RLCM talk battery alarm critical (continued)

21 Does the FSP use NTI repeaters?

FSP	Do
uses NTI repeaters	step 22
does not use NTI repeaters	step 32

22 To reset circuit breaker CB8 or CB9, move the switch to the ON/OFF and back to the ON position in quick sequence. The LED must go OFF.

If circuit breaker	Do
trips again	step 23
remains ON, LED goes off	step 57

At the MAP terminal

23 To busy the LCM unit, type

>BSY UNIT lcm_unit
and press the Enter key.

where

lcm_unit   is the LCM unit to busy

If	Busy
CB8 is the circuit breaker tripped	unit 0
CB9 is the circuit breaker tripped	unit 1

RLCM talk battery alarm critical (continued)

24 To identify the C-side peripheral, type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
                  ┌── Host XPM type and number
                  ▼
Link  0: LTC 0    0;Cap  MS;Status:OK   ;MsgCon:CLS
Link  1: LTC 0    1;Cap  MS;Status:OK   ;MsgCon:CLS
Link  2: LTC 0    3;Cap   s;Status:OK
Link  3: LTC 0    4;Cap   S;Status:OK
```

25 To post the peripheral, type

>POST pm_type pm_no
and press the Enter key.

where

pm_type	is the name of the host XPM (LGC, LTC, or RCC)
pm_no	is the number of the host XPM (0 to 255)

26 To diplay the P-side links, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
Link 0: LCM REM1 00 0  2;Cap MS;Status:OK;  MsgCond: CLS
Link 1: LCM REM1 00 0  1;Cap MS;Status:OK;  MsgCond: CLS
```

Record information for the links to busy.

27 To busy the line

>BSY LINK link_no
and press the Enter key.

where

link_no	is the number of a P-side link that interfaces the RLCM

Note: Perform this step for each link that interfaces the RLCM unit busied in step 23.

RLCM talk battery alarm critical (continued)

28 To access the CARRIER level of the MAP display, type

>TRKS;CARRIER
and press the Enter key.

29 To post the host XPM P-side links, type

>POST pm_type pm_no link_no
and press the Enter key.

where

pm_type	is the host peripheral (LGC, LTC, RCC, or RCC2)
pm_no	is the number of the peripheral (0 to 255)
link_no	is the number of the link with the host XPM. Refer to step 24 display.

To view additional links, use the NEXT command when the system prompts with the `MORE ...` prompt.

Example of a MAP response:

```
N CLASS SITE LTC CK D ALRM SLIP FRME BER  ES SES STATE
0 REMOTE HOST 0   0 C       0    0    1   0   0   ManB
                    ▲
                    └─Host XPM P-side link number
```

30 To offline the links to prevent alarms and to reset the counters when the links restore, type

>OFFL item_no
and press the Enter key.

where

item_no is the item number under the *n* (0 to 4) column

Note: Perform this step for each link busied in step 27.

At the RLCM site

31 Remove the fuses and unseat the repeaters for the affected LCM unit.

If the affected LCM unit	Do
is unit 0	step 32
is unit 1	step 33

RLCM talk battery alarm critical (continued)

32 Remove the fuses and repeaters for CB8 and LCA 0 in the following order.

- remove –48V line drawer fuses, 11 through 15
- remove fuse F01 of the FSP, for CB8 only
- unseat NT repeater cards, 1 through 4.

Go to step 34.

33 Remove the fuses and repeaters for CB9 and LCA 1 in the following order.

a. remove –48V line drawer fuses, 11 through 15

b. unseat NT repeater cards, 5 through 7.

34 Obtain a capacitor forming tool.

Note: A capacitor forming tool consists of a 100 watt 120V light bulb that screws into a socket with bare-ended twisted wires.

35 Unscrew the slotted nut on the front of the FSP.

36

DANGER
Risk of electrocution
Terminals in the FSP can have an electrical potential of –48V dc to –60V dc. Do not touch any terminals inside the FSP.

Open the FSP panel.

RLCM talk battery alarm critical (continued)

37

DANGER
Risk of electrocution
Terminals in the FSP can have an electrical potential. Remove all jewelry before you perform this step.

Connect the leads of the capacitor forming tool:

- across the top and bottom terminals with wires attached to the connection
- across the top and second from the bottom terminals of the tripped circuit breaker

If after 1 minute, the bulb	Do
is lit and you did not replace the capacitor	step 38
is lit and you did replace the capacitor	step 56
is not lit	step 45

38 Locate the talk battery filter capacitor inside the FSP.

If the circuit breaker	The capacitor to replace
is CB8	is C1
is CB9	is C2

39 Obtain a replacement capacitor.

40 Label the leads to prevent incorrect lead connections. Label the leads that go to the positive terminal of the capacitor as (+). Label the leads that go to the negative terminal as (–).

41 Disconnect the leads from the short-circuited capacitor.

42 Remove the capacitor

43 Install a replacement capacitor.

RLCM talk battery alarm critical (continued)

44 Connect the leads labeled (+) to the positive terminal of the capacitor. Connect the leads labeled (–) to the negative terminal of the capacitor. Go to step 37.

45 Set the circuit breaker to ON.

If the circuit breaker	Do
remains ON	step 46
trips again	step 56

46 Insert the five –48V line drawer fuses removed in step 32. Pause for 15 s between each fuse.

47 Reseat the NTI repeaters unseated in step 32.

At the MAP terminal

48 To access the CARRIER level of the MAP display, type

>TRKS;CARRIER
and press the Enter key.

49 To post the host XPM P-side links, type

>POST pm_type pm_no link_no
and press the Enter key.

where

pm_type	is the host peripheral (LGC, LTC, RCC, or RCC2)
pm_no	is the number of the peripheral (0 to 255)
link_no	is the number of the link with the host XPM. Refer to step 24 display.

Note: To view additional links, use the NEXT command when the system prompts with the `MORE ...` prompt.

Example of a MAP response:

```
N CLASS SITE LTC CK D ALARM SLIP FRAME BER   ES SES STATE
0 REMOTE HOST 0   0 C         0     0    1    0   0  OFFL
                  └─Host XPM P-side link number
```

RLCM talk battery alarm critical (continued)

50 To busy the links offlined in step 30, type

>BSY item_no
and press the Enter key.

where

item_no is the item number under the *n* (0-4) column

Note: Perform this step for each offlined link.

51 To access the PM level of the MAP and to post the host peripheral, type

>PM;POST pm_type pm_no
and press the Enter key.

where

pm_type is the name of the host XPM (LGC, LTC, or RCC)
pm_no is the number of the host XPM (0 to 255)

52 To return to service the links busied in step 27, type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link that interfaces the RLCM

Note: Perform this step for each manually busied link.

RLCM talk battery alarm critical (end)

53 To post the RLCM, type

>POST LCM site frame lcm
and press the Enter key.

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0-511)
lcm	is the number of the LCM

54 To test the LCM unit, type

>TST UNIT lcm_unit
and press the ENTER key.

where

lcm_unit is the LCM unit busied in step 23

If TST	Do
passes	step 55
fails	step 56

55 To return to service the LCM unit, type

>RTS UNIT lcm_unit
and press the ENTER key.

where

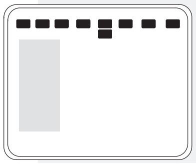
lcm_unit is the LCM unit tested in step 54

56 For additional help to clear this alarm, contact the next level of support.

57 This procedure is complete. If the system displays other alarms, refer to the correct clearing alarm procedures for the indicated alarms.

RLCM major

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nLCM**	.	.	.	.	.
				M					

Indication

The alarm code LCM under the PM subsystem header indicates an LCM alarm. The M under the LCM indicates a major alarm. The number n before LCM indicates the number of RLCMs with a major alarm.

Meaning

The *n* is the number of RLCMs that are in the manual busy (ManB), system busy (SysB), or C-side busy (CBsy) state.

Result

The ManB and SysB LCMs do not directly affect service. One unit of the RLCM continues to provide service. Local backup is not present. Failure of the other unit of the RLCM will interrupt service.

A CBsy condition can interrupt communication between the RLCM and the host. This interruption reduces the service that the RLCM provides to the local area.

Common procedures

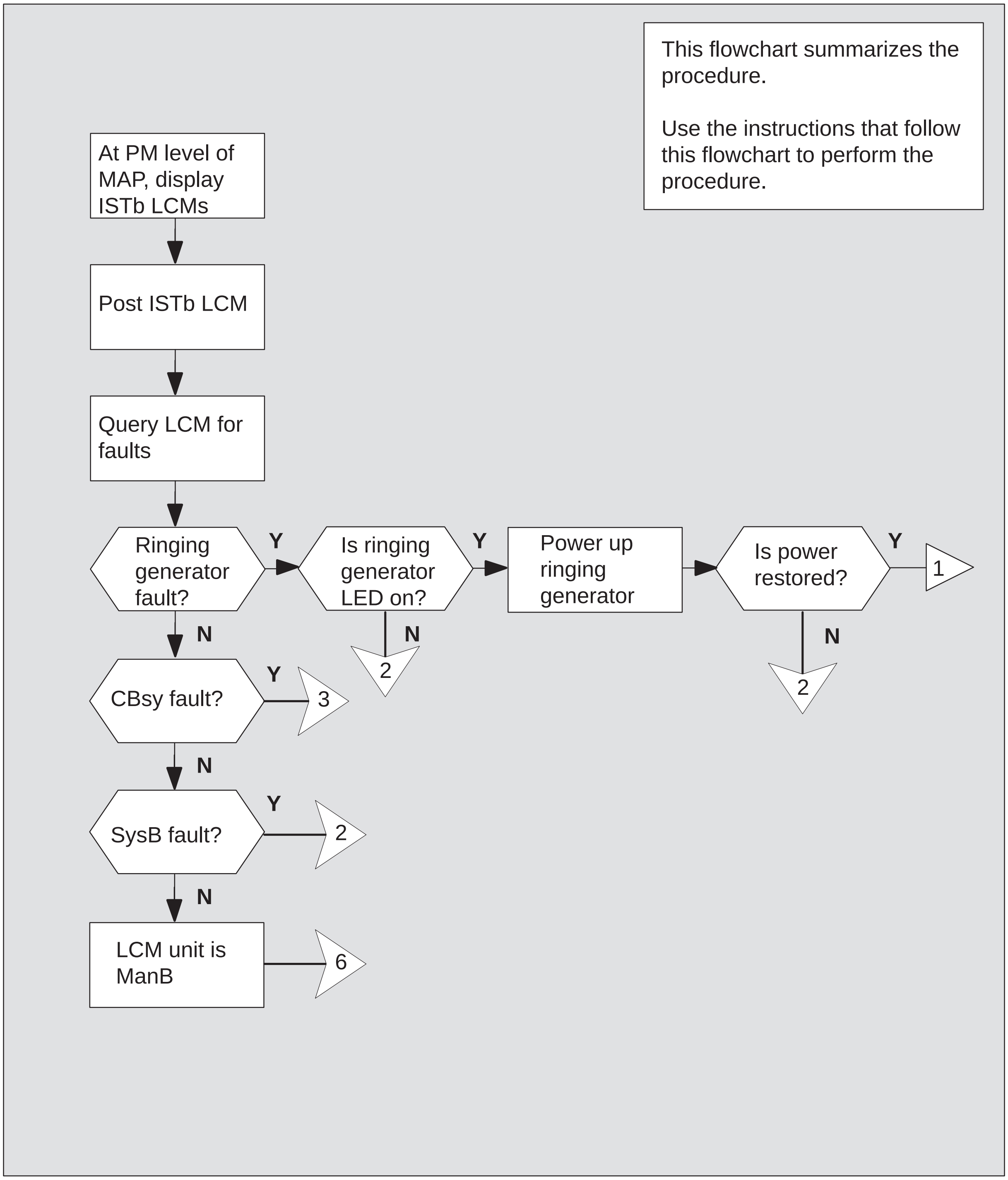
There are no common procedures.

Action

This procedure contains a flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

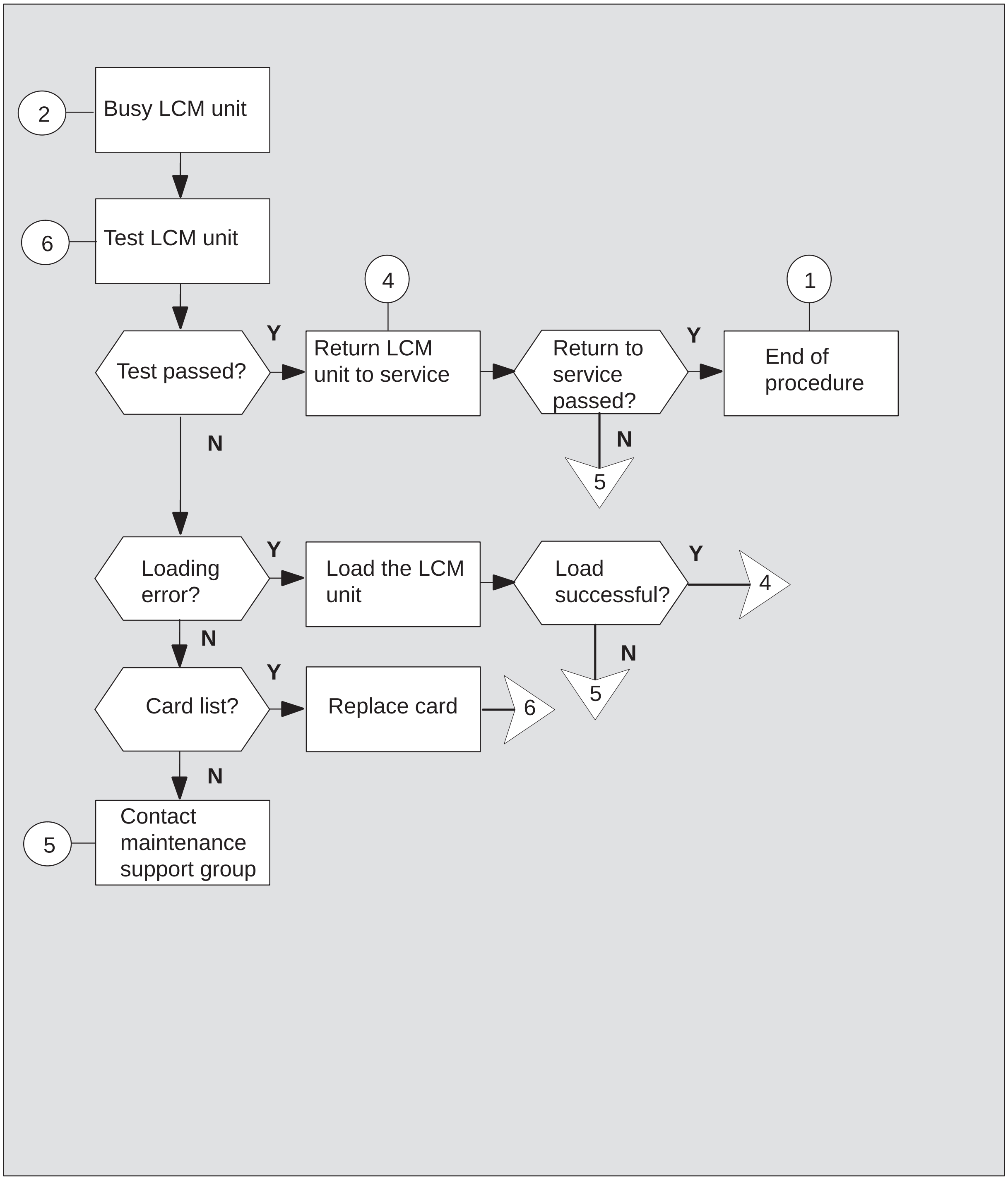
RLCM
major (continued)

Summary of clearing an RLCM major alarm

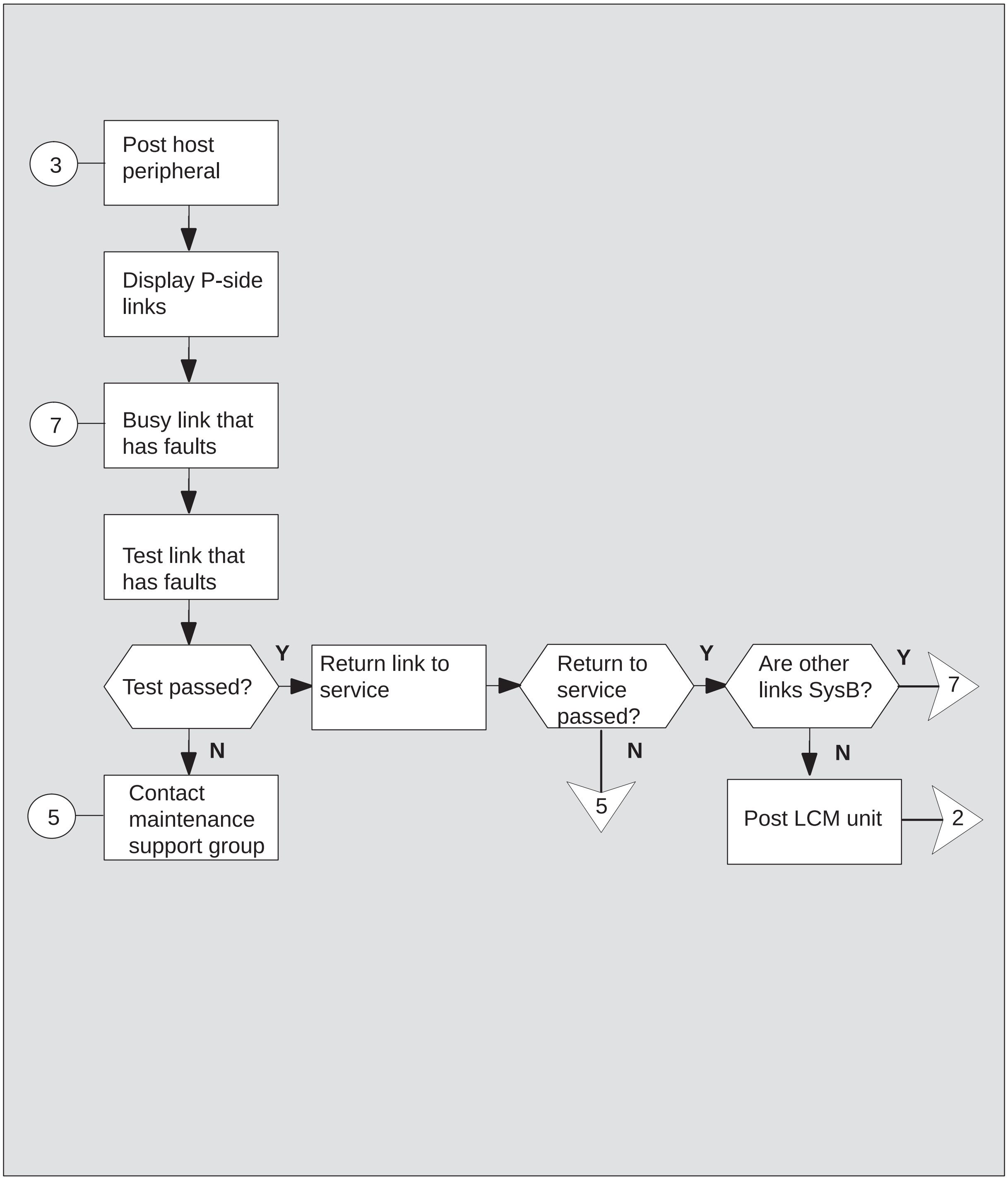


RLCM
major (continued)

Summary of clearing an RLCM major alarm (continued)



Summary of clearing an RLCM major alarm (continued)



RLCM major (continued)

Clearing an RLCM major alarm

At the MAP terminal

1 To silence an audible alarm, type

>MAPCI;MTC;SIL
and press the Enter key.

2 To access the PM level of the MAP display, type

>PM
and press the Enter key.

3 To identify the RLCM that has faults, type

>DISP STATE ISTB LCM
and press the Enter key.

4 To post the RLCM with the alarm condition, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0 to 511)
lcm	is the number of the RLCM

5 Determine the fault indicators, type

>QUERYPM FLT
and press the Enter key.

If fault indicated	Do
is ringing generator	step 6
is CBsy (C-side busy)	step 9
is SysB	step 13
is ManB	step 17

RLCM
major (continued)

At the RLCM site

6 Visually inspect the ring generator to see if the LED is lit.

If the LED	Do
is lit	step 7
is not lit	step 13

7 Power up the ringing generator (RG) by moving the power switch to the ON position. (The LED turns OFF.) These switches are identified as follows:

RG 0 corresponds to LCM unit 0 CB2

RG 1 corresponds to LCM unit 1 CB3

8 Determine if the system restores power to the ring generator.

If	Do
turning ON the RG restores power	step 23
turning ON the RG does not restore power	step 13

At the MAP terminal

9 To identify C-side links to the host PM, type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
Link 0: LTC 0       2; Cap MS; Status: OK    ;MsgCond: OPN
Link 1: LTC 0       6; Cap MS; Status: SysB  ;MsgCond: CLS
```

10 To post the host peripheral (LGC, LTC, or RCC), type

>POST pm_type pm_no
and press the Enter key.

where

pm_type	is LGC, LTC, or RCC
pm_no	is the number of the host peripheral

RLCM major (continued)

11 To identify the P-side links that have faults, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
Link 2:LCM REM1 00 0  0;Cap MS;Status:OK   ;MsgCond: OPN
Link 6:LCM REM1 00 0  1;Cap MS;Status:SysB ;MsgCond: CLS
```

Record information for the links that have a state other than OK.

12 To busy the link that has faults, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link identified in step 11

13 To test the busy link, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link busied in step 12

If test	Do
passes	step 14
fails	step 21

RLCM
major (continued)

14 To return the busied link to service type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link busied in step 12

If RTS	Do
passes and other links are not SysB	step 15
passes and other links are SysB	step 12
fails	step 21

15 To post the RLCM with the alarm condition, type

>POST LCM site frame lcm
and press the Enter key.

where

site is the site name of the RLCM (alphanumeric)
frame is the frame number of the RLCM (0–511)
lcm is the number of the RLCM

16

CAUTION
If you do not allow the time required for the system to clear the alarm, a false alarm indication can occur.
Allow 3 to 5 min for the system to clear the alarm before you proceed to the next step.

To busy the RLCM unit associated with the alarm, type

>BSY UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit to busy (0 or 1)

RLCM
major (continued)

17 To test the busy unit, type

>TST UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit to test (0 or 1)

If test	Do
passes	step 19
fails because of loading error	step 18
fails, and the unit produces a card list	step 20
fails, and the unit does not produce a card list	step 21

18 To attempt to load the RLCM unit, type

>LOADPM UNIT lcm_unit CC
and press the Enter key.

where

lcm_unit is the LCM unit to load (0 or 1)

If load	Do
is successful	step 19
is not successful	step 21

RLCM
major (end)

19 To attempt to return the RLCM unit to service, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit that returns to service (0 or 1)

If RTS	Do
passes	step 23
fails	step 21

20 The card list identifies the cards that have possible faults. Replace the cards one at a time in the order listed as directed below:

If you	Do
did not replace the last card on the list	step 22
replaced the last card on the list	step 21

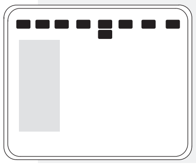
21 For additional help, contact the next level of support.

22 Go to the *Card Replacement Procedures* to replace the first (or next) card on the card list. Go to step 17 when you replace the card.

23 The procedure is complete. If additional alarms display, proceed to the appropriate alarm clearing procedure.

RLCM RG major

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nLCM**	.	.	.	.	.
				M					

Indication

A major alarm involving an LCM is indicated by *n*LCM under the PM subsystem header with an `M` beneath it at the MTC level of the MAP display.

Meaning

One of the ringing generator units is in the System busy (SysB) state.

Impact

Service is not affected since a switching of support to a backup ringing generator (SwRG) automatically occurs. However, if the backup ringing generator fails, ringing will not be produced.

Common procedures

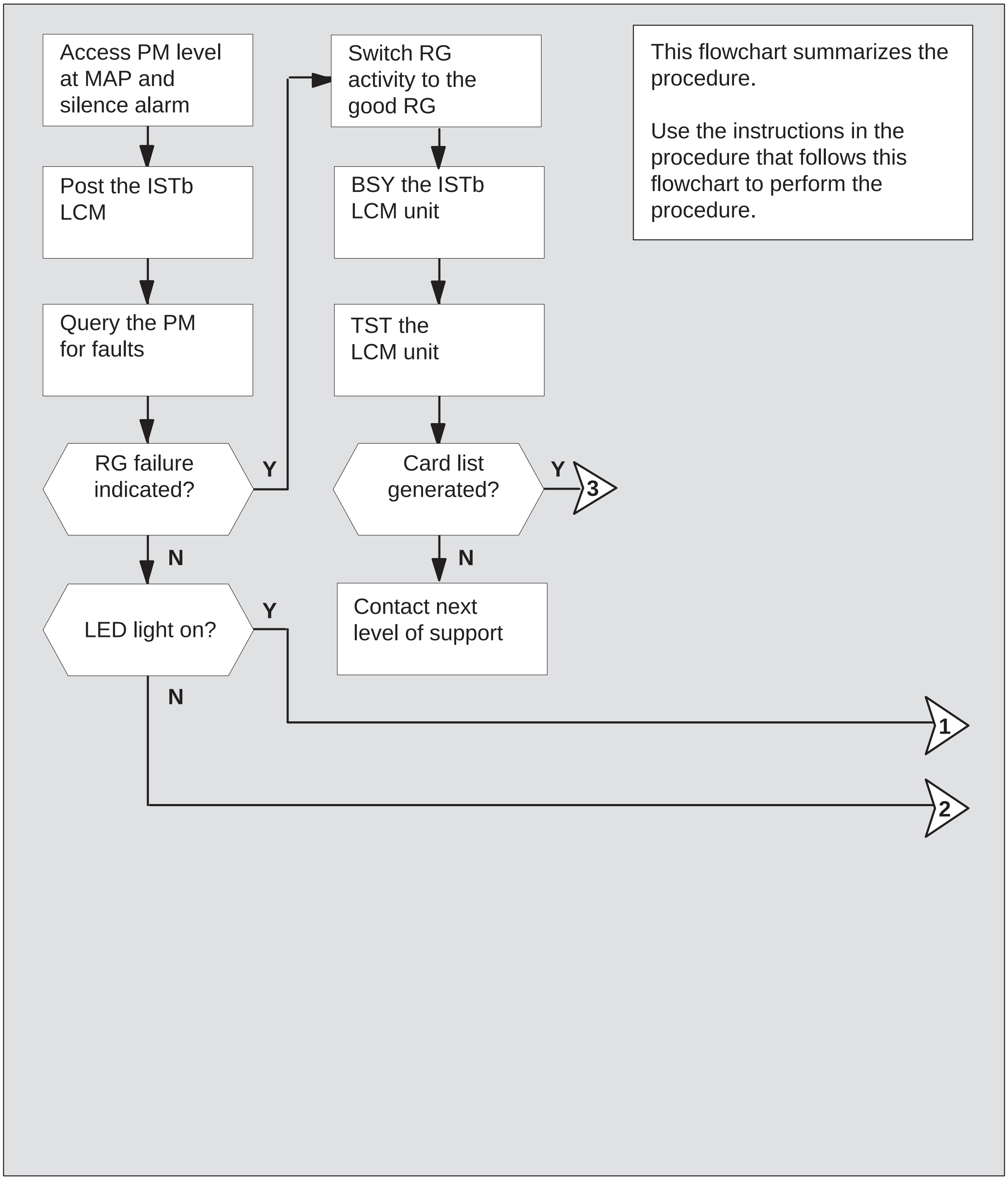
None

Action

The following flowchart is only a summary of the procedure. Use the instructions in the step-action procedure that follows the flowchart to clear the alarm.

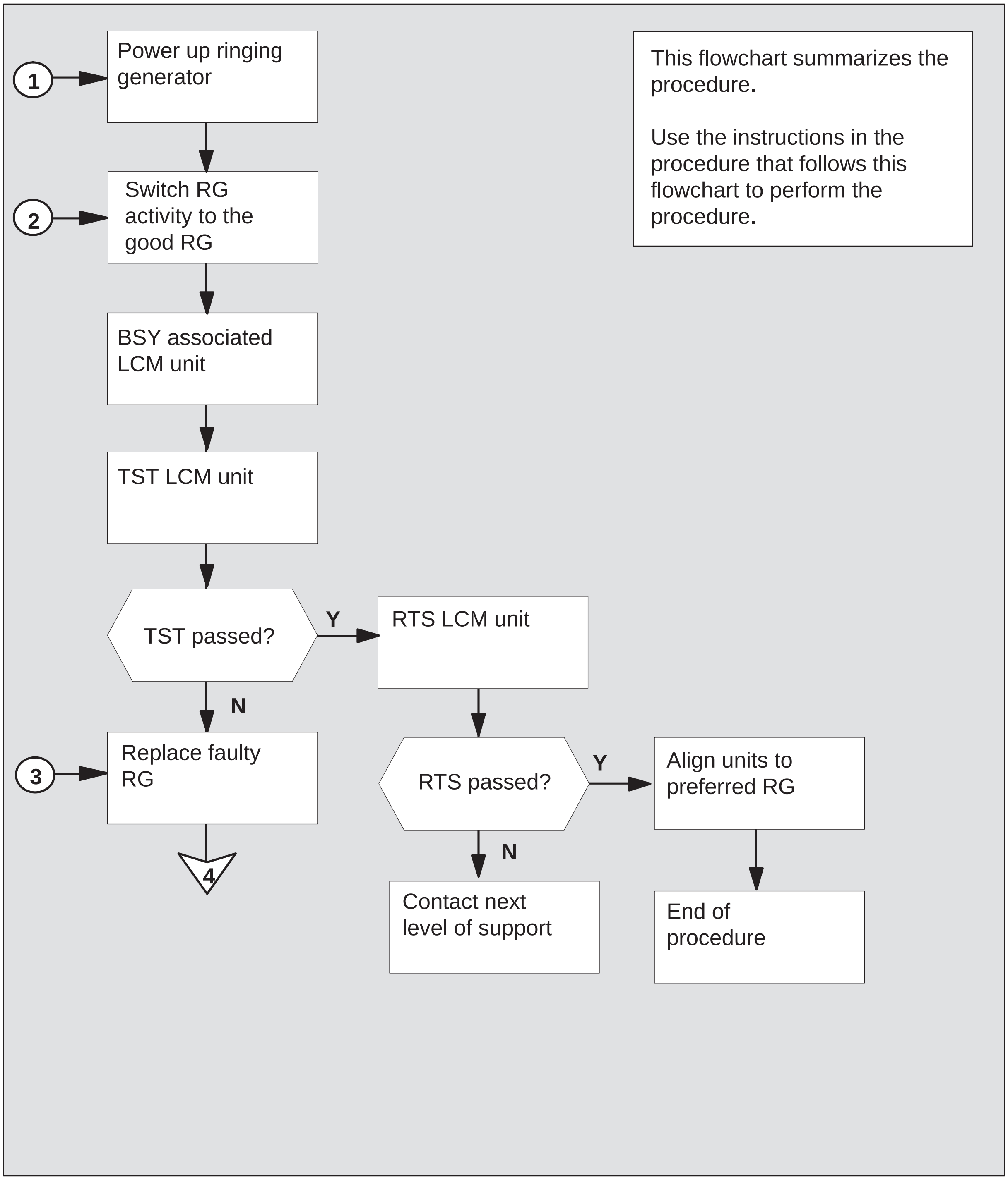
RLCM RG
major (continued)

Summary of clearing an RLCM RG major alarm



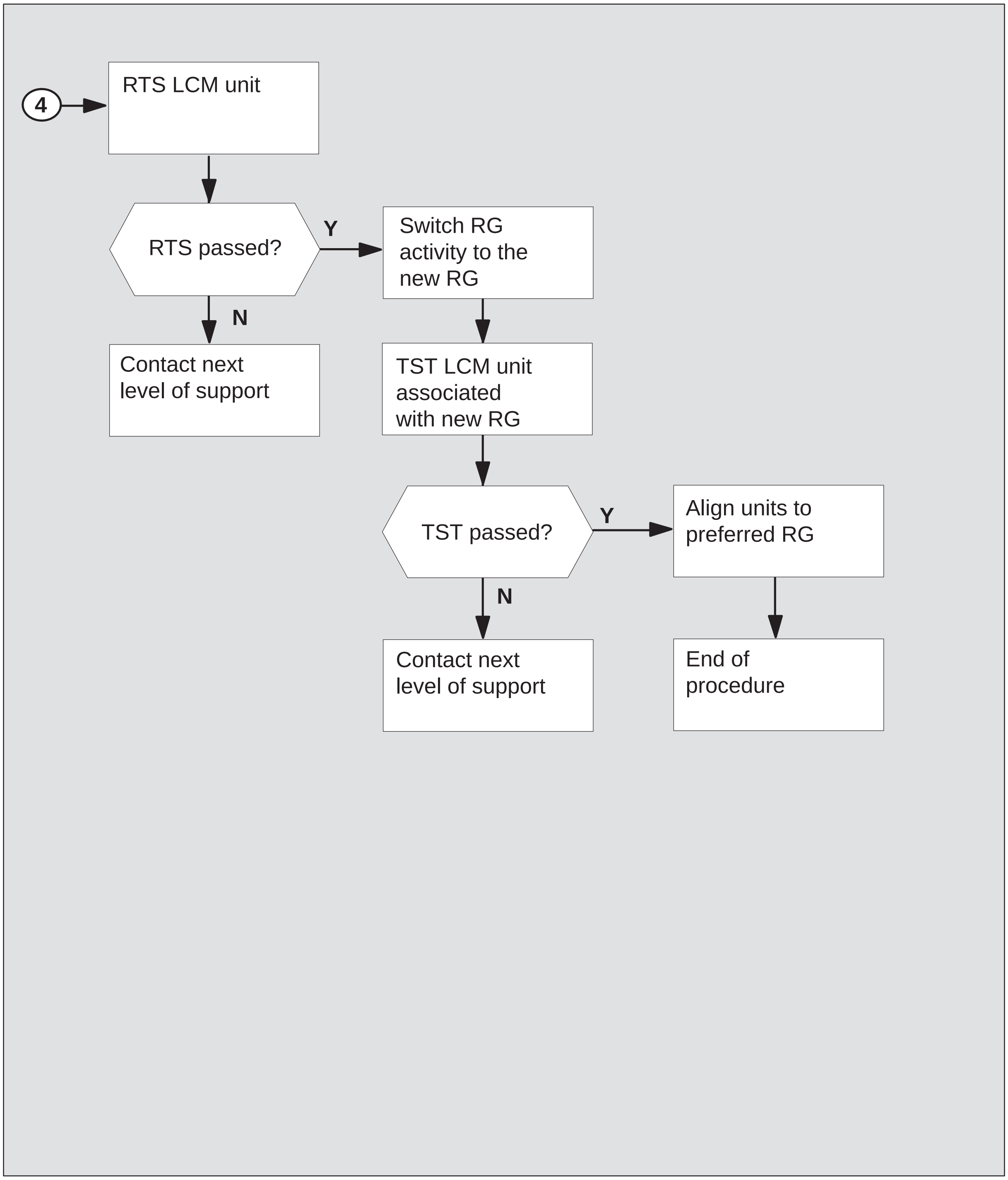
RLCM RG
major (continued)

Summary of clearing anRLCM RG major alarm (continued)



RLCM RG
major (continued)

Summary of clearing anRLCM RG major alarm (continued)



RLCM RG
major (continued)

Clearing an RLCM RG major alarm

At the MAP terminal

1

> **ATTENTION**
> You should be entering this procedure from the PM system level alarm clearing procedure step which identified a PM alarm associated with an LCM ringing generator fault.

Silence the alarm by typing

>MAPCI;MTC;PM;SIL
and pressing the Enter key.

2 Identify the faulty RLCM by typing

>DISP STATE ISTB LCM
and pressing the Enter key.

Example of a MAP response:

```
ISTb:  REM1 14 1
```

3 Post the ISTb LCM identified in step 2 by typing

>POST LCM site frame_no lcm_no
and pressing the Enter key.

where

site is the name of the site at which the LCM is located
frame_no is the number of the frame (00 to 511)
lcm_no is the number of the LCM (0 or 1) in the frame

Example of a MAP response

```
       SysB     ManB     OffL     CBsy     ISTb      InSv
PM      0        0        0        0        2          22
LCM     0        0        0        0        2          12

LCM   REM1  14 1 ISTb  Links_OOS:  CSide  0   PSide   0
Unit0:   InSv                 /RG: 1
Unit1:   ISTb                 /RG: 1
                            11  11  11  11  11  RG:Pref 1 SysB
 Drwr:  01  23  45  67  89  01  23  45  67  89     Stby 0 InSv
        ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
```

RLCM RG
major (continued)

4 Check for fault indicators by typing

>QUERYPM FLT
and pressing the Enter key.

Example of a MAP display:

```
QUERYPM FLT
Node inservice troubles exist:
    One or both Units inservice trouble
LCM   UNIT 0  No faults exist
LCM   UNIT 1  Inservice Troubles Exist:
              Ring Generator ANI/COIN failure
```

If RG failure is	Do
indicated	step 7
not indicated	step 5

At the RLCM site

5 Make a visual inspection of the ringing generator. Check to see if the LED is lit.

If the LED is	Do
lit	step 6
not lit	step 7

6 Power up the ringing generator by moving the power switch to the ON position. The LED should go out. These switches are identified here as:

- RG 0 CB2
- RG 1 CB3

RLCM RG
major (continued)

At the MAP terminal

7 Ensured both LCM units are aligned to the good RG by typing

>SWRG UNIT unit_no
and pressing the Enter key.

where

unit_no is the LCM unit (0 or 1) associated with the faulty RG

Example of a MAP display:

```
LCM REM1 14 1 Unit 1 SWRG Passed
```

Note: Repeat this step until both units of the LCM are on the good RG.

If the SWRG command	Do
passed	step 8
failed	step 18

8 Manually busy the ISTb LCM unit identified in step 2 by typing

>BSY UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the ISTb LCM unit.

9 Test the ManB LCM by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the ManB LCM unit.

If cardlist is	Do
generated	step 10
not generated	step 18

RLCM RG
major (continued)

10 Observe the card listing shown on MAP display.

Example of a MAP response:

```
SITE FLR RPOS BAY_ID   SHF DESCRIPTION SLOT EQPEC
Rem1 01  A00  RLCM 00   38  LCM:000    :01  6X60
Rem1 01  A00  RLCM 00   04  LCM:000    :04  6X51
```

11 Determine if the NT6X60 circuit card was replaced.

If the NT6X60 card has	Do
been replaced	step 18
not been replaced	Go to step 17 to replace the ringing generator

12 Return the LCM to service by typing

>RTS UNIT unit_no
and pressing the Enter key.

where

unit_no is the number of the ManB LCM (0 or 1).

If	Do
RTS PASSED	step 13
RTS FAILED	step 18

RLCM RG
major (continued)

13 Align RG activity to the new RG by typing

>SWRG UNIT unit_no
and pressing the Enter key.

where

unit_no   is the LCM unit (0 or 1) associated with the new RG

Example of a MAP display:

```
LCM REM1 14 1 Unit 1 SWRG Passed
```

If the SWRG command	Do
passed, and RG activity must be switched for the other LCM unit	step 14
passed, and RG activity is acceptable for both LCM units	step 15
failed	step 18

14 Repeat step 13 for the other LCM unit in this frame.

15 Test the new RG by typing

>TST UNIT unit_no
and pressing the Enter key.

where

unit_no   is the number of the LCM unit (0 or 1).

Example of a MAP response:

```
LCM REM1 14 1 Unit 1  InSvce Tests Initiated
LCM REM1 14 1 Unit 1  Tst Passed
```

Note: Repeat this step for the other LCM unit.

If TST	Do
passed	step 16
failed	step 18

RLCM RG major (end)

16 Align RG activity to the preferred RG by typing

>SWRG UNIT unit_no
and pressing the Enter key.

where

unit_no is the LCM unit (0 or 1) assigned to the new RG

Example of a MAP display:

```
LCM REM1 14 0 InSv Links  OOS: Cside 0 Pside 0
Unit 0: InSv      /RG:1
Unit 1: InSv      /RG:1
                           11  11  11  11  11  RG: Pref 1 InSv
Drwr:  01  23  45  67  89  01  23  45  67  89      Stby 0 InSv
       ..  ..  --  --  --  --  ..  --  ..  ..
```

Note: Repeat this step until both units of the LCM are on the preferred RG.

If the SWRG command	Do
passed	step 19
failed	step 18

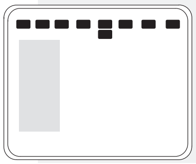
17 Go to the appropriate procedure in the *Card Replacement Procedures*. When you have finished with the card replacement procedures, go to step 12 of this procedure.

18 Obtain further assistance in clearing this alarm by contacting the personnel responsible for higher level support.

19 You have successfully completed this procedure. If there are other alarms displayed, reference the appropriate alarm clearing procedures for the indicated alarms.

Ext FSP
RLCE frame major

Alarm display



CM	MS	IOD	Net	PM	CCS	Lns	Trks	**Ext**	Appl
.	.	.	.	.	.	.	.	**1FSP**	.
								M	

Indication

At the MTC level of the MAP, the alarm code FSP, preceded by a number, appears under the EXT header of the alarm banner. This code indicates an external frame supervisory panel (FSP) alarm.

The letter M below the alarm code indicates the alarm class is major. The number under the EXT header of the alarm banner indicates the number of frames affected by the problems.

Meaning

One or more frames in the office has a power problem fault or a cooling unit fault.

Impact

The type of fault and the type of frame that contains the fault determines the fault’s effect on subscriber service.

Common procedures

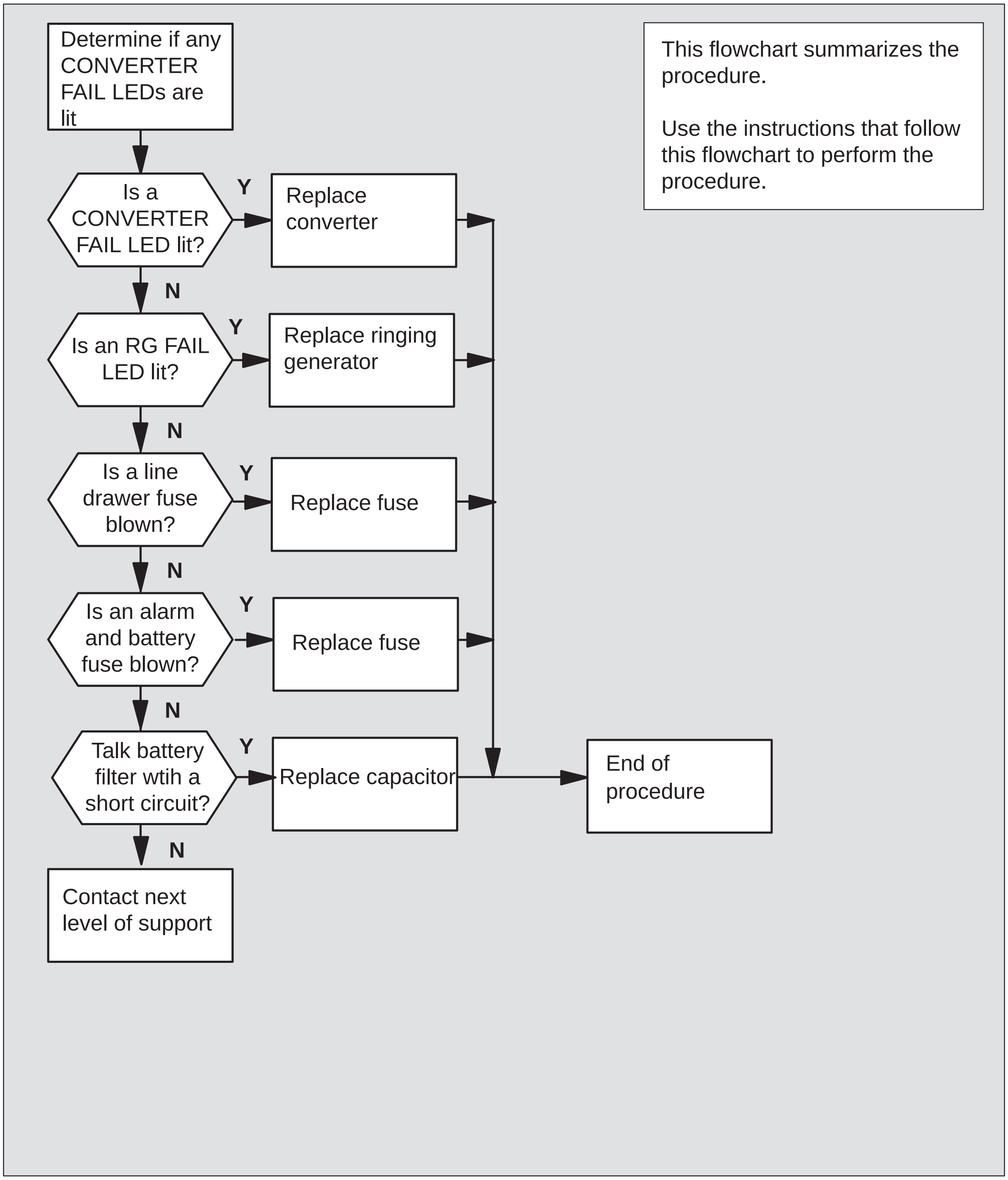
There are no common procedures.

Action

The section provides a summary flowchart of the procedure and a list of steps to clear the alarm. A detailed step-action procedure follows the flowchart.

Ext FSP
RLCE frame major (continued)

Summary of clearing an Ext FSP RLCE frame major alarm



Ext FSP
RLCE frame major (continued)

Clearing an Ext FSP RLCE frame majoralarm

At the RLCE frame

1 Determine if any converter fail LEDs on each converter in the frame are lit.

If	Do
a converter fail LED is lit	step 55
the converter fail LEDs are not lit	step 2

2 Determine if one or both ringing generator (RG) fail LEDs on the two RGs are lit. The RGs are located at the top of the frame,

Note: The FAIL LED is located behind the front panel of the RG.

If	Do
a FAIL LED is lit	step 41
the FAIL LEDs are not lit	step 3

3 Determine if any line drawer fuses (01 to 15, and RA and RB) are blown. The line drawer fuses are located on the fuse panel above each unit in the frame.

If	Do
a fuse is blown	step 9
the fuses are not blown	step 4

4 Determine if any alarm battery supply (ABS) fuses (01 to 08),are blown (protruding fuse indicator). The ABS fuses are located on the FSP.

If	Do
a fuse is blown	step 5
the fuses are not blown	step 109

5 Determine if the alarm battery supply wiring in the FSP is short-circuited. To determine if the alarm battery supply wiring is short-circuited, contact the next level of support.

Ext FSP
RLCE frame major (continued)

6 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

7 Remove the blown fuse.

8

DANGER
Risk of fire
Replace the blown fuse with a fuse of the same type, rating (color code) and vendor. This action provides continued protection against risk of fire.

Insert the replacement fuse.

If the fuse	Do
blows again	step 112
does not blow	step 105

9 Determine which fuse is blown.

Note: Fuses 01 to 05 each supply +5 V, fuses 06 to 10 each supply +15 V, and fuses 11 to 15 each supply –48 V.

If the blown fuse	Do
is any one of 01 to 05	step 14
is any one of 06 to 15	step 10
is any one of RA or RB	step 14

Ext FSP
RLCE frame major (continued)

10 Use the following table to determine which +15V fuse (06 through 10) is associated with which –48V fuse (11 through 15).

–48V fuse number	+15V fuse number
11	06
12	07
13	08
14	09
15	10

11 Remove the blown fuse and its associated fuse. For example, if the blown fuse is 06, also remove fuse 11.

12 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

13

DANGER
Risk of fire
Replace the blown fuse with a fuse of the same type, rating (color code), and vendor. This action provides continued protection against risk of fire.

Insert the +15V fuse first. Insert the –48V fuse second.

If the fuse	Do
blows again	step 17
does not blow	step 105

14 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

15 Remove the blown fuse.

Ext FSP
RLCE frame major (continued)

16

> **DANGER**
> **Risk of fire**
> Replace the blown fuse with a fuse of the same type, rating (color code) and vendor. This action provides continued protection against risk of fire.

Insert the replacement fuse.

If the fuse	Do
blows again	step 19
does not blow	step 105

17 Remove the blown fuse and its associated fuse. For example, if the blown fuse is 06, also remove fuse 11.

18 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

19 Use the following table to determine which drawer in the shelf below the fuse panel is associated with the blown fuse.

Fuse number	Drawer number Array 0	Drawer number Array 1
01, 06, 11	0 (leftmost)	5 (leftmost)
02, 07, 12	1	6
03, 08, 13	2	7
04, 09, 14	3	8
05, 10, 15	4	9

Note: The RA and RB fuses supply ringing voltage to all five drawers in the shelf. Array 0 houses drawers 0–4 and array 1 houses drawers 5–9.

Ext FSP
RLCE frame major (continued)

20

> **CAUTION**
> **Loss of service**
> Perform this procedure during periods of low traffic.

Pull out the line drawer you identified.

Note: When you handle a blown RA or RB fuse, begin with the top left drawer.

21

> **DANGER**
> **Personal injury**
> Use caution when you handle the line card. The line feed resistor can be hot.

Unseat all the line cards in the drawer.

Note: Do not remove the line cards from the drawer.

If you	Do
handle any one of fuses 01 to 05	step 23
handle any one of fuses 06 to 15	step 22
handle an RA or RB fuse	step 23

Ext FSP
RLCE frame major (continued)

22

DANGER
Risk of fire
Replace the blown fuse with a fuse of the same type, rating (color code) and vendor. This action provides continued protection against risk of fire.

Insert the +15V fuse first. Insert the –48V fuse second.

If the fuse	Do
blows again	step 26
does not blow	step 28

23 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

24 Remove the blown fuse.

25

DANGER
Risk of fire
Replace the blown fuse with a fuse of the same type, rating (color code) and vendor. This action provides continued protection against risk of fire.

Insert the replacement fuse.

If the fuse	Do
blows again	step 26
does not blow	step 28

Ext FSP
RLCE frame major (continued)

26 Determine if the wires in the drawer are loose or short-circuited.

If the wires	Do
are loose or short-circuited	step 112
are not loose or short-circuited, the fuse is a ringing voltage fuse (RA or RB), and the five drawers in the shelf are not done.	step 27
are not loose or short-circuited, the fuse you deal with is a ringing voltage fuse (RA or RB), and the five drawers in the shelf are done.	step 112
are not loose or short-circuited, the fuse is a line drawer fuses (01 to 15).	step 112

27 Reseat all the line cards in the drawer. Repeat steps 20 and 21 for the next drawer.

28 Reseat the line cards one at a time.

29 Reseat each card. Determine if the fuse is blown.

If after you	Do
reseat a line card, the fuse blows again	step 30
reseat all of the line cards, the fuse does not blow	step 105

Ext FSP
RLCE frame major (continued)

30

DANGER
Personal injury
Use caution when handling the line card. The line feed resistor can be hot.

Remove the line card from the drawer.

31 Obtain a replacement line card. Make sure the replacement card has the same product engineering code (PEC), including the suffix, as the card you remove.

32 Insert the replacement line card into the drawer.

If you are dealing with	Do
any one of fuses 01 to 05	step 36
any one of fuses 06 to 15	step 33
an RA or RB fuse	step 36

33 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

34 Remove the blown fuse and its associated fuse. For example, if the blown fuse is 06, also remove fuse 11.

35

DANGER
Risk of fire
Replace the blown fuse with a fuse of the same type, rating (color code) and vendor. This action provides continued protection against risk of fire.

Insert the +15V fuse first. Insert the –48V fuse second.

If the fuse	Do
blows again	step 112
does not blow	step 39

Ext FSP
RLCE frame major (continued)

36 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

37 Remove the blown fuse.

38

DANGER
Risk of fire
Replace the blown fuse with a fuse of the same type, rating (color code) and vendor. This action provides continued protection against risk of fire.

Insert the replacement fuse.

If the fuse	Do
blows again	step 112
does not blow	step 39

39 Reseat all other line cards in the drawer.

40 Push the drawer back in. Go to step 105.

41 Use the following table to identify which circuit breaker is associated with the RG with the lit converter fail LED. The circuit breaker is located on the FSP.

RG number	Circuit breaker number
RG0 (left side)	CB2
RG1	CB3

42 Determine if the associated circuit breaker is ON or OFF.

If the circuit breaker	Do
is ON	step 52
is OFF	step 43

Ext FSP
RLCE frame major (continued)

43 Set the circuit breaker to ON.

If the circuit breaker	**Do**
turns OFF, and the fail LED on the RG is lit	step 44
remains ON, and the fail LED on the RG is not lit	step 105
remains ON, and the fail LED on the RG is lit	step 52

At the PDC frame

44 Locate the fuse that powers the RG in the RLCM frame.

45 Determine if the fuse is blown.

If the fuse	**Do**
is blown	step 46
is not blown	step 113

46 Remove the fuse holder with the blown fuse.

47 Replace the cartridge fuse in the fuse holder.

48

DANGER
Risk of fire
Replace the blown fuse with a fuse of the same type, rating (color code) and vendor. This action provides continued protection against risk of fire.

Replace the blown fuse.

49 Install the fuse holder on the PDC frame.

Ext FSP
RLCE frame major (continued)

50 Determine if the fuse blows again.

If the fuse	Do
blows again	step112
does not blow again	step 51

At the RLCE frame

51 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the RG fail LED is lit.	step 53
remains ON, and the RG fail LED is not lit	step105
remains ON, and the RG fail LED is lit	step 52

52 Set the circuit breaker to OFF.

53 Replace the RG by performing the correct procedure in *Card Replacement Procedures*. Complete the procedure, and return to this point.

54 Determine if the RG fail LED for the replaced RG is lit.

If the RG fail LED	Do
is lit	step 112
is not lit	step 105

55 Determine which power converter has a lit converter fail LED.

If the converter	Do
is an NT6X53	step 56
is not an NT6X53	step 59

Ext FSP
RLCE frame major (continued)

56 Use the following table to identify which circuit breaker is associated with the shelf with a lit converter fail LED. The circuit breaker is located on the FSP.

Shelf number	Circuit breaker number
04	CB6
21	CB7

57 Determine if the associated circuit breaker is ON or OFF.

If the circuit breaker	Do
is ON	step77
is OFF	step 58

58 Set the identified circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the RG fail LED is lit	step 66
remains ON, and the converter fail LED is lit	step 77
remains ON, and the converter fail LED is not lit	step105

59 Determine if the POWER switch on the converter is ON or OFF.

If the POWER switch	Do
is ON	step 61
is OFF	step 60

Ext FSP
RLCE frame major (continued)

60 Set the POWER switch on the converter to ON.

If the converter fail LED	Do
is lit	step 61
is not lit	step 105

61 Use the following table to identify which circuit breaker is associated with the shelf with the lit converter fail LED. The circuit breaker is located on the FSP.

Shelf number	Circuit breaker number
38 NT2X70 in slot 22	CB4
38 NT2X70 in slot 25	CB1
55 NT2X09 in slot 17	CB5

62 Determine if the associated circuit breaker is ON or OFF.

If the circuit breaker is	Do
ON	step 63
OFF	step 64

63 Set the identified circuit breaker to OFF.

64 Press and hold the RESET button on the converter while setting the circuit breaker to ON.

Ext FSP
RLCE frame major (continued)

65 Release the RESET button.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 66
remains ON, and the converter fail LED is not lit	step 105
remains ON, and the converter fail LED is lit	step 77

66 Record the numbers of the frame and shelf with the lit converter fail LED.

At the PDC frame

67 Locate the fuse that powers the shelf in the RLCE frame.

68 Determine if the fuse is blown.

If the fuse	Do
is blown	step 69
is not blown	step 78

69 Remove the fuse holder with the blown fuse.

70 Replace the cartridge fuse in the fuse holder.

71

DANGER
Risk of fire
Replace the blown fuse with a fuse of the same type, rating (color code) and vendor. This action provides continued protection against risk of fire.

Replace the blown fuse.

72 Install the fuse holder on the PDC frame.

Ext FSP
RLCE frame major (continued)

At the RLCE frame

73 Determine the type of converter with a lit converter fail LED.

If the converter	Do
is an NT6X53	step 76
is not an NT6X53	step 74

74 Press and hold the RESET button on the converter while setting the circuit breaker to ON.

75 Release the RESET button.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step78
remains ON, and the converter fail LED is not lit	step 105
remains ON, and the converter fail LED is lit	step 77

76 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 78
remains ON, and the converter fail LED is not lit	step105
remains ON, and the converter fail LED is lit	step 77

77 Set the circuit breaker to OFF.

78 Replace the converter. Perform the correct procedure in *Card Replacement Procedures*. Complete the procedure and return to this point.

Ext FSP
RLCE frame major (continued)

79 Determine the type of replaced converter.

If the replaced converter	Do
is an NT6X53	step 81
is not an NT6X53	step 80

80 Determine if the converter fail LED for the replaced converter is lit.

If the converter fail LED	Do
is lit	step 97
is not lit	step 105

81 Determine the state of the replaced converter and the associated circuit breaker.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 83
remains ON, and the converter fail LED is not lit	step 105
remains ON, and the converter fail LED is lit	step 82

82 Set the circuit breaker to OFF.

83 Remove the NT6X51 and NT6X52 cards from the shelf with the lit converter fail LED.

84 Set the circuit breaker to ON.

If the converter fail LED	Do
is lit	step 97
is not lit	step 85

Ext FSP
RLCE frame major (continued)

85 Set the circuit breaker to OFF.

86 Insert the NT6X51 card in the shelf again.

87 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 89
remains ON, and the converter fail LED is not lit	step 91
remains ON, and the converter fail LED is lit	step 88

88 Set the circuit breaker to OFF.

89 Replace the NT6X51 card. Perform the correct procedure in *Card Replacement Procedures*. Complete the procedure and return to this point.

90 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 95
remains ON, and the converter fail LED is not lit	step 91
remains ON, and the converter fail LED is lit	step 94

91 Set the circuit breaker to OFF.

92 Insert the NT6X52 card in the shelf again.

Ext FSP
RLCE frame major (continued)

93 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 95
remains ON, and the converter fail LED is not lit	step 105
remains ON, and the converter fail LED is lit	step 94

94 Set the circuit breaker to OFF.

95 Replace the NT6X52 card. Perform the correct procedure in *Card Replacement Procedures* Complete the procedure and return to this point.

96 Set the circuit breaker to ON.

If the converter fail LED is	Do
lit	step 102
not lit	step 105

97 Determine if the pins on the backplane of the shelf are bent or short-circuited.

If the pins	Do
are bent or short-circuited	step 98
are not bent or short-circuited and the converter is an NT6X53	step 100
are not bent or short-circuited, and the converter is not an NT6X53	step 102

98 Set the circuit breaker to OFF.

99 Straighten or replace bent or short-circuited pins. Go to step 96.

100 Insert the NT6X51 and the NT6X52 cards in the shelf again.

Ext FSP
RLCE frame major (continued)

101 Set the circuit breaker to ON.

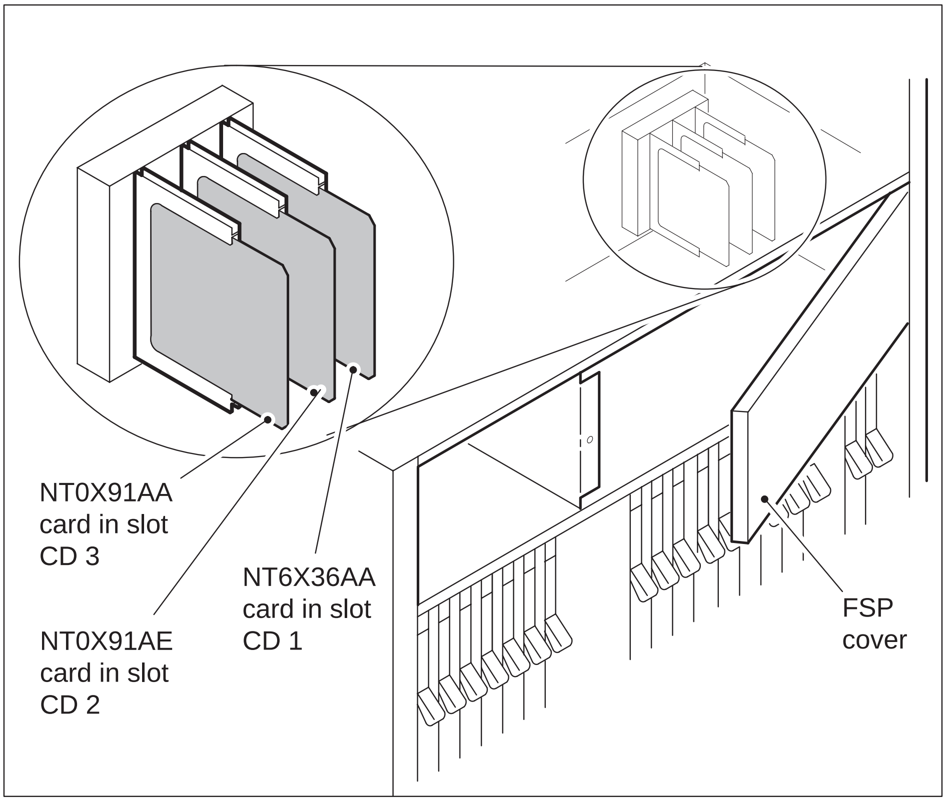
If the converter fail LED	Do
is lit	step 102
is not lit	step105

102 Use the following table and diagram to identify the alarm and control card associated with the shelf that has the lit converter fail LED.

Shelf number	Alarm and control card	Card position
38 NT2X70 in slot 25	slot CD2 NT0X91AE	middle
38 NT2X70 in slot 22	slot CD3 NT0X91AA	left
55 NT2X09 in slot 17	slot CD2 NT0X91AE	middle
04/21 NT6X53 in slot 1	slot CD1 NT6X36	right
38 NT6X60 in slots 1 and 5	slot CD1 NT6X36	right

Ext FSP
RLCE frame major (continued)

RLCE FSP card layout



Ext FSP
RLCE frame major (continued)

103 Record the numbers of the LCM and RMM in the frame.

104 Replace the alarm and control card. Perform the correct procedure in *Card Replacement Procedures.* Complete the procedure and return to this point.

At the RLCE frame

105 Determine if the FRAME fail lamp on the FSP is lit.

If the FRAME fail lamp	Do
is lit, and lit fail LEDs or blown fuses are present	step 2
is lit, and lit fail LEDs or blown fuses are not present any longer	step 112
is not lit	step 106

At the MAP terminal

106 To access the EXT level of the MAP display, type

>MAPCI;MTC;EXT
and press the Enter key.

107 Determine if an FSP alarm is present.

If an FSP alarm	Do
is present, and you did not access all the frames with an FSP alarm	step 108
is present, and you accessed all the frames with an FSP alarm	step 112
is not present	step 113

Ext FSP
RLCE frame major (end)

108 Perform the correct procedure for the type of frame with the FSP alarm. Complete the procedure and return to this point.

At the RLCE frame

109 Inspect the FSP. Check circuit breakers CB8 and CB9.

If circuit breakers	Do
are tripped	step 110
are not tripped	step 113

110 Reset circuit breaker (CB8 or CB9). Move the switch to the ON/OFF position and immediately back to the ON position. The LED goes OFF.

If circuit breaker	Do
trips again	step 111
remains ON (LED turns off)	step113

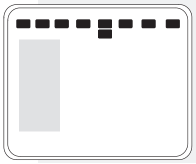
111 Access the Table of Contents for the RLCM talk battery alarm procedure. Return to this step when the procedure is complete.

112 For additional help, contact the next level of support.

113 The procedure is complete.

RMM major

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nSysB**	.	.	.	.	.
				M					

Indication

The alarm code *n*SysB can appear under the PM subsystem header at the MTC level of the MAP display. This code indicates an alarm associated with an RMM. The letter *M* under the alarm code indicates that the alarm class is major.

Meaning

The indicated number (*n*) of RMM units are in the system busy (SysB) state.

Result

If the RMM unit fails, the system discontinues maintenance and line testing. This condition does not affect subscriber service.

Common procedures

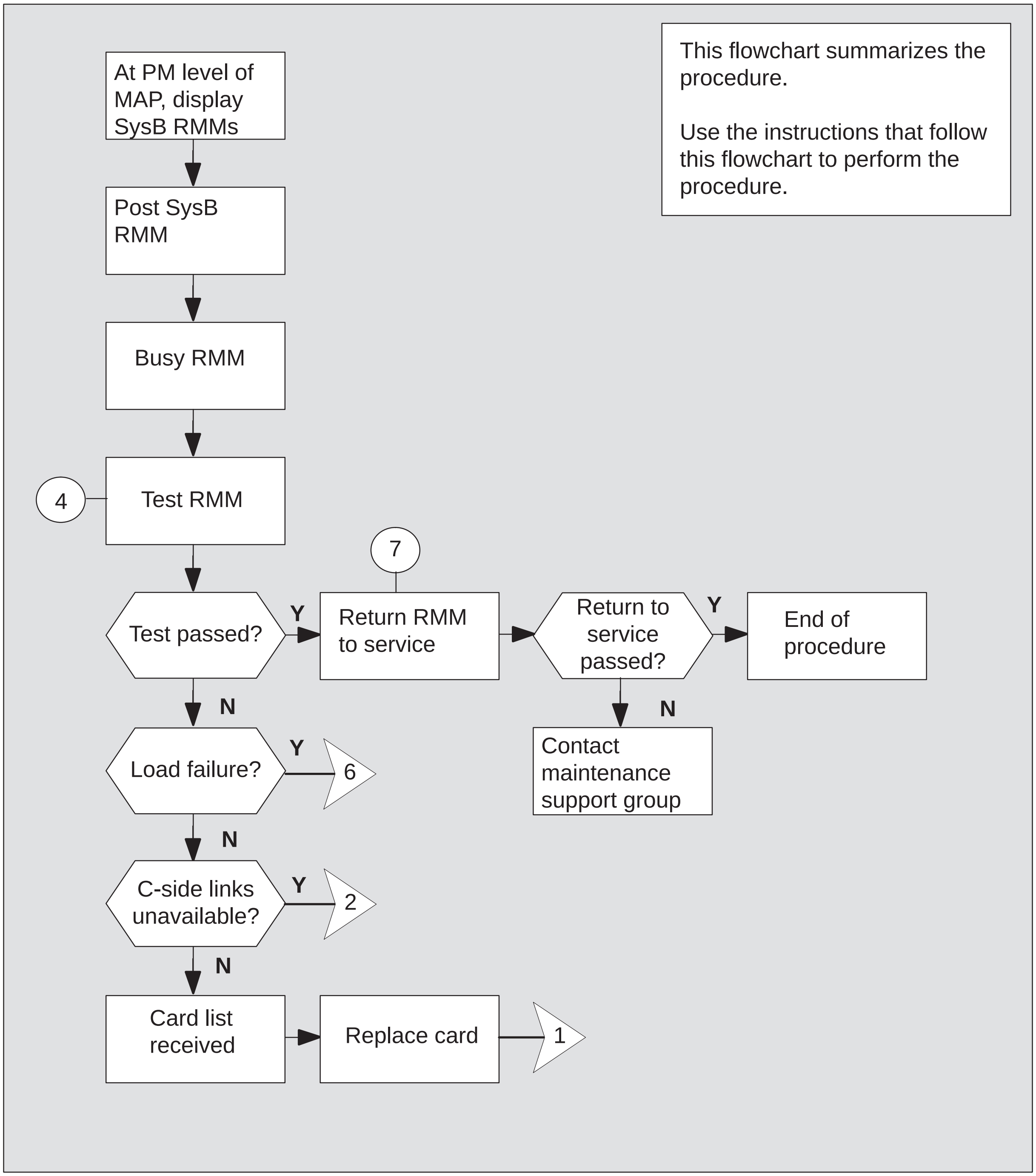
There are no common procedures.

Action

The following flowchart is a summary of the procedure. Use the instructions in the step-action procedure that follows the flowchart to clear the alarm.

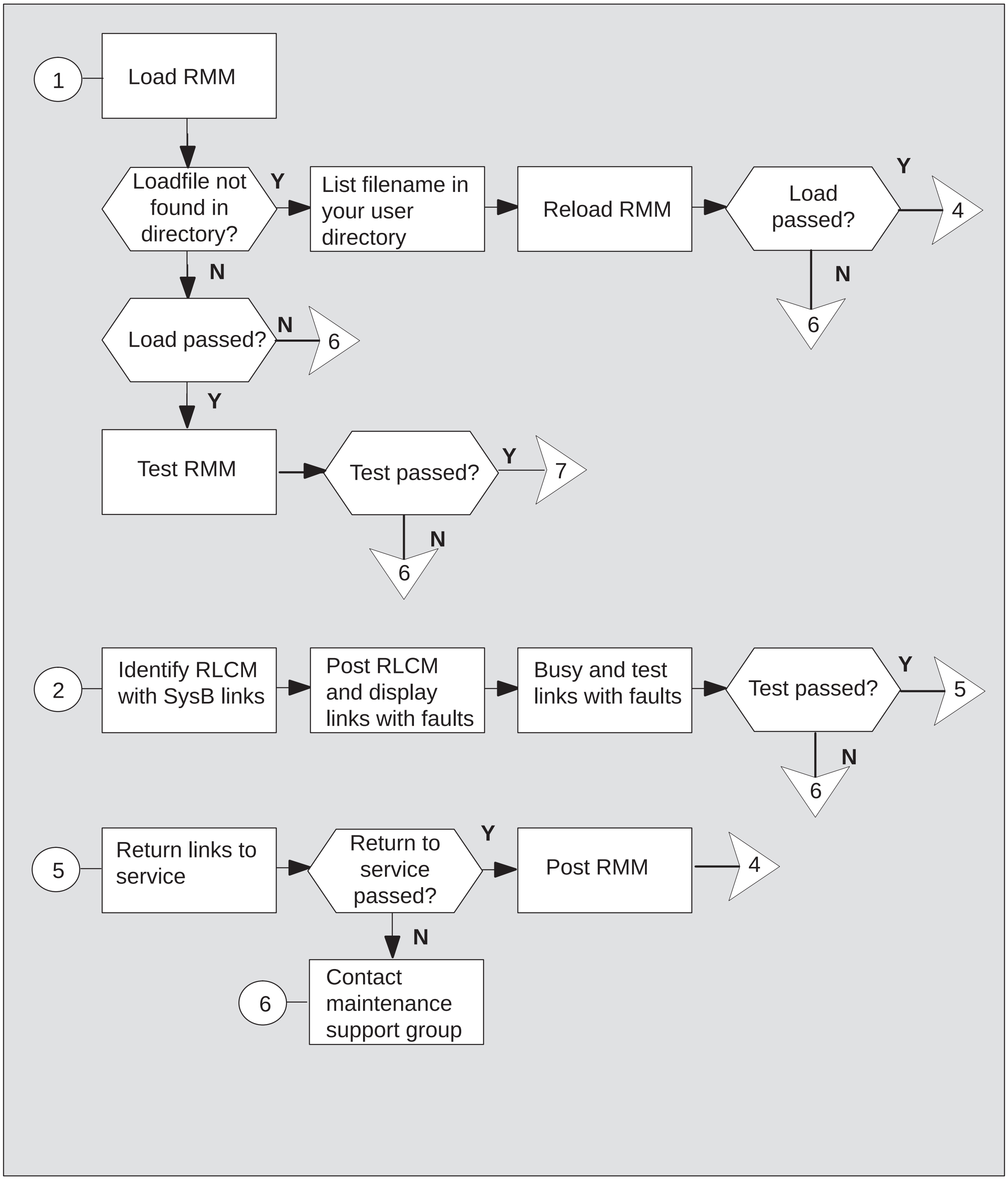
RMM
major (continued)

Summary of clearing an RMM major alarms



RMM
major (continued)

Summary of clearing an RMM major alarm (continued)



Clearing an RMM major alarm

At the MAP terminal

1 To silence the alarm, type

>MAPCI;MTC;PM;SIL
and press the Enter key.

2 To identify the RMM that has faults, type

>DISP STATE SYSB RMM
and press the Enter key.

Example of a MAP response:

```
SysB  RMM: 2
```

3 To post the SysB RMM identified in step 2, type

>POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM that has faults

4 To manually busy the RMM posted in step 3, type

>BSY
and press the Enter key.

5 To perform a test on the RMM that has faults, type

>TST
and press the Enter key.

If test	Do
passes	step 32
fails due to load failure	step 6
fails due to C-side links unavailable	step 24
fails and the system generates a card list	step 33

RMM
major (continued)

6 To load the RMM, type

>LOADPM
and press the Enter key.

If	Do
the system displays the message `load file not found in directory`	step 7
load passes	step 31
load fails	step 35

7 Determine the type of device containing the PM load files.

If load files are located	Do
on a tape	step 8
on an IOC disk	step 14
on a SLM disk	step 19

8 Locate the tape containing the PM load files.

At the IOE frame

9 Mount the tape on a magnetic tape drive.

At the MAP terminal

10 To download the tape, type

>MOUNT tape_no
and press the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

11 To list the contents of the tape in the user directory, type

>LIST T tape_no
and press the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

12 To demount the tape drive, type

>DEMOUNT T tape_no
and press the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

13 Go to step 23.

14 From office records, determine and note the number of the input/output controller (IOC) disk. Note the name of the volume containing the PM load files.

15 To access the disk utility level of the MAP, type

>DSKUT
and press the Enter key.

16 To list the IOC file names in the user directory, type

>LISTVOL volume_name ALL
and press the Enter key.

where

volume_name is the name of the volume containing the PM load files obtained in step 14

17 To leave the disk utility, type

>QUIT
and press the Enter key.

18 Go to step 23.

19 From office records, determine and note the number of the system load module (SLM) disk. Note the name of the volume containing the PM load files.

20 To access the disk utility level of the MAP, type

>DISKUT
and press the Enter key.

21 To list the SLM file names in the user directory, type

>LF volume_name
and press the Enter key.

where

volume_name is the name of the volume containing the PM load files obtained in step 19

RMM
major (continued)

22 To leave the disk utility, type

>QUIT
and press the Enter key.

23 To reload the RMM, type

>LOADPM
and press the Enter key.

If	Do
load fails	step 35
load passes	step 31

24 To identify the RLCM with links in a SysB condition, type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
LINK 0: LCM REM1 00 0  0;CAP MS;STATUS:SysB,;MSGCOND:CLS
LINK 1: LCM REM1 00 0  1;CAP MS;STATUS:SysB,;MSGCOND:CLS
```

25 To post the RLCM identified in step 24, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0 to 511)
lcm	is the number of the LCM

RMM
major (continued)

26

> **CAUTION**
> **If you do not allow the time required for the system to clear the alarm, a false alarm indication can occur.**
> Allow 3 to 5 min for the system to clear the alarm before you proceed to the next step.

To identify the P-side links that have faults, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
LINK  0: RMM 0 0;CAP MS;STATUS:SysB,;MSGCOND: CLS
LINK  1: RMM 0 1;CAP MS;STATUS:SysB,;MSGCOND: CLS
LINK  2: ESA 0 0;CAP  S;STATUS:  OK,;MSGCOND: OPN
LINK  4: ESA 0 1;CAP  S;STATUS:  OK,;MSGCOND: OPN
```

27 To busy the link that has faults, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link identified in step 26

28 To test the ManB link, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of the link (0 or 1) made manually busy in step 27

If test	Do
passes	step 29
fails	step 35

RMM
major (continued)

29 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 (0 or 1) tested in step 28

If RTS	Do
passes	step 30
fails	step 35

30 To post the ManB RMM, type

>POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM made manually busy in step 4

31 To test the RMM, type

>TST
and press the Enter key.

If test	Do
passes	step 32
fails and the system generates a card list	step 33
fails, and the system does not generate a card list	step 35

RMM
major (end)

32 To return the ManB RMM to service, type

>RTS
and press the Enter key.

If RTS	Do
passes	step 36
fails	step 35

33 The card list identifies the cards with possible faults. Replace the cards one card at a time in the order this procedure indicates.

If you	Do
replaced all the cards on the list	step 35
did not replace all the cards on the list	step 34

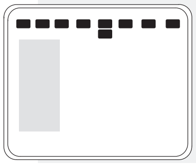
34 Refer to the card replacement procedure in the *Card Replacement Procedures* for the card that follows on the card list. When you complete the card replacement procedures, go to step 6 of this procedure.

35 For additional help, contact the next level of support.

36 The procedure is complete. If other alarms appear, refer to the appropriate alarm clearing procedures for the indicated alarms.

RLCM minor

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	***n*LCM**	.	.	.	.	.

Indication

The alarm code LCM under the PM subsystem header indicates an LCM alarm. The absence of *C* or M under the LCM indicates a minor alarm. The number *n* before LCM indicates the number of LCMs with a minor alarm.

Meaning

The number *n* of LCMs are in the in-service trouble (IsTb) state.

Impact

The in-service trouble condition does not affect subscriber service in a direct manner because one unit of the LCM continues to provide service. Local backup is not available. If the other LCM unit fails, service is interrupted.

Common procedures

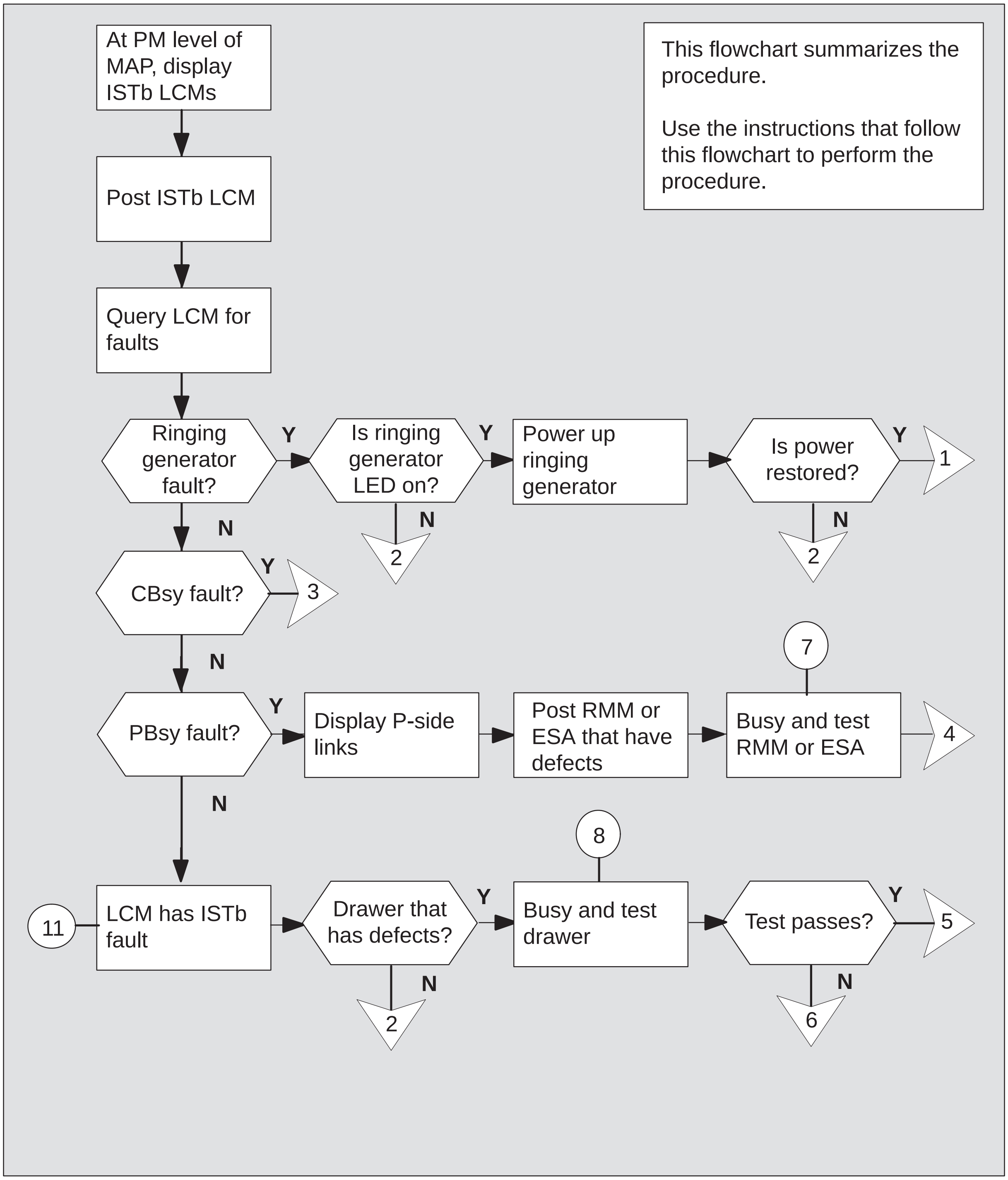
There are no common procedures.

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.

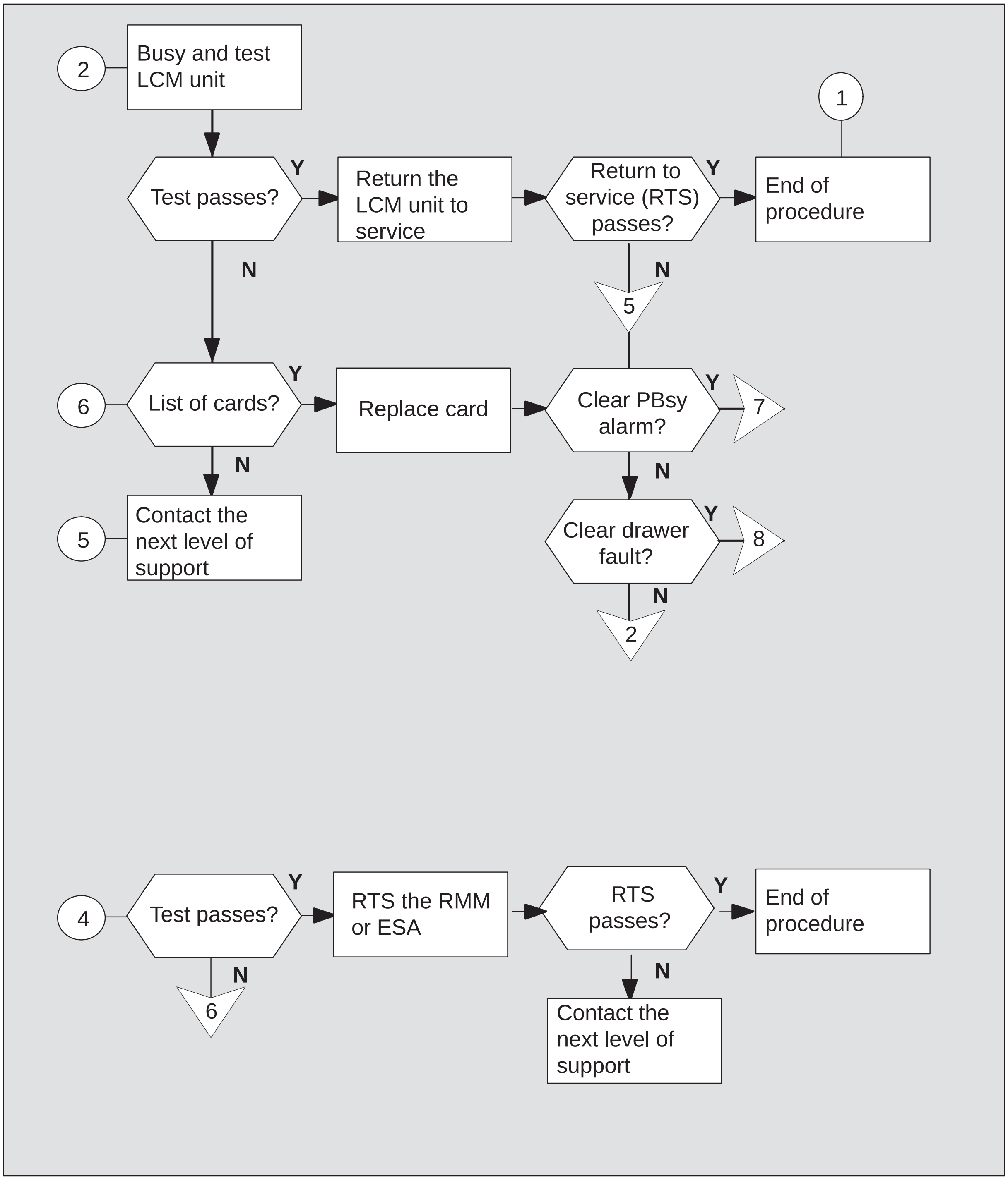
RLCM
minor (continued)

Summary of clearing an RLCM minor alarm



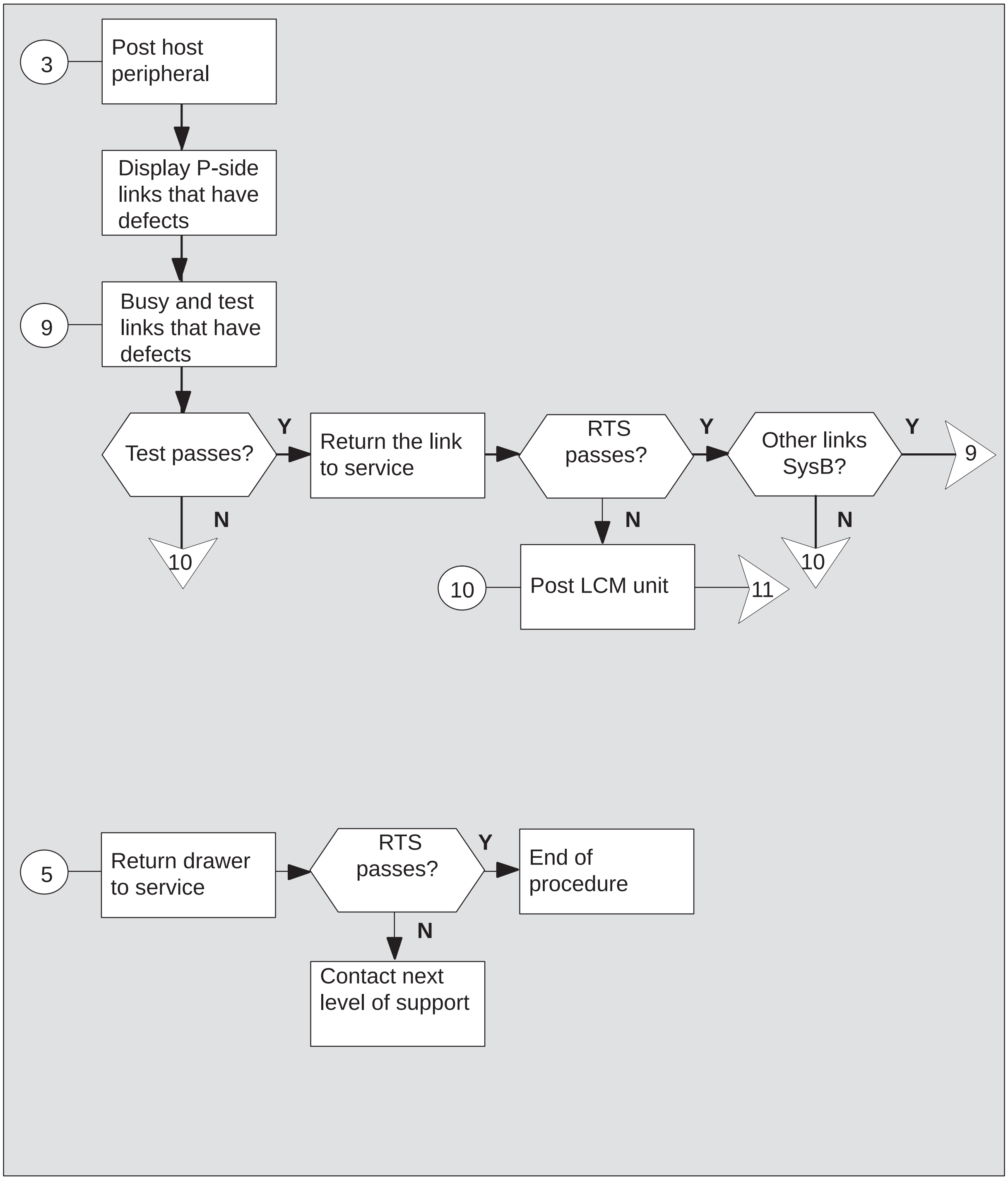
RLCM
minor (continued)

Summary of clearing an RLCM minor alarm (continued)



RLCM
minor (continued)

Summary of clearing an RLCM minor alarm (continued)



RLCM minor (continued)

Clearing an RLCM minor alarm

At the MAP terminal

1 To silence the alarm, if required, type

>MAPCI;MTC;SIL
and press the Enter key.

2 To access the peripheral module (PM) level of the MAP display, type

>PM
and press the Enter key.

3 To identify the defective RLCM, type:

>DISP STATE ISTB LCM
and press the Enter key.

4 To post the RLCM with the alarm condition, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0-511)
lcm	is the number of the LCM

5 To determine the fault indicators, type

>QUERYPM FLT
and press the Enter key.

If the fault	Do
is ringing generator	step 6
is CBsy (C-side busy)	step 9
is PBsy (P-side busy)	step 15
is DRWR FLT (drawer fault)	step 21
is ISTb (In-service trouble)	step 25

RLCM
minor (continued)

At the RLCM site

6 Inspect the ringing generator to check if the light-emitting diode (LED) is lit.

If the LED	Do
is lit	step 7
is not lit	step 25

7 To power up the ringing generator, move the power switch to the ON position. (The LED light must go off.) The switches are:

- RG 0 which corresponds to LCM unit 0 CB2
- RG 1 which corresponds to LCM unit 1 CB4

8 Determine if power is restored to the ringing generator.

If power	Do
is restored	step 31
is not restored	step 25

At the MAP terminal

9 To identify C-side links to the host PM, type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
Link 0: LTC 0      2; Cap MS; Status: OK    ;MsgCond: OPN
Link 1: LTC 0      6; Cap MS; Status: SysB  ;MsgCond: CLS
```

10 To post the host peripheral, either a line group controller (LGC), a lline trunk controller (LTC) or a remote cluster controller (RCC), type

>POST pm_type pm_no
and press the Enter key.

where

pm_type is LGC, LTC, or RCC
pm_no is the number of the host peripheral

RLCM
minor (continued)

11 To identify the defective P-side links, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
Link 2: LCM REM1 00 0  2;Cap MS;Status: OK  ;MsgCond: OPN
Link 6: LCM REM1 00 0  1;Cap MS;Status: SysB,;MsgCond: CLS
```

Record information for links that have a state other than OK.

12 To choose and busy the link that has defects, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of a peripheral-side (P-side) link that has defects from step 11

13 To test the busied link, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link that has defects busied in step 12

If test	Do
passes	step 14
fails	step 21

14 To RTS the busied link, type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link that has defects busied in step 12

If RTS	Do
passes and other links are not system busy (SysB)	step 20
passes and other links are SysB	step 12
fails	step 21

15 To display P-side links, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
Link  0: RMM 0      0;Cap MS;Status:PBsy ,P;MsgCond:CLS
Link  1: RMM 0      1;Cap MS;Status:PBsy ,P;MsgCond:CLS
Link  2: ESA 0      0;Cap M ;Status:OK   ,P;MsgCond:OPN
Link  3: ESA 0      1;Cap M ;Status:OK   ,P;MsgCond:OPN
```

16 To post the remote maintenance module (RMM) or emergency stand-along (ESA) processor that has defects (if equipped), type

>POST module module_no
and press the Enter key.

where

module is the name of the P-side module (RMM or ESA)
module_no is the number of the RMM or ESA processor

17 To busy the RMM or ESA processor, type

>BSY
and press the Enter key.

RLCM
minor (continued)

18 To test the RMM or ESA processor, type

>TST
and press the Enter key.

If test	**Do**
passes	step 19
fails, and the system produces a card list	step 28
fails, and the system does not produce a card list	step 29

19 To RTS the RMM or ESA processor, type

>RTS
and press the Enter key.

If RTS	**Do**
passes	step 31
fails	step 29

20 To post the RLCM with the alarm condition, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0-511)
lcm	is the number of the LCM at the RLCM site

RLCM
minor (continued)

21

> **CAUTION**
> **Failure to allow enough time can cause false alarm indication.**
> Allow 3 to 5 min for the system to clear the alarm before you proceed to the next step.

Determine if the problem is a drawer that has defects. Letters that appear under the line subgroup numbers indicate a drawer that has defects. The line subgroup numbers associate with a physical drawer.

Example of a MAP response:

```
LCM  REM1 00 0   ISTb   Links OOS: Cside  0 Pside  0
Unit0: InSv                    /RG: 0
Unit1: InSv                    /RG: 0
                      11 11 11 11 11 RG: Pref 0 InSv
Drwr:  01 23 45 67 89 01 23 45 67 89     Stby 1 InSv
       .. SS .. .. .. .. .. .. .. ..
```

If the system	Do
indicates the problem is a drawer with defects	step 22
indicates the system is not a drawer with defects	step 25

RLCM minor (continued)

22 To busy the two line subgroups that associate with the drawer that has defects, type

>BSY DRWR lsg
and press the Enter key

where

lsg is the number of the line subgroups that associate with the drawer that has defects

Example of a MAP response:

```
LCM  REM1 00 0   Drwr 2 will be taken out of service
Please confirm (“YES” or “NO”):
```

>YES
and press the Enter key

Repeat this step for the other line subgroup the associates with the drawerthat has defects.

23 To test the two line subgroups that associate with the drawer that has defects, type

>TST DRWR lsg
and press the Enter key.

where

lsg is the number of one of the line subgroups that associate with the drawer that has defects.

Note: Repeat this step for the other line subgroup that associates with the drawer that has defects.

If test	Do
passes	step 24
fails, and the system produces a card list	step 28
fails, and the system does not produce a card list	step 29

24 To RTS the two line subgroups, type

>RTS DRWR lsg
and press the Enter key.

where

lsg is the number of one of the line subgroups that associate with the drawer that has defects

Example of a MAP response:

```
OSvce Tests Initiated
LCM  REM1 00 0   Drwr 2 Tst Passed
LCM  REM1 00 0   Drwr 2 Rts Passed
```

Repeat this step for the other line subgroup that associates with the drawer that has defects.

If return to service	Do
passes	step 31
fails	step 29

25 To busy the LCM unit that associates with the alarm, type

>BSY UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit you must busy (0 or 1)

RLCM minor (continued)

26 To test the busied unit, type

>TST UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit you must test (0 or 1)

If test	Do
passes	step 27
fails, and the system produces a card list	step 28
fails, and the system does not produce a card list	step 29

27 To attempt to RTS the RLCM, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit to RTS (0 or 1)

If RTS	Do
passes	step 31
fails	step 29

28 The card list identifies the cards that can become defective. Replace the cards one at a time according to the following procedure.

If last card on list	Do
was not replaced	step 30
was replaced	step 29

29 For additional help, contact the next level of support.

RLCM
minor (end)

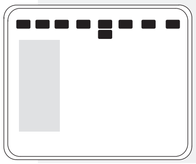
30 Perform the *Card Replacement Procedures* to replace the first (or next) card on the card list. Replace card and return to the appropriate step in this procedure.

If you clear	Do
a peripheral busy (PBsy) alarm	step 18
drawer with defects	step 23
other alarms	step 26

31 The procedure is complete. If other alarms appear at the MAP display, perform the appropriate alarm clearing procedure.

PM LCM RG minor

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nLCM**	.	.	.	.	.

Indication

An *n*LCM under the PM subsystem header at the MTC level of the MAP display indicates a minor alarm that involves an LCM.

The number (*n*) before LCM indicates the number of LCMs with this alarm.

Meaning

One of the ringing generator units is in the in-service trouble (ISTb) state.

Impact

This condition does not affect service. The system automatically switches support to a backup ringing generator (SwRG). If the backup ringing generator fails, the system does not produce rings.

Common procedures

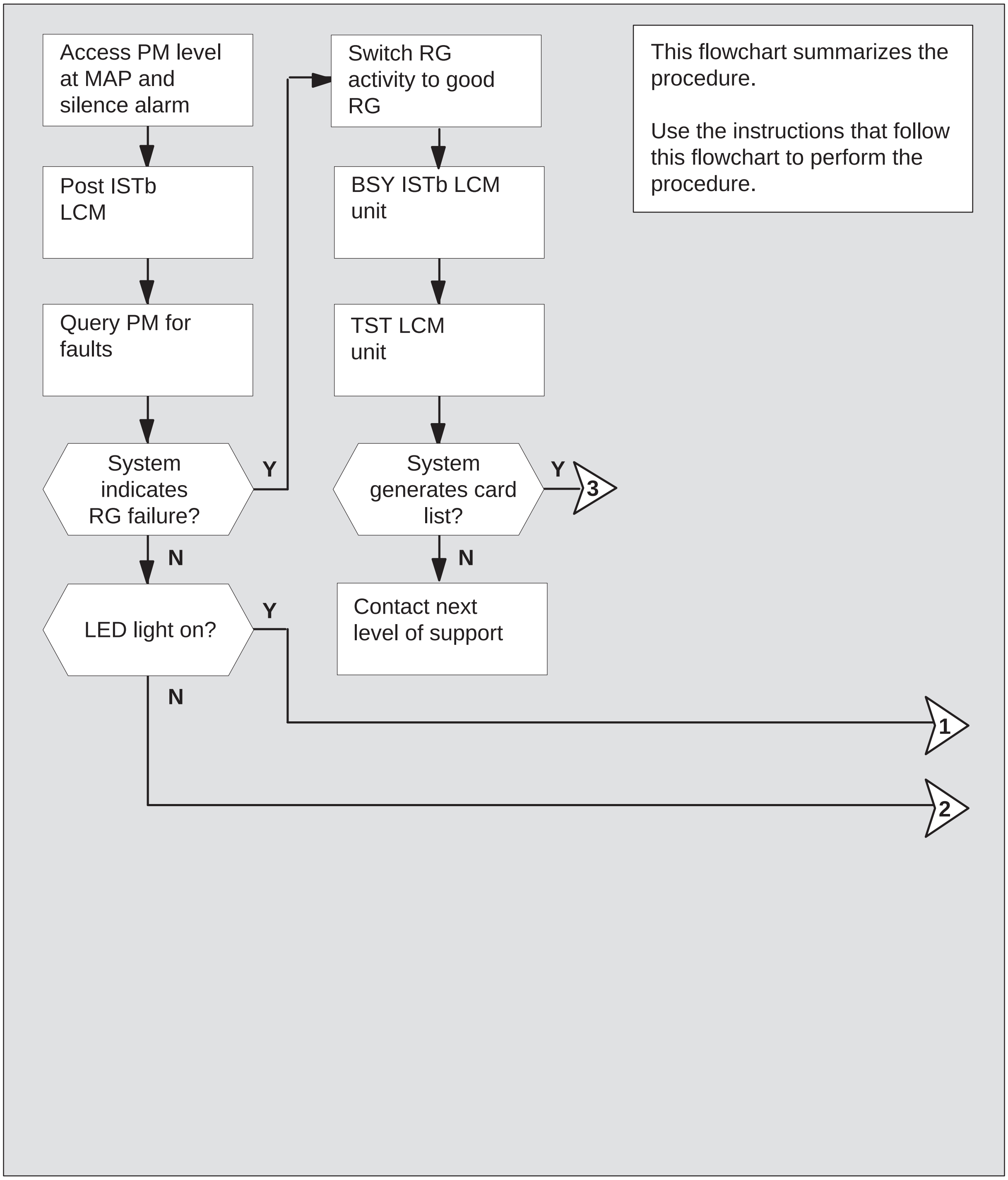
There are no common procedures.

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.

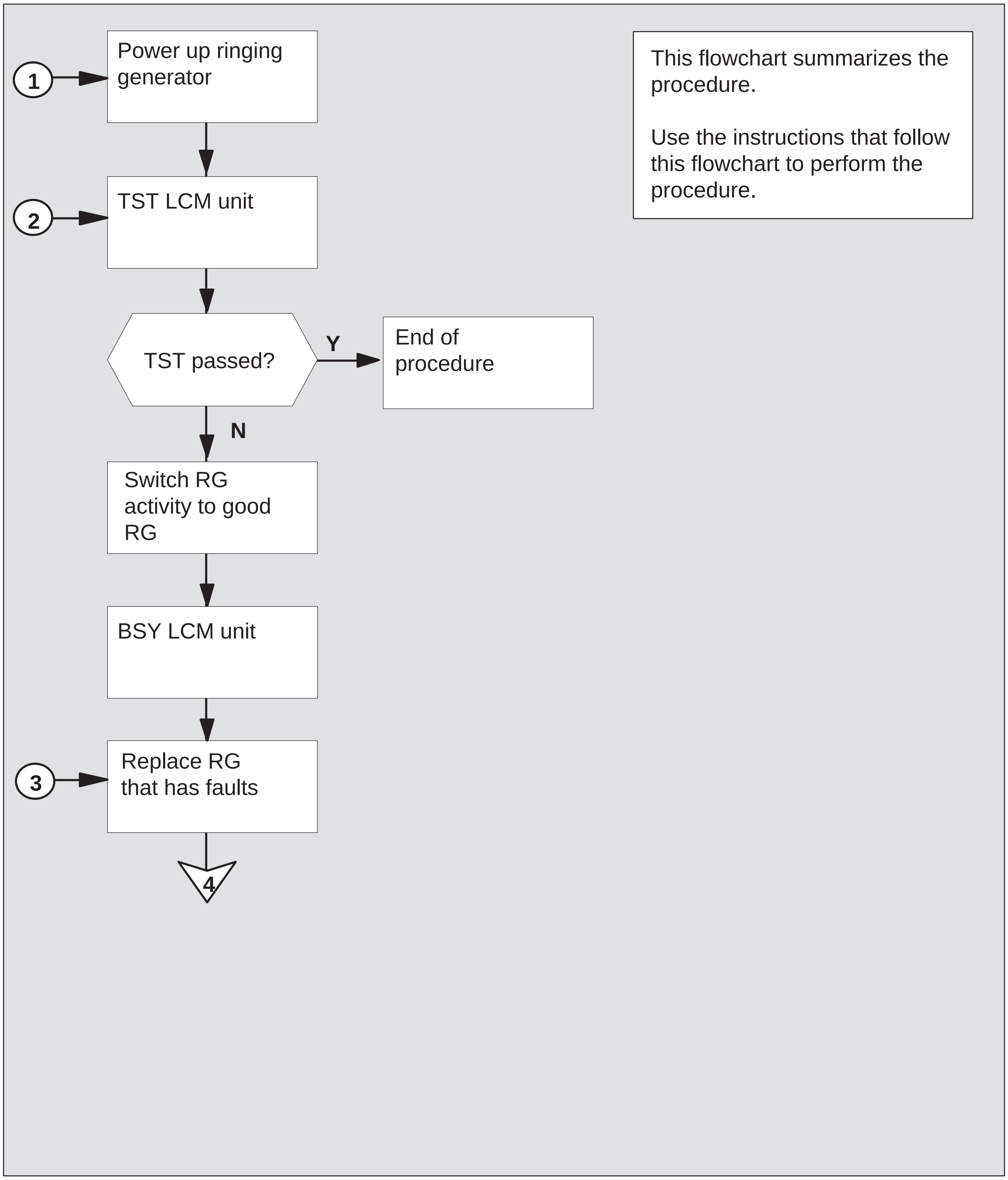
PM LCM RG
minor (continued)

Summary of clearing a PM LCM RG minor alarm



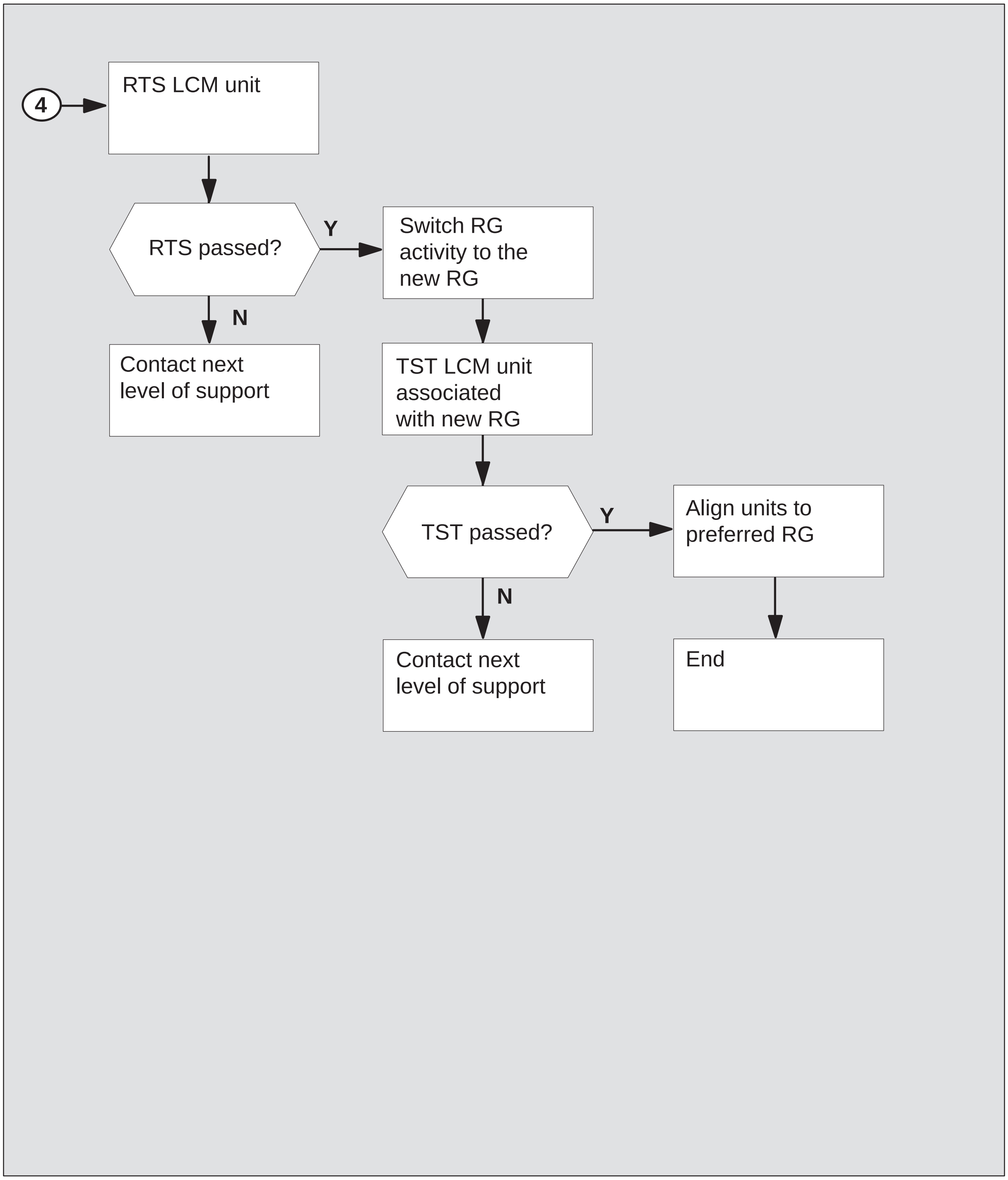
PM LCM RG
minor (continued)

Summary of clearing a PM LCM RG minor alarm (continued)



PM LCM RG
minor (continued)

Summary of clearing a PM LCM RG minor alarm (continued)



PM LCM RG
minor (continued)

Clearing a PM LCM RG minor alarm

At the MAP display

1

> **ATTENTION**
> Enter this procedure from the PM system level alarm clearing procedure step that identified an LCM ringing generator (RG) associated fault.

To silence the alarm, if required, type

>MAPCI;MTC;PM;SIL
and press the Enter key.

2 To identify the LCM that has faults, type

>DISP STATE ISTB LCM
and press the Enter key.

Example of a MAP response:

```
ISTb: REM2 00 0
```

3 To post the ISTb LCM unit identified in step 2, type

>POST LCM lcm_site_name lcm_frame_no lcm_no
and press the Enter key.

where

lcm_site_name	is the site name for the defective LCM
lcm_frame_no	is the number (00 to 511) of the LCM frame
lcm_no	is the number of the defective LCM

Example of a MAP response:

```
      SysB     ManB     OffL     CBsy     ISTb      InSv
PM     1        0        2        0        2         12
LCM    0        0        2        0        2          9

LCM   REM2  00 0 ISTb  Links_OOS:  CSide  0   PSide   0
Unit0:   InsV                /RG: 0
Unit1:   ISTb                /RG: 0
                           11  11  11  11  11 RG:Pref 0 InSv
Drwr:  01  23  45  67  89  01  23  45  67  89    Stby 1 ISTb
       ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
```

PM LCM RG
minor (continued)

4 To check for fault indicators, type

>QUERYPM FLT
and press the Enter key.

Example of a MAP response:

```
Node inservice troubles exist:
  One or both Units inservice trouble
 LCM   UNIT 0  No Inservice trouble Exist:
 LCM   UNIT 1  Inservice Troubles Exist:
Ringing Generator Failure:Ring Generator in Excess load
```

If the system	Do
indicates RG failure	step 7
does not indicate RG failure	step 5

At the LCM

5 Inspect the ringing generator. Check to see if the light-emitting diode (LED) is ON.

If the LED	Do
is ON	step 6
is OFF	step 7

6 Move the power switch to the ON position to power up the ringing generator. The LED should go OFF. These switches are identified as

RG 0

RG 1.

If the system	Do
restores power	step 16
does not restore power	step 7

PM LCM RG
minor (continued)

At the MAP terminal

7 To align RG activity to the good RG, if required, type

>SWRG UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) associated with the RG that has faults

Example of a MAP display:

```
LCM REM2 00 0 Unit 1 SWRG Passed
```

If the SWRG command	Do
passes, and RG activity must be switched for the other unit	step 8
passes, and RG activity is acceptable for both PM units	step 9
fails	step 10

8 Repeat step 7 for the other LCM unit in this frame.

9 To manually busy the ISTb LCM unit, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the number of the LCM unit (0 or 1) assigned to the RG that has faults

PM LCM RG
minor (continued)

10 To test the ManB LCM unit, type

>TST UNIT unit_no
and press the Enter key.

where

unit_no is the number of the LCM unit manually busied in step 9

Example of a MAP response:

```
LCM  REM2 00 0 Unit 1 InSvce Test Initiated
LCM  REM2 00 0 Unit 1 Tst Failed: (Reason for failure)
                                 or
LCM  REM2 00 0 Unit 1 InSvce Test Initiated
LCM  REM2 00 0 Unit 1 Tst passed
```

If TST	Do
passes	step 13
fails	step 11

11 Observe the card listing that appears in the MAP display.

Example of a MAP response:

```
SITE   FLR  RPOS   BAY_ID  SHF DESCRIPTION SLOT   EQPEC
REM2    01   A00   LCM 00  38    LCM   000  01     6X30
REM2    01   A00   LCM 00  04    LCM   000  04     6X51
REM2    01   A00   LCM 00  38    LCM   000  11     6X30
REM2    01   A00   LCM 00  21    LCM   000  04     6X51
```

12 Determine if the NT6X30 circuit card was replaced.

If you	Do
replaced the NT6X60 card	step 19
did not replace the NT6X30 card	step 18

PM LCM RG
minor (continued)

13 To return the LCM unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

unit_no is the number of the LCM unit manually busied in step 9

If RTS	Do
passes	step 14
fails	step 19

14 To align RG activity to the new RG, type

>SWRG UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) associated with the new RG

Example of a MAP display:

```
LCM REM2 00 0 Unit 1 SWRG Passed
```

If the SWRG command	Do
passes and RG activity must be switched for the other unit	step 15
passes, and RG activity is acceptable for both units	step 16
fails	step 19

15 Repeat step 14 for the other LCM unit in this frame.

PM LCM RG
minor (end)

16 To test the new RG, type

>TST UNIT unit_no
and press the Enter key.

where

unit_no is the number of the LCM unit (0 or 1) associated with the new RG

If TST	Do
passes	step 17
fails	step 19

17 To align RG activity to the preferred RG, if required, type

>SWRG UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) associated with the new RG

Example of a MAP response.

```
LCM REM2 00 0 InSv Links  OOS: Cside 0 Pside 0
Unit 0: InSv      /RG:0
Unit 1: InSv      /RG:0
                           11  11  11  11  11  RG: Pref 0 InSv
Drwr:  01  23  45  67  89  01  23  45  67  89      Stby 1 InSv
       ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
```

Note: Repeat this step to assign both units of the LCM to the preferred RG.

If SWRG command	Do
passes	step 20
fails	step 19

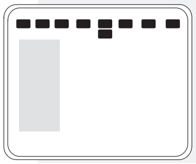
18 Go to the card replacement procedure for the NT6X30 circuit card in *Card Replacement Procedures*. Complete the procedure and go to step 13 of this procedure.

19 For additional help, contact the next level of support.

20 The procedure is complete. If the system displays other alarms, refer to the correct alarm clearing procedures for the indicated alarms.

RMM
minor

Alarm display



CM	MS	IOD	Net	**PM**	Lns	Trks	Ext	Appl
.	.	.	.	**nCBsy**	.	.	.	.

Indication

At the MTC level of the MAP display, an *n*CBsy under the peripheral module (PM) subsystem header indicates a minor alarm associated with a remote maintenance module (RMM).

Meaning

The indicated number of units are in the C-side busy (CBsy) state.

Impact

This CBsy state does not affect subscriber service. Local RMM backup is not available if the unit fails.

Common procedures

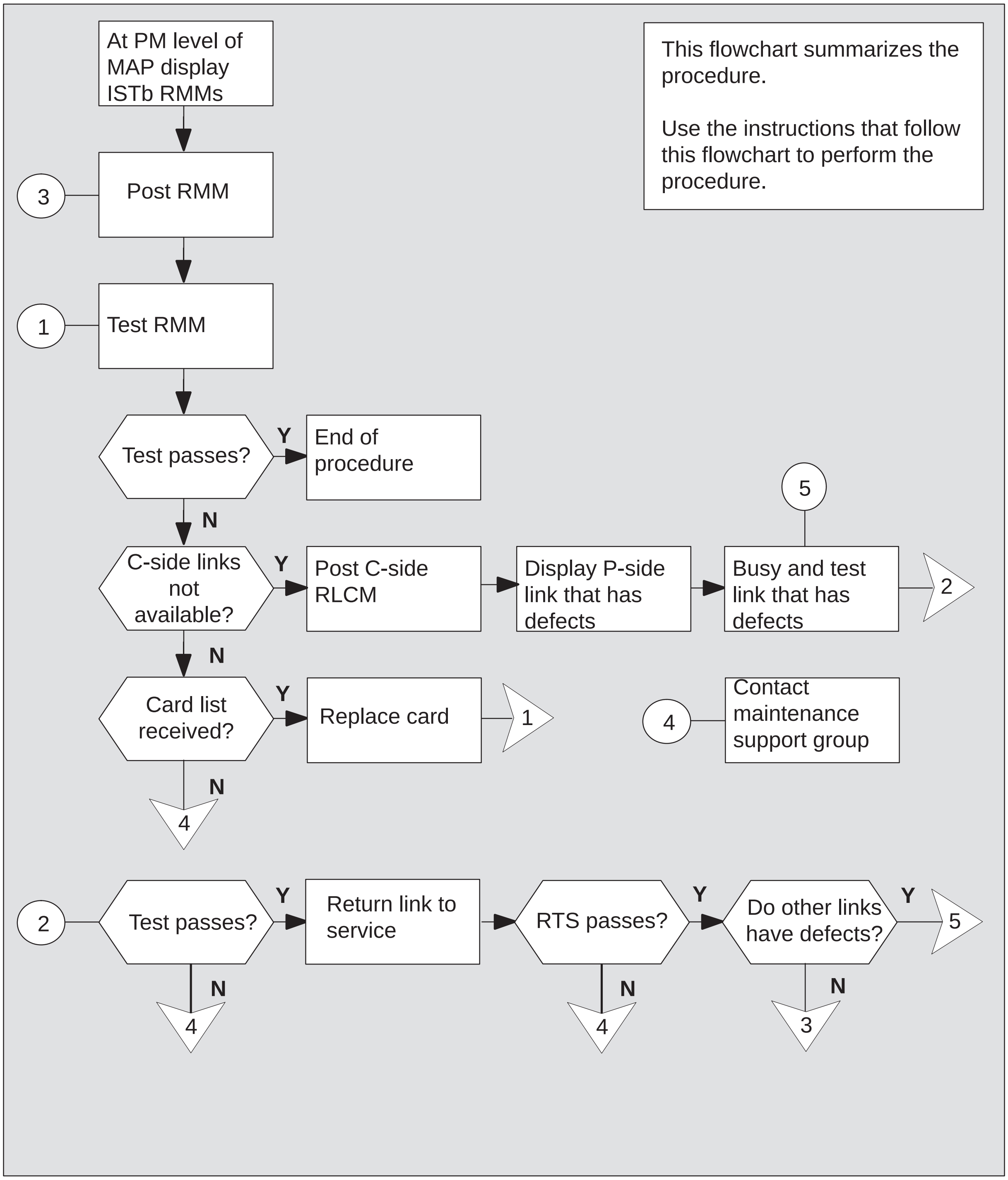
There are no common procedures.

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.

RMM
minor (continued)

Summary of RMM minor alarm



RMM
minor (continued)

Clearing an RMM minor alarm

At the MAP terminal

1 To silence the alarm, type

>MAPCI;MTC;PM;SIL
and press the Enter key.

2 To identify the defective RMM, type

>DISP STATE ISTB RMM
and press the Enter key.

Example of a MAP response

```
ISTb  RMM: 2
```

3 To post the in-service trouble (ISTB) RMM in step 2, type

>POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the defective RMM

4 To perform an in-service test on the defective RMM, type

>TST
and press the Enter key.

If test	Do
passes	step 17
fails because C-side links are not available	step 5
fails and a card list appears	step 14
fails and a card list does not appear	step 17

5 To identify the RLCM with links busied by the system (SYSB), type

>TRNSL C
and press the Enter key.

Example of a MAP response

```
LINK  0:  LCM RLCM 00 0  0;CAP MS;STATUS:SysB,;MSGCOND:CLS
LINK  1:  LCM RLCM 00 0  1;CAP MS;STATUS:  OK,;MSGCOND:OPN
```

6 To post the RLCM in step 5, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0 to 511)
lcm	is the number of the LCM

7

CAUTION
If you do not allow the time required for the system to clear the alarm, a false alarm indication occurs.
Allow 3 to 5 min for the system to clear the alarm before you proceed to the next step.

To identify the peripheral-side (P-side) links that have defects, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
LINK 0: RMM 0 0;CAP MS;STATUS:SysB,;MSGCOND: CLS
LINK 1: RMM 0 1;CAP MS;STATUS:  OK,;MSGCOND: OPN
LINK 2: ESA 0 0;CAP  S;STATUS:  OK,;MSGCOND: OPN
LINK 4: ESA 0 1;CAP  S;STATUS:  OK,;MSGCOND: OPN
```

8 To busy the link that has defects, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of the P-side link that has defects in step 7

RMM
minor (continued)

9 To test the ManB link, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of the link (0 or 1) manually busied in step 8

If	Do
`TST PASSED`	step 10
`TST FAILED`	step 16

10 To RTS the link, type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of the link (0 or 1) tested in step 9

If	Do
`RTS PASSED`	step 11
`RTS FAILED`	step 16

11 Determine if additional links must be clear.

If all the links that had defects	Do
are clear	step 12
are not clear	step 8

12 To post the RMM, type

>POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM to post

RMM
minor (end)

13 To test the RMM, type

>TST
and press the Enter key.

If test	Do
`TST PASSED`	step 17
`TST FAILED` and the system produces a card list	step 14
`TST FAILED` and the system does not produce a card list	step 16

14 The card list identifies the cards that can have defects. Replace the cards one at a time in the order listed. The directions for the order of card replacement follow:

If all cards on the list	Do
are replaced	step 16
are not replaced	step 15

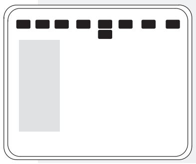
15 Perform the *Card Replacement Procedures* for the next card on the card list. Complete the card replacement procedures and go to step 13.

16 For additional help, contact the next level of support.

17 This procedure is complete. If the system displays other alarms, perform the appropriate alarm clearing procedures.

ESA
critical, minor

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	**nESA**	.	.	.	.	.
				C					

Indication

The alarm code ESA under the PM subsystem header indicates an ESA alarm. The *C* indicates a critical ESA alarm. The absence of the *C* under the ESA indicates a minor ESA alarm. The number *(n)* before ESA indicates the number of ESA processors with the alarm condition.

Meaning

The *n* is the number of ESAs in the system busy (SysB) or in-service trouble (ISTb) state.

Impact

The SysB condition directly affects service when the RLCM is in ESA. There is no local backup. An interruption of service can occur if the RLCM cannot contact the host office and the ESA processor is SysB.

The ISTb condition does not directly affect service. Investigate the trouble condition to avoid a possible service interruption if the ESA condition deteriorates.

Common procedures

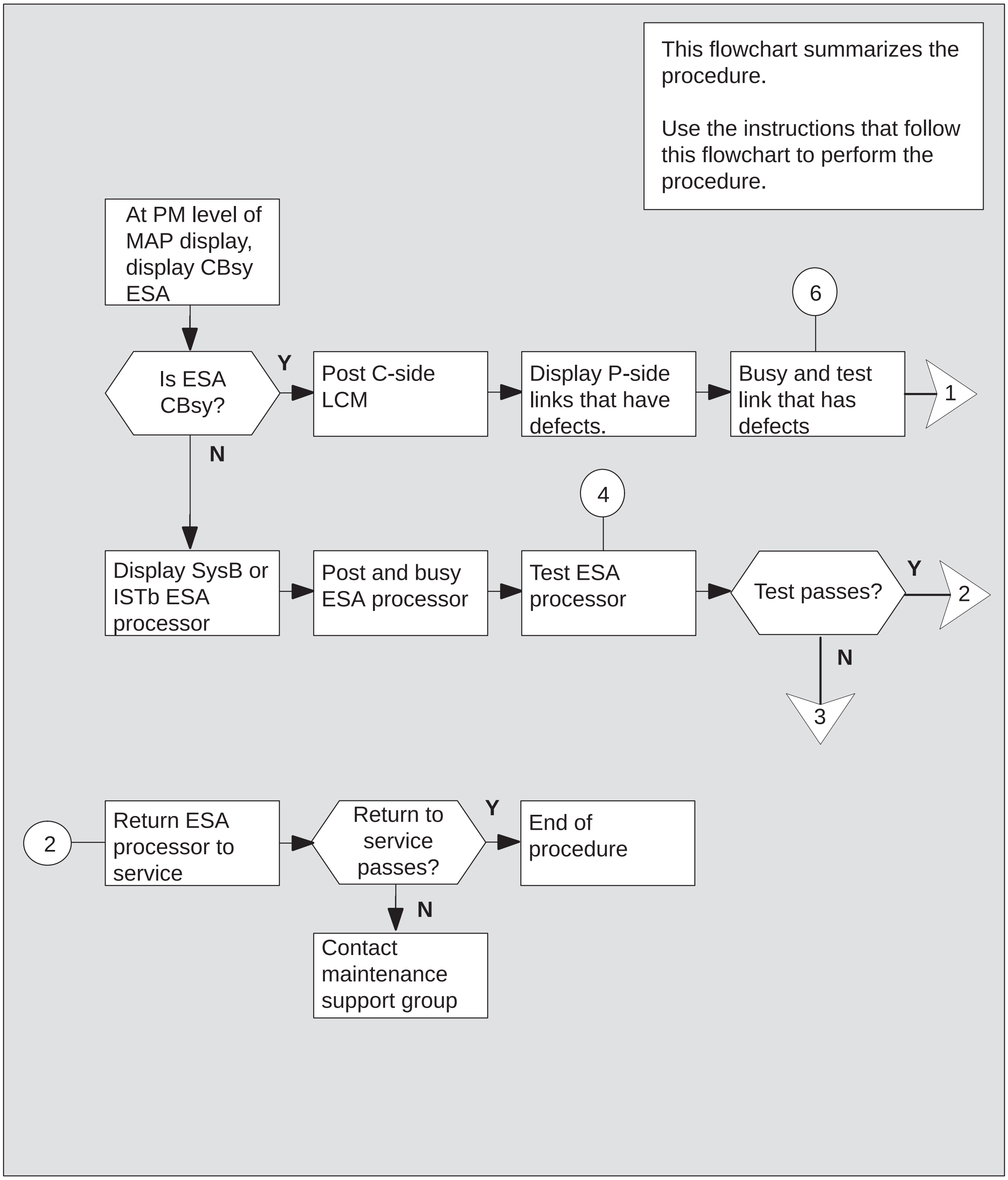
There are no common procedures.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review this procedure. Follow the steps to perform the procedure.

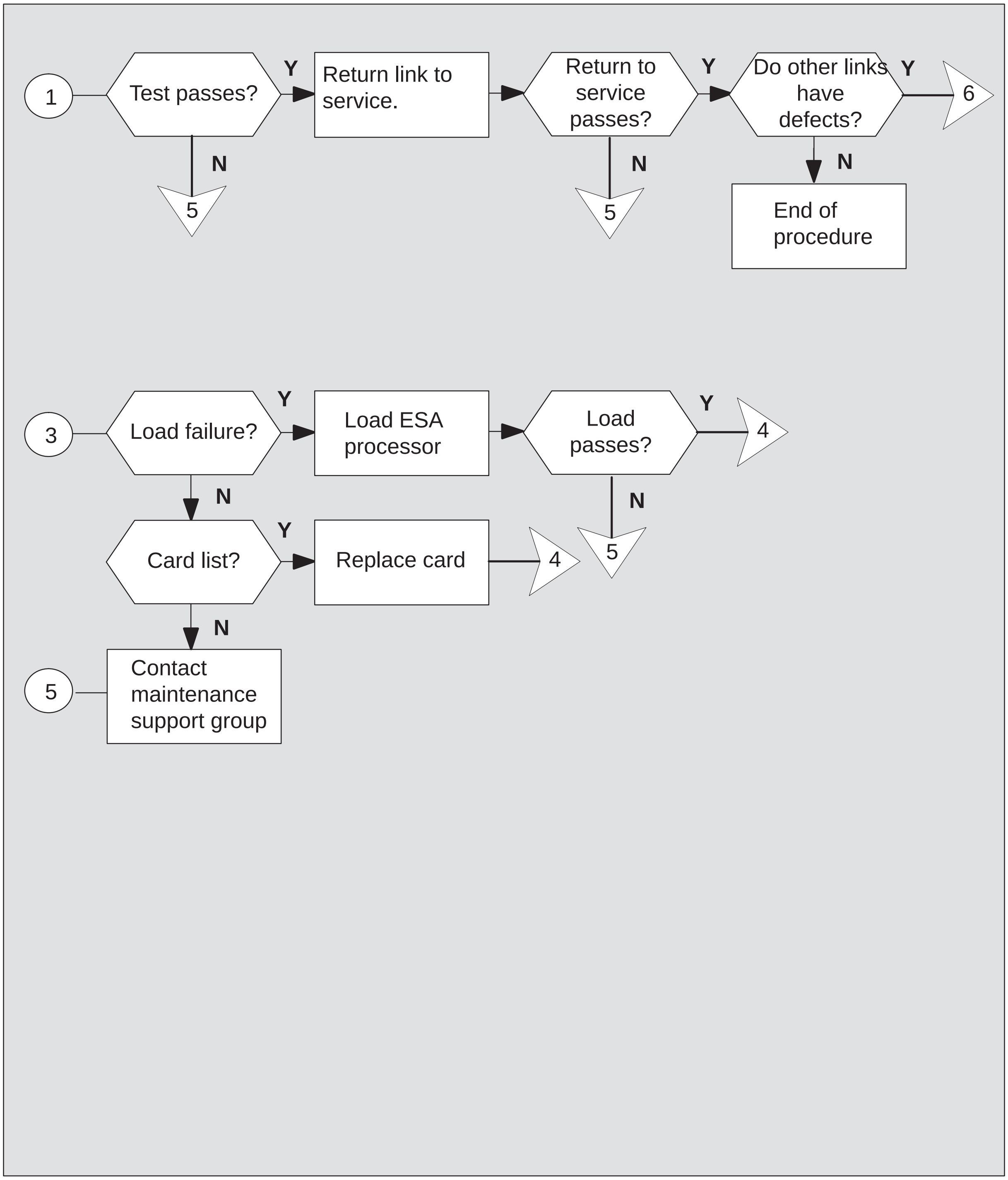
ESA
critical, minor (continued)

Summary of clearing ESA critical, minor alarm



ESA
critical, minor (continued)

Summary of ESA critical, minor alarm (continued)



ESA
critical, minor (continued)

Clearing an ESA critical, minor alarm

At the MAP terminal

1 An alarm can be audible. To silence the alarm type

>MAPCI;MTC;SIL
and press the Enter key.

2 To access the PM level of the MAP display, type

>PM
and press the Enter key.

3 To identify the central-side busy (CBsy) ESA processor, type

>DISP STATE CBSY ESA
and press the Enter key.

If ESA	Do
is CBsy	step 4
is not CBsy	step 11

4 To post the ESA processor, type

>POST ESA esa_no
and press the Enter key.

where

esa_no is the number of the ESA processor (0 to 255)

Example of a MAP response:

```
REM1  ESA    0 CBsy
```

ESA
critical, minor (continued)

5 To display the central-side (C-side) links and identify which RLCM associates with the links, type

>TRNSL
and press the Enter key.

Example of a MAP response:

```
Link 0: RMM 0        0;Cap MS;Status:OK    ;MsgCond:OPN
Link 1: RMM 0        1;Cap MS;Status:OK    ;MsgCond:OPN
Link 2: ESA 0        0;Cap M ;Status:SysB  ;MsgCond:CLS
Link 3: ESA 0        1;Cap M ;Status:SysB  ;MsgCond:CLS
```

Record information for the ESA with a state that is not OK.

6 To identify the RLCM associated with the defective link and post the RLCM, type

>POST LCM site frame lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCM (0 to 511)
lcm	is the number of the LCM (0 to 1)

7 To identify peripheral-side (P-side) links with defects associated with ESA, type

>TRNSL P
and press the Enter key.

Example of a MAP response:

```
Link 0: RMM 0        0;Cap MS;Status:OK    ;MsgCond:OPN
Link 1: RMM 0        1;Cap MS;Status:OK    ;MsgCond:OPN
Link 2: ESA 0        0;Cap M ;Status:SysB  ;MsgCond:CLS
Link 3: ESA 0        1;Cap M ;Status:SysB  ;MsgCond:CLS
```

Record information for the ESA link with a state that is not OK.

8 To busy the link that has defects, type

>BSY LINK link_no
and press the Enter key.

where

link_no	is the number of a P-side link identified in step 7

ESA
critical, minor (continued)

9 To test the busied link, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link

If test	Do
passes	step 10
fails	step 20

10 To return to service the busied link, type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of a P-side link

If return to service	Do
passes and other links are not SysB	step 21
passes and other links are SysB	step 8
fails	step 20

11 To identify the SysB ESA processor, type

>DISP SYSB ESA
and press the Enter key.

If ESA	Do
is SysB	step 13
is not SysB	step 12

ESA
critical, minor (continued)

12 To identify the ISTb ESA processor, type

>DISP ISTB ESA
and press the Enter key.

13 To post the ESA processor with the alarm condition, type

>POST ESA esa_no
and press the Enter key.

where

esa_no   is the number of the ESA processor (0 to 255)

Example of a MAP response:

```
REM1  ESA    0 SysB
```

14 To busy the posted ESA processor, type

>BSY
and press the Enter key.

Example of MAP response:

```
This action will take this PM out of service
Please confirm (“Yes” or “No”)
```

To confirm busy, type

>YES
and press the Enter key.

15 To test the ESA processor, type

>TST
and press the Enter key.

If test	Do
passes	step 18
fails because of loading errors	step 16
fails, and system produces card list	step 17
fails, and system does not produce card list	step 20

ESA
critical, minor (end)

16 To attempt to reload the ESA processor, type

>LOADPM
and press the Enter key.

If load	Do
is successful	step 15
is not successful	step 20

17 The card list identifies cards that can have defects. Replace the cards one at a time in the order listed.

If all cards on the list	Do
are replaced	step 20
are not replaced	step 19

18 To return to service the ESA processor, type

>RTS
and press the Enter key.

If return to service	Do
is successful	step 21
fails because of loading error	step 16
fails because of CBsy condition	step 4
other than listed here	step 20

19 Go to the card replacement procedure *Card Replacement Procedures* for the next card on the card list. When you finish the card replacement procedure, go to step15 of this procedure.

20 To obtain additional help to clear this alarm, contact the next level support.

21 The procedure is complete. If additional alarms display, go to the appropriate how procedure on how to clear alarms.

RLCM card replacement procedures

This chapter contains the card replacement procedures for the Remote Line Concentrating Module (RLCM). These procedures are used by maintenance personnel to remove and replace hardware modules.

Except when used as part of verification or acceptance procedures, these procedures are used only when referred to by another maintenance procedure, such as the *Alarm Clearing Procedures*.

Procedures in the manual are named to correspond with the Nortel (Northern Telecom) product equipment code (PEC) and the shelf where the card is to be replaced. These procedures are arranged in alphabetical order for easy location.

NT0X10 in RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT0X10	AA	Miscellaneous Scan Card (SC)

Common procedures

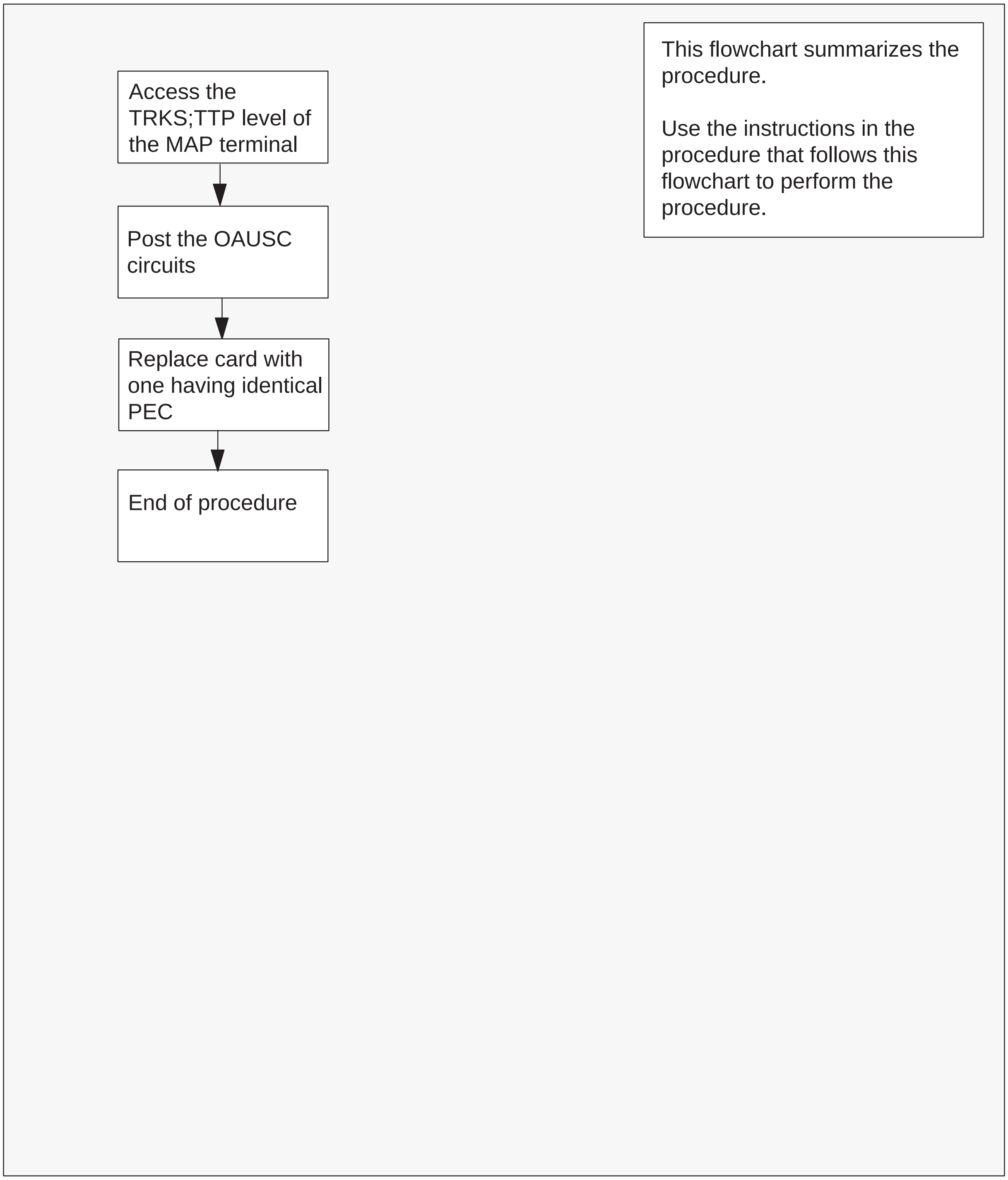
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT0X10
in RMM (continued)

Summary of card replacement procedure for an NT0X10 card in RMM



NT0X10
in RMM (continued)

Replacing an NT0X10 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP display

2 Access the TTP level of the MAP and post the scan points on the card to be replaced by tying

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no ckt_no
and pressing the Enter key.

rmm_no	is the number of the RMM with the faulty NT0X10 card.
ckt_no	is the number of the first scan point (SC) of the seven SC points on this card.

Example of a MAP display response:

```
LAST CIRCUIT = 14
POST CKT IDLED
SHORT CLLI IS:  1146
OK, CLLI POSTED

POST  13   DELQ       BUSY Q          DIG
TTP 6-006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG TESTEQ  RMM 0 0     OAUSC    0     IDL
```

At the RMM shelf

3

WARNING
Static electricity damage
Wear a wrist strap connected to the wrist strap grounding point of a frame supervisory panel (FSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Replace the NT0X10 card using the procedure *Replacing a card.* When you have completed the procedure, return to this point, otherwise go to step 6.

4 Send any faulty cards for repair according to local procedure.

NT0X10
in RMM (end)

5 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 7.

6 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

7 You have completed this procedure.

NT0X91
RLCE

Application

Use this procedure to replace the following card in an RLCE FSP.

PEC	Suffixes	Name
NT0X91	AA, AE	FSP drive and alarm circuit pack

Common procedures

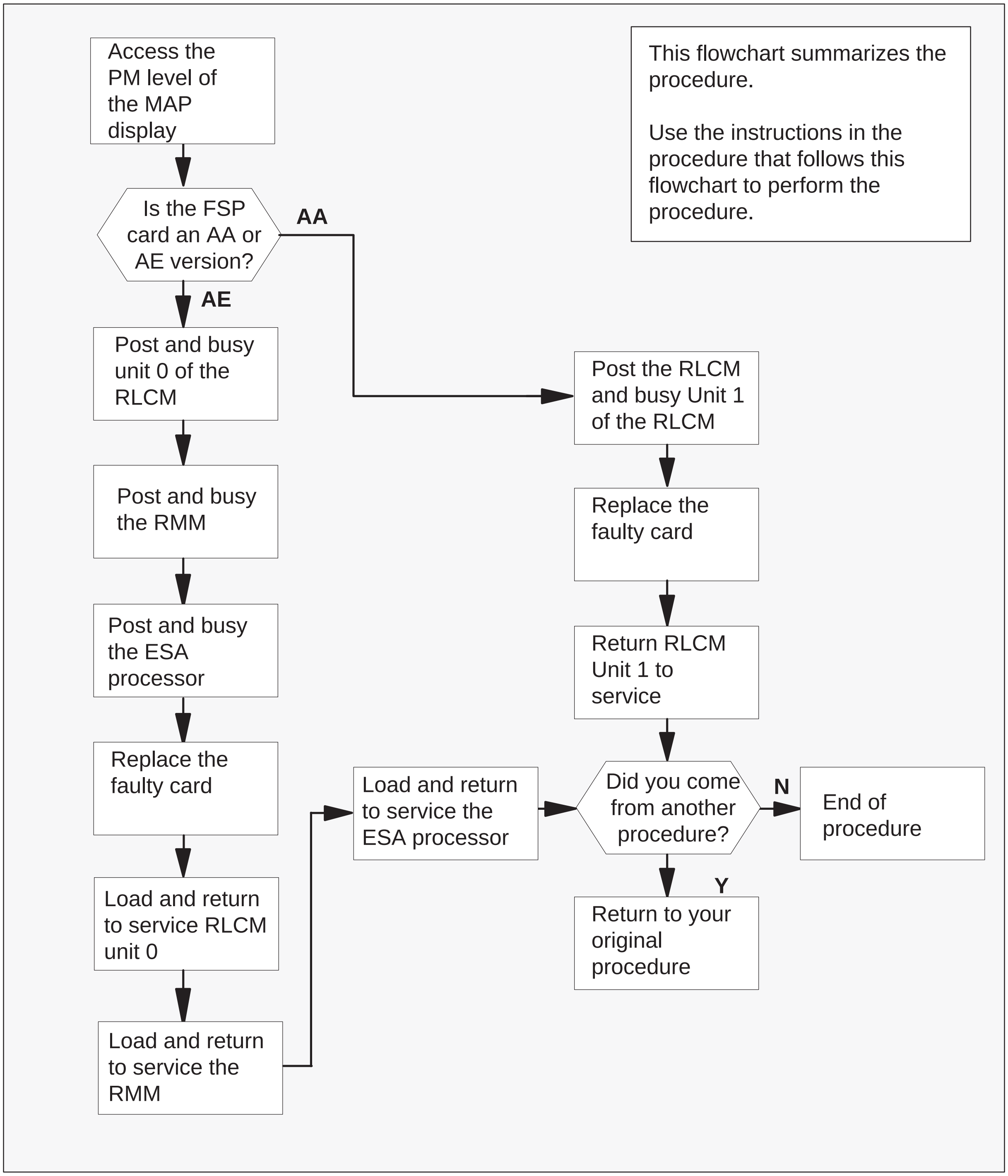
None.

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.

NT0X91
RLCE (continued)

Summary of card replacement procedure for an NT0X91 card in an RLCE



NT0X91
RLCE (continued)

Replacing an NT0X91 card in an RLCE

At your current location

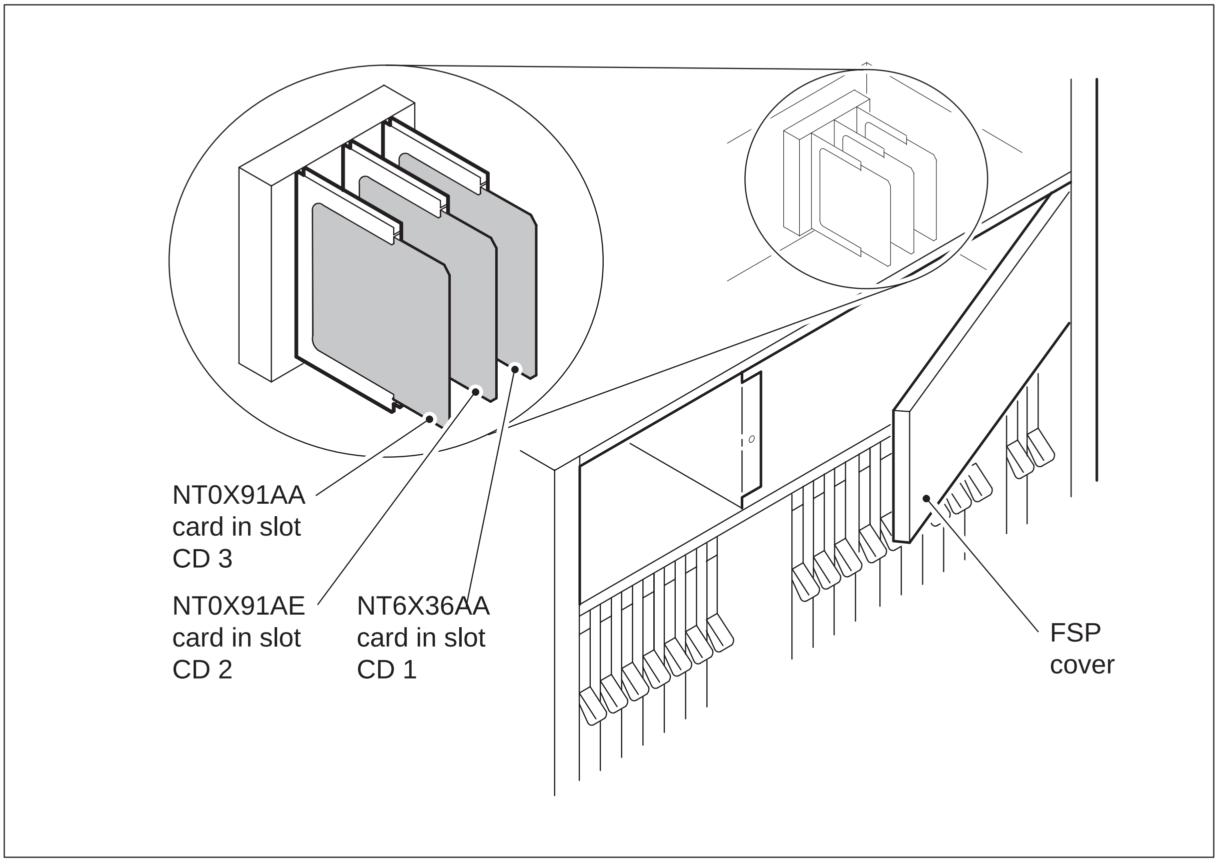
1 Obtain a replacement card. Ensure that the replacement card has the same product engineering code (PEC), including suffix, as the card being removed.

2 Use the following table to identify the slot containing the alarm and control card to be replaced.

Alarm and control card	slot
NT0X91AA	slot CD3
NT0X91AE	slot CD2
NT6X36AA	slot CD1

Note: Refer to the following for FSP card slot locations.

FSP Alarm and Control cards



NT0X91
RLCE (continued)

3 Use the following table to identify which shelves, converters, and circuit breakers (CB) are associated with the alarm and control card you want to replace.

Alarm and Shelf control card	power Converter	shelf number	circuit breaker
NT0X91AA	NT2X70 in slot 22	38	CB4
NT0X91AE	NT2X70 in slot 25	38	CB1
NT0X91AE	NT2X09 and NT2X06	55	CB5

Note: The CBs are located on the FSP, shelf position 72.

4 Record the numbers of the shelves and CBs associated with the alarm and control card.

5 Record the numbers of each remote line concentrating module (RLCM), remote maintenance module (RMM) and emergency stand alone (ESA) module associated with the alarm and control card to be replaced.

At the MAP display

6

CAUTION
Loss of service
This procedure contains directions to busy one unit of a peripheral module (PM) in a frame. Since busying a unit of a PM affects redundancy, replace alarm and control cards only during periods of low traffic.

Access the PM level of the MAP display by typing

>MAPCI;MTC;PM
and pressing the Enter key.

NT0X91
RLCE (continued)

7 Post the RLCM that is controlled by the alarm and control card as recorded in step 5 by typing

>POST LCM site_name frame_no lcm_no
and pressing the Enter key.

where

site_name	is the name of the site where the LCM is located
frame_no	is the number of the frame where the LCM is located
lcm_no	is the number of the LCM unit associated with the faulty card

If Converter suffix is	Do
AA	step 8
AE	step 26

8 Busy LCM unit 1 by typing

>BSY UNIT 1
and pressing the Enter key.

At the RLCE frame

9 Put on a wrist strap.

10 Set CB4 as recorded in step 4 to the OFF position.

11 Unscrew the slotted nut located on the left-hand side of the FSP.

12

DANGER
Risk of electrocution
Some of the terminals inside the frame supervisory panel (FSP) have an electrical potential of –48 V dc. Remove all jewelry before replacing a card in the FSP. Do not touch any terminals in the FSP.

Open the FSP panel.

13 Remove the NT0X91AA card from the slot identified in step 2.

14 Insert the replacement card.

15 Close the FSP panel.

NT0X91
RLCE (continued)

16 Tighten the slotted nut on the FSP.

17 Set CB4 as recorded in step 4 to the ON position.

18 Proceed as follows to reset the converters in the host interface equipment shelf (HIE).

19 Power up the NT2X70 in slot 22 as follows:

If NT2X70 suffix is	Do
AE	step 20
AA, AB, AC, or AD	step 21

20 Toggle the ON/OFF/RESET switch on the power converter faceplate, identified in step 3, to the RESET position and hold while setting CB1, on the FSP, to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the FSP will go OFF, release the ON/OFF/RESET switch, go to step 22.

21 Press the RESET button on the power converter faceplate while setting CB1, identified in step 3, on the FSP to the ON position. The converter FAIL LED will go OFF, release the RESET button.

22 Remove the wrist strap.

23 Determine if a Converter Fail LED is lit.

If Converter Fail LED is	Do
lit	step 80
not lit	step 24

At the MAP display

24 Return to service LCM unit 1 by typing

>RTS UNIT 1
and pressing the Enter key.

NT0X91
RLCE (continued)

25 The next action depends on your reason for performing this procedure

If you were	Do
directed to this procedure from a maintenance procedure	step 79
not directed to this procedure from a maintenance procedure	step 81

26 Busy LCM unit 0 by typing

>BSY UNIT 0
and pressing the Enter key.

27 Post the RMM that is controlled by the alarm and control card as recorded in step 5 by typing

>POST RMM rmm_no
and pressing the Enter key.

where

rmm_no   is the number of the RMM to be posted, as recorded in step 5

28 Busy the RMM by typing

>BSY
and pressing the Enter key.

29 Post the ESA processor that is controlled by the alarm and control card as recorded in step 5 by typing

>POST ESA esa_no
and pressing the Enter key.

where

esa_no   is the number of the ESA processor to be posted, as recorded in step 5

30 Busy the ESA processor by typing

>BSY
and pressing the Enter key.

At the RLCE frame

31 Put on a wrist strap.

32 Set CB1 as recorded in step 4 to OFF.

NT0X91
RLCE (continued)

33 Set CB5 as recorded in step 4 to OFF.

34 Unscrew the slotted nut located on the left-hand side of the FSP.

35

DANGER
Risk of electrocution
Some of the terminals inside the frame supervisory panel (FSP) have an electrical potential of –48 V dc. Remove all jewelry before replacing a card in the FSP. Do not touch any terminals in the FSP.

Open the FSP panel.

36 Remove the NT0X91AE card from the slot identified in step 2.

37 Insert the replacement card.

38 Close the FSP panel.

39 Tighten the slotted nut on the FSP.

40 Proceed as follows to reset the converters in the host interface equipment shelf (HIE), and the RMM.

41 Power up the NT2X70 in slot 25 as follows:

If NT2X70 suffix is	Do
AE	step 42
AA, AB, AC, or AD	step 43

42 Toggle the ON/OFF/RESET switch on the power converter faceplate, identified in step 3, to the RESET position and hold while setting CB1, on the FSP, to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the FSP will go OFF, release the ON/OFF/RESET switch, go to step 44.

43 Press the RESET button on the power converter faceplate while setting CB1, identified in step 3, on the FSP to the ON position. The converter FAIL LED will go OFF, release the RESET button.

44 Set the power switch on the NT2X09 and NT2X06 power converters on the RMM shelf to the ON position.

NT0X91
RLCE (continued)

45 Press the RESET button on the NT2X09 power converter while setting CB5, on the FSP to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the FSP will go off.

46 Remove the wrist strap.

47 Determine if a Converter Fail LED is lit.

If Converter Fail LED is	Do
lit	step 80
not lit	step 48

At the MAP display

48 Post the LCM that is controlled by the alarm and control card you have just replaced by typing

>POST LCM site_name frame_no lcm_no
and pressing the Enter key.

where

site_name	is the name of the site where the LCM is located
frame_no	is the number of the frame where the LCM is located
lcm_no	is the number of the LCM unit with the new FSP card

49 Load the LCM unit by typing

>LOADPM UNIT 0 CC
and pressing the Enter key.

If	Do
message `loadfile not found in directory` is not received	step 50
load passed	step 71
load failed	step 80

50 Query the LCM for the name of the current PM load by typing

>QUERYPM
and pressing the Enter key.

Example of a MAP response:

```
PM Type: LCM  Int. No.: 11  Status index: 6  Node_No: 111
Memory Size – Unit 0: 256K , Unit 1: 256K
Loadnames:LCMINV –XLCM08AX, Unit0:XLCM08AX, Unit1:XLCM08AX
LCM REM1 00 0 is included in the list of LCM types
 scheduled for a REX test.
Last REX test was WED. 1995/04/19 at 02:09:33; PASSED.
Node Status: {OK, FALSE}
Unit 0 Status:{OK, FALSE}
Unit 1 Status:{OK, FALSE}
 Site Flr RPos  Bay_id   Shf  Description    Slot   EqPEC
 REM1  01  A02  RLCE 00   04  LCM  14 0             6X04AA
Services : NEUTRAL
```

Note: Dashed boxes indicate a valid loadname.

51 Determine the type of device where the PM load files are located.

If load files are located on	Do
tape	step 52
IOC disk	step 58
SLM disk	step 63

52 Locate the tape that contains the PM load files.

At the IOE frame

53 Mount the tape on a magnetic tape drive.

At the MAP display

54 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no   is the number of the tape drive containing the PM load files

NT0X91
RLCE (continued)

55 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files.

56 Demount the tape drive by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

57 Go to step 70.

58 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

59 Access the IOC disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

60 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 58.

61 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

62 Go to step 70.

63 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

64 Access the SLM disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

NT0X91
RLCE (continued)

65 List the SLM disk volume names by typing

>LV CM
and pressing the Enter key.

66 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name	is the name of the volume that contains the PM load files, obtained in step 63.

67 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

68 Access the PM level of the MAP display by typing

>MAPCI;MTC;PM
and pressing the Enter key.

69 Post the LCM that is controlled by the alarm and control card you have just replaced by typing

>POST LCM site_name frame_no lcm_no
and pressing the Enter key.

where

site_name	is the name of the site where the LCM is located
frame_no	is the number of the frame where the LCM is located
lcm_no	is the number of the LCM unit with the new FSP card

70 Load LCM unit 0 by typing

>LOADPM UNIT 0 CC
and pressing the Enter key.

NT0X91
RLCE (continued)

71 Return LCM unit 0 to service by typing

>RTS UNIT 0
and pressing the Enter key.

If unit 0	Do
RTS passed	step 72
RTS failed	step 80

72 Post the RMM that is controlled by the alarm and control card you have just replaced by typing

>POST RMM rmm_no
and pressing the Enter key.

where

rmm_no is the number of the RMM to be posted, as recorded in step 5

73 Load the RMM by typing

>LOADPM
and pressing the Enter key.

74 Return the RMM to service by typing

>RTS
and pressing the Enter key.

If the rmm	Do
RTS passed	step 75
RTS failed	step 80

75 Post the ESA processor that is controlled by the alarm and control card you have just replaced by typing

>POST ESA esa_no
and pressing the Enter key.

where

esa_no is the number of the ESA processor to be posted, as recorded in step 5

NT0X91
RLCE (end)

76 Load the ESA processor by typing

>LOADPM
and pressing the Enter key.

77 Return the ESA to service by typing

>RTS
and pressing the Enter key.

If ESA processor	Do
RTS passed	step 78
RTS failed	step 80

78 The next action depends on your reason for performing this procedure

If you were	Do
directed to this procedure from a maintenance procedure	step 79
not directed to this procedure from a maintenance procedure	step 81

79 Return to the maintenance procedure that sent you to this procedure and continue as directed.

80 For further assistance, contact the personnel responsible for the next level of support.

81 You have completed this procedure.

NT2X06
RMM

Application

Use this procedure to replace an NT2X06 in a remote maintenance module (RMM).

PEC	Suffix	Name
NT2X06	AB	Power converter common features

Common procedures

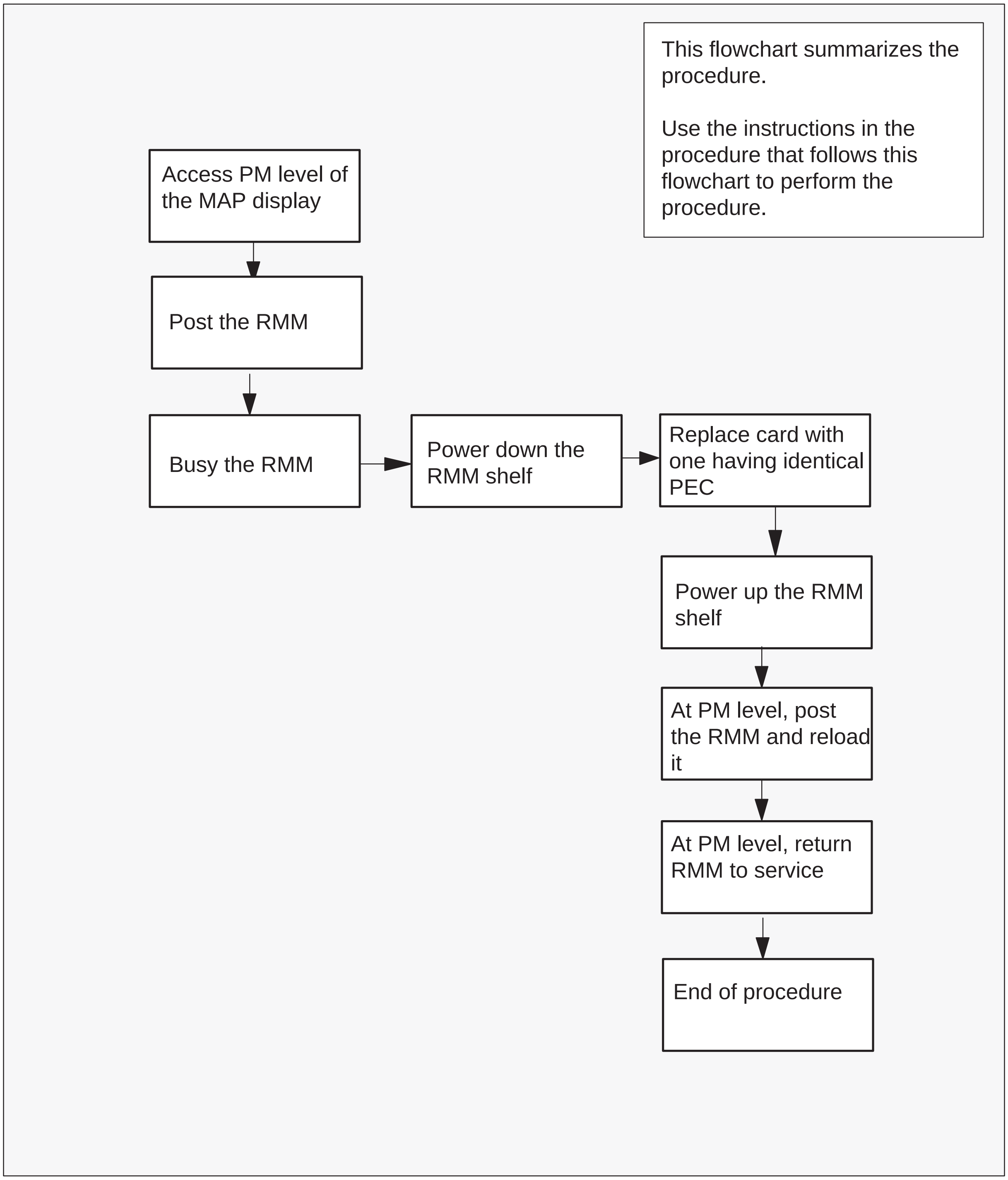
The procedure “Replacing a card” is referenced in this procedure.

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.

NT2X06
RMM (continued)

Summary of card replacement procedure for an NT2X06 in an RMM



NT2X06
RMM (continued)

Replacing an NT2X06 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

2 If you were directed to this procedure from the *Alarm Clearing Procedures*, go to step 6. Otherwise, continue with step 3.

At the MAP terminal

3 Access the peripheral module (PM) level of the MAP display by typing

>MAPCI;MTC;PM
and pressing the Enter key.

4 Post the RMM by typing

>POST RMM rmm_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf where the card is to be replaced

Example of a MAP response:

```
        SysB     ManB     Offl     CBsy     ISTb    InSv
PM         0        2        2        0        7      21
RMM        1        0        1        0        0       6

RMM     0    SysB
```

5 Busy the RMM by typing

>BSY
and pressing the Enter key.

NT2X06
RMM (continued)

At the RMM

6

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point at the top of each equipment rack, (Bay 0, 1, 2, and 3), while handling circuit cards. This protects the cards against damage caused by static electricity.

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 LED on the modular supervisory panel (MSP) will be ON.

7 Replace the NT2X06 card using the procedure “Replacing a card”. When you have completed the procedure, return to this point in the procedure.

8 Power up the RMM unit as follows:

Ensure the converter (NT2X06) is inserted. Set the POWER switch to the ON position.

9 Press the RESET button on the power converter while setting the circuit breaker on the MSP to the ON position. Both the CONVERTER FAIL LED and FRAME FAIL lamp on the MSP will be ON.

10 If you were directed to this procedure from the *Alarm Clearing Procedures*, return now to the alarm clearing procedure that directed you here. Otherwise, continue with step 11.

NT2X06
RMM (continued)

At the MAP terminal

11 Go to the PM level and post the RMM, if not already posted, and load the RMM by typing

>PM;POST RMM rmm_no;LOADPM
and pressing the Enter key

where

rmm_no is the number of the RMM shelf where the card is to be replaced

If	Do
message is `loadfile not found in directory`	step 12
load passed	step 29
load failed	step 32

At the RMM

12 Determine the type of device where the PM load files are located.

If load files are located on	Do
tape	step 13
IOC disk	step 19
SLM disk	step 24

13 Locate the tape that contains the PM load files.

14 Mount the tape on a magnetic tape drive.

At the MAP terminal

15 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape containing the PM load files

16 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape containing the PM load files

17 Demount the tape drive by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

18 Go to step 28.

19 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

20 Access the disk utility level of the MAP display by typing

>DSKUT
and pressing the Enter key.

21 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files obtained in step 19.

22 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

23 Go to step 28.

24 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

25 Access the disk utility level of the MAP display by typing

>DISKUT
and pressing the Enter key.

NT2X06
RMM (continued)

26 List the SLM file names into your user directory by typing

>LV CM;LF file_name
and pressing the Enter key.

where

file_name is the name of the SLM disk volume containing the PM load files obtained in step 24.

27 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

28 Reload the RMM by typing

>LOADPM
and pressing the Enter key.

If	Do
load failed	step 32
load passed	step 29

29 Return the RMM to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 33
failed	step 32

30 Send any faulty cards for repair according to local procedure.

31 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 33.

NT2X06
RMM (end)

32 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

33 You have completed this procedure.

NT2X09
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT2X09	AA, AB	Multioutput Power Converter (5V/40A)

Common procedures

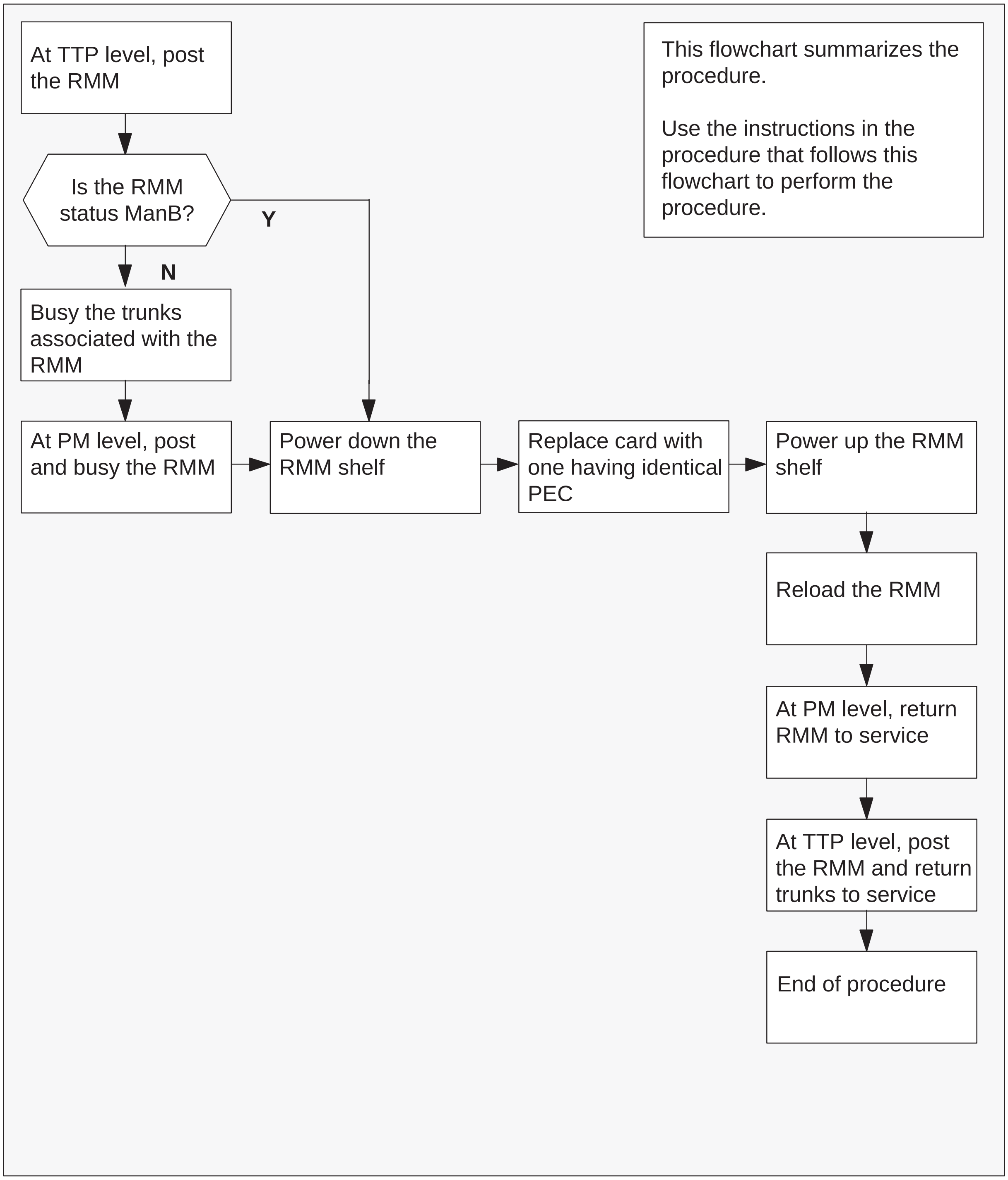
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT2X09
RMM (continued)

Summary of card replacement procedure for an NT2X09 card in an RMM



NT2X09
RMM (continued)

Replacing an NT2X09 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

2 If you were directed to this procedure from another maintenance procedure, go to step 8; otherwise, continue with step 3.

At the MAP display

3 Access the TTP level of the MAP and post the RMM that contains the card to be replaced by typing

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no
and pressing the Enter key.

where

rmm_no   is the number of the RMM shelf in which the card is to be replaced

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  OTDA00
OK, CLLI POSTED

POST  20   DELQ       BUSY Q          DIG
TTP 6–006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG    MF RMM 0 0  OTWAON23DA00 2001   LO
                                      P_IDL
```

4 Check the status of the RMM.

If RMM status is	Do
MB, PMB, RMB	step 8
other	step 5

5 Busy the trunks that are associated with the RMM to be busied by typing

>BSY ALL
and pressing the Enter key.

NT2X09
RMM (continued)

6 Go to the PM level of the MAP and post the RMM by typing

>PM;POST RMM rmm_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced

Example of a MAP display:

```
        SysB     ManB     Offl     CBsy     ISTb     InSv
PM         0        2        2        0        7       21
RMM        0        0        1        0        0        6

RMM     0    InSv
```

7 Busy the RMM by typing

>BSY
and pressing the Enter key.

At the RMM shelf

8

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point of a frame supervisory panel (FSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

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 at the MAP terminal by typing

>SIL
and pressing the Enter key.

9 Replace the NT2X09 card using the procedure “Replacing a card”. When you have completed the procedure, return to this point.

10 Power up the RMM unit as follows:

a. Ensure that the converter (NT2X09) is inserted. A major audible alarm may sound. This alarm is silenced when power is restored to the converter.

b. Set the POWER switch to the ON position.

NT2X09
RMM (continued)

11 Press the RESET button on the power converter while setting the circuit breaker on the frame supervisory panel (FSP) to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the FSP will be ON.

12 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 13.

At the MAP display

13 Go to the PM level and post the RMM, if not already posted, and load the RMM by typing

>PM;POST RMM rmm_no;LOADPM
and pressing the Enter key.

where

rmm_no is the number of the RMM associated with the new NT2X09 card

If	Do
message “loadfile not found in directory” is received	step 14
load passed	step 31
load failed	step 36

14 Determine the type of device on which the RMM load files are located.

If	Do
tape	step 15
IOC disk	step 21
SLM disk	step 26

15 Locate the tape that contains the PM load files.

At the IOE frame

16 Mount the tape on a magnetic tape drive.

At the MAP display

17 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no   is the number of the tape drive containing the PM load files

18 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no   is the number of the tape drive containing the PM load files

19 Demount the tape drive by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no   is the number of the tape drive containing the PM load files

20 Go to step 30.

21 From office records, determine and note the number of the input/output controller (IOC) disk and the number of the volume that contains the PM load files.

22 Access the disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

23 List the IOC file names into your user directory by typing

>LISTVOL volume_name all
and pressing the Enter key.

where

volume_name   is the name of the volume that contains the PM load files, obtained in step 21.

24 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

NT2X09
RMM (continued)

25 Go to step 30.

26 From office records, determine and note the number of the system load module (SLM) disk and the number of the volume that contains the PM load files.

27 Access the disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

28 List the SLM file names into your user directory by typing

>LV CM;LF Volume_name
and pressing the Enter key.

where

Volume_name is the name of the volume containing the PM load files, obtained in step 26.

29 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

30 Reload the RMM by typing

>LOADPM
and pressing the Enter key.

If	Do
load failed	step 36
load passed	step 31

31 Return the RMM to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 32
failed	step 36

NT2X09
RMM (end)

32 Go to the TTP level of the MAP and post the RMM by typing

>TRKS;TTP;POST P RMM rmm_no
and pressing the Enter key.

33 Return to service the circuits by typing

>RTS ALL
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced

If RTS	Do
passed	step 34
failed	step 36

34 Send any faulty cards for repair according to local procedure.

35 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 37.

36 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

37 You have completed this procedure.

NT2X10
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT2X10	AA, AC, BA	Line Test Unit Analog Card (LTUA)

Common procedures

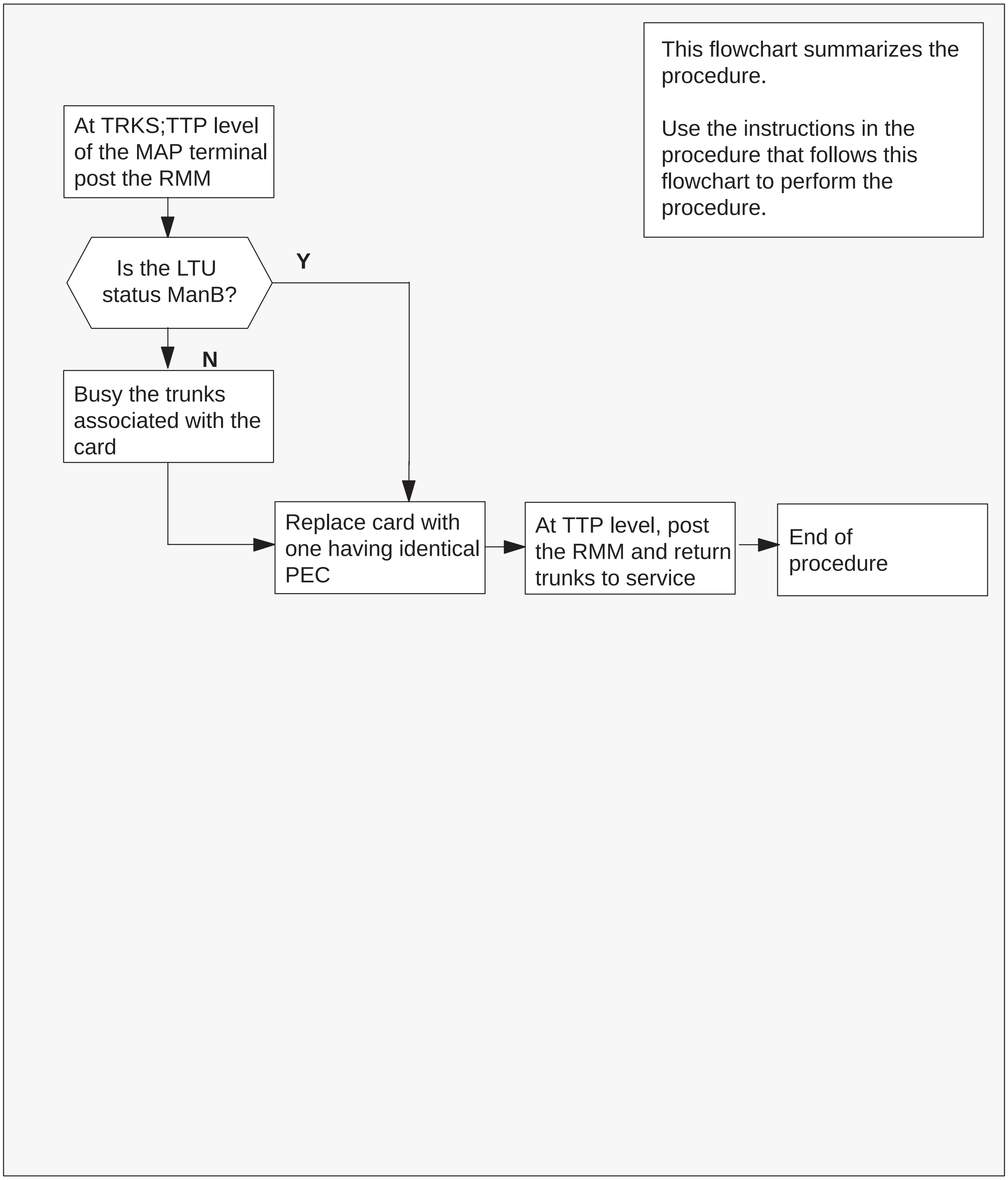
The procedure *Replacing a card* is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT2X10
RMM (continued)

Summary of card replacement procedure for an NT2X10 card in an RMM



NT2X10
RMM (continued)

Replacing an NT2X10 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP display

2 Access the TTP level of the MAP and post the Line Test Unit to be replaced by typing

>MAPCI;MTC;TRKS;TTP;POST T LTU ltu_no
and pressing the Enter key.

where

ltu_no is the number of the faulty LTU

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  LTU
OK, CLLI POSTED

POST       DELQ       BUSY Q          DIG
TTP 6-006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG         RMM 0 0     LTU   21       IDL
```

3 Busy the trunks that are associated with the card to be replaced by typing

>BSY
and pressing the Enter key.

At the RMM shelf

4

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point of a frame supervisory panel (FSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Replace the NT2X10 card using the procedure *Replacing a card.* When you have completed the procedure, return to this point.

NT2X10
RMM (end)

At the MAP display

5 Test the new NT2X10 card by typing

>TST
and pressing the Enter key.

If TST	Do
passed	step 6
failed	step 9

6 Return to service the circuits busied in step 3 by typing

>RTS

and pressing the Enter key.

If RTS	Do
passed	step 7
failed	step 9

7 Send any faulty cards for repair according to local procedure.

8 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 10.

9 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

10 You have completed this procedure.

NT2X11
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT2X11	AA, AB, AC, AD, BA	Line Test Unit Digital Card (LTUD)

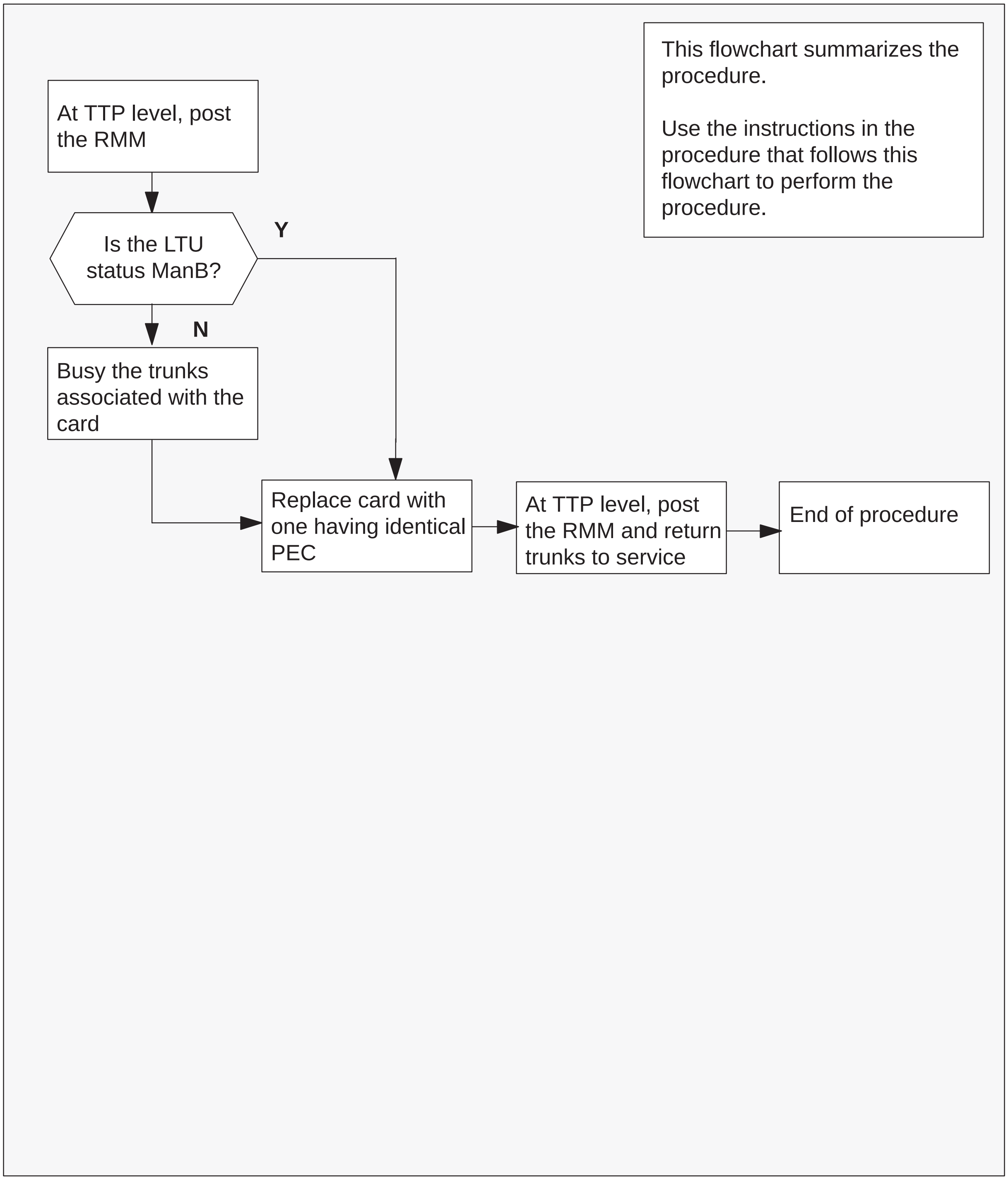
Common procedures

The procedure *Replacing a card* is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

Summary of card replacement procedure for an NT2X11 card in an RMM



NT2X11
RMM (continued)

Replacing an NT2X11 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP display

2 Access the TTP level of the MAP and post the line test unit to be replaced by typing

>MAPCI;MTC;TRKS;TTP;POST T LTU ltu_no
and pressing the Enter key.

where

ltu_no   is the number of the line test unit which is to be replaced

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  LTU
OK, CLLI POSTED

POST       DELQ       BUSY Q          DIG
TTP 6–006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG         RMM 0 0     LTU  21        LO
                                      P_IDL
```

3

> **WARNING**
> **Briefly state reasons for the warning**
> Enter the reasons for the warning: a warning informs the reader of a risk of service interruption, or damage to equipment, or both.

Busy the trunks that are associated with the card to be replaced by typing

>BSY
and pressing the Enter key.

At the RMM shelf

4 Replace the NT2X11 card using the procedure *Replacing a card.* When you have completed the procedure, return to this point.

NT2X11
RMM (end)

At the MAP display

5 Test the new NT2X11 card by typing

>TST

If TST	Do
passed	step 6
failed	step 9

and pressing the Enter key.

6 Return to service the circuits busied in step 3 by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 7
failed	step 9

7 Send any faulty cards for repair according to local procedure.

8 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 10.

9 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

10 You have completed this procedure.

NT2X48
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT2X48	AB	Digital 4-channel Digitone Receiver

Common procedures

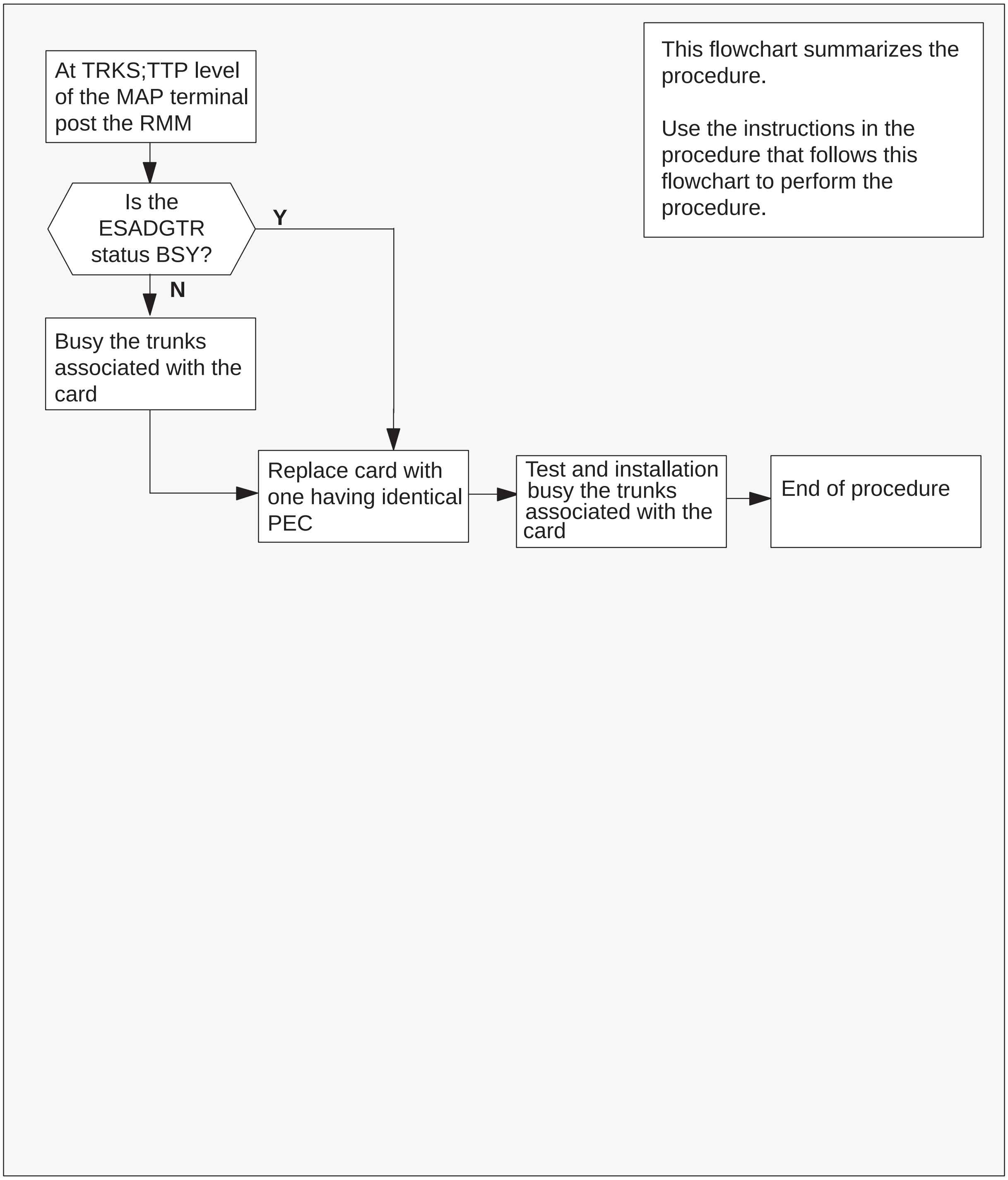
The procedure *Replacing a card* is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT2X48
RMM (continued)

Summary of card replacement procedure for an NT2X48 card in an RMM



NT2X48
RMM (continued)

Replacing an NT2X48 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP display

2 Access the TTP level of the MAP and post the ESA digitone receivers associated with the card to be replaced by typing

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no ckt_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced
ckt_no is the number of the first circuit where the NT2X48 card is physically located.

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  1125
OK, CLLI POSTED

POST  3   DELQ       BUSY Q          DIG
TTP 6-006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG     RMM   0 0      ESAGDTR 11       CFL
```

3 Busy and installation busy the trunks that are associated with the card to be replaced by typing

>BSY;BSY INB;NEXT
and pressing the Enter key.

Note: Repeat this step for each circuit associated with the NT2X48 being replaced.

NT2X48
RMM (continued)

At the RMM shelf

4

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point of a frame supervisory panel (FSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Replace the NT2X48 card using the procedure *Replacing a card*. When you have completed the procedure, return to this point.

At the MAP display

5 Test all of the digitone receivers on the new NT2X48 card by typing

>TST

6 Continue testing through all four digitone circuits on the card by typing

>NEXT

If TST	Do
passed	step 7
failed	step 11

7 Repost all four ESADGTR circuits by typing

>POST P RMM rmm_no ckt_no to ckt_no
and pressing the Enter key.

where

ckt_no is the number of the first and last circuits on the NT2X48 card.

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  1125
OK, CLLI POSTED

POST  3   DELQ       BUSY Q          DIG
TTP 6–006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG     RMM   0 0      ESAGDTR 11       IDL
```

NT2X48
RMM (end)

8 Installation busy the trunks that are associated with the new NT2X48 card by typing

>BSY INB ALL
and pressing the Enter key.

Note: ESA digitone receivers should always be in an INB state when the RLCM is under CC control, to prevent CC access. The ESA processor will turn the circuits up to an idle state when the RLCM is in the ESA environment.

9 Send any faulty cards for repair according to local procedure.

10 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 12.

11 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

12 You have completed this procedure.

NT2X57
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT2X57	AA	Signal Distribution Card (SD)

Common procedures

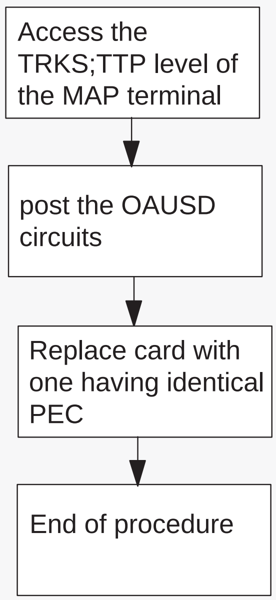
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT2X57
RMM (continued)

Summary of card replacement procedure for an NT2X57 card in an RMM



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

NT2X57
RMM (continued)

Replacing an NT2X57 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP display

2 Access the TTP level of the MAP and post the signal distribution circuits on the card to be replaced by typing

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no ckt_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf where the card is to be replaced
ckt_no is the number of the first circuit where the NT2X57 card is physically located.

Example of a MAP response:

```
LAST CIRCUIT = 14
POST CKT IDLED
SHORT CLLI IS:  1147
OK, CLLI POSTED

POST  13   DELQ       BUSY Q          DIG
TTP 6–006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG TESTEQ RMM 0 0     OAUSD 0         IDL
```

At the RMM shelf

3

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point of a frame supervisory panel (FSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Replace the NT2X57 card using the procedure “Replacing a card”. When you have completed the procedure, return to this point.

NT2X57
RMM (end)

At the MAP display

4 Repost to verify the signal distribution circuits on the card that was replaced by typing

>POST P RMM rmm_no ckt_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf where the card was replaced
ckt_no is the number of the first circuit where the NT2X57 card is physically located.

Example of a MAP response:

```
LAST CIRCUIT = 14
POST CKT IDLED
SHORT CLLI IS:  1147
OK, CLLI POSTED

POST  13   DELQ       BUSY Q          DIG
TTP 6–006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG TESTEQ RMM 0 0     OAUSD 0         IDL
```

5 Send any faulty cards for repair according to local procedure.

6 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 8.

7 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

8 You have completed this procedure.

NT2X59
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT2X59	AA	Group CODEC Card

Common procedures

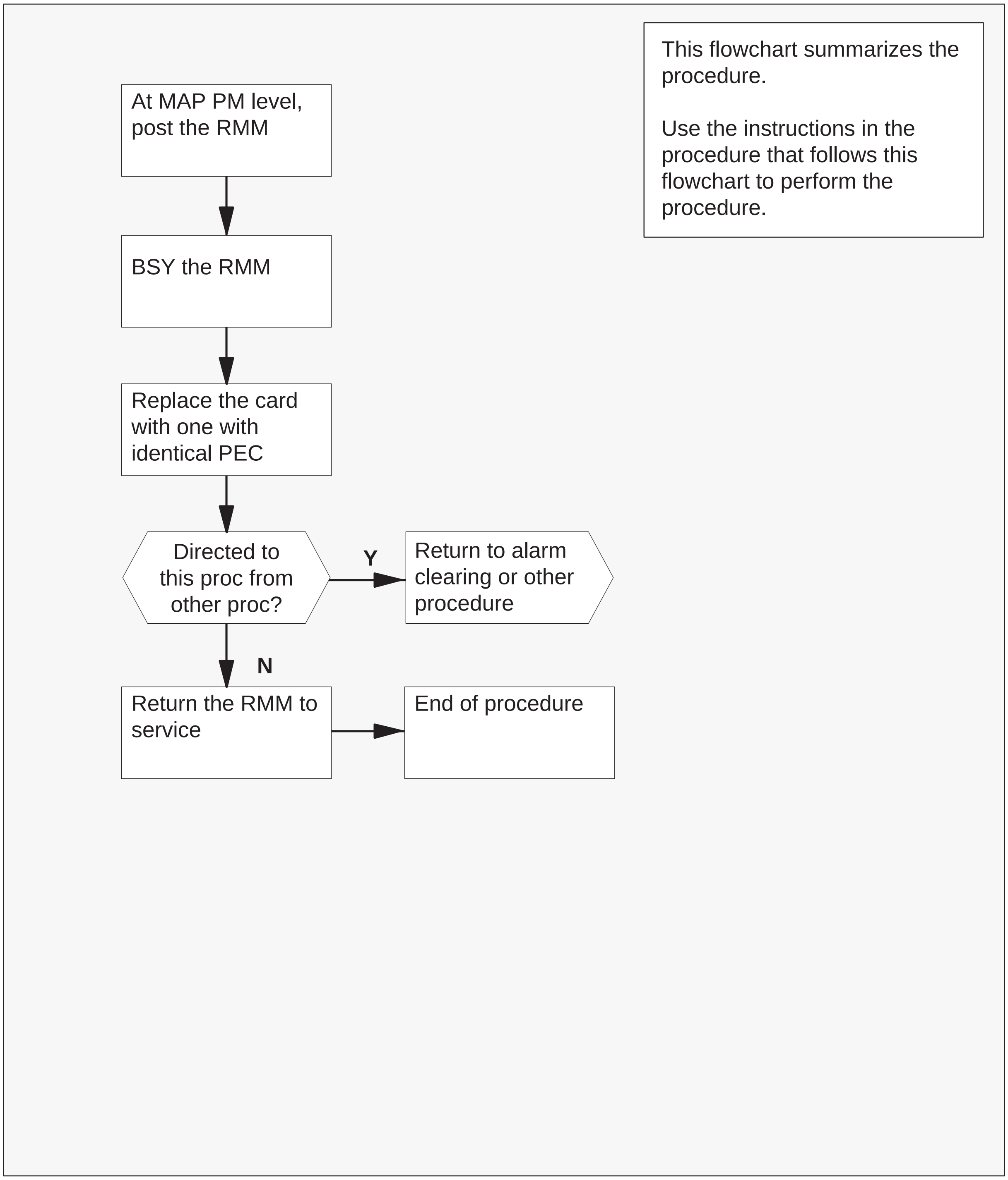
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT2X59
RMM (continued)

Summary of card replacement procedure for an NT2X59 card in an RMM



Replacing an NT2X59 card in an RMM

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 Obtain a replacement card. Ensure that 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 RMM by typing

>MAPCI;MTC;PM;POST RMM rmm_no
and pressing the Enter key.

where

rmm_no is the number of the RMM where the card is to be replaced

Example of a MAP display:

```
   CM    MS    IOD    Net    PM    CCS    LNS    Trks    Ext    APPL
   .     .      .      .   4SysB   .      .       .      .      .

RMM                 SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit    PM          4        0       10        3        3       130
 2 Post_   RMM         1        0        0        0        0        15
 3
 4         RMM  5  SysB
 5 Trnsl
 6 Tst
 7 Bsy
 8 RTS
 9 OffL
10 LoadPM
11 Disp_
12 Next
13
14 QueryPM
15
16
17
18
```

NT2X59
RMM (continued)

4 Busy the RMM by typing

>BSY
and pressing the Enter key.

Example of a MAP display:

```
   CM    MS    IOD    Net    PM    CCS    LNS    Trks    Ext    APPL
   .     .      .      .    3SysB   .      .       .      .      .

 RMM               SysB      ManB      OffL      CBsy      ISTb       InSv
  0 Quit    PM        3         0        10         3         3        130
  2 Post_   RMM       0         1         0         0         0         15
  3
  4         RMM  5  ManB
  5 Trnsl
  6 Tst
  7 Bsy
  8 RTS
  9 OffL
 10 LoadPM
 11 Disp_
 12 Next
 13
 14 QueryPM
 15
 16
 17
 18
```

At the RMM shelf

5

> **CAUTION**
> **Static discharge may cause damage to circuit packs**
> Put on a wrist strap and connect it to the frame of the RMM before removing or inserting any cards. This protects the RMM against service degradation caused by static electricity.

Replace the NT2X59 card using the procedure “Replacing a card”. When you have completed the procedure, return to this point.

NT2X59
RMM (continued)

6 Use the following information to determine the next step in this procedure.

If you entered this procedure	Do
from an alarm clearing procedure	step 12
from other procedure	step 7

At the MAP display

7 Load the RMM by typing

>LOADPM
and pressing the Enter key.

If LOADPM command	Do
passed	step 8
failed	step 13

8 Return the RMM to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 9
failed	step 13

9 Send any faulty cards for repair according to local procedure.

10 Record the following items in office records:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

11 Go to step 14.

NT2X59
RMM (end)

12 Return to the *Alarm Clearing Procedure* that directed you to this card replacement procedure. If necessary, go to the point where the faulty card list was produced, identify the next faulty card on the list, and go to the appropriate replacement procedure in this manual for that card.

13 Obtain further assistance in replacing this card by contacting personnel responsible for higher level of support.

14 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT2X70
HIE

Application

Use this procedure to replace the following card in the host interface equipment (HIE) shelf.

PEC	Suffixes	Name
NT2X70	AA, AB, AC, AD, AE	Power Converter (5V/12V)

Common procedures

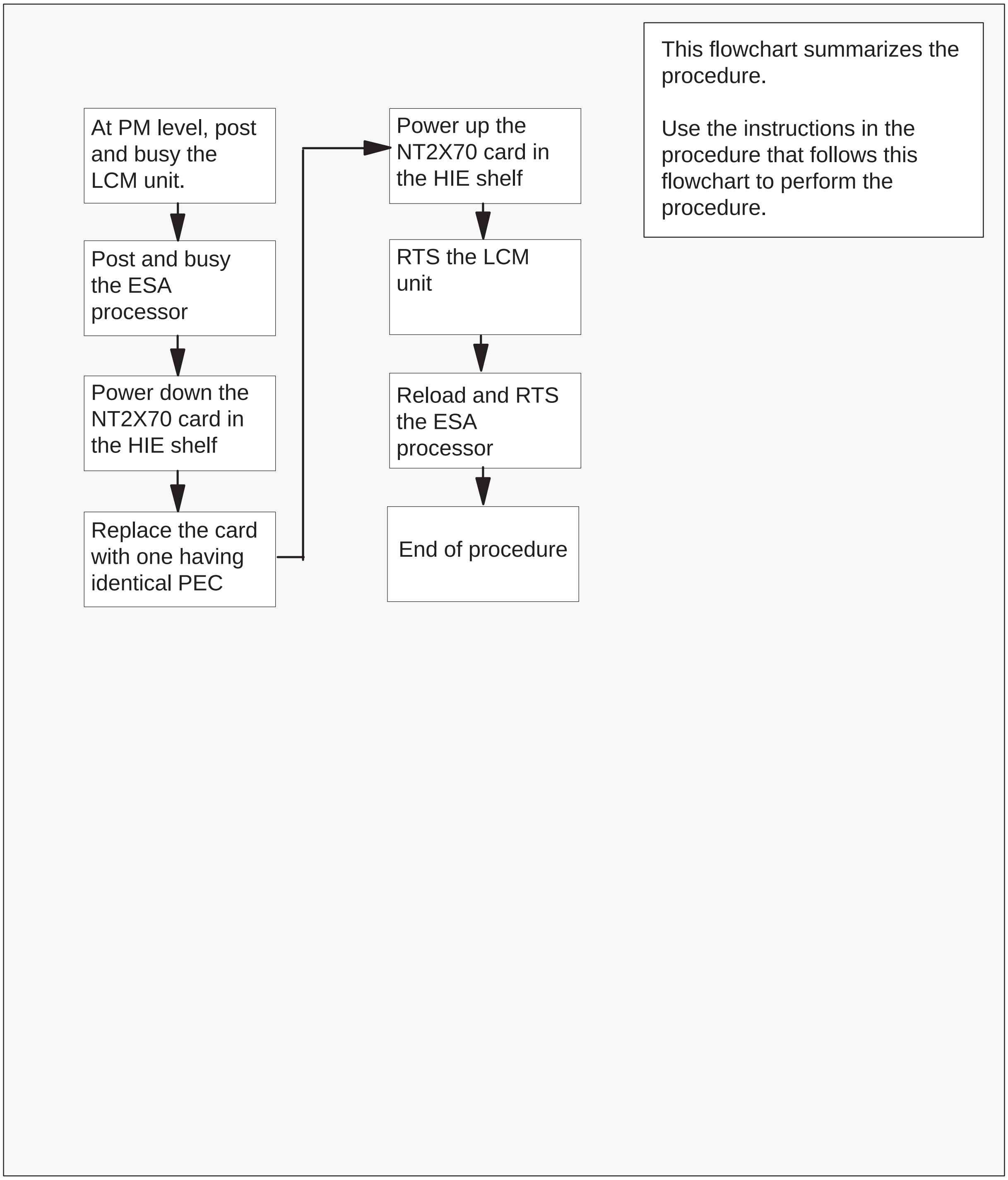
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT2X70
HIE (continued)

Summary of card replacement procedure for an NT2X70 card in an HIE shelf



Replacing an NT2X70 card in an HIE shelf

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 Obtain a replacement card. Ensure that 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 of the MAP display and post the remote line concentrating module (RLCM) associated with the faulty NT2X70 card by typing

>MAPCI;MTC;PM;POST LCM site_name frame_no lcm_no
and pressing the Enter key.

where

site_name is the name of the site, where the RLCM is located
frame_no is the number of the frame where the LCM is located
lcm_no is the number of the LCM module in the frame

If the NT2X70 card is in	Do
slot 25	step 4
slot 22	step 36

4 Display the P-side links of the RLCM by typing

>TRNSL P
and pressing the Enter key.

Example of a MAP display:

```
Link    0:  RMM 0   0;  Cap MS;Status:    OK;  MsgCond:OPN
Link    1:  RMM 0   1;  Cap MS;Status:    OK;  MsgCond:OPN
Link    2:  ESA 0   0   Cap M ;Status:    OK;  MsgCond:OPN
Link    3   ESA 0   1   Cap M ;Status:    OK;  MsgCond:OPN
```

Note: In this example both the RMM and ESA modules are provisioned. However, should either of these modules not be provisioned in your office, skip the steps relating to that module and continue with the rest of the procedure.

NT2X70
HIE (continued)

5

> **CAUTION**
> **Loss of service**
> This procedure contains directions to busy one or more peripheral modules (PM) in a frame. Since busying a PM affects subscriber service, replace power converters only during periods of low traffic

Busy unit 0 of the RLCM by typing

>BSY UNIT 0
and pressing the Enter key.

6 Post the ESA processor identified in step 4 by typing

>POST ESA esa_no
and pressing the Enter key.

where

esa_no	is the number of the ESA processor associated with the faulty NT2X70 card.

Busy the ESA processor by typing

>BSY
and pressing the Enter key.

Example of a MAP response:

```
This action will take this PM out of service
Please confirm (“Yes” or “No”)
```

Respond to the system prompt by typing

>YES

At the HIE shelf

7

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point of a frame supervisory panel (FSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Power down the NT2X70 card in slot 25 of the HIE shelf 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, at the MAP terminal, by typing

>SIL

and pressing the Enter key.

If NT2X70 is in	trip circuit breaker
shelf 38 slot 25	CB1 on FSP
shelf 38 slot 22	CB4 on FSP

Note: For the NTNX14AA cabinet the circuit breaker assignments are:

NTNX14AA cabinet	trip circuit breaker
shelf 33 slot 25	CB3 on FSP
shelf 33 slot 22	CB8 on FSP

8 Replace the NT2X70 card in slot 25 using the procedure “Replacing a card”. When you have completed the procedure, return to this point

NT2X70
HIE (continued)

9 Power up the NT2X70 card in slot 25 of the HIE shelf as follows:

a. Ensure that the converter (NT2X70) is inserted. A major audible alarm may sound. This alarm is silenced when power is restored to the converter.

b. Set the POWER switch to the ON position.

If NT2X70 suffix is	trip circuit breaker
AE	step 10
AA, AB, AC, or AD	step 11

10 Toggle the ON/OFF/RESET switch on the power converter faceplate to the RESET position and hold while setting the circuit breaker on the FSP to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the FSP will go OFF, release the ON/OFF/RESET switch. Go to step 12.

11 Press the RESET button on the power converter faceplate while setting the circuit breaker on the FSP to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the FSP will go OFF, release the RESET button.

12 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 13.

At the MAP display

13 Post the RLCM associated with the faulty NT2X70 card by typing

>POST LCM site_name frame_no lcm_no
and pressing the Enter key.

where

site_name	is the name of the site where the RLCM is located
frame_no	is the number of the frame where the LCM is located
lcm_no	is the number of the LCM module in the frame

NT2X70
HIE (continued)

14 Return LCM unit 0 to service by typing

>RTS UNIT 0
and pressing the Enter key.

If RTS	Do
passed	step 15
failed	step 73

15 Post the ESA processor associated with the faulty NT2X70 card by typing

>POST ESA esa_no
and pressing the Enter key.

where

esa_no is the number of the ESA processor identified in step 4.

16 Load the ESA processor by typing

>LOADPM
and pressing the Enter key.

If	Do
message “loadfile not found in directory” is not received	step 17
load passed	step 33
load failed	step 37

17 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 18
IOC disk	step 24
SLM disk	step 29

18 Locate the tape that contains the PM load files.

NT2X70
HIE (continued)

At the IOE frame

19 Mount the tape on a magnetic tape drive.

At the MAP display

20 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no   is the number of the tape drive containing the PM load files

21 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no   is the number of the tape drive containing the PM load files.

22 Release the tape drive from your user directory by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no   is the number of the tape drive mounted in step 20.

23 Go to step 34.

24 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

25 Access the disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

26 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name   is the name of the volume that contains the PM load files, obtained in step 24.

NT2X70
HIE (continued)

27 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

28 Go to step 34.

29 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

30 Access the disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

31 List the SLM disk volume names by typing

>LV CM
and pressing the Enter key.

32 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 29.

33 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

34 Load the LCM unit by typing

>LOADPM
and pressing the Enter key.

If loadpm	Do
passed	step 35
failed	step 73

35 Return the LCM unit to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 69
failed	step 73

At the MAP display

36 Post the remote line concentrating module (RLCM) associated with the faulty NT2X70 card by typing

>POST LCM site_name frame_no lcm_no
and pressing the Enter key.

where

site_name	is the name of the site where the RLCM is located
frame_no	is the number of the frame where the LCM is located
lcm_no	is the number of the LCM module in the frame

37 Busy unit 1 of the RLCM by typing

>BSY UNIT 1
and pressing the Enter key.

38 Post the ESA processor identified in step 4 by typing

>POST ESA esa_no
and pressing the Enter key.

where

esa_no	is the number of the ESA processor associated with the faulty NT2X70 card.

39 Busy the ESA processor by typing

>BSY
and pressing the Enter key.

Example of a MAP response:

```
This action will take this PM out of service
Please confirm (“Yes” or “No”)
```

Respond to the system prompt by typing

>YES

At the HIE shelf

40

WARNING
Static electricity damage
Wear a wrist strap connected to the wrist strap grounding point of a frame supervisory panel (FSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Power down the NT2X70 card in slot 22 of the HIE shelf 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

>SIL
and pressing the Enter key.

If NT2X70 is in	trip circuit breaker
shelf 38 slot 25	CB1 on FSP
shelf 38 slot 22	CB4 on FSP

Note: For the NTNX14AA cabinet the circuit breaker assignments are:

NTNX14AA cabinet	trip circuit breaker
shelf 33 slot 25	CB3 on FSP
shelf 33 slot 22	CB8 on FSP

NT2X70
HIE (continued)

41 Replace the NT2X70 card in slot 22 using the procedure *Replacing a card.* When you have completed the procedure, return to this point

42 Power up the NT2X70 card in slot 22 of the HIE shelf as follows:

a. Ensure that the NT2X70 card is inserted. A major audible alarm may sound. This alarm is silenced when power is restored to the converter.

b. Set the POWER switch to the ON position.

If NT2X70 suffix is	trip circuit breaker
AE	step 43
AA, AB, AC, or AD	step 44

43 Toggle the ON/OFF/RESET switch on the power converter faceplate to the RESET position and hold while setting the circuit breaker on the FSP to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the FSP will go OFF, release the ON/OFF/RESET switch. Go to step 45.

44 Press the RESET button on the power converter faceplate while setting the circuit breaker on the FSP to the ON position. Both the converter FAIL LED and FRAME FAIL lamp on the FSP will go OFF, release the RESET button.

45 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 46.

At the MAP display

46 Post the RLCM associated with the faulty NT2X70 card by typing

>POST LCM site_name frame_no lcm_no
and pressing the Enter key.

where

site_name	is the name of the site where the RLCM is located
frame_no	is the number of the frame where the LCM is located
lcm_no	is the number of the LCM module in the frame

NT2X70
HIE (continued)

47 Return LCM unit 1 to service by typing

>RTS UNIT 1
and pressing the Enter key.

If RTS	Do
passed	step 48
failed	step 73

48 Post the ESA processor associated with the faulty NT2X70 card by typing

>POST ESA esa_no
and pressing the Enter key.

where

esa_no is the number of the ESA processor identified in step 4.

49 Load the ESA processor by typing

>LOADPM
and pressing the Enter key.

If	Do
message “loadfile not found in directory” is not received	step 50
load passed	step 68
load failed	step 73

50 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 51
IOC disk	step 57
SLM disk	step 62

51 Locate the tape that contains the PM load files.

NT2X70
HIE (continued)

At the IOE frame

52 Mount the tape on a magnetic tape drive.

At the MAP display

53 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

54 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files.

55 Release the tape drive from your user directory by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive mounted in step 53.

56 Go to step 67.

57 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

58 Access the disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

59 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 57.

60 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

61 Go to step 67.

62 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

63 Access the disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

64 List the SLM disk volume names by typing

>LV CM
and pressing the Enter key.

65 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 62.

66 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

67 Load the LCM unit by typing

>LOADPM
and pressing the Enter key.

If loadpm	Do
passed	step 68
failed	step 73

NT2X70
HIE (end)

68 Return the ESA processor to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 69
failed	step 73

69 Send any faulty cards for repair according to local procedure.

70 Record the following items in office records:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card.

71 Go to step 74.

72 Return to the procedure that directed you to this card replacement procedure. If necessary, go to the point where the faulty card list was produced, identify the next faulty card on the list, and go to the appropriate replacement procedure in this manual for that card.

73 Obtain further assistance in replacing this card by contacting personnel responsible for higher level of support.

74 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT2X90
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT2X90	AB, AC, AD	Incoming/outgoing Transmission Test Trunk Circuit (TTT)

Common procedures

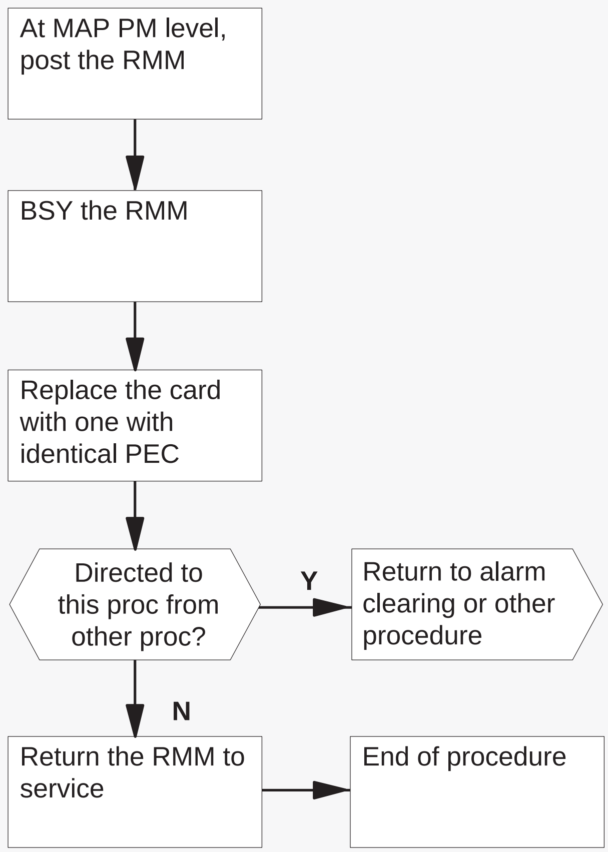
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT2X90
RMM (continued)

Summary of card replacement procedure for an NT2X90 card in an RMM



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

Replacing an NT2X90 card in an RMM

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 Obtain a replacement card. Ensure that 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 RMM by typing

>MAPCI;MTC;PM;POST RMM rmm_no
and pressing the Enter key.

where

rmm_no is the number of the RMM from which the card is to be removed

Example of a MAP display:

```
   CM    MS    IOD    Net    PM    CCS    LNS    Trks    Ext    APPL
   .     .      .      .    4SysB   .      .       .      .      .

RMM                SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit    PM        4        0       10        3        3        130
 2 Post_   RMM       0        1        1        0        0          2
 3
 4         RMM  5  ISTb
 5 Trnsl
 6 Tst
 7 Bsy
 8 RTS
 9 OffL
10 LoadPM
11 Disp_
12 Next
13
14 QueryPM
15
16
17
18
```

NT2X90
RMM (continued)

4 Busy the RMM by typing

>BSY

and pressing the Enter key.

Example of a MAP display:

```
    CM    MS    IOD    Net    PM    CCS    LNS    Trks    Ext    APPL
    .     .      .      .    4SysB   .      .       .       .      .

 RMM                  SysB     ManB     OffL     CBsy     ISTb      InSv
  0 Quit    PM           4        0       10        3        3       130
  2 Post_   RMM          0        1        1        0        0         2
  3
  4         RMM  5  ManB
  5 Trnsl
  6 Tst
  7 Bsy
  8 RTS
  9 OffL
 10 LoadPM
 11 Disp_
 12 Next
 13
 14 QueryPM
 15
 16
 17
 18
```

At the RMM shelf

5

> **CAUTION**
> **Static discharge may cause damage to circuit packs**
> Put on a wrist strap and connect it to the frame of the RMM before removing or inserting any cards. This protects the RMM against service degradation caused by static electricity.

Replace the NT2X90 card using the procedure “Replacing a card”. When you have completed the procedure, return to this point.

NT2X90
RMM (continued)

6 Use the following information to determine the next step in this procedure.

If you entered this procedure	Do
from an alarm clearing procedure	step 12
from other	step 7

At the MAP display

7 Test the RMM by typing

>TST
and pressing the Enter key.

Example of a MAP response:

```
Test Passed
    or
Test Failed
```

If the TST	Do
passes	step 8
fails	step 13

8 Return the RMM to service by typing

>RTS
and pressing the Enter key.

If the RTS	Do
passes	step 9
fails	step 13

9 Send any faulty cards for repair according to local procedure.

10 Record the following items in office records:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card.

NT2X90
RMM (end)

11 Go to step 14.

12 Return to the *Alarm Clearing Procedures* that directed you to this card replacement procedure. If necessary, go to the point where the faulty card list was produced, identify the next faulty card on the list, and go to the appropriate replacement procedure in this manual for that card.

13 Obtain further assistance in replacing this card by contacting personnel responsible for higher level of support.

14 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT3X09
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT3X09	AA, BA	Remote Metallic Access (MTA) card

Common procedures

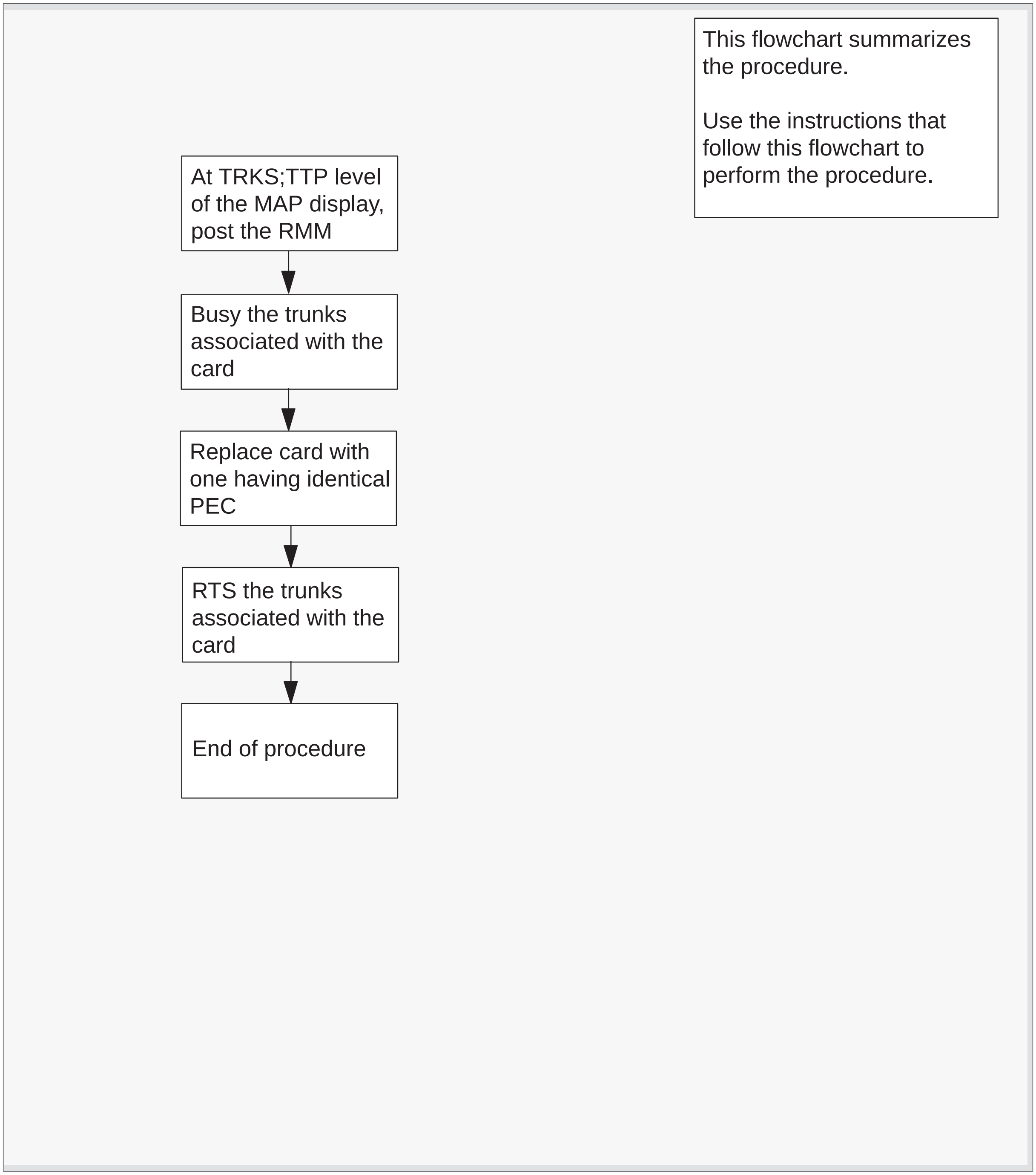
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT3X09
RMM (continued)

Summary of replacing an NT3X09 card in an RMM



Replacing an NT3X09 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP terminal

2 Access the TTP level of the MAP terminal and post the RMM that contains the card to be replaced by typing

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no ckt_no

and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced
ckt_no is the number of the first circuit where the NT3X09 card is physically located

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  1118
OK, CLLI POSTED

POST  20   DELQ       BUSY Q          DIG
TTP 6–006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG  MISC RMM 0 0    MTADRIVER 20      LO
```

3 Check the status of the RMM.

If RMM status is	Do
MB, PMB, RMB	step 5
other	step 4

4 Busy the trunks that are associated with the card to be replaced by typing

>BSY ; NEXT
and pressing the Enter key.

Note: Repeat this step for all circuits associated with the faulty NT3X09 card to be replaced.

NT3X09
RMM (continued)

At the RLCE frame

5

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point of a frame supervisory panel (FSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Replace the NT3X09 card using the procedure "Replacing a card". When you have completed the procedure, return to this point.

At the MAP terminal

6 Post the new NT3X09 card by typing

>POST P RMM rmm_no ckt_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced
ckt_no is the number of the first circuit where the NT3X09 card is physically located.

7 Return to service the circuits busied in step 4 by typing

>RTS ;NEXT
and pressing the Enter key.

Note: Repeat this step for all circuits associated with the new NT3X09 card.

If RTS	Do
passed	step 8
failed	step 10

8 Send any faulty cards for repair according to local procedure.

9 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 11.

NT3X09
RMM (end)

10 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

11 You have completed this procedure.

NT6X17
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X17	AA, AB, AC	Standard Line Circuit Type A (POTS)
NT6X17	BA	World Line Card Type A

The NT6X17BA World Line Card Type A replaces the following cards:

- NT6X17AC, North America
- NT6X93AA, Turkey, Belize
- NT6X93BA, Caribbean
- NT6X93CA, China
- NT6X93EA, Australia
- NT6X99AA, UK ScopeDial
- NTMX29AA, British Telephone

Common procedures

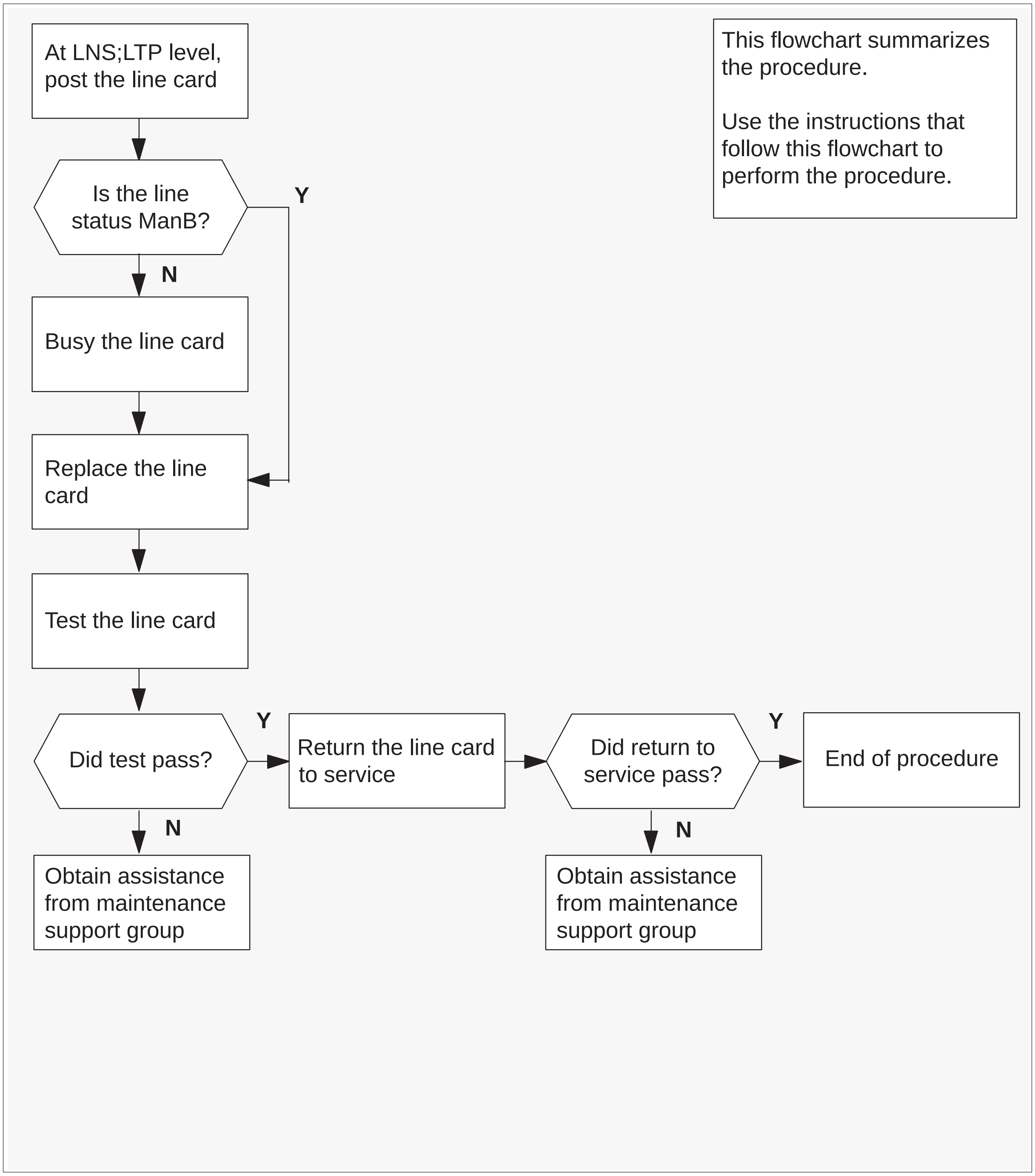
The procedure “Replacing a line card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X17
RLCM (continued)

Summary of replacing an NT6X17 card in an RLCM



NT6X17
RLCM (continued)

Replacing an NT6X17 card in an RLCM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

2 Access the LTP level of the MAP terminal and post the line associated with the card to be replaced by typing

>MAPCI;MTC;LNS;LTP;POST L site lcm lsg ckt

and pressing the Enter key.

where

site is the name of the site where the RLCM is located
lcm is the number of the RLCM with the faulty card
lsg is the number of the line subgroup with the faulty card
ckt is the number of the circuit associated with the faulty card

Example of a MAP response:

```
LCC PTY RNG .....LEN.........  DN   STA F S LTA TE RESULT
1FR      REM1 00 0 03 03     7213355 MB
```

3 Check the status of the posted line.

If the line status is	Do
manual busy (ManB)	step 5
not ManB	step 4

4 Busy the line by typing

>BSY

and pressing the Enter key.

5 Go to the procedure “Replacing a line card”. When you have completed the procedure, return to this point.

NT6X17
RLCM (end)

At the MAP terminal

6 Test the line card just replaced by typing

>DIAG

and pressing the Enter key.

If DIAG	Do
passed	step 7
failed	step 10

7 Return the line card to service by typing

>RTS

and pressing the Enter key.

If RTS	Do
passed	step 8
failed	step 10

8 Send any faulty cards for repair according to local procedure.

9 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 11.

10 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

11 You have successfully completed this procedure.

NT6X18
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X18	AA, AB	Line Card Type B (Coin/Ground Start)
NT6X18	BA	World Line Card Type B

Common procedures

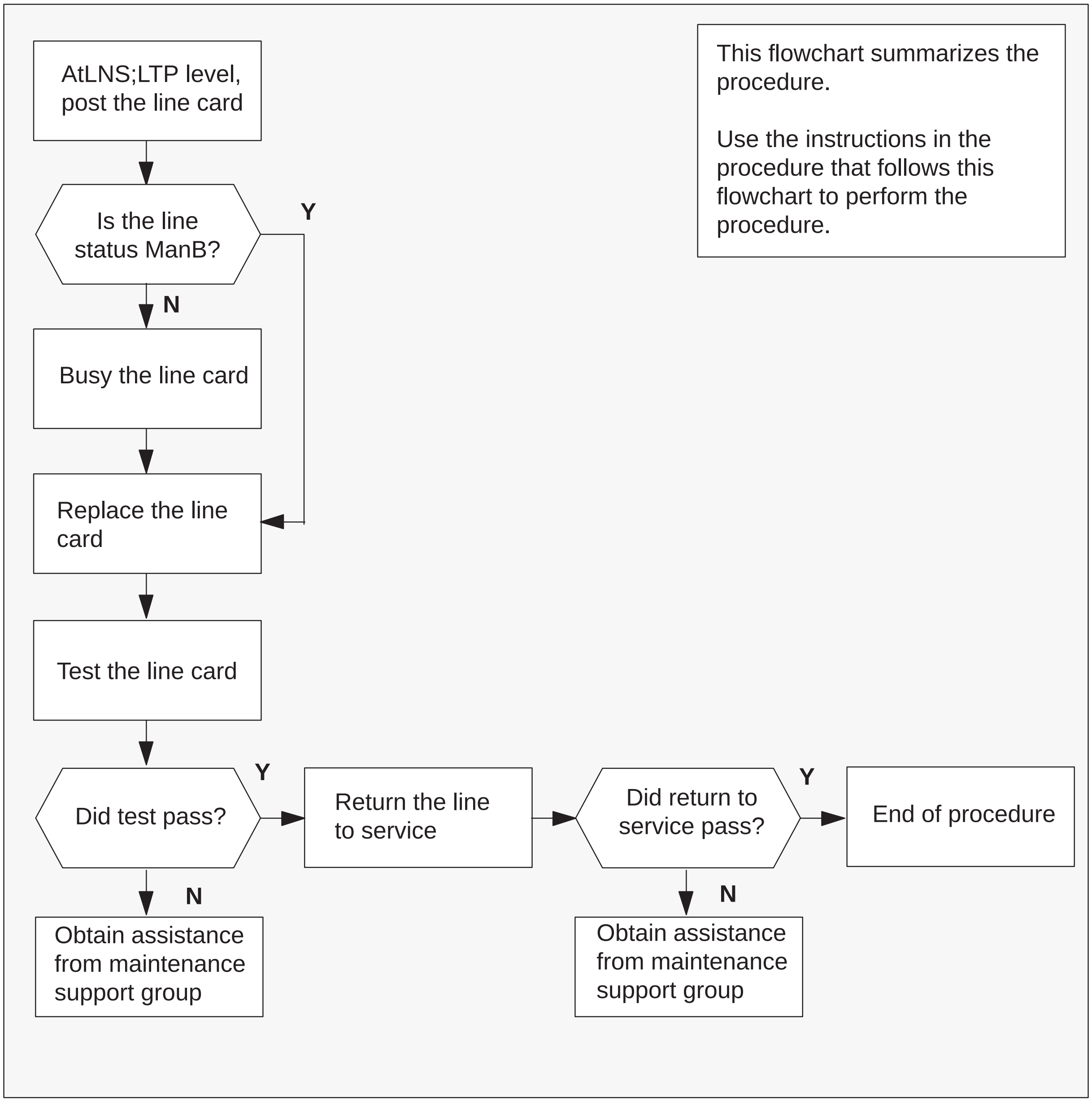
The procedure *Replacing a line card* is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X18
RLCM (continued)

Summary of replacing an NT6X18 card in an RLCM



NT6X18
RLCM (continued)

Replacing an NT6X18 card in an RLCM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

2 Access the LTP level of the MAP and post the line associated with the card to be replaced by typing

>MAPCI;MTC;LNS;LTP;POST L site lcm lsg ckt

and pressing the Enter key.

where

site is the name of the site where the RLCM is located
lcm is the number of the RLCM with the faulty card
lsg is the number of the line subgroup with the faulty card
ckt is the number of the circuit associated with the faulty card

Example of a MAP response:

```
LCC PTY RNG .....LEN.........  DN   STA F S LTA TE RESULT
1FR         REM1 00 0 03 03   7213355 MB
```

3 Check the status of the posted line.

If the line status is	Do
manual busy (ManB)	step 5
not ManB	step 4

4 Busy the line by typing

>BSY
and pressing the Enter key.

5 Go to the procedure *Replacing a line card.* When you have completed the procedure, return to this point.

At the MAP terminal

6 Test the line card just replaced by typing

>DIAG

and pressing the Enter key.

If DIAG	Do
passed	step 7
failed	step 10

ATTENTION

There is a new diagnostics test for NT6X18AA/AB cards. This NT6X18 card may be good. See the NT6X18 line card description in the general maintenance section of this book for information on running an enhanced diagnostics.

7 Return the line card to service by typing

>RTS

and pressing the Enter key.

If RTS	Do
passed	step 8
failed	step 10

8 Send any faulty cards for repair according to local procedure.

9 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 11.

10 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

NT6X18
RLCM (end)

11 You have successfully completed this procedure.

NT6X19
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X19	AA	Message Waiting Line Card

Common procedures

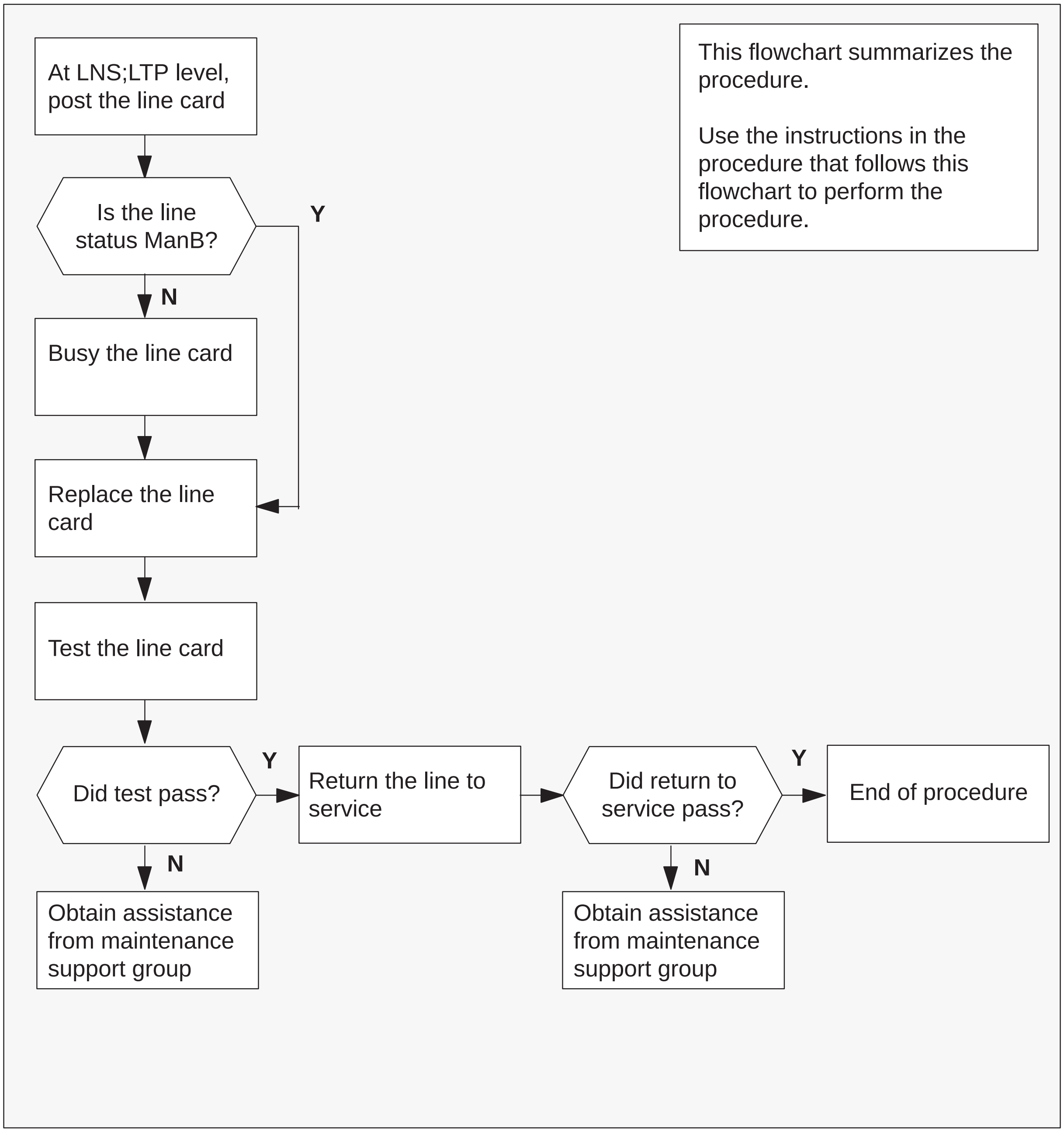
The procedure *Replacing a line card* is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X19
RLCM (continued)

Summary of replacing an NT6X19 card in an RLCM



Replacing an NT6X19 card in an RLCM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

2 Access the LTP level of the MAP and post the line associated with the card to be replaced by typing

>MAPCI;MTC;LNS;LTP;POST L site lcm lsg ckt

and pressing the Enter key.

where

site	is the name of the site where the RLCM is located
lcm	is the number of the RLCM with the faulty card
lsg	is the number of the line subgroup with the faulty card
ckt	is the number of the circuit associated with the faulty card

Example of a MAP response:

```
LCC PTY RNG .....LEN.......... DN   STA F S LTA TE RESULT
1FR      REM1 00 0 03 03     7213355 MB
```

3 Check the status of the posted line.

If the line status is	Do
manual busy (ManB)	step 5
not ManB	step 4

4 Busy the line by typing

>BSY
and pressing the Enter key.

5 Go to the procedure *Replacing a line card.* When you have completed the procedure, return to this point.

NT6X19
RLCM (end)

At the MAP terminal

6 Test the line card just replaced by typing

>DIAG

and pressing the Enter key.

If DIAG	Do
passed	step 7
failed	step 10

7 Return the line card to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 8
failed	step 10

8 Send any faulty cards for repair according to local procedure.

9 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 11.

10 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

11 You have successfully completed this procedure.

NT6X20
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X20	AA	Message Waiting Converter

Common procedures

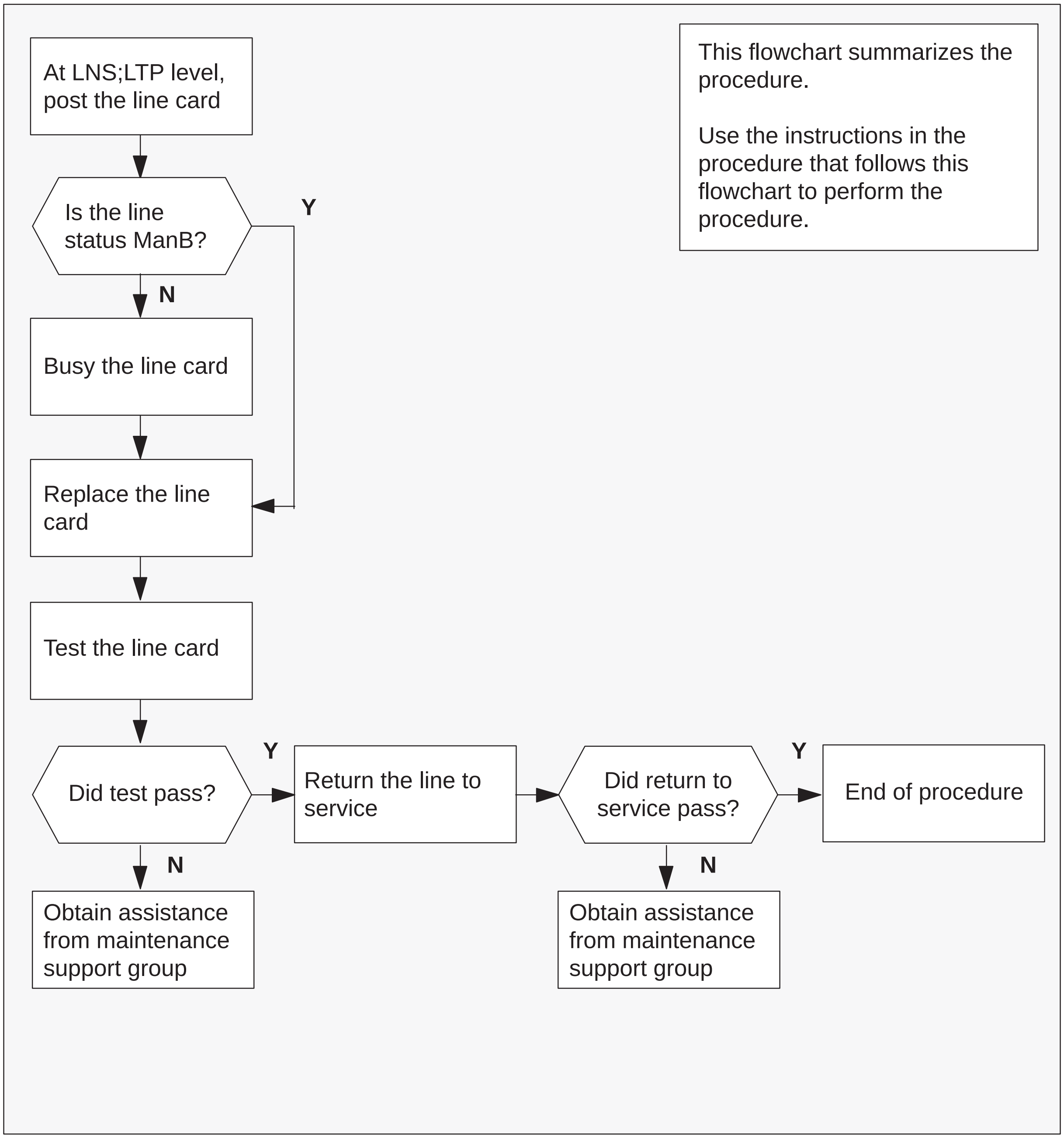
The procedure “Replacing a line card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X20
RLCM (continued)

Summary of card replacement procedure for an NT6X20 card in an RLCM



Replacing an NT6X20 card in an RLCM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

2 Access the LTP level of the MAP terminal and post the line associated with the card to be replaced by typing

>MAPCI;MTC;LNS;LTP;POST L site lcm lsg ckt
and pressing the Enter key.

where

site	is the name of the site where the RLCM is located
lcm	is the number of the RLCM with the faulty card
lsg	is the number of the line subgroup with the faulty card
ckt	is the number of the circuit associated with the faulty card

Example of a MAP response:

```
LCC PTY RNG .....LEN.......... DN   STA F S LTA TE RESULT
1FR      REM1 00 0 03 03     7213355 MB
```

3 Check the status of the posted line.

If the line status is	Do
manual busy (ManB)	step 5
not ManB	step 4

4 Busy the line by typing

>BSY
and pressing the Enter key.

5 Go to the procedure “Replacing a line card”. When you have completed the procedure, return to this point.

NT6X20
RLCM (end)

At the MAP terminal

6 Test the line card just replaced by typing

>DIAG

and pressing the Enter key.

If DIAG	Do
passed	step 7
failed	step 10

7 Return the line card to service by typing

>RTS

and pressing the Enter key.

If RTS	Do
passed	step 8
failed	step 10

8 Send any faulty cards for repair according to local procedure.

9 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 11.

10 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

11 You have successfully completed this procedure.

NT6X21
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X21	AA, AB, AC, AD	Line card type C, Meridian Digital Centrex (MDC), electronic business set

Common procedures

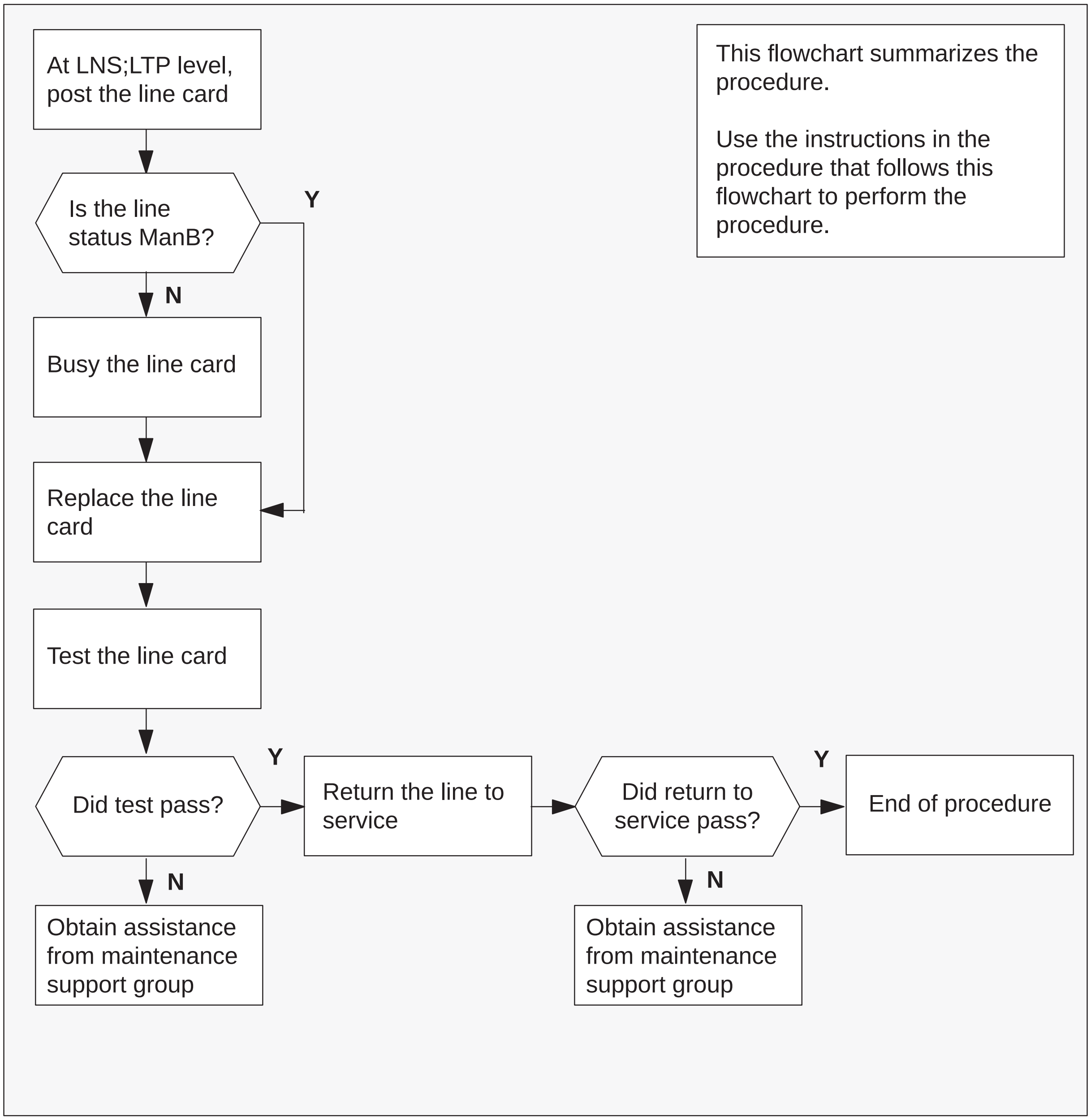
The procedure “Replacing a line card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X21
RLCM (continued)

Summary of replacing an NT6X21 card in an RLCM



NT6X21
RLCM (continued)

Replacing an NT6X21 card in an RLCM

At your current location

1 Obtain a replacement card. Ensure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

2 Make DIP switch changes for the line card.

If the line card code is	Do
AA, AB, AC	step 4
AD	step 3

3 Make DIP switch settings as referenced in the *Maintenance* section of this manual.

At the MAP terminal

4 Access the LTP level of the MAP terminal and post the line associated with the card to be replaced by typing

>MAPCI;MTC;LNS;LTP;POST L site lcm lsg ckt
and pressing the Enter key.

where

site	is the name of the site where the RLCM is located
lcm	is the number of the RLCM with the faulty card
lsg	is the number of the line subgroup with the faulty card
ckt	is the number of the circuit associated with the faulty card

Example of a MAP response:

```
LCC PTY RNG .....LEN.......... DN   STA F S LTA TE RESULT
1FR      REM1 00 0 03 03     7213355 MB
```

NT6X21
RLCM (continued)

5 Check the status of the posted line.

If the line status is	Do
manual busy (ManB)	step 7
not ManB	step 6

6 Busy the line by typing

>BSY
and pressing the Enter key.

At the RLCM site

7 Go to the procedure “Replacing a line card”. When you have completed the procedure, return to this point.

At the MAP terminal

8 Test the line card just replaced by typing

>DIAG

and pressing the Enter key.

If the DIAG	Do
passed	step 9
failed	step 12

9 Return the line card to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 10
failed	step 12

10 Send any faulty cards for repair according to local procedure.

NT6X21
RLCM (end)

11 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 13.

12 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

13 You have successfully completed this procedure.

NT6X27 in HIE

Application

This procedure replaces the following card in a host interface equipment (HIE) shelf:

PEC	Suffixes	Name
NT6X27	BB	PCM-30 Interface

Common procedures

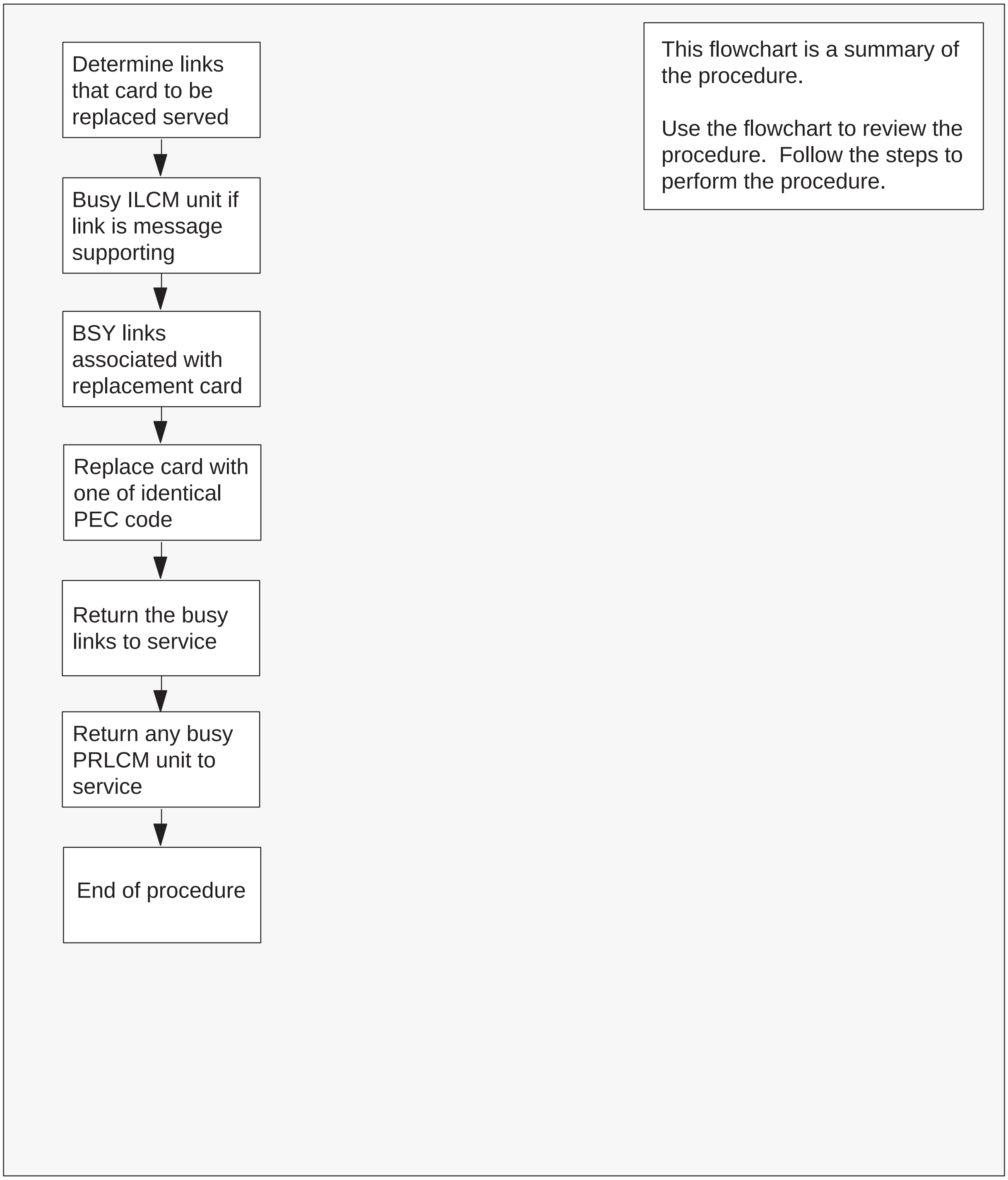
This procedure refers to the Replacing a card procedure.

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.

NT6X27
in HIE (continued)

Summary of card replacement procedure for an NT6X27 card in an in HIE



NT6X27
in HIE (continued)

Replacing an NT6X27 card in an HIE

At your current location:

1 Obtain a replacement card. Make sure the replacement card has the same product equipment code (PEC) and PEC suffix, as the card to be removed.

2 If another maintenance procedure directs you to this procedure, go to step 4. If another procedure does not direct you to this procedure, go to step 3.

At the MAP display

3 To access the peripheral module (PM) level and post the international line concentrating module (ILCM), type:

>MAPCI;MTC;PM;POST ILCM site frame lcm_no
and press the Enter key.

where

site	is the name of the PRLCM site (alphanumeric)
frame	is the frame number of the PRLCM cabinet
lcm_no	is the number of the PRLCM ILCM

4 To display C-side link information, type:

> TRNSL C
and press the Enter key.

Example of a MAP response:

PLGC P-side link numbers

```
Link 0: PLGC 0       2; Cap MS; Status: OK    ;MsgCond: OPI
Link 1: PLGC 0       6; Cap MS; Status: SysB  ;MsgCond: CL:
```

5 Use the display in step 4 to determine the central side (C-side) PM (PLGC, or RCO2) that connects to the PRLCM. To post this module, type:

> POST host_pm host_pm_no
and press the Enter key.

where

host_pm	is the name of the host PM (PLGC, or RCO2)
host_pm_no	is the number of the host PM

NT6X27
in HIE (continued)

6 To display the peripheral side (P-side) link information, type:

> TRNSL P
and press the Enter key.

Example of a MAP response:

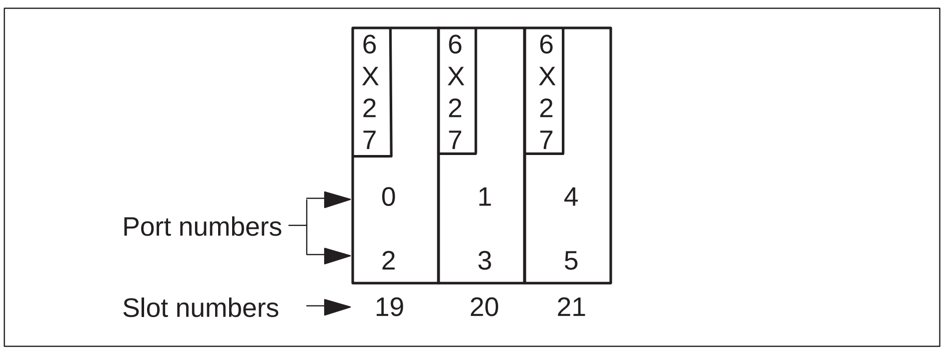
NT6X27 port numbers

```
Link 2: ILCM REM1 00 0  0;Cap MS;Status:OK   ;MsgCond: OPN
Link 6: ILCM REM1 00 0  1;Cap MS;Status:SysB ;MsgCond: CLS
```

7 Record the numbers of the links with status not correct.

Use the following diagram to determine the PCM-30 interface card(s) that correspond to the links that step 6 identifies as defective.

Note: Each NT6X27 card has two ports. For example, the defective link 6 appears in step 6. This link connects to port 1 as indicated, Port 1 corresponds to the NT6X27 in slot 20.



8 Determine the slot location of the defective card.

If defective card	Do
is in slot 19 or 20 of the HIE	step 9
is in slot 21 of the HIE	step 12

NT6X27
in HIE (continued)

9 To post the ILCM, type:

>POST ILCM site frame lcm_no
and press the Enter key.

where

site	is the name of the PRLCM site (alphanumeric)
frame	is the frame number of the PRLCM cabinet
lcm_no	is the number of the ILCM

10 To busy the ILCM unit, type:

>BSY UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the ILCM unit to be busied zero or one

Note: For ILCM unit 0, card is in slot 19. For ILCM unit 1, card is in slot 20.

11 To post the C-side PM, posted before in step 5, where the PRLCM is interfaced, type:

>POST host_pm host_pm_no
and press the Enter key.

where

host_pm	is the name of the host PM (PLGC or RCO2)
host_pm_no	is the number of the host PM

12 Use the information collected in step 7. To busy both links for the defective card, type :

>BSY LINK link_no
and press the Enter key.

where

link_no is one of two links associated with the defective card.

Note: Repeat this step for the other link associated with the defective card.

At the PRLCM cabinet

13

WARNING
Calls in progress can be interrupted.
Wait at least 15 min to allow calls in progress to complete before you remove the NT6X27 PCM-30 interface card.

NT6X27
in HIE (continued)

Change DIP switch settings on the new replacement card to match the defecitve card to be removed.

14 Use the procedure *Replacing a card to replace the NT6X27 card*. When you replace the card, return to this step.

At the MAP display

15 To test the busy links in step 12, type:

>TST LINK link_no
and press the Enter key.

where

link_no is one of two links associated with the replacement card

Note: Repeat this step for the other link associated with the replacement card.

If test	Do
fails	step 23
passes	step16

16 To Return to service (RTS) the links busied in step 12, type:

>RTS LINK link_no
and press the Enter key.

where

link_no is one of two links for the replacement card

Note: Repeat this entry for the other link associated with the replacement card.

If RTS	Do
fails	step 23
passes	step17

NT6X27
in HIE (continued)

17 Determine if there are links to clear.

If there	Do
are links to clear	step 12
are no links to clear	step18

18 Return to the procedure that directed you to this procedure. Continue as directed.

19 To post the ILCM, type:

>POST ILCM site frame lcm_no
and press the Enter key.

where

site	is the site name of the PRLCM (alphanumeric)
frame	is the frame number of the PRLCM cabinet
lcm_no	is the number of the ILCM

20 To return the busy unit to service, type:

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the ILCM unit busied in step 10

If RTS	Do
fails	step 23
passes	step 21

21 Send defective cards for repair according to local procedure.

22 Record the following items in office records:

- date of card replacement
- serial number of the card
- problems that prompted replacement of the card.

Proceed to step 24.

NT6X27
in HIE (end)

23 For additional help, contact the next level of support.

24 This procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure. Continue as directed.

NT6X36
RLCE

Application

Use this procedure to replace the following card in an RLCE.

PEC	Suffixes	Name
NT6X36	AA, AB	FSP alarm card
NT6X36	KA	FSP alarm and control card

Common procedures

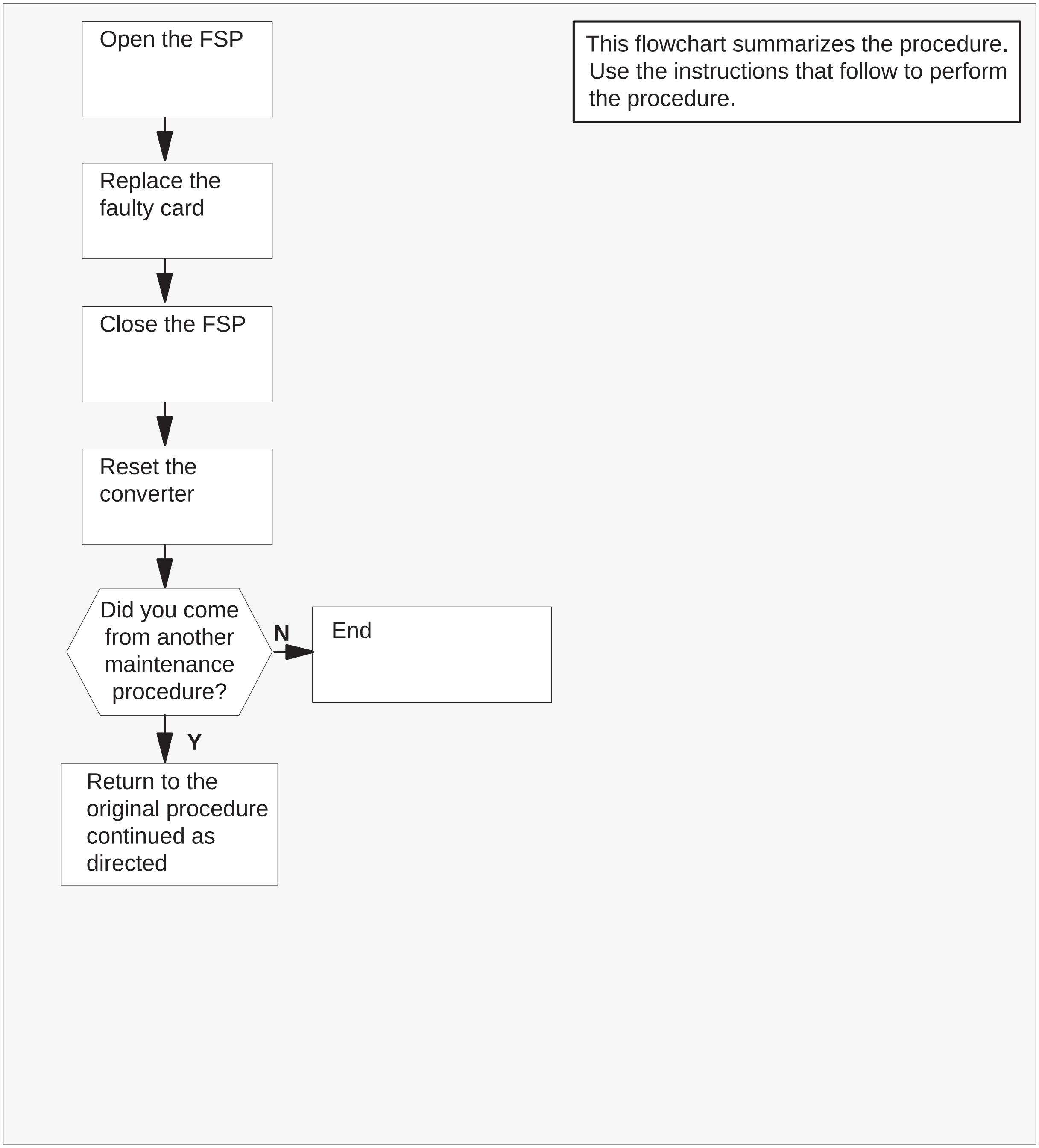
None

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X36
RLCE (continued)

Summary of replacing an NT6X36 card in an RLCE



NT6X36
RLCE (continued)

Replacing an NT6X36 card in an RLCE

At your current location

1

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist-strap grounding point of a frame supervisory panel (FSP) or a modular supervisory panel (MSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Obtain a replacement card. Ensure that the replacement card has the same product engineering code (PEC), including suffix, as the card being removed.

At the RLCE frame

2

> **DANGER**
> **Risk of electrocution**
> Some of the terminals inside the frame supervisory panel (FSP) have an electrical potential of -48V dc. Remove all jewelry before replacing a card in the FSP. Do not touch any terminal in the FSP.

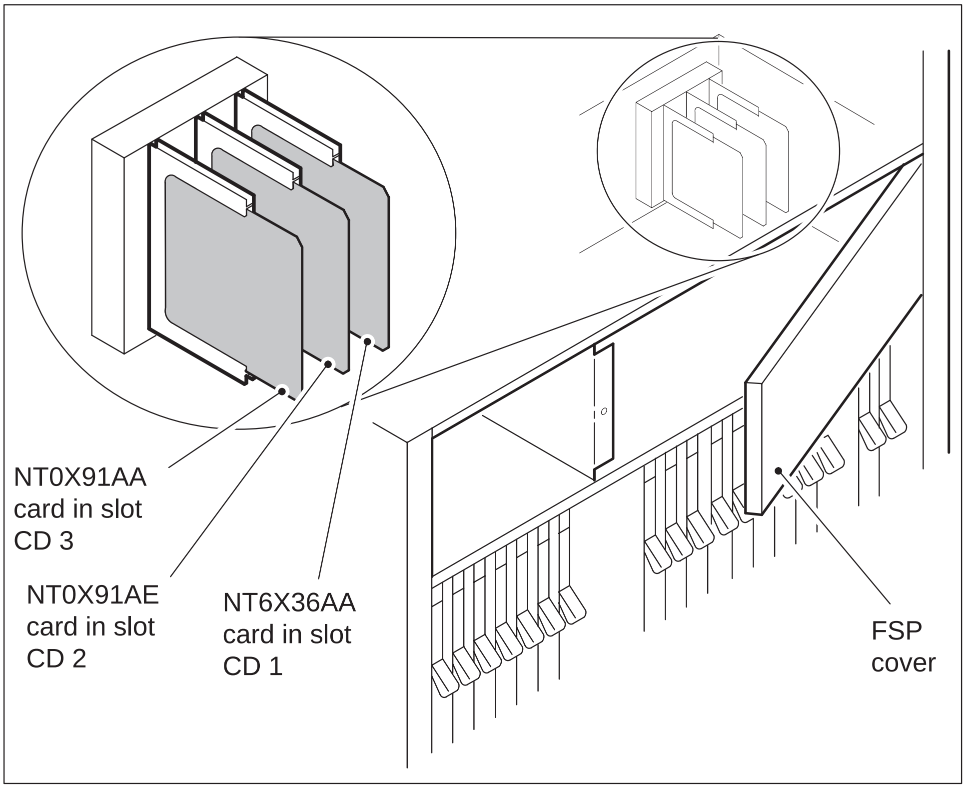
Unscrew the slotted nut on the left-hand side of the FSP.

3 Open the FSP panel.

NT6X36
RLCE (continued)

4 Remove the alarm and control card, NT6X36AA.

FSP Alarm and control cards



5 Insert the replacement alarm and control card.

6 Close the FSP panel.

7 Tighten the slotted nut on the FSP.

Proceed as follows to reset the converter in each shelf that is controlled by the alarm and control card you have just replaced.

8 Press the RESET button.

If the CONVERTER FAIL LED is	Do
lit	step 11
not lit	step 9

NT6X36
RLCE (end)

9 The next action depends on your reason for performing this procedure.

If you were	Do
directed to this procedure from a maintenance procedure	step 10
not directed to this procedure from a maintenance procedure	step 12

10 Return to the maintenance procedure that sent you to this procedure and continue as directed.

11 For further assistance, contact the personnel responsible for the next level of support.

12 You have completed this procedure.

NT6X45
HIE

Application

Use this procedure to replace the following card in an HIE shelf.

PEC	Suffixes	Name
NT6X45	AF	RLCM ESA Processor (Master Processor-ESA)

Note: NT6X45 with suffix AF is the ESA processor supported only for RLCM ESA.

Common procedures

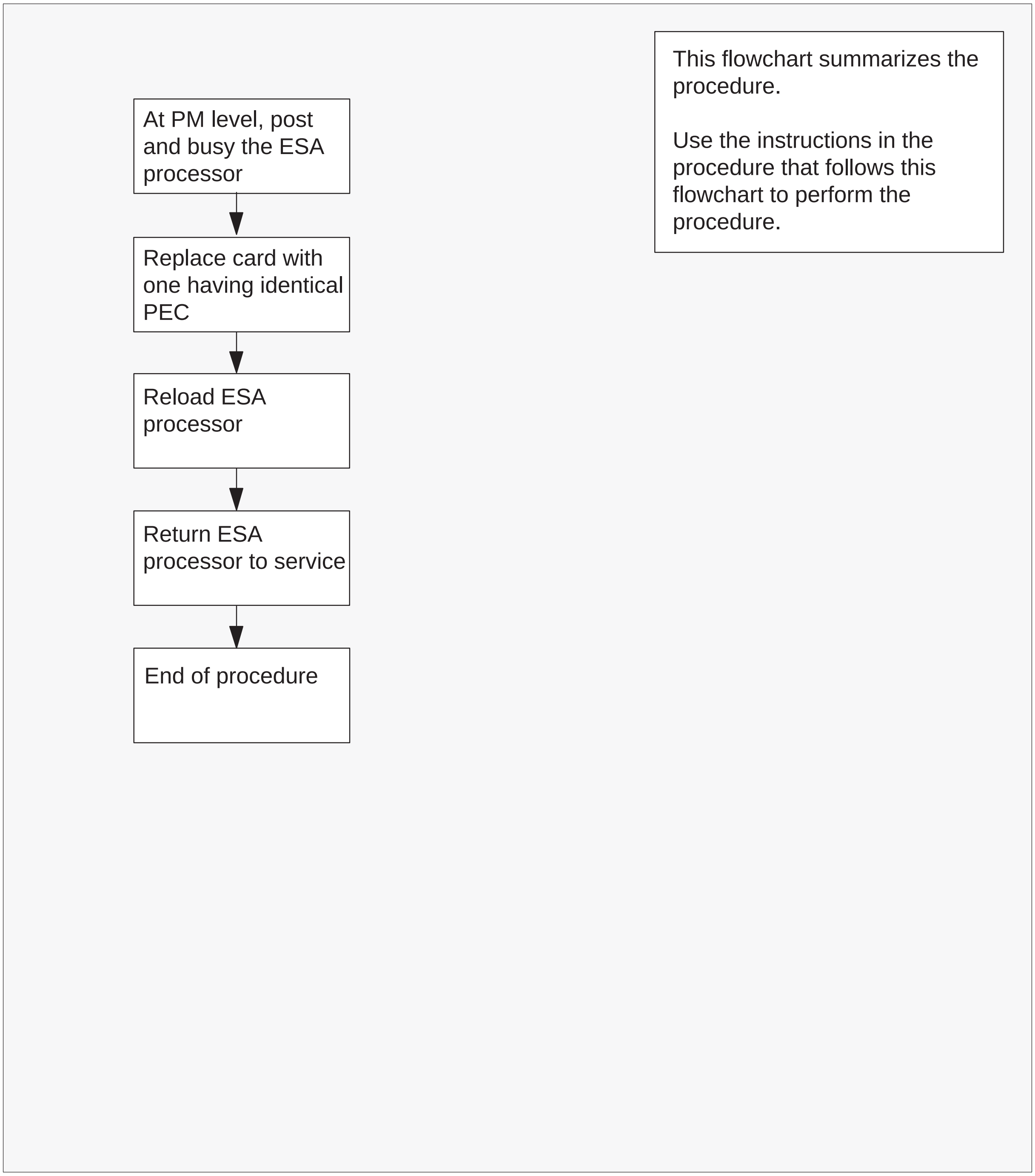
The procedure *Replacing a card* is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X45
HIE (continued)

Summary of replacing an NT6X45 card in an HIE



NT6X45
HIE (continued)

Replacing an NT6X45 card in an HIE

At your current location

1 Obtain a replacement card. Verify that the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

2 If you were directed to this procedure from another maintenance procedure, go to step 5; otherwise, continue with step 3.

At the MAP terminal

3 Post the ESA processor by typing

>MAPCI;MTC;PM;POST ESA esa_no
and pressing the Enter key.

where

esa_no is the number of the ESA processor (0 to 255)

4 Busy the ESA processor by typing

>BSY
and pressing the Enter key.

Example of a MAP response:

```
This action will take this PM out of service
Please confirm (“Yes” or “No”)
```

Respond by typing

>YES
and pressing the Enter key.

At the RLCE frame

5 Replace the NT6X45 card using the procedure *Replacing a card.* When you have completed the procedure, return to this point.

6 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 7.

NT6X45
HIE (continued)

7 Load the ESA processor by typing

>LOADPM
and pressing the Enter key.

If	Do
message “loadfile not found in directory” is received	step 8
Load passed	step 26
Load failed	step 29

8 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 9
IOC disk	step 15
SLM disk	step 20

9 Locate the tape that contains the PM load files.

10 Mount the tape on a magnetic tape drive.

At the MAP terminal

11 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

12 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

NT6X45
HIE (continued)

13 Demount the tape by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

14 Go to step 25.

15 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

16 Access the disk utility level of the MAP display by typing

>DSKUT
and pressing the Enter key.

17 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step15

18 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

19 Go to step 25.

20 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

21 Access the disk utility level of the MAP display by typing

>DISKUT
and pressing the Enter key.

22 List all SLM disk volumes into your user directory by typing

>LV CM
and pressing the Enter key.

NT6X45
HIE (continued)

23 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 20

24 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

25 Reload the ESA processor by typing

>LOADPM
and pressing the Enter key.

If loadpm	Do
passed	step 26
failed	step 29

26 Return the ESA processor to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 27
failed	step 29

27 Send any faulty cards for repair according to local procedure.

28 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 30.

NT6X45
HIE (end)

29 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

30 You have completed this procedure.

NT6X47
HIE

Application

Use this procedure to replace the following card in an HIE shelf.

PEC	Suffixes	Name
NT6X47	AB, AC	Master Processor Memory (ESA) Plus

Common procedures

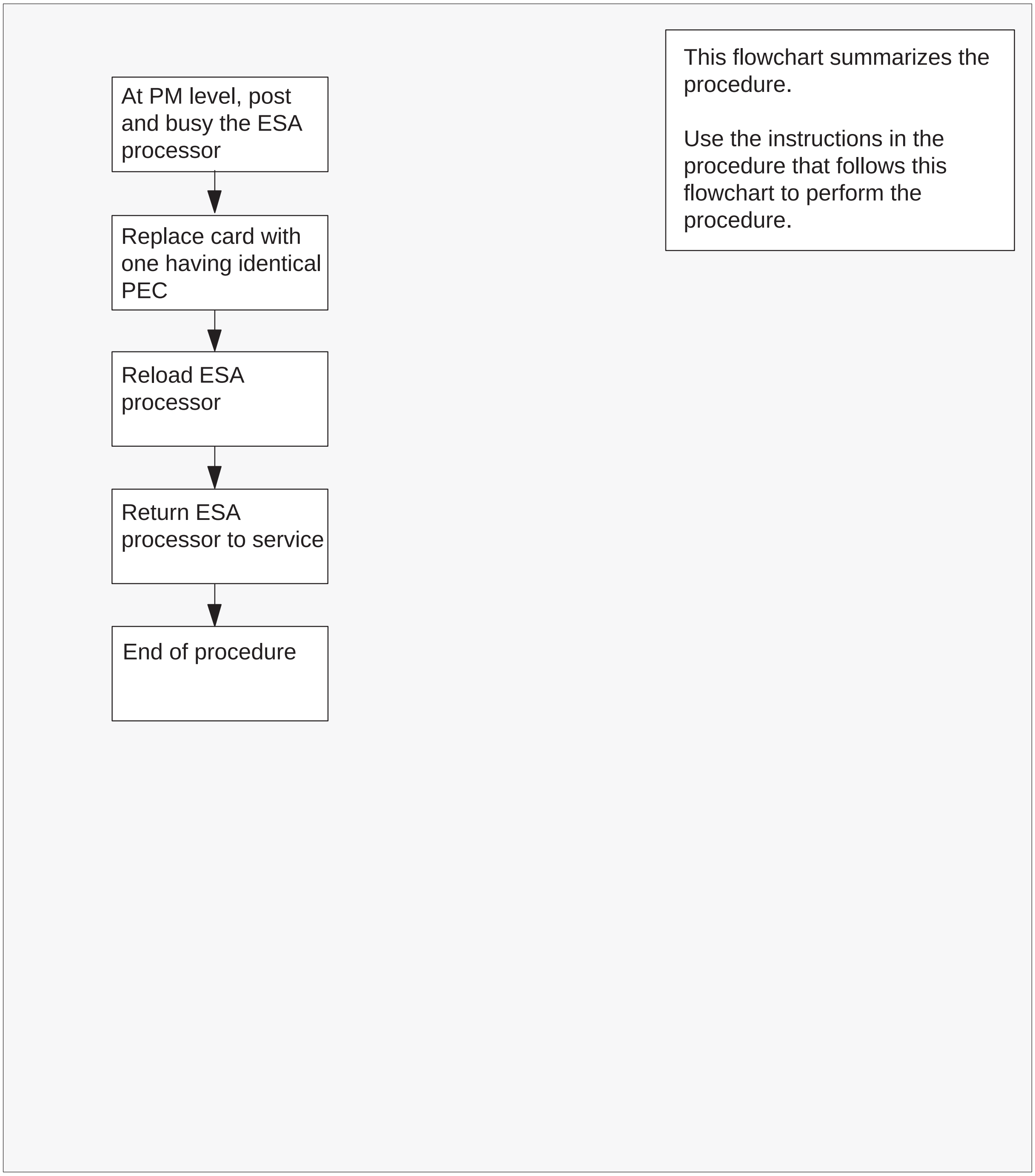
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X47
HIE (continued)

Summary of replacing an NT6X47 card in an HIE



NT6X47
HIE (continued)

Replacing an NT6X47 card in an HIE

At your current location

1 Obtain a replacement card. Verify that the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

2 If you were directed to this procedure from another maintenance procedure, go to step 5; otherwise, continue with step 3.

At the MAP terminal

3 Post the ESA processor by typing

>MAPCI;MTC;PM;POST ESA esa_no
and pressing the Enter key.

where

esa_no is the number of the ESA processor (0 to 255)

4 Busy the ESA processor by typing

>BSY
and pressing the Enter key.

Example of a MAP response:

```
This action will take this PM out of service
Please confirm (“Yes” or “No”)
```

Respond by typing

>YES
and pressing the Enter key.

At the RLCE frame

5 Replace the NT6X47 card using the procedure “Replacing a card”. When you have completed the procedure, return to this point.

6 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 7.

At the MAP terminal

7 Load the ESA processor by typing

>LOADPM
and pressing the Enter key.

If	Do
message “loadfile not found in directory” is received	step 8
load passed	step 26
load failed	step 29

8 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 9
IOC disk	step 15
SLM disk	step 20

9 Locate the tape that contains the PM load files.

At the IOE frame

10 Mount the tape on a magnetic tape drive.

At the MAP terminal

11 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

12 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

NT6X47
HIE (continued)

13 Demount the tape by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

14 Go to step 25.

15 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

16 Access the disk utility level of the MAP display by typing

>DSKUT
and pressing the Enter key.

17 List the IOC disk file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 15

18 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

19 Go to step 25.

20 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

21 Access the disk utility level of the MAP display by typing

>DISKUT
and pressing the Enter key.

22 List the SLM disk volumes into your user directory by typing

>LV CM
and pressing the Enter key.

NT6X47
HIE (continued)

23 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume containing the PM load files, obtained in step 20

24 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

25 Reload the ESA processor by typing

>LOADPM
and pressing the Enter key.

If	Do
load passed	step 26
load failed	step 29

26 Return the ESA processor to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 27
failed	step 29

27 Send any faulty cards for repair according to local procedure.

28 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 30.

NT6X47
HIE (end)

29 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

30 You have completed this procedure.

NT6X50
HIE

Application

Use this procedure to replace the following card in an HIE shelf.

PEC	Suffixes	Name
NT6X50	AA	DS-1 Interface

Common procedures

The procedure *Replacing a card* is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X50
HIE (continued)

Summary of card replacement procedure for an NT6X50 card in an HIE

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

Determine links serviced by card to be replaced

↓

Busy LCM unit if link is message supporting

↓

BSY links associated with replacement card

↓

Replace card with one of identical PEC code

↓

Return the busied links to service

↓

Return any busied RLCM unit to service

↓

End of procedure

NT6X50
HIE (continued)

Replacing an NT6X50 card in an HIE

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

2 If you were directed to this procedure from another maintenance procedure, go to step 4; otherwise, continue with step 3.

At the MAP display

3 Access the PM level and post the LCM by typing

>MAPCI;MTC;PM;POST LCM site frame lcm
and pressing the Enter key.

where

site	is the name of the RLCM site (alphanumeric)
frame	is the frame number of the RLCE (0 to 511)
lcm	is the number of the LCM

4 Display C-side link information by typing

> TRNSL C
and pressing the Enter key.

Example of a MAP response:

LTC P-side link numbers

```
Link 0: LTC 0       2; Cap MS; Status: OK    ;MsgCond: OPN
Link 1: LTC 0       6; Cap MS; Status: SysB  ;MsgCond: CLS
```

5 From the display in step 4, determine the C-side peripheral module (LTC, LGC, or RCC) to which the RLCM is connected and post it by typing

> POST host_pm host_pm_no
and pressing the Enter key.

where

host_pm	is the name of the host PM (LTC, LGC, or RCC)
host_pm_no	is the number of the host PM (0 to 255)

NT6X50
HIE (continued)

6 Display P-side link information by typing

> TRNSL P
and pressing the Enter key.

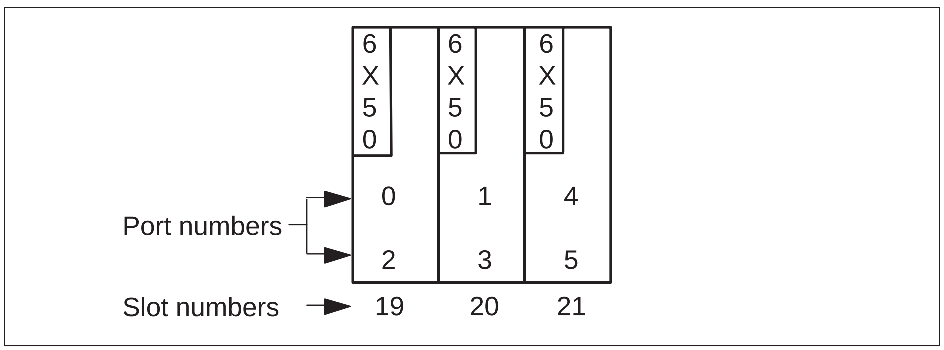
Example of a MAP response:

RLCM C-side port numbers

```
Link 2: LCM REM1 00 0  0;Cap MS;Status:OK   ;MsgCond: OPN
Link 6: LCM REM1 00 0  1;Cap MS;Status:SysB ;MsgCond: CLS
```

7 Record the numbers of the links with status not OK.

Use the following diagram to determine which DS-1 interface card or cards corresponds to the links identified as faulty in step 6. Note that each NT6X50 card has 2 ports. For example, the faulty link 6 displayed in step 6 is connected to port 1 as indicated, which corresponds to the NT6X50 in slot 20.



8 Determine the slot location of the faulty card.

If faulty card is in slot	**Do**
19 or 20 of the HIE	step 9
21 of the HIE	step 12

NT6X50
HIE (continued)

9 Post the LCM by typing

>POST LCM site frame lcm_no
and pressing the Enter key.

where

site	is the name of the RLCM site (alphanumeric)
frame	is the frame number of the RLCE (0–511)
lcm_no	is the number of the LCM

10 Busy LCM unit 0 for card in slot 19 or LCM unit 1 for card in slot 20 by typing

>BSY UNIT lcm_unit_no
and pressing the Enter key.

where

lcm_unit_no	is the RLCM unit to be busied, (0 or 1).

11 Post the C-side peripheral module, previously posted in step 5, where the RLCM is connected by typing

>POST host_pm host_pm_no
and pressing the Enter key.

where

host_pm	is the name of the host PM, previously posted in step 5
host_pm_no	is the number of the host PM (0 to 255)

12 Using the information collected in steps 6 and 7, busy both links associated with the faulty card by typing

>BSY LINK link_no
and pressing the Enter key.

where

link_no	is one of two links associated with the faulty card

Note: Repeat this step for the other link associated with the faulty card.

At the RLCE frame

13

> **WARNING**
> **Calls in progress may be interrupted.**
> The craftsperson must wait at least 15 minutes to allow calls in progress to be completed before removing the NT6X50 DS-1 interface card.

Change dip switch settings on the new replacement card to match the faulty card being removed.

14 Replace the NT6X50 card using the procedure *Replacing a card*. When the card has been replaced, return to this point.

At the MAP display

15 Test the links busied in step 12 by typing

>TST LINK link_no
and pressing the Enter key.

where

link_no is one of two links associated with the replacement card

Note: Repeat this step for the other link associated with the replacement card.

If test	Do
failed	step 24
passed	step16

NT6X50
HIE (continued)

16 Return to service the links busied in step 12 by typing

>RTS LINK link_no
and pressing the Enter key.

where

link_no is one of two links associated with the replacement card

Note: Repeat this entry for the other link associated with the replacement card.

If RTS	Do
failed	step 24
passed	step17

17 Determine if there are remaining links to clear.

If there are	Do
remaining links to clear	step 12
no remaining links to clear	step18

18 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 19.

19 Determine if an LCM unit is manual busy.

If LCM unit	Do
is ManB	step 20
is not ManB	step 22

NT6X50
HIE (end)

20 Post the LCM by typing

>POST LCM site frame lcm_no
and pressing the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCE (0 to 511)
lcm_no	is the number of the LCM

21 Return the busied unit to service by typing

>RTS UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit	is the RLCM unit busied in step 10

If RTS	Do
failed	step 24
passed	step 22

22 Send any faulty cards for repair according to local procedure.

23 Record the following items in office records:

- date the card was replaced
- serial number of the card
- symptoms that prompted replacement of the card

Proceed to step 25.

24 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

25 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT6X51
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X51	AA, AB, AC	LCM Processor Card

Common procedures

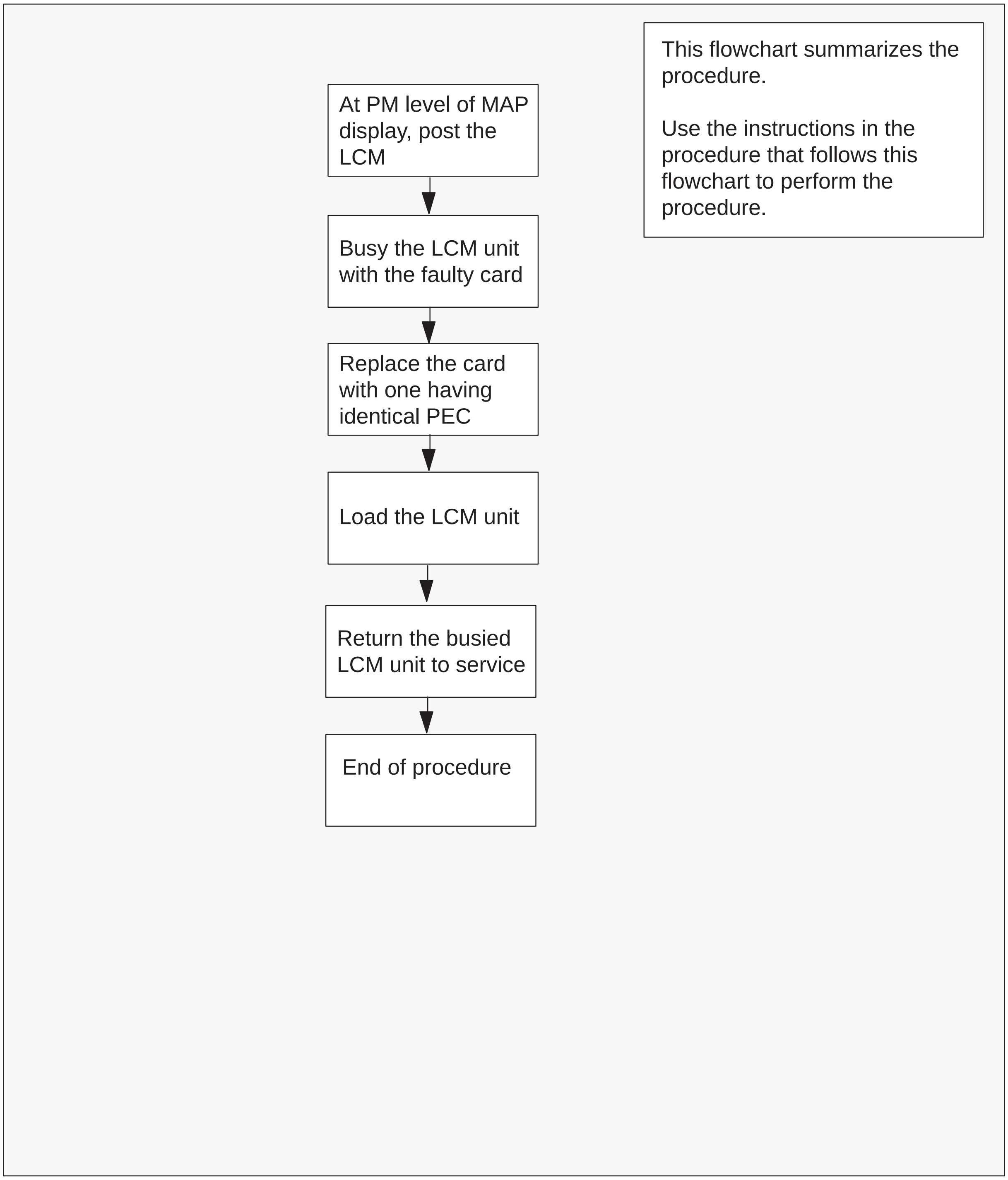
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X51
RLCM (continued)

Summary of card replacement procedure for an NT6X51 card in an RLCM



Replacing an NT6X51 card in an RLCM

> **ATTENTION**
> 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 your current location

1

> **CAUTION**
> **Loss of service**
> This procedure includes directions to manually busy one or more peripheral module (PM) units. Since manually busying a PM unit can cause service degradation, perform this procedure only if necessary to restore out-of-service components. Otherwise, carry out this procedure during periods of low traffic.

Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

2 If you were directed to this procedure from another maintenance procedure, go to step 6; otherwise, continue with step 3.

At the MAP display

3 Access the PM level and post the LCM by typing

>MAPCI;MTC;PM;POST LCM site frame lcm
and pressing the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCE (0–511)
lcm	is the number of the LCM

NT6X51
RLCM (continued)

4 Determine the state of the PM unit associated with the card you are replacing.

If the state of the PM unit is	Do
`SysB` , `CBsy`, `ISTb`, `InSv`	step 5
`ManB`	step 6
`Offl`	step 30

5 Busy the LCM unit containing the faulty card by typing

>BSY UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit is the LCM unit to be busied (0 or 1)

At the RLCE frame

6

WARNING
Static electricity damage
Wear a wrist strap connected to the wrist-strap grounding point of a frame supervisory panel (FSP) or a modular supervisory panel (MSP) while handling circuit cards. This protects the cards against damage caused by static electricity.

Replace the NT6X51 card using the procedure “Replacing a card”. When the card has been replaced, return to this point.

7 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 8.

8 Load the LCM unit by typing

>LOADPM UNIT lcm_unit CC
and pressing the Enter key.

where

lcm_unit is the LCM unit to be loaded (0 or 1)

If	Do
message “loadfile not found in directory” is received	step 9
load passed	step 26
load failed	step 29

9 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 10
IOC disk	step 16
SLM disk	step 21

10 Locate the tape that contains the PM load files.

At the IOE frame

11 Mount the tape on a magnetic tape drive.

At the MAP display

12 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

NT6X51
RLCM (continued)

13 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files.

14 Demount the tape drive by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

15 Go to step 25.

16 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

17 Access the disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

18 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 16.

19 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

20 Go to step 25.

21 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

22 Access the disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

23 List the SLM file names into your user directory by typing

>LV CM;LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 21.

24 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

25 Load the LCM unit by typing

>LOADPM UNIT lcm_unit CC
and pressing the Enter key.

where

lcm_unit is the LCM unit to be loaded (0 or 1)

If	Do
load failed	step 29
load passed	step 26

26 Return the LCM unit to service by typing

>RTS UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit is the LCM busied in step 5 (0 or 1)

If RTS	Do
passed	step 27
failed	step 29

27 Send any faulty cards for repair according to local procedure.

NT6X51
RLCM (end)

28 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 31.

29 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

30 Consult office personnel to determine why the component is offline. Continue as directed by office personnel.

31 You have successfully completed this procedure.

NT6X52
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X52	AA, AB	Digital Control Card (DCC)

Common procedures

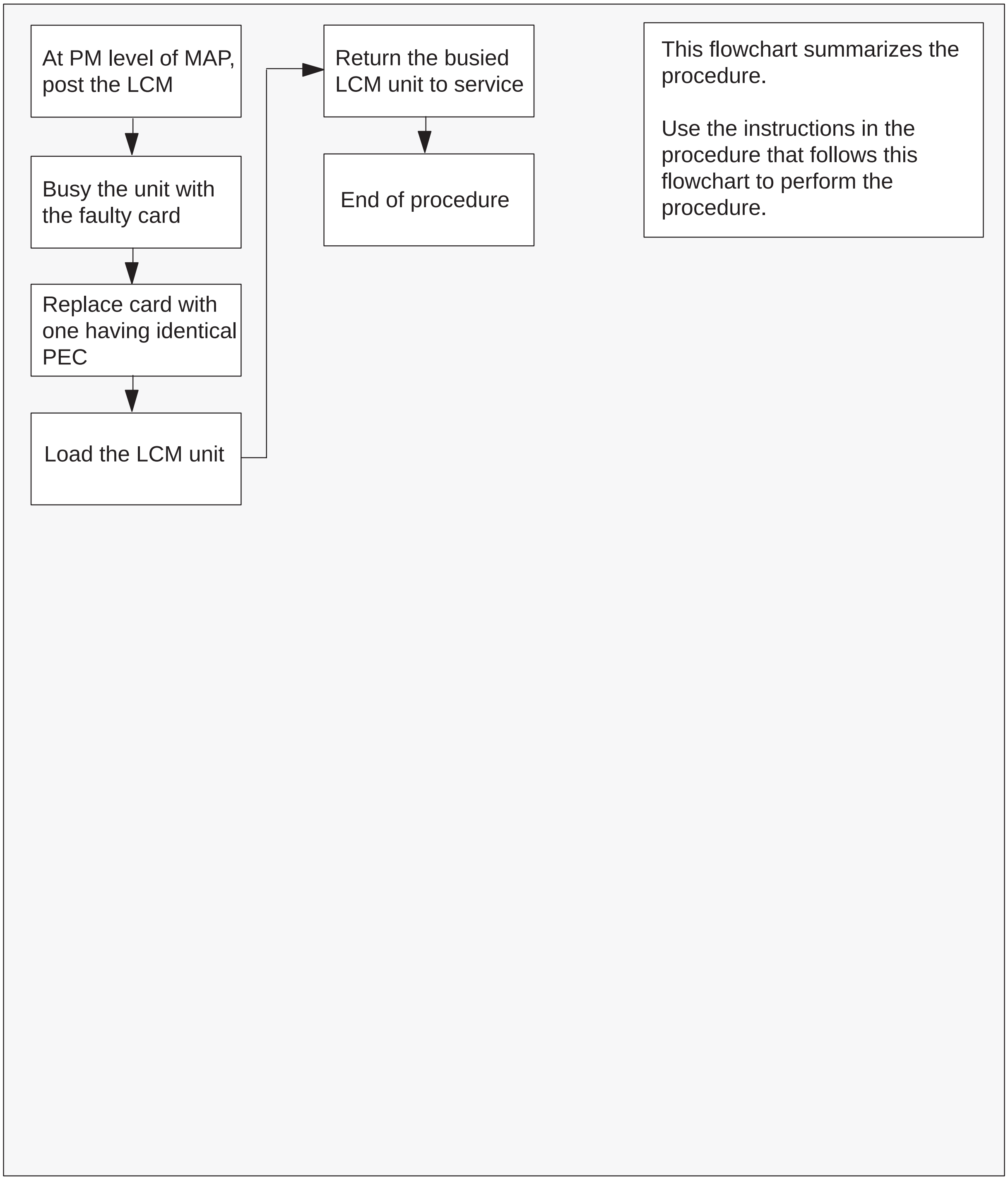
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X52
RLCM (continued)

Summary of card replacement procedure for an NT6X52 card in an RLCM



Replacing an NT6X52 card in an RLCM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

2 If you were directed to this procedure from another maintenance procedure, go to step 5; otherwise, continue with step 3.

At the MAP display

3 Access the PM level and post the LCM by typing

>MAPCI;MTC;PM;POST LCM site frame lcm
and pressing the Enter key.

where

site	is the site name of the RLCM
frame	is the frame number of the RLCE (0 to 511)
lcm	is the number of the LCM

4 Busy the LCM unit containing the faulty card by typing

>BSY UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit is the LCM unit to be busied (0 or 1)

At the RLCE

5 Replace the NT6X52 card using the procedure “Replacing a card”. When the card is replaced, return to this point.

6 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 7.

NT6X52
RLCM (continued)

7 Load the LCM unit by typing

>LOADPM UNIT lcm_unit CC
and pressing the Enter key.

where

lcm_unit is the LCM unit to be loaded (0 or 1)

If	Do
message “loadfile not found in directory” is received	step 8
load passed	step 26
load failed	step 29

8 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 9
IOC disk	step 15
SLM disk	step 20

9 Locate the tape that contains the PM load files.

10 Mount the tape on a magnetic tape drive.

At the MAP display

11 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

12 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

NT6X52
RLCM (continued)

13 Demount the tape by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

14 Go to step 25.

15 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

16 Access the disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

17 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files obtained in step 15

18 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

19 Go to step 25.

20 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

21 Access the disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

22 List the SLM disk volume names by typing

>LV CM
and pressing the Enter key.

NT6X52
RLCM (continued)

23 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 20

24 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

25 Reload the LCM unit by typing

>LOADPM UNIT lcm_unit CC
and pressing the Enter key.

where

lcm_unit is the LCM unit to be loaded (0 or 1)

If	Do
load failed	step 29
load passed	step 26

26 Return the LCM unit to service by typing

>RTS UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit is the LCM busied in step 4 (0 or 1)

If RTS	Do
passed	step 27
failed	step 29

27 Send any faulty cards for repair according to local procedure.

NT6X52
RLCM (end)

28 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 30.

29 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

30 You have successfully completed this procedure.

NT6X53
RLCM

Application

Use this procedure to replace the following card in an RLCM

PEC	Suffixes	Name
NT6X53	AA, BA, CA	Power Converter Card (5V/15V)

Common procedures

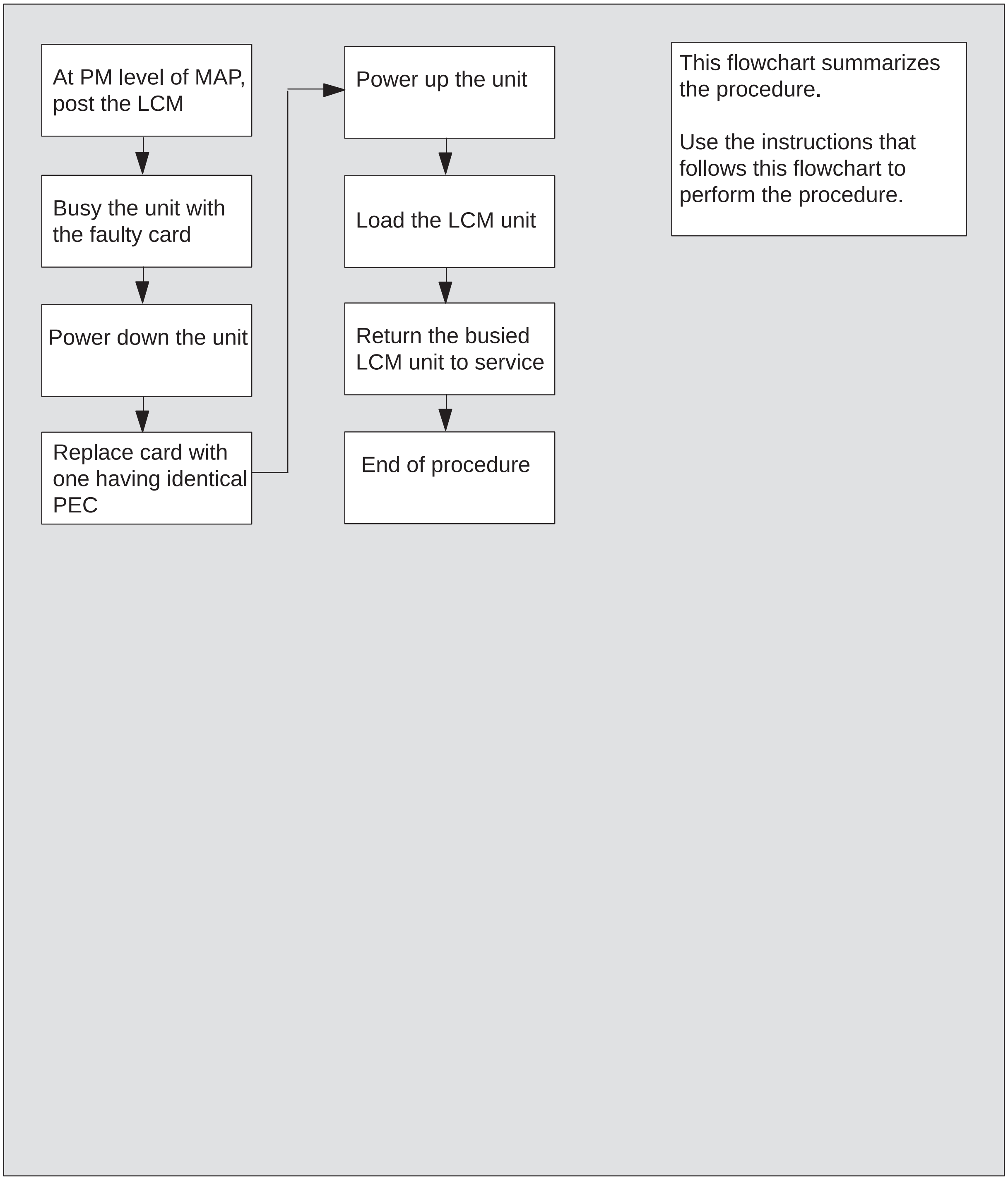
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X53
RLCM (continued)

Summary of card replacement procedure for an NT6X53 card in an RLCM



NT6X53
RLCM (continued)

Replacing an NT6X53 in an RLCM

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 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

3 Access the PM level of the MAP and post the LCM by typing

>MAPCI;MTC;PM;POST LCM site frame lcm
and pressing the Enter key.

where

site	is the name of the RLCM site
frame	is the frame number of the RLCE frame (0 to 511)
lcm	is the number of the LCM

Example of a MAP display:

```
  CM    MS    IOD    Net    PM   CCS   LNS   Trks    Ext    Appl
   .     .     .      .    1LCM   .     .     .       .      .

 LCM            SysB     ManB     OffL     CBsy     ISTb      InSv
  0 Quit    PM    0        0        0        0        1       130
  2 Post_   LCM   0        0        0        0        1        10
  3
  4 SwRg         LCM   Rem1  OO 0 ISTb   Links_OOS: CSide 0 PSide 0
  5 Trnsl        Unit-0:  InSv  Mtce TakeOver    /RG:  0
  6 Tst          Unit-1:  SysB  Mtce             /RG:  0
  7 Bsy                               11 11 11 11 11 RG:Pref:0 InSv
  8 RTS          Drwr: 01 23 45 67 89 01 23 45 67 89    Stby:1 InSv
  9 OffL               .. .. .. .. .. .. .. .. .. ..
 10 LoadPM
 11 Disp_
 12 Next
 13
 14 QueryPM
 15
 16
 17
 18
```

4 Busy the LCM unit containing the faulty card by typing

>BSY UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit   is the LCM unit (0 or 1) to be busied

Example of a MAP display:

```
 CM    MS     IOD    Net     PM   CCS   LNS   Trks    Ext    Appl
  .     .      .      .    1LCM   .      .     .       .      .

 LCM            SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit    PM    0        0        0        0        1        130
 2 Post_   LCM   0        0        0        0        1         10
 3
 4 SwRg           LCM   Rem1  OO O ISTb   Links_OOS: CSide 0 PSide 0
 5 Trnsl          Unit-0:  InSv  Mtce TakeOver    /RG:  0
 6 Tst            Unit-1:  ManB  Mtce             /RG:  0
 7 Bsy                                  11 11 11 11 11 RG:Pref:0 InSv
 8 RTS            Drwr: 01 23 45 67 89 01 23 45 67 89    Stby:1 InSv
 9 OffL                 .. .. .. .. .. .. .. .. .. ..
10 LoadPM
11 Disp_
12 Next
13
14 QueryPM
15
16
17
18
```

NT6X53
RLCM (continued)

At the RLCE frame

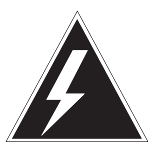
5 Turn the circuit breaker OFF for the unit in which the power converter is being replaced. Use the table below to determine which FSP circuit breaker serves the unit.

Circuit breaker	Unit FED	Locations
CB6	LCA 0	Shelf 04 slot 01
CB7	LCA 1	Shelf 21 slot 01

Note: For the NTNX14AA cabinet the circuit breaker assignments are:

Circuit breaker	Unit FED	Locations
CB2	LCA 0	bay 0 slot 01
CB7	LCA 1	bay 0 slot 01

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 LCM. This protects the equipment against damage caused by static electricity.

Replace the NT6X53 card using the procedure “Replacing a card”. When the card has been replaced, return to this point.

7 Power up the LCM unit as follows:

a. Ensure that the power converter (NT6X53) is inserted. A major audible alarm may sound. This alarm is silenced when power is restored to the converter.

b. Set the circuit breaker to the ON position. The converter fail LED and frame fail lamp on the FSP will be extinguished.

Determine the correct FSP switch for the shelf in which the power converter was replaced from the diagram below. The switches are numbered corresponding to the shelf position.

Circuit breaker	Unit FED	Locations
CB6	LCA 0	Shelf 04 slot 01
CB7	LCA 1	Shelf 21 slot 01

Note: For the NTNX14AA cabinet the circuit breaker assignments are:

Circuit breaker	Unit FED	Locations
CB2	LCA 0	bay 0 slot 01
CB7	LCA 1	bay 0 slot 01

c. Turn the circuit breaker on for the unit with the new power converter.

a. The converter fail LED will be extinguished.

b. The frame fail lamp on the FSP will be extinguished.

8 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 9.

At the MAP display

9 Load the LCM unit by typing

>LOADPM UNIT lcm_unit CC
and pressing the Enter key.

where

lcm_unit is the LCM unit (0 or 1)to be loaded

If	Do
message “loadfile not found in directory” is received	step 10
load passed	step 29
load failed	step 33

NT6X53
RLCM (continued)

10 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 11
IOC disk	step 17
SLM disk	step 22

11 Locate the tape that contains the PM load files.

At the IOE frame

12 Mount the tape on a magnetic tape drive.

At the MAP display

13 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

14 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files.

15 Release the tape drive from your user directory by typing:

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive mounted in step 13.

16 Go to step 27.

17 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

NT6X53
RLCM (continued)

18 Access the disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

19 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 17.

20 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

21 Go to step 27.

22 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

23 Access the disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

24 List the SLM disk volume names by typing

>LV CM
and pressing the Enter key.

25 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 22.

26 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

NT6X53
RLCM (continued)

27 Load the LCM unit by typing

>LOADPM UNIT lcm_unit CC
and pressing the Enter key.

where

lcm_unit is the LCM unit (0 or 1)to be loaded

If	Do
load failed	step 33
load passed	step 28

28 Use the following information to determine the next step in this procedure.

If you entered this procedure	Do
an alarm clearing procedure	step 32
other	step 29

29 Return the LCM unit to service by typing

>RTS UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit is the LCM (0 or 1) busied in step 4

If RTS	Do
passed	step 30
failed	step 33

30 Send any faulty cards for repair according to local procedure.

NT6X53
RLCM (end)

31 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 34.

32 Return to the *Alarm Clearing Procedure* that directed you to this procedure. If necessary, go to the point where the 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.

33 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

34 You have successfully completed this procedure.

NT6X54
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X54	AA	Bus Interface Card (BIC)
NT6X54	DA	ISDN drawer controller (IDC) card (BIC)
		Note: Peripherals with ISDN line drawer for remotes (ILDR) must use the NT6X54DA card. ILDR is first available for remote switching center-SONET (RSC-S) and remote switching center (RSC) configurations in the NA007/XPM08 timeframe. ILDR is first available for remote line concentrating module (RLCM), outside plant module (OPM), and outside plant access cabinet (OPAC) configurations in the NA008/XPM81 timeframe.

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.

NT6X54
RLCM (continued)

Summary of card replacement procedure for an NT6X54 card in an RLCM

At PM level, post the LCM

↓

Busy LSGs of drawer containing faulty card

↓

Remove –48, +15, and +5 volt fuses

↓

Replace the faulty card with one of same PEC

↓

Replace +5, +15, and –48 volt fuses

↓

Return the drawer to service

↓

End of procedure

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

NT6X54
RLCM (continued)

Replacing an NT6X54 card in an RLCM

At your current location

1

> **ATTENTION**
> If you are entering this procedure due to a loss of power in the LCM's controller (LGC/LTC/RCC), check logutil for PM181 log with reason text of: `DCC BIC Looparound` and go to step 10.

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 equipment code (PEC), including suffix, as the card that is to be removed.

3 If you were directed to this procedure from the *Alarm Clearing Procedures*, go to step 10. Otherwise, continue with step 4.

At the MAP terminal

4 Access the peripheral module (PM) level of the MAP (maintenance and administration position) display and post the RLCM by typing

>MAPCI;MTC;PM;POST LCM site frame lcm
and pressing the Enter key.

where

site	is the site name (alphanumeric) of the RLCM
frame	is the frame number (0 through 511) of the RLCE
lcm	is the number (0 or 1) of the LCM

NT6X54
RLCM (continued)

Example of a MAP display:

```
 CM    MS    IOD    Net    PM   CCS   LNS   Trks    Ext    Appl
  .     .     .      .    1LCM   .      .     .      .      .

LCM            SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit    PM    0        1        0        0        0       130
 2 Post_   LCM   0        1        0        0        0         0
 3
 4 SwRg          LCM   Rem1  OO 0 ISTb   Links_OOS: CSide 0 PSide 0
 5 Trnsl         Unit-0:  InSv  Mtce       /RG:  0
 6 Tst           Unit-1:  InsV  Mtce       /RG:  0
 7 Bsy                                 11 11 11 11 11 RG:Pref:0 InSv
 8 RTS           Drwr: 01 23 45 67 89 01 23 45 67 89    Stby:1 InSv
 9 OffL                .. .. SS .. .. .. .. .. .. ..
10 LoadPM
11 Disp_
12 Next
13
14 QueryPM
15
16
17
18
```

Note: ILDR drawers are identified in reverse video on the MAP display.

5 Determine whether or not you need to access the ILD level on the MAP terminal.

If the card you are replacing is	Do
NT6X54DA	step 6
NT6X54AA	step 9

6 Access the ILD level on the MAP terminal by typing

>ILD
and pressing the Enter key.

7 Post the ILDR drawer in which the card is being replaced by typing

>POST drawer_no
and pressing the Enter key.

where

drawer_no is the ILD drawer number (0 through 19) in the LCM

NT6X54
RLCM (continued)

8 Busy both line subgroups associated with the LCM drawer in which the card is being replaced by typing

>BSY DRWR
and pressing the Enter key.

Example of a MAP response;

```
Please confirm (“YES,” “Y,” “NO,” or “N”):
```

Confirm the system prompt by typing

>YES
and pressing the Enter key.

Go to step 10.

9 Busy both line subgroups associated with the RLCM drawer in which the card is being replaced by typing

>BSY DRWR lsg
and pressing the Enter key.

where

lsg is one of two line subgroups (0 through 19) associated with the drawer

Example of a MAP response:

```
LCM REM1 00 0  Drwr 4 will be taken out of service
Please confirm (“YES,” “Y,” “NO,” or “N”):
```

Confirm the system prompt by typing

>YES
and pressing the Enter key.

Note: Repeat this step for the other line subgroup associated with the line drawer.

Example of a MAP display:

```
 CM     MS     IOD     Net     PM    CCS    LNS    Trks     Ext     Appl
  .      .      .       .     1LCM    .      .      .        .       .

LCM              SysB      ManB      OffL      CBsy      ISTb       InSv
 0 Quit    PM     0         1         0         0         0         130
 2 Post_   LCM    0         1         0         0         0           0
 3
 4 SwRg          LCM    Rem1  OO O ISTb   Links_OOS: CSide 0 PSide 0
 5 Trnsl         Unit-0:  InSv  Mtce       /RG:  0
 6 Tst           Unit-1:  InsV  Mtce       /RG:  0
 7 Bsy                                 11 11 11 11 11 RG:Pref:0 InSv
 8 RTS           Drwr: 01 23 45 67 89 01 23 45 67 89    Stby:1 InSv
 9 OffL                .. .. MM .. .. .. .. .. .. ..
10 LoadPM
11 Disp_
12 Next
13
14 QueryPM
15
16
17
18
```

At the RLCE frame

10 Remove the –48V fuse for the line drawer containing the faulty bus interface card.

11 Remove the +15V fuse for the line drawer containing the faulty bus interface card.

12 Remove the +5V fuse for the line drawer containing the faulty bus interface card.

If entry into this procedure is due to	Do
replacement of BIC	step 13
loss of power in LCM’s controller	step 17

NT6X54
RLCM (continued)

13

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 (FSP) of the RLCM. This protects the equipment against damage caused by static electricity.

WARNING
Card damage—transport
Take the following precautions to protect circuit cards from electrical and mechanical damage during transport:

When handling a circuit card not in an electrostatic discharge (ESD) protective container, stand on a conductive floor mat. Wear a wrist strap connected, through a 1-megohm resistor, to a suitably grounded object, such as a metal workbench or a DMS switch cabinet (Nortel [Northern Telecom] Corporate Standard 5028). Store and transport circuit cards in an ESD protective container.

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.

NT6X54
RLCM (continued)

> **WARNING**
> **Hot materials**
> Exercise care when handling the line card. The line feed resistor may be very hot.

Put on a wrist strap.

14 Open the line drawer by following these substeps:

a. Face the drawer shelf and grasp the lip at the bottom of the drawer.

b. Push up on the drawer latch with your thumb and pull the drawer out approximately 15.0 cm (about 6.0 in).

15 Remove the BIC to be replaced by following these substeps:

a. Open the locking levers on the BIC.

b. Grasping the open locking levers, remove the card from the line drawer in one steady motion. The card will unplug from its socket.

Note: Do not use a rocking motion to remove the card.

16 Replace the faulty card by following these substeps:

a. Remove the replacement card from the ESD container.

b. Open the locking levers on the card.

c. Position the card in its backplane socket. In one steady motion, push against the top and bottom of the card with your thumbs until the card plugs fully into the backplane socket, close and lock the locking levers.

Note: Do not use a rocking motion to insert the card.

d. Close the line drawer.

17 Replace the +5V fuse for the line drawer containing the faulty bus interface card.

18 Replace the +15V fuse for the line drawer containing the faulty bus interface card.

19 Replace the –48V fuse for the line drawer containing the faulty bus interface card.

NT6X54
RLCM (continued)

20 If you were directed to this procedure from the *Alarm clearing procedure ,* return now to the alarm clearing procedure that directed you here. Otherwise, continue with step 21.

At the MAP terminal

21 Determine which procedure to use to return the line subgroups to service.

If the card you are replacing is	Do
NT6X54AA	step 22
NT6X54DA	step 23

22 Return the line subgroups to service by typing

>RTS DRWR lsg
and pressing the Enter key.

where

lsg is one of two line subgroups (0 through 19) associated with the drawer

Note: Repeat this step for the other line subgroup associated with the line drawer.

If RTS	Do
passed	step 24
failed	step 26

23 Return the line subgroups to service by typing

>RTS DRWR
and pressing the Enter key.

If RTS	Do
passed	step 24
failed	step 26

24 Send any faulty cards for repair according to local procedure.

NT6X54
RLCM (end)

25 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 27.

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.

NT6X60
HIE

Application

Use this procedure to replace the following card in a host interface environment (HIE).

PEC	Suffixes	Name
NT6X60	AA, BA, CA, DA	North American Ring Generator

A summary of the card replacement procedure for the NT6X60 in a HIE is shown below. The procedure used to perform the task follows the flowchart.

Common procedures

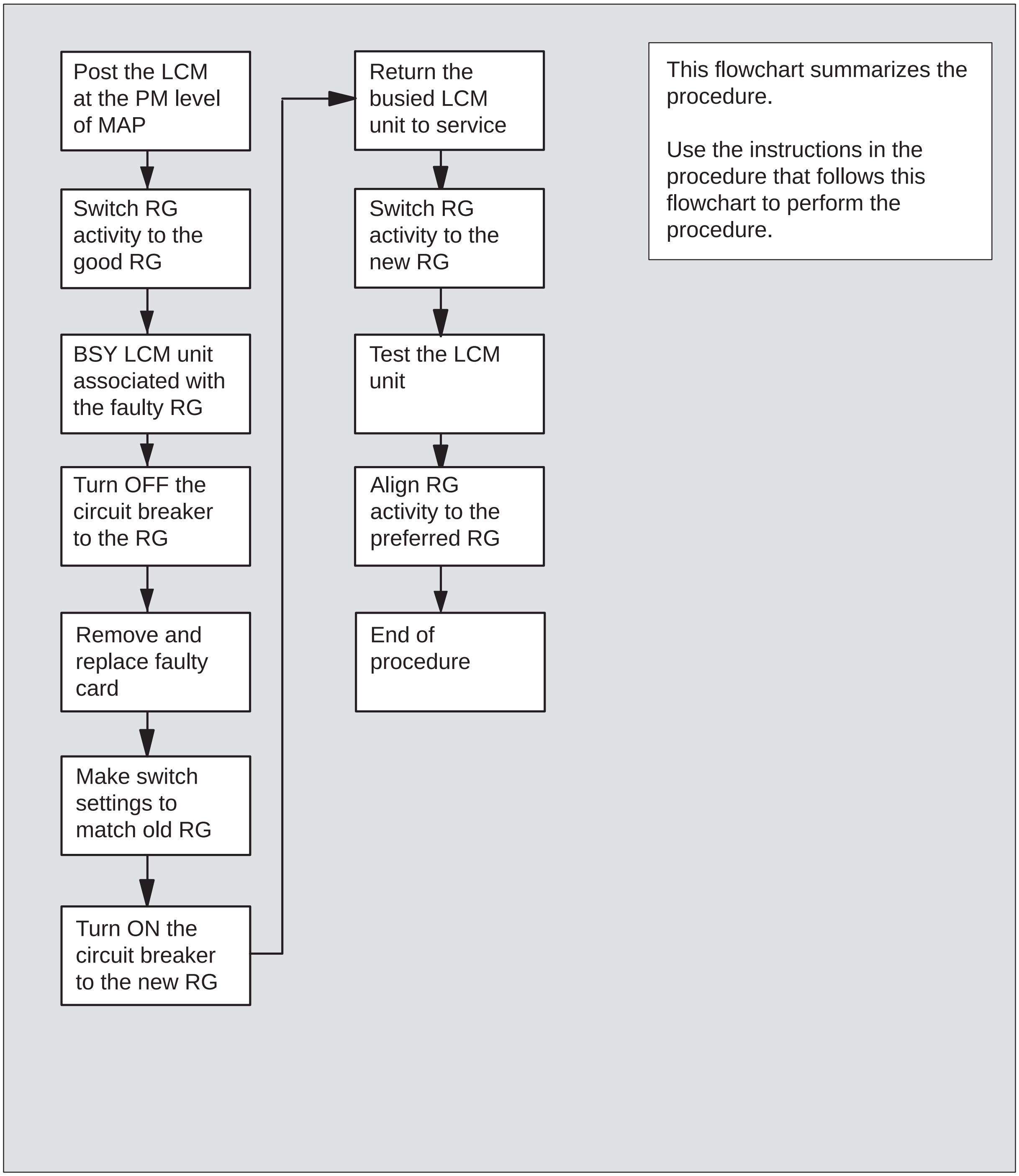
None

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X60
HIE (continued)

Summary of card replacement procedure for an NT6X60 card in an HIE



NT6X60
HIE (continued)

Replacing an NT6X60 card in an HIE

At your current location

1

> **CAUTION**
> **Loss of service**
> This procedure includes directions to manually busy one or more peripheral module (PM) units. Since manually busying a PM unit can cause service degradation, perform this procedure only if necessary to restore out-of-service components. Otherwise, carry out this procedure during periods of low traffic.

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 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC) including suffix, as the card that is to be removed.

3 If you were directed to this procedure from the *Alarm Clearing Procedures*, go to step 9. Otherwise, continue with step 4.

At the MAP terminal

4 Post the line concentrating module (LCM) with the HIE shelf containing the card to be replaced by typing

>MAPCI;MTC;PM;POST LCM site frame lcm
and pressing the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the number of the RLCM frame (00 to 511)
lcm	is the number of the LCM (00 to 199)

Example of a MAP response:

```
LCM REM1 00 0 ISTb Links  OOS: Cside 0 Pside 0
Unit 0: ISTb      /RG:0
Unit 1: InSv      /RG:0
                           11  11  11  11  11  RG: Pref 0 ISTb
Drwr:  01  23  45  67  89  01  23  45  67  89      Stby 1 InSv
       ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
```

5 Determine the line concentrating array (LCA) associated with the NT6X60 card to be replaced by using the following table.

LCM unit	RG card	HIE slot
LCA–0	RG–0	1, 2, 3, 4
LCA–1	RG–1	5, 6, 7, 8

6 Check the state of the PM units.

If the PM units are	Do
`OFFL or SysB`	step 8
One unit is `InSv or ISTb` the other unit is `ISTB or SysB`	step 7

7 Switch ringing generator activity to the good NT6X60 card by typing

>SWRG UNIT unit_no
and pressing the Enter key.

where

lcm_unit   is the LCM unit (0 or 1) aligned to the faulty RG

Note: If necessary repeat this step until both units of the LCM are on the good RG.

If the SWRG command	Do
passed	step 8
failed	step23

8 Busy the LCM unit associated with the faulty RG by typing

>BSY UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit   is the LCM unit (0 or 1) as seen in step 5

NT6X60
HIE (continued)

At the FSP

9 Turn OFF the circuit breaker for the ringing generator to be replaced by using the information in the following table:

Circuit breaker	Ringing Generator
CB2	RG–0
CB3	RG–1

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 LCM. This protects the equipment against damage caused by static electricity.

> **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.

Put on a wrist strap.

At the HIE

11 Remove the NT6X60 card as follows:

1. Locate the card to be removed on the appropriate shelf.
2. Open the locking levers on the card to be replaced and gently pull the card towards you until it clears the shelf.
3. Place the card you have removed in an electrostatic discharge (ESD) protective container.
4. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card you just removed.
5. Examine the switch settings (if any) of the card just removed. Ensure that the switch settings on the replacement card match those of the card being replaced.

NT6X60
HIE (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.

1. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure that the card is fully seated in the shelf.
2. Close the locking levers.

At the FSP

14 Turn ON the circuit breaker turned OFF in step 9.

15 Remove the wrist strap.

16 If you were directed to this procedure from the *Alarm Clearing Procedures*, return now to the alarm clearing procedure that directed you here. Otherwise, continue with step 17.

At the MAP terminal

17 Return the LCM unit to service by typing

>RTS UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit   is the number of the LCM unit (0 or 1) busied in step 8

If RTS	Do
passed	step 18
failed	step 23

NT6X60
HIE (continued)

18 Switch ringing generator activity to the new NT6X60 card by typing

>SWRG UNIT unit_no
and pressing the Enter key.

where

lcm_unit is the LCM unit (0 or 1)

Note: Repeat this step until both units of the LCM are aligned to the new RG.

If the SWRG command	Do
passed	step 19
failed	step23

19 Test the new ringing generator by typing

>TST UNIT lcm_unit_no
and pressing the Enter key.

where

lcm_unit_no is the number of the LCM unit busied in step 8

Example of a MAP response:

```
LCM REM1 00 0 Unit 0  InSvce Tests Initiated
LCM REM1 00 0 Unit 0  Tst Passed
```

If TST	Do
passed	step20
failed	step 23

NT6X60
HIE (end)

20 If required, align ringing generator activity to the preferred RG by typing

>SWRG UNIT unit_no
and pressing the Enter key.

where

lcm_unit is the LCM unit (0 or 1)

Note: Repeat this step until both units of the LCM are aligned to the preferred RG.

If the SWRG command	Do
passed	step 21
failed	step23

21 Send any faulty cards for repair according to local procedure.

22 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 24.

23 Obtain further assistance in replacing this card by contacting personnel responsible for a 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.

NT6X71
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X71	AA	Data line card

Common procedures

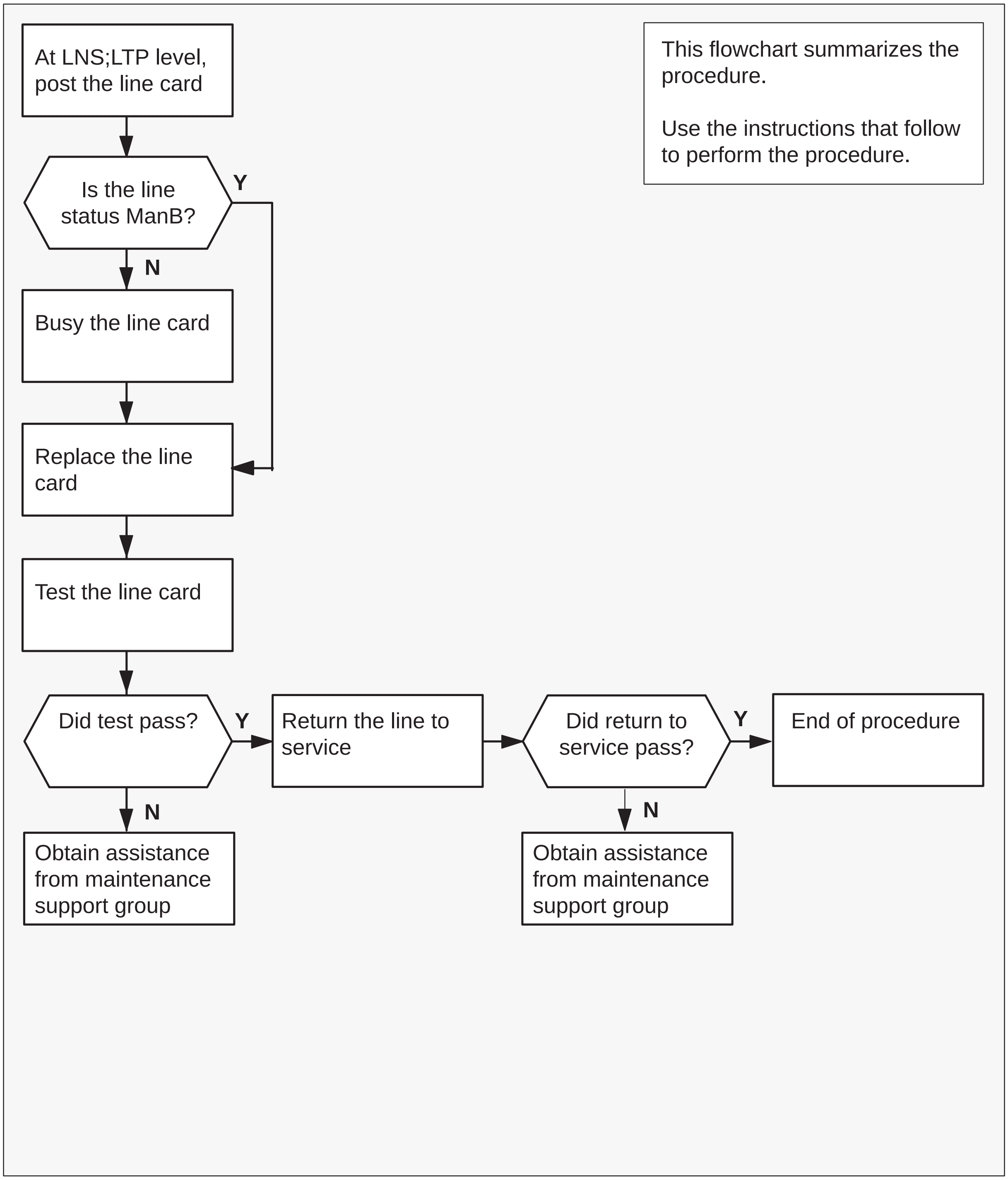
The procedure “Replacing a line card” is referenced in this procedure:

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X71
RLCM (continued)

Summary of card replacement procedure for an NT6X71 card in an RLCM



NT6X71
RLCM (continued)

Replacing an NT6X71 card in an RLCM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP terminal

2 Access the line test position (LTP) level of the MAP display and post the line associated with the card to be replaced by typing

>MAPCI;MTC;LNS;LTP;POST L site lcm lsg ckt
and pressing the Enter key.

where

site is the name of the site where the RLCM is located
lcm is the number of the RLCM with the faulty card
lsg is the number of the line subgroup with the faulty card
ckt is the number of the circuit associated with the faulty card

Example of a MAP display:

```
LCC PTY RNG .....LEN..........  DN   STA F S LTA TE RESULT
1FR      REM1 00 0 03 03     7213355 MB
```

3 Check the status of the posted line.

If the line status is	Do
ManB	step 5
not ManB	step 4

4 Busy the line by typing

>BSY
and pressing the Enter key.

5 Go to the procedure “Replacing a line card”. When you have completed the procedure, return here.

NT6X71
RLCM (end)

At the MAP

6 Test the line card just replaced by typing

>DIAG
and pressing the Enter key.

If the DIAG	Do
passed	step 7
failed	step 10

7 Return the line card to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 8
failed	step 10

8 Send any faulty cards for repair according to local procedure.

9 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 11.

10 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

11 You have successfully completed this procedure.

NT6X73
HIE

Application

Use this procedure to replace the following card in a host interface equipment (HIE) shelf.

PEC	Suffixes	Name
NT6X73	AA	Link Control Card (LCC)

Common procedures

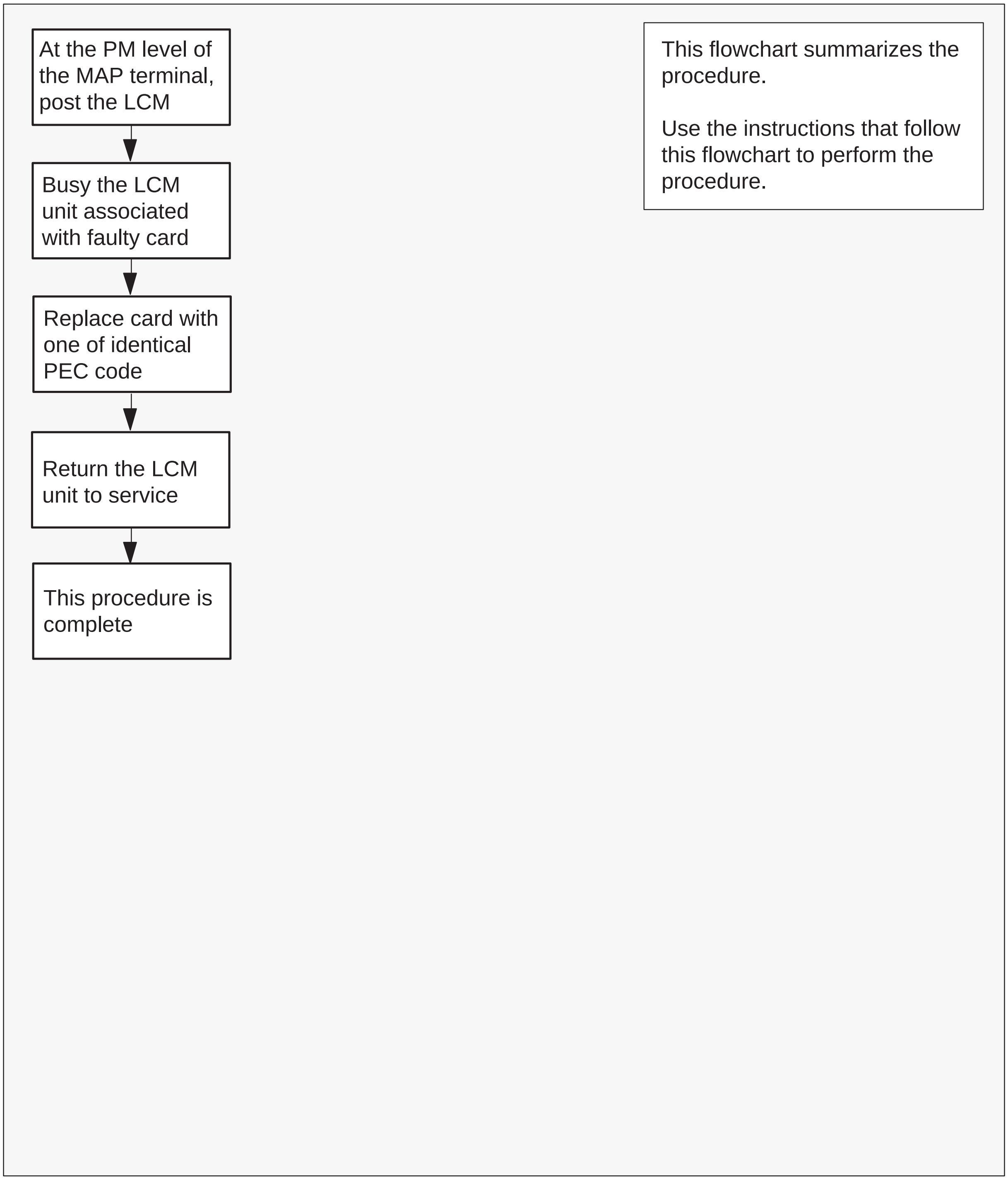
The procedure “Replacing a card” is referenced in this procedure:

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X73
HIE (continued)

Summary of card replacement procedure for an NT6X73 card in an HIE



NT6X73
HIE (continued)

Replacing an NT6X73 card in an HIE

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 equipment code (PEC), including suffix, as the card to be removed.

3 If you were directed to this procedure from another maintenance procedure, go to step 7. Otherwise, continue with step 4.

At the MAP terminal

4 Access the peripheral module (PM) level and post the line concentrating module (LCM) by typing

>MAPCI;MTC;PM;POST LCM site frame lcm
and pressing the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
frame	is the frame number of the RLCE (0 to 511)
lcm	is the number of the LCM

5 Use the following table to determine which LCM unit is associated with the faulty NT6X73.

LCM unit	LCC card	LCC slot
0	LCC0	17
1	LCC1	18

6

> **CAUTION**
> **Loss of service**
> This procedure contains directions to busy one or more peripheral modules (PM) in a frame. Since busying a PM affects subscriber service, replace the link control card (LCC) only during periods of low traffic

Busy the LCM unit associated with the faulty NT6X73 by typing

>BSY UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit is the LCM unit number (0 to 1)

At the HIE shelf

7 Replace the NT6X73 card using the procedure “Replacing a card”. When the card is replaced, return to this point.

8 If you were directed to this procedure from another maintenance procedure, return now to the alarm clearing procedure that directed you here; otherwise, continue with step 9.

At the MAP terminal

9 Return the busied unit to service by typing

>RTS UNIT lcm_unit
and pressing the Enter key.

where

lcm_unit is the RLCM unit busied in step 6

If RTS	Do
failed	step 12
passed	step 10

10 Send any faulty cards for repair according to local procedure.

11 Record the following items in office records:

- date the card was replaced

NT6X73
HIE (end)

- serial number of the card
- symptoms that prompted replacement of the card

Proceed to step 13.

12 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

13 You have successfully completed this procedure.

NT6X74
RMM

Application

Use this procedure to replace the following card in an RMM.

PEC	Suffixes	Name
NT6X74	AB	RMM Control Card

Common procedures

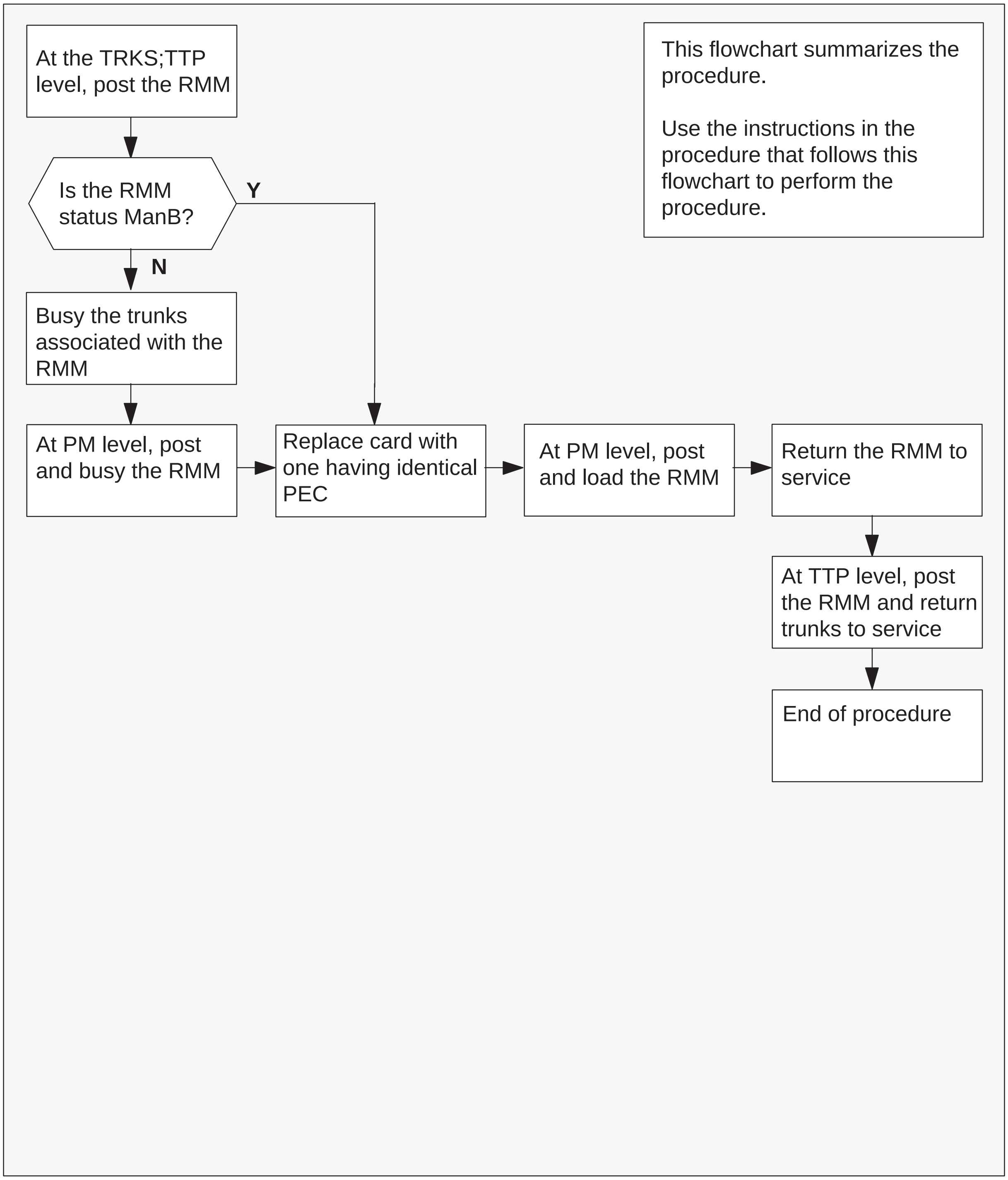
The procedure “Replacing a card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X74
RMM (continued)

Summary of card replacement procedures for an NT6X74 card in an RMM



Replacing an NT6X74 card in an RMM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

2 If you were directed to this procedure from another maintenance procedure, go to step 8; otherwise, continue with step 3.

At the MAP display

3 Access the TTP level of the MAP and post the RMM that contains the card to be replaced by typing

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  OTDA00
OK, CLLI POSTED

POST  20   DELQ       BUSY Q          DIG
TTP 6-006
CKT TYPE   PM NO.     COM LANG        STA S R DOT TE R
OG    MF RMM 0 0  OTWAON23DA00 2001   LO
                                      P_IDL
```

4 Check the status of the RMM.

If RMM status is	Do
MB, PMB, RMB	step 8
other	step 5

5 Busy the trunks that are associated with the card to be replaced by typing

>BSY ALL
and pressing the Enter key.

6 Go to the PM level of the MAP and post the RMM by typing

>PM;POST RMM rmm_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced

Example of a MAP response:

```
        SysB     ManB     Offl     CBsy     ISTb     InSv
PM         0        2        2        0        7       21
RMM        0        0        1        0        0        6

RMM     0    InSv
```

7 Busy the RMM by typing

>BSY
and pressing the Enter key.

At the RMM

8 Replace the NT6X74 card using the procedure “Replacing a card”. When the card is replaced, return to this point.

9 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed; otherwise, continue with step 10.

At the MAP display

10 Load the RMM by typing

>LOADPM
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced

If	Do
message “loadfile not found in directory” is received	step 11
load passed	step 28
load failed	step 33

11 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 12
IOC disk	step 17
SLM disk	step 22

12 Locate the tape that contains the PM load files.

13 Mount the tape on a magnetic tape drive.

14 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

15 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files.

16 Demount the tape drive by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files.

Go to step 27.

17 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

18 Access the disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

NT6X74
RMM (continued)

19 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 17.

20 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

21 Go to step 27.

22 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

23 Access the disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

24 List all disk volumes to user directory by typing

>LV CM
and pressing the enter key.

25 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 22.

26 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

NT6X74
RMM (continued)

27 Reload the RMM by typing

>LOADPM
and pressing the Enter key.

If	Do
load failed	step 33
load passed	step 28

28 Return the RMM unit to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 29
failed	step 33

29 Go to the TTP level of the MAP and post the RMM by typing

>TRKS;TTP;POST P RMM rmm_no
and pressing the Enter key.

where

rmm_no is the number of the RMM shelf in which the card is to be replaced

30 Return to service the circuits busied in step 5 by typing

>RTS ALL
and pressing the Enter key.

If RTS	Do
passed	step 31
failed	step 33

NT6X74
RMM (end)

31 Send any faulty cards for repair according to local procedure.

32 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 34.

33 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

34 You have successfully completed this procedure.

NT6X75
HIE

Application

Use this procedure to replace the following card in an HIE shelf.

PEC	Suffixes	Name
NT6X75	AA	RLCM ESA Tone and Clock Card

Common procedures

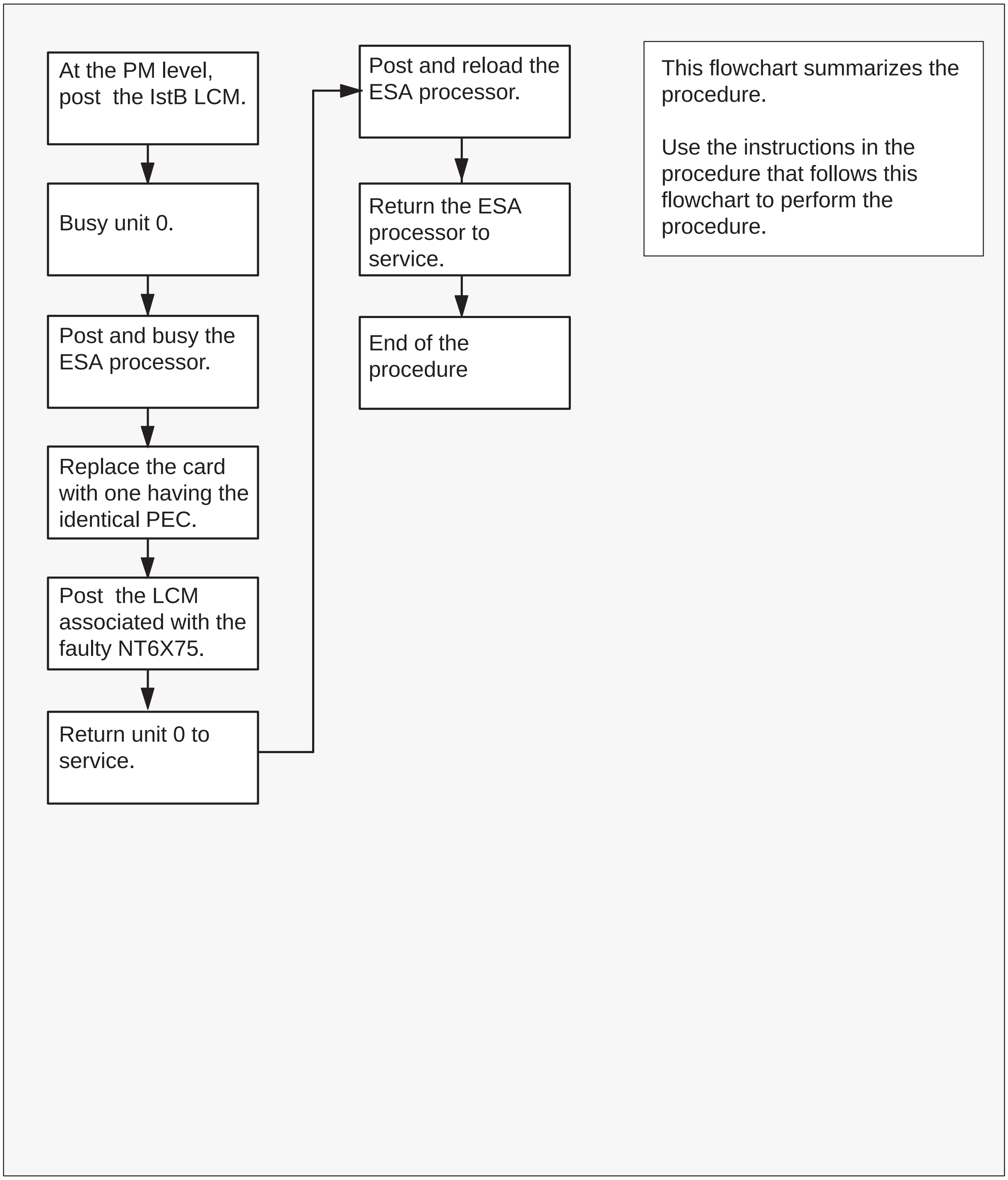
The procedure “Replacing a card” is referenced in this procedure:

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X75
HIE (continued)

Summary of card replacement procedure for an NT6X75 card in an HIE



Replacing an NT6X75 card in an HIE

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 that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

3 If you were directed to this procedure from another maintenance procedure, go to step 10; otherwise, continue with step 4.

At the MAP display

4 Post the LCM associated with the faulty NT6X75 card by typing

>MAPCI;MTC;PM;POST LCM site frame lcm
and pressing the Enter key.

where

site	is the name of the location of the RLCM
frame	is the number of the RLCE
lcm	is the number of the LCM in the RLCE

5 Translate the links to the P-side peripherals by typing

>TRNSL P
and pressing the Enter key.

6 Post the Emergency Stand-Alone (ESA) processor by typing

>POST ESA esa_no
and pressing the Enter key.

where

esa_no	is the number of the ESA processor identified in step 5.

NT6X75
HIE (continued)

7 Busy the ESA processor by typing

>BSY
and pressing the Enter key.

Example of a MAP response:

```
This action will take this PM out of service
Please confirm (“Yes” or “No”)
```

Respond by typing

>YES
and pressing the Enter key.

8 Post the LCM associated with the faulty NT6X75 card by typing

>POST LCM site frame lcm
and pressing the Enter key.

where

site	is the name of the location of the RLCM
frame	is the number of the RLCE
lcm	is the number of the LCM in the RLCE

9 Busy unit 0 by typing

>BSY UNIT 0
and pressing the Enter key.

At the RLCE frame

10 Replace the NT6X75 card using the procedure “Replacing a card”. When you have completed the procedure, return to step 11 of this procedure.

11 If you were directed to this procedure from the *Alarm Clearing Procedures*, return now to the alarm clearing procedure that directed you here. Otherwise, continue with step 12.

At the MAP terminal

12 Return to service unit 0 by typing

>RTS UNIT 0
and pressing the Enter key.

If RTS	Do
passed	step 13
failed	step 36

13 Post the ESA processor identified in step 5 by typing

>POST ESA esa_no
and pressing the Enter key.

where

esa_no is the number of the ESA processor

14 Load the ESA processor by typing

>LOADPM
and pressing the Enter key.

If	Do
message “loadfile not found in directory” is received	step 15
load passed	step 33
load failed	step 36

15 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 16
IOC disk	step 22
SLM disk	step 27

16 Locate the tape that contains the PM load files.

At the IOE frame

17 Mount the tape on a magnetic tape drive.

At the MAP display

18 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

NT6X75
HIE (continued)

19 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

20 Demount the tape by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

21 Go to step 32.

22 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

23 Access the disk utility level of the MAP by typing

>DSKUT
and pressing the Enter key.

24 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 22.

25 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

26 Go to step 32.

27 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

28 Access the disk utility level of the MAP by typing

>DISKUT
and pressing the Enter key.

29 List the disk volume names for both S00D and S01D by typing

>LV CM
and pressing the Enter key.

30 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 27.

31 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

32 Reload the ESA processor by typing

>LOADPM
and pressing the Enter key.

If	Do
load failed	step 36
load passed	step 33

33 Return the ESA processor to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 34
failed	step 36

34 Send any faulty cards for repair according to local procedure.

NT6X75
HIE (end)

35 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 37.

36 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

37 You have successfully completed this procedure.

NT6X99
RLCM

Application

Use this procedure to replace the following card in an RLCM.

PEC	Suffixes	Name
NT6X99	AA	Datapath Bit Error Rate Tester Line Card

Common procedures

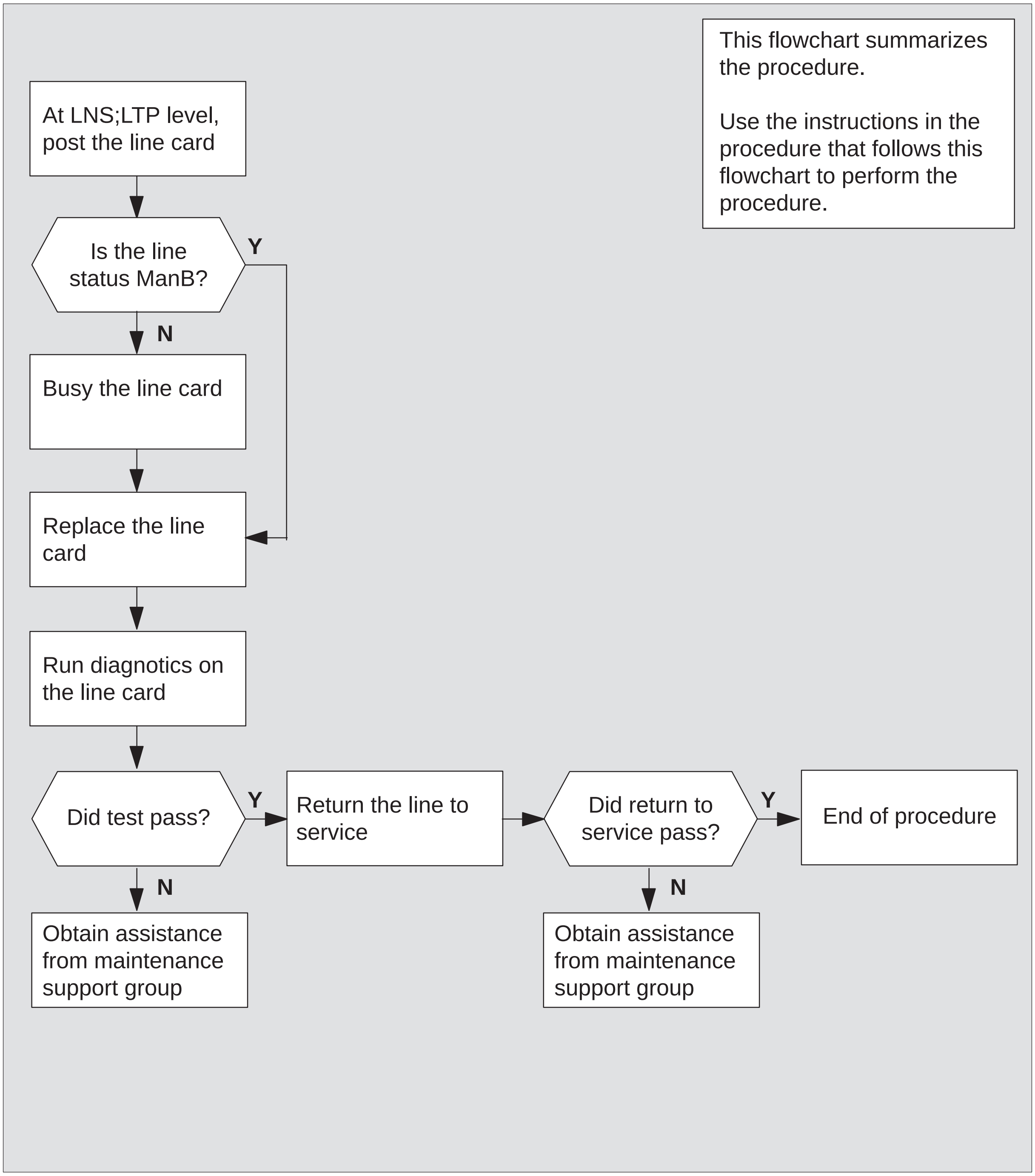
The procedure “Replacing a line card” is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X99
RLCM (continued)

Summary of card replacement procedure for an NT6X99 card in an RLCM



NT6X99
RLCM (continued)

Replacing an NT6X99 card in an RLCM

At your current location

1 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

2 Access the LTP level of the MAP and post the line associated with the card to be replaced by typing

>MAPCI;MTC;LNS;LTP;POST L site lcm lsg ckt
and pressing the Enter key.

where

site	is the name of the site where the RLCM is located
lcm	is the number of the RLCM with the faulty card
lsg	is the number of the line subgroup with the faulty card
ckt	is the number of the circuit associated with the faulty card

Example of a MAP display:

```
LCC PTY RNG .....LEN..........DN   STA F S LTA TE RESULT
1FR         REM1 00 0 03 03  IBERT MB
```

3 Check the status of the posted line.

If the line status is	Do
manual busy (MB)	step 5
not MB	step 4

4 Busy the line by typing

>BSY
and pressing the Enter key.

5 Go to the procedure “Replacing a line card”. When you have completed the procedure, return to this point.

NT6X99
RLCM (end)

At the MAP display

6 Test the line card just replaced by typing

>DIAG
and pressing the Enter key.

If the DIAG	Do
passed	step 7
failed	step 10

7 Return the line card to service by typing

>RTS
and pressing the Enter key.

If the RTS	Do
passed	step 8
failed	step 10

8 Send any faulty cards for repair according to local procedure.

9 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 11.

10 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

11 You have successfully completed this procedure.

NTEX17
RLCM

Application

Use this procedure to replace the following card in an RLCM line drawer.

PEC	Suffixes	Name
NTEX17	AA	xDSL line card
NTEX17	BA	xDSL line card
NTEX17	CA	xDSL line card
NTEX17	DA	xDSL line card

Common procedures

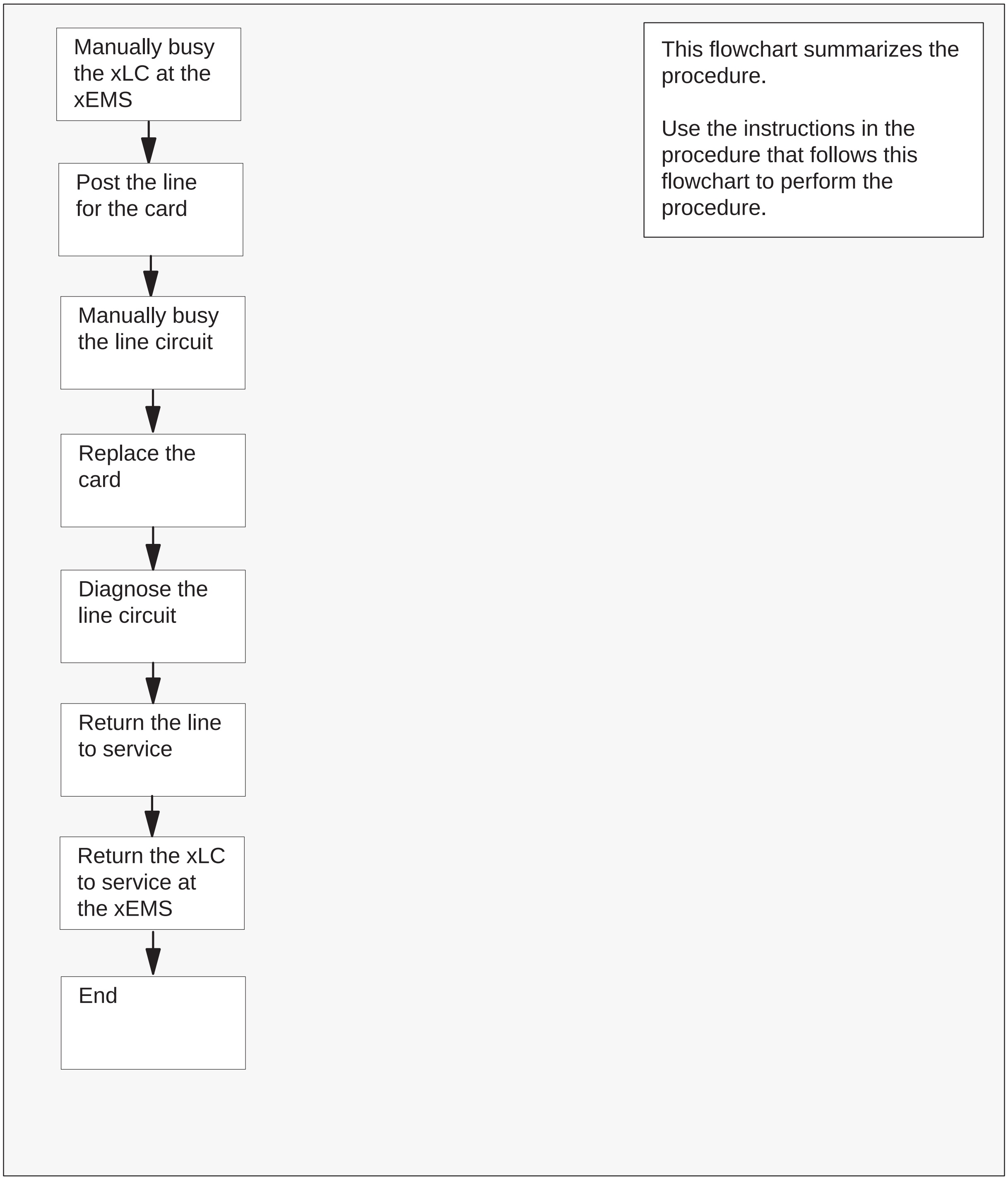
None

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.

NTEX17
RLCM (continued)

Summary of replacing an NTEX17 in an RLCM



NTEX17
RLCM (continued)

Replacing an NTEX17 in an RLCM

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 Obtain a replacement card. Make sure that the replacement card and the card that you remove have the same product engineering code (PEC) and PEC suffix.

At the xEMS workstation

3 Go to the submap of the LCM line drawer with the NTEX17 card that you will replace.

4 Place the cursor on the XLC you want to busy and use the mouse to select

Maintenance : XLC –> MB
and press the Enter key.

At the MAP terminal

5 To access the LTP level of the MAP display, type

>MAPCI;MTC;LNS;LTP
and press the Enter key.

Example of a MAP display:

```
POST        DELQ            BUSYQ         PREFIX

LCC PTY RNG .....LEN..........     DN    STA F S LTA  TE  RESULT
```

Note: If you worked at the LTP level of the MAP display, a posted line can be present. A posted line does not interfere with this maintenance procedure.

6 To post the line for the card to be replaced, type

>POST L site frame_no unit_no drawer_no slot_no
and press the Enter key.

where

site	is the PM location (alphanumeric)
frame_no	is the frame number (0 to 511)
unit_no	is the PM unit number (0 or 1)
drawer_no	is the line drawer number (0 to 19)
ckt_no	is the card slot number (0 to 31)

Example of a MAP display:

```
LCC PTY RNG .....LEN..........     DN    STA F S LTA  TE  RESULT
1FR         REM1 01 0 01 01     621 1134 IDL
```

NTEX17
RLCM (continued)

7 Determine the state of the posted line.

If the state of the line	Do
is CPB, CPD	step 8
is CUT, HAZ, IDL, LO, PLO, SB	step 9
is MB	step 10
is NEQ	To determine why the component is offline or not equipped, consult operating company personnel. Continue as directed by operating company personnel.
is DEL, DMB, INB, LMB	step 19

8 Wait until the line state changes. Go to step 7.

9 To manually busy the line circuit, type

>BSY
and press the Enter key.

Example of a MAP display:

```
LCC PTY RNG .....LEN..........     DN    STA F S LTA  TE  RESULT
1FR         HOST 01 0 01 01     621 1134 MB
```

Note: Observe that the state that appears under the STA header changed to MB.

If BSY command	Do
passed	step 10
failed	step 19

At the MAP terminal

10 To display the cabinet location of the faulty line card, type

>CKTLOC
and press the Enter key.

Example of a MAP display:

```
Site Flr RPos  Bay_id   Shf  Description    Slot     EqPEC
REM1  01  B04  LCE  01   04  LCM  01 0      01:00    EX17DA

GRD START   2DB LOSS   BAL NETWORK   MAN OVR SET
  NO          NO       NON LOADED        NO
```

Note: In the example MAP display, the line card is an NTEX17DA and the location of the card is

Site	in the remote site
Flr	on the 1st floor
RPos	row B is the location of the line equipment bay 04
Bay_id	in line concentrating equipment, bay 01
Shf	in shelf 04
Description	in hardware device LCM, bay 01
Slot	in line drawer 01, slot 00

NTEX17
RLCM (continued)

At the shelf

11

WARNING
Static electricity damage
Wear a wrist strap that connects to a wrist-strap grounding point to handle circuit cards. The wrist-strap grounding point is on a frame supervisory panel (FSP) or a modular supervisory panel (MSP). The wrist strap protects the cards against static electricity damage.

WARNING
Risk of 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 card into its slot.

WARNING
Risk of equipment damage
Proceed only if a step in a maintenance procedure directs you here. If you perform this procedure without permission, equipment damage can occur.

DANGER
Risk of electrocution
Proceed only if a step in a maintenance procedure directs you here. If you perform this procedure without permission, personal injury can occur.

Put on a wriststrap.

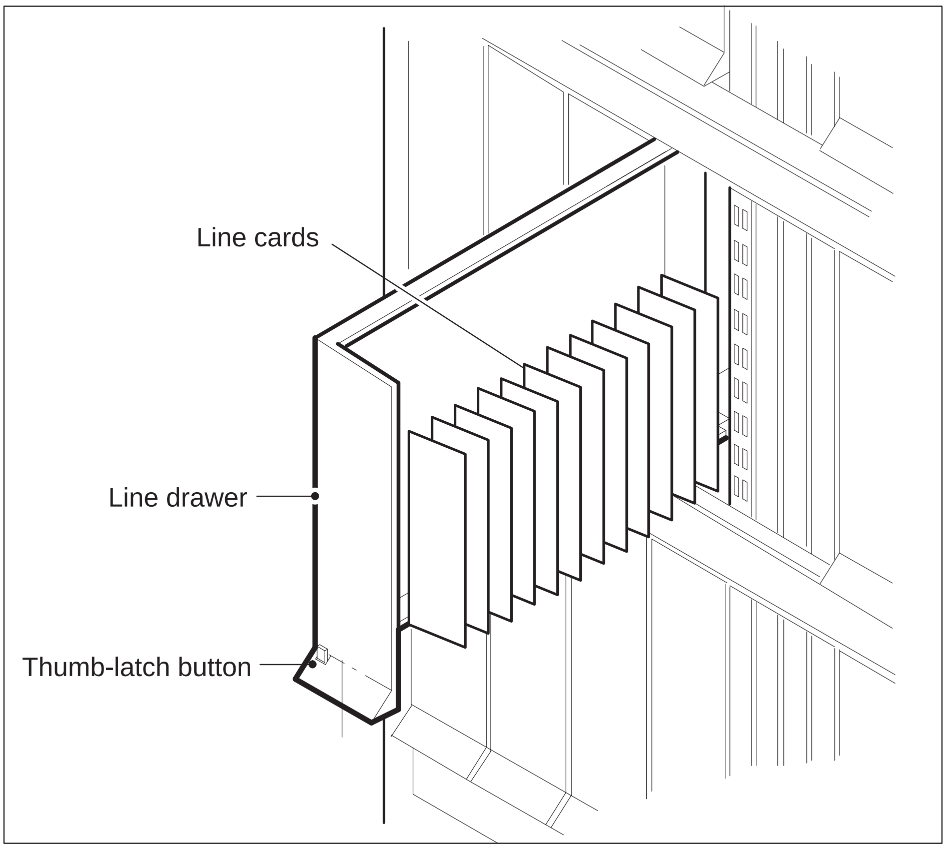
Note 1: A card shroud is required to insert or remove an NTEX17 card in line drawers. This is a 6-inch (152 mm) card, and requires the card shroud with apparatus code QTH58A and common product code A0313317.

NTEX17
RLCM (continued)

Note 2: A card removal tool is required to remove the NTEX17 card from line drawers. The apparatus code for the grip tool is QTH57A, and the common product code is A0298292. You can also use the large grip tool ITA9953.

12 Use the information you obtained in step 6 to locate the physical location of the line card.

13 Prepare to remove the faulty card identified in step 6 by opening the line drawer and following these substeps.



a. Face the drawer shelf and grasp the handle at the bottom of the drawer with your right hand.

b. Push up on the drawer latch with your thumb and pull the drawer out until fully withdrawn. It is fully withdrawn when the drawer stop, at the top, prevents further travel.

c. Maintain a slight pull on the handle and lift the faceplate of the drawer approximately 2.5 cm (1.0 in.).

NTEX17
RLCM (continued)

d. While holding the drawer in this position, push the bottom of the drawer nearest the shelf with your left hand to a position about 1.0 cm (0.5 in) to the right.

e. Hold the drawer in this position with your left hand and lower the faceplate of the drawer by releasing the grip of your right hand.

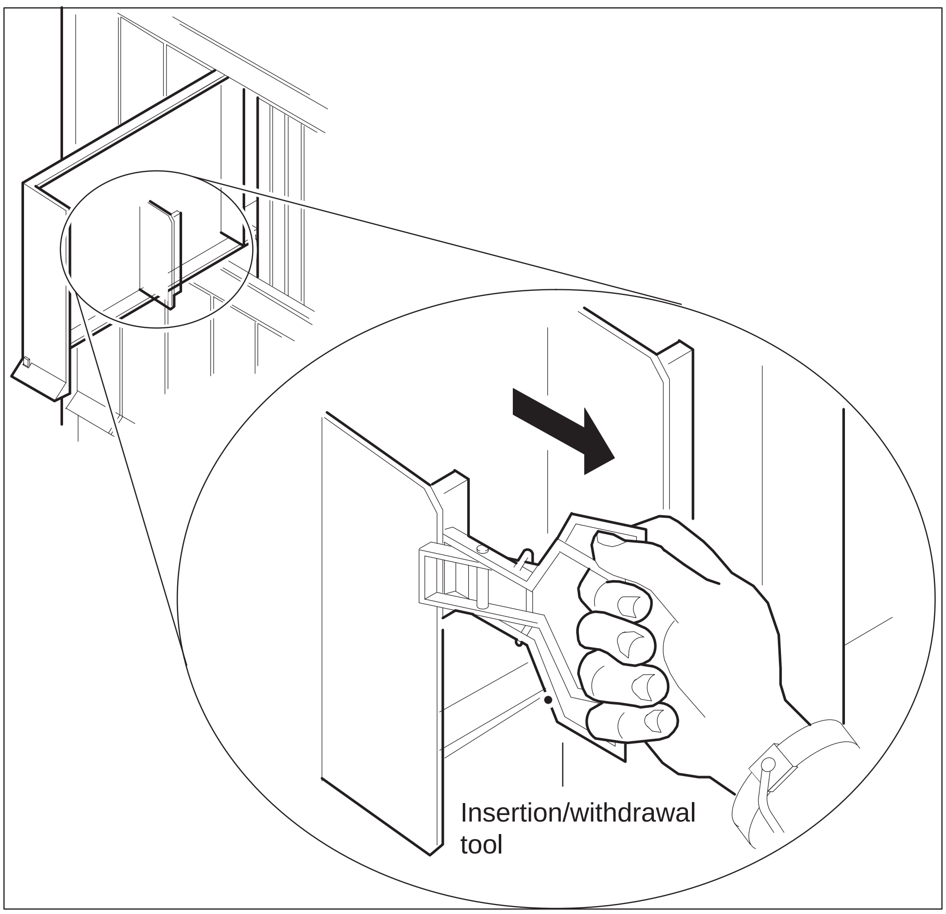
f. Ensure a card shroud and line card extractor are available.

NTEX17
RLCM (continued)

14

DANGER
Risk of personal injury
Make sure you handle the line card carefully. The line feed resistor can be very hot. To avoid injury, use the insertion/withdrawal tool to remove the card as shown in the figure that follows.

Remove the line card to be replaced by using the following substeps:



NTEX17
RLCM (continued)

a. Slide a card shroud over the card to be removed and an adjacent card. If there is not an adjacent card on either side, do not use the card shroud.

b. Grasp the edge of the card with a line card extractor at a point midway between the top and bottom edges. Hold the extractor in your right hand.

c. Squeeze the handles of the extractor together to grasp the card tightly.

d. Hold the front cover of the line drawer to steady it using your left hand.

e. Pull the extractor away from the drawer, and the card will become unplugged from its socket on the drawer backplane.

f. Continue pulling the card with the extractor until the card is clear of the shroud.

g. Insert the card removed into the ESD container and store using local procedures.

15 Replace the faulty card using the following substeps:

a. Remove the replacement card from the ESD container.

b. Slide the card in the shroud guide slots toward the drawer backplane.

c. Hold the front cover of the line drawer with your left hand to steady it.

d. Grasp the top and bottom edges of the card with the fingers of your right hand.

e. Push the card toward the backplane until it plugs fully into the backplane socket.

16 Close the line drawer.

NTEX17
RLCM (end)

At the MAP terminal

17 To perform a diagnostic test on the line, type

>DIAG
and press the Enter key.

Example of a MAP response:

```
ECOME004AH ***+LINE100 DEC17 10:04:26 0200 PASS LN_DIAG
        LEN HOST 01 0 11 02      NO DIRN
        DIAGNOSTIC RESULT   Card Diagnostic OK
        ACTION REQUIRED  None
        CARD TYPE  EX17DA
```

If the DIAG command	Do
passed	step 18
failed	step 19

18 To return the line to service, type

>RTS
and press the Enter key.

If RTS command	Do
passed	step 20
failed	step 19

19 Obtain further assistance in replacing this card by contacting personnel responsible for a higher level of support.

At the xEMS workstation

20 At the submap of the LCM line drawer with the NTEX17 card that you replaced.

21 Place the cursor on the the XLC card you want to return the card to service and use the mouse to select

Maintenance : XLC –> IDL
and press the Enter key.

22 The procedure is complete.

NTEX54
RLCM

Application

Use this procedure to replace the following cards in an RLCM line drawer.

PEC	Suffixes	Name
NTEX54	AA	Data enhanced bus interface card (DBIC)
NTEX54	AB	Data enhanced bus interface card (DBIC)
NTEX54	BA	Data enhanced bus interface card (DBIC)
NTEX54	CA	Data enhanced bus interface card (DBIC)

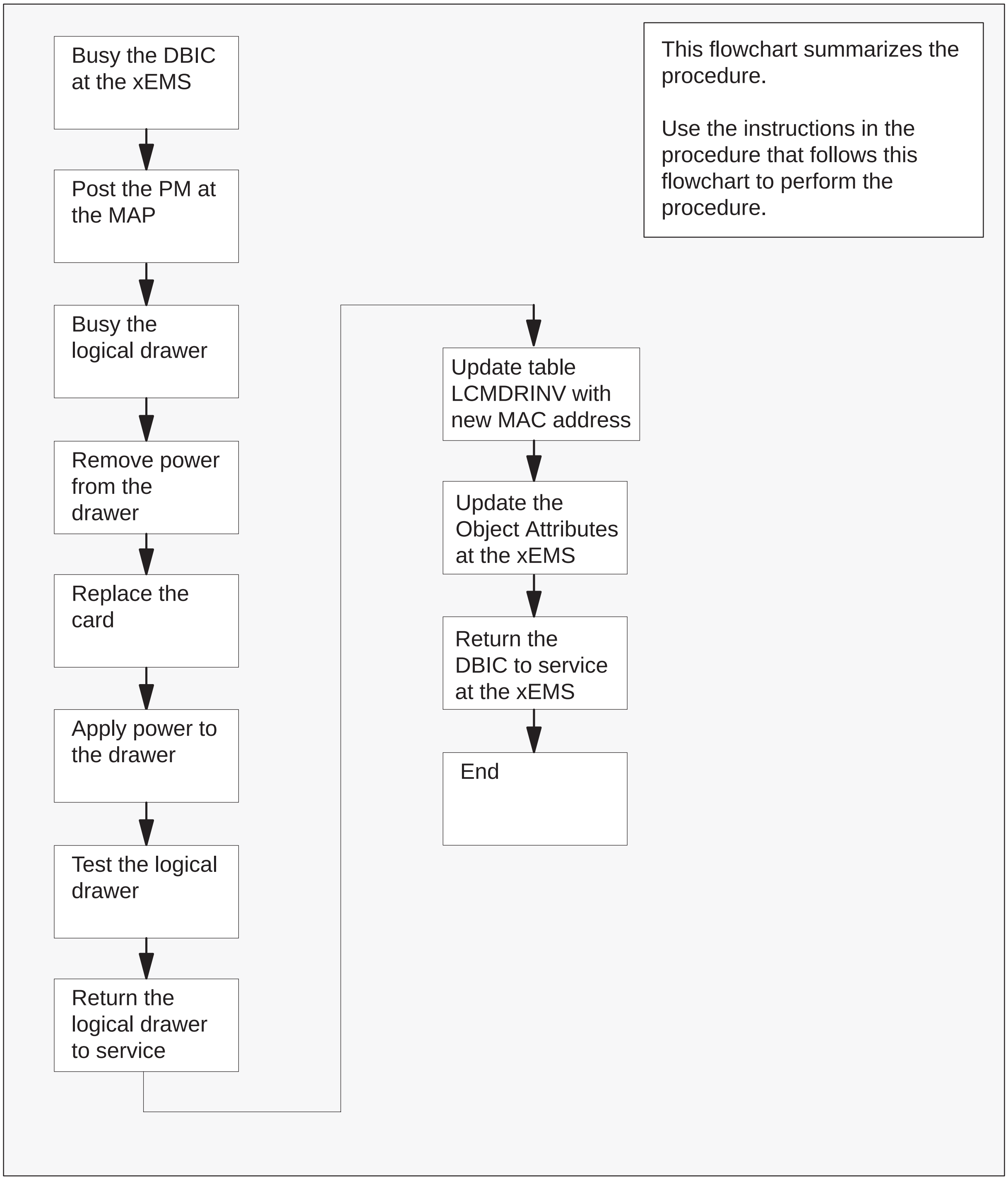
Common procedures

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.

Summary of replacing an NTEX54 in an RLCM



NTEX54
RLCM (continued)

Replacing an NTEX54 in an RLCM

At your current location

1

> **CAUTION**
> **Loss of service**
> This procedure directs you to manually busy a line drawer. Removal of a line drawer from service can cause the system to drop calls in progress. Perform this procedure only if you need to restore out-of-service components. Unless it is urgent, perform this procedure during periods of low traffic.

Obtain a replacement card. Make sure that the replacement card and the card that you remove have the same product engineering code (PEC) and PEC suffix.

2

> **CAUTION**
> **Transport network must know new MAC address**
> Work with the network administrator during this procedure. The transport network must know the MAC adress of the new DBIC before the DBIC can support 1MMS.

Write down the 12-digit number stamped on the new NTEX54 card. This number is the media access control (MAC) address. You will use the MAC address later in this procedure.

At the xEMS workstation

3 Go to the submap of the LCM line drawer with the NTEX54 card that you will replace.

4 Place the cursor on the DBIC you want to busy and use the mouse to select

Maintenance –> DBIC –> ManB

from the pop-up menu.

At the MAP terminal

5 To access the peripheral module (PM) level of the MAP (maintenance and administration position) display and post the LCM, type

>MAPCI;MTC;PM;POST LCM site frame_no lcm_no
and press the Enter key.

where

site	is the PM location (alphanumeric)
frame_no	is the equipment frame number (00 to 511)
lcm_no	is the number of the LCM (0 or 1)

Example of a MAP display:

```
LCM  REM1 01 1   ISTb   Links OOS: Cside  0 Pside  0
Unit0: ISTb                   /RG: 0
Unit1: ISTb  Mtce             /RG: 1  Ring gen Test
                           11  11  11  11  11  RG: Pref 1 InSv
Drwr:  01  23  45  67  89  01  23  45  67  89      Stby 0 InSv
       ..  ..  ..  ..  MM  ..  ..  ..  ..  ..
```

6 Record the numbers of the logical drawers for the NTEX54.

Note: Logical drawers configure in pairs for the physical drawer. The NTEX54 services the physical drawer. Both logical drawers must be manually busy to perform this card replacement procedure.

7 Check the state of the affected logical drawers.

If the state for	Do
one or both logical drawers is `I,S,` or `.` (dot)	step 8
both logical drawers is `M`	step 11
one or both logical drawers is `0` or `–`	Determine why the drawer is offline. If necessary, contact the next level of support.

NTEX54
RLCM (continued)

8 To manually busy the logical drawer, type

>BSY DRWR drwr_no
and press the Enter key.

where

drwr_no	is the logical drawer number (0 to 23)

Example of a MAP response:

```
LCM REM1 01 1  Drwr 0 will be taken out of service
Please confirm (”YES”, ”Y”, ”NO”, or ”N”):
```

9 To confirm the command, type

>YES
and press the Enter key.

Example of a MAP response:

```
LCM REM1 01 1  Drwr 0 Bsy Passed
```

If	Do
you must busy the other logical drawer of the pair	step 10
both logical drawers are now M	step 11

10 Busy the other logical drawer of the pair.

>BSY DRWR drwr_no
and press the Enter key.

where

drwr_no	is the logical drawer number (0 to 23)

Example of a MAP response:

```
LCM REM1 01 1  Drwr 0 Bsy Passed
```

NTEX54
RLCM (continued)

At the shelf

11

WARNING
Static electricity damage
Wear a wrist strap that connects to the wrist-strap grounding point to handle circuit cards. The wrist-strap grounding point is on a frame supervisory panel (FSP) or a modular supervisory panel (MSP). The wrist strap protects the cards against static electricity damage.

WARNING
Potential equipment damage
Note the fuses that you remove from the fuse panel. If you do not insert fuses in the correct location on the fuse panel, equipment damage occurs.

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 card into its slot.

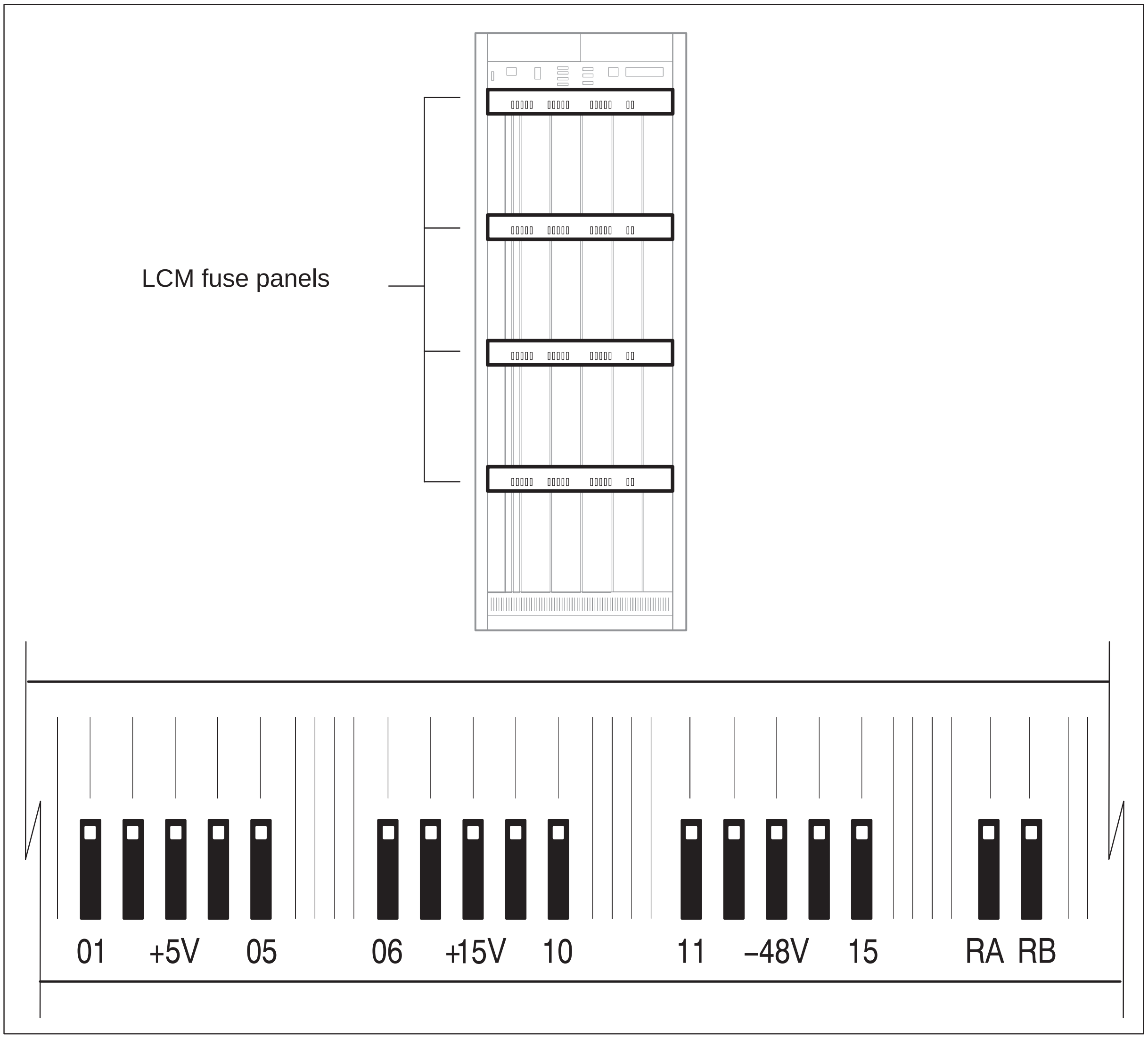
Remove fuses for the line drawer containing the faulty DBIC. Perform the following steps. Refer to the figure that follows to identify the correct fuses.

Note: Fuse markings do not always identify voltage. Make sure that you note the fuses and the location of the fuses in the fuse panel.

a. Remove the –48V fuse for the line drawer that contains the faulty DBIC.

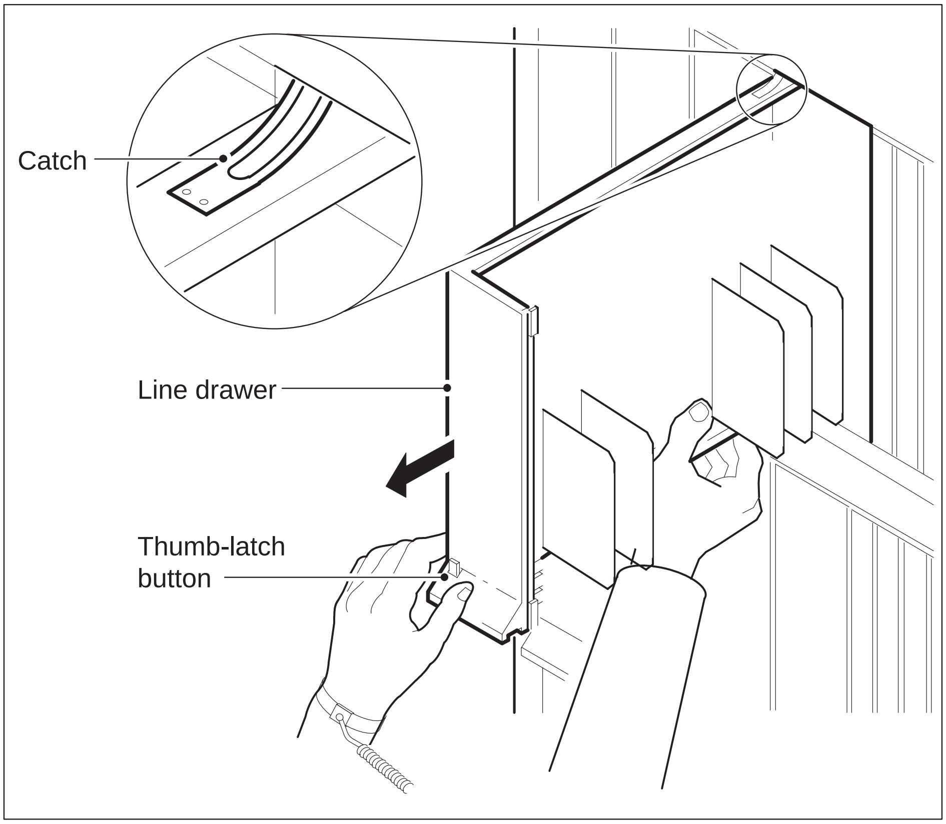
b. Remove the +15V fuse for the line drawer that contains the faulty DBIC.

c. Remove the +5V fuse for the line drawer that contains the faulty DBIC.



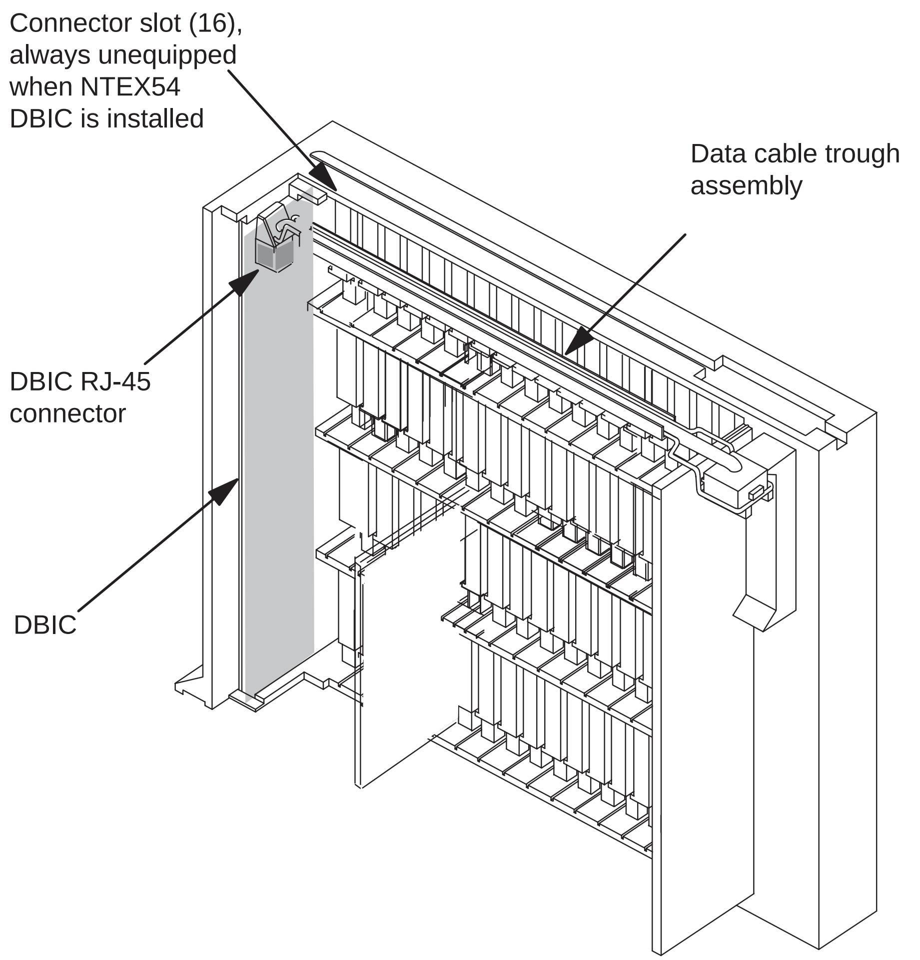
NTEX54
RLCM (continued)

12 Identify the drawer. Press the small thumb-latch button on the lower left edge of the drawer. Pull the drawer out. To secure the drawer in a steady horizontal position, tip the drawer until the catch rests on the line drawer track.



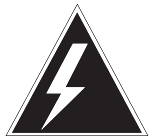
NTEX54
RLCM (continued)

13 Disconnect the data cable from the RJ-45 connector on the DBIC. The RJ-45 connector is located at slot position 16 of the odd LSG (connector slot). Refer to the following figure.



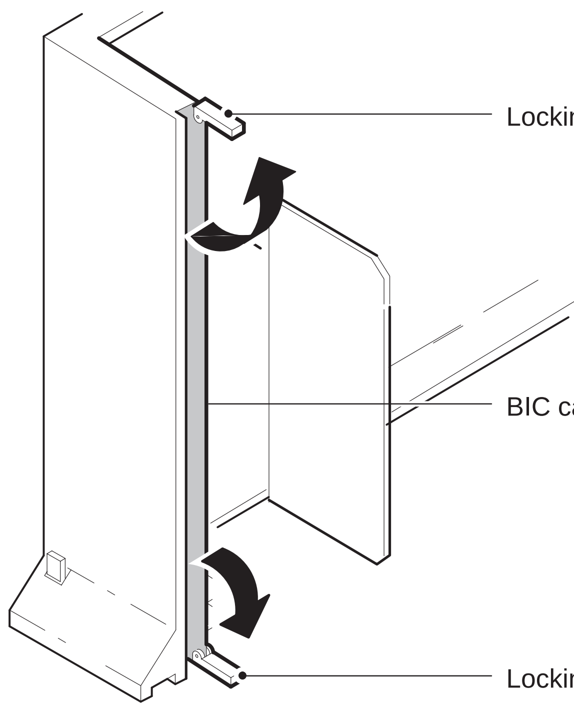
NTEX54
RLCM (continued)

14



WARNING
Do not hold the card by the levers only
If you hold a card by the locking levers only, the levers can break. Pull the card half way out of the slot. Carefully grasp the card from below for more support. Continue to remove the card from the drawer. Make sure that you do not touch any wires or internal parts on the card.

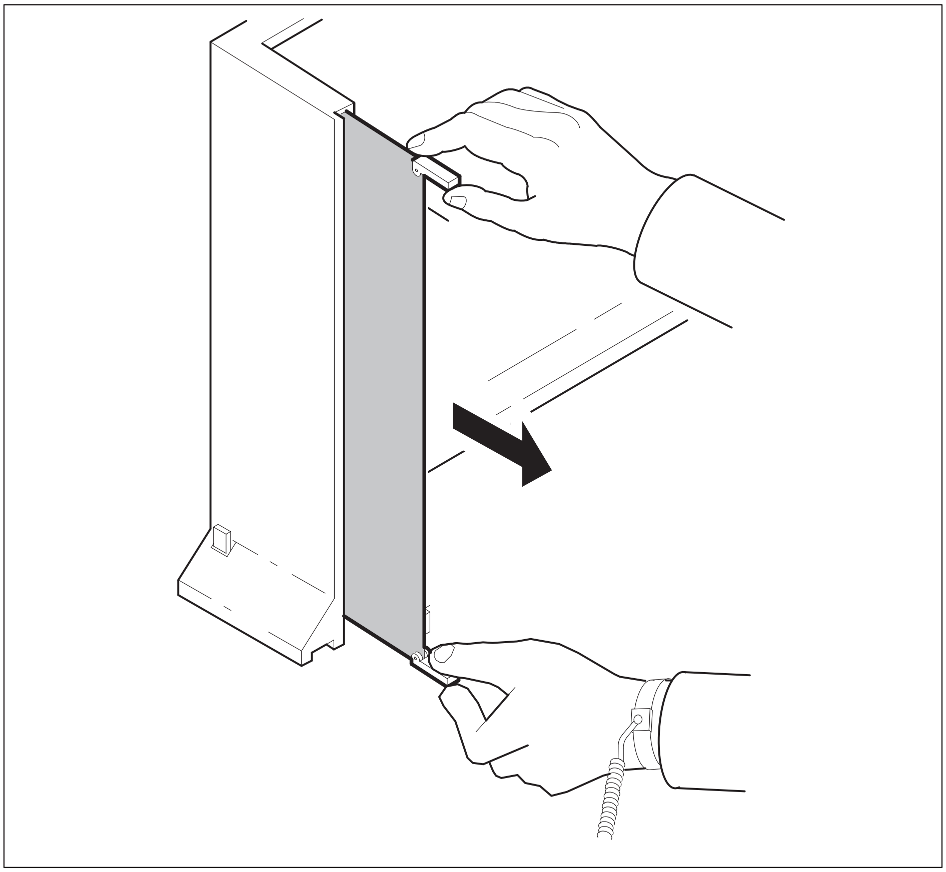
Open the locking levers on the face of the card.



NTEX54
RLCM (continued)

15 Grasp the locking levers. Carefully pull the card toward you until the card clears the drawer.

Note: Do not use a rocking motion to remove the card.



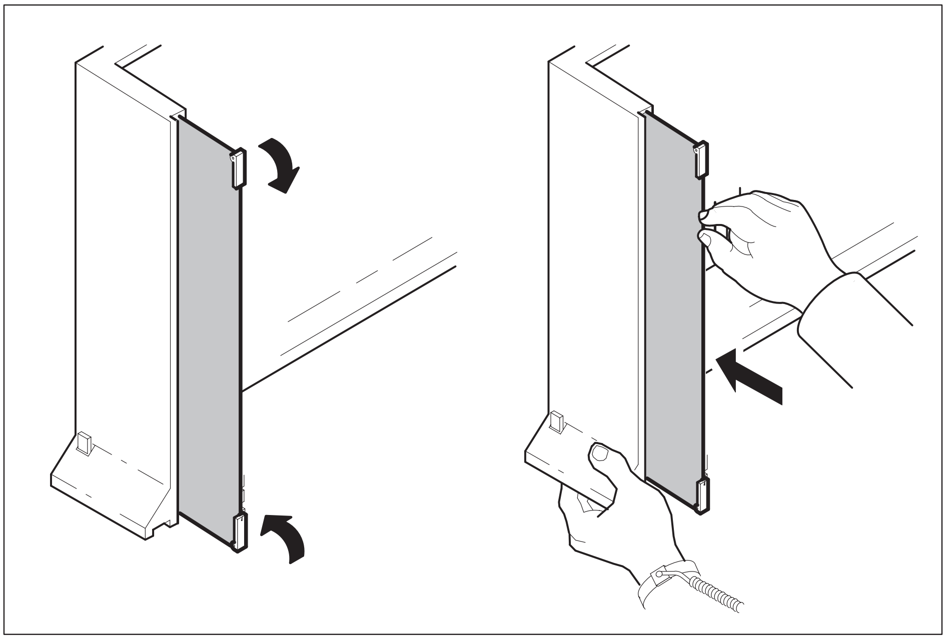
16 Place the card that you removed in an electrostatic discharge (ESD) protective container.

17 Make sure that the replacement card and the card that you remove have the same PEC and PEC suffix.

18 Close the locking levers on the replacement card. Align the card with the pin slots in the drawer. Carefully slide the card into the drawer.

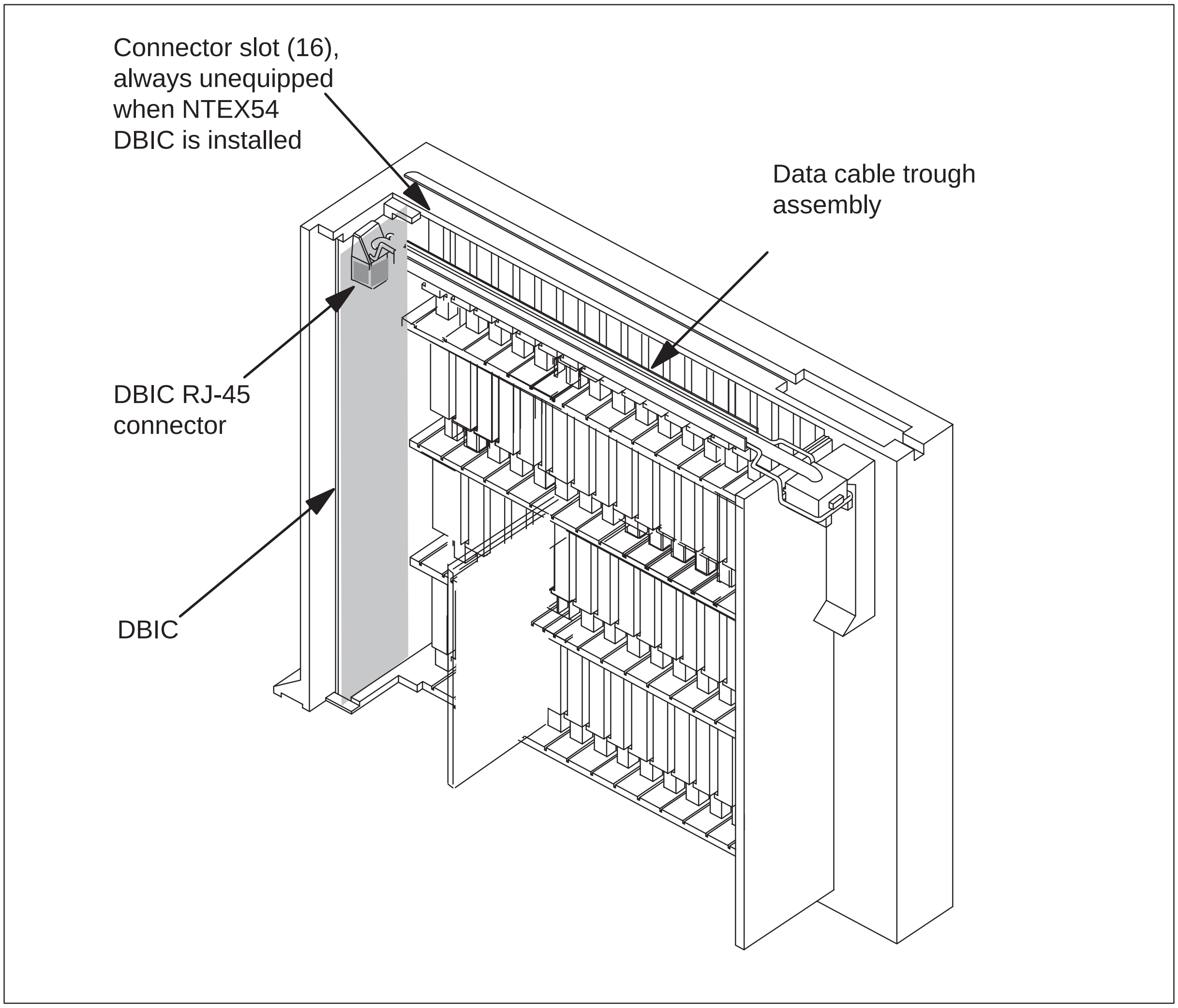
19 Support the drawer with your left hand. Use your right hand to push on the upper and lower edges of the card. Make sure that the card sits completely in the drawer.

Note: Do not use a rocking motion to insert the card.



NTEX54
RLCM (continued)

20 Connect the data cable to the RJ-45 connector that you disconnected in step 13. Refer to the following figure.



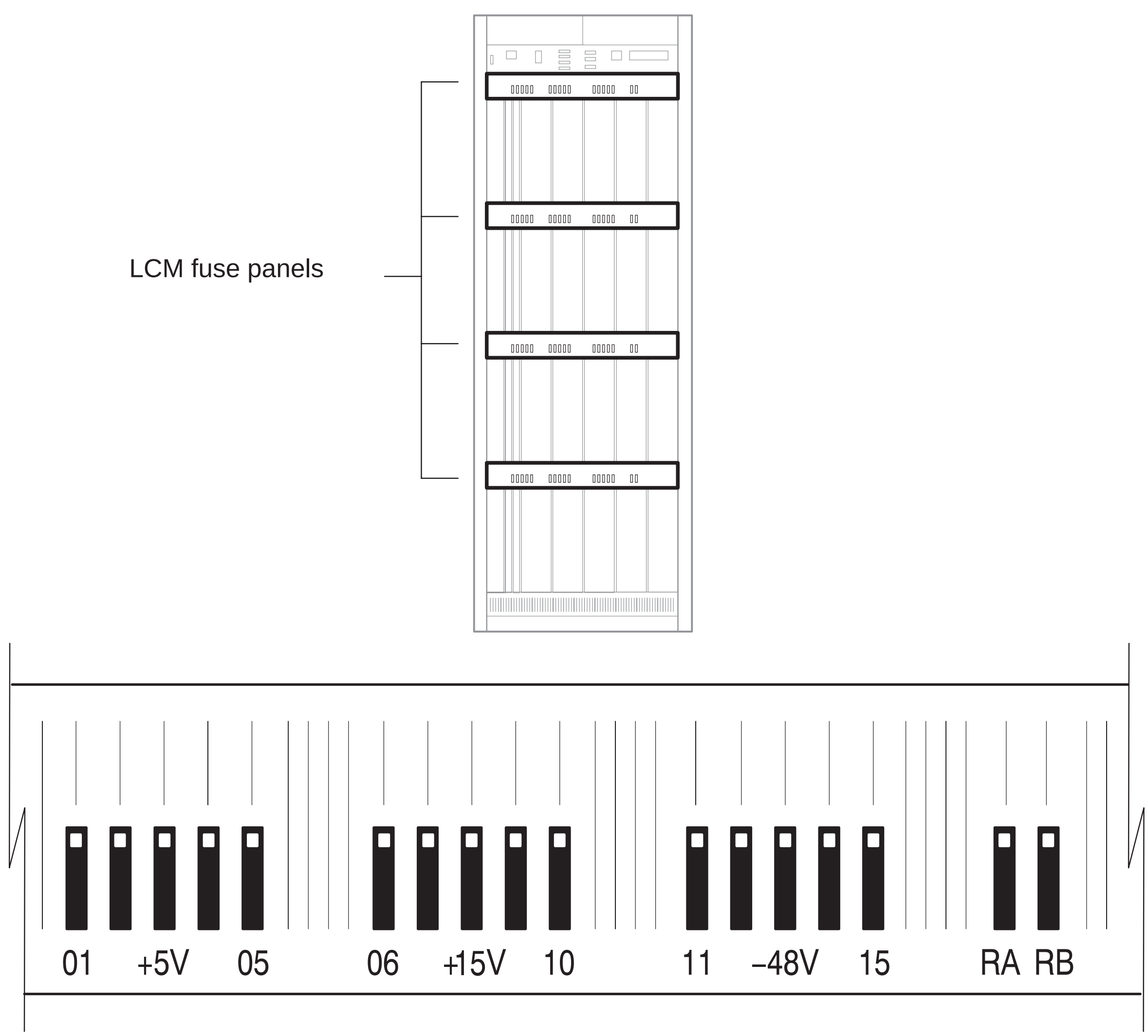
21 Close the line drawer.

NTEX54
RLCM (continued)

22

> **WARNING**
> **Potential equipment damage**
> Make sure you insert the fuses in the correct location on the fuse panel to prevent equipment damage.

Insert the fuses that you removed in step 11. Refer to the following figure.



Note: Fuses are coded for position. The colored square on the face of the fuse identifies the top edge.

a. Insert the +5V fuse.

b. Insert the +15V fuse.

c. Insert the –48V fuse.

At the MAP terminal

23 A maintenance flag (Mtce) can appear. This flag indicates that system-initiated maintenance tasks are in progress. To stop the system-initiated maintenance tasks, type

>ABTK
and press the Enter key.

24 To return the logical drawer to service, type

>RTS DRWR drwr_no
and press the Enter key.

where

drwr_no   is the logical drawer number (0 to 19)

Example of a MAP response:

```
OSvce Tests Initiated
LCM REM1 00 0  Drwr 0 Tst Passed
LCM REM1 00 0  Drwr 0 Rts Passed
```

If the RTS command	Do
passed, and you must return the other logical drawer to service	step 25
passed, and the other logical drawer is in service	step 26
failed	step 39

25 Repeat step 24 for the other logical drawer in the pair.

NTEX54
RLCM (continued)

26 Update table LCMDRINV.

Note: Make sure you have the new MAC address from the replacement card as recorded in step 2.

a. To open table LCMDRINV, type

>TABLE LCMDRINV
and press the Enter key.

b. To position on the tuple for the LCM, type

>POS site_name frame_no lcm_no
and press the Enter key.

where

site_name	is the name of the site
frame_no	is the number of the frame
lcm_no	is the number of the LCM

c. To begin changing the tuple, type

>CHA
and press the Enter key.

d. To continue processing, type

>Y
and press the Enter key.

e. Press the Enter key to scroll through the fields until you access the field with the MAC address.

f. Enter the new MAC address. Type

>drwr_id card_pec drwr_pec mac_address ip_address
and press the Enter key.

where

drwr_id	is the physical number of the drawer
card_pec	is NTEX54AA, NTEX54AB, NTEX54BA, or NTEX54CA
drwr_pec	is the PEC of the drawer
mac_address	is the MAC address of the new NTEX54
ip_address	is the IP address of the new NTEX54

g. Press the Enter key to scroll through remaining fields.

h. Confirm the change. Type

>Y
and press the Enter key.

NTEX54
RLCM (continued)

i. Exit the table. Type

>QUIT
and press the Enter key.

At the xEMS workstation

27

> **CAUTION**
> **Transport network must know new MAC address**
> Before you return the DBIC to service, you must provide the MAC address for the DBIC to the transport network. Contact the network administrator for assistance.

Go to the submap of the LCM line drawer with the new NTEX54 card.

28 Select the card by placing the cursor on the DBIC.

29 From the pop-up menu select Describe/Modify Object. The Object Description dialog box appears.

30 From the Object Description dialog box, select HSTP Application from the fields under Object Attributes.

31 Select View/Modify Object Attributes.

32 Enter the new MAC address in the %LAC MAC Address field, for example, 0060381120a1.

33 Click the Verify button to verify the information.

34 Click the OK button to close the Attributes dialog box.

35 Click OK to close the Object Description dialog box.

36 Place the cursor on the DBIC you want to return to service and use the mouse to select

Maintenance –> DBIC –> Rts
from the pop-up menu.

37 Send any faulty cards for repair according to local procedure.

NTEX54
RLCM (end)

38 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 40.

39 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

40 You have successfully completed this card replacement procedure.

NTMX45
HIE

Application

Use this procedure to replace an NTMX45 in host interface equipment (HIE) shelf.

PEC	Suffixes	Name
NTMX45	AA	Emergency Stand-Alone (ESA) processor (EP)

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the "Index" in this document. The index lists the cards, shelves, and frames in this card replacement NTP.

Common procedures

This procedure does not refer to any common procedures.

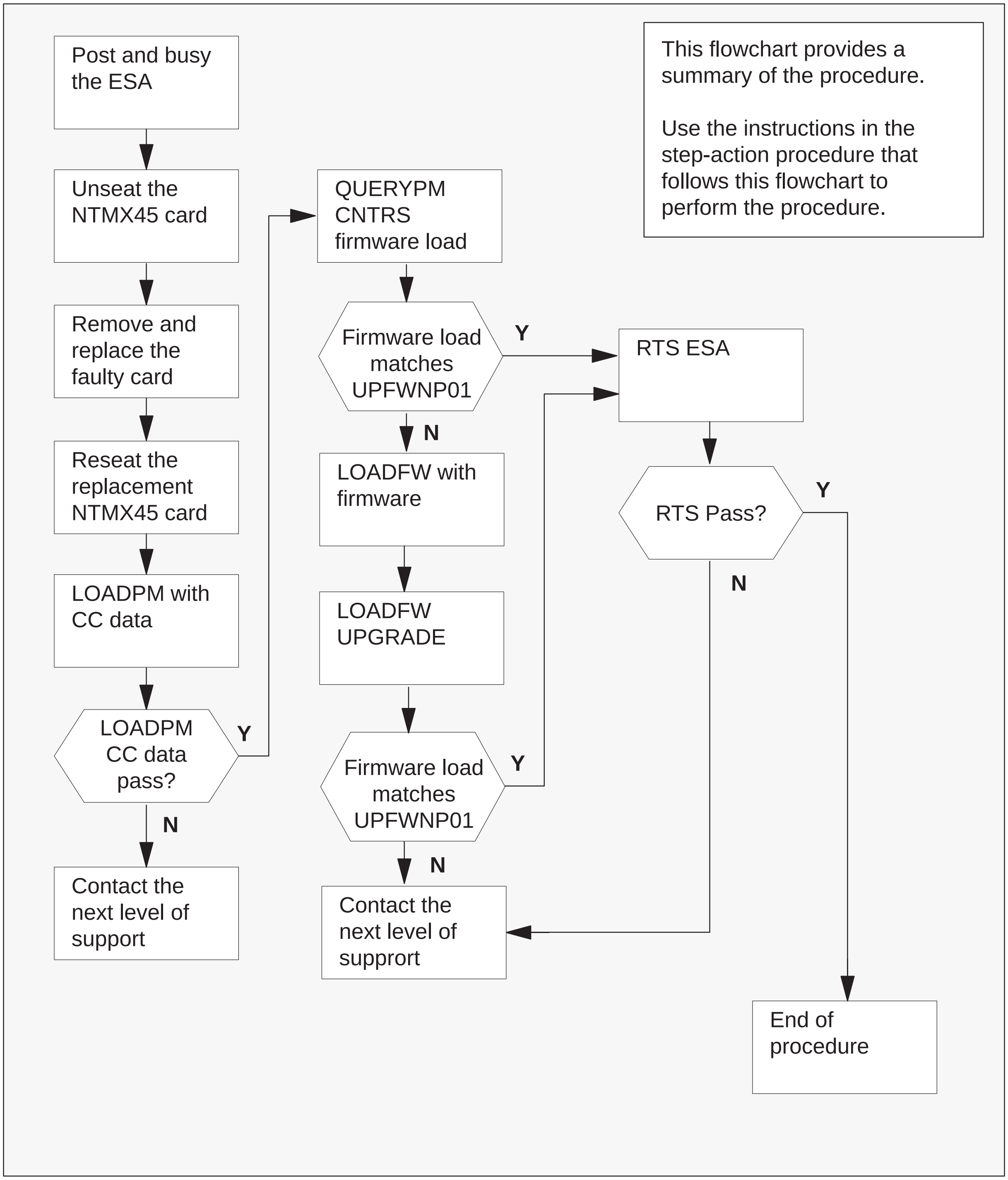
Next level of maintenance

A problem can occur that requires the help of the local maintenance personnel. Gather all important logs, reports, and system information (that is, product type and current software load) for analysis. The related logs, maintenance notes, and system information help make sure that the next level of maintenance and support can find the problem. More detail about logs appears in the *Log Report Reference Manual*.

Action

The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to replace the card.

NTMX45
HIE (continued)



NTMX45
HIE (continued)

Replacing an NTMX45 HIE

At your Current Location

1 Continue if you were referred to this card replacement procedure

- from a step in a maintenance procedure
- to verify or accept cards
- by your maintenance support group

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC) including suffix, as the original card.

At the MAP terminal

3 Access the PM level of the MAP and post the ESA by typing

>MAPCI;MTC;PM;POST ESA esa_no
and pressing the Enter key.

where

esa_no is the number of the ESA unit to be busied (0 to 255)

Example of a MAP display:

```
  CM    MS   IOD   Net    PM    CCS    LNS    Trks    Ext    APPL
   .     .     .     .   1RLCM   .      .      .       .      .

 ESA              SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit     PM     0        0        2        0        2         25
 2 Post_    ESA    0        0        0        0        1          1
 3 ListSet
 4                                  Links_OOS: CSide  0
 5 Trnsl          RLCM  ESA    4 Sysb
 6 Tst
 7 Bsy_
 8 RTS_
 9 OffL
10 LoadPM
11 Disp_
12 Next_
13
14 QueryPM
15
16
17
18
```

At the MAP terminal

4 Busy the inactive ESA processor by typing

>BSY
and pressing the Enter key.

Example of a MAP response:

```
ESA 4      This action will take this PM
           out of service
Please confirm (“YES”, “Y”, “NO”, or “N”):
```

Respond by typing

>YES

At the RLCM frame

5

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 LCM. This protects the equipment against damage caused by static electricity.

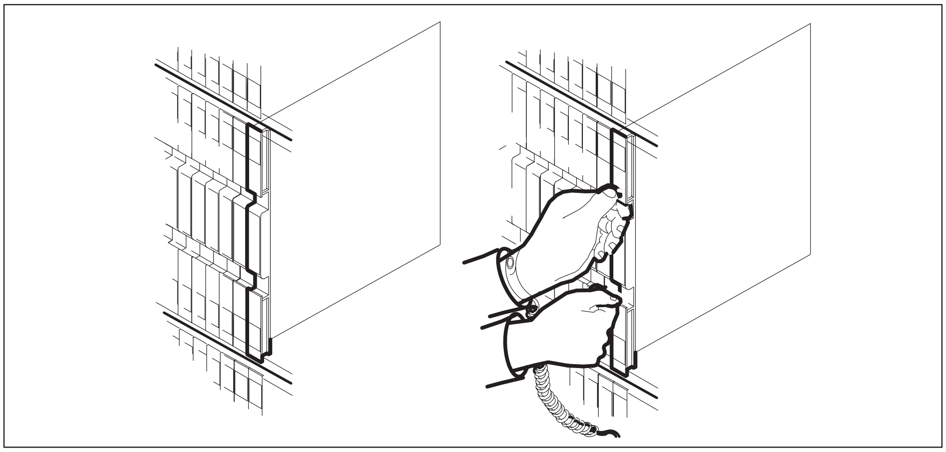
WARNING
Equipment damage
Take the following precautions when removing or inserting a card:
1. Do not apply direct pressure to the components.
2. Do not force the cards into the slots.

Put on a wrist strap.

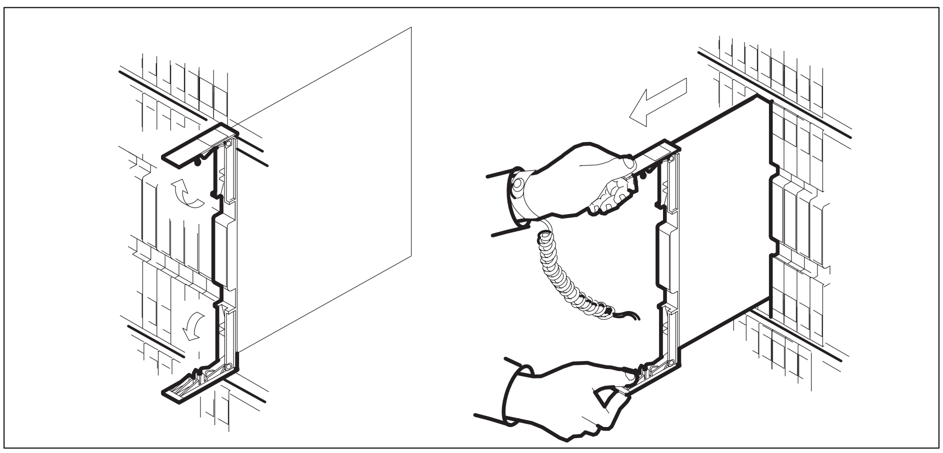
6 Remove the NTMX45 card as shown in the following figures.

NTMX45
HIE (continued)

a. Locate the damaged card on the appropriate shelf.



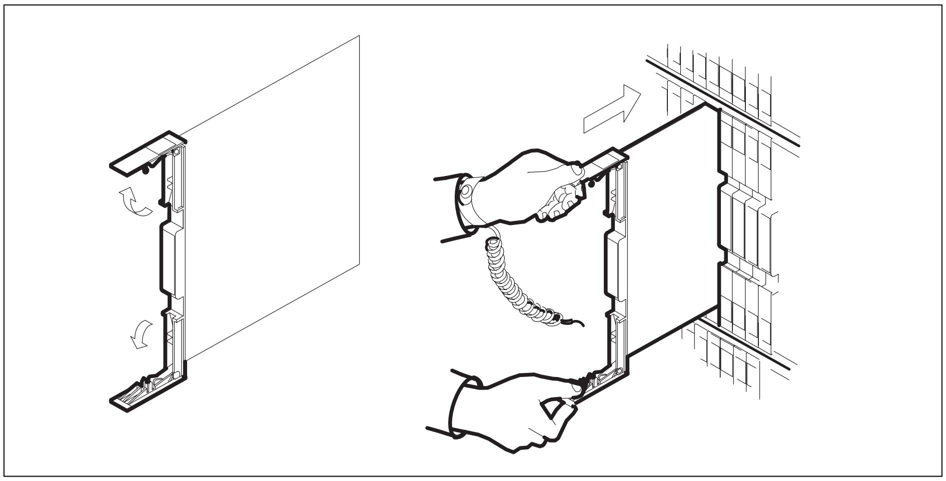
b. Open the locking levers on the damaged card and carefully pull the card towards you until it clears the shelf.



c. Make sure that the replacement card has the same PEC and suffix as the card you just removed. Also make sure that all DIP switches on the replacement card match settings of the card just removed.

7 Open the locking levers on the replacement card.

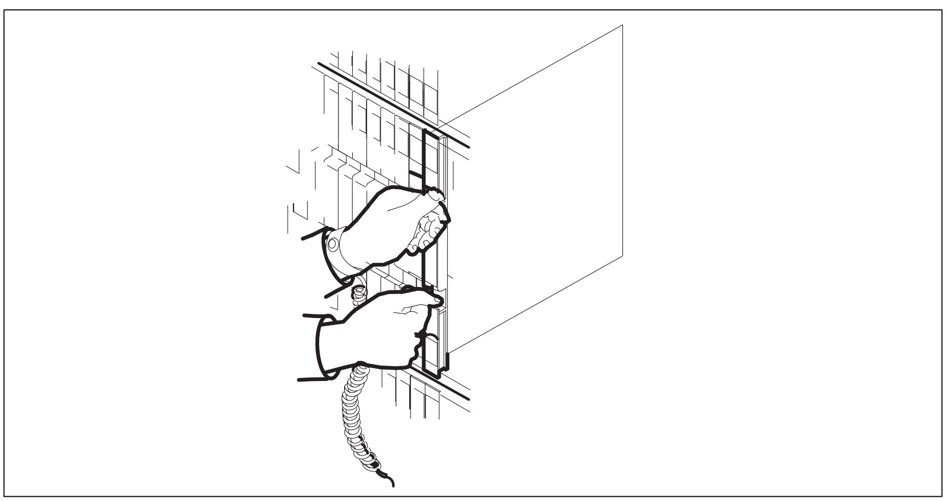
a. Align the card with the slots in the shelf and carefully slide the card into the shelf.



Seat and lock the card.

b. Use your fingers or thumbs to push on the upper and lower edges of the faceplate.

c. Close the locking levers.



NTMX45
HIE (continued)

8 Use the following table to determine the next step in this procedure.

If you entered this procedure from	Do
an alarm clearing procedure	step 34
other	step 9

9 Load the ESA processor by typing

>LOADPM
and pressing the Enter key.

If the load	Do
message “loadfile not found in directory” is received	step 10
load passes	step 28
load fails	step 35

10 Determine the type of device on which the PM load files are located.

If load files are located on	Do
tape	step 11
IOC disk	step 17
SLM disk	step 22

11 Locate the tape that contains the PM load files.

12 Mount the tape on a magnetic tape drive.

At the MAP terminal

13 Download the tape by typing

>MOUNT tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

14 List the contents of the tape in your user directory by typing

>LIST T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

15 Demount the tape by typing

>DEMOUNT T tape_no
and pressing the Enter key.

where

tape_no is the number of the tape drive containing the PM load files

16 Go to step 27.

17 From office records, determine and note the number of the input/output controller (IOC) disk and the name of the volume that contains the PM load files.

18 Access the disk utility level of the MAP display by typing

>DSKUT
and pressing the Enter key.

19 List the IOC file names into your user directory by typing

>LISTVOL volume_name ALL
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 17

20 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

21 Go to step 27.

22 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume that contains the PM load files.

NTMX45
HIE (continued)

23 Access the disk utility level of the MAP display by typing

>DISKUT
and pressing the Enter key.

24 List all SLM disk volumes into your user directory by typing

>LV CM
and pressing the Enter key.

25 List the SLM file names into your user directory by typing

>LF volume_name
and pressing the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 22

26 Leave the disk utility by typing

>QUIT
and pressing the Enter key.

27 Reload the ESA processor by typing

>LOADPM
and pressing the Enter key.

If loadpm	Do
passes	step 28
fails	step 35

NTMX45
HIE (continued)

28 Query the PM counters for the firmware load on the NTMX45 by typing

>QUERYPM CNTRS
and pressing the Enter key.

Example of a MAP display:

```
Unsolicitited MSG limit = 250, count = 0
Ram Load: MSA12AM1
EPRom Version: Ac01
EEPRom Load: Loadable NP02 , Executable: NP02
EP:MX45AA
```

NTMX45 Firmware loadname

If firmware is	Do
valid	step 31
invalid	step 29

29 Load the NTMX45 firmware by typing

>LOADFW
and pressing the Enter key.

Note: The command applies the firmware file provisioned in table XESAINV unless the firmware load is indicated with the command.

If load	Do
passes	step 30
fails	step 35

30 Upgrade the firmware in the NTMX45AA by typing

>LOADFW UPGRADE
and pressing the Enter key.

If the LOADFW UPGRADE	Do
passes	step 31
fails	step 35

NTMX45
HIE (end)

31 Return the ESA to service by typing

>RTS
and pressing the Enter key.

If the RTS	Do
passes	step 32
fails	step 35

32 Send any damaged cards for repair according to local procedure.

33 Record the following items in office records:

- date the card was replaced
- serial number of the card
- problems that required replacement of the card

Go to step 36.

34 Return to the *Alarm Clearning Procedure* that referred you to this procedure. If necessary, go to the point where the damaged card list was produced, identify the next damaged card on the list, and go to the appropriate procedure for that card in this manual.

35 Contact the next level of support for additional help to replace this card.

36 You have completed this procedure. Return to the maintenance procedure that referred you to this card replacement procedure and continue.

Replacing a card
RLCM

Application

Use this procedure to unseat, remove, and reseat cards.

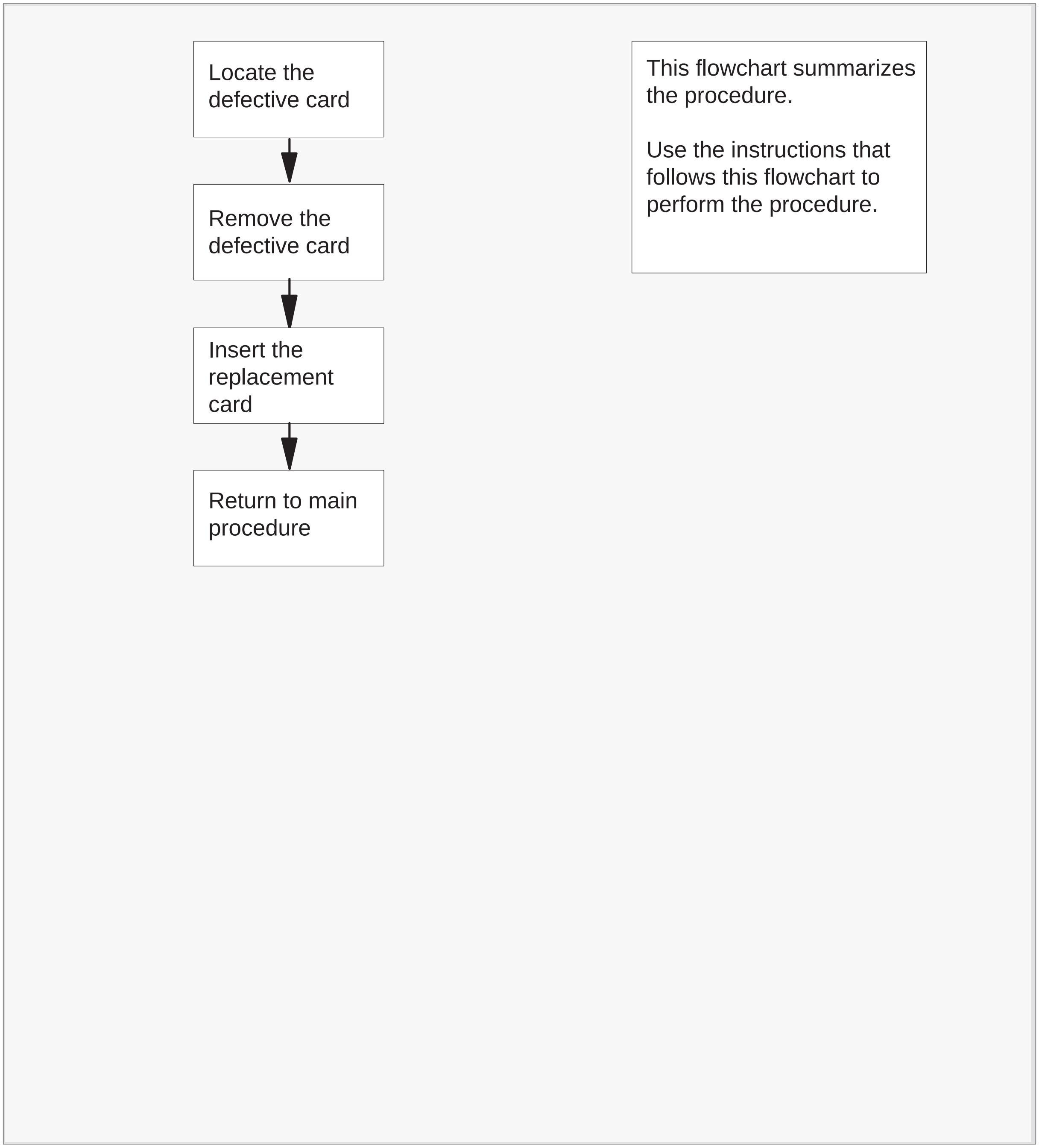
Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

Replacing a card

RLCM (continued)

Summary of common procedures for Replacing a card



Replacing a card
RLCM (continued)

Replacing a card

At the LCM

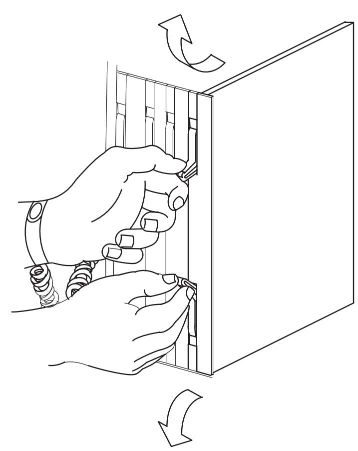
1 Proceed only if you have been directed to this procedure from a step in a maintenance procedure. Using this procedure independently may cause equipment damage or loss of service.

2

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point on the frame supervisory panel (FSP) while handling cards. This precaution protects the cards against damage caused by static electricity.

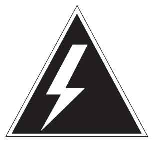
Remove any cables from the faceplate of the card to be replaced and note the connector numbers.

3 Locate the card to be removed on the appropriate shelf if you have not already done so.



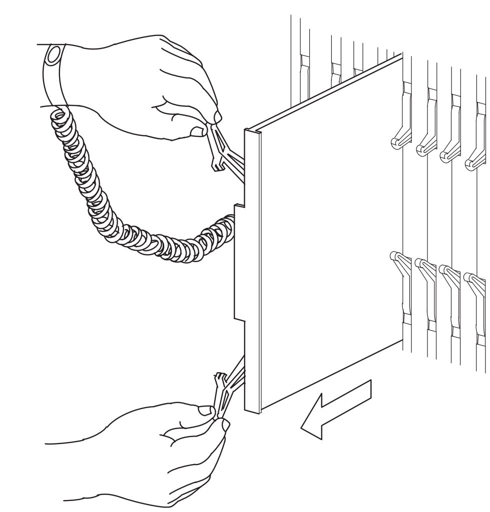
Replacing a card
RLCM (continued)

4



WARNING
Do not hold card by levers only
Holding a card by the levers only may result in lever breakage. Once the card has been pulled half way out of the shelf, carefully grasp the card underneath for more secure support and continue to remove the card from the shelf. Avoid touching any wires or internal parts on the card.

Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



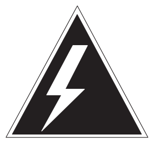
5 Examine the switch settings (if any) of the card just removed. Ensure that the switch settings on the replacement card match those of the card being replaced.

6 Place the card you have removed in an electrostatic discharge (ESD) protective container.

7 Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card you just removed.

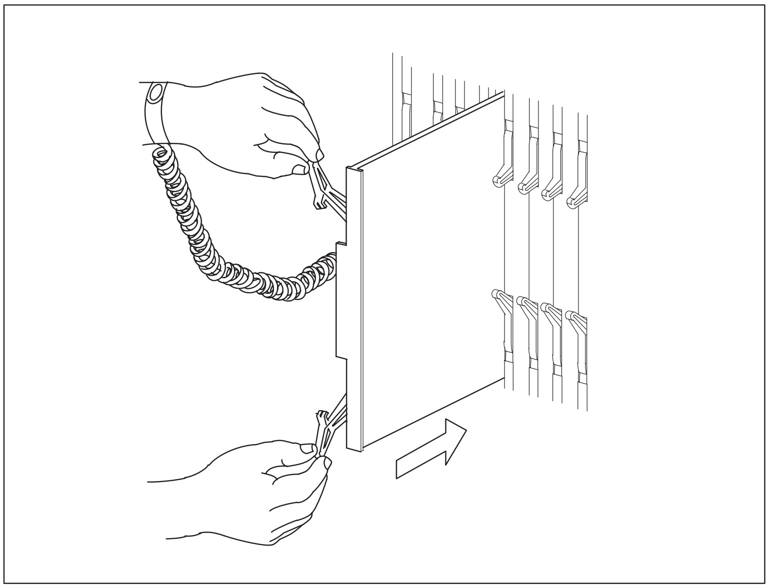
Replacing a card
RLCM (continued)

8



WARNING
Improper insertion may damage circuit packs
Do not apply direct pressure to the components.
Do not force the cards into the slots.

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.

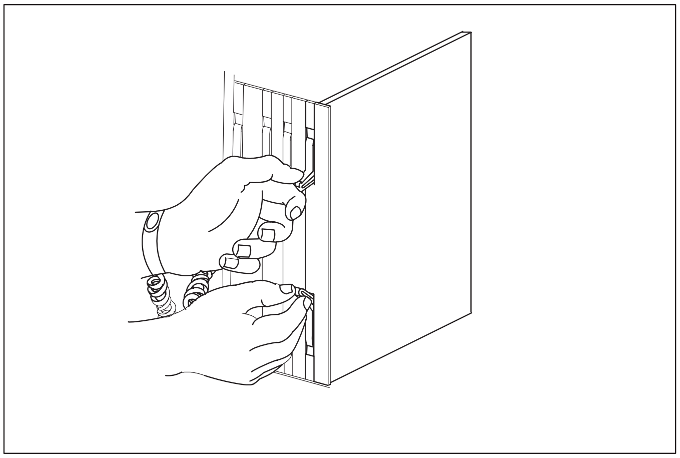


9 Seat and lock the card.

a. Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure that the card is fully seated in the shelf.

Replacing a card
RLCM (end)

b. Close the locking levers.



10 Reconnect any previously removed cables to the faceplate of the replacement card.

11 You have completed this procedure. Return to the main procedure that sent you to this procedure and continue as directed.

Replacing a line card
RLCM

Application

Use this procedure to unseat, remove, and reseat line cards if you have been directed from a maintenance procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

Replacing a line card
RLCM (continued)

Summary of procedure for Replacing a line card

Locate the defective line card

↓

Remove the defective line card

↓

Insert the replacement line card

↓

Return to main procedure

This flowchart summarizes the procedure.

Use the instructions in the step-action table that follows this flowchart to perform the procedure.

Replacing a line card
RLCM (continued)

Replacing a line card

At your current location:

1

WARNING
Improper handling could possibly damage cards
Store and transport circuit cards in electrostatic discharge (ESD) protective containers to prevent electrical and mechanical damage. When handling circuit cards not in ESD protective containers, stand on a conductive floor mat and wear a wrist strap, connected through a 1-megohm resistor to a suitably grounded object such as a metal workbench or a DMS frame. (Refer to Northern Telecom Corporate Standard 5028.)

WARNING
Equipment damage
Take these precautions when removing or inserting a card:
•.Do not apply direct pressure to the components.
•.Do not force the cards into the slots.

WARNING
Hot materials
Exercise care when handling the line card. The line feed resistor may be very hot.

CAUTION
Special tools required
Card shrouds and removal tools are required for removing cards from the line drawers. For descriptions of these tools, refer to the note at the end of this procedure.

Replacing a line card
RLCM (continued)

Proceed only if you have been directed to this procedure from a step in a maintenance procedure. Using this procedure independently may cause equipment damage or loss of service.

Note 1: Card shrouds are required for inserting or removing cards in line drawers. Two sizes are available for use with 3-inch and 6-inch cards, as shown in the following table.

Line card insertion / withdrawal tool for	Apparatus code	Common product code
3-inch cards	QTH56A	A0298291
6-inch cards	QTH58A	A0313317

Note 2: Card removal tools are required for removing cards from line drawers. Two sizes are available, as shown in the following table.

Card removal tool for	Apparatus code	Common product code
3-4 inch cards	QTH57A	A0298292
Note: For 4-inch or larger cards, use the large grip tool ITA9953.		

2 Locate the line drawer containing the line card to be removed.

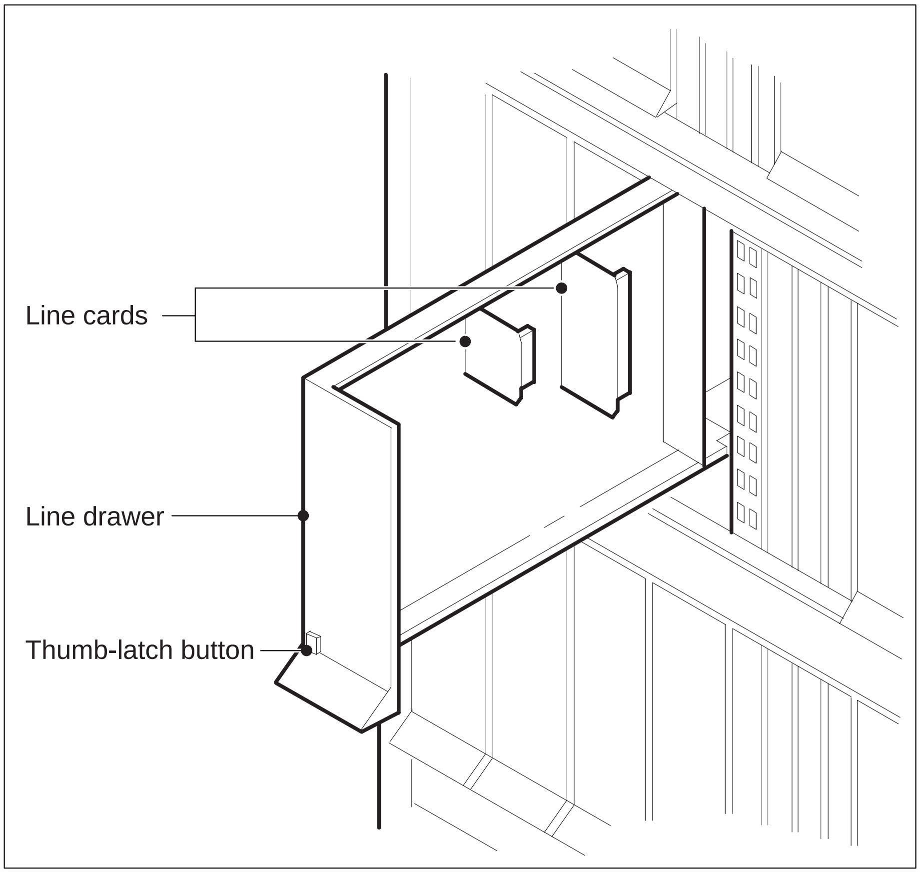
3 Open the line drawer to prepare to remove the faulty card by following the steps below:

a. Face the drawer shelf and grasp the handle at the bottom of the drawer with the right hand.

b. Push up on the drawer latch with your thumb and pull the drawer out until fully withdrawn. It is fully withdrawn when the drawer stop, at the top, prevents further travel.

Replacing a line card
RLCM (continued)

c. Ensure that a card shroud and line card extractor are available. (See note at end of this procedure.)



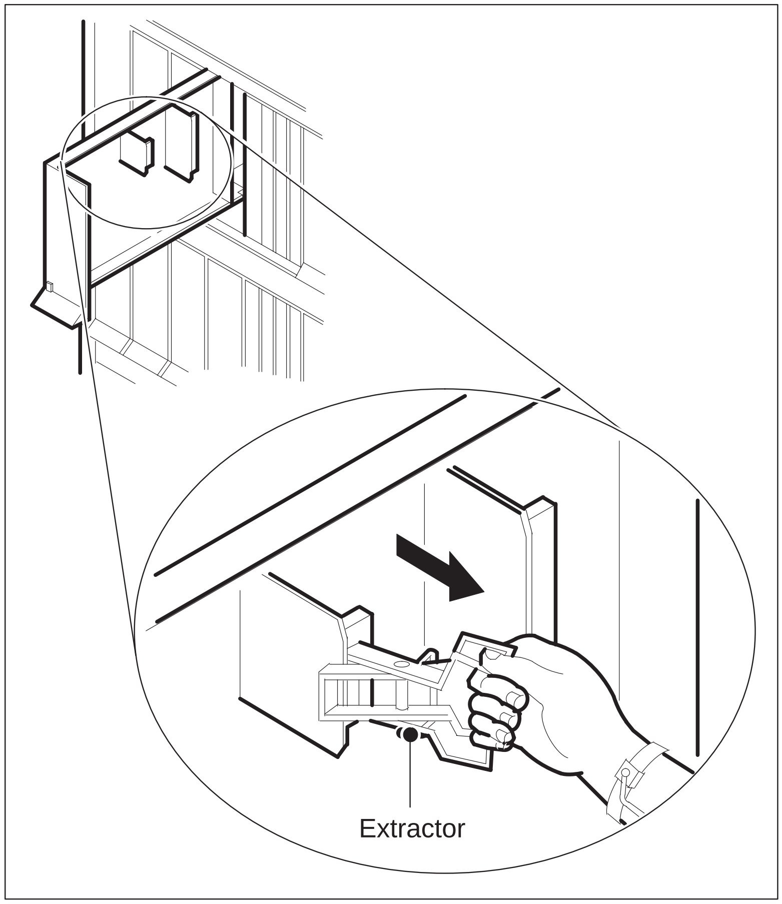
4 Remove the line card to be replaced by using the following steps:

a. Slide a card shroud over the card to be removed and an adjacent card. (If there is not an adjacent card on either side, do not use the card shroud.)

b. Grasp the edge of the card with a line card extractor at a point midway between the top and bottom edges. Hold the extractor in your right hand.

Replacing a line card
RLCM (continued)

c. Squeeze the handles of the extractor together to grasp the card tightly.



d. Hold the front cover of the line drawer to steady it with your left hand.

e. Pull the extractor away from the drawer to unplug the card from its socket on the drawer backplane.

f. Continue pulling the card with the extractor until the card is clear of the shroud.

g. Insert the removed card into an ESD container and store according to local procedures.

5 Verify that the product equipment code (PEC) on the nameplate of the removed card and of the replacement card is the same.

6 Replace the faulty card using the following steps:

Replacing a line card
RLCM (end)

a. Remove the replacement card from its ESD container.

b. Slide the card into the shroud guide slots toward the drawer backplane.

c. Hold the front cover of the line drawer with your left hand to steady it.

d. Grasp the top and bottom edges of the card with the fingers of your right hand.

e. Push the card toward the backplane until it plugs fully into the backplane socket.

7 You have completed this procedure. Return to the main procedure that sent you to this procedure and continue as directed.

RLCM trouble locating and clearing

This section on how to locate and clear trouble is for maintenance engineering and field maintenance personnel. This personnel must have a basic knowledge of the DMS-100 Family of switches and of the Remote Line Concentrating Module (RLCM). Operating company personnel who need specific, step-by-step procedures to perform maintenance tasks do not use this procedure.

Trouble isolation and correction

Description of troubleshooting procedures

Basic troubleshooting procedures consist of the following:

- location and clearance of faults
- fault isolation tests
- diagnostic tests
- product-specific test tools

Performance indicators

To locate a fault, examine the performance indicators the system normally generates. Operational measurements (OM), log reports, and alarms indicate fault conditions.

Operational measurements

The OMs are systems that collect data and track the frequency of certain events. The OM data provides a summary of use and performance. The OMs detect present and future system troubles. The OMs threshold feature allows the system to monitor and report key Remote Line Concentrating Module (RLCM) activity. The primary method of trouble detection consists of daily and weekly reports. Refer to *Extended Peripheral Modules Operational Measurements Reference Manual* for additional information about the OMs specified to the RLCM.

Log reports

Logs are analysis tools and provide information on call errors, diagnostic results, and system status. Logs are also good indicators of trouble conditions when any of the following conditions are present:

- sudden increase in volume of logs
- message not printed reports
- large number of logs

Alarms

Audible and visual alarms indicate that maintenance is required. Correct performance of routine system maintenance and use of OMs and logs minimizes the occurrence of alarms.

The level of the alarm indicates how severe the alarm is and the degree of maintenance required. The alarm levels are minor, major or critical. The following table describes alarm conditions.

Alarm description

Alarm	MAP display	Description
Minor	(blank)	Normally does not affect service.
Major	(M)	Normally indicates a condition that degrades service.
Critical	(*C*)	Normally indicates a service power failure or possible service power failure.

The following guidelines are followed for alarm response:

- When several alarms of the same severe condition appear on the MAP display screen, clear the alarms on the screen from left to right.
- If, when you correct an alarm, an alarm that is more severe occurs, respond to the new alarm. Do not continue attempts to clear the previous alarm.

For alarm clearing procedures, refer to the Alarm Clearing Procedures.

Locating and clearing faults

The standard troubleshooting steps for how to locate and clear faults are as follows:

1. Silence any audible alarms the system causes after detection of alarm conditions.
2. To isolate the fault, read the status displays and trace fault codes to the menu level needed to clear the fault.
3. Busy the hardware to remove system access to the defective component. The removal of access prevents system interference and allows the performance of maintenance activity.
4. Test the defective component and identify the cards that you must replace. Replace the defective card and test it again.

5 Return the hardware to service.

Fault isolation tests

The detection of a fault condition in the RCLM requires a maintenance action. Fault isolation tests determine the location of the fault. The tests correct the fault condition. These test results must be reported to the appropriate maintenance support. The following sections list the procedures to isolate and correct faults with specified RCLM components.

Defective line drawer

To handle a defective line drawer:

1. Post, busy, test, and RTS the drawer.
2. If test or RTS failure occurs with a card list, use an appropriate card replacement procedure to replace the cards. Test the cards again and RTS the drawer.
3. If test or RTS failure occurs without a card list, perform the MAP terminal response tests and RTS the drawer.

Defective shelf circuit pack

To handle a defective shelf circuit pack:

1. Post the line concentrating module (LCM).
2. Determine if fault indicators are present.
3. Busy the unit with the defective card.
4. Perform the appropriate card replacement procedures.
5. Test and RTS the LCM unit.

Defective line card

If one card failure occurs during the line card diagnostics test, the failure causes failure of the whole LCM unit. The defective card can be difficult to locate. Two procedures are available which maintenance personnel can use to locate the defective card.

Perform procedure 1 during a maintenance window to avoid possible service interruptions. Technicians with experience can perform this procedure during busy service periods.

Procedure 1

To identify a defective card:

1. Find the vertical connection to the LCM in trouble. Use Table MTAVERT.
2. Carefully use a buttset on the backplane of the MTADRIVER.

Operating company personnel can hear one of the following items:

- — dial tone—A 6X17 card draws a dial tone. Dial the operator and ask for your line number. The number you are currently on will be the defective line.what number you are on, which will be your faulty line.
- — 8khz tone—This is either a data line card 6X71 or 6X76.
- — talk battery—If possible, hook up a proprietary telephone and call the operator to see the directory number (DN) now in use.

Perform procedure 2 during a maintenance window to avoid possible service interruptions. Technicians with experience can perform this procedure during the day if precautions are taken.

Procedure 2

To identify a defective card:

1. Access the line test position (LTP) level of the MAP display and post any line equipment number (LEN) located on the defective LCM.
2. Put a tone on the posted LEN. Go to the maintenance with the buttset and listen to all other LENS on the LCM.

Note: Operating company personnel locates two LENS with tone. One LEN is the LEN first posted at the LTP level. The second LEN is the defective line card.

Defective DS-1 link

To handle a defective DS-1 link:

1. Post the RLCM.
2. Determine if fault indicators are present.
3. Display the central side (C-side) links.
4. Post the host XMS-based peripheral module (XPM). Determine the peripheral module (PM) state of the host XPM.
5. If the host XPM is in-service (InSv), display peripheral side (P-side) links, busy, test, and RTS the host XPM.
6. If the host XPM is in-service trouble (ISTb), busy and test the host PM in search of the appropriate card list.
7. Perform the appropriate card replacement procedures.
8. RTS the host XPM.

Defective ringing generator (RG) frequency generator circuit

To handle a defective RG frequency generator circuit:

1. Test the RG.
2. If the test fails, replace the RG.

Load file mismatch

To handle a load file mismatch:

1. Post the RLCM.
2. Use the QUERYPM command to display the PM load in the RLCM.
3. Determine the correct RLCM PM load.
4. Correct Table LCMINV if the table does not have the correct PM load for the RLCM.
5. If the table does not have a correct PM load for the RLCM, obtain the correct PM load. Reload the RLCM.

Diagnostic tests

Bit error rate performance tests

Bit error rate performance (BERP) tests test transmission paths through the network. These tests provide the operating company with a tool to assess the bit error performance of the Digital Multiplex System-100 (DMS-100) switch. The operating company can assess the subtending nodes of the DMS–100 with BERP tests. Feature package NTX881AB includes BERP tests. The BERP tests require the NT6X99AA IBERT line card available in the LCM of the RLCM.

The BERP test consists of many bit error rate tests (BERT). To perform a BERT, operating company personnel perform the following:

- connect an integrated bit error rate tester (IBERT) to another part of that IBERT, or to a specified endpoint like a data line card (DLC)
- transmit a known bit pattern

The bit pattern is reflected back to the IBERT and is compared to the original bit pattern. Any errors in the returned bit stream are recorded. The results of each BERT comprises the result of the BERP test.

Access the BERP test from the maintenance (MTC) level of the MAP terminal. The BERP level commands can set up tests for a continuous basis or for a set duration.

Link tests

Performance of BERP tests can occur on the DS-1 links that connect the host controller to the RLCM. To perform the BERP test on a DS-1 link, a loopback must be available at a point on the transmission path. The DS-1 loopback is at the P-side of the host XPM. All 24 channels on the DS-link, loop back. For a DS-1 loopback to occur, remove all DS-1 link tests.

XPM bit error ratio test

The host XPM performs the XPM bit error ratio test (XBERT) for the RLCM subsystem. XBERT is a diagnostic test that does the following:

- detect and measure pulse code modulation (PCM) bit errors that occur in XPM and RLCM cards.
- commission DS-1 and PCM-30 links and trunks that loop back at the remote end without the use of a remote node.

The XBERT detects bit errors in the transmission of high-speed data in the cards of the host XPM. In this event, the XPM a line group controller (LGC), line trunk controller (LTC), remote cluster controller (RCC), and cards in the RLCM. Feature package NTX885AA includes he XBERT tests. The XBERT tests require the NT6X99AA IBERT line card available in the LCM of the RLCM.

Note: To use XBERT, the XPM must have an NT6X69AB message protocol card or an NT6X69AA message protocol card with an NT6X79 tone card.

Test conditions

For accurate fault detection, the XBERT tests run on an active in-service XPM unit and on an out-of-service unit. At least one unit of the RLCM must be in-service.

Note: Do not use XBERT as a tool to provide accurate bit error ratio evaluations. The XBERT does not use the CCITT standard test patterns in test procedures. The XBERT uses XPM tone PCM to provide the 64-kbps test bit stream.

Test types

The XBERT runs two tests with the use of the Initiate (I) command. These tests involve the RLCM. The test names and the cards that correspond to the tests appear in the following table.

XBERT tests

Test name	Related cards
XBERTDCC	NT6X44, NT6X50, NT6X69, NT6X52, NT6X73
XBERTBIC	NT6X44, NT6X50, NT6X69, NT6X52, NT6X54, NT6X73

The isolate command automatically runs tests to isolate a fault in a specified set of cards. The number of cards in the card list can vary from one to three. The number of cards in the list depends on each test result.

One manual request can test the P-side ports of the XPM or the RLCM bus interface cards (BIC) in sequence.

Test XBERTDCC (digroup control cards)

To test the digroup control cards (DCC), the XPMDCC test path travels through the following cards:

- Message card (NT6X69)
- Timeswitch card (NT6X44)
- DS-1 interface card (NT6X50)
- DCC (NT6X52)
- Link control card (LCC) (NT6X73)

To set up the test path, XBERTDCC attempts to establish a looparound of a manually specified P-side port at the RLCM DCC. If the attempt is not successful, the system displays a response and terminates the test. If the RLCM looparound is successful, the test runs.

Test XBERTBIC (bus interface cards)

To test BICs, the XBERTBIC test path travels through the following cards:

- Message card (NT6X69)
- Timeswitch card (NT6X44)
- DS-1 interface card (NT6X50)
- LCC (NT6X73)
- DCC (NT6X52)
- BIC (NT6X54)

To set up the test path, the XBERTBIC attempts to establish a looparound of the manually specified P-side port at an RLCM BIC. With BIC, specify manually the test loop that must terminate. If the attempt is not successful, the system displays a response and terminates the test. If the NT6X54 looparound is successful, the test runs.

Entering XBERT

Enter the XBERT level at any level of the MAP terminal. The user enters one of the following commands:

- XBERT <<PM>> <<PM#>>
- XBERT N <<node#>>

When the user enters the command XBERT N <<node#>>, the user enters XBERT through the PMs node-assignment number. Table NNASST contains node-assignment numbers. The user can also use the QUERYPM command to post that must be tested at the PM MAP display level to locate node-assignment numbers.

Lines maintenance

Tests of line circuits, subscriber loops, and stations occur in the lines maintenance (LNS) subsystem. This subsystem tests line circuits and subscriber loops manually and automatically.

Line testing determines if a line circuit, loop, or line circuit and loop group functions correctly. If the line is defective, line tests also determine if the fault lies in the line circuit or the attached loop. Another department, like plant maintenance, receives faults that occur in the loop. A fault in the line circuit requires a line card replacement. Test the line again to make sure fault clearance occurs.

Automatic line tests

The LNS subsystem performs automatic line tests (ALT) on line circuits and loops. These tests are normally performed often. The subsystem performs the initial scheduling with a switch operator. The subsystem performs the tests that follow without a switch operator. The LNS subsystem also performs automatic line tests when a line shows a fault.

The following figure shows the commands available at the sublevels of the LNS subsystem.

Line maintenance commands

LNS

0 QUIT_
3 LTP
4 ALT
5LNSTRBL

LTP

0 Quit
2 Post_
3
4
5 Bsy
6 RTS
7 Diag
8
9AlmStat
10 CktLoc
11 Hold
12 Next
13
14
15
16 Prefix
17 LCO
18 Level_

LNSTRBL

0 Quit
2 Disp_
3StopDisp
4ListAlm_
5
6 CreatSup
7
8 Supress
9 Resume
10 Qsup
11
12
13
14
15
16 ClrAlm_
17 ClrBuf_
18_

ALT

0 Quit
2 Post_
3 ALTInfo
4
5
6
7 SDiag
8 Diag
9 LIT
10 Bal
11 CktTst
12
13
14
15
16
17
18

LTPLTA

0 Quit
2 Post_
3 MonLTA
4 TalkLTA
5 Orig
6 LnTst
7 VDC
8 VAC
9 Res
10 Cap
11 Hold
12 Next
13
14 LTA
15 BalNet
16 Coin_
17 Ring
18 DgtTst

LTPMAN

0 Quit
2 Post_
3
4 Loss
5 Noise
6 ToneGen
7 Jack
8 TstRing
9 Bal
10 RlsConn
11 Hold
12 Next
13
14 Ckttst
15 Sustate
16 SetLpBk_
17
18

LTPDATA

0 Quit
2 Post_
3
4 Equip_
5 Connect_
6 Sustate
7 LoopBk_
8 Bert
9
10 BPVO_
11 Hold
12 Next
13
14
15
16
17
18

IBNCON

0 Quit
2
3 Select_
4 Next
5 Bsy
6 RTS
7 Diagnose
8
9
10 Seize
11 Release
12 Clear
13 PrevDm
14
15
16 QConLine
17 QCustGrp
18 QSeated

ALTLIT (see note)

0 Quit
2 Post_
3 LITInfo
4 Start
5 Stop
6 Remove
7 Define_
8 Submit
9
10
11 DefMAN
12
13 DefSCHD_
14
15 Status_
16
17 OVRride_
18

Note: The menu of commands for the ALTLIT level is the same as for the other ALT sublevels, except the command LITINFO in the ALTLIT level does not appear at any other ALT sublevel.

The LNS subsystem performs automatic line tests in a DMS-100 switch office. The earlier figure shows the commands available at the ALT level of the LNS level, which define the ALT. These commands are as follows:

- The DIAGN command performs a complete diagnostic test on the line card circuits. This command identifies defective line cards before the defective cards generate customer reports. The DIAGN command uses the line test unit (LTU) of the RLCM RMM to start tests. If the LTU is not available, this command starts the no-LTU diagnostic.
- The SDIAG command is a subset of the DIAG test and make sure that most of the line card circuits operate correctly.
- The BAL command automatically sets the balance network in the line card. This action provides transmission balance between the four-wire side of the switch and the two-wire loop. The BAL command minimizes subscriber reports of noise, echo, and garbled speech.
- The LIT command starts an automatic test that detects cable pair faults. Fault clearance must occur before these cables affect service and subscribers report problems of a hum, noise, grounds, or a false ring trip.
- The CKTTST command applies to loops using Meridian business sets (MBS), data units (DU) associated with Datapath, asynchronous interface modules (AIM), and IBERT line cards. The CKTTST command performs circuit tests to confirm the ability of the set or line card, or the set and the line card. The CKTTST command also transmits and receives messages correctly and adheres to message protocol.

The switch operator receives the lines, posted at the LTP, that fail to meet standards of quality. The ALT log subsystem generates output reports that also identify test results. After identification of the failures, test the lines manually and correct the lines.

Station tests

Station tests are performed in the LNS subsystem at a MAP terminal. Station tests are also performed for the Silent Switchman (SSMAN) and Station Ringer (SR) tests. These tests are performed from a station. Stations are tested manually.

The visual display unit (VDU) displays station test results. The VDU does not display the results for the Station Ringer and Silent Switchman tests. The test results are returned to the station.

Station tests determine if a station functions properly when connected to a loop and line circuit group.

Manual line tests

The switch operator performs manual lines tests on line circuits, loops, and stations. The switch operator tests line circuits and loops separately. A MAP terminal displays the immediate test results to the switch operator.

Manual tests of lines occur as part of routine maintenance, after the system generates a customer report, or after ALT failure occurs. Manual line tests occur at the LTP level. The manual line test uses any of the four levels of the LNS subsystem: ALT, LTP, LTP manual (LTPMAN). The manual line test also uses the LTP line test access (LTPLTA).

Manual line testing at the ALT level defines one test line immediately. Three other levels are available for manual line tests. At these three levels, manual tests occur when the switch operator places the required line in the control position. The switch operator controls this line and can manipulate this line. Post the line before you place the line in the control position.

Ring pretrip on LCM lines

A ring pretrip is a premature ring trip. It is a false indication that the ringing phone was answered.

In NA009, the PRETRIP nonmenu command is added to the LCM level. The PRETRIP command provides operating company personnel the

- option to enable or disable pretrip log reports on the posted LCM or all LCMs in the posted set
- option to enable or disable extension of the ring trip filter timing on all 4FR lines on the posted LCM or all LCMs in the posted set
- ability to query the status of the two previous pretrip options

Note: When a new LCM tuple is entered in table LCMINV, the value for LOGS and 4FR are set to DISABLE by default.

In response to the command string HELP PRETRIP, the command syntax is displayed at the MAP terminal as follows.

```
>help pretrip
PRETRIP : AVAILABLE RINGING PRETRIP OPTIONS
    LOGS: Enable/Disable Pretrip LOG Reporting for
          the posted PM or posted set of PMs.
    4FR:  Used to reduce Ring Pretrip occurrences on
          long loop length 4FR lines.  Enabling this
          command results in extension of the Ring
          Trip filter timing for ALL lines serviced
          by the posted PM or posted set of PMs.
 Query:   Displays the status of Pretrip options
Parms: <OPTION>     {LOGS     <ACTION>  {ENABLE   [<OPTION> {ALL}],
                                         DISABLE   [<OPTION> {ALL}]} [<NOWAIT>{NOWAIT}],
                    4FR       <ACTION> {ENABLE    [<OPTION> {ALL}],
                                         DISABLE   [<OPTION> {ALL}]} [<NOWAIT> {NOWAIT}]
                    QUERY}
```

Pretrip log reports

Pretrip log reports are enabled or disabled for a posted LCM or all LCMs in the posted set. If the LCM is in service, the effect is immediate. Otherwise, the LCM is updated during the next RTS. You must enter one of the following actions with the command string PRETRIP LOGS.

- ENABLE – This enables recording of LINE113 log reports for the posted LCM when the system detects a pretrip.
- DISABLE – This prevents any LINE113 log reports from being generated when the system detects a pretrip on a posted LCM.

You can enter the following optional parameters with either of the previous actions.

- ALL – This results in the selected action being applied to all LCMs in the posted set.
- NOWAIT – This option prevents waiting for confirmation that the command has been completed.

For example, to record LINE113 logs for all pretrips detected on all LCMs in the posted set, activate the logs feature by typing

>PRETRIP LOGS ENABLE ALL

and pressing the Enter key.

When a pretrip occurs and the pretrip logs are enabled, a LINE113 log is output. An example of a LINE113 log follows.

```
LINE113  JAN27 09:14:14 6220 TBL
   KRCM 03 0 19 04    DN 6195441578
   TROUBLE CODE = RINGING_FAILED
   RINGING TROUBLE = PRETRIP
   CALLID = 98776
```

When a pretrip occurs on a line that connects to an LCM, a LINE138 log is output. A LINE138 log identifies the call that was routed to a treatment. An example of a LINE138 log follows.

```
LINE138 JAN27 09:14:14 6321 INFO TRMT
   KRCM 03 0 00 08    DN 6195441579
   TREATMENT SET = SYFL   CALLED NO = 5441578
   CALLID= 01D8 0003
```

After two pretrips occur, the line is scheduled for a diagnostic. If the diagnostic fails, a LINE101 log is generated. An example of a LINE101 log follows.

```
LINE101 JAN27 09:16:05 3782 FAIL LN_DIAG
   KRCM 03 0 01 06    DN 6195441586
   DIAGNOSTIC RESULT  Ringing Failed Pre Trip
   ACTION REQUIRED  Chk Ringing
   CARD TYPE  6X17AC
```

Pretrip on 4FR lines

The command string PRETRIP 4FR ENABLE is used to reduce ring pretrip occurrences on long loop length 4FR lines served from the posted LCM or all LCMs in the posted set. The effect of this command is not immediate and will not be realized until the next RTS of the LCM. You must enter one of the following actions with the command string PRETRIP 4FR.

- ENABLE – This extends 4FR line ring filter timing.
- DISABLE – This returns to non-extended 4FR line ring filter timing.

The following optional parameters can be entered with either of the previous actions.

- ALL – This results in the selected action being applied to all LCMs in the posted set.
- NOWAIT – This option prevents waiting for confirmation that a command has been completed.

For example, entend 4FR line ring filter timing for all LCMs in the posted set by typing

>PRETRIP 4FR ENABLE ALL
and pressing the Enter key.

Display status of pretrip options logs and 4FR

Display the status of options LOGS and 4FR by typing

>PRETRIP QUERY
and pressing the Enter key.

An example of a system response to the PRETRIP QUERY command string follows.

```
  CM    MS     IOD     Net     PM     CCS     Lns     Trks     Ext  APPL
   .     .      .       .     1LCM     .       .        .       .     .
                                *C*

 LCM                SysB     ManB     OffL     CBsy     ISTb      InSv
  0 Quit       PM    0         0        2        0        2         42
  2 Post_      LCM   0         0        0        0        2          9
  3 ListSet
  4 SwRG     LCM  HOST 00 0  InSv     Links_OOS:  CSide  0   PSide   0
  5 Trnsl_   Unit0:   InSv                 /RG: 1
  6 Tst_     Unit1:   InSv                 /RG: 1
  7 Bsy_                              11  11  11  11  11  RG:Pref 1 InsV
  8 RTS_     Drwr:  01  23  45  67  89  01  23  45  67  89     Stby 0 Insv
  9 OffL            ..  ..  ..  ..  ..  ..  ..  ..  ..  ..
 10 LoadPM_  pretrip query
 11 Disp_    LCM HOST 00 0 – PRETRIP LOGS are DISABLED
 12 Next                     PRETRIP 4FR is DISABLED
 13
 14 QueryPM
 15
 16
 17
 18
```

Product-specific test tools

Line maintenance cutover (LMCUT)

Feature package NTX057 allows the Line Maintenance Cutover (LMCUT) facility and the Automatic Board-to-Board Testing (ABBT) feature during commissioning. This feature allows the LMCUT and ABBT to transfer or cutover in-service lines from a current switch to a DMS switch. This feature also provides message recording of all performances of the LMCUT command in a progress file.

The line concentrating modules (LCM) support the LMCUT commands. The LMCUT commands are valid when the directory number (DN) cuts over the switch of LCMs. The DNs or LENs determine the occurrence of the cutover. The DNs and LENs that experience cutover are separate. The OPRTCO, RLSCO, and NOBST commands are the same commands for the DNs and LENs that experience cutover.

The LMCUT commands allow the user to do the following:

- set or query the cutover mode of the switch (made by DN or LEN).
- enable, disable, clear, or query the progress message recording.
- operate, release, or verify the cutover relays on a range of DNs or on a range of LENs.
- operate, release, or query the HOLD relay setting on a drawer.

Troubleshooting chart

The following table describes basic troubleshooting procedures for the Remote Line Concentrating Module (RLCM) alarms.

RLCM alarm clearing

Alarm condition	Possible cause	Action
Critical	Defective line concentrating module (LCM) processor cards in both LCM units Defective power converter cards in both LCM units All DS30A message ports are closed.	Identify and post the system busy (SysB) LCM. Busy both units of the defective LCM. Return to service (RTS) the defective LCM. If an RTS fails, load the defective LCM. Test and RTS the defective LCM.

—continued—

RLCM alarm clearing (continued)

Alarm condition	Possible cause	Action
Major	Defective LCM processor Defective digroup control card Defective power converter Defective ringing generator (RG) circuit Closed DS30A message port Line group controller (LGC) or line trunk controller (LTC) forces activity switch in LCM.	Identify and post the in-service trouble (ISTb) LCM. Identify fault indicators with QUERYPM FLT command. If the LCM is C-side busy (CBsy), identify central-side (C-side) links to host peripheral module (PM). Post host PM for defective P-side links. Busy, test, and RTS the defective P-side links. Post, busy, test, and RTS the defective LCM. If the LCM is system-busy (SysB), busy and test the defective LCM unit. If the test fails, with a card list, replace any defective cards. Test, and RTS the defective LCM unit. If the test fails, with no card list, test the defective LCM unit again and RTS the LCM unit. If the LCM is manual busy (ManB), test the defective LCM unit. If the test fails, with a card list, replace any defective cards. Test, and RTS the defective LCM unit. If the test fails, with no card list, test the defective LCM unit again and RTS the LCM unit.

—continued—

RLCM alarm clearing (continued)

Alarm condition	Possible cause	Action
Minor	Defective RG frequency generator circuit Activity mismatch Data error Diagnostic failure Load file mismatch Self-test failure	Identify and post the ISTb LCM. Identify fault indicators with QUERYPM FLT command. If the LCM is CBsy, identify C-side links to the host PM. Post the host PM for defective P-side links. Busy, test, and RTS the defective P-side links. Post, busy, test, and RTS the defective LCM. If the LCM is SysB, busy and test the defective LCM unit. If the test fails, with a card list, replace any cards. Test and RTS the defective LCM unit. If the test fails, with no card list, test the defective LCM unit again and RTS the LCM unit. If the LCM is ManB, test the defective LCM unit. If the test fails, with a card list, replace any defective cards. Test and RTS the defective LCM unit. If the test fails, with no card list, test the defective LCM unit again and RTS the LCM unit.
	—end—	

Refer to *Alarm Clearing Procedures* for more complete troubleshooting methods for RLCM alarms.

Advanced troubleshooting procedures

Under normal conditions, the user busies and tests a defective unit. As a result of this test, the MAP terminal displays a list of cards. The card at the top of the list is often the cause of the problem. When you replace the problem card, test the defective unit again. If the unit passes this test, the unit returns to service (RTS) and the troubleshooting procedure is complete.

If normal troubleshooting procedures do not restore a unit to service, advanced troubleshooting procedures can be necessary. Experienced operating company personnel, can use MAP terminal responses from troubleshooting attempts that are not successful to formulate a maintenance plan. Operating company personnel can repair the fault with more advanced step-action procedures also.

Powering up the RLCM

Anticipate a power outage when a natural disaster is about to occur. An anticipated power outage can require operating company personnel to power down the Remote Line Concentrating Module (RLCM) for the duration of the event. This action minimizes damage to the equipment and allows the operating company to bring the power back up in an ordered fashion. This section describes these procedures.

To power up the RLCM, perform the following steps:

1. Post the RLCM from the MAP terminal.
2. At the remote site, set the switch on the power converter to the ON position.
3. While you hold in the reset button on the power converter, flip the appropriate circuit breaker up. Do not hold the circuit breaker up. If you apply power to the RLCM, the circuit breaker stays in the ON position. If a problem is present with the power, the circuit breaker trips back down to the OFF position.

   Note: Repeat steps 2 and 3 for the other line concentrating module (LCM) unit.

4. Busy both LCM units.

5 List the peripheral module (PM) loads at the input-output (IO) device that you want to use to RTS the units. To perform the following action if this action was not performed during the power-up procedure, type

>DSKUT;LISTVOL volume name ALL
and press the Enter key.

or, if you load from a DMS Supernode, type

>DISKUT;LV CM;LF volume name
and press the Enter key.

where

volume name is the volume where the PM loads are found

Note: List the PM loads one time only.

6 Load the RLCM with the LOADPM command.

7 Test the RLCM.

8 Return to service the RLCM.

9 The procedure is complete.

Powering down the RLCM

CAUTION
Loss of service
Reserve this procedure for extreme conditions, like when a natural disaster is about to occur. This action results in a loss of subscriber service.

Power down the RLCM from the MAP terminal with the following steps:

1 Post the RLCM.

2 Identify the unit to power down.

3 To busy the RLCM unit, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the number of the unit to power down.

4 To remove the power from the busied RLCM unit, set circuit breaker (CB) on the FSP to OFF.

if unit to power down	Trip circuit breaker
is Unit 0	CB6
is Unit 1	CB6

5 You powered down the RLCM unit.

6 Repeat this procedure for the mate unit.

7 The procedure is complete.

Common procedures

The following sections for loading, RTS, dial tone and ringing generators present common troubleshooting procedures.

Troubleshooting a failure to load

The following procedure outlines the steps to troubleshoot a failure to load the peripheral program files for the RLCM.

1 Verify that blown fuses are not present and that power converters are powered up and supply the correct voltages.

2 Unseat the 6X51, 6X52, and 6X53 cards from unit 1. Unseat the 6X50 (slot 20 of HIE shelf), 6X73 (slot 18 of HIE shelf), and the 2X70 (slot 22 of the HIE shelf) cards.

3 Attempt to load unit 0.

4 If unit 0 fails to load, reseat the cards removed from unit 1. Unseat the 6X51, 6X52, and 6X53 cards from unit 0. Unseat the 6X50 (slot 19 of HIE shelf), 6X73 (slot 17 of HIE shelf), and the 2X70 (slot 25 of the HIE shelf) cards. Attempt to load unit 1.

5 If both units fail to load, attempt to load the PM from another device. Load from the input output controller (IOC) disk drive first. Load from the system load module (SLM). If the other two fail, load from the original PMLOAD tape.

6 Replace the 6X51, 6X52, and 6X53 cards in unit 0 and unseat the same cards in unit 1. Attempt to load unit 0.

7 If unit 0 fails, replace the 6X51, 6X52, and 6X53 cards in unit 1. Unseat the same cards in unit 0. Attempt to load unit 1.

8 If both units fail to load, replace the 6X73 (slot 17 of HIE shelf) and the 6X50 (slot 19 of HIE shelf) cards. Attempt to load unit 0.

9 If unit 0 fails to load, replace the 6X73 (slot 18 of HIE shelf) and the 6X50 (slot 20 of HIE shelf) cards. Attempt to load unit 1.

10 If both units fail to load, replace the 6X50 cards that correspond, in the host XPM.

11 Power down and unseat the 2X59, 6X74, 2X09, and 2X06 cards in the remote maintenance module (RMM) shelf. Attempt to load each unit.

12 Perform the following steps to determine if links to the RLCM are defective:

> **WARNING**
> **Possible service interruption**
> Use caution when you use PMDEBUG on a peripheral that operates. Use only the commands shown.

a. Perform a QUERYPM on the RLCM. Note the node number. Enter TRNSL C and note the XPM or RCC that hosts.

b. To PMDEBUG the host XPM, enter <pmdebug hosting XPM> (that is, pmdebug LTC 0, ...).

c. To find the internal node number, enter <mp * * * * * cp e nn 0> (where nn equals the external node number obtained from QUERYPM in step a.).

d. Enter <sp * * * * * n>. This entry accesses the signal processor new messaging level.

e. Enter <n>. This entry accesses the netlayer sublevel.

f. Enter <neta>. This entry accesses the net address sublevel.

g. Enter the internal node number obtained in step a. when the system prompts for the number.

h. Enter the unit that corresponds to the messaging link in question.

i. Note the data link number specified as open.

j. Enter <* d>. This action accesses the dl data level.

k. Enter <v dl> (where dl equals the data link number obtained in steps h and i). This action verifies you work with the proper link. The output indicates the same type PM as the remote you work with (for example, rlcm_fmt).

l. Enter <r dl> (same as step k). This displays hex values that correspond to control bytes received from the remote. (To halt this action, enter return twice.)

m. Remove the DS-1 interface card for the link at the remote end.

n. Verify hex values equal #FF. If the hex values do not equal #FF, verify that you removed the correct DS-1 interface card. Verify that you monitor the correct data link number. If these are correct, check for miswires or shorts on the link. Remove repeater cards until values equal #FF, and correct the problem. If you correct the problem, proceed to step o.

o. At the remote, loop back the link to test (transmit to receive on port) toward the host.

p. With the span looped back, verify the values equal one of the DMS-X control byte values (usually #1E). These values appear in the following table.

DMS-X control byte	Value	Meaning
MIS	#8D	May I send
SOM	#4B	Start of message
PACK	#1E	Positive acknowledgment
NACK	#55	Negative acknowledgment
EOM	#4B	End of message
ESC	#4B	Escape character

If values equal the values in the table, the link functions. If values do not equal the values in the table, the link or host equipment is defective. If values are correct, remove the loopback, verify that values equal #FF and reseat the DS-1 interface card. If values are not correct, recheck the loopback to verify the loopback looped correctly. Troubleshoot the link or switch the link with the nonmessaging link at both ends. Verify that proper hex values are present.

q. Enter <* * mp>.

r. Enter <quit>.

13 Check for bent pins behind the 6X51, 6X52, 6X53, 6X73, and 6X50 cards. Verify the connector on slot 5 of each shelf on the backplane is secure.

14 If the RLCM fails to load, SWACT the line group controller (LGC). Contact the next level of support.

Troubleshooting RTS failure

Implement the RTS FORCE command if the RLCM fails to RTS. The following procedure describes the RTS FORCE procedure.

1 Check logutil for RTS failure reasons.

2 Replace any cards on the card list given at the MAP level or in the logs.

3 Unseat the 6X51, 6X52, and 6X53 cards from unit 1. Unseat the 6X50 (slot 20 of HIE shelf), 6X73 (slot 18 of HIE shelf), and the 2X70 (slot 25 of the HIE shelf) cards. Attempt to RTS FORCE unit 0.

4 If unit 0 fails to RTS, reseat the cards into unit 1. Unseat the 6X51, 6X52, and 6X53 cards from unit 0. Unseat the 6X50 (slot 19 of HIE shelf), 6X73 (slot 17 of HIE shelf), and 2X70 (slot 22 of the HIE shelf) cards. Reload unit 1 and attempt a RTS FORCE.

5 If the RLCM returns to service (RTS), and a C-side busy (CBsy) follows, SWACT the LGC and attempt again.

6 If the RLCM RTS, and a system busy (SysB) follows, a defective 6X54 card, line car, or drawer can be present. Check logutil for a possible card list.

7 If any light-emitting diodes (LED) on the RGs illuminate, go to the procedure, Troubleshooting ringing generator problems.

8 If both units fail to RTS, contact your next level of support.

9 The procedure is complete.

Troubleshooting dial tone problems

After you power up the RLCM and one or both LCM units are in service, check the line subgroups (LSG). Verify the LSGs have dial tone. If the LSGs do not have dial tone, use the following procedure to troubleshoot the source of dial tone failure.

1 If the even line subgroups (LSG) do not have dial tone, reseat and/or replace, the 6X52 card in unit 0.

2 If the odd LSGs do not have dial tone, reseat and/or replace, the 6X52 card in unit 1.

3 If LSGs 0 to 9 do not have dial tone, verify with a voltmeter that TB1 lug 7 reads –48 V. This terminal block is on the back of the frame supervisory panel (FSP). This voltage is the talk-battery supply for these drawers. This voltage comes from the power distribution center (PDC) for this frame. Check the fuse in the PDC if the voltage is not present.

4 If LSGs 10 through 19 do not have dial tone, verify with a voltmeter that TB1 lug 8 reads –48V. This voltage is the talk-battery supply for these drawers.

5 If you do not have dial tone, contact the next level of support.

6 The procedure is complete.

Troubleshooting ringing generator problems

If one or both RGs fail, or if the LEDs on the 6X60 RGs illuminate, perform the following procedure to correct the fault.

1 Replace the ringing generator (RG) first.

Note: When you power down an RG, you remove the corresponding RLCM unit from service. When you power down RG-0, you remove unit 0 from service.

2 Remove the RA and RB fuses one shelf at a time and observe the LEDs. The RA fuse supplies ringing to the even subgroups for the correct shelf. The RB fuse supplies ringing to the odd subgroups for the correct shelf. If the LED extinguishes when you remove a fuse, proceed to step 4. If the LED does not extinguish, proceed to step 3.

3 Busy one unit at a time. Unseat the 6X51, 6X52, and 6X53 cards and watch for the cycling to stop. This action isolates the trouble to that unit. Replace the 6x51, 6x52, and 6x53 cards.

4 Reseat the cards in the unit with the problems. Begin to remove the fuses for each drawer in the shelf. Pull all three fuses (5 V, 15 V, and 48 V) for the drawer. If the cycling does not stop, replace the fuses for that drawer. Proceed to the next drawer until the cycling stops.

5 If you remove all the fuses and the cycling does not stop, more than one drawer can be defective. Remove all fuses for all drawers in the specified shelf at the same time. Replace the three fuses for each drawer and note when the cycling starts. When the cycling starts for a specified drawer, remove the fuses again and go to the next drawer. This action isolates all the drawers at fault.

6 When you isolate the drawer, insert the fuses back for that drawer (or drawers). Unplug the controller cable on the back of the line drawer. The controller cable is the center cable, labeled C and D.

7 Replace the 6X54 card in the isolated drawer and connect the controller cable back into position.

8 If the cycling continues, unseat the line cards one at a time in the suspect subgroups to locate the defective line card. Replace the line drawer if necessary.

9 Contact the next level of support.

10 The procedure is complete.

RLCM routine maintenance procedures

This chapter contains routine procedures for the remote line concentrating module (RLCM). These procedures describe preventive maintenance tasks. These procedures are for maintenance engineering and field maintenance personnel. Maintenance engineering and field maintenance personnel perform these maintenance tasks at scheduled intervals.

Inspecting spare fuse holders RLCM

Application

Use this procedure to inspect spare fuse holders for the remote line concentrating module (RLCM). Refill the fuse holders when necessary.

Interval

Perform this procedure one time every week.

Common procedures

There are no common procedures.

Action

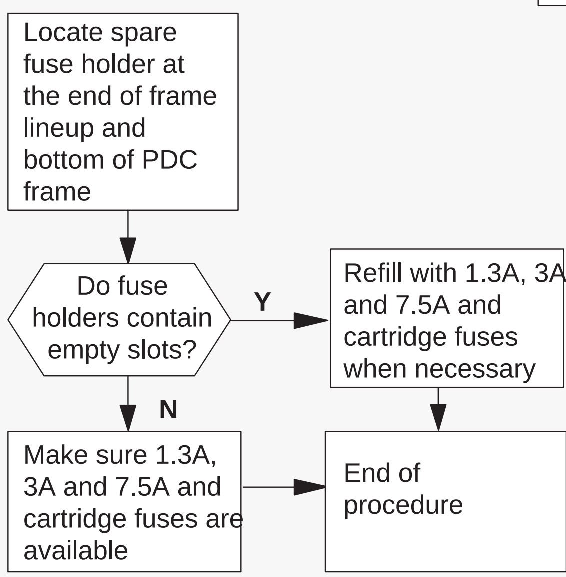
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Use the steps to perform the procedure.

Inspecting spare fuse holders
RLCM (continued)

Summary of Inspecting spare fuse holders

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



Inspecting spare fuse holders
RLCM (end)

Inspecting spare fuse holders

At the RLCM site

1 Locate the spare fuse holders at the end of the frame lineup and bottom of the power distribution center (PDC) frame.

2 Inspect the spare fuse holders.

If spare fuse holders	Do
are empty	step 3
are not empty	step 4

3 Fill the spare fuse holder with the following fuses:

- 1.3A fuses (White)
- 3A fuses (Blue)
- 7.5A fuses (Orange)
- 30 cartridge fuse (PDC only)

4 The procedure is complete.

Testing power converter voltages HIE

Application

Use this procedure to test power converter voltages for all power converters in the host interface shelf (HIE).

Interval

Perform this procedure in six month intervals.

Common procedures

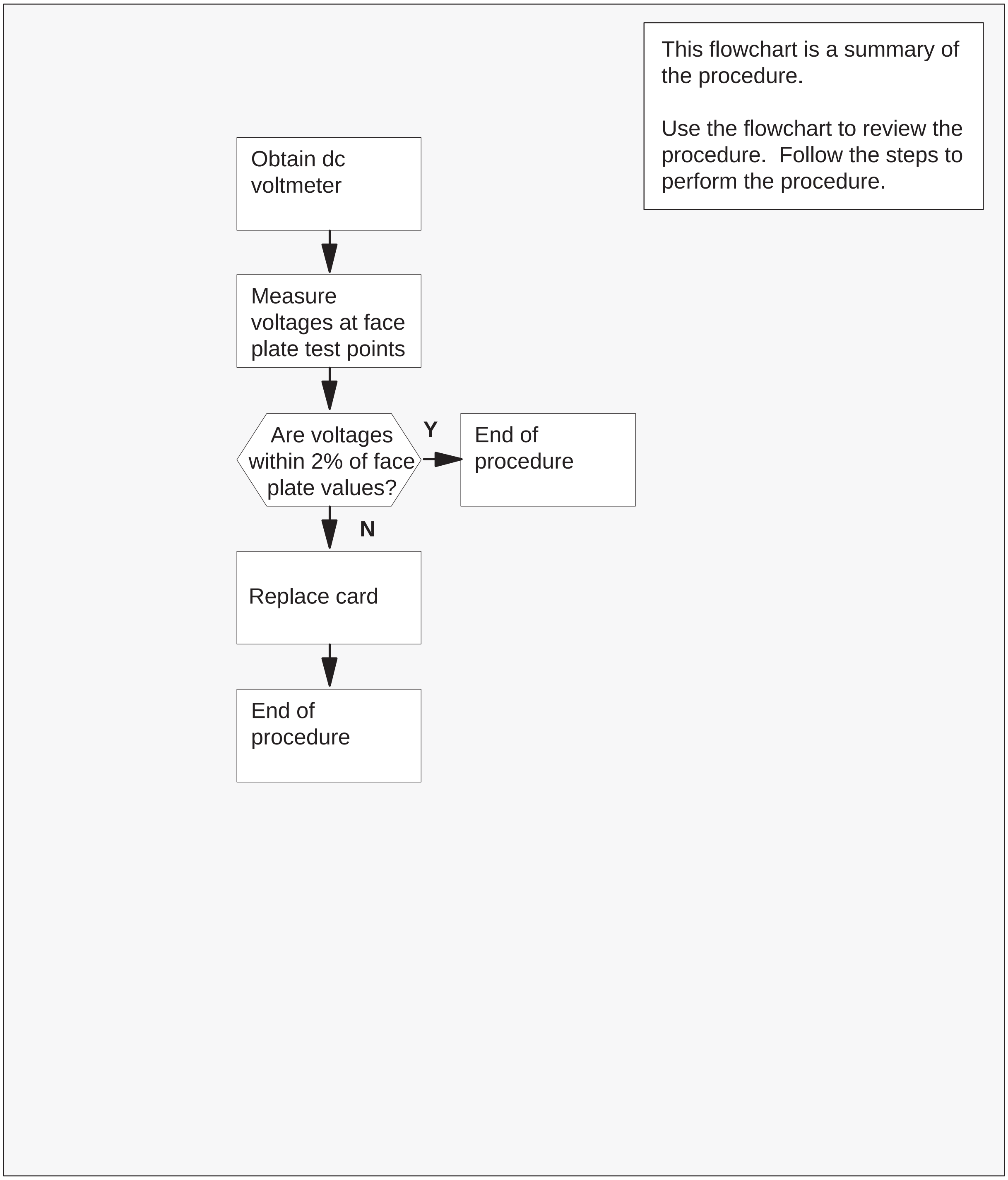
Does not apply

Action

This procedure contains a summary flowchart as an overview of the procedure. Follow the exact steps to perform this procedure.

Testing power converter voltages
HIE (continued)

Summary of Testing power converter voltages



Testing power converter voltages HIE (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 both NT2X70 power converters in the HIE shelf.

3 The voltages must be within 2% of the nominal values printed on the NT2X70 faceplate. Compare the voltages measured with the following acceptable voltage ranges:

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 *Card Replacement Procedures* directs.

When you return to this procedure, go to step 5.

5 This procedure is complete.

Returning a card for repair or replacement RLCE

Application

Use this procedure to return a circuit pack to Nortel for repair or replacement. Your location, Canada or the United States, determines the documents you must complete. You location determines to which address you must return the card.

Interval

Perform this procedure as needed.

Common procedures

Common procedures do not apply.

Action

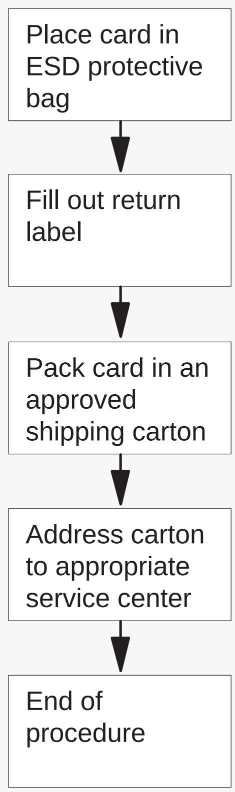
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Returning a card for repair or replacement
RLCE (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
RLCE (continued)

Returning a card for repair or replacement

At your current location

1 Place the card in an electrostatic-discharge (ESD) 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 you return. If you require 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 that you perform the following actions:

- enclose each card or assembly in packing paper
- surround each card or assembly in bubble pack or foam
- secured each card or assembly in the carton so that no card or assembly can 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 label (form 24-115) for each card or assembly that you return.

Make sure that you 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 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 RLCE (end)

If you require 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 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 in the carton so that no card or assembly can 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.

Testing wriststrap grounding cords RLCM

Application

Use this procedure to verify the resistance of the wriststrap grounding cords is at the correct level. The resistance must be low enough to allow static electricity to discharge from a person. The resistance must also be high enough to protect the wearer from electrocution if the equipment short-circuits.

Interval

Perform this procedure each month.

Common procedures

There are no common procedures.

Action

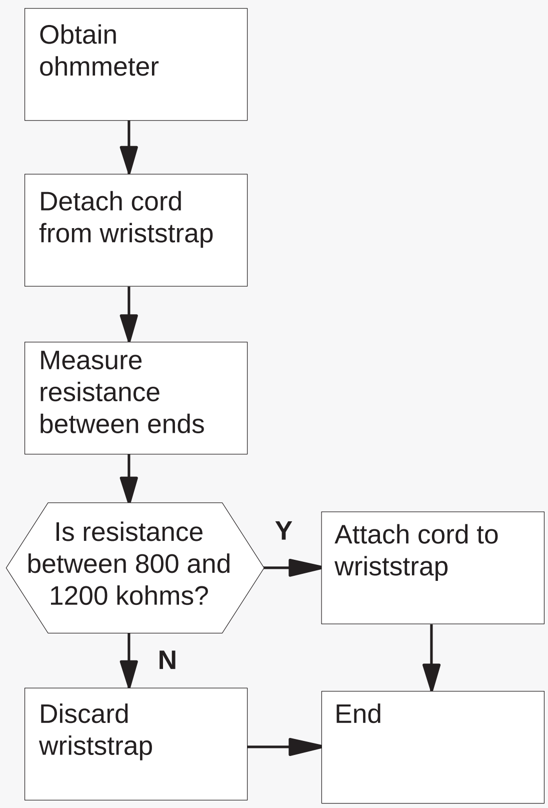
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Testing wriststrap grounding cords
RLCM (continued)

Summary of Testing wriststrap grounding cords

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



Testing wriststrap grounding cords
RLCM (end)

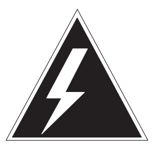
Testing wriststrap grounding cords

At your current location

1 Obtain an ohmmeter.

2

DANGER
Risk of electrocution
The grounding cord is safe to use if resistance measures higher than 800 kohms. A lower resistance exposes the wearer to the risk of electrocution if equipment short-circuits.



WARNING
Damage to electronic equipment
A grounding cord that has a resistance higher than 1200 kohms cannot conduct enough static charges to ground. The cord does not protect sensitive electronic equipment against build-ups of static charges that can cause damage.

Detach the grounding cord from the wriststrap.

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 wriststrap assembly. Assemble the wriststrap to the grounding cord. Go to step 6.

5 Discard the assembly. *Do not use the assembly.*

6 The procedure is complete.

Index

Numbers

A

C

D

E

F

H

I

L

M

N

DMS-100 Family

Remote Line Concentrating Module

Maintenance Manual

Product Documentation–Dept 3423
Nortel Networks
P.O. Box 13010
RTP, NC 27709–3010
1-877-662-5669, Option 4 + 1

Publication number: 297–8351–550
Product release: XPM12 and up
Document release: Standard 04.01
Date: August 1999
Printed in the United States of America

NORTEL NETWORKS

How the world shares ideas.