297-8381-550

DMS-100 Family

Remote Line Concentrating Module with Extended Distance Capability

Maintenance Manual

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NORTEL

NORTHERN TELECOM

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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:

- P*Alarm Clearing Procedures*
- P*Card Replacement Procedures*
- P*Operational Measurements Reference Manual*
- P*Input/Output System Reference Manual, 297-1001-129*
- P*Translations Guide*
- P*Provisioning Guide, PLN–8991–104*

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

Introduction

The Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC) is a remote peripheral that provides extended geographic coverage for the Digital Multiplex System-100 (DMS-100) switch. The RLCM-EDC is configured to operate at a distance of 1,500 to 2,000 miles from the host office with a maximum engineered one-way path delay of up to 20 milliseconds.

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

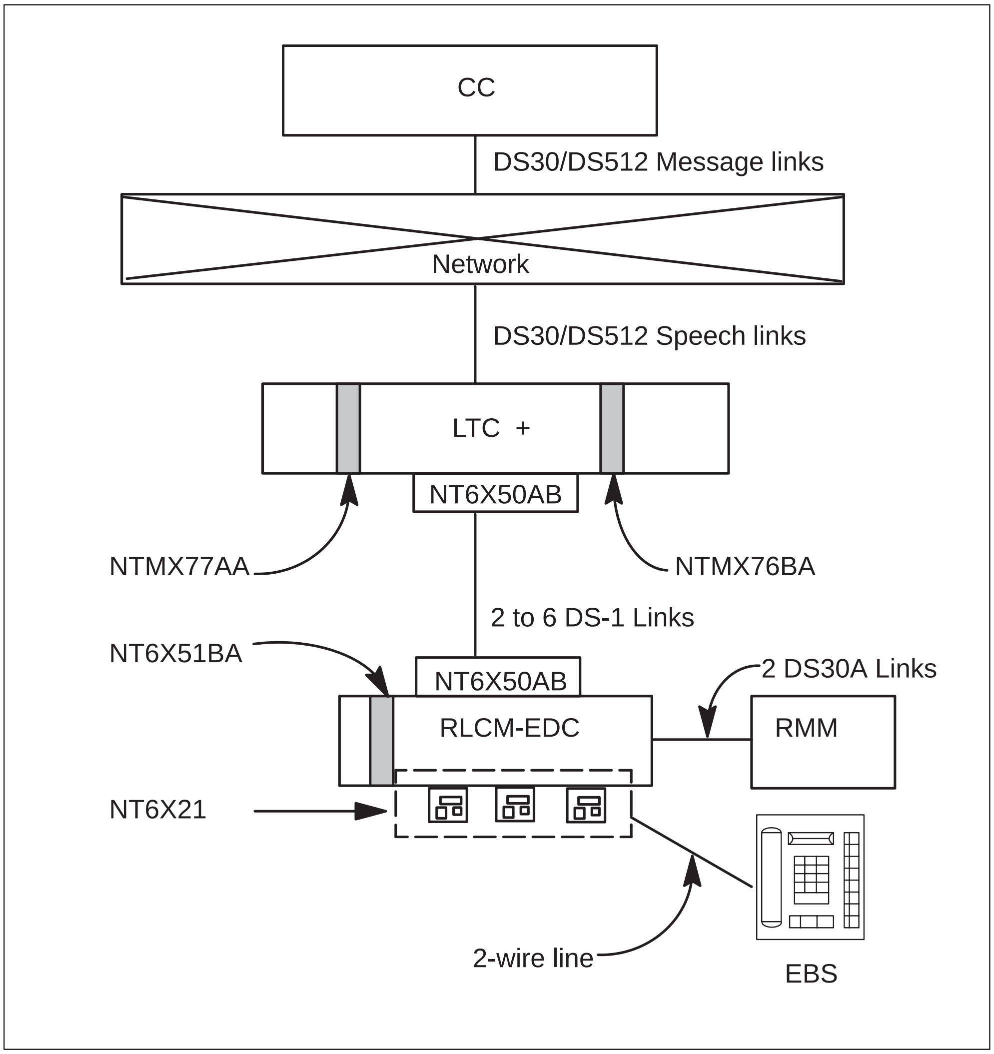
- RLCM-EDC
- DS-1 links that connect the RLCM-EDC to the host controller
- subscriber lines

Functional overview

The RLCM-EDC provides an interface for two to six DS-1 links from a Line Trunk Controller PLUS (peripheral life upgrade strategy, LTC+) and, in a non-blocking configuration, up to 140 electronic business sets (EBS) connected locally. Refer to *PLN-8991-104* for NT6X21 EBS provisioning information.

The host LTC+ is modified with an NTMX76BA card replacing the NT6X69 messaging card. The NTMX76BA is a new messaging card that supports High-level Data Link Control (HDLC), International Telecommunication Union-T Link Access Protocol on D channel (ITU-T Q.921 LAPD) to the RLCM-EDC, which is provisioned with the new NT6X51BA LCM processor card. The LTC+ and RLCM-EDC are provisioned with NT6X50AB DS-1 interface cards to support the extended super frame (ESF) transmission format. The DS-1 channels are configured for clear channel 64 kilobits per second (64 kbit/s) service using the bipolar 8-bit zero substitution (B8ZS) channel coding method. Refer to figure “RLCM-EDC to LTC+ hardware configuration” for a view of the modified peripherals.

RLCM-EDC to LTC+ hardware configuration



Hardware description

This section describes how the different hardware components of the RLCM-EDC interact for maintenance and troubleshooting. The following paragraphs describe the hardware necessary for the RLCM-EDC, NTX146AA feature package.

General configuration

The RLCM-EDC is housed in an NTNX14AA remote line controller cabinet (RLCC). The RLCC contains the following main components:

- dual-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 cabinet contains the LCM, consisting of two line concentrating arrays (LCA). The upper part of the RLCC cabinet 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. Refer to figure “RLCC cabinet, shelf, and panel arrangement” for the layout of the RLCC equipment cabinet.

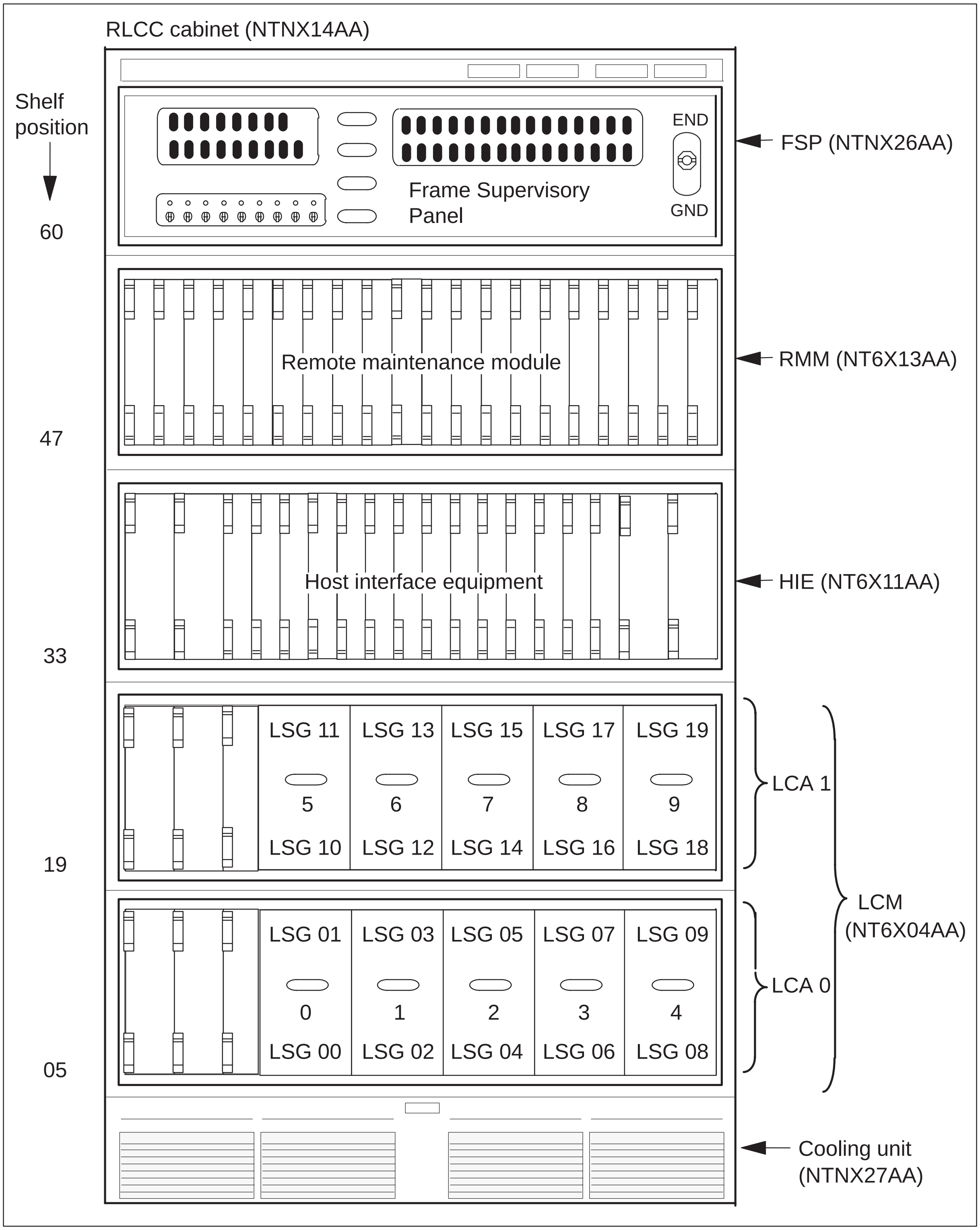
Line concentrating module

The LCM occupies shelf positions 05 and 19 of the RLCC cabinet. The dual unit LCM contains two LCA shelves. LCA-0 is always the bottom array or shelf and LCA-1 is the top array of the LCM.

Each LCA shelf is equipped with the new processor pack (NT6X51BA), digroup controller card (DCC), power converter, and five line drawers. Each line drawer connects up to 64 line card slots. The 64 line card slots are divided into two groups of 32. Each group of 32 line card slots is called a line subgroup (LSG).

The 10 line drawers and the 20 LSGs in the 2 LCA shelves are identified in the following figure “RLCC cabinet, shelf, and panel arrangement.”

RLCC cabinet, shelf, and panel arrangement



In the RLCC, the LCM connects two to six DS-1 control-side (C-side) links to its 20 line sub-groups (LSG). The following LCM components make up this interface:

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

The RLCM-EDC has a minimum of two DS-1 links because each primary link carries one message channel to the LTC+ for the LCM unit and one for the RMM. Each DS-1 link carries 24 speech channels, making possible 48 to 144 available channels. Four of these channels, are always nailed up for messaging to the host controller. Other links, up to a total of six, may be accommodated depending on traffic capacity and the concentration ratio required.

New LCM processor NT6X51BA has hardware and software capability to implement the HDLC LAP-D messaging protocol required in the extended distance capability to the controlling LTC+. The LCM processor cards are a multi-processor design that partitions the real-time critical work in the peripheral to allow higher call completion rates than the standard RLCM product.

LCA shelf configuration

The layout of the LCA shelves and line drawers of the RLCM-EDC are shown in the following figure “Line concentrating array (LCA) shelf layout.”

An LCA shelf contains the following parts:

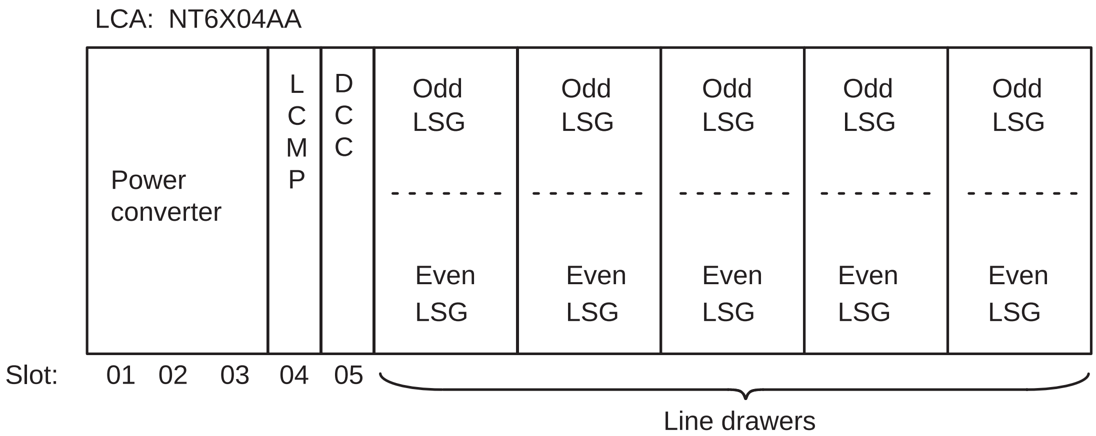
- one power converter
- one control complex
- five line drawers

Power converter card

The power converter card (NT6X53), located in slots 01–03 of the LCA, contains circuits for converting –48V office battery to regulated +5V and +15V outputs for the shelf circuitry.

Power connections to the two shelves of an LCM are arranged so that one converter can supply power to both 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	6X51BA	LCM processor card (see note)
05	DCC	6X52AA	Digroup control card
–	–	6X05AA	Line drawer
–	LSG	–	Line subgroup

Note: The NT6X51BA processor card contains two banks of flash ROM memory, 4M in each bank

LCM control complex cards

The LCM processor (LCMP) card and di-group control card (DCC) are often referred to as common cards in the LCA. In each LCA, the common cards, which are always provided. The following paragraphs describe the functions of these cards.

LCM processor card

The LCMP, NT6X51BA, located in slot 04 of each LCA shelf, has three Motorola 68302 processors running at 16.67 megahertz (MHz) each and additional resources, which are tightly coupled. The tasks required of the LCM processor pack are distributed among the different processors. The following figure, “NT6X51BA functional block diagram,” shows the following processors and their resources:

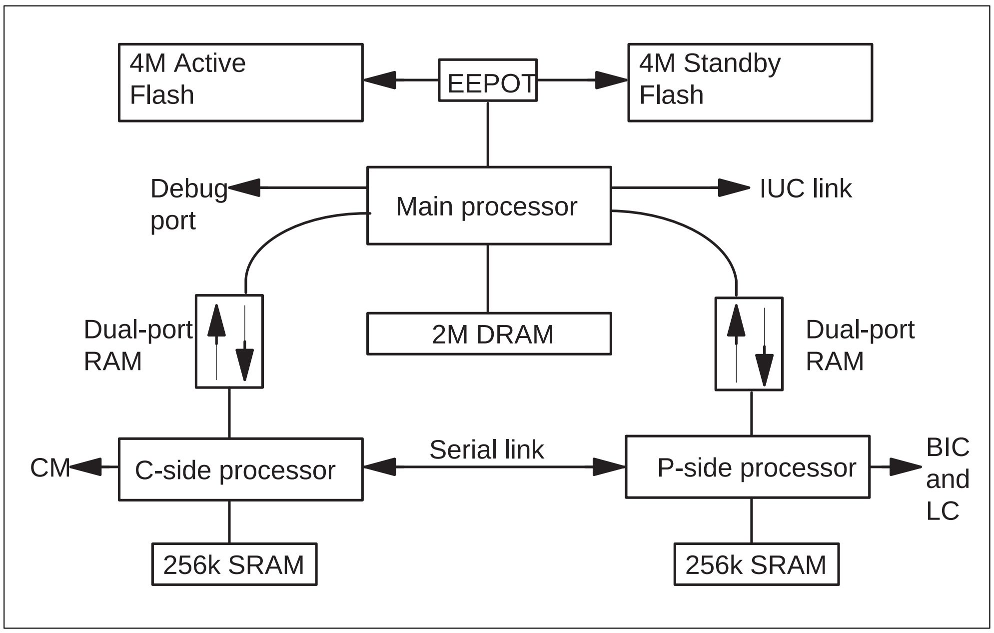
- main processor (MP)
- control side (C-side) processor (CP)
- peripheral side (P-side) processor (PP)
- miscellaneous hardware resources
- faceplate hardware resources

MP circuit resources The main processor is the controlling processor for the NT6X51BA card. Under normal operating conditions, it directly controls the LCMP activity signals, DCC timeswitch and connection memories, operation of the inter-unit communication (IUC) serial link to the mate processor, and for interfacing the debug monitor serial port. The non-volatile flash ROM space holds all executable code for the MP and reset code for the CP and PP processors. Two banks of flash ROM of 4 megabytes (4M) each are provided so the MP can actively execute code from one bank while updating the code space in the mate or standby (STBY) bank. Switch of activity between the two banks is implemented using a deterministic protocol implemented in hardware and software. The MP is the first processor released for operation after hardware reset and is responsible for configuring the other two processors (CP and PP) before releasing them to run. Each processor runs asynchronously and independently of the other two processors for maximum computing efficiency.

When a new software load is sent to the RLCM-EDC processor by the computing module (CM) the RLCM-EDC unit can remain in-service (InSv), executing code from the active bank, while the new load is being written into the STBY bank.

The NT6X51BA card contains two banks of FLASH ROM memory. Each bank can hold up to 4M of software and data. The NT6X51BA also contains a 2M bank of DRAM (Dynamic RAM). FLASH ROM devices can be reprogrammed multiple times. The two banks of FLASH ROM are configured so that only one FLASH ROM bank is active at any one time. An electrically erasable potentiometer (EEPOT) determines which bank is active. The logic on the board does not allow the active bank to be erased or reprogrammed. Only the standby bank can be erased and reprogrammed. This allows the RLCM-EDC to be downloaded while in service. As seen in the following diagram

NT6X51BA processor configuration



CP circuit resources The CP transfers message packets from the DMS host carried by C-side message links to the MP. The CP uses the HDLC (LAPD Q.921) protocol for the C-side message channel. Bus accesses into the DCC are arbitrated between the MP and CP processors since there is only one processor bus interface implemented on the NT6X52 DCC pack.

PP circuit resources The PP transfers message packets from line drawer bus interface card (BIC) circuits across receiver control (RCON) and transmit control (TCON) serial message links.

Miscellaneous hardware resources The NT6X51BA card contains the following miscellaneous hardware functions that are not part of any processor circuit:

- power rail input circuit

- C-side clock receiver and monitor circuit

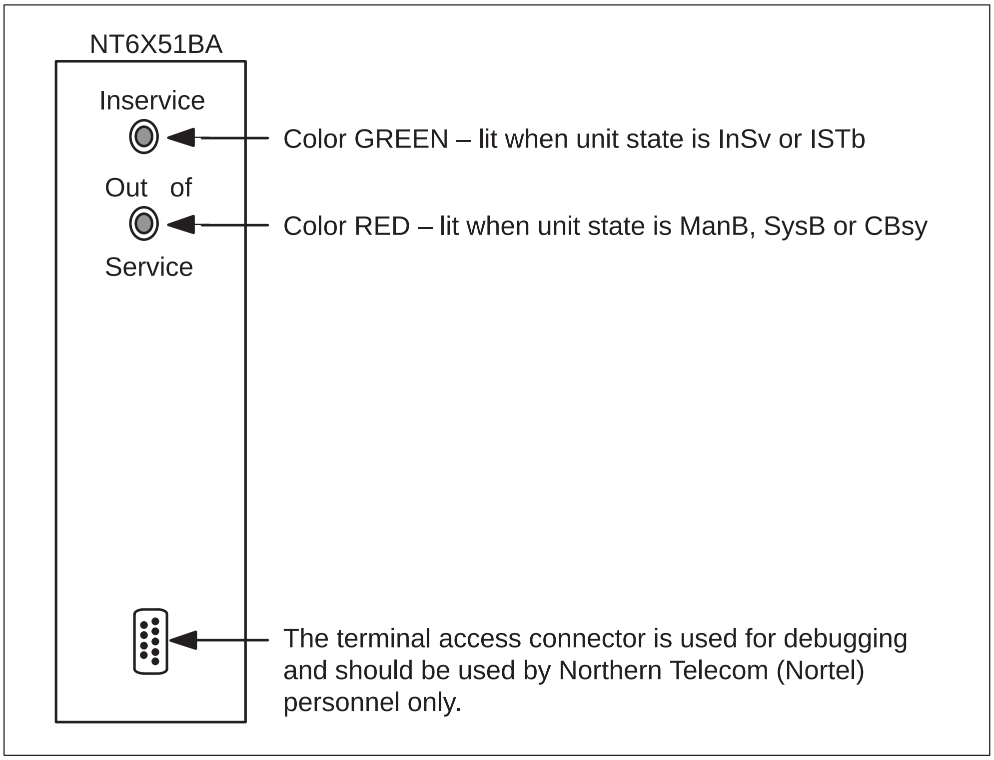
A voltage controlled crystal (VCC) filter circuit attenuates the impact of both voltage and current changes on the 5-V power input to the card.

Faceplate hardware resources The NT6X51BA has the following sets of resources on its faceplate:

- activity status light emitting diodes (LED)
- terminal access connector

The following figure shows NT6X51BA hardware resources.

NT6X51BA faceplate hardware resources



The activity status has two LEDs, one GREEN the other RED. When the GREEN LED is lit, the LCM processor is in an active In-Service (InSv) or In-Service-Trouble (ISTb) state. When the RED LED is lit, the LCM processor is in an Out-of-Service (OOS) state, either manual-busy (ManB), system-busy (SysB) or central-side busy (CBsy).

The terminal access connector provides low-level debug monitor access to monitor the operation on the LCM processor software. This function is a debugging tool only and the information provided through this port is raw data pulled directly from operating software memory areas. This port should be accessed by Nortel personnel only.

Interfaces

This section describes the following NT6X51BA interfaces:

- external
- internal
- inter-unit communication link

External interfaces The NT6X51BA LCM processor has electrical connections with the following hardware elements in the RLCM-EDC remote peripheral interfaces:

- the mate NT6X51BA LCM processor pack through the IUC link and operational status signals
- the NT6X52 DCC, through a parallel processor bus
- the NT6X53 power supply, which provides operational status signals and relay multiplex control signals for the ringing bus multiplexer on the power supply pack
- each NT6X54 BIC in the line drawers: a LCM processor activity status signal and a RCON / TCON serial message link
- external debug monitor terminal devices providing RS—232 TXD and RXD signals with asynchronous character transmission rates of 9600 bit/s

Internal LCM wiring interfaces do not change with the implementation of the NT6X51BA LCM processor. Likewise, RLCM-EDC peripheral module cabinet wiring does not change because of the implementation of the EDC feature hardware.

Internal interfaces A shared memory buffer is used between the MP and each of the of the two front end processors for interprocessor message packet exchanges.

Inter-unit communication (IUC) link interface The IUC is a bidirectional serial data communication link between the two NT6X51BA LCM processors that send and receive information to and from the mate unit. In addition to the two serial data signals, each processor provides activity status to its mate processor. This link also sends and receives load records to and from the mate unit (mate loading and updating).

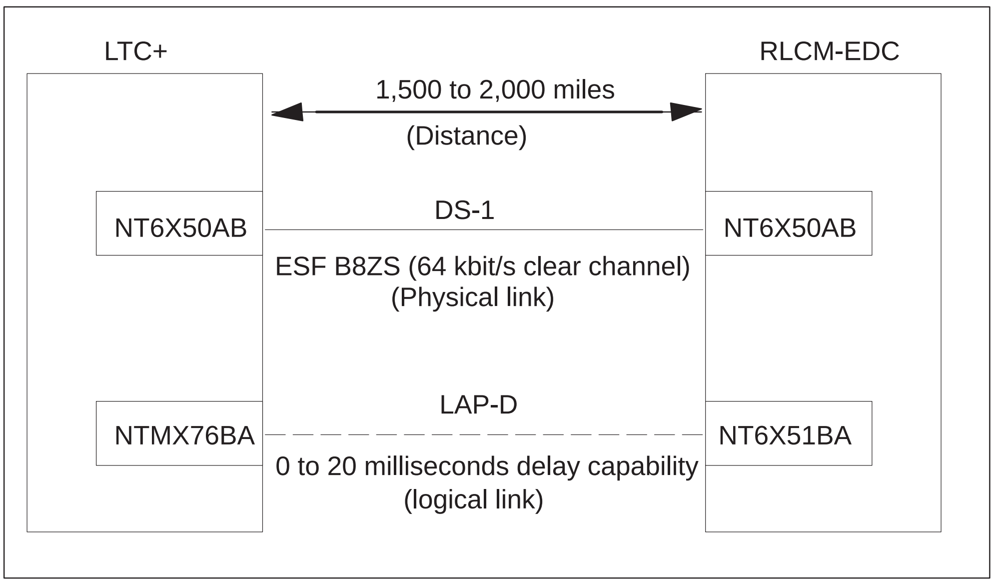
Delay tolerant C-side messaging

The RLCM-EDC uses the LAPD protocol, the International Telecommunications Unit (ITU) standard Q.921, as the data link layer. This is an HDLC-based protocol and through the use of sliding-window protocols allows communications over long distances and large propagation times as much as 20 milliseconds, one-way.

The LTC+ for RLCM-EDC is modified to implement HDLC LAPD messaging to subtending remote LCM processors while maintaining use of the DMS-X protocol to other subtending processors such as the Remote Maintenance Module (RMM) processor. Both data link protocols are supported simultaneously.

The LTC+ and RLCM-EDC interface to DS-1 facilities formatted in extended super frame (ESF) transmission format (24 frames). The DS-0 channels in these DS-1 facilities are configured for 64-kbit/s clear channel data using bipolar 8-bit zero substitution (B8ZS) channel coding method, as shown in the following figure.

LTC+ to RLCM-EDC HDLC message interface

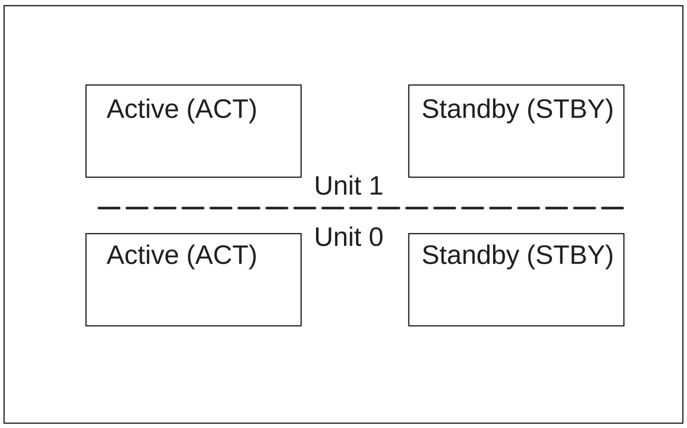


The NTMX76BA messaging card has the following message protocol termination capabilities:

- 32 HDLC link termination ports
- 127 DMS-X link termination ports

New load sources for the LOADPM command An RLCM-EDC contains two banks of flash ROM with 4M capacity each. Each bank can contain a complete RLCM-EDC load. The bank being used by the processor is the active bank and is in the active mode. The other bank is the standby bank and is in the standby mode. The following figure shows the flash ROM bank configurations.

Flash ROM memory bank load configurations



Flash ROM banks affect the loading of the RLCM-EDC unit as follows:

- InSv loading capability

  The RLCM-EDC units can be loaded while they are InSv. Normal call processing functions of a unit can continue while a new load is being downloaded to the unit in its STBY bank.

- faster recovery

  The RLCM-EDC can recover faster from catastrophic outages because a backup (STBY) load is available in each unit.

- flexible loading strategies

  The RLCM-EDC provides flexible loading options and offers operating company personnel complete control of loads in each flash ROM bank.

Commands

This section addresses the following commands associated with RLCM-EDC:

- LOADPM
- BSY
- RTS
- SWLD
- QUERYPM
- TST

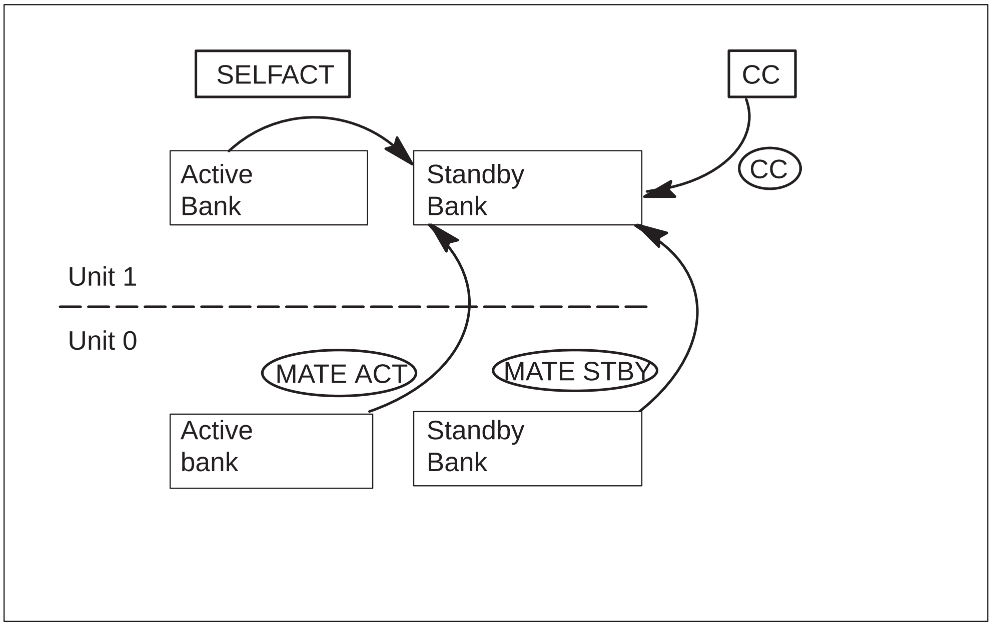
LOADPM command The LOADPM command is used to send a load to the flash ROM bank in an RLCM-EDC. This command can be performed on an in-service (InSv) or out-of-service (OOS) RLCM-EDC unit. The load sent to a unit is always downloaded into the bank that is in standby mode at the time. During an InSv download, the processor of the unit continues its call processing functions executing the load in the active bank. Once the download is complete, the new load in the standby bank remains dormant until activated manually or by the system.

The system initiated activation of a standby bank will occur only during attempts to recover from catastrophic failures in the RLCM-EDC. Manual activation of the load in the standby bank requires operating company personnel to enter a command at the MAP display terminal. The RTS command with the switch load (SWLD) option is used when activating the load in an OOS unit. The new SWLD command, positioned at menu item number 13, is used when activating the load in an InSv unit. During activation of the new load, the processor of the RLCM-EDC unit switches the active bank to a standby state and starts executing the load in the newly active (previously standby) bank.

When a unit of the RLCM-EDC is loaded and the load is activated, the standby bank contains the old (previously active) load until operator company personnel choose to manually load the standby bank with another software load. This feature is useful when an operating company is upgrading the RLCM-EDC to a new release of the software load. During the upgrade the operating company may choose to retain the old load until they are satisfied with the quality of the new software load. Operating company personnel can, at any time, load the standby bank with the same load as the active bank. This provides redundancy of loads in the RLCM-EDC and is beneficial in the event of catastrophic load failures of the active bank.

New options are added to the LOADPM command to make use of the sophisticated architecture of the LCM processor card. To simplify the number of outcomes resulting from a LOADPM command, based on the combinations of its options. The SOURCE option of the LOADPM command is changed from an optional to a required parameter. The following figure shows load sources for the RCLM-EDC

Load sources for the RLCM-EDC



The destination of the load in an RLCM-EDC unit is always the standby bank, although multiple sources for the load are available. These options give operating company personnel full control of the source for loading a unit. Options ACT and STBY are suboptions to the existing MATE option, these new suboptions allow operating company personnel to specify the bank of the mate unit to be used for loading. Option SELF ACTIVE (SELFACT) copies the load from the ACT bank into the STBY bank of the same unit.

The source CC (central control) is unchanged, however the new option, SELFACT is added as shown in the following table, “Load sources for the RLCM-EDC.” New options ACT, STBY and SELFACT apply only to RLCM-EDC nodes.

Load sources for the RLCM-EDC

Parameter	Value	Description
Source	CC, MATE, SELFACT	The SOURCE parameter is a required parameter. Functionality of the command with a source value of CC remains unchanged. When the MATE option is used without specifying the BANK parameter, the command defaults to STBY. This means the STBY bank of the mate will be used as the source for the load. SELFACT is an acronym for SeLF ACTive. When the source option is set to SELFACT, the active bank of the unit being loaded is the source for the load. The contents of the active bank are copied over to the standby bank of the unit being loaded.
Bank	ACT, STBY	The BANK parameter is optional and is used only by RLCM-EDC nodes. When used with the MATE option, this parameter specifies the bank of the mate to use as the source for the load. This parameter is ignored by all other LCM variants using the 64K/256K processors.

The following response is observed on the successful completion of a LOADPM command when performed on an InSv or OOS unit.

>LOADPM UNIT 1 CC

Example of MAP response

```
LCM REM1 0 0 Unit 1 loadPM Passed.
```

When the source option used is SELFACT, the active bank of the unit being loaded is the source for the load. The contents of the active bank are copied into the STBY bank of the same unit.

>LOADPM UNIT 1 SELFACT

Example of MAP response

```
LCM REM1 0 0 Unit 1 loadPM Passed.
```

Loading continues while the prompt is returned to operating company personnel when the NOWAIT option is used, such as in the following example.

>LOADPM UNIT 1 CC NOWAIT

Example of MAP response

```
LCM REM1 0 0 Unit 1 Request Submitted.
```

LOADPM command error messages The following responses are observed when an attempt is made to load an RLCM-EDC LCM or unit and fails.

The following response is observed for the LOADPM command when performed on a unit that has a mate unit OOS. Operating company personnel must RTS the OOS unit and retry the LOADPM command with the MATE option. When the specific bank to load from is not included in the command, the system defaults to the STBY bank of the mate unit.

>LOADPM UNIT 1 MATE ACT

or

>LOADPM UNIT 1 MATE STBY

or

>LOADPM UNIT 1 MATE

Example of MAP response

```
 LCM REM1 0 0 Unit 1     Request Invalid
                 Mate unit must be InSv/ISTb for mate load
```

The following response is observed for the LOADPM command when the mate unit is OOS and the ACT option is used. When this response is observed, operating company personnel must RTS the OOS unit then execute the LOADPM command with ACT option.

>LOADPM UNIT 1 ACT

Example of MAP response

```
 LCM REM1 0 0 Unit 1     Request Invalid
                   Unit must be InSv/ISTb for ACT option.
```

The following response is observed for the LOADPM command when the mate unit is OOS and the SELFACT option is used. When this response is observed, operating company personnel must RTS the OOS unit then execute the LOADPM command with the SELFACT option.

>LOADPM UNIT 1 SELFACT

Example of MAP response

```
LCM REM1 0 0 Unit 1     Request Invalid
                Unit must be InSv/ISTb for SELFACT option
```

The following response is observed for the LOADPM command when the SELFACT option is performed on a SMEM (64K/256K) LCM. The operating company personnel must retry the command without the SELFACT option.

>LOADPM UNIT 1 SELFACT

or

>LOADPM PM SELFACT

Example of MAP response

```
SELFACT option invalid. See HELP LOADPM
```

The LOADPM command takes significantly longer to complete on RLCM-EDC nodes compared to existing LCM nodes, due to the size of the new software load for the RLCM-EDC product.

Limitations

The following limitations must be ahered to when using the `LOADPM` command for an RLCM-EDC:

- The loadfile name is obtained from table LCMINV when the load source specified is CC. This is overridden when the name of the loadfile is provided as a parameter of the command string.
- When the specified load source is MATE, the load is obtained from either the active or standby bank of the mate unit, depending on the suboption used, `ACT` or `STBY`.
- The `LOADPM` command with `MATE` option defaults to the `STBY` bank if no suboption is specified.
- When the specified source is `SELFACT` and the unit is InSv, the contents of the active bank are copied into the standby bank of the same unit.
- The `NOCHECK` option is not valid for the RLCM-EDC.

- The `PM` option can only be used if both units are in the same state such as, InSv, ISTb or ManB. If the LCM being loaded has two different states such as, one unit InSv and one unit OOS, the operating company personnel must use the `UNIT` option and load each unit separately.
- If one unit of the RLCM-EDC is performing a `MATE` load, the other unit cannot perform any loading functions.

BSY command Option smaller memory (SMEM) is used with the option `ALL` prior to parallel loading a set of posted LCMs. This command option allows operating company personnel to take advantage of the InSv loading feature of the RLCM-EDC when loading multiple LCMs. A load operation on multiple existing LCMs require the units being loaded to be in a `ManB` state. The BSY command used with option `ALL` sets the LCM units in the `ManB` state. Using the existing command `BSY ALL` places all posted LCM units, including RLCM-EDC units, into a `ManB` state. It is not necessary to busy the RLCM-EDC units for loading. When option `SMEM` is used with option `ALL`, only non-RLCM-EDC units (64K/256K) of the posted set are placed in the `ManB` state. Operating company personnel can issue the command shown in the following example of a MAP display and load the posted set, which can include both existing LCMs and RLCM-EDCs.

> **ATTENTION**
> The BSY command will remove a unit or whole PM from service and should be executed during periods of low traffic.

>BSY UNIT 0 ALL SMEM

Example of MAP response

```
This operation will be performed on 2 LCMs.
Please confirm (“YES”,“Y”,“NO”,“N”):.

>Y

LCM HOST 01 0 Unit 0  Calls On Unit May Be Affected
Please confirm (“YES”, “Y”, “NO”, or “N”):

>Y

LCM REM1 01 0 Unit 0 Request not submitted:Not an SMEM LCM
LCM HOST 02 0 Unit 0 Bsy passed

Summary:
1 Passed.
1 not submitted
```

The following MAP display response is observed when the BSY command is executed with the ALL option but not the SMEM suboption.

>BSY UNIT 0 ALL

Example of MAP response

```
This will cause ALL LCMs in the posted set to be busied.
The SMEM option of the BSY command should be
used if loading the 4M LCMs in-service is desired.
This operation will be performed on 2 LCMs.
Please confirm (“YES”,“Y”,“NO”,“N”):.
>Y
LCM REM1 01 0 Unit 0 Bsy passed
LCM HOST 02 0 Unit 0 Bsy passed

Summary:
2 Passed.
```

Options of the BSY command and their descriptions are listed in the following table, “Options of the BSY command,” as they relate to the RLCM-EDC product.

Options of the BSY command

Command	Parameter	Description
BSY	ALL	Busy all PMs or units currently posted at the PM level of the MAP display in the posted set.
BSY	SMEM	This option is intended for use with the ALL option when preparing to parallel load a set of LCMs (64K, 256K). The command busies the 64K and 256K LCMs but leaves the 4M LCMs InSv.

RTS command The RTS command retains all existing functionality. The new options SMEM and SWLD are added to the RTS command to return to service only the smaller memory (64K/256K) LCMs and activate new loads in 4M LCMs. The SMEM option is applicable only when option ALL is used. The following response is observed when the RTS command is used with options ALL and SMEM.

>RTS UNIT 0 ALL SMEM

Example of MAP response

```
This operation will be performed on 2 LCMs.
Please confirm (“YES”,“Y”,“NO”,“N”):.
>Y
LCM HOST 02 0 Unit 0  Calls On Unit May Be Affected
Please confirm (“YES”, “Y”, “NO”, or “N”):
>Y

LCM REM1 01 0 Unit 0 Request not submitted:Not an SMEM LCM
LCM HOST 02 0 Unit 0 Bsy passed

Summary:
1 Passed.
1 not submitted
```

The RTS command, without any options, is used to RTS a unit or whole PM using the load in the active bank. If the unit or PM fails to RTS the operating company personnel can retry the RTS command with the SWLD option.

>RTS UNIT 0

Example of MAP response

```
LCM REM1 01 0 Unit 0 Invalid Active load.
                     Use QueryPM to check loads.
```

The SWLD option is added to the RTS command to activate new loads in the STBY bank of the specified unit or whole PM. The SWLD option is applicable only to RLCM-EDC nodes. The SWLD option is valid only when the unit or LCM is in a ManB state.

>RTS UNIT 0 SWLD

Example of MAP response

```
LCM REM1 01 0 Unit 0 Invalid Standby load.
                     Use QueryPM to check loads.
```

RTS command error messages The RTS command rejects any attempt to return to service a unit which has an invalid load in the active and standby banks. A new response is generated when attempting to RTS a RLCM-EDC unit which has an invalid load in the active and standby banks. When this response is observed the operating company personnel can try the RTS command with the SWLD option. If the same response is obtained for the SWLD option also, the operating company personnel will have to load the unit with a valid load using the LOADPM command. After loading, the unit can be returned to service with the RTS SWLD command.

The following response is observed when an attempt is made to RTS an RLCM-EDC unit with an invalid load in the active bank.

>RTS UNIT 0

or

>RTS UNIT 0 SWLD

Example of MAP response

```
LCM REM1 01 0 Unit 0 Invalid Active load.
                    Use QueryPM to check loads.
```

The following table, “Options of the RTS command,” describes RTS command options as related to the RLCM-EDC product.

Options of the RTS command

Command	Option	Description
RTS	ALL	This option allows operating company personnel to execute the RTS command on a set of posted LCMs.
RTS	SMEM	This option is use with the ALL option when preparing to RTS a set of posted LCMs (64K, and 256K). The command returns to service the 64K and 256K LCMs but leaves the 4M LCMs in their current state.
RTS	SWLD	This option is used to activate a new load in the STBY bank following the successful completion of the LOADPM command on an OOS unit.

SWLD command The SWLD command is a new command available at the LCM level of the MAP display menu in position 13 and is applicable only to RLCM-EDC nodes. When this command option is used on an InSv node, it places the RLCM-EDC in a simplex mode for a short period of time. A warning is displayed at the MAP terminal and operating company personnel are prompted to confirm the command with an option to reject the commands execution if desired.

When used on an InSv node with option UNIT, as shown in the following example of a MAP display. The SWLD command places the LCM in the takeover mode and the specified unit in an OOS mode and internally switches the ACT and STBY flash ROM banks. It brings the unit back to an InSv state, executing the new load in the newly active (previously STBY) bank. When used with option PM on an InSv node, the command repeats the sequence for both units in succession.

> **ATTENTION**
> The SWLD command will remove a unit from service creating non-duplex operation. This command should be executed during periods of low traffic.

>SWLD UNIT 0

Example of MAP response

```
Existing loads: Unit 0: Act:REDC01AA    Stby:REDC02AB
New loads after a successful SWLD will be:
Unit 0: Act:REDC02AB    Stby:REDC01AA
Please confirm (“YES”,“Y”,“NO”,“N”):.
Y.
LCM REM1 01 0 Unit 0 SWLD passed.
```

The SWLD command when issued with a UNIT option first checks to see if the mate unit is in service. The command is rejected if executed on an InSv unit which has a OOS mate unit, as seen in the example below. To execute the SWLD command on an InSv unit of a simplex node, use the RTS command on the OOS unit. After successful completion of the RTS command, operating company personnel can use the SWLD command with the unit option.

>SWLD UNIT 1

Example of MAP response

```
LCM REM1 01 0       Unit 1  Request Invalid
                Mate unit must be either InSv or ISTb
```

The ALL option is used to execute the command on a set of posted LCMs. The set may include LCMs of different types (64K, 256K, 4M). The command however executes only on 4M LCMs.

>SWLD UNIT 0 ALL

Example of MAP response

```
This operation will be performed on 2 LCMs.
This operation will not be performed on 1 LCM.
Please confirm (“YES”,“Y”,“NO”,“N”):.

Y.

LCM REM1 01 0 Unit 0 SWLD Passed
LCM REM2 01 0 Unit 0 SWLD Passed
Summary:
2 Passed.
1 Unaffected..
```

When option NOWAIT is used, the prompt is returned to operating company personnel while continuing to execute the command on the posted LCM.

>SWLD UNIT 0 NOWAIT

Example of MAP response

```
Existing loads: Unit 0: Act:REDC01AA    Stby:REDC02AB
New loads after a successful SWLD will be:
Unit 0: Act:REDC02AB    Stby:REDC01AA
Please confirm (“YES”,“Y”,“NO”,“N”):.
Y.
LCM REM1 01 0 Unit 0 Request Submitted.
```

SWLD command error messages The following responses are observed when an attempt is made to SWLD an RLCM-EDC LCM or unit and fails.

The following response is observed when an attempt is made to SWLD an RLCM-EDC unit with invalid loads in both the active and standby banks.

>SWLD UNIT 0

Example of MAP response

```
LCM REM1 05 0: Request Invalid
               Invalid active and standby loads in Unit 0
               LOAD the standby bank and then SWLD the unit.
```

The following response is observed when an attempt is made to SWLD an RLCM-EDC unit with an invalid load in the active bank.

>SWLD UNIT 0

Example of MAP response

```
LCM REM1 05 0: Request Invalid
               Invalid active load in Unit 0
               SWLD the unit.
```

The following response is observed when an attempt is made to SWLD an RLCM-EDC unit with an invalid load in the standby bank.

>SWLD UNIT 0

Example of MAP response

```
LCM REM1 05 0: Request Invalid
               Invalid standby load in Unit 0
               load the standby bank of the unit.
```

The following response is observed when an attempt is made to SWLD a non-RLCM-EDC unit.

>SWLD UNIT 0

Example of MAP response

```
LCM HOST 05 0 Unit 0: Request Invalid
               LCM MEMSIZE must be 4M in table LCMINV
```

The following response is observed when an attempt is made to SWLD an RLCM-EDC unit and the system is unable to check the loadnames from the LCM unit

Example of MAP response

>SWLD UNIT 0

```
WARNING: Could not retrieve the loadnames.
```

The following table, “Options of the SWLD command,” lists parameters and options for the SWLD command.

Options of the SWLD command

Parameter	Value	Description
DEVICE	UNIT, PM	The SWLD command is used on a unit or whole PM as determined by the device option.
NOWAIT	NOWAIT	When the SWLD command is used with the option NOWAIT, a prompt is returned to operating company personnel while continuing to execute the command.
ALL	ALL	This option allows operating company personnel to execute the SWLD command on a set of posted RLCM-EDCs.

QUERYPM command Output for the QUERYPM command is different for a RLCM-EDC as compared to an existing SMEM LCM. The command functionality remains unchanged for existing smaller memory (64K and 256K) LCMs, as seen in the example below.

>QUERYPM

Example of MAP response

4M LCM

```
PM Type: LCM  Int. No.: 9  Status index: 7  Node_No: 40
LCM REM1 02 0  Memory Size – Unit 0: 4M , Unit 1: 4M
ESA equipped: No, Intraswitching is Off
Loadname: LCMINV – REDC07AA
Unit0 Loads: Act– REDC07AB Stby– REDC07AA
Unit1 Loads: Act– REDC07AB Stby– REDC07AA
REX is ON; INCOMPLETE on SAT. 1995/10/28 at 01:35:19
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  K03  RLCM 02   04  LCM  02 0              6X04AA
Services : NEUTRAL
```

or

SMEM LCM

```
PM Type: LCM  Int. No.: 7  Status index: 4  Node_No: 104
Memory Size – Unit 0: 256K , Unit 1: 256K
ESA equipped: NO, Intraswitching is OFF
Loadnames: LCMINV – LCM01D  , Unit0: LCM01D  , Unit1: LCM01D
LCM HOST 00 0 is included in the list of LCM types
  scheduled for a REX test.
REX on LCM HOST 00 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Status: {OK, FALSE}              /RG: 1
Unit 1 Status: {OK, FALSE}              /RG: 1
Ring Generator Status:
     RG 0 Status: {OK}           Standby
     RG 1 Status: {OK}           Preferred
     RG in Overload : NO
 Site Flr RPos  Bay_id   Shf  Description    Slot     EqPEC
 NCSU  01  B01  RLCM 00   04  LCM  00 0                6X04AA
Services : NEUTRAL
```

The QUERYPM command displays information about the posted RLCM-EDC. The output indicates that the memory sizes of the two units as `4M`. The MAP display also includes the loadfile names contained in the ACT and STBY banks of flash ROM of each unit. The `QUERYPM` command, used without options, does not output any loadfile information for out-of-service (OOS) units. To obtain loadfile information from a ManB unit or PM, the QUERYPM with OOS option must be used, as seen in the example below. The OOS option is valid for a ManB state only, it is not valid for states of SysB or Cbsy.

If the standby bank has a corrupt load, the response to QUERYPM indicates a **FLT** for the bank with the corrupt load. This causes the unit with the corrupt load to be set to a state of ISTb. The LCM audit fails the load test on a bank with a corrupted load. The CM generates a log report to alert operating company personnel of the situation. They can choose to reload the standby bank of ISTb unit or take other action. In the follow example, unit 1 of the RLCM-EDC has a corrupt load in the STBY bank causing an ISTb state for the LCM portion of the RLCM-EDC.

Example of MAP response

```
>QUERYPM
PM Type: LCM  Int. No.: 9  Status index: 7  Node_No: 40
LCM REM1 02 0  Memory Size – Unit 0: 4M , Unit 1: 4M
ESA equipped: No, Intraswitching is Off
Loadname: LCMINV – REDC07AA
Unit0 Loads: Act– REDC07AB Stby– REDC07AA
Unit1 Loads: Act– REDC07AB Stby– REDC07AA *FLT*
REX is ON; INCOMPLETE on SAT. 1995/10/28 at 01:35:19
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  K03  RLCM 02   04  LCM  02 0             6X04AA
Services : NEUTRAL
```

or

```
>QUERYPM  OOS
PM Type: LCM  Int. No.: 9  Status index: 7  Node_No: 40
LCM REM1 02 0  Memory Size – Unit 0: 4M , Unit 1: 4M
ESA equipped: No, Intraswitching is Off
Loadname: LCMINV – REDC07AA
Unit0 Loads: Act– REDC07AB Stby– REDC07AA
Unit1 Loads: Act– REDC07AB Stby– REDC07AA
REX is ON; INCOMPLETE on SAT. 1995/10/28 at 01:35:19
Node Status: {MAN_BUSY, FALSE}
Unit 0 Status: {MAN_BUSY, FALSE}
Unit 1 Status: {MAN_BUSY, FALSE}
Site Flr RPos  Bay_id   Shf  Description   Slot    EqPEC
REM1  01  K03  RLCM 02   04  LCM  02 0             6X04AA
Services : NEUTRAL
```

The QUERYPM command with the CNTRS option displays the values of various counters that are specific to the transmission protocol being used between the LCM and the C-side LTC+. The RLCM-EDC communicates with the LTC+ using LAP-D protocol over DS-1 links. When performed with a RLCM-EDC posted on the MAP, the QUERYPM CNTRS command displays the following values of counters specific to the LAP-D protocol.

- FrmSendCnt
- FrmReSendCnt
- FrmRcvCnt
- ErrInvalidFrmSizeCnt
- Receipt Unsolicited Response
- Peer Initiated Reestablishment
- Unsuc. Retransmissions

- Misc. Cside Link Errors
- IUC FrmSendCnt
- IUC FrmReSendCnt
- IUC FrmRcvCnt
- IUC ErrInvalidFrmSizeCnt
- IUC Receipt Unsolicited Response
- IUC Peer Initiated Reestablishment
- IUC Unsuc. Retransmissions
- Misc. IUC Link Errors

Example of MAP display

>QUERYPM CNTRS

```
Current Message Thresholds ade...
   Unsolicited:     Unit 0 = 1, Unit 1 = 1 (limit = 200)
   Data:        Unit 0 = 0, Unit 1 = 0 (limit = 10)
   Swerr:       Unit 0 = 0, Unit 1 = 0 (limit = 50)
   Fault limit = 1

            UNIT 0  UNIT 1      |           UNIT 0  UNIT 1
   FRAMSEND      0       0|     IFRMSEND         0       0
   FRMRSEND      0       0|     IFRMRSND         0       0
   FRAMRECV      0       0|     IFRMRECV         0       0
   INVFRMSZ      0       0|     IINFRMSZ         0       0
   RCVUSRSP      0       0|     IRCVURSP         0       0
   PEERREES      0       0|     IPEERRES         0       0
   UNSUCRET      0       0|     IUNSCRET         0       0
   CLINKERR      0       0|     ILINKERR         0       0
```

Options of the QUERYPM command

Parameter	Value	Description
FLT	FLT	This option reports fault reasons when the unit being queried is ISTB or SYSB.
CNTRS	CNTRS	This option queries the values of the LAPD counters from an InSv unit
DRWR	DRWR	This option queries drawer information.
OOS	OOS	This option is valid only for RLCM-EDCs. This option allows the user to query an OOS unit.

TST command The TST command option COVREX does not apply to the RLCM-EDC because this option requires a POTS line card be installed in the line drawer. The RLCM-EDC supports only the NT6X21 EBS line card in the initial application. All other options apply and provide existing functionality.

Example of MAP display

>TST COVREX NOW

```
This LCM does not support the LCM COVREX test
```

Error detection

Error detection methods for the LTC+ are unchanged except for logic added to test the unique circuits on the NT6X50AB DS-1 interface and NTMX76BA cards. Error detection for the RMM remains unchanged from the standard RLCM application.

Error detection for the LCM portion of the RLCM-EDC is modified since there are three different processors on the NT6X51BA cards. Errors detected by the different processors are listed in table “RLCM-EDC hardware errors.”

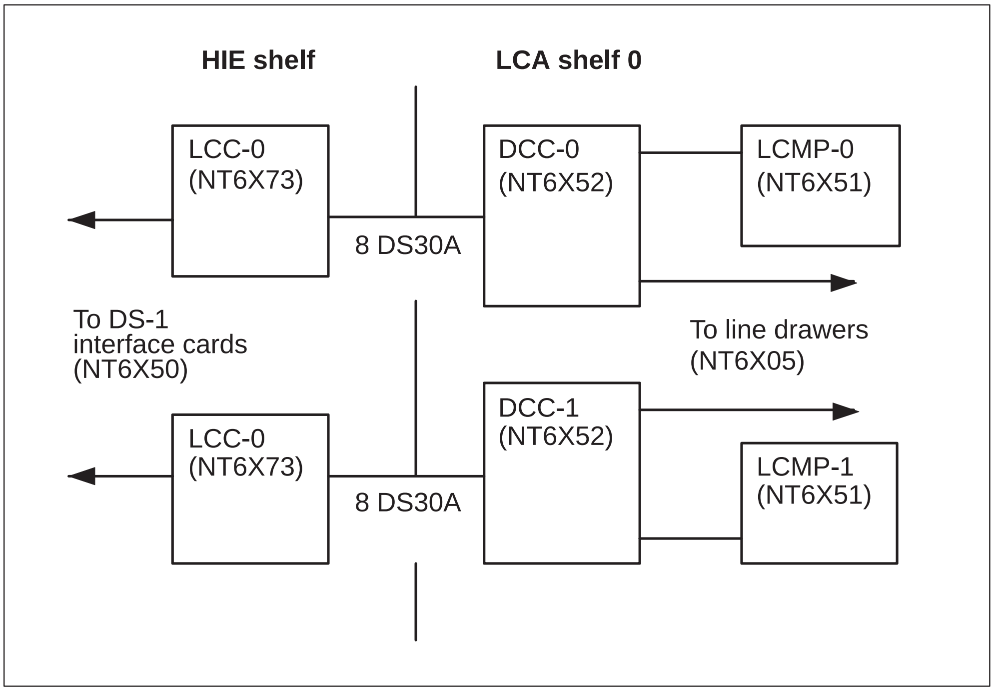
RLCM-EDC hardware errors

Error/fault	Diagnostic/test	Detected by
Load	ROM level	MP
Checksum	1. ROM level 2. Periodic checksum	MP, CP, or PP
Memory	1. ROM level 2. Periodic checksum	MP, CP, or PP
Code execution	1. Hardware notification 2. Operation system notification	MP, CP, or PP
Bus cycle monitor	Hardware notification	MP, CP, or PP
Write protect failure	Hardware notification	MP, CP, or PP
Watchdog (sanity) time-out	Hardware notification	MP, CP, or PP
Parity	Hardware notification	MP
IUC link	IUC loopback	MP
Mate activity read	Commissioning	MP
Frame	Hardware notification	MP
Timing	1. ROM level 2. Commissioning	MP, CP, or PP

Digroup control card

The DCC (NT6X52) is located in slot 05 of the LCA shelf. The DCC allows the LCA and HIE shelves to communicate. The DCC provides an interface between its corresponding LCM processor in the LCA and one link control card (LCC) in the HIE through eight DS30A links, as shown in the following figure, “RLCM-EDC DS30A to DS-1 interface.”

RLCM-EDC DS30A to DS-1 interface

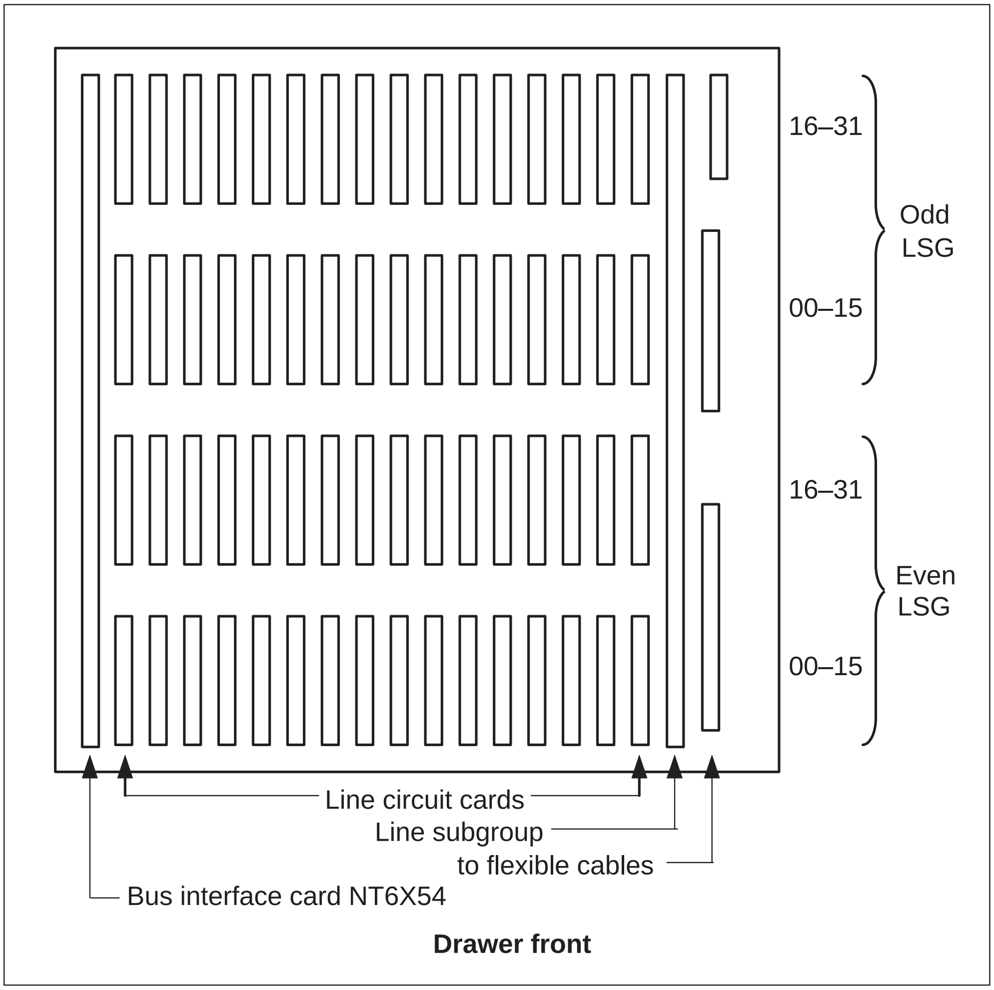


The DCC provides time switching for associating a line card to a given channel on a DS30A link and provides digital loop-around paths for fault isolation.

Line drawers

Each line drawer (NT6X05) in the LCA shelf has one bus interface card (BIC) and a maximum of 64 line cards of various types. The following figure shows the side view of a typical LCA line drawer. The line drawer can be withdrawn from the frame to access line circuit cards, yet remain operative because of flexible cables connected to the rear receptacles.

LCA line drawer NT6X05AA, circuit card location



Drawer state display

The codes used to display line drawer states at the MAP terminal are listed in table “LCM drawer states.” This text uses standard abbreviations rather than code to describe line drawer states.

At the LCM level of the MAP display, the status of the drawers is displayed below the status of the LCM units. The drawers are numbered from 0 through 19 and grouped in pairs to show that they share the same BIC card and, normally, interface a different processor (odd or even). The following display shows an example of drawer status:

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

When a drawer state changes, the status display is updated. The state can be changed by the system or manually.

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 Bus Interface Card (BIC) (NT6X54) is located at the front of the line drawer, behind the front faceplate. The BIC connects to the two LSGs (64 line cards) in the drawer where it is installed. In addition to connecting its two 32-channel LSGs to both LCAs, the BIC performs the following functions:

- scans line circuits for presence of a hook switch change or message (interpretation 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, is accomplished through the single BIC in each drawer.

Line cards

The line cards are located behind the BIC card in 4 rows of up to 16 line cards in each row. The top two rows of line cards form the odd-numbered LSG, and the bottom two rows form the even-numbered LSG. Normally, LCA-1 control complex controls the odd LSG of both arrays, and LCA-0 control complex controls the even LSGs of both arrays, using the ten 32-channel P-side ports available on the DCC of each array.

Both the LSGs and the individual line cards in the LSGs are numbered. LSG numbers in an RLCM-EDC range from LSG-00 through LSG-19. Line card numbers range from 00 through 31. Using these numbers, the line cards are uniquely identified and inventoried in the DMS switch central control (CC) by their line equipment numbers (LEN), as shown in the following table.

Parts of LEN for RLCM-EDC

Part	Description
Site	Four-character alphanumeric name that identifies the remote site where the RLCM-EDC is located. The LEN for a line configured in the host office has a site name of HOST.
Frame	Numeric (00–99) that identifies the RLCM-EDC frame containing the line card.
LCM	Numeric (0) that identifies the LCM in the frame containing the line card. (The RLCM-EDC contains only one LCM identified as LCM-0).
LSG	Numeric (00–19) that identifies the line subgroup of the LCM containing the line card.
Circuit	Numeric (00–31) that identifies the position of the line card in the LSG. The following example, table “Example LENs for line cards”, shows how line cards are numbered for identification in an LSG.

A complete LEN for an RLCM-EDC line card consists of five units of information, as described in the following table. The example shows LENs for line cards in a typical office. The first two LENs are for RLCM-EDC-supported lines.

Example LENs for line cards

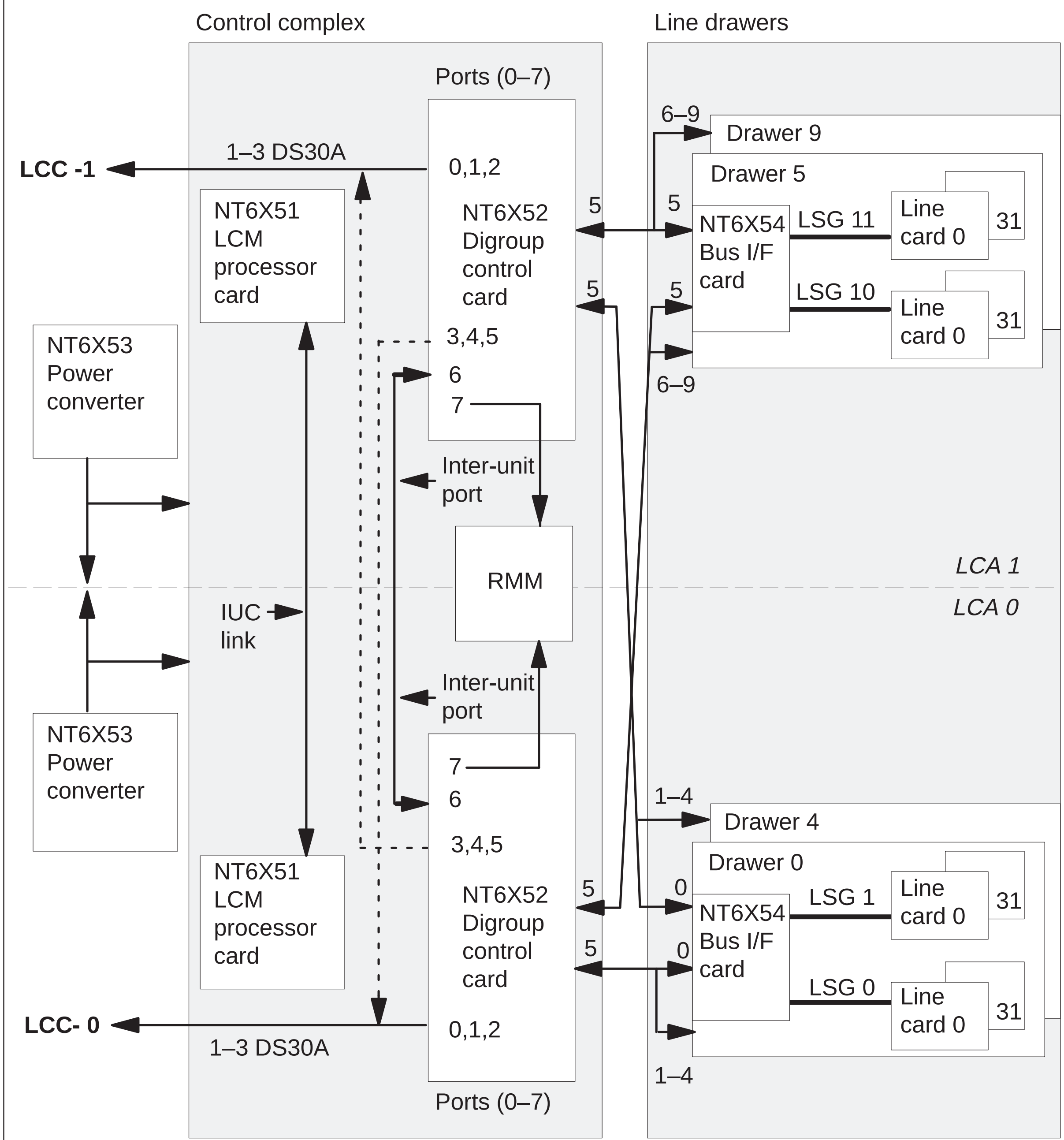
Site	Frame	LCM	LSG	LC
HOST	01	0	14	6
REM1	00	0	07	30
REM2	00	0	18	26

The only line card supported by the RLCM-EDC, in the initial application, is the NT6X21 series Type C line cards. Both the display (M5209) and non-display (M5009) versions of the EBS may be provisioned at the RLCM-EDC. The NT6X21 card supports Meridian Digital Centrex (MDC) related electronic multiline telephone sets and operator consoles.

Functional description

The following figure is a functional block diagram of the RLCM-EDC LCA shelves. All the components of this figure are discussed in this chapter.

Functional block diagram



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

HIE description

The HIE occupies a single shelf at position 33 in the RLCM-EDC frame. The HIE allows the LCA shelves of the RLCM-EDC to connect both to the remote maintenance module (RMM) and to the host office. The HIE shelf contains the following components:

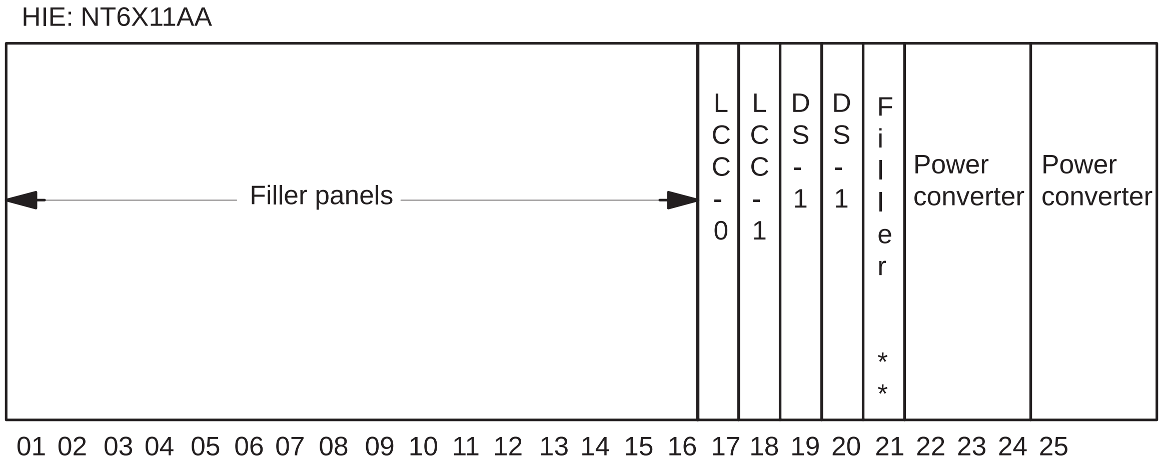
- two power converters
- two LCCs
- two to three DS-1 interface cards

These components are described in the following sections. See the following figure for the HIE shelf layout.

Power converter cards

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

HIE shelf layout

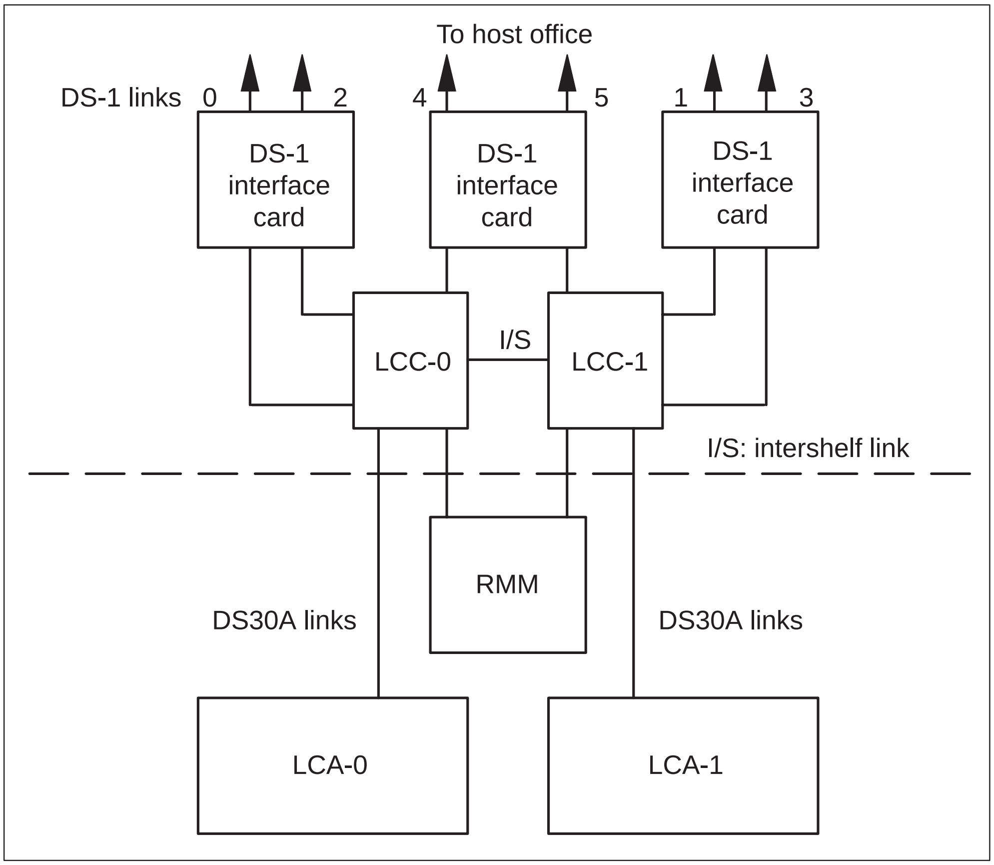


Slot	Abbr	NT PEC	Remarks
01–04	....	0X50AG	Filler panel
05–08		0X50AG	Filler panel
09–13	–	0X50AG	Filler panel
14		0X50AA	Filler panel
15		0X50AA	Filler panel
16		0X50AA	Filler panel
17, 18	LCC	6X73AA	Link control card (LCC-0, LCC-1)
19, 20	DS-1	6X50AB	DS-1 interface (2 DS-1 links per card)
21	–	0X50AA	Filler panel If additional DS-1 links are required (for a total of six DS-1 links), filler panel is replaced by NT6X50AB.
22–24	–	2X70AA	Power converter
25	–	2X70AA	Power converter

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-EDC LCA shelf and the DS-1 links to the host office. The following figure shows how the DS-1 links are terminated on the LCC and in the LCA.

LCC interface to DS-1 interface cards



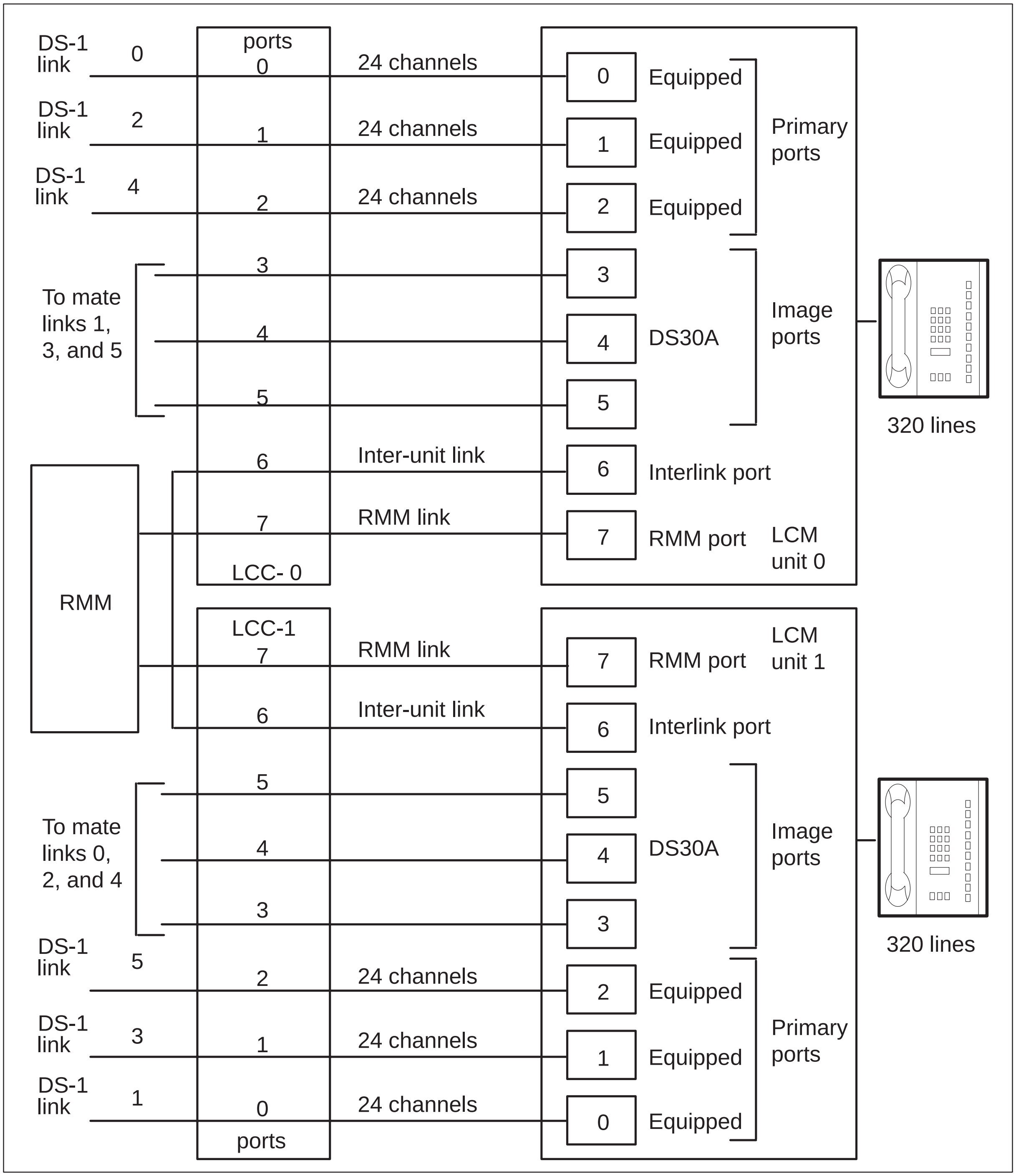
Under normal conditions, when both are active, LCC-0 connects LCA-0, and LCC-1 connects LCA-1. LCC-0 serves even numbered DS-1 links (0, 2, and 4) from the DS-1 interface cards, and LCC-1 serves odd numbered DS-1 links (1, 3, and 5). The following figure shows how the LCCs are configured in the RLCM-EDC.

One-to-one mapping of LCA primary ports with DS-1 links means that all 24 channels of a DS-1 link come out of one 32-channel DS30A port. Extra channels are used for control and signaling, from the host, and for intra- and interswitch channels.

The following figure, “RLCM-EDC link, port and channel structure,” shows that the LCC accepts eight DS30A links from its LCA. Through the LCC, these links provide

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

RLCM-EDC link, port and channel structure



The LCC also provides system clocks for the DCC, RMM, and LCM. When both units of the LCM are active, LCC-0 is frequency-locked to its primary DS-1 link, and the LCC-1 clock is locked to LCC-0. Thus, both LCC clocks derive their timing from the same source, which is the host LTC+.

The DS30A ports in the LCA are numbered 0–7. Their functions are listed 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. Message channels are mapped onto channels 1 and 2 of each of the two primary DS-1 links to the host office. Other channels that carry speech are mapped onto channels 3 through 24 of the primary DS-1 links.
3, 4, 5	Image	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, and port 5 takes over mate port 2 of the mate LCA. The mapping of all channels onto the DS-1 links is maintained, and the active LCC takes control of all DS-1 links.
6	Interlink	Provides a DS30A link for intershelf connections.
7	Maintenance	Provides the LCA access to the RMM through the LCCs. Through the RMM ports, individual line circuits can be selected and metallic test access (MTA) connections can be made to the tip and ring leads for testing.

DS-1 interface cards

DS-1 interface cards (NT6X50AB) are located in slots 19 and 20 of the HIE shelf, and an additional card may 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 LTC+ and connects them on up to six links to the LCC.

A minimum of two DS-1 cards are required so the two primary message channels from the LCM are carried on different cards for reliability. A third DS-1 card is added only if six DS-1 links to the host are needed to handle the traffic load of the RLCM-EDC.

DS-1 ports are not duplicated, but each processor in the LCA shelves of the RLCM-EDC can control all six DS-1 ports.

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

Note: Links 0 and 1 are message supporting links that have special maintenance protection applied to them. 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 prevents manually busying the link where the looparound is applied when the unit it supports is still in service. When the unit this link supports is manually busied, the looparound (extended DS-1 maintenance) is disabled. At this time, the link can be busied and the looparound is re-enabled as NT6X50 card diagnostics for maintenance of the DS-1 link.

Figure “RLCM-EDC link, port and channel structure” shows RLCM-EDC link, port, and channel structure.

Remote maintenance module

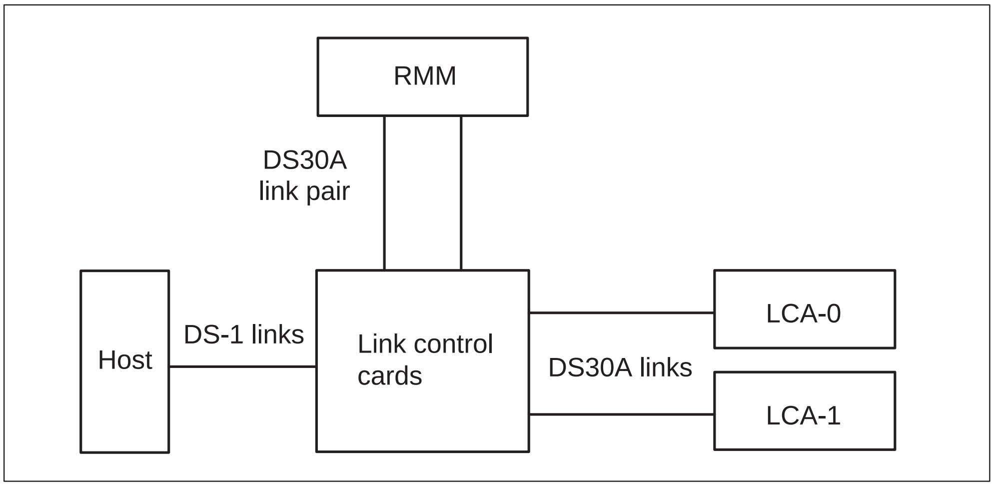
This section describes the remote maintenance module (RMM) in an RLCM-EDC.

RMM description

The RMM, which occupies shelf position 47 in the RLCC cabinet, is a modified, cost-reduced form of the maintenance trunk module (MTM). The RMM contains its own processor, which performs scanning of the service circuits and digit collection during ESA.

The RMM C-side interface uses a pair of DS30A links, one to each LCC in the HIE shelf. The DS30A links ensure the RMM is operable, regardless of which LCC is active. The LCC passes maintenance requests from the host to the RMM and provides a link between the RMM and line circuits in the LCA. At the host office, RLCM-EDC maintenance is directed to the RMM using the MAP terminal. The following figure shows how the RMM communicates with both the host and the LCA through the LCC.

RMM connection with host and LCA through LCC



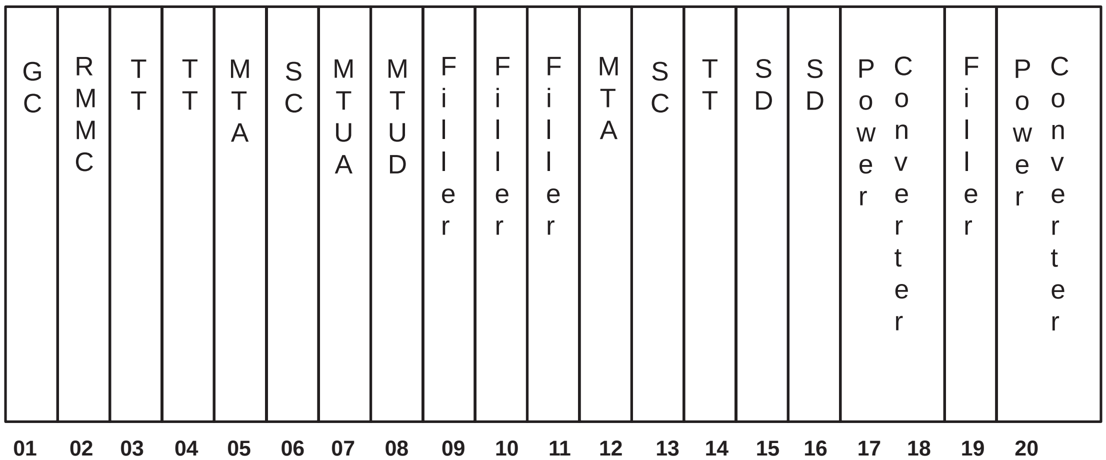
The RMM uses DMS-X protocol to communicate with the host, using the LCC interface to the DS-1 links. The RMM can accommodate up to 14 maintenance and service circuit cards. These cards vary in type and are selected to meet provisioning requirements.

RMM shelf configuration

The RMM shelf has only 20 slots, as opposed to 25 in the HIE. The two leftmost slots of the RMM (01, 02) are assigned to the DS30A interface and control cards. Slots 17–18 and 20 on the far right of the shelf contain two types of power converters required in the RMM. The remainder of the shelf (slots 3–16) is assigned to service circuit cards provisioned to meet office engineering requirements. The following figure, “Remote maintenance module shelf layout,” shows an example of card selections for a typical RMM.

Remote maintenance module shelf layout

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	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	Multi-output power converter
19	-	0X50AC	Filler panel
20	-	2X06AB	Power converter

Note: Slots 03 through 16 show a typical complement of RMM test and service circuits. This complement varies depending on office requirements.

RMM control card

The RMM control card (NT6X74AB), located in slot 02, is required in the RMM. 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 is responsible for the processing of DMS-X messages, trunk messages, and pulse code modulation (PCM) data.

Power converters

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

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

The multi-output power converter, occupying slots 17 and 18 of the RMM, provides a regulated, common-ground dc power supply that has five different outputs (+24 V, +12 V, +5 V, -15V, and –5V). The other power converter, located 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), located at the far left of the RMM shelf in slot 01, is a required card. It encodes analog samples from the RMM trunk circuits into PCM code words, and decodes the PCM words from the host or RLCM-EDC lines into 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 as follows:

- Remote Metallic Test Access, Remote (MTA) (NT3X09AA). The remote MTA provides metallic connections between test access points in the line circuits and testing equipment. It consists of a two-wire metallic matrix with four horizontal busses and eight vertical. One horizontal bus is connected to the MTA bus for the 320 line circuits in LCA-0 and the other to a similar MTA bus in LCA-1. Two horizontals are unused. The verticals are connected to service circuits or spare line circuits. Host office circuits provide MTA functions during normal RLCM-EDC operation.
- Metallic Test Access (MTA) (NT3X09BA). The MTA performs the same functions as the NT3X09AA, but has eight horizontal buses as well as 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-EDC hardware to detect alarm conditions or manually controlled operations. The SC card is divided into two circuits, each known as an SC group. Each SC group contains seven SC points. Each SC point connects one circuit to be monitored 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 for 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 is divided into two circuits, each known as an SD group. Each SD group consists of seven SD points. Each SD point connects one visual or audible alarm.
- Line Test Unit (NT2X10AA, AB, AC, NT2X11AA, AB, AC, AD). The line test unit (LTU) is a testing facility that can be connected 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 adjacent even numbered slot. The LTU analog test card is used to perform 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 existing 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 all the functions of the LTU with greater speed and accuracy. It may also be used to test Meridian Business Set lines. 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, such as the number 14 line test desk, and the RMM. The test trunk card provides monitoring and speech circuits to subscriber lines and allows operator verification calls through a VER90 trunk.

Multiplex facility transmission equipment

The LTC+ and RLCM-EDC equipment interface DS-1 facilities formatted in extended super frame (ESF) transmission format (24 frames). The DS-0 channels in these DS-1 facilities are configured for 64-kbit/s clear channel data using bipolar 8-bit zero suppression (B8ZS) channel coding method.

Outside the DMS-100 isolated ground zone (IGZ) at the host site and RLCM-EDC remote site, the DS-1 links are terminated into transmission multiplex equipment. The DMS-100 system does not support a control interface with this equipment. At the RLCM-EDC site, the transmission multiplex equipment achieves network synchronization and provides the RLCM-EDC with a stable clock and frame reference through the primary DS-1 links.

Frame supervisory panel (FSP)

The FSP (NTNX26AA) occupies shelf position 60 of the RLCC cabinet. The FSP provides talk jacks, fuse alarm features, and power control for the RLCM-EDC. The FSP contains 48-V distribution breakers to the four cards that control the alarm facilities and power converters in the RLCC cabinet. These cards and their functions are as follows:

- NT6X36AA Alarm card

  This card is used to monitor the power converters in the RLCC cabinet, and generate an alarm when an undervoltage condition occurs in any of the power converters.

- NT6X36AC Fan Alarm card

  This card is used to monitor the power in the RLCC cabinet related to the fan cooling units located below shelf 05 which provides cooling for the RLCM-EDC cabinet, and generates an alarm when an undervoltage or fan failure condition occurs in the cabinet.

- NT0X91AA Alarm and Converter Drive

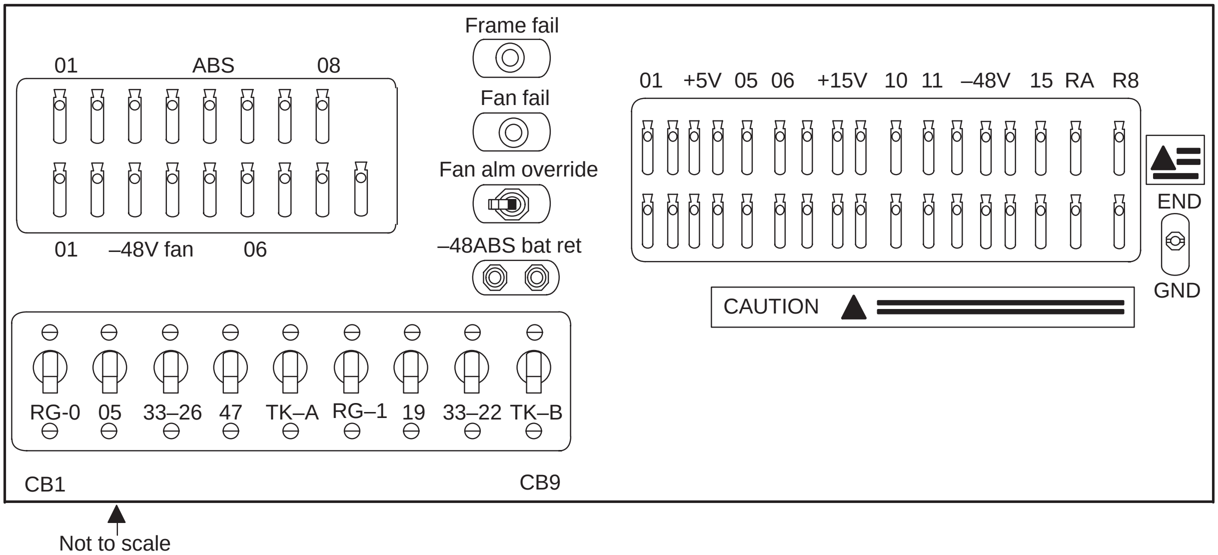
  This card controls the alarms and power for the NT6X53AA power converter for unit 1 of the LCM and the NT2X70AA in slot position 22 of the host interface equipment shelf (HIE).

- NT0X91AE Converter Drive and Protection Circuit

  This card controls the alarms and power for the NT6X53AA power converter for unit 0 of the LCM, the NT2X70AA in slot position 25 of the HIE, and the NT2X09AA/NT2X06AB in slot positions 17 and 20, respectively, 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 CB power distribution, assignments, shelf type and slot position, PEC code and equipment supported.

FSP shelf layout



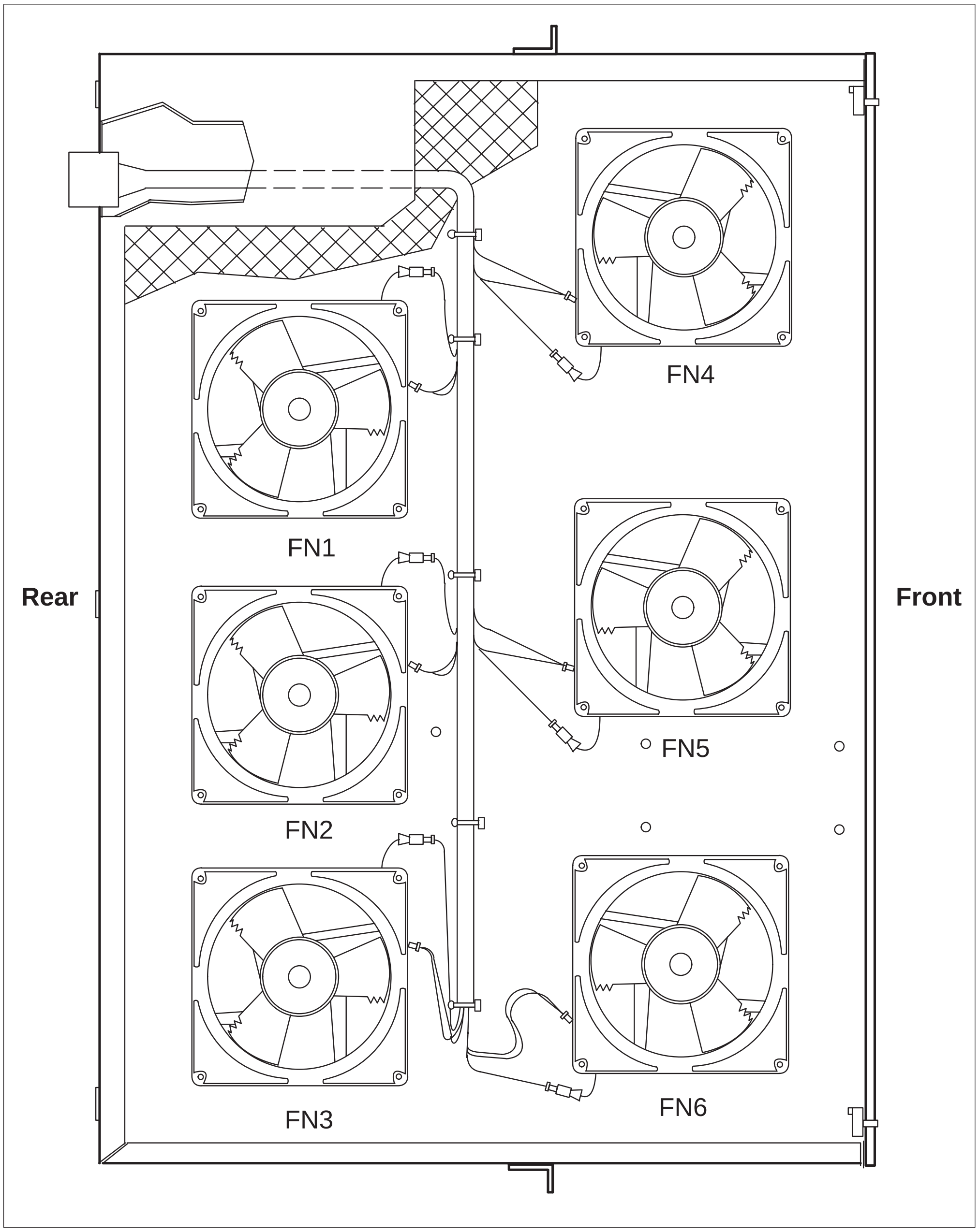
FSP circuit breaker assignments

CB	Shelf type	Shelf pos.	Slot pos.	PEC code	Equipment
CB1	HIE	33	01		not used
CB2	LCA	05	01	NT6X53AA	LCM unit 0
CB3	HIE	33	26	NT2X70AF	Power converter
CB4	RMM	47	17	NT2X06AB	RMM
CB5	TRK – A				not used
CB6	HIE	33	05		not used
CB7	LCA	19	01	NT6X53AA	LCM unit 1
CB8	HIE	33	22	Nt2X70AF	Power converter
CB9	TRK – B				not used

Cooling unit

The NTNX27AA cooling unit (CU) is located at the bottom of the RLCC cabinet. The CU includes six circulation fans as seen in the figure “RLCC cooling unit” providing forced-air convection cooling for the four shelves of cards in the RLCC.

RLCC cooling unit



Software description

The following sections describe the software operation of the NTX146AB feature package.

Interface to DS-1 links

The RLCM-EDC provides an interface between the host controller and up to 640 subscriber lines (140 P-phones in the initial application) through the DS-1 links. The LCCs reassign data carried over the 32 channels of a DS30A link to the 24 channels of a corresponding DS-1 link.

LCC control data

When a unit of the RLCM-EDC is to be placed in service (InSv), the LCC for that unit receives control data from the LCM indicating the number of DS-1 cards equipped and which clock source is to be used for the RLCM-EDC. The LCM receives this data, in turn, from the host LTC. Messages are sent to the LCM unit from the host during its return to service (RTS), and whenever the CC attempts to switch the LCM clock source from one LCC to the other.

The LCC clock source, which is frequency-locked to the primary DS-1 links, is controlled by RLCM-EDC software, except when both units of the LCM are inactive. When this is the case, LCM hardware forces each LCM unit to take its clock source from its own LCC.

Other host office functions

The following functions are controlled by software resident in the host DMS-100 Family office:

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

Signaling and supervision

Signaling allows the DMS-100 switch to communicate with its stations or other switching offices. The RLCM-EDC uses HDLC LAP-D protocol to communicate over its DS-1 links with the host LTC+ for the extended distance capability application. This protocol is implemented by the NTMX76BA messaging card, located in the host LTC+, replacing the NT6X69 card. The same links are used as message links between the LTC+ and the RLCM-EDC, but timeslot 06 is used through the speech bus interface (SBIF).

Subscriber tones

The host LTC+ provides properly cadenced tones, which the RLCM-EDC applies as needed to subscriber lines. The tones supported by the host LTC+ are:

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

The RLCM-EDC is subordinate to the DMS-100 switch CC and is not involved in any signaling between the host office and other systems.

Functional limitations

For feature package NTX146AB to work properly, certain conditions must be observed. These limitations or restrictions may be hardware or software-dependent, as follows.

Hardware restrictions

The following hardware limitations apply to the NTX146AB software package:

- A maximum of 640 lines can be served by one RLCM-EDC, however the RLCM-EDC is engineered for a non-blocking configuration for up to 140 EBS lines, in the initial application.
- A minimum of two and a maximum of six DS-1 (T-span) links connect the RLCM-EDC with the host office.
- All DS-1 links to the RLCM-EDC must terminate on the same host LTC+. The two message supporting links must terminate on different NT6X50AB cards.
- The maximum power input to the RLCM-EDC bay is 35A at –48V.

Software restrictions

Feature package NTX146AB requires the following software packages in order to operate:

- NTX000AA**:** Bilge
- NTX001AA: Common Basic
- NTX270AA: New Peripheral Maintenance Package

- NTX901AA: Local Features I

Fault conditions

Several types of faults can occur in the components of the RLCM-EDC. DS1 links from the LTC in the host office to the RLCM-EDC can become faulty. If they do, messaging from the CC can be lost, and subscriber service can also be lost.

A circuit card in the RLCM-EDC, including the power converter card, may be faulty and may adversely affect subscriber service. RLCM-EDC equipment, other than circuit cards, may also become faulty.

The RLCM-EDC P-side links carry messages that are vital to the maintenance of subscriber service. A faulty peripheral side link may also impact subscriber service.

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

LCA shelf failure

When a fault condition exists that causes one of the LCA units in the LCM to go out of service, the in-service unit assumes control of the mate unit's lines in addition to its own. This function, called takeover, is an automatic maintenance feature of the LCM configuration. See "Takeover capability." If any one of the following fails, the LCA shelf goes into takeover:

- mate processor
- digroup control card in the mate unit
- mate LCC in the HIE shelf

Note: As of XPM04 (and XPM03B) and the corresponding CM load, an LCM unit is no longer SysB'd due to power converter failure (although it must be ManB'd to replace the bad converter). The unit runs fine on power from the mate converter.

Line drawer faults

A faulty bus interface card (BIC) or line card causes a faulty condition in a line drawer. This fault is not sufficient to cause a takeover. If the BIC problem is service affecting and the CM and LCM determine that the drawer operates properly when under control of the takeover unit, one unit will be SysB'd to preserve service to customers in that drawer. This only occurs if both units are in service when the BIC problem was found.

Link failure

Link failures include the following:

DS-1 links

Link failures are usually associated with the DS-1 interface cards in the host controller, DS-1 link, or DS-1 interface cards in the RLCM-EDC. Monitoring is performed through operational measurements (OM) that indicate when maintenance or out-of-service thresholds have been exceeded.

The host controller maintains and tests the DS-1 links, generates alarms for link faults, and reassigns channels when faults occur on these links. Operating company personnel can obtain the bipolar violation (BpV) count at the RLCM-EDC either by posting the host LTC+ at the carrier level of the MAP display and observing the counts from NT6X50AB card in the host LTC+ or by issuing the DETAIL command with the REM option on each individual link and observing the counts from NT6X50AB card in the RLCM-EDC. BpVs, although not severe enough to raise an alarm, can signal deterioration of a DS-1 link.

Because the signals on a DS-1 link travel in two directions, either the host controller or the RLCM-EDC can detect faults (such as BpVs). The RLCM-EDC notifies the host controller when the BpV count exceeds the threshold of 1 BpV per 10^3 bits. The RLCM-EDC also monitors the loss of frame indicator for the DS-1 links. RLCM-EDC, due to ESF settings, looks for loss of signal (red alarm) in addition to loss of frame (loss of more than 2.5 seconds). That is, if the line is broken, ESF mode does not show loss of frame, indicating only loss of signal (red alarm). The outgoing alarm is removed when the signal or frame has been restored for 10 seconds. These timings, typically 2.5 and 10 seconds, reflect the same values datafilled for each link as datafilled for the host LTC.

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

DS30A links

DS30A links on the P-side of the RLCM-EDC can experience failure. These links connect to an RMM. Faults on these links can affect the associated modules as well.

Load file mismatch

A load file mismatch fault condition exists when a load in the active bank of the LCM does not match the load specified in table LCMINV.

Automatic maintenance

The DMS-100 Family peripheral modules (PM) are designed to be reliable under many different fault conditions. Peripheral modules contain several hardware redundancies that serve as backup operations for module, card, and link failures. Therefore, fault conditions can exist without immediate serious impact to service.

When fault conditions occur, the DMS and the RLCM-EDC initiate audits or other system actions to try to find the fault and correct it automatically.

The following sections discuss the following types of automatic maintenance:

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

RLCM-EDC audits

Audits are scheduled to run in the RLCM-EDC every 15 seconds to refresh the control data for DS-1 and LCC circuits and to monitor the LCC for faults. The DS-1 interface cards are monitored for faults by a second audit run every second. However, the RLCM-EDC does as many as three links every second. The normal audit period is every second. However, if more than three links are datafilled, and the unit is in takeover, the audit period is every two seconds. The functions of these system audits, as they affect LCC and DS-1 circuits, are described in the following paragraphs.

Link control card maintenance

The RLCM-EDC monitors the status of its LCC to ensure control data are being transmitted correctly to the LCC and the LCC clock is running fault-free. Control data are rewritten to the LCC periodically.

DS-1 interface card maintenance

For each of its DS-1 interface cards, the RLCM-EDC automatically monitors the BpV counter and notifies the CC when the count exceeds the threshold of 1 BpV per 10^3 bits (10 kbits). The RLCM-EDC also monitors the loss-of-frame indicator and loss-of-signal indicator (red alarm) for the DS-1 links and turns on an outgoing alarm for any frame or signal loss of more than 2.5 seconds. The outgoing alarm is removed when the frame or signal has been restored for 10 seconds. These timings, typically 2.5 and 10 seconds, reflect the same values datafilled for each link as datafilled for the host LTC.

When the RLCM-EDC detects DS-1 slips, it increments a slip counter and provides a message-driven interface to allow the counter to be queried from the host office (from the carrier MAP display level). Control data are rewritten to the DS-1 cards periodically.

LCM drawer maintenance

A system audit runs every 10 min for each LCM and attempts to return to service any drawers in the SysB state. If any faults are detected, drawers in the ISTb state are also tested and handled. The following table describes LCM unit states and their corresponding tests.

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 DMS-100 PMs, a number is used to calculate the checksum (CHKSUM) for each software load. After loading the PM and testing it, the checksum total is compared with the expected checksum total. If the totals match, the load is correct. If there is a mismatch, the load must be loaded again using 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 all internal components of the LTC speech path for data integrity, including C-side and P-side looparounds and speech bus timeslots.
- P-side link diagnostic (PLNKDIAG). Test links between the LTC and any subsidiary peripherals, including the RLCM-EDC. Tests are performed on either all links or 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

Each test is executed only if all preceding tests have passed. The four tests are described in the following paragraphs.

Hardware presence test This test ensures the formatter, message, and timeswitch cards are present in the LTC+. This hardware is necessary for the remainder of the tests. If any 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 ensures that DS-1 interface (NT6X50) cards, datafilled for the LTC+, are still present. It is used to set up the subsequent P-side loop test. The P-side interface test terminates when a failed NT6X50 card is detected or removed. When the diagnostic returns a `No Resources` error and produces a PM181 log report.

P-side loop test After the P-side interface test checks for the presence of all NT6X50 cards, the P-side loop test verifies the correct operation of these and other dedicated P-side loop-around circuits for the LTC+. The P-side interface cards supported in the LTC+ P-side loop test are as follows.

If the LTC+ is in inactive mode where one unit is inactive and the other manual busy (ManB), system busy (SysB), or in-service (InSv), the P-side loop test checks only NT6X48 P-side loops. If the LTC+ is in active mode (one unit active and the other in SysB, ManB, or InSv), both NT6X48 and NT6X50 P-side loops are tested. 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 on every channel is run. 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 the following 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 and timeswitch cards in the LTC+. These cards are necessary for the other P-side link diagnostic tests to run. If any of these cards are 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 that in the speech path diagnostic. It ensures that all LTC+ P-side links to be tested are still present. This test flags missing or failed NT6X48 or NT6X50 cards in the LTC+.

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

RLCM-EDC facility maintenance

When line diagnostics are invoked for RLCM-EDC-supported lines and the RLCM-EDC has no serving LTU or MTU, the RLCM-EDC executes the no-LTU diagnostic. This software establishes a connection to a transmission test unit (TTU) in the host office, which uses this circuit for limited line testing in place of the LTU or MTU.

Overload resources

Overload resouces for the RLCM-EDC is implemented in two categories: overload detection and overload control.

Overload detection

Detection is based on monitoring the size of message queues to certain key Call–processing tasks. If the size of these queues exceeds a threshold, the overload controls are initiated. There are two threshold levels, low and high, and both are implemented with hysteresis, (exit criteria are more stringent than entrance criteria at each level). Overload is detected by measuring the number of times the size of the message queue exceeded a specific value during the measurement period, which is 20 seconds.

The threshold value for number of messages on the queue, and for the number of times the queue exceeded that number is defined by four values, which are:

- LOW_ENTRY_THRESHOLD
- LOW_EXIT_THRESHOLD
- HIGH_ENTRY_THRESHOLD
- HIGH_EXIT_THRESHOLD

Each of the four threshold values are used first to compare the number of messages on the task queue each time the procedure, SEND_MSG, is called. Secondly, if the number of messages on the queue is above the value for LOW_ENTRY_THRESHOLD, a counter called OVLD_LEVEL is incremented. At each 20 second interval, the value of OVLD_LEVEL is compared to the LOW_ENTRY_THRESHOLD and HIGH_ENTRY_THRESHOLD values to determine if a new overload state has been entered. If a task is already in overload, the OVLD_LEVEL counter is compared to exit thresholds to determine if the current overload state has expired.

Overload control

Overload control is made up of overload messages to the CM and traffic throttle messages to the LTC+.

At LOW overload, a message is sent to the CM, which marks the unit Inservice trouble (ISTb), and blocks maintenance actions on the unit; call processing traffic is not affected. At HIGH overload, a message is sent to the LTC+ to throttle fifty per cent (50%), of both originations and termination to the RLCM-EDC unit. The overload condition at the CM will remain in effect until another message is sent to drop overload state.

However, the LTC+ requires a new overload message to be sent at least every three seconds to keep the throttling in effect. If the LTC+ is not refreshed, it will incrementally drop out of overload in the space of about fifteen seconds. This is to prevent a lost message keeping the LCM throttled indefinitely.

Takeover capability

Because there are power connections between the two shelves of the LCM, the LCM can operate in a load-sharing mode. If one power converter goes out, the mate converter supplies power to both shelves. This is called takeover. In the takeover state, the InSv unit assumes control of the lines associated with the OOS mate unit, in addition to its own. Also, the InSv unit has access to the DS30A C-side ports formerly used by the OOS mate. All 20 line subgroups are accessed by the DCC of the InSv unit.

Takeover also occurs when one LCA control complex, the LCM processor and digroup card fails, the remaining control complex can support all DS-1 links and the LSGs of both LCAs.

Calls in process at the time of takeover are terminated and must be redialed, but calls already connected and in progress are maintained.

LCC takeover

The LCC provides an interface between the LCA and the DS-1 interface cards in the HIE shelf. Each LCA is associated with an LCC in the HIE shelf. If an LCA shelf fails, it is considered inactive and takes down the associated LCC.

Likewise, if an LCC fails, it takes down the associated LCA shelf. If either an LCC or an LCA shelf fails, the active LCC and LCA perform a takeover and support the DS-1 links of the inactive LCC and LCA. Takeover is possible 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 is returned to service, the subscriber lines in takeover are redistributed back to their normal processor. No calls in the talking state are lost when returning to the normal mode of operation.

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

To ensure that message and speech data can be sent to and from the BIC, the RLCM-EDC 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, to ensure the fault is not transient or from the DCC or processor card.

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

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

Some drawer ISTb conditions can be detected only 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 returned to service with an ISTb condition, the ISTb state is cleared when the InSv unit or drawer tests are performed.

- BIC looparound sets the drawer to the SysB state so it cannot have messages sent to it. All lines to the drawer are made line maintenance busy (LMB), since the call processing is disabled.
- BIC scan sends a scan message to the BIC to ensure the scan chip can detect supervision changes on all datafilled lines. Since this involves a message, the path through the DCC is similar to the BIC looparound.
- DCC looparound tests a loop in the DCC. The looparound does not test all the DCC hardware for the DCC/BIC communication. If a fault exists with this hardware, the DCC looparound passes while subsequent BIC looparound tests fail, even though no drawer fault actually exists.
- DCC/BIC looparound sets the drawer to the ISTb state. A failure on the speech path hardware to the drawer has occurred. Although a particular channel may have failed the test, it is not certain if all channels are affected. Call processing may still be possible. For this reason, the drawer state is updated to ISTb at the MAP display, but the drawer is not prevented from handling call processing. The DCC/BIC looparound tests the PCM path by sending test patterns to the BIC. The patterns received by the transmit time switch are expected to be the same within a timeout period.

The list of full InSv tests follows:

- lcc_la_test_code
- bic_msg_test_all
- is_dcc_commssng_la_test
- rd_td_test_all

- checksum_inactive_bank
- lcc_fault_code
- comm_iuc_la_tst
- bic_scan_test_all
- bic_act_test_all
- power_converter_test
- test_lc
- ring_mux_relays_test
- cside_link_looparound_test
- msg_test

Faults that occur on a BIC drawer affect call processing regardless of which unit is in service and controlling that drawer. Since the full in-service tests use the DCC, it must first be determined that the fault is not in the DCC, where takeover is justified. If takeover occurs as a result of a reported drawer fault, the DCC is at fault even though the LCM has failed the BIC tests.

In the takeover mode, the inactive unit DCC cannot access any drawers for call processing. However, the inactive unit DCC can access any drawer for testing. The active LCM unit still has access to all drawers through its DCC.

Valid drawer faults do not take an LCM unit out-of-service. However, the status of the unit is still ISTb. The ISTb reason is either Self Test or Diag Fail, depending on which test failed and caused the ISTb condition. Additional diagnostic information is available for LCM shelves equipped with the NT6X51AB expanded memory board. After the CC has detected an LCM unit has ISTb, the unit can still be made SysB by too many unsolicited messages being received.

LCM REXTEST

The LCM routine exercise test (REXTEST) consists of running out-of-service diagnostics for each LCM unit, as well as in-service diagnostics for each unit in both normal and takeover modes. This test is controlled by office parameter NODEREXCONTROL in table OFCVAR.

It may not be possible to test every LCM in the office during the REX interval. In this case, when the next interval starts, REX will pick up where it left off during the previous interval. It takes up to 15 min to perform a REX test on an LCM.

LCMREX test flow

A REX test for an LCM includes the following procedure:

1. If both units of the LCM are in service, unit 0 is made SysB; a PM128 state change log is generated with the reason `REX in progress`, the LCM node status is made ISTb, and a minor alarm is generated.
2. In-service diagnostics are run on unit 1, which is in takeover; if any diagnostics fail, the unit is placed ISTb and a PM181 log is generated.
3. Unit 0 is returned to service. Out-of-service and in-service diagnostics are run. If out-of-service diagnostics fail, the unit is left SysB, a major alarm is raised, and PM106 is generated. If the unit is returned to service successfully and the in-service diagnostic fails, the unit is placed ISTb and a PM181 log is generated.
4. If unit 0 is returned to service successfully, these steps are repeated for unit 1.

If a REX test fails, a PM600 log is generated. The PM600 log initiates a major alarm for the XPM that failed the REX test. The major alarm appears at the MAP terminal under the PM banner at the top of the display. A PM181 log is generated after a successful REX test.

If an InSv or OOS diagnostic test fails, the REX test failure reason includes the mnemonic (an easy-to-remember abbreviation) of the diagnostic that failed and the unit that failed (0 or 1).

The QUERYPM, QUERYPM FLT and TST REX QUERY, commands contain information about the last REX test. Both manually and system-initiated REX tests store and display a new date, time, and status (passed or failed) in the REX test maintenance record. *Passed* means the REX test completed with no errors. *Failed* means the REX test did not complete because of an error. This information is available through the QUERY PM and TST REX QUERY commands. If the REX test fails, the user either performs a manual RTS, a manual REX test, or an automated REX test to return the LCM to service from ISTb.

The following restrictions apply to REX tests:

- Up to four LCM_REX_TESTs can be run concurrently if the HOST XPM they subtend to is not being REX tested.
- 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 PM600 log is not generated 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 an S/DMS system REX test (SREX) controller which coordinates all system REX tests 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 makes it easier to perform a REX test on the whole switch including all peripherals such as the RLCM-EDC in less time. REX tests are performed to provide early indication of faults that can impact service and allow operating company personnel to take corrective measures.

Feature AF3771 allows REX test failures to be found and resolved sooner, thereby reducing outages in the field. The SREX test controller also allows operating company personnel to

- change the order in which peripherals are tested
- coordinate between manual- and system-initiated REX tests
- receive alarms for the RLCM-EDC not being REX tested in a time limit set using 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 datafilled in table OFCVAR under the NODEREXCONTROL parameter.
- RESUME resumes REX testing after suspending REX testing.
- QUERY returns the status of the REX test (active or suspended).
- HELP returns a brief description of the REX test.

The order for the REX test for feature AF3771 is as follows:

1. critical nodes, such as the communications module (CM) and message switch (MS)
2. number of days since the last system or manual REX test
3. order of internal PM number

Table REXSCHED must be datafilled to establish the REX test schedule for the RLCM-EDC. This table contains the information required by the REX test coordinator to schedule the tests according to operating company specifications. In addition, the test can be disabled by datafilling table REXSCHED. For more information about table REXSCHED, refer to the data schema section of the *Translations Guide*.

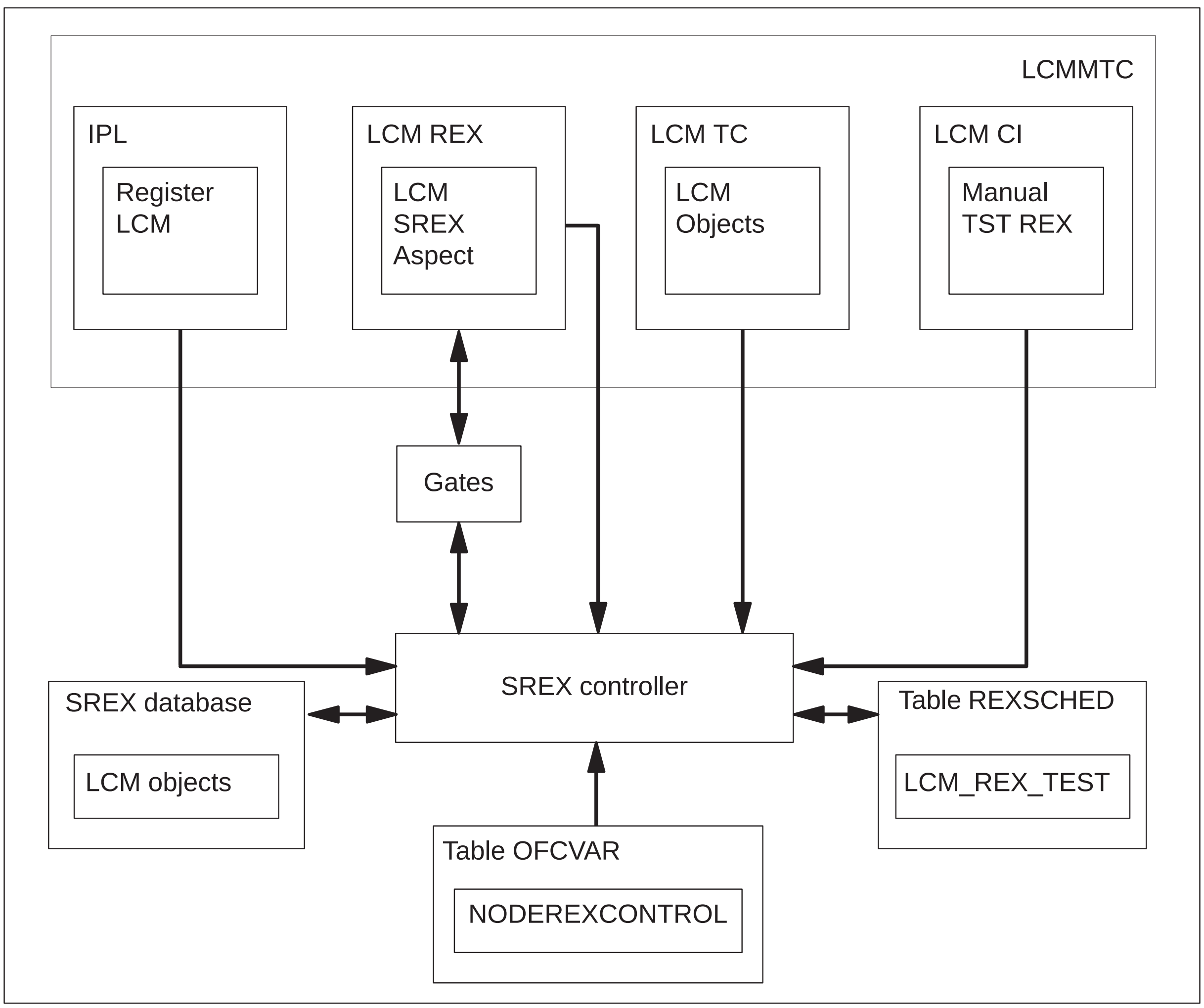
The IOAU112 log report for LCMs is generated if

- the LCM has not been REX tested for more than seven days
- REX test takes longer than specified
- REX test could not be started after a defined number of attempts

LCM REX test dependencies

To avoid conflicts, all concurrent REX tests of XPMs and LCMs are scheduled by the SREX controller. The LCMSREX subsystem registers the LCM_REX_TEST class and identifies dependencies with other REX_TEST types during initial program load (IPL). As LCM nodes are added to the SREX database, the controller automatically datafills entries with defaults in table REXSCHED. See the following figure for a depiction of LCMSREX and SREX controller subsystem dependencies.

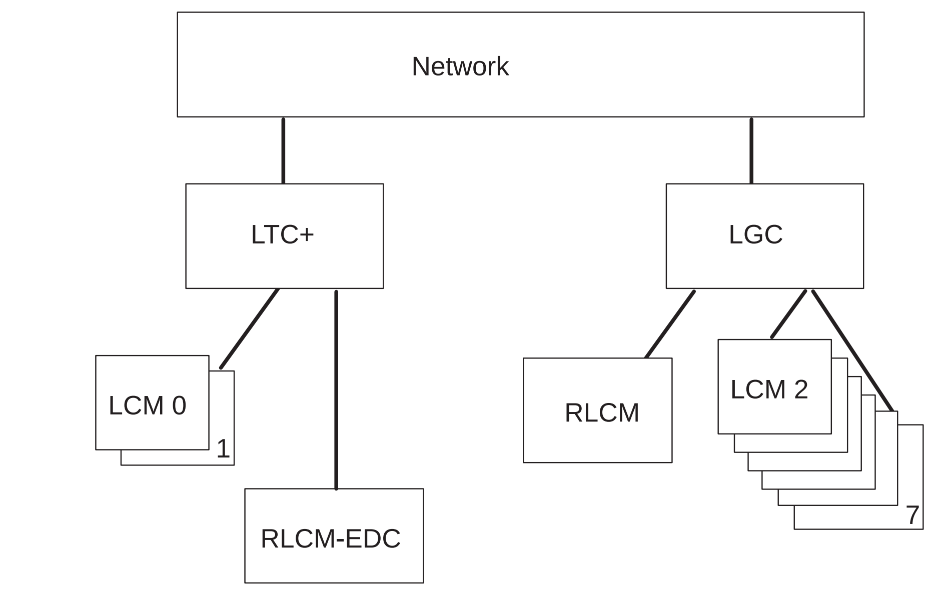
LCMSREX and SREX controller subsystem dependencies



Line concentrating module (LCM) REX test scheduling

Scheduling of SREX tests for LCMs is controlled by table REXSCHED. The LCM_REX_TEST task SREX can be executed concurrently in multiples of four and simultaneously with REX tests of XPMs. Conflicts arise when an XPM scheduled for REX testing is the host of an LCM scheduled for REX testing. See the following figure for a depiction of SREX scheduling.

SREX scheduling



Note 1: REX tests can be running on LCM 0, LCM 1, RLCM-EDC and concurrently with REX tests running on the LGC.

Note 2: REX tests could not be running on LCM 2 through LCM 7 or the RLCM if a REX test was running on the LGC.

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

- LCM REX test
- MAP command for manual REX test
- fault indicators
- REX test maintenance record
- MAP commands to access REX test failures

MAP commands for manual REX tests

LCM diagnostics provide the capability to implement a manual LCM REX test. A manual REX test is accomplished by adding a REX parameter to the TST command at the PM level of the MAP display. Examples of this command are as follows:

> **ATTENTION**
>
> The REX test will remove a unit from service and should be executed during periods of low traffic.

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

and pressing the Enter key

>QUERYPM

and pressing the Enter key

With the LCM in the `Post` position of the LCM MAP level, manual control of scheduled LCM REX tests is set by typing

>TST REX [ON] [OFF]

and pressing the Enter key

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

LCM REX tests are set for immediate execution by typing

>TST REX NOW

and pressing the Enter key

Note: Performs LCM_REX_TEST on the posted LCM.

Fault indicators

An unsuccessful REX test sets the LCM unit either 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 additional failure conditions are detected, 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 rather than InSv with the REX failed reason. To remove the ISTb state, the LCM must complete either a successful manual RTS or a successful manual or scheduled REX test.

The node assessment graph log (NAG400) is generated hourly, or in response to the NAG command, to list all nodes that are not in-service (InSv). Field REX_INFO of log NAG400 displays the results of the latest REX test. For LCMs, the LCM_REX_TEST result is listed first. For more information about NAG400 logs, refer to the *Log Reports Reference Manual*.

The CI level NAG command allows the craftsperson to display all out-of-service nodes. The MAP response to the NAG command is similar to that presented in the NAG400 log report. The command and log report are part of the node assessment graph (NAG) feature which provides a snapshot of nodes in the system that are out-of-service or have a REX issue. The craftsperson can include the offline nodes in the output by entering the command string NAG ALL. The log report function, which runs hourly, can be turned on an off by entering the command string NAG ON or NAG OFF.

For a node to be included in the output or log report, it must be in one of the following states: system busy (SysB), C-side busy (CBsy), in-service trouble (ISTb), or manual busy (ManB). A node may also be included if it has failed, aborted or did not complete the last REX test. If a node has no REX problem, the string *ATP* appears in the REX column to indicate that all tests passed.

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

```
Front End Load: FSL37AO
Level   Node        Status  REX INFO        UNIT 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

A maintenance record is generated from a REX test to indicate results of recent REX tests for each LCM datafilled. This information is available at the PM level of the MAP display for a posted LCM.

> ***Note:*** Following a reload restart, the maintenance record is erased for each LCM.

Escalation to manual maintenance

When automatic maintenance fails to correct a fault in the DMS switch, the DMS switch provides trouble indicators that reveal a fault condition still exists. Alarms are examples of trouble indicators. Some OMs and logs also indicate a fault condition and a failure of automatic maintenance. Manual intervention becomes necessary as maintenance personnel attempt to clear the fault at the MAP terminal. Refer to the chapter "Troubleshooting chart" for a procedure on alarm clearing. Refer to the chapter "RLCM-EDC related logs" for log information and to the chapter "RLCM-EDC related operational measurements" for OM 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 their meanings are shown in the following table.

Alarm description

Alarm	MAP display	Description
Minor	(blank)	Usually non-service affecting
Major	(M)	Usually indicates a service-degrading, threatening condition
Critical	(*C*)	Usually indicates a service outage or potential service outage

The alarm type is displayed under the header, along with the alarm severity. If several alarms are occur, the most serious alarm is shown. When this alarm is cleared, the next most serious alarm is displayed. When there is no alarm condition, that is, when the PM system is fully in service, a dot (.) is shown under the header PM.

The following table shows alarms related to the RLCM-EDC that appear under the PM subsystem header of the MAP display.

Alarm class codes, displays, and conditions

PM header display	Condition
`PM`	All PMs are in service. No alarm conditions are in effect.

`PM`
`nnSysB`
`*C*`
	More than 10% of the PMs are SysB–critical alarm.

`PM`
`nnLCM`
`*C*`
	Both units of one or more LCMs are not in-service critical alarm.

`PM`
`nnSysB`
`M`
	10% or fewer of the PMs are SysB major alarm.

`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.

Note: If nn is greater than 99, two asterisks (**) are displayed instead of numbers.	

Subscriber lines manual maintenance

Subscriber lines that fail to meet certain quality standards are identified to the switch operator by posting the failures at the line test position (LTP) or by output reports generated by the ALT log subsystem, The automatic maintenance failures thus identified are then manually tested and corrected. For more information, refer to the *Input/Output System Reference Manual, 297-1001-129*.

Drawer maintenance

Drawer states can be monitored and changed from the LCM level of the MAP display. Drawer tests can also be run by manually testing a unit at the MAP display. When the system detects a faulty card, its drawer can be removed from service for testing and for card replacement, without affecting other call processing or LCM maintenance.

Signaling for RLCM-EDC

Signaling for RLCM-EDC

This section describes the signaling protocols that the Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC) uses. The RLCM-EDC uses the protocols to communicate with the DMS-100 switch and to provide subscriber services. The following subsections describe RLCM-EDC signaling and the types of subscriber services the signaling protocols provide.

Signaling and communications protocols

The RLCM-EDC uses the following protocols for communications and subscriber services:

- Q.921 CCITT link access procedure on the D-channel (LAPD)

  The Q.921 LAPD protocol establishes data link communications between a service access point identifier (SAPI) and a terminal end point identifier (TEI). The data link transmits information from a higher layer protocol, or receives information for delivery to a higher layer protocol. Q.921 protocol transmits common signal channel (CSC) messages and embedded operations channel (EOC) messages.

- DMS-X

  The DMS-X is a half-duplex byte-oriented protocol. The DMS-X is implemented through a full duplex message channel like the DS-1 or DS-30A links. The RLCM-EDC processor handles the DMS-X message protocol on the processor message channels. The DMS-X handles protocol to the host, remote, or collocated equipment.

RLCM-EDC signaling links

The DS-1 interface cards (NT6X50AB) are in the host interface equipment shelf. The DS-1 interface cards are the signaling interfaces between the RLCM-EDC and the host XMS-based peripheral module (XPM). The XPM is a line trunk controller PLUS (LTC+).

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

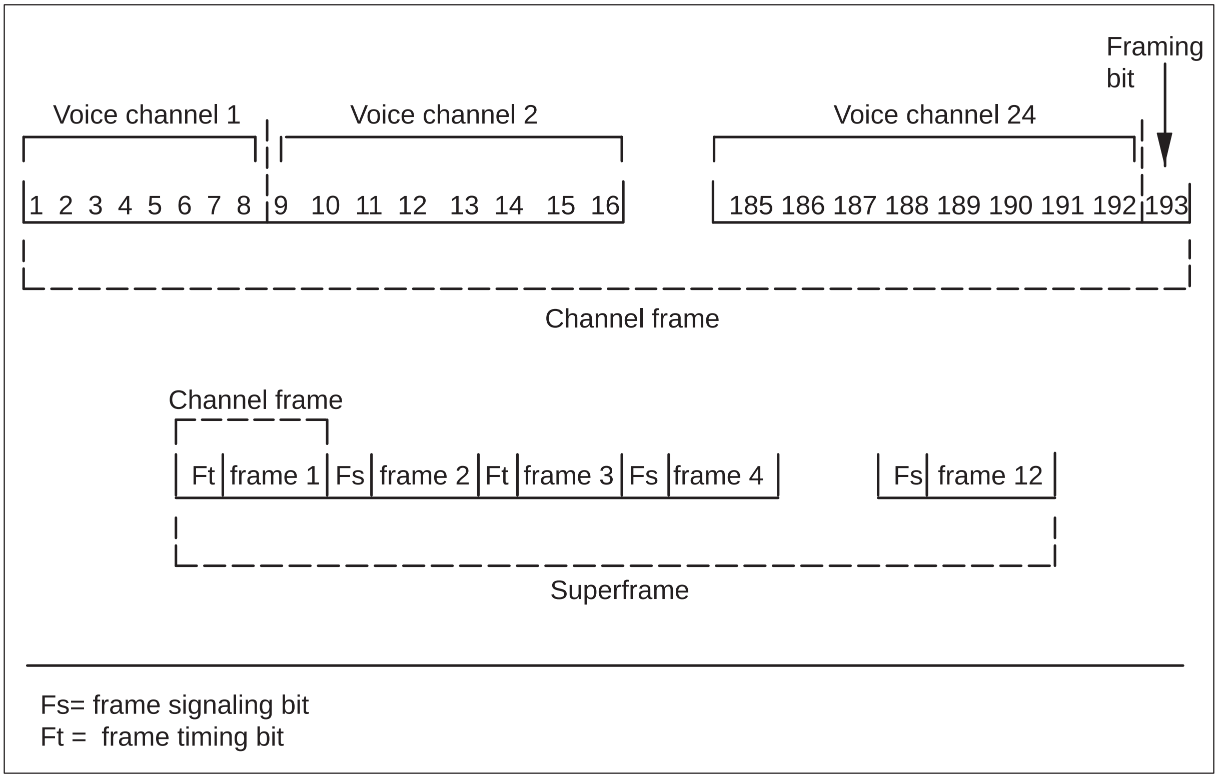
- communicate the states of subscriber lines
- perform call processing
- set up test configurations
- pass test results

The DMS-100 switch precedes the RLCM-EDC. The host office handles signaling between the host and other systems. This process is called intersystem signaling. The host office handles host to subscriber signaling, known as operator signaling.

C-side links

The RLCM-EDC requires a minimum of two DS-1 links to the host. These links are the primary links. The LCM part of the RLCM-EDC requires two message channels to the host LTC+. The RLCM-EDC uses link access protocol for D channel (LAPD) messaging on the C-side links to the C-side LTC+. The links use the extended super frame bipolar 8 bit zero suppression (ESF8BZS) template required for LAPD messaging.

DS-1 frame format



Message channels

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 LTC+. These channels occupy channel 2 on each of the primary links.

The system first sends messages from the CC to the RLCM-EDC to the host LTC+. The LTC+ recognizes the message is for the P-side node. The LTC+ uses the XPM messaging software system to send the message to a specified destination through a message channel between the two nodes.

The XPM messaging software system consists of the following functional layers:

- The physical link layer (level 1) provides the mechanism required to transfer the data bits from one node to another node. The DS-1 link that connects between the host LTC+ P-side interface card and the LTC+ C-side interface card is the necessary mechanism.

- The data link layer (level 2) provides the mechanism required to transfer messages from one node to another node. This other node connects directly to the first node. The network layer selects the route for the transfer of messages. The data link layer performs error detection and notification. The data link layer maintains the sequence order of messages and allows the activation and deactivation of links that support messages.
- The network layer (level 3) provides application software. This software contains the mechanism required to send a message from one node to another node in the network. The network layer selects a route to send the message toward the desired destination node. The network starts the necessary service from the message link layer.

Data link layer

The LTC+ converts two standard DS-1 frames to one internal DS60 frame. Timeslot 1 of links 0 and 2 are extracted from the DS-1 interface. The timeslots are wired directly to the first network message interface (NMIF) channel in the correct LTC+ message card. The speech bus interface (SBIF) directs messages along the speech bus until the messages reach the messaging card. Each timeslot on the speech bus can be a messaging channel toward the C-side or P-side of the shelf. The DMS-X protocol uses channel 1 on each link.

Signaling protocol

Two data link protocols are in use between an LTC and RLCM-EDC. The two data link protocols are DMS-X and high data link control (HDLC). To apply a data link protocol on a specified timeslot, the system declares a specified channel a data link. The timeslots can be the C-side of an RLCM-EDC or P-side of an LTC+. This data link is assigned to a specified node entity. Additional data links are created in the LTC+ and RLCM-EDC.

HDLC protocol

High data link controller (HDLC) protocol is a current LTC+ to RLCM-EDC message protocol. The HDLC applies to the extended distance capability (EDC) application. The NTMX76BA messaging card implements this protocol. The NTMX76BA messaging card in the host LTC+ replaces the NT6X69 card. The same links serve as message links between the LTC+ and the RLCM EDC. The use of timeslot 6 occurs through speech bus interface (SBIF).

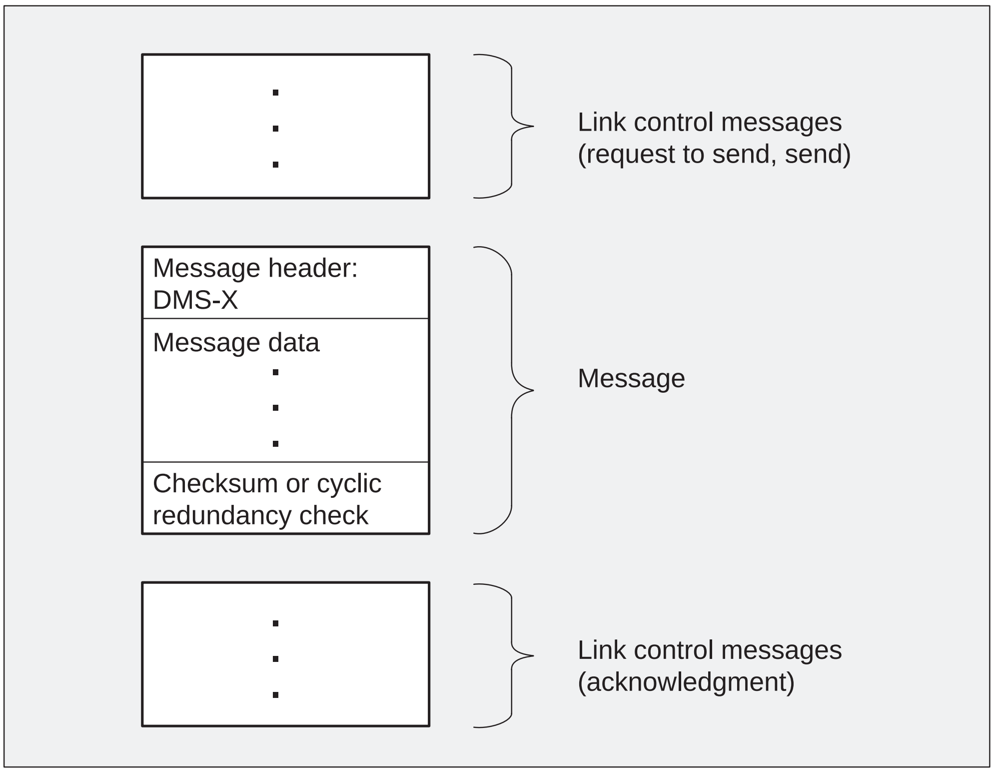
The system cannot apply HDLC protocol through the NMIF. The speech bus requires two additional timeslots. The system cannot use these timeslots for speech.

DMS-X protocol

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

The following figure illustrates a general form of handshaking protocol. This protocol is part of DMS-X protocol.

DMS-X handshaking protocol

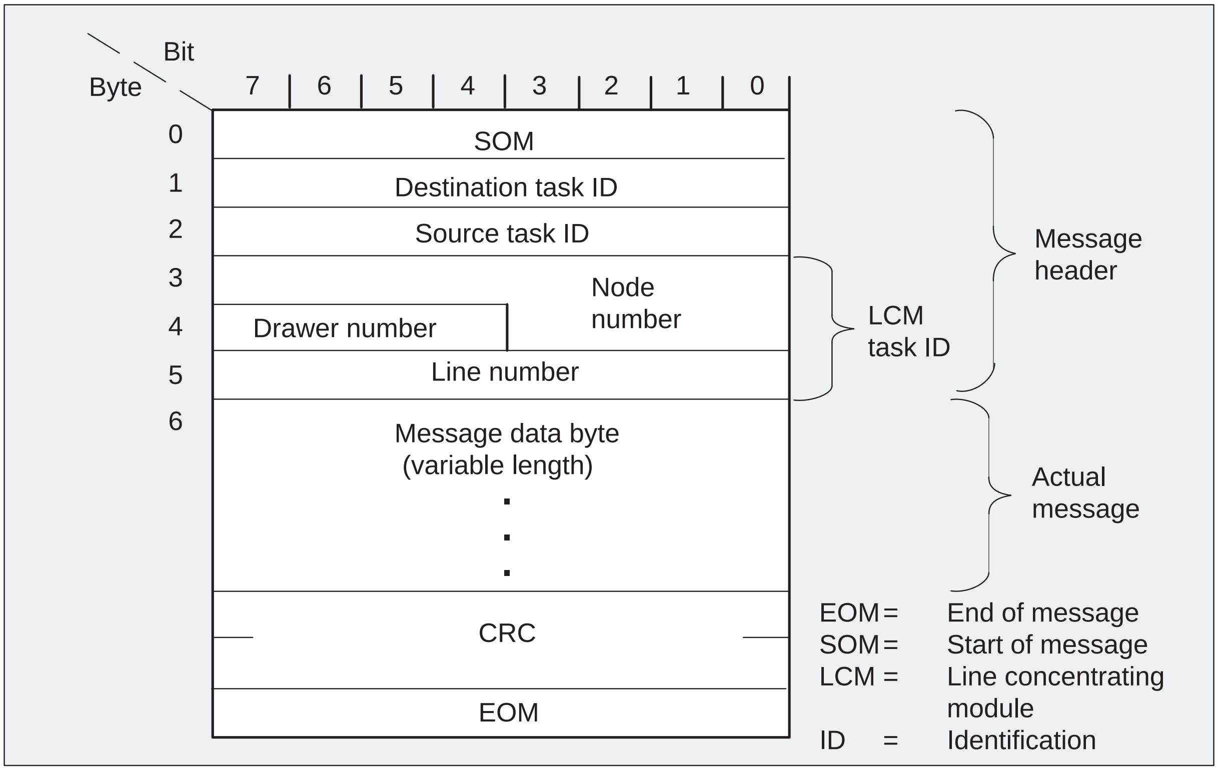


DMS-X protocol includes a cyclic redundancy check (CRC) code for error detection. Message time-out and message checksum or CRC calculation perform message error detection.

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 reroutes the message over an alternate central-side (C-side) link. Hardware redundancies provide a minimum of one alternative path to and from a node.

The following figure describes the format of DMS-X messages.

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 in the LCM that receives the outgoing message.
- The third byte specifies the source task ID. This ID identifies the LCM task that sent the incoming message.
- The next three bytes specify the task ID number.

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

Extended frame format

The DS-1 extended super frame format (ESF) has 24 frames. The 24 sync-bits are used as follows:

- 6 bits for framing pattern sequence (FPS)

  The fourth framing bit carries a FPS bit. Every fourth framing bit, after the fourth bit, carries a FPS bit. The FPS and the cyclic redundancy check (CRC) define an in-frame condition.

- 12 bits for facility data link (FDL)

  The 4-kbit/s facility data link (FDL) bit begins with the first framing bit. An FDL messaged bit is carried every other frame.

- 6 bits for cyclic redundancy check (CRC)

  The cyclic redundancy check (CRC) bit begins with the second bit and is carried every fourth bit. In an extended super frame, a block check field is checked six times. The CRC-6 check detects bits that emulate an FSP bit. This check determines if an out-of-frame condition is present

The following table describes the superframe alignment pattern.

Superframe alignment pattern

Frame number	Framing bit type	Framing bit value
1	FDL	m
2	CRC	CB1
3	FDL	m
4	FPS	0
5	FDL	m
6	CRC	CB2
7	FDL	m
8	FPS	0
9	FDL	m
10	CRC	CB3
11	FDL	m
12	FPS	1
13	FDL	m
14	CRC	CB4
15	FDL	m
16	FPS	0
17	FDL	m
18	CRC	CB5
19	FDL	m
20	FPS	1
21	FDL	m
22	CRC	CB6
23	FDL	m
24	FPS	1

CB = check bits
m = message 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

Messaging transmits the on- and off-hook messages that allow the host XPM to identify subscribers that require service.

When a subscriber lifts the handset from the cradle, a voltage source provides a steady flow of current through the transmitter. The 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 recognizes 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 multi-frequency signals through the RLCM to the CO. The type of signals that the subscriber line transmits depends on the type of telephone. The CO analyzes the digits and determines the placement of an interoffice call. The calling end of the trunk is seized. The CO transmits a connect signal forward to the called end of the trunk. The connect signal is a sustained off-hook signal. This signal indicates a request for service and continues until a break occurs in the connection.

Tone generation

The NTMX76BA messaging circuit pack contains the same downloadable tone circuits as the tones on the NT6X69LA/LB circuit packs. The DMS core supplies the tone data according to system configuration information. A static random access memory (SRAM) device on the NTMX76BA card holds the tone data.

The NTMX76BA messaging circuit pack contains a set of tones for North American networks use in a read-only memory (ROM) device. This tone set is the same tone set implemented on some NT6X69 messaging packs. These messaging packs include the NT6X69AC. These messaging packs can have the tone ROM.

Hardware on the NTMX76BA messaging circuit pack transmits the tone data into parallel speech bus timeslots. This transmission routes the tone data to specified line cards and subscriber sets. The call processing software defines the line cards and subscriber sets.

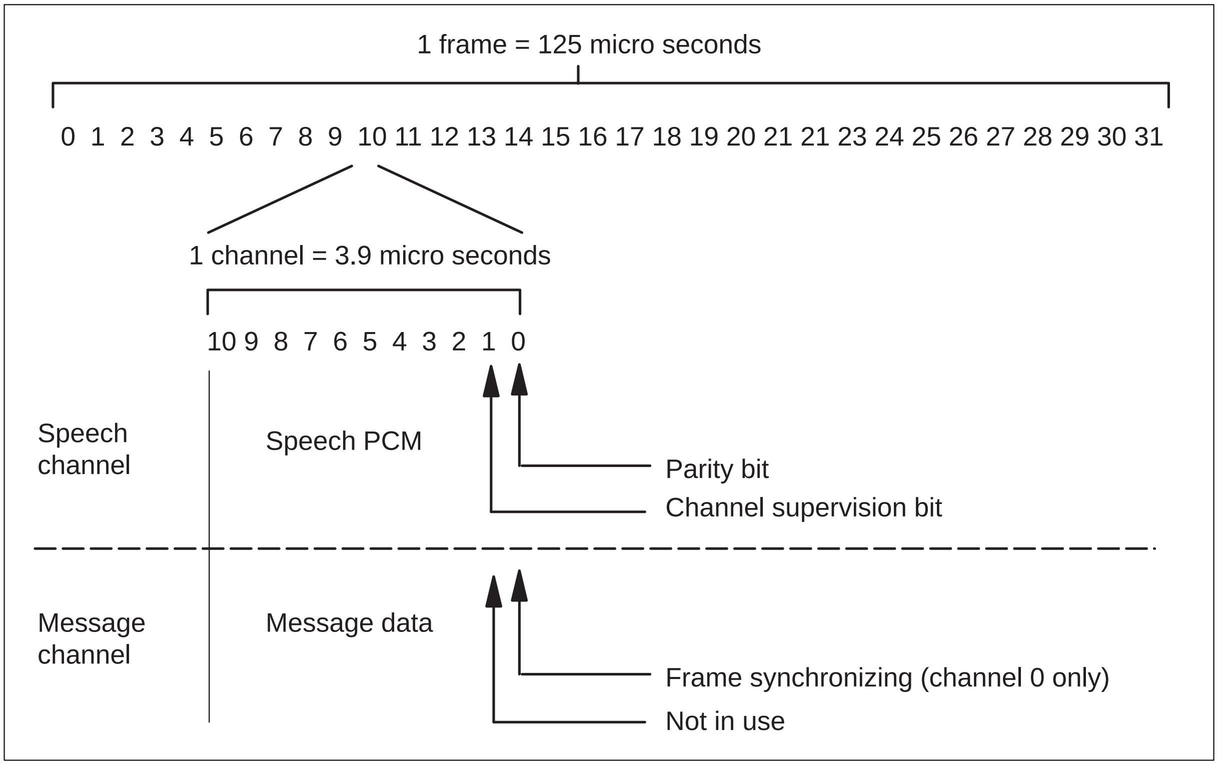
End-to-end signaling

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 the signals. If the subscriber presses specified keys at the MBS, the subscriber can outpulse DTMF signals to the machine. These DTMF signals start, stop, rewind, and playback the recordings on tape at the machine. After each DTMF signal of 130 ms, a reconnection of the PCM signal occurs.

DS-30A links

The DS30A channel frames carry speech information or message information. The following figure is the format of a DS30A frame. The DS30A links operate at a rate of 2.56 Mbyte/s with a sampling frequency of 8000 frames each second. The DS30A link frame consists of 32 channels. Each channel contains 10 bits of pulse code modulation (PCM) data.

DS-30A frame format



Electronic business set signaling

Electronic Business Set (EBS) signaling enables call processing software to communicate directly with the EBS terminal. An above-voice frequency, low-speed data channel transports the EBS messaging over the loop. This data channel sends signaling information over a separate D-channel between the RLCM-EDC and the host.

RLCM-EDC hardware

This chapter describes the Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC) hardware components. The RLCM–EDC hardware components give subscribers the full resources of the digital switching system. The following sections describe hardware components and additional components of the RLCM-EDC.

RLCM-EDC hardware components

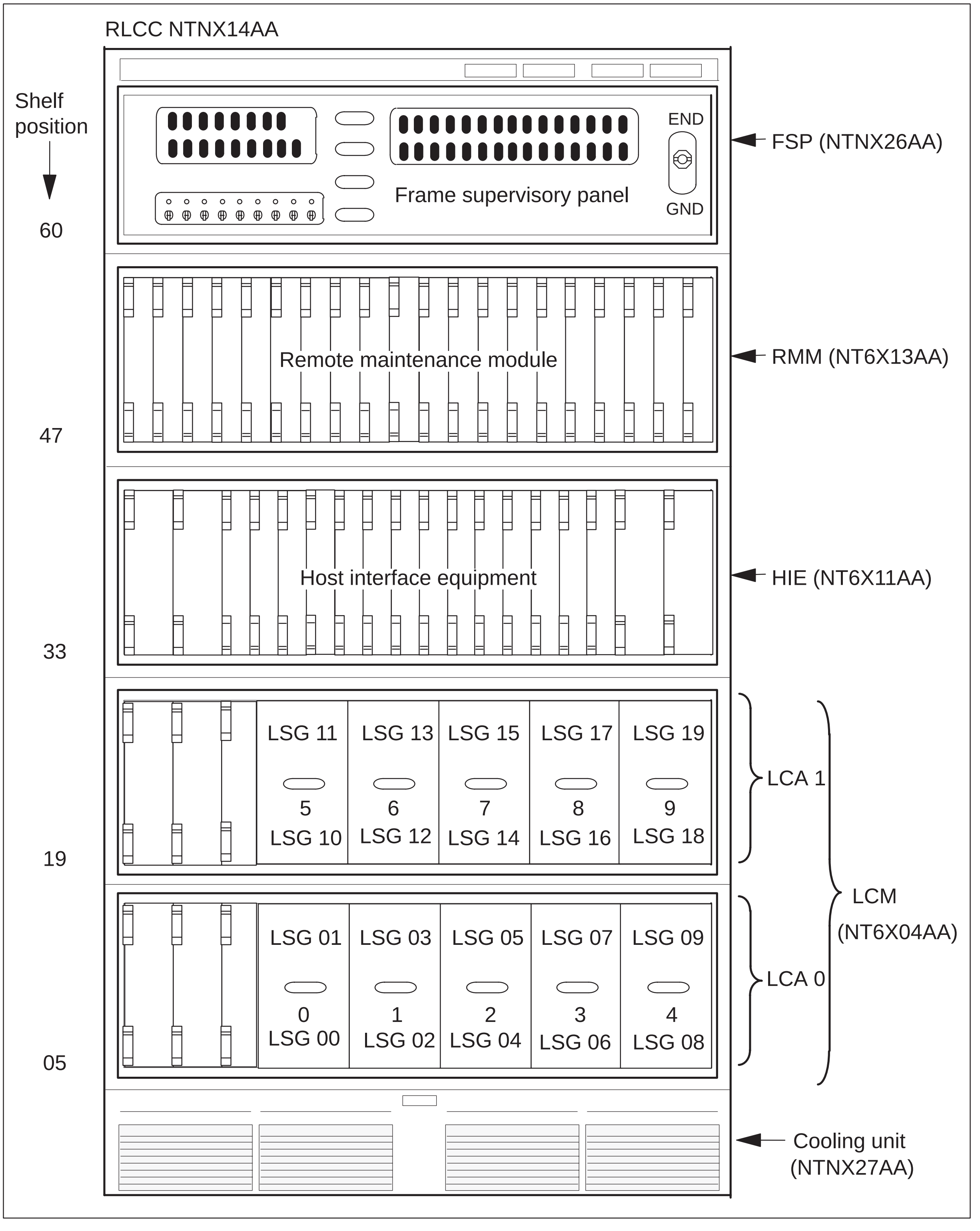
The RLCM-EDC is in a Digital Multiplex System (DMS) remote line controller cabinet (RLCC). The cabinet contains four shelves with the following components:

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

Hardware configuration

The following figure, RLCC cabinet, shelf, and panel arrangement, shows the layout of the RLCM-EDC equipment. The equipment is in a single DMS-100 cabinet equipment bay. The approximate 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.

RLCC cabinet, shelf, and panel arrangement



Line concentrating module

The LCM is the basic design building block of the remote peripheral group. The control side (C-side) of an LCM interfaces with the host network over DS30A links. The RLCM-EDC connects over two to six DS-1 links to the host network. Links connect through a controller peripheral like a line trunk controller PLUS (LTC+).

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

The LCM contains two shelves called line concentrating arrays (LCA). Each LCA contains five line drawers. A fully equipped LCM contains ten line drawers. A fully-equipped LCM supports 640 subscriber lines. Each LCA has a control complex, processor, digroup control card and power converter. The control units operate in a load sharing mode. If one of the processors fails, the mate processor takes complete control of the LCM. If one power converter fails, the power converter that remains can supply power to all line cards of the LCM.

The RLCM-EDC contains a dual-unit LCM (NTNX28AA), mounted in an LCM shelf assembly. The NTNX28AA contains the following components:

- an NT6X51BA processor card with three Motorola 68302 processors in a tight coupled distributed process architecture.
- a main processor (MP) with four Megabytes (MB) of read-only memory (ROM) on two banks, (active/standby)
- a C-side processor (CP) that terminates C-side messaging data in high data link controller (HDLC) or DMS-X format
- a P-side processor (PP) that operates the serial communication links between the NT6X51BA card and the bus interface card (BIC). The NT6X51BA card and the BIC are in each line drawer of the LCM.

The LCM contains the following cards:

- NT6X53AA—Power converter 5V/15V
- NT6X51BA—LCM processor with 4MB memory (two banks)
- NT6X52AA—Digroup controller
- NT6X54AA—Bus interface card (BIC) (up to ten)
- NT6X21AD—Meridian electronic business set (EBS)

Note: The NT6X21 EBS card is the only applicable line card in the first application of the RLCM-EDC.

Line cards

Each of the ten line drawers of the LCM contains a pair of line subgroups (LSG) and a single BIC. Each LSG contains 32-line card slots that support a maximum of 640 subscriber line slots. The RLCM-EDC supports subscriber line card types in the first application. These subscriber line card types are: NT6X21AA, AB, AC, and AD for Meridian electronic business set (EBS).

HIE

The HIE shelf contains a maximum of three DS-1 interface cards (NT6X50AB) to connect the DS-1 links to the host controller. The HIE shelf also contains the following common cards:

- NT6X73AA—Link control card (two)
- NT2X70AF—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 LCC also convert data between DS30A format to and from the LCM. The DS30A ports of the LCM map to the DS-1 interface cards in the HIE. Data routes through the DS-1 links to the host.

Each LCM unit (LCA shelf) has one LCC in the HIE. In normal operation, the two LCCs form alternate connections to even and odd LCAs. If an LCC fails in the HIE, the mate LCA handles all the DS-1 links.

Each LCC functions as a clock. The LCC locks the frequency of the LCC to the primary DS-1 links. The same clock source drives both LCC clocks. The clock source is the host LTC+. One of the LCCs is the primary LCC, as the host LTC+ directs. The LCC frequency locks the C-side primary link of that LCC. The LCC synchronizes to the timing that the host peripheral of the LCC downloaded. The other LCC frequency locks to the primary LCC clock to derive the timing of the LCC. The LCC clock functions serve both the DCCs and the Remote Maintenance Module (RMM).

FSP

The FSP provides an interface between the power distribution center and the power converters in the LCM. The FSP also contains alarm circuits that monitor conditions of low voltage from the power converters.

RMM

An optional component of the RLCM-EDC is the RMM. The RMM is in the RMM shelf assembly. The RMM is a single-shelf module based on the maintenance trunk module (MTM). The RMM provides maintenance and service capabilities for the RLCM-EDC. The RMM consists of two power converters, an RMM control card, a codec and tone card. The RMM can contain a maximum of 14 provisionable 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

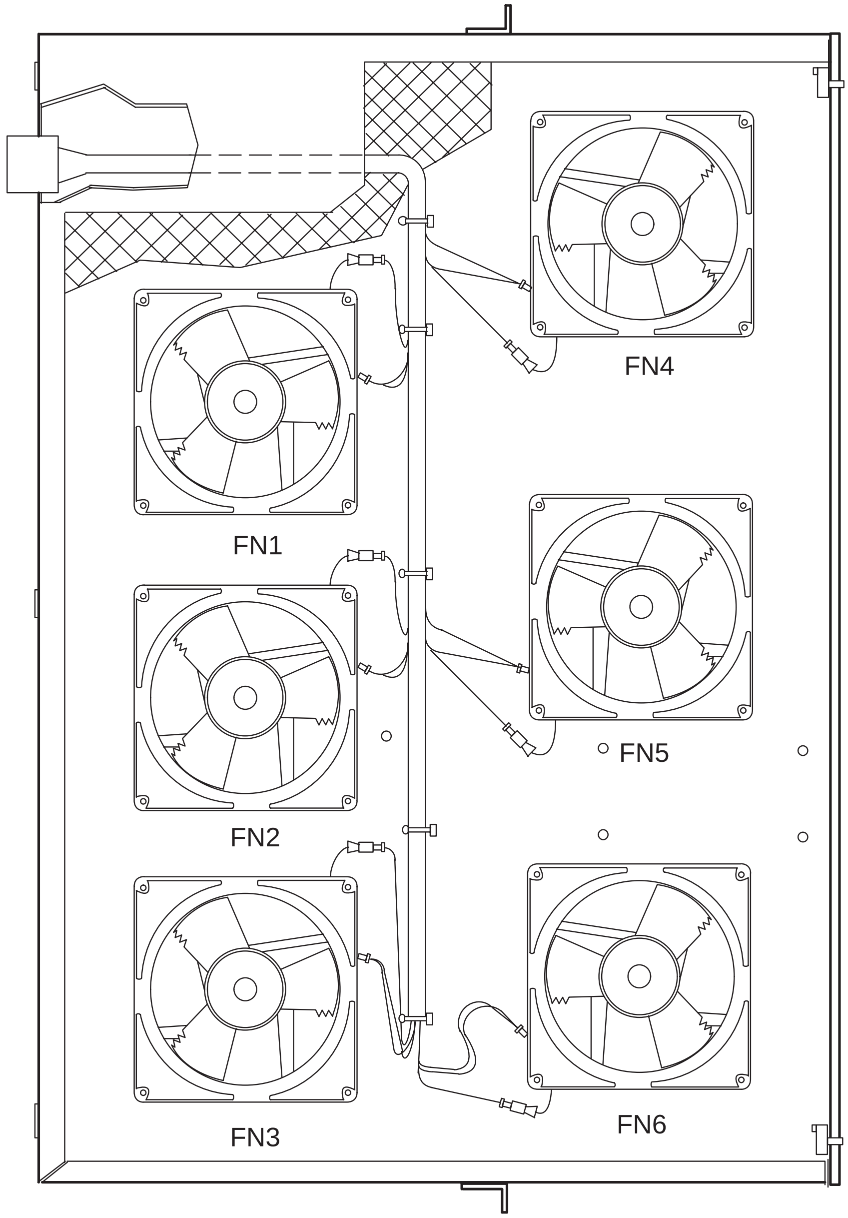
Cards that can be provisioned in the RMM follow:

- 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

Cooling unit (CU)

The CU (NTNX27AA) includes six circulation fans. The circulation fans use forced-air convection to cool the four shelves of cards in the RLCM-EDC cabinet. The following figure shows the layout of the CU.

NTNX27AA components



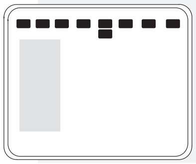
Note: This figure is not to scale.

RLCM-EDC recovery procedures

This chapter describes recovery procedures for the Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC). Maintenance personnel can use this procedure in a DMS-100/200 office.

RLCM-EDC recovery procedure

Alarm display



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

Application

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

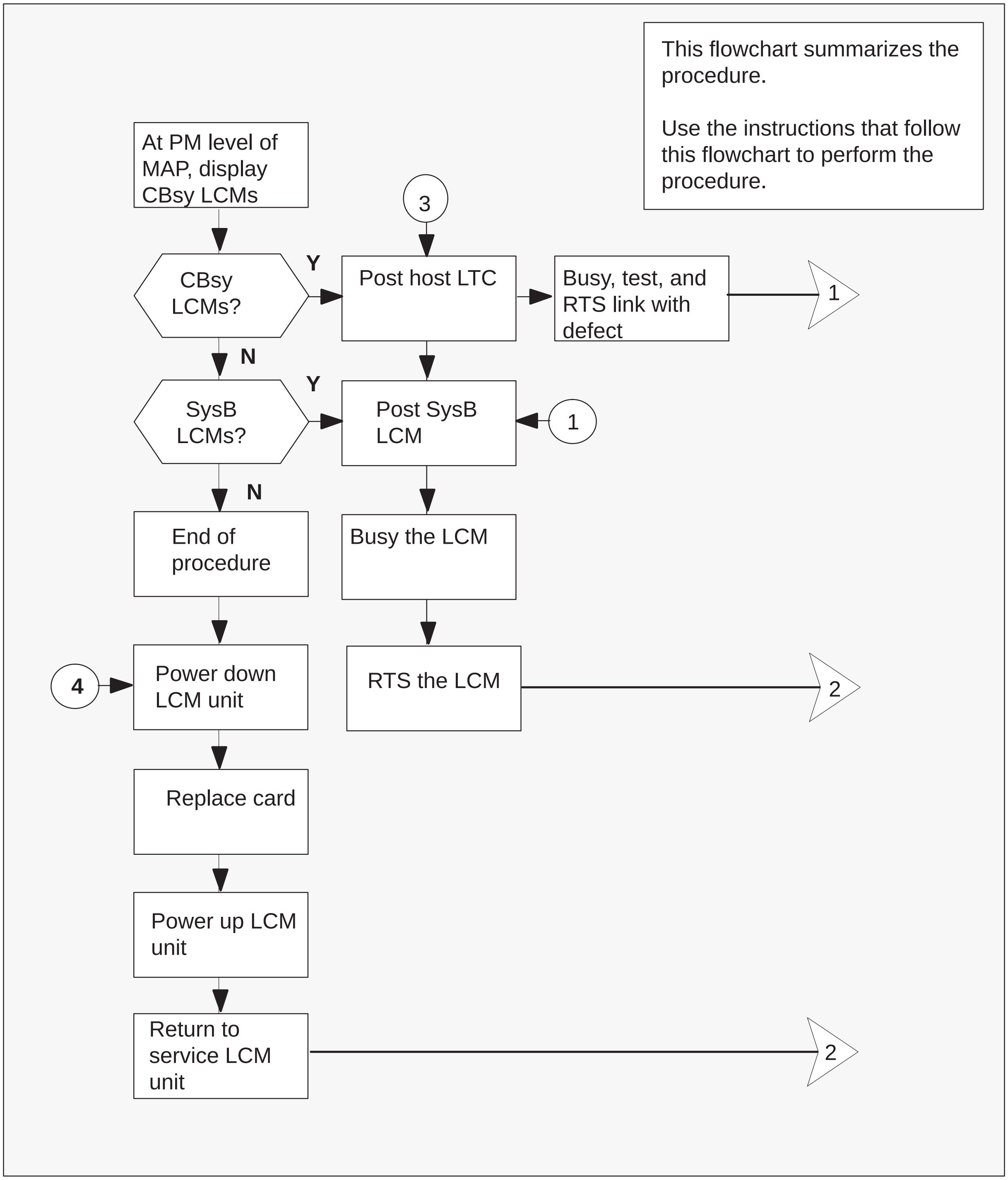
Action

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

Note: The numbers in the flowchart do not coincide with step-action numbers. Instead, the numbers indicate navigation within the flowchart.

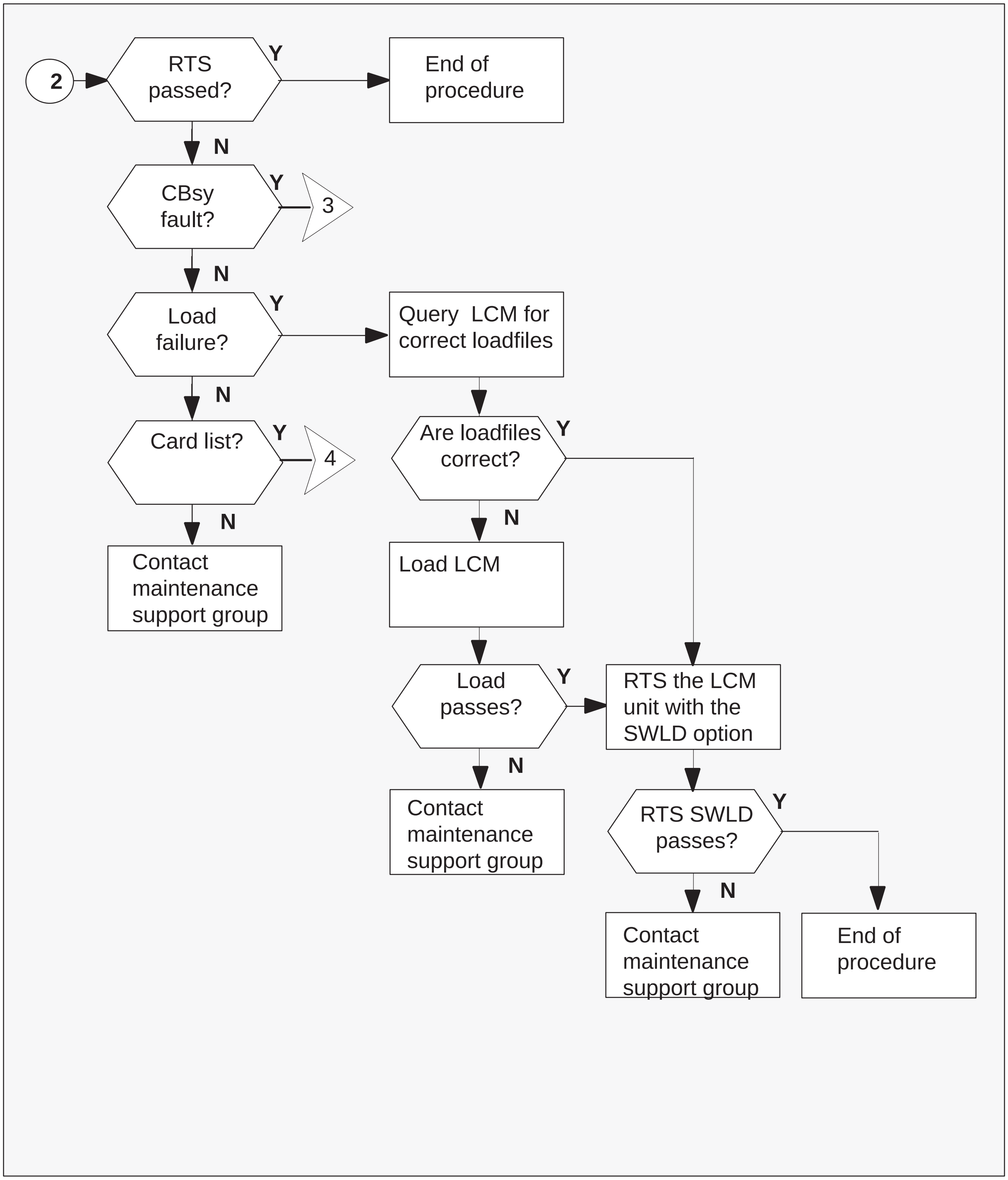
RLCM-EDC recovery procedure (continued)

Summary of an RLCM–EDC recovery procedure



RLCM-EDC recovery procedure (continued)

Summary of an RLCM–EDC recovery procedure (continued)



RLCM-EDC recovery procedure

At the MAP terminal

1 To silence an audible alarm, 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-EDC, type

>DISP STATE CBSY LCM
and press the Enter key.

If response	Do
indicates no CBsy LCMs	step 11
indicates CBsy LCMs	step 4

4 To post the RLCM-EDC with the alarm condition, type

>POST LCM CBSY
press the Enter key.

Note: Note the name and number of this RLCM-EDC.

5 To identify the control side (C-side) links to the host Line Trunk Controller PLUS (LTC+), type

>TRNSL C
and press the Enter key.

Example of a MAP response:

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

6 To post the host LTC+, type

>POST LTC ltc_no
and press the Enter key.

where

ltc_no is the number of the LTC+ (0 to 255)

RLCM-EDC recovery procedure (continued)

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

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

8 To busy the defective link, type

>BSY LINK link_no
and press the Enter key.

where

link_no is the number of a defective P-side link identified in step 7

Note: Repeat this step for each defective link.

9 To test the busy link, type

>TST LINK link_no
and press the Enter key.

where

link_no is the number of a damaged P-side link busied in step 8

Note: Repeat this step for each busy link.

If test	Do
passes	step 10
fails	step 24

RLCM-EDC recovery procedure (continued)

10 To return the busy link to service (RTS), type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of a defective P-side link tested in step 9

Note: Repeat this step for each tested link.

If RTS	Do
passed and other links are not SysB	step 11
passed but other links are SysB	step 8
failed	step 24

11 To identify the defective RLCM-EDC at the peripheral module (PM) level of the MAP display, type

>DISP STATE SYSB LCM
and press the Enter key.

If MAP response	Do
indicates no SysB LCMs	step 32
indicates SysB LCMs	step 12

12 To post the RLCM-EDC with the alarm condition, type

>POST LCM SYSB
and press the Enter key.

RLCM-EDC recovery procedure (continued)

13 To busy both LCM units of the RLCM-EDC, type

>BSY PM
and press the Enter key.

14 To query the out-of–service (OOS) LCM for correct load information, type

>QUERYPM OOS
and press the Enter key.

Example of a MAP response:

```
PM Type: LCM  Int. No.: 9  Status index: 7  Node_No: 40
LCM REM1 02 0  Memory Size – Unit 0: 4M , Unit 1: 4M
ESA equipped: No, Intraswitching is Off
Loadname: LCMINV – REDC07AA
Unit0 Loads: Act– REDC07AB *FLT* Stby– REDC07AA
Unit1 Loads: Act– REDC07AB *FLT* Stby– REDC07AA
REX is ON; INCOMPLETE on SAT. 1995/10/28 at 01:35:19
Node Status: {MAN_BUSY, FALSE}
Unit 0 Status: {MAN_BUSY, FALSE}
Unit 1 Status: {MAN_BUSY, FALSE}
Site Flr RPos  Bay_id   Shf  Description   Slot    EqPEC
REM1  01  K03  RLCM 02   04  LCM  02 0             6X04AA
Services : NEUTRAL
```

If loadfiles	Do
are valid	step 15
are invalid	step 22

15 To RTS the PM, type

>RTS PM
are press the Enter key.

If RTS	Do
passes	step 32
fails	step 16

RLCM-EDC recovery procedure (continued)

16 Check if links to the RLCM-EDC are stable. To find and record the link numbers for this RLCM-EDC, type

>TRNSL C
and press the Enter key.

Example of a MAP response:

```
                          Host LTC P-side link number
                            ▼
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
```

Note: Record the link information for use later in this procedure.

17 To access the CARRIER level of the MAP, type

>TRKS;CARRIER
and press the Enter key.

RLCM-EDC recovery procedure (continued)

18 To post the host LTC+ links to the RLCM-EDC and check link conditions for slips and framing errors, type

>POST LTC ltc_no link_no
and pressing the Enter key.

where

pm_no	is the number of the LTC+ (0 to 255)
link_no	is the number of the link associated with the host LTC+ (refer to step 16 display)

Note: Repeat the POST command for each link on the RLCM-EDC.

Example of a MAP response:

```
                              Host LTC 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   <-7. 0   0  INSV
```

Note: This display shows carrier facilities from the host LTC+ to the RLCM-EDC. Use the Detail REM option to check the carrier facilities from the remote site back to the host LTC+.

If link conditions	Do
show a high number of SLIP and FRME	step 25
show a very low number of SLIP and FRME	step 19

19 To post the RLCM-EDC, type

>PM;POST LCM site cabinet lcm
press the Enter key.

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the cabinet number of the RLCC-EDC
lcm	is the number of the LCM

RLCM-EDC recovery procedure (continued)

20 To attempt to RTS the RLCM-EDC and switch load to the standby bank, type

>RTS PM SWLD
and press the Enter key.

Example of a MAP response:

```
Existing loads: Unit 0: Act:REDC07AA *FLT*  Stby:REDC07AA
                Unit 1: Act:REDC07AA *FLT*  Stby:REDC07AA

New loads after a successful RTS will be:
        Unit 0: Act:REDC07AA    Stby:REDC07AA *FLT*
        Unit 1: Act:REDC07AA    Stby:REDC07AA *FLT*.

Do you wish to continue?
Please confirm (“YES”, “Y”, “NO”, or “N”):
```

If RTS	Do
passes	step 32
fails, and the system produces a card list	step 21
fails, but the system does not produce a card list	step 24
has load failure	step 22

21 The card list identifies the cards most likely to be defective. Replace the listed cards one at a time.

If last card on list	Do
has not been replaced	step 26
has been replaced	step 24

RLCM-EDC recovery procedure (continued)

22 To attempt to reload the RLCM-EDC, type

>LOADPM PM CC
press the Enter key.

If load	Do
passes	step 23
fails in one unit	step 30
fails	step 24

23 To attempt again to RTS the RLCM-EDC and activate the loads in the standby banks, type

>RTS PM SWLD
and press the Enter key.

Example of a MAP response:

```
Existing loads: Unit 0: Act:REDC07AA *FLT*  Stby:REDC07AA
                Unit 1: Act:REDC07AA *FLT*  Stby:REDC07AA

New loads after a successful RTS will be:
        Unit 0: Act:REDC07AA    Stby:REDC07AA *FLT*
        Unit 1: Act:REDC07AA    Stby:REDC07AA *FLT*.

Do you wish to continue?
Please confirm (“YES”, “Y”, “NO”, or “N”):
```

If RTS	Do
passes	step 32
fails	step 24

24 Contact your maintenance support group for more instructions on how to clear this fault.

25 Contact the carrier maintenance support group for maintenance on the open links or unstable links. When carriers are restored, go to step 17.

RLCM-EDC recovery procedure (continued)

26 Switch OFF the circuit breaker to power down the converter in the LCM unit of the RLCM-EDC.

Use the following table to determine which frame supervisory panel (FSP) circuit breaker serves the unit.

Circuit breaker	**Unit**
CB2	LCA 0
CB7	LCA 1

27 Go to the *Card Replacement Procedures* to replace the first (or next) card on the card list. Notify outside plant personnel of the card you wish to change. Return to this step after replacement of the card.

28 Switch on the circuit breaker of the RLCM-EDC in use to power up the converter in the LCM unit of the RLCM-EDC.

29 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
failes	step 30

30 To attempt to load the LCM unit, type

>LOADPM UNIT lcm_unit CC
and press the Enter key.

where

lcm_unit is the LCM unit (0 or 1) that failed to load in step 22

If load	**Do**
passes	step 31
fails	step 24

RLCM-EDC recovery procedure (end)

31 To attempt to return the LCM unit to service and switch load to standby bank, type

>RTS UNIT lcm_unit SWLD
press the Enter key.

where

lcm_unit is the LCM unit to be returned to service (0 or 1)

Example of a MAP response:

```
Existing loads: Unit 0: Act:REDC07AA *FLT*  Stby:REDC07AA

New loads after a successful RTS will be:
        Unit 0: Act:REDC07AA    Stby:REDC07AA *FLT*

Do you wish to continue?
Please confirm (“YES”, “Y”, “NO”, or “N”):
```

>Y

If RTS	Do
passes	step 32
fails	step 24

32 The procedure is complete. If the system displays additional alarms, proceed to the appropriate *Alarm and Clearing Procedure*.

RLCM-EDC alarm clearing procedures

This chapter contains the alarm clearing procedures for the Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC). 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 numerical and alphabetical order.

PM LCM critical

Alarm display

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

Indication

Use this procedure to recover service in an RLCM-EDC when both units of the line concentrating module (LCM) are out of service. This condition always produces a central side busy (CBsy) alarm.

The LCM alarm appears under the PM header in the MAP subsystem display. This alarm indicates an alarm condition in the RLCM-EDC. The *n* indicates the number of RLCM-EDCs with alarms. The **C** that appears under the alarm indicates a critical 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

Call processing ceases with a critical alarm indication when an LCM is SysB or CBsy.

Common procedures

There are no common procedures.

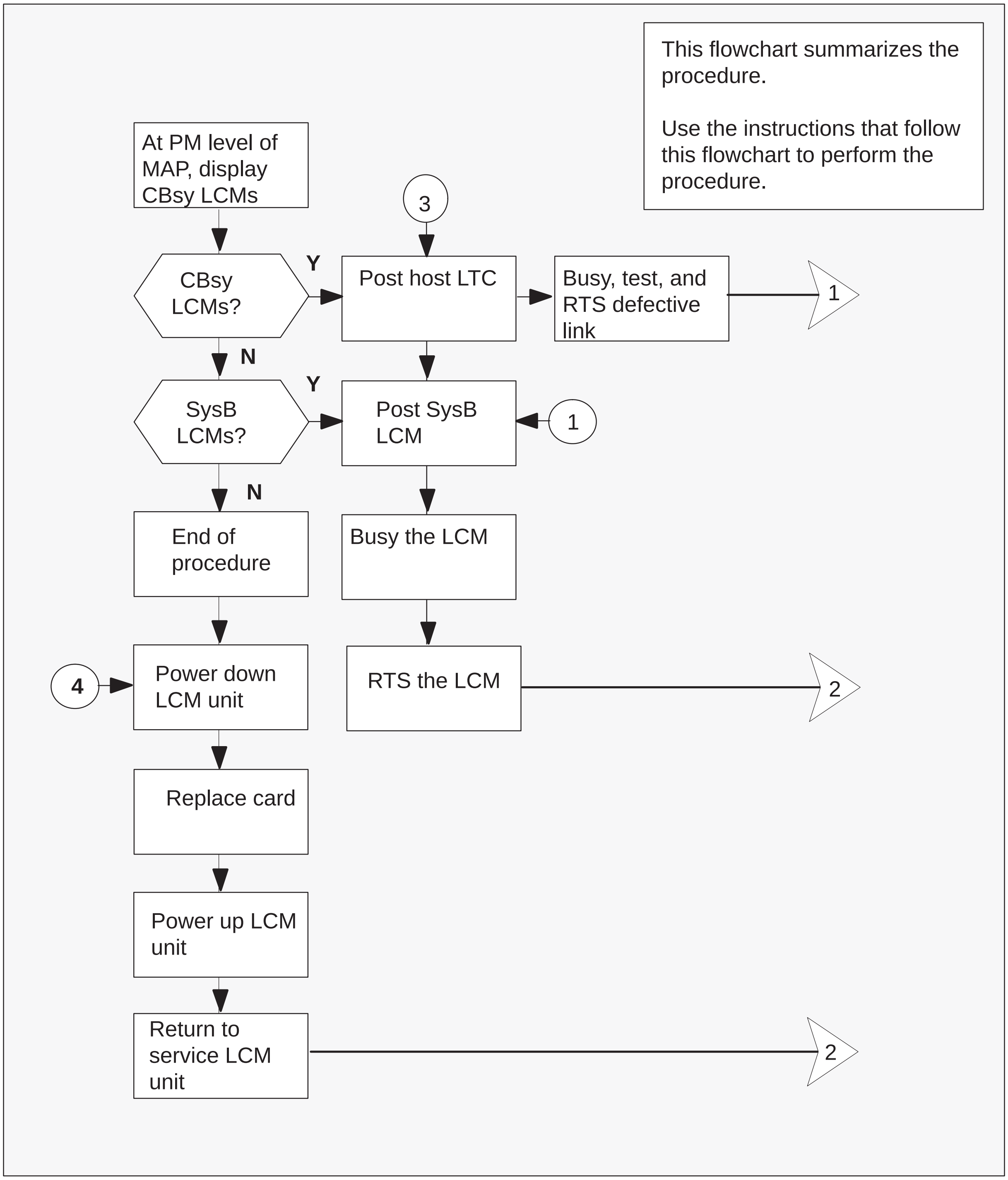
Action

This procedure contains a summary flowchart. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Note: The numbers in the flowchart do not coincide with the step-action numbers. The numbers indicate where to go in the flowchart.

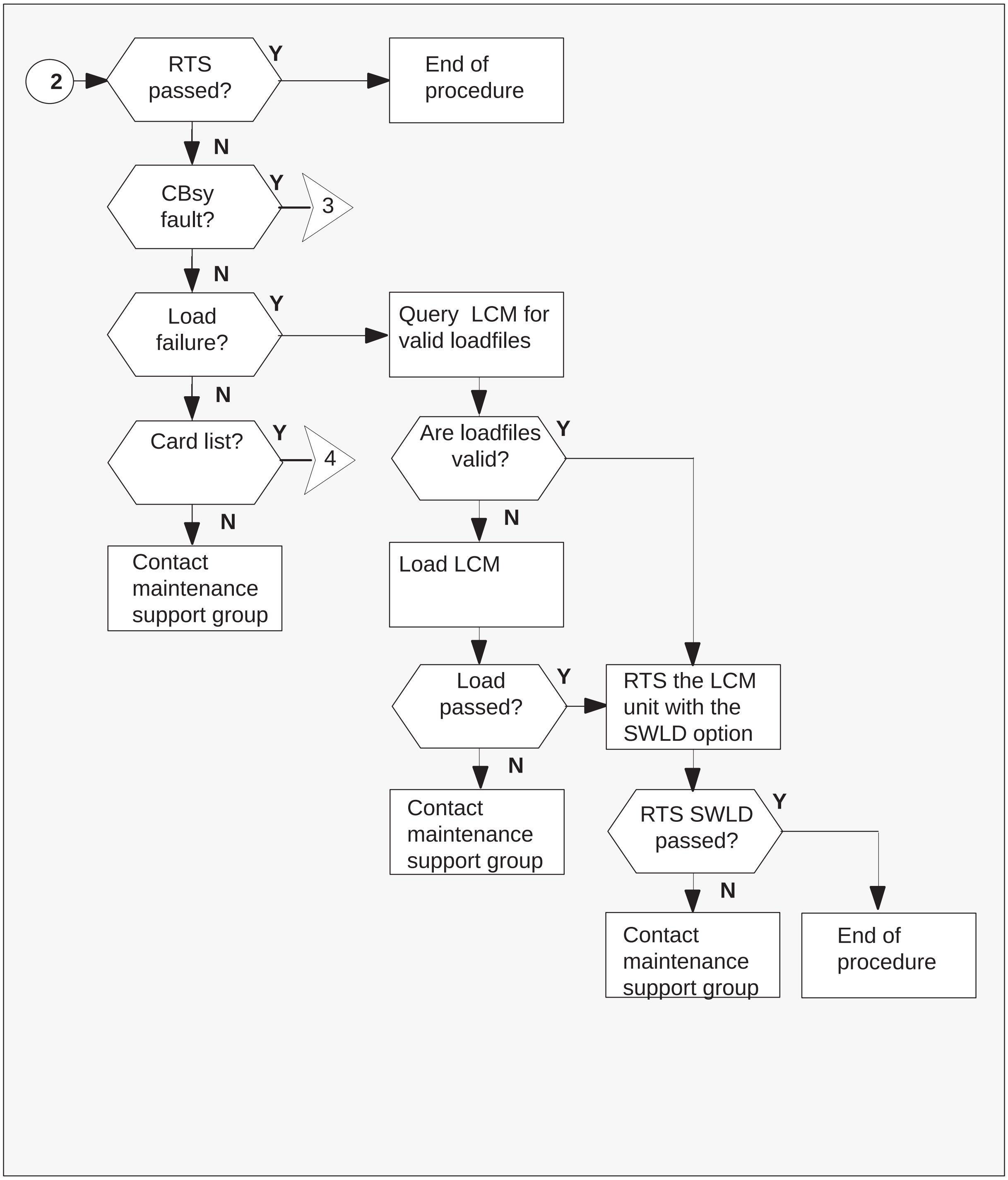
PM LCM
critical (continued)

Summary of clearing a PM LCM critical alarm



PM LCM
critical (continued)

Summary of clearing a PM LCM critical alarm (continued)



PM LCM
critical (continued)

Clearing a PM LCM 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-EDC that has faults, type

>DISP STATE CBSY LCM
and press the Enter key.

If response	Do
does not indicate CBsy LCMs	step 11
indicates CBsy LCMs	step 4

4 To post the RLCM-EDC with the alarm condition, type

>POST LCM CBSY
and press the Enter key.

Note: Record the name and number of the posted RLCM-EDC.

5 To identify central side (C-side) links to the host Line Trunk Controller PLUS (LTC+), type

>TRNSL C
and press the Enter key.

Example of a MAP response:

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

6 To post the host LTC+, type

>POST LTC ltc_no
and press the Enter key.

where

ltc_no   is the number of the LTC+ (0 to 255) in step 5

PM LCM
critical (continued)

7 To display the peripheral side (P-side) links of the LTC+, 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
```

Note: Record information for the links that have a state 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 a P-side link made busy in step 8

If test	Do
passes	step 10
fails	step 17

PM LCM
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 a P-side link tested in step 9

Note: Repeat this step for each link correctly tested.

If RTS	Do
passes and no other links are system busy (SysB)	step 11
passes but other links are SysB	step 8
fails	step 24

11 To identify the RLCM-EDC that has faults, type

>DISP STATE SYSB LCM
and press the Enter key.

If response	Do
does not indicate SysB LCMs	step 32
indicates SysB LCMs	step 12

12 To post the RLCM-EDC identified in step 11 with the alarm condition, type

>POST LCM SYSB
and press the Enter key.

13 To busy both LCM units of the RLCM-EDC, type

>BSY PM
and press the Enter key.

PM LCM
critical (continued)

14 To query the LCM for correct loadfile names, type

>QUERYPM OOS
and press the Enter key.

Example of a MAP response

```
PM Type: LCM  Int. No.: 9  Status index: 7  Node_No: 40
LCM REM1 02 0  Memory Size – Unit 0: 4M , Unit 1: 4M
ESA equipped: No, Intraswitching is Off
Loadname: LCMINV – REDC07AA
Unit0 Loads: Act– REDC07AB Stby– REDC07AA
Unit1 Loads: Act– REDC07AB Stby– REDC07AA
REX is ON; INCOMPLETE on SAT. 1995/10/28 at 01:35:19
Node Status: {MAN_BUSY, FALSE}
Unit 0 Status: {MAN_BUSY, FALSE}
Unit 1 Status: {MAN_BUSY, FALSE}
Site Flr RPos  Bay_id   Shf  Description   Slot    EqPEC
REM1  01  K03  RLCM 02   04  LCM  02 0             6X04AA
Services : NEUTRAL
```

If loadfile names	Do
are valid	step 15
are invalid or corrupted	step 22

15 To return to service (RTS) the PM, type

>RTS PM
and press the Enter key.

If RTS	Do
passes	step 32
fails	step 16

PM LCM
critical (continued)

16 Check to see if links to the RLCM-EDC are stable. To find and record the link numbers for this RLCM-EDC, type

>TRNSL C
and press the Enter key.

Example of a MAP response

```
Link  0:    LTC 1       0;Cap MS;Status:P,   ;MsgCon:CLS
Link  1:    LTC 1       2;Cap MS;Status:P,   ;MsgCon:CLS
Link  2:    LTC 1       3;Cap  S;Status:P,
Link  3:    LTC 1       4;Cap  S;Status:P,
```

17 To access the CARRIER level of the MAP terminal, type

>TRKS;CARRIER
and press the Enter key.

PM LCM
critical (continued)

18 To post the host LTC+ links and check link conditions for slips and framing errors, type

>POST LTC ltc_no link_no
and press the Enter key.

where

ltc_no	is the number of the LTC+ (0 to 255)
link_no	is the number of the link associated with the host XPM (see step 16 display)

Note: Repeat the POST command for each link supplied for the RLCM-EDC.

Example of a MAP response:

```
                              Host LTC+ 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  1995262 0    0   INSV
```

Note: This display shows carrier facilities from the host LTC+ to the RLCM-EDC. Use the Detail REM option to check the carrier facilities from the remote site back to the host LTD+.

If link conditions	Do
indicate a high number of `SLIP and FRME`	step 24
indicate a very low number of `SLIP and FRME`	step 19

19 To post the RLCM-EDC with the alarm condition, type

>PM; POST LCM site cabinet lcm
and press the Enter key.

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the cabinet number of the RLCC-EDC
lcm	is the number of the LCM

PM LCM
critical (continued)

20 To attempt to RTS the RLCM-EDC and switch load to the standby bank, type

>RTS PM SWLD
and press the Enter key.

Example of a MAP response:

```
Existing loads: Unit 0: Act:REDC07AA *FLT*  Stby:REDC07AA
                Unit 1: Act:REDC07AA *FLT*  Stby:REDC07AA

New loads after a successful RTS will be:
        Unit 0: Act:REDC07AA    Stby:REDC07AA *FLT*
        Unit 1: Act:REDC07AA    Stby:REDC07AA *FLT*.
```

Do you wish to continue?
Please confirm (“YES”, “Y”, “NO”, or “N”):

If RTS	Do
passes	step 32
fails, and the system produces a card list	step 21
fails, and the system does not produce a card list	step 25
results in load failure	step 22

21 The card list identifies the cards most at risk for faults. Replace the cards one at a time in the order listed from top to bottom.

If you	Do
replaced the last card on the list	step 26
did not replace the last card on the list	step 25

PM LCM
critical (continued)

22 To attempt to reload the RLCM-EDC, type

>LOADPM PM CC
and press the Enter key.

If load	Do
passes	step 23
fails in one unit	step 30
fails	step 25

23 To attempt to RTS the RLCM-EDC again, and switch load to standby banks, type

>RTS PM SWLD
and press the Enter key.

Example of a MAP response:

```
Existing loads: Unit 0: Act:REDC07AA *FLT*  Stby:REDC07AA
                Unit 1: Act:REDC07AA *FLT*  Stby:REDC07AA

New loads after a successful RTS will be:
        Unit 0: Act:REDC07AA    Stby:REDC07AA *FLT*
        Unit 1: Act:REDC07AA    Stby:REDC07AA *FLT*.
```

Do you wish to continue?
Please confirm (“YES”, “Y”, “NO”, or “N”):

If RTS	Do
passes	step 32
fails	step 25

24 Contact the carrier maintenance support group for maintenance on the open links or the unstable links. When carriers are restored, go to step 17.

25 For additional help, contact the maintenance support group.

PM LCM
critical (continued)

26 To power down the converter in the LCM unit of the RLCM-EDC you are working on, switch OFF the circuit breaker.

Use the following table to determine which frame supervisory panel (FSP) circuit breaker serves the unit.

Circuit breaker	**Unit**
CB02	LCA 0
CB07	LCA 1

27 Perform the *Card Replacement Procedures.* Replace the first (or next) card on the card list. Notify outside plant personnel that you are changing the card. Return to this step after you replace the card.

28 Power up the converter in the RLCM-EDC's LCM unit you are working on. Switch ON the circuit breaker that you turned OFF in step 26.

29 To RTS the LCM unit, type

>RTS UNIT unit_no
and press the Enter key.

where

lcm_unit is the LCM unit to RTS (0 or 1)

If RTS	**Do**
passes	step 32
fails	step 30

30 To attempt to load the LCM unit, type

>LOADPM UNIT lcm_unit CC
and press the Enter key.

where

lcm_unit is the LCM unit (0 or 1) that failed to load in step 22

If load	**Do**
passes	step 31
fails	step 26

PM LCM
critical (end)

31 To attempt to RTS the LCM unit and switch load to standby bank, type

>RTS UNIT lcm_unit SWLD
and press the Enter key.

where

lcm_unit is the LCM unit of the RLCM-EDC to RTS (0 or 1)

Example of a MAP response:

```
Existing loads: Unit 0: Act:REDC07AA *FLT*  Stby:REDC07AA

New loads after a successful RTS will be:
        Unit 0: Act:REDC07AA    Stby:REDC07AA *FLT*
```

Do you wish to continue?
Please confirm (“YES”, “Y”, “NO”, or “N”):

>Y

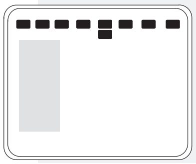
If RTS	Do
passes	step 32
fails	step 25

32 The procedure is complete.

Go to the correct alarm clearing procedure if additional alarms appear.

PM LCM 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 LCMs that have a major alarm.

Meaning

The LCM is in-service trouble (ISTb) because of one of the following conditions:

- one unit is system busy and one unit is ISTb
- one unit is system busy and one unit is in-service
- one unit is C-side busy and one unit is ISTb
- one unit is C-side busy and one unit is in-service

Result

The SysB and CBsy LCMsdo not directly affect service, because one unit of the LCM still provides service. There is no local backup. Failure of the other LCM unit will interrupt service.

A CBsy condition can interrupt communication between the RLCM-EDC and the host. An interruption of communication between the RLCM-EDC and the host reduces the service that the RLCM-EDC provides to the local area. Out of service line drawers affect call processing. If all line drawers are in-service call processing is not affected.

Common procedures

There are no common procedures.

Action

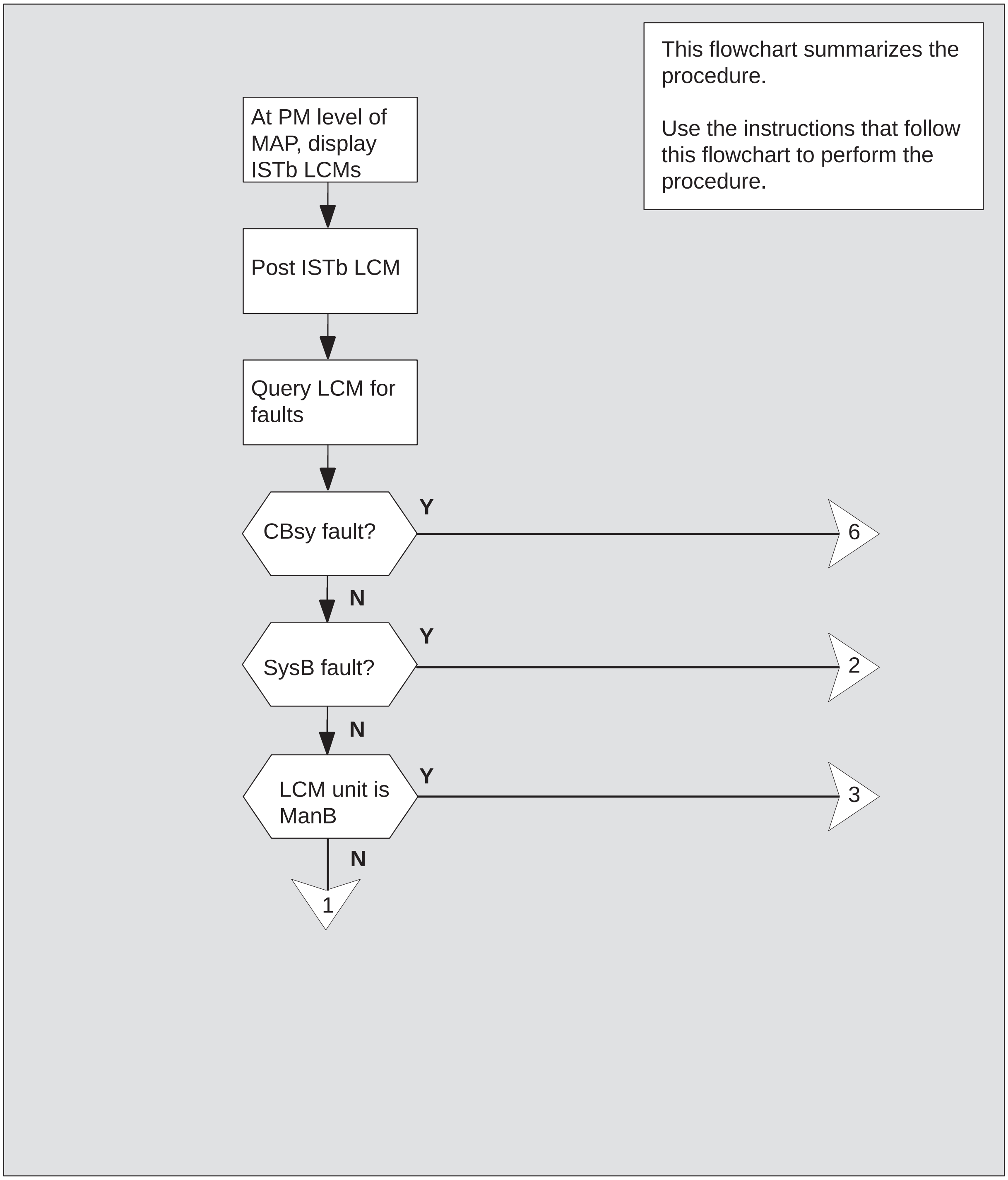
This procedure contains a flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

PM LCM
major (continued)

Note: The numbers represented in the flowchart do not coincide with the step-action numbers. The numbers indicate movement in the flowchart only.

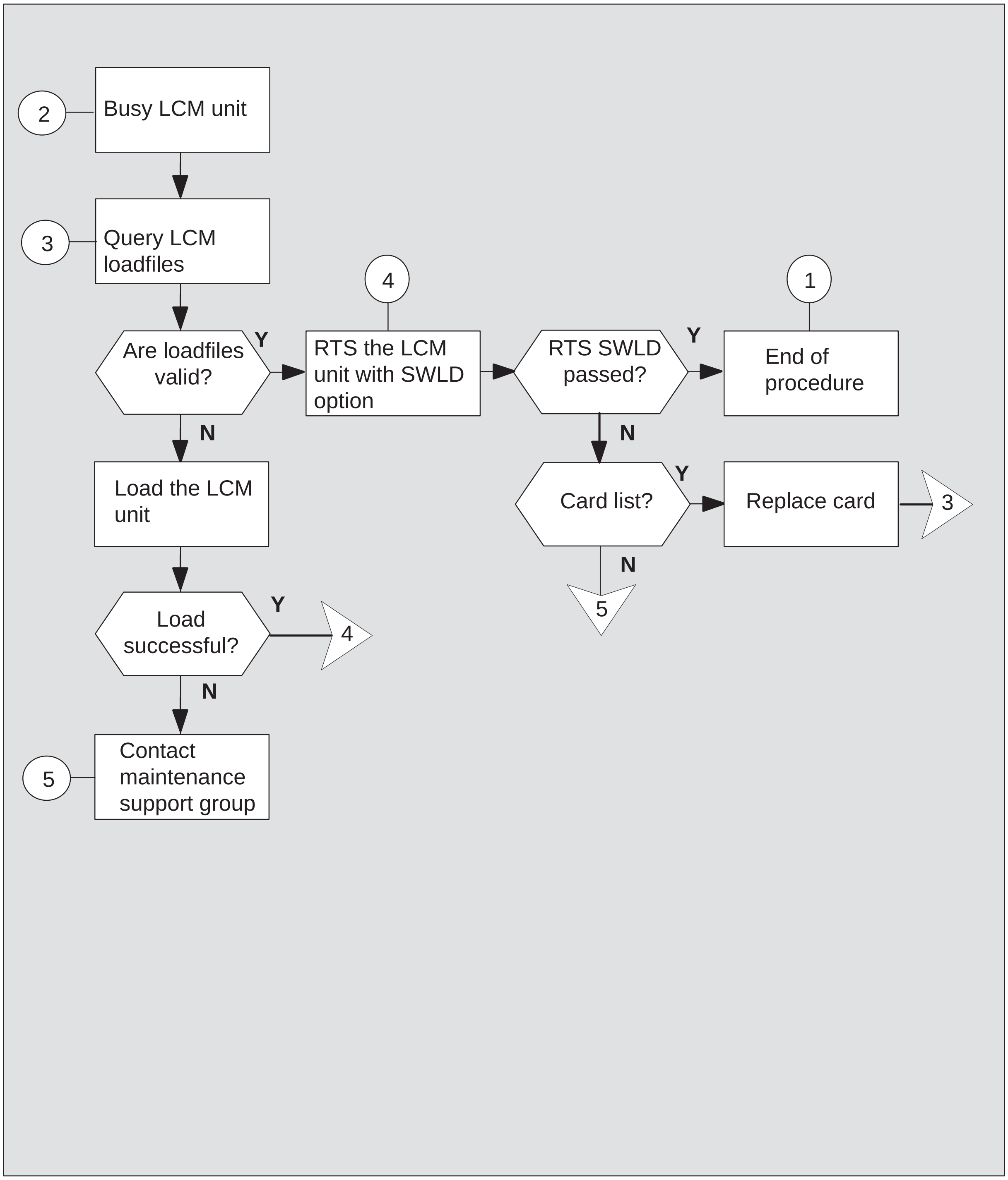
PM LCM
major (continued)

Summary of clearing a PM LCM major alarm



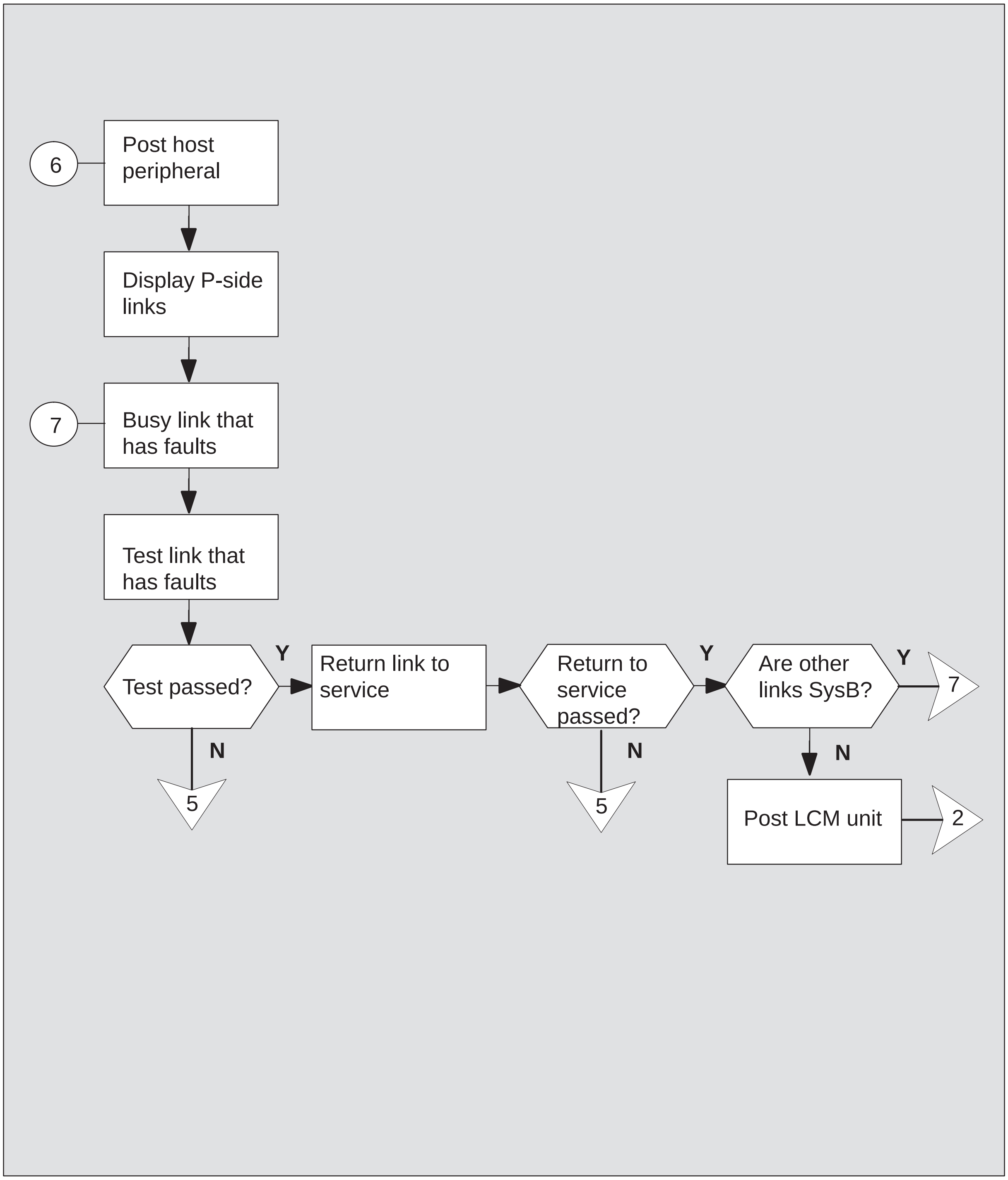
PM LCM
major (continued)

Summary of clearing a PM LCM major alarm (continued)



PM LCM
major (continued)

Summary of clearing a PM LCM major alarm (continued)



PM LCM
major (continued)

Clearing an PM LCM 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-EDC that has faults, type

>DISP STATE ISTB LCM
and press the Enter key.

4 To post the RLCM-EDC with the alarm condition, type

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

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the cabinet number of the RLCC-EDC
lcm	is the number of the LCM

5 To determine the fault indicators, type

>QUERYPM FLT
and press the Enter key.

If fault indicated	Do
is CBsy	step 6
is SysB	step 13
is ManB	step 14

6 To identify the C-side links to the host Line Trunk Controller PLUS (LTC+), 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
```

7 To post the host LTC+, type

>POST LTC ltc_no
and press the Enter key.

where

ltc_no — is the number of the host LTC+ (0 to 255)

8 To identify the peripheral side (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
```

Note: Record information for the links that have a state other than OK.

9 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 with faults identified in step 8

10 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 busied in step 9

If test	Do
passes	step 11
fails	step 18

PM LCM
major (continued)

11 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 defective P-side link busied in step 9

If RTS	Do
passes and other links are not SysB	step 12
passes and other links are SysB	step 9
fails	step 18

12 To post the RLCM-EDC identified in step 3, type

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

where

site is the site name of the RLCM (alphanumeric)
cabinet is the cabinet number of the RLCC-EDC
lcm is the number of the LCM

13

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-EDC unit associated with the alarm, type

>BSY UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit that will be busied (0 or 1)

14 To RTS the busied unit, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit to be tested (0 or 1)

If RTS	Do
passes	step 20
fails because of a loading error	step 15
fails, and a card list appears	step 17
fails, and a card list does not appear	step 18

15 To attempt to load the RLCM-EDC unit, type

>LOADPM UNIT lcm_unit CC
and press the Enter key.

where

lcm_unit is the LCM unit to be loaded (0 or 1)

Example of a MAP response:

```
LCM REM1 0 0 Unit 0 loadPM Passed.
```

If loading	Do
passes	step 16
fails	step 18

16 To attempt to return the RLCM-EDC unit to service and switch load to the standby bank, type

>RTS UNIT lcm_unit SWLD
and press the Enter key.

where

PM LCM
major (end)

lcm_unit is the LCM unit that will return to service (0 or 1)

Example of a MAP response:

```
Existing loads: Unit 0: Act:REDC07AA *FLT*  Stby:REDC07AA

New loads after a successful RTS will be:
        Unit 0: Act:REDC07AA    Stby:REDC07AA *FLT*
```

Do you wish to continue?
Please confirm (“YES”, “Y”, “NO”, or “N”):

>Y

If RTS	Do
passes	step 20
fails	step 18

17 The card list identifies the cards that can have faults. Replace the cards one at a time in the order listed top to bottom.

If you	Do
did not replace all the cards on the list	step 19
replaced all the cards on the list	step 18

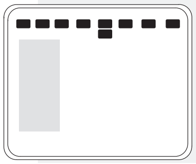
18 For additional instructions in how to clear this fault, contact the next level of maintenance support.

19 Go to the *Card Replacement Procedures* to replace the first (or next) card on the card list. Go to step 14 after replacing the card.

20 This procedure is complete. If additional alarms appear, go to the correct alarm clearing procedure.

Ext FSP
RLCC-EDC cabinet major

Alarm display



CM	MS	IOD	Net	PM	CCS	Lns	Trks	**Ext**	Appl
.	.	.	.	.	.	.	.	**nFSP**	.
								M	

Indication

At the MTC level of the MAP display, FSP preceded by a number appears under the EXT header of the alarm banner, and indicates an external frame supervisory panel (FSP) alarm. The `M` under the FSP indicates a major alarm. The number `n` before FSP indicates the number of FSPs with a major alarm.

Meaning

One or more frames in the office has a power fault or a cooling unit fault.

Impact

The impact on subscriber service depends on the nature of the fault and the type of frame where the fault is located.

Common procedures

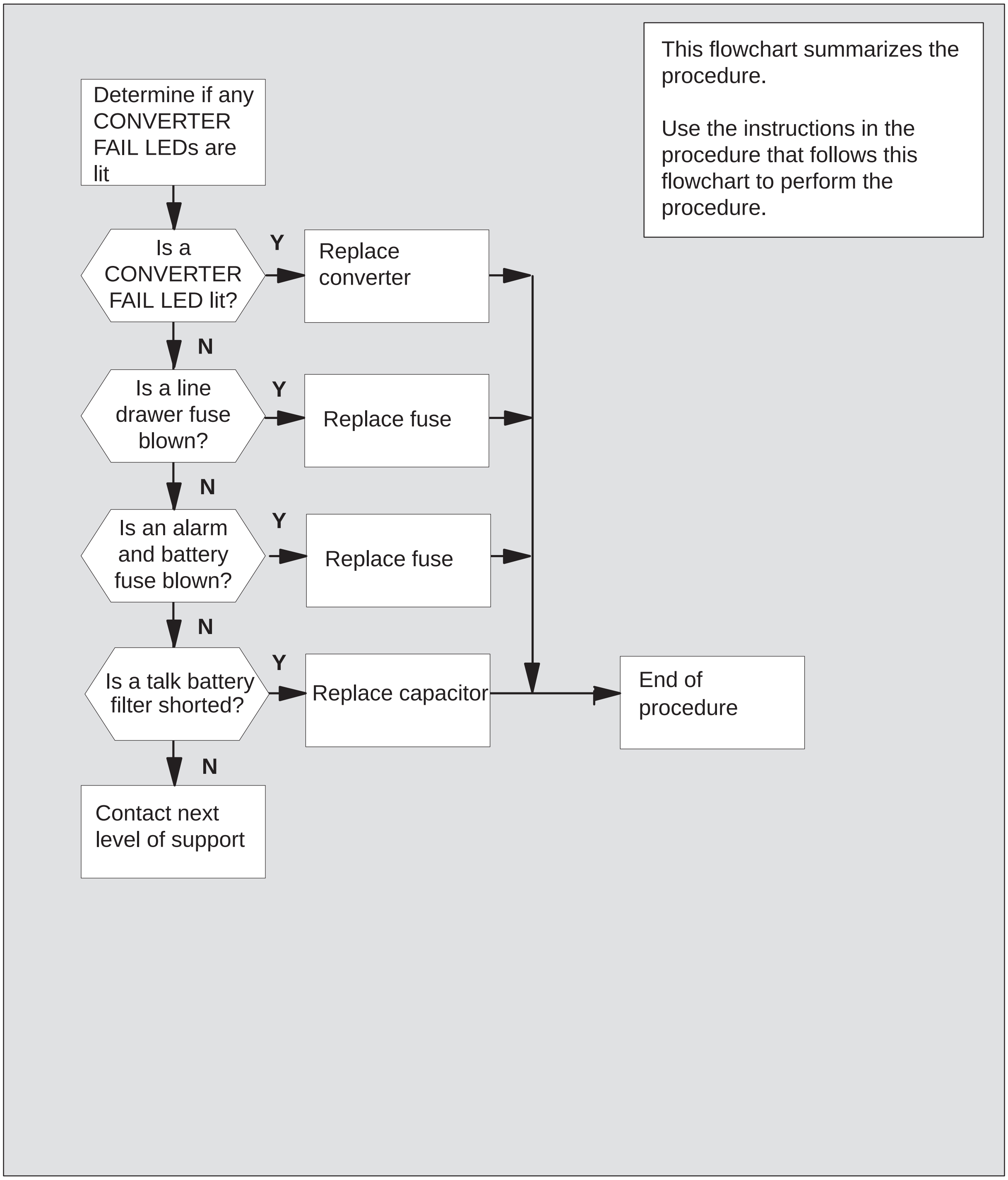
None

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.

Ext FSP
RLCC-EDC cabinet major (continued)

Summary of clearing an Ext FSP RLCC-EDC cabinet major alarm



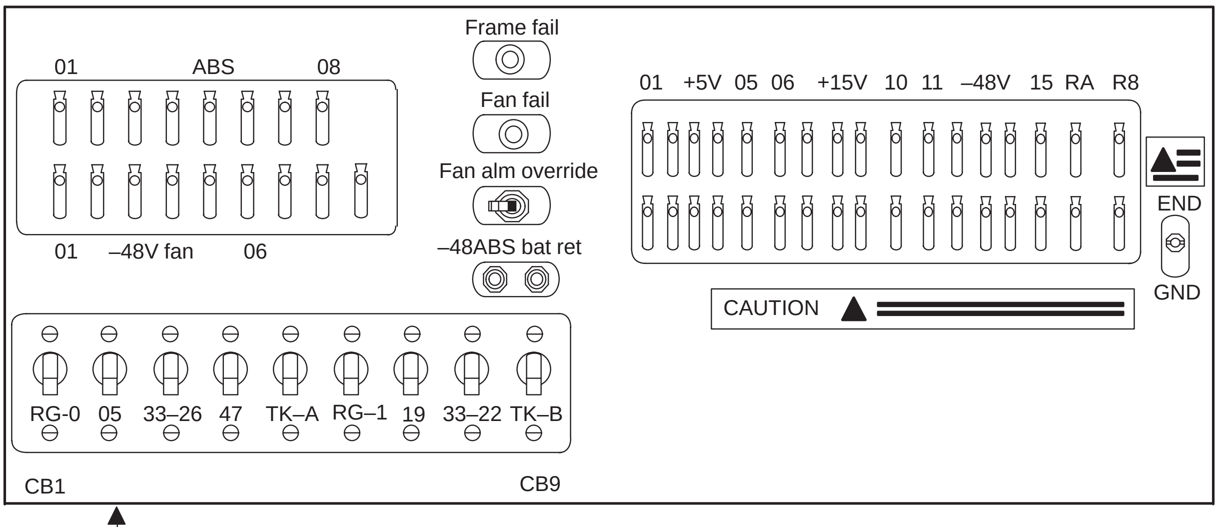
Ext FSP
RLCC-EDC cabinet major (continued)

Clearing an Ext FSP RLCC-EDC cabinet major alarm

At the RLCC-EDC cabinet

1 Put on a tested wrist strap and connect to designated location to observe ESD precautions. Reference the following diagram and table for the location of the circuit breakers on the NTNX26AA frame supervisory panel (FSP).

FSP shelf layout



Not to scale

FSP circuit breaker assignments

CB	Shelf type	Shelf pos.	Slot pos.	PEC code	Equipment
CB2	LCA	05	01	NT6X53AA	LCM unit 0
CB3	HIE	33	26	NT2X70AF	Power converter
CB4	RMM	47	17/20	NT2X09AA/ NT2X06AB	RMM
CB7	LCA	19	01	NT6X53AA	LCM unit 1
CB8	HIE	33	22	Nt2X70AF	Power converter

Ext FSP
RLCC-EDC cabinet major (continued)

2 Determine if any of the converter fail LEDs on each converter in the frame are lit.

If	Do
any converter fail LEDs are lit	step 41
no converter fail LEDs are lit	step 3

3 Determine if any of the line drawer fuses (01 to 15), located on the fuse panel above each unit in the frame, are blown.

If	Do
a fuse is blown	step 9
no fuses are blown	step 4

4 Determine if any of the alarm battery supply (ABS) fuses (01 to 08), located on the FSP, are blown (protruding fuse indicator).

If	Do
a fuse is blown	step 5
no fuses are blown	step 95

5 Determine if the alarm battery supply wiring inside the FSP is short-circuited by contacting the personnel at the next level of support, which may also request this information.

6 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

7 Remove the blown fuse.

Ext FSP
RLCC-EDC cabinet major (continued)

8

DANGER
Risk of fire
For continued protection against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Insert the replacement fuse.

If the fuse	Do
blows again	step 97
does not blow	step 91

9 Determine which fuse is blown.

Note: Fuses 01 to 05 each supply +5V, fuses 06 to 10 each supply +15V, and fuses 11 to 15 each supply –48V.

If the blown fuse is any one of	Do
01 to 05	step 14
06 to 15	step 10

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, then remove fuse 11 as well.

Ext FSP
RLCC-EDC cabinet major (continued)

12 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

13

> **DANGER**
> **Risk of fire**
> For continued protection against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Insert the +15V fuse, then the –48V fuse.

If the fuse	Do
blows again	step 17
does not blow	step 91

14 Obtain a replacement fuse with the same voltage and amperage as the blown fuse.

15 Remove the blown fuse.

16

> **DANGER**
> **Risk of fire**
> For continued protection against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Insert the replacement fuse.

If the fuse	Do
blows again	step 19
does not blow	step 91

17 Remove the blown fuse and its associated fuse. For example, if the blown fuse is 06, then remove fuse 11 as well.

Ext FSP
RLCC-EDC cabinet major (continued)

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

20

CAUTION
Loss of service
Perform this procedure during periods of low traffic.

Pull out the line drawer you have just identified.

Ext FSP
RLCC-EDC cabinet major (continued)

21

> **DANGER**
> **Personal injury**
> Exercise care when handling the line card. The line feed resistor may be hot.

Unseat all the line cards in the drawer.

Note: Just unseat the line cards, do not remove them from the drawer.

If you are dealing with	Do
any one of fuses 01 to 05	step 23
any one of fuses 06 to 15	step 22

22

> **DANGER**
> **Risk of fire**
> For continued protection against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Insert the +15V fuse first, then the –48V fuse.

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.

Ext FSP
RLCC-EDC cabinet major (continued)

25

> **DANGER**
> **Risk of fire**
> For continued protection against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Insert the replacement fuse.

If the fuse	Do
blows again	step 26
does not blow	step 28

26 Determine if the drawer has any loose or short-circuited wires.

If there are	Do
loose or short-circuited wires	step 97
no loose or short-circuited wires, and the fuse you are dealing with is a ringing voltage fuse (RA or RB), and you have not done all five drawers in the shelf	step 27
no loose or short-circuited wires, the fuse you are dealing with is a ringing voltage fuse (RA or RB), and you have done all five drawers in the shelf	step 97
no loose or short-circuited wires, and the fuse you are dealing with is one of the line drawer fuses (01 to 15)	step 97

27 Reseat all the line cards in the drawer and repeat steps 20 and 21 for the next drawer.

28 Reseat the line cards one at a time.

Ext FSP
RLCC-EDC cabinet major (continued)

29 Determine if the fuse is blown after reseating each card.

If after reseating	Do
any line card, the fuse blows again	step 30
all of the line cards, the fuse does not blow	step 91

30

DANGER
Personal injury
Exercise care when handling the line card. The line feed resistor may be hot.

Remove the line card from the drawer.

31 Obtain a replacement line card. Ensure the replacement card has the same product engineering code (PEC), including the suffix, as the card being removed.

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

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, then remove fuse 11 as well.

Ext FSP
RLCC-EDC cabinet major (continued)

35

> **DANGER**
> **Risk of fire**
> For continued protection against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Insert the +15V fuse, then the –48V fuse.

If the fuse	Do
blows again	step 97
does not blow	step 39

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**
> For continued protection against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Insert the replacement fuse.

If the fuse	Do
blows again	step 97
does not blow	step 39

39 Reseat all the other line cards in the drawer.

40 Push the drawer back in, and go to step 91.

Ext FSP
RLCC-EDC cabinet major (continued)

41 Determine which power converter has a lit converter fail LED.

If the converter is	Do
an NT6X53	step 42
not an NT6X53	step 45

42 Use the following table to identify which circuit breaker located on the FSP is associated with the shelf with a lit converter fail LED.

Shelf number	Circuit breaker number
05	CB2
19	CB7

43 Determine if the associated circuit breaker is ON or OFF.

If the circuit breaker is	Do
ON	step 63
OFF	step 44

44 Set the circuit breaker you have just identified to ON.

If the circuit breaker	Do
remains ON, and the converter fail LED is lit	step 63
remains ON, and the converter fail LED is not lit	step 91

Ext FSP
RLCC-EDC cabinet major (continued)

45 Determine if the POWER switch on the converter is ON or OFF.

If the POWER switch is	Do
ON	step 47
OFF	step 46

46 Set the POWER switch on the converter to ON.

If the converter fail LED is	Do
lit	step 47
not lit	step 91

47 Use the following table to identify which circuit breaker located on the FSP is associated with the shelf with the lit converter fail LED.

Shelf number	Circuit breaker number
33 NT2X70 in slot 22	CB8
33 NT2X70 in slot 26	CB3
47 NT2X09 in slot 17	CB4

48 Determine if the associated circuit breaker is ON or OFF.

If the circuit breaker is	Do
ON	step 49
OFF	step 50

49 Set the circuit breaker you have just identified to OFF.

50 Press and hold the RESET button on the converter while setting the circuit breaker to ON.

Ext FSP
RLCC-EDC cabinet major (continued)

51 Release the RESET button.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 52
remains ON, and the converter fail LED is not lit	step 91
remains ON, and the converter fail LED is lit	step 63

52 Record the numbers of the frame and shelf with the lit converter fail LED.

At the PDC frame

53 Locate the fuse that powers the shelf in the RLCC cabinet.

54 Determine if the fuse is blown.

If he fuse is	Do
blown	step 55
not blown	step 64

55 Remove the fuse holder that contains the blown fuse.

56 Replace the cartridge fuse inside the fuse holder.

57

DANGER
Risk of fire
For continued protection against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and manufacturer.

Replace the blown fuse.

58 Install the fuse holder back onto the PDC frame.

Ext FSP
RLCC-EDC cabinet major (continued)

At the RLCC-EDC cabinet

59 Determine what type of converter had a lit converter fail LED.

If the converter is	Do
an NT6X53	step 62
not an NT6X53	step 60

60 Press and hold the RESET button on the converter while setting the circuit breaker to ON.

61 Release the RESET button.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 64
remains ON, and the converter fail LED is not lit	step 91
remains ON, and the converter fail LED is lit	step 63

62 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 64
remains ON, and the converter fail LED is not lit	step 91
remains ON, and the converter fail LED is lit	step 63

63 Set the circuit breaker to OFF.

64 Replace the converter by performing the appropriate procedure in *Card Replacement Procedures*. When you have completed the procedure, return to this point.

Ext FSP
RLCC-EDC cabinet major (continued)

65 Determine what type of converter you have just replaced.

If the converter you have just replaced is	Do
an NT6X53	step 67
not an NT6X53	step 66

66 Determine if the converter fail LED for the converter you have just replaced is lit.

If the converter fail LED is	Do
lit	step 83
not lit	step 91

67 Determine the state of the converter you have just replaced, and the associated circuit breaker.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 69
remains ON, and the converter fail LED is not lit	step 91
remains ON, and the converter fail LED is lit	step 68

68 Set the circuit breaker to OFF.

69 Remove the NT6X51 and NT6X52 cards from the shelf with the lit converter fail LED.

Ext FSP
RLCC-EDC cabinet major (continued)

70 Set the circuit breaker to ON.

If the converter fail LED is	Do
lit	step 83
not lit	step 71

71 Set the circuit breaker to OFF.

72 Insert the NT6X51 card back into the shelf.

73 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 75
remains ON, and the converter fail LED is not lit	step 77
remains ON, and the converter fail LED is lit	step 74

74 Set the circuit breaker to OFF.

75 Replace the NT6X51 card by performing the appropriate procedure in *Card Replacement Procedures*. When you have completed the procedure, return to this point.

76 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 81
remains ON, and the converter fail LED is not lit	step 77
remains ON, and the converter fail LED is lit	step 80

77 Set the circuit breaker to OFF.

Ext FSP
RLCC-EDC cabinet major (continued)

78 Insert the NT6X52 card back into the shelf.

79 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the converter fail LED is lit	step 81
remains ON, and the converter fail LED is not lit	step 88
remains ON, and the converter fail LED is lit	step 80

80 Set the circuit breaker to OFF.

81 Replace the NT6X52 card by performing the appropriate procedure in *Card Replacement Procedures*. When you have completed the procedure, return to this step.

82 Set the circuit breaker to ON.

If the converter fail LED is	Do
lit	step 88
not lit	step 91

83 Determine if there are bent or short-circuited pins on the backplane of the shelf.

If there are	Do
bent or short-circuited pins	step 84
no bent or short-circuited pins, and the converter you are dealing with is an NT6X53	step 86
no bent or short-circuited pins, and the converter you are dealing with is not an NT6X53	step 88

84 Set the circuit breaker to OFF.

Ext FSP
RLCC-EDC cabinet major (continued)

85 Straiten or replace bent or short-circuited pins. Then go to step 82.

86 Insert the NT6X51 and the NT6X52 cards back into the shelf.

87 Set the circuit breaker to ON.

If the converter fail LED is	Do
lit	step 88
not lit	step 91

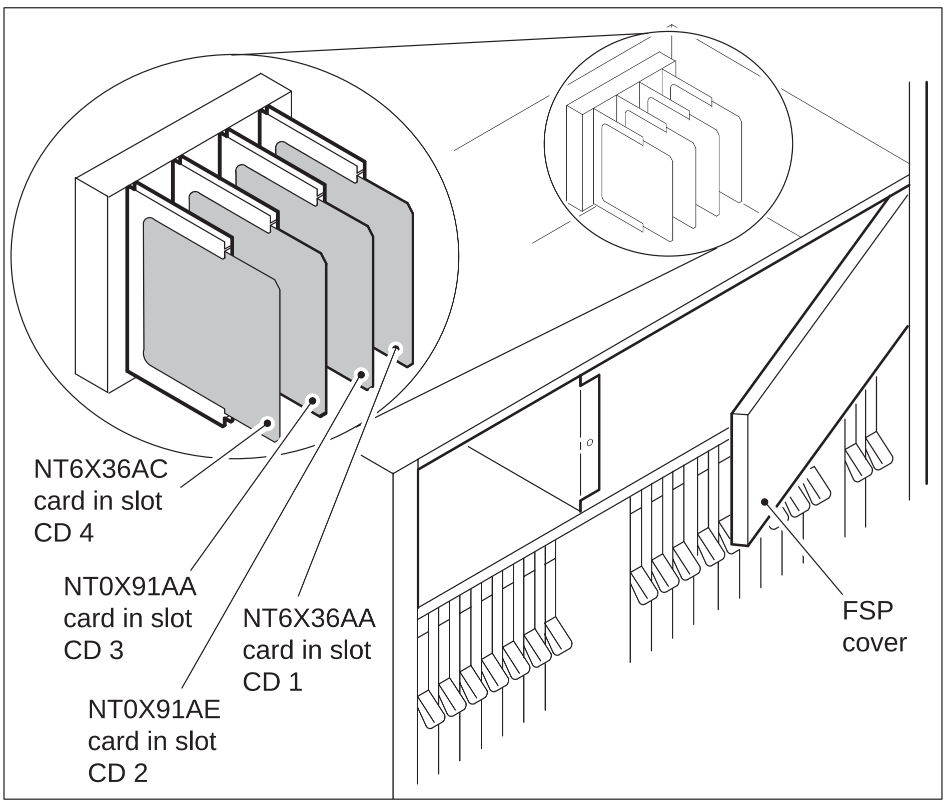
Ext FSP
RLCC-EDC cabinet major (continued)

88 Use the following table and illustration to identify which alarm and control card is associated with the shelf with the lit converter fail LED.

Alarm and control card	slot
NT6X36AA	slot CD1
NT0X91AE	slot CD2
NT0X91AA	slot CD3
NT6X36AC	slot CD4

Note: Refer to the figure “FSP alarm and control cards” for FSP card slot locations.

RLCC-EDC FSP layout



Ext FSP
RLCC-EDC cabinet major (continued)

89 Record the numbers of the LCM and RMM in the frame.

90 Replace the alarm and control card by performing the appropriate procedure in *Card Replacement Procedures*. When you have completed the procedure, return to this step.

At the RLCC-EDC cabinet

91 Determine if the FRAME fail lamp on the FSP is lit.

If the FRAME fail lamp is	Do
lit, and there are more lit fail LEDs or blown fuses	step 2
lit, and there are no more lit fail LEDs or blown fuses	step 97
not lit	step 92

At the MAP terminal

92 Access the EXT level of the MAP display by typing

>MAPCI;MTC;EXT
and pressing the Enter key.

93 Determine whether an FSP alarm is present.

If an FSP alarm is	Do
present, and you have not accessed all the frames with an FSP alarm	step 94
present, and you have accessed all the frames with an FSP alarm	step 97
not present	step 98

94 Perform the appropriate procedure for the type of frame that has the FSP alarm. When you have completed the procedure, return to this step.

Ext FSP
RLCC-EDC cabinet major (end)

At the RLCC-EDC cabinet

95 Make a visual inspection of the FSP. Check circuit breakers CB5 and CB9.

If circuit breakers are	Do
tripped	step 96
not tripped	step 98

96 Reset circuit breaker (CB8 or CB9) by moving the switch to the ON/OFF and back to the ON position in quick succession. (The LED light should go OFF.)

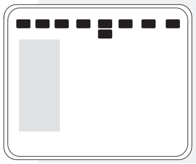
If circuit breaker	Do
trips again	step 97
remains ON (LED goes off)	step 98

97 For further assistance, contact the personnel responsible for the next level of support.

98 You have successfully completed this procedure.

PM 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* below the alarm code indicates that the alarm class is major.

Meaning

The indicated number 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.

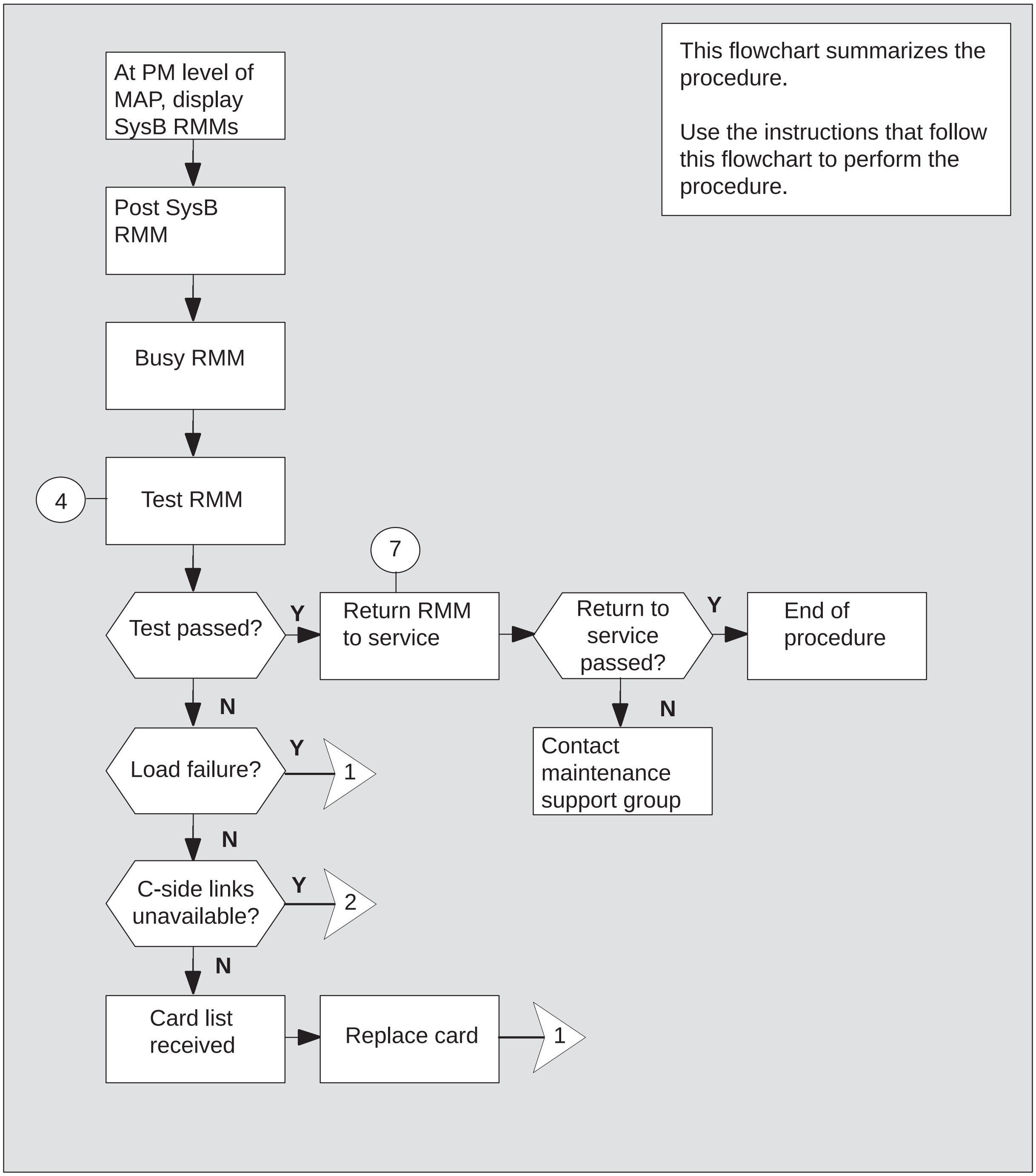
Action

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.

Note: The numbers represented in the flowchart do not coincide with the step-action numbers. The numbers indicate movement in the flowchart.

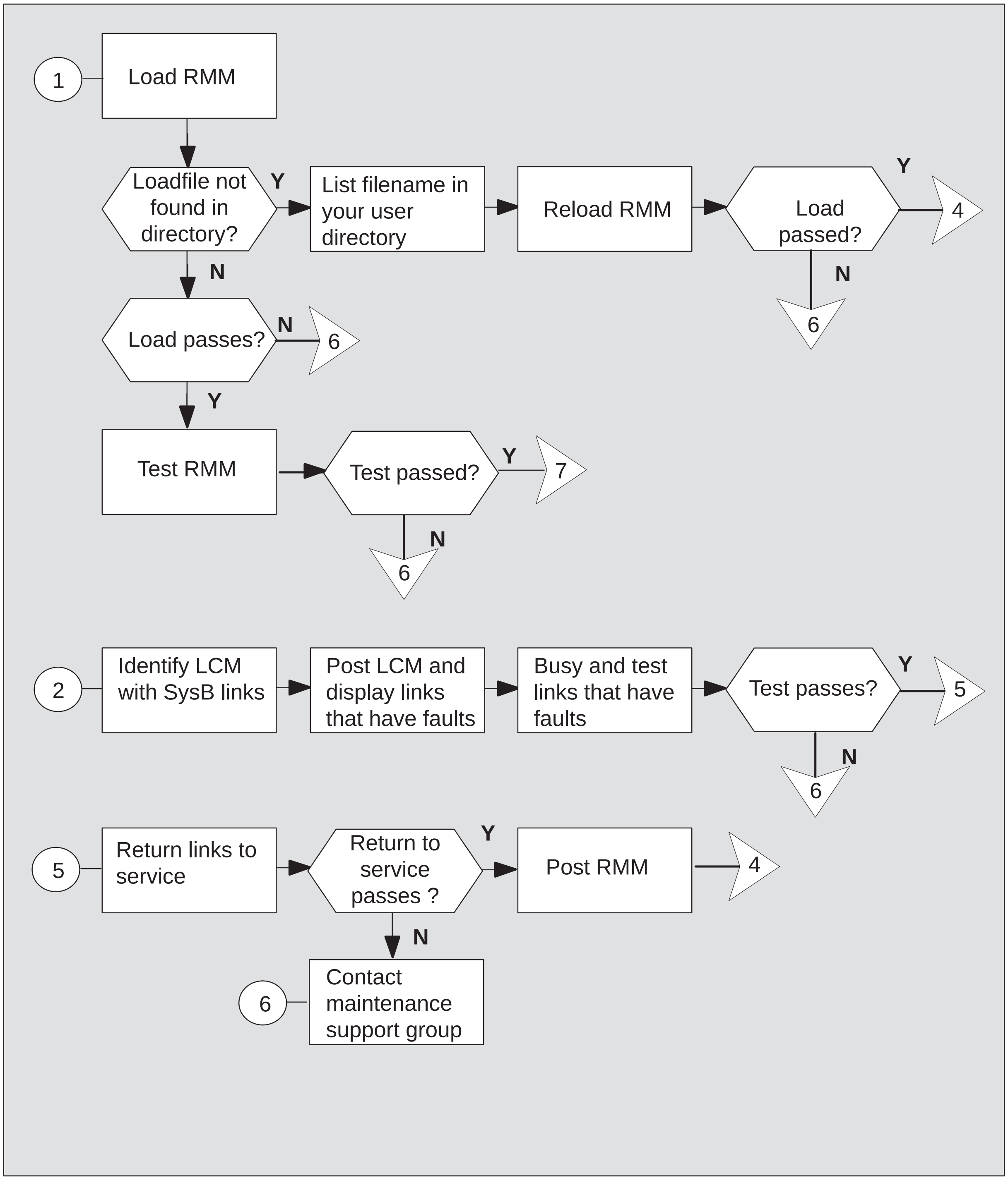
PM RMM
major (continued)

Summary of clearing a PM RMM major alarm



PM RMM
major (continued)

Summary of clearing a PM RMM major alarm (continued)



PM RMM
major (continued)

Clearing a PM RMM major alarm

At the MAP terminal

1 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 RMM that has faults, type

>DISP STATE SYSB RMM
and press the Enter key.

Example of a MAP response:

```
SysB  RMM: 2
```

4 To post the SysB RMM identified in step 3, type

>POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM that has faults

5 To manually busy the RMM posted in step 4, type

>BSY
and press the Enter key.

6 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 7

PM RMM
major (continued)

If test	Do
fails due to C-side links unavailable	step 25
fails and the system generates a card list	step 33

7 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 8
load passes	step 31
load fails	step 35

8 To determine the type of device containing the PM load files.

If load files are located	Do
on a tape	step 9
on an IOC disk	step 15
on an SLM disk	step 20

9 Locate the tape containing the PM load files.

At the IOE frame

10 Mount the tape on a magnetic tape drive.

PM RMM
major (continued)

At the MAP terminal

11 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

12 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

13 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

14 Go to step 24.

15 From office records, determine and note the number of the input/output controller (IOC) disk. Determine the name of the volume containing the PM load files.

16 To access the disk utility level of the MAP, type

>DSKUT
and press the Enter key.

17 To list the IOC file names in your 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 15

18 To leave the disk utility, type

>QUIT
and press the Enter key.

PM RMM
major (continued)

19 Go to step 24.

20 From office records, determine and note the number of the system load module (SLM) disk and the name of the volume containing the PM load files.

21 To access the disk utility level of the MAP, type

>DISKUT
and press the Enter key.

22 To list the SLM volumes and file names in the user directory, type

>LV CM;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 20

23 To leave the disk utility, type

>QUIT
and press the Enter key.

24 To reload the RMM, type

>LOADPM
and press the Enter key.

If	Do
load passes	step 31
load fails	step 35

25 To identify the C-side LCM, 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
```

PM RMM
major (continued)

26 To post the LCM identified in step 25, type

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

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the cabinet number of the RLCC-EDC
lcm	is the number of the LCM

27

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
```

28 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 27

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 made busy 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 5

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

PM 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 listed top to bottom.

If you	Do
replaced all the cards on the list	step 35
did not replace all the cards on the list	step 34

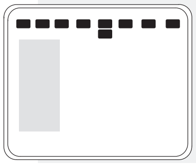
34 Refer to the card replacement procedure in the *Card Replacement Procedures* for the card that follows on the card list. When you complete the card replacement procedures, go to step 7 of this procedure.

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.

PM LCM
minor

Alarm display



CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	Appl
.	.	.	.	***n*LCM**	.	.	.	.	.

Indication

The alarm code LCM preceded by a number under the PM header of the alarm banner indicates a line concentrating module (LCM) minor alarm. The number (n) indicates the number of LCMs that the alarm affects. The alarm banner appears at the MTC level of the MAP display. The above figure illustrates an alarm banner with an LCM minor alarm.

Meaning

The LCM is in-service trouble (ISTb) because of one of the following conditions:

- both units are ISTb
- one unit is ISTb and one unit is in-service
- one unit is ISTb and one unit is manual busy
- one unit is in-service and one unit is manual busy
- both units are in-service with some C-side links out of service

Result

This condition does not affect service.

Common procedures

There are no common procedures.

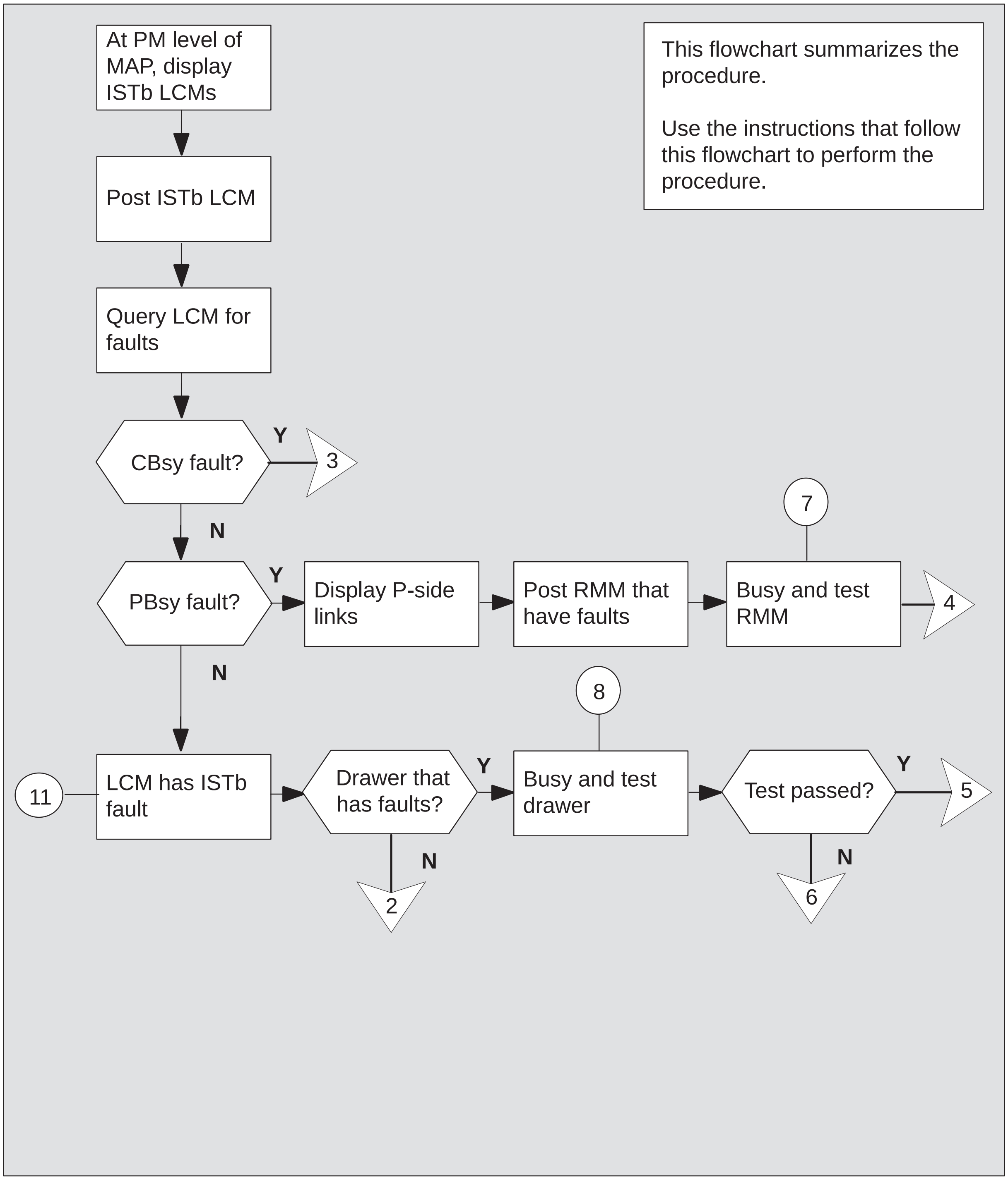
Action

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 within the flowchart.

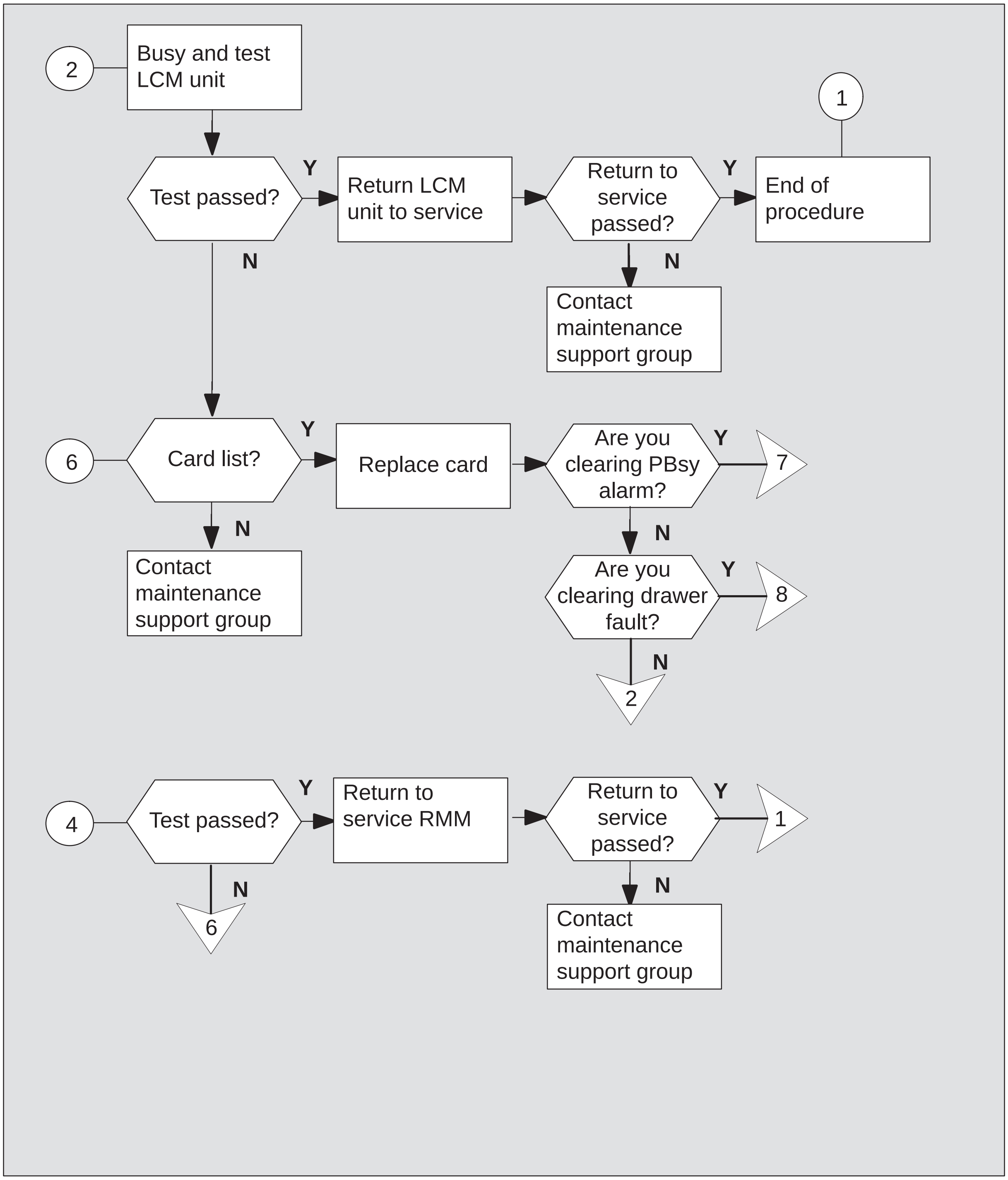
PM LCM
minor (continued)

Summary of clearing a PM LCM minor alarm



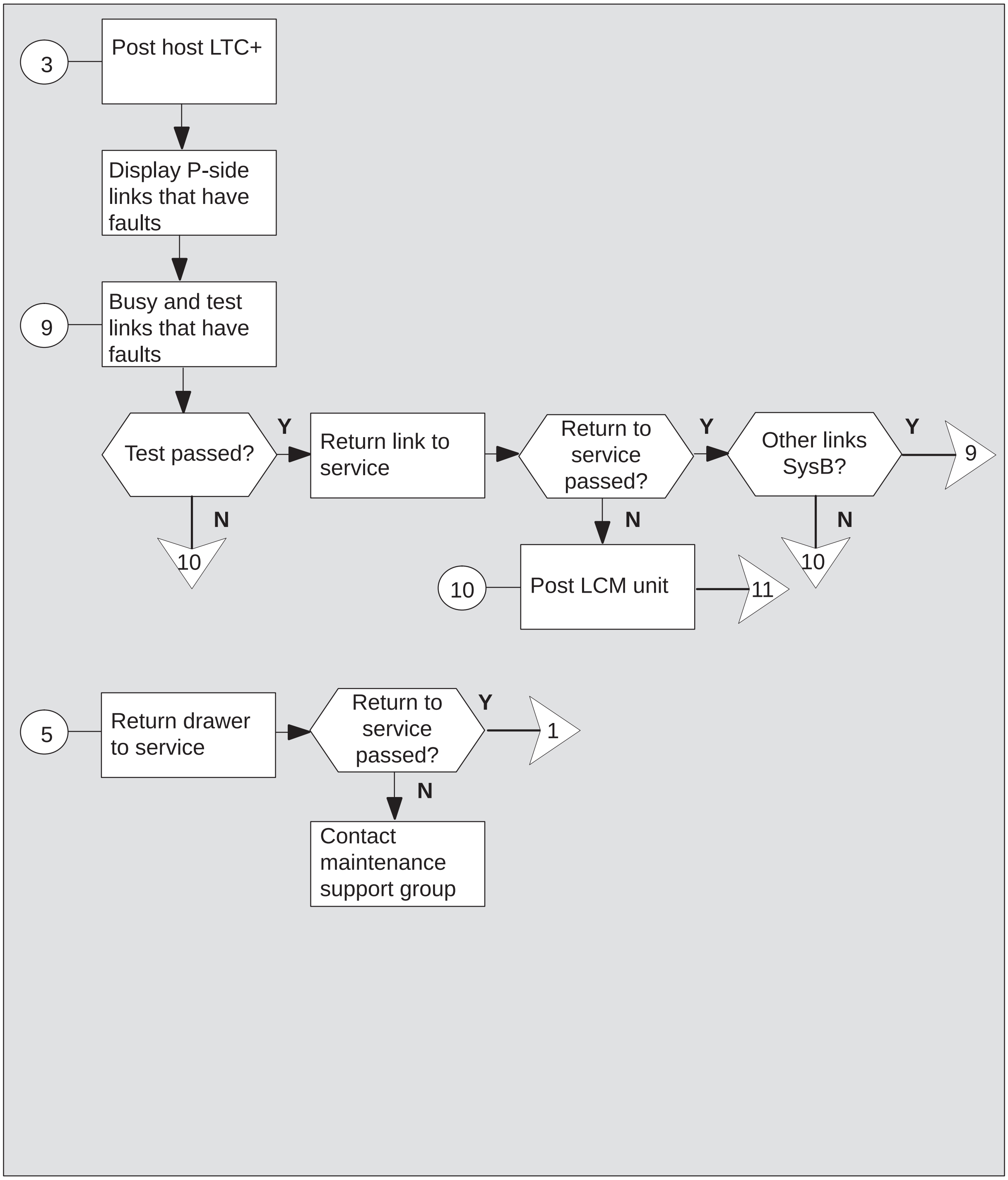
PM LCM
minor (continued)

Summary of clearing a PM LCM minor alarm (continued)



PM LCM
minor (continued)

Summary of clearing a PM LCM minor alarm (continued)



Clearing a PM LCM minor 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-EDC that has faults, type

>DISP STATE ISTB LCM
and press the Enter key.

4 To post the RLCM-EDC with the alarm condition, type

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

where

site	is the site name of the RLCM-EDC (alphanumeric)
frame	is the cabinet number of the RLCC-EDC
lcm	is the number of the LCM

5 To determine the fault indicators, type

>QUERYPM FLT
and press the Enter key.

If the system	Do
indicates a CBsy (C-side busy) fault	step 6
indicates a PBsy (P-side busy) fault	step 12
indicates a DRWR FLT (drawer fault)	step 18
indicates an ISTb (In-service trouble) fault	step 22

PM LCM
minor (continued)

At the MAP terminal

6 To identify C-side links to the host Line Trunk Controller PLUS (LTC+), 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
```

7 To post the host LTC+, type

>POST LTC ltc_no
and press the Enter key.

where

ltc_no is the number of the host LTC+ identified in step 6

8 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  2;Cap MS;Status: OK  ;MsgCond: OPN
Link 6: LCM REM1 00 0  1;Cap MS;Status: SysB,;MsgCond: CLS
```

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

9 To choose and 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 8

PM LCM
minor (continued)

10 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 busied in step 9

If test	Do
passed	step 11
failed	step 18

11 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 tested in step 10

If RTS	Do
passed and no other links are SysB	step 17
passed but other links are SysB	step 9
failed	step 18

12 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
```

PM LCM
minor (continued)

13 To post the RMM that has faults, type

>POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM identified in step12

14 To busy the RMM, type

>BSY
and press the Enter key.

15 To test the RMM, type

>TST
and press the Enter key.

If test	Do
passed	step 16
failed, and the system produces a card list	step 25
failed, but the system did not produce a card list	step 26

16 To return to service the RMM, type

>RTS
and press the Enter key.

If RTS	Do
passed	step 28
failed	step 26

17 To post the RLCM-EDC with the alarm condition, type

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

where

site	is the site name of the RLCM (alphanumeric)
frame	is the cabinet number of the RLCC-EDC
lcm	is the number of the LCM

18

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.

Determine if the problem is a drawer that has faults. Letters under the line subgroup numbers associated with a physical drawer indicate a drawer that has faults.

Example of a MAP response:

```
LCM  REM1 00 0   ISTb   Links OOS: Cside  0 Pside  0
Unit0: InSv
Unit1: InSv
                      11 11 11 11 11 RG: Unequip
Drwr:  01 23 45 67 89 01 23 45 67 89
       .. SS .. .. .. .. .. .. .. ..
```

If the system	Do
indicates a drawer that has faults	step 19
does not indicate a drawer that has faults	step 22

19 To busy both line subgroups associated with the drawer that has faults, type

>BSY DRWR lsg
and pressing the Enter key.

where

lsg	is the number of the line subgroups associated with the drawer that has faults

Note: Repeat this step for the other line subgroup associated with the drawer that has faults.

20 To test both line subgroups associated with the drawer that has faults, type

>TST DRWR lsg
and press the Enter key.

where

lsg is the number of one of the line subgroups associated with the drawer that has faults.

Note: Repeat this step for the other line subgroup associated with the drawer that has faults.

If test	Do
passed	step 21
failed, and the system produces a card list	step 25
failed, but the system does not produce a card list	step 26

21 To return to service both line subgroups, type

>RTS DRWR lsg
and press the Enter key.

where

lsg is the number of one of the line subgroups associated with the drawer that has faults

Example of a MAP response:

```
OSvce Tests Initiated
LCM  REM1 00 0   Drwr 2 Tst Passed
LCM  REM1 00 0   Drwr 2 Rts Passed
```

Note: Repeat this step for the other line subgroup associated with the drawer that has faults.

If return to service	Do
passed	step 28
failed	step 26

PM LCM
minor (continued)

22 To busy the LCM unit associated with the alarm, type

>BSY UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit to be busied (0 or 1)

23 To test the busied 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
passed	step 24
failed, and the system produces a card list	step 25
failed, but the system does not produce a card list	step 26

24 To attempt to return the RLCM-EDC to service, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit is the LCM unit to return to service (0 or 1)

If RTS	Do
passed	step 28
failed	step 26

PM LCM
minor (end)

25 The card list identifies the cards that have possible faults. Replace the cards one at a time in the order listed from top to bottom.

If you	Do
replaced a card on the list	step 27
did not replace a card on the list	step 26

26 For additional help, contact the next level of support.

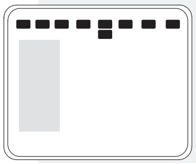
27 Go to the *Card Replacement Procedures* to replace the first (or next) card on the card list. After you replace the card, return to the step in this procedure indicated in the following table.

If you	Do
are clearing a PBsy alarm	step 15
are clearing drawer faults	step 20
are clearing all other alarms	step 23

28 The procedure is complete. If the system displays additional alarms, proceed to the correct alarm clearing procedure.

PM RMM minor

Alarm display



CM	MS	IOD	Net	**PM**	Lns	Trks	Ext	Appl
.	.	.	.	**nRMM**	.	.	.	.

Indication

An *n* RMM under the peripheral module (PM) subsystem header indicates a minor alarm that involves a remote maintenance module (RMM). This header appears at the MTC level of the MAP display.

Meaning

The *n* indicates the number of affected RMMs.

Impact

Subscriber service is not affected. Local RMM backup is not available if the RMM fails.

Common procedures

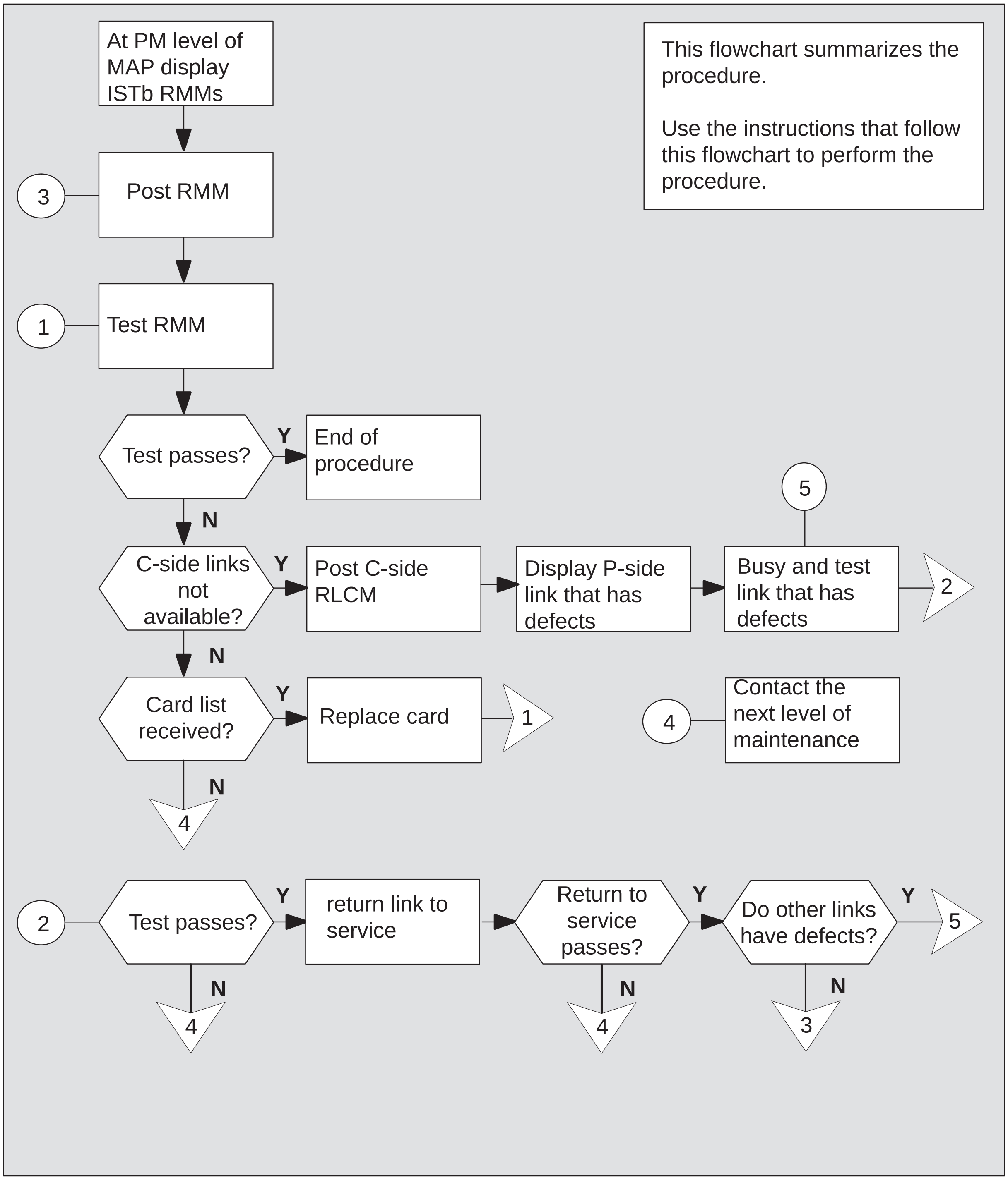
There are no common procedures.

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.

PM RMM
minor (continued)

Summary of clearing a PM RMM minor alarm



Clearing an PM 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 from step 2, type

>POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM that has defects

4 To perform an in-service test on the RMM that has defects, type

>TST
and press the Enter key.

If test	Do
passes	step 16
fails because of C-side links not available	step 5
fails and the system produces a card list	step 13
fails and the system does not produce a card list	step 15

PM RMM
minor (continued)

5 To identify the remote line concentrating module with extended distance capability (RLCM-EDC) with links busied by the system (SYSB), 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:  OK,;MSGCOND:OPN
```

6 To post the LCM from step 5, type

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

where

site	is the site name of the RLCM (alphanumeric)
cabinet	is the number of the RLCC cabinet
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 m 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
```

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 the P-side link that has defects from step 7

PM RMM
minor (continued)

9 To return the link to service, type

>RTS LINK link_no
and press the Enter key.

where

link_no is the number of the P-side link busied in step 8

If	Do
RTS PASSES	step 10
RTS FAILES	step 15

10 Determine if you must clear additional links

If the links that have defects	Do
are cleared	step 11
are not cleared	step 8

11 To post the RMM, type

>POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM associated with the link that has defects

12 To test the RMM, type

>TST
and press the Enter key.

If test	Do
TST PASSED	step 16
TST FAILED, and the system produces a card list	step 13
TST FAILED, and the system does not produce a card list	step 15

PM RMM
minor (end)

13 The card list identifies the cards that can be defective. Replace the cards one at a time according to the procedure.

If the cards on the list	Do
were replaced	step 15
were not replaced	step 14

14 Go to the *Card Replacement Procedures* for the next card on the card list. When you finish with the card replacement procedures, go to step 12.

15 For additional help, contact the next level of maintenance.

16 The procedure is complete. If other alarms appear at the MAP display, refer to the correct alarm clearing procedures.

RLCM-EDC card replacement procedures

This chapter contains the card replacement procedures for the Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC). Maintenance personnel use these procedures to remove and replace hardware modules.

Maintenance personnel use these procedures in one of the following conditions:

- The RLCM-EDC card replacement procedures are part of procedures to verify or accept.
- Another maintenance procedure refers to RLCM-EDC card replacement procedures. An alarm clearing procedure is an example of another maintenance procedure.

Procedures in the manual correspond with the Northern Telecom (NT) product equipment code (PEC) and the shelf where the card replacement occurs. These procedures are in alphabetical order for easy location.

NT0X10
in RMM

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table:

PEC	Suffixes	Cardname	Shelf/frame name
NT0X10	AA	Miscellaneous Scan Card (SC)	RMM/RLCC

If you cannot identify the product engineering code (PEC), PEC suffix, shelf or frame for the card to replace, refer to the Index. The Index lists cards, shelves, and frames documented in this maintenance manual.

Common procedures

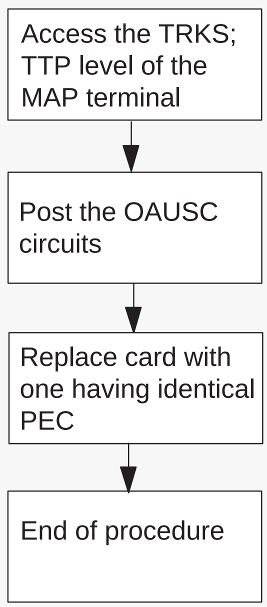
This procedure references the, Replacing a card, procedure.

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.

NT0X10
in RMM (continued)

Summary of replacing an NT0X10 card in RMM



This flowchart is a summary the procedure.

Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT0X10
in RMM (continued)

Replacing an NT0X10 in RMM

At your current location

1 Obtain a replacement card. Make sure that the replacement card has the same PEC, PEC suffix, as the card removed.

At the MAP display

2 To access the Trunk Test Position (TTP) level of the MAP terminal and post the SC associated with the defective card, type:

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no ckt_no
and press the Enter key.

where

rmm_no is the number of the RMM with the defective NT0X10 card
ckt_no is the number of the first scan point 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 that connects to the wrist-strap grounding point of a frame supervisory panel (FSP) to handle circuit cards. The wrist strap protects the cards against static electricity damage.

To replace the NT0X10 card use the procedure, Replacing a card. When you complete the procedure, return to this point or go to step 7.

NT0X10
RMM (end)

4 To clear the trunk test position, type:

>NEXT
and press the Enter key.

Note: Repeat this command until the system clears the TTP control position.

5 Send any defective cards for repair according to local procedure.

6 Record the following items in office records:

- date you replaced the card
- serial number of the card
- problems that prompted replacement of the card.

Go to step 8.

7 For additional help, contact the next level of support.

8 This procedure is complete.

NT0X91 in FSP

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT0X91	AA, AE	FSP drive and alarm circuit pack	FSP/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index for a list of cards, shelves, and frames documented in this maintenance manual.

Common procedures

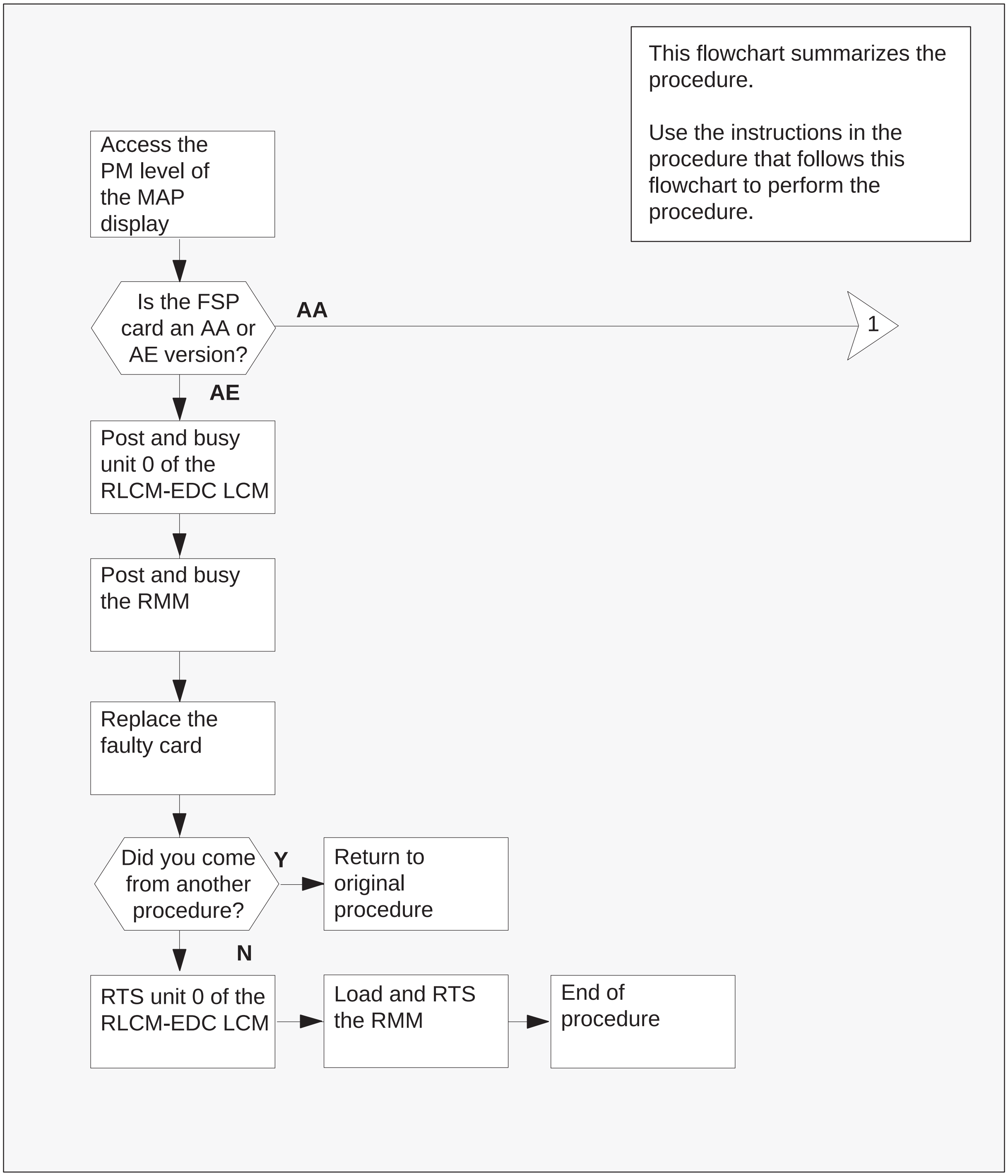
None

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.

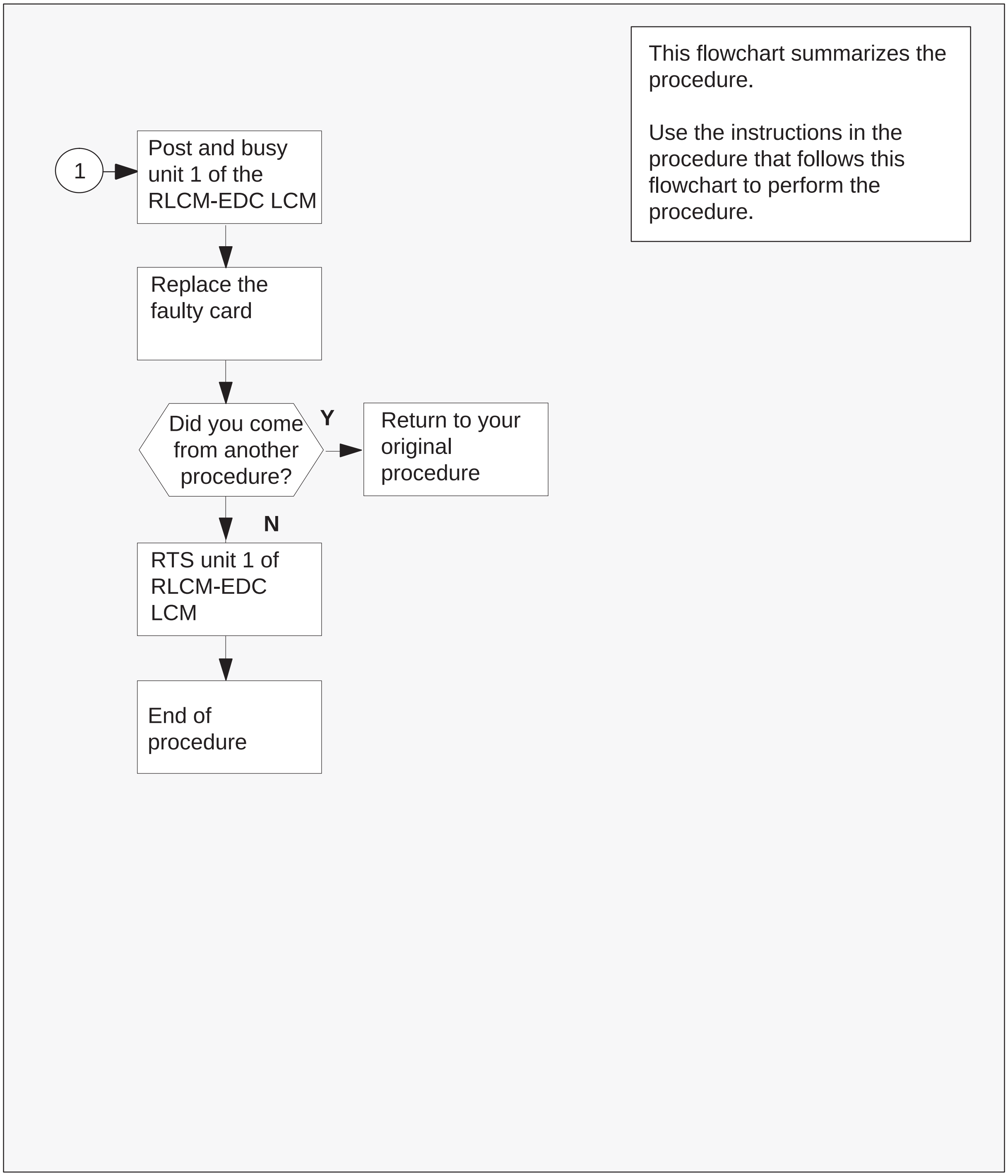
NT0X91
in FSP (continued)

Summary of replacing an NT0X91 card in FSP



NT0X91
in FSP (continued)

Summary of replacing an NT0X91 card in FSP (continued)



NT0X91
in FSP (continued)

Replacing an NT0X91 in FSP

At your current location

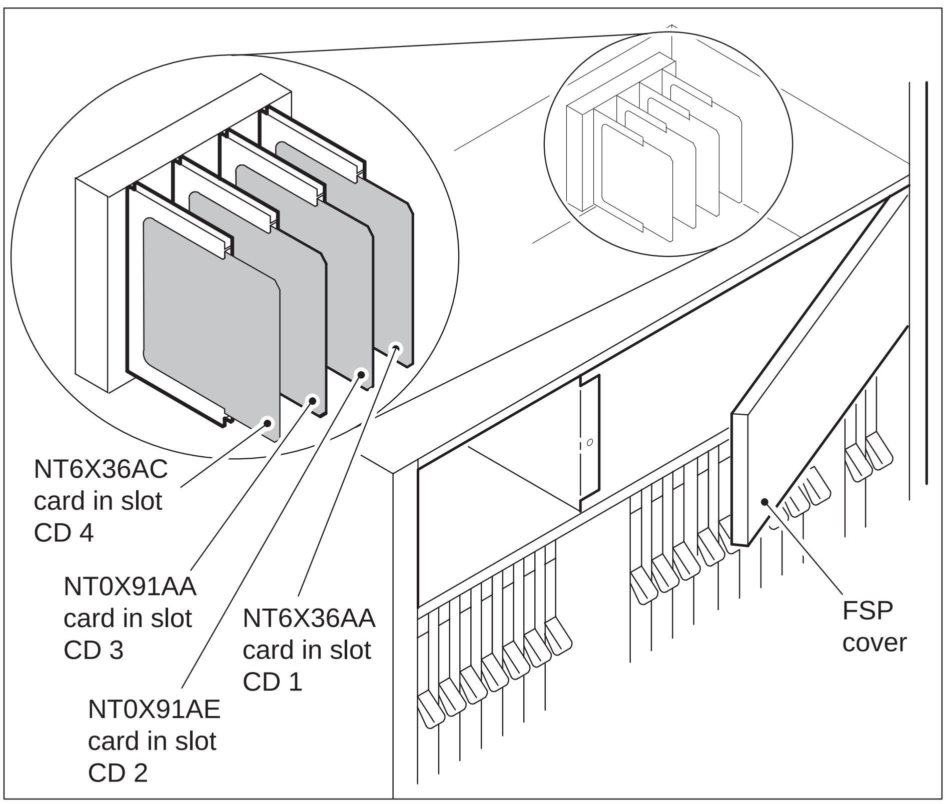
1 Obtain a replacement card. Ensure that the replacement card has the same product engineering code (PEC), including suffix, as the card being removed.

2 Use the following table to identify the slot containing the alarm and control card to be replaced.

Alarm and control cards	slot
NT6X36AA	slot CD1
NT0X91AE	slot CD2
NT0X91AA	slot CD3
NT6X36AC	slot CD4

Note: Refer to the following figure for FSP card slot locations.

FSP Alarm and control cards



NT0X91
in FSP (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	33	CB8
NT0X91AE	NT2X70 in slot 26	33	CB3
NT0X91AE	NT2X09 and NT2X06	47	CB4

Note: The CBs are located on the FSP, shelf position 60.

4 Record the numbers of the shelves and CBs associated with the alarm and control card.

5 Record the numbers of the host interface equipment (HIE) shelf, line concentrating module (LCM) and remote maintenance module (RMM) 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.

7 Post the RLCM-EDC that is controlled by the alarm and control card as recorded in step 5 by typing

>POST LCM site cabinet lcm
and pressing the Enter key.

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the cabinet number of the RLCC-EDC
lcm	is the number of the LCM

If Converter suffix is	Do
AA	step 8
AE	step 24

8 Busy LCM unit 1 by typing

>BSY UNIT 1
and pressing the Enter key.

At the RLCC cabinet

9 Put on a wrist strap.

10 Set CB8 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
in FSP (continued)

16 Tighten the slotted nut on the FSP.

17 Set CB8 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 by toggling the ON/OFF/RESET switch on the power converter faceplate, identified in step 3, to the RESET position and hold while setting CB8, at the FSP, to the ON position. Both the converter FAIL LED and FRAME FAIL lamp at the FSP will go OFF, release the CB and ON/OFF/RESET switch.

20 Remove the wrist strap.

21 Determine if a Converter Fail LED is lit.

If Converter Fail LED is	Do
lit	step 54
not lit	step 22

22 The next action depends on your reason for performing this procedure.

If you were	Do
directed to this procedure from a maintenance procedure	step 52
not directed to this procedure from a maintenance procedure	step 23

At the MAP display

23 Return to service LCM unit 1 by typing

>RTS UNIT 1
and pressing the Enter key.

If unit 1	Do
RTS passed	step 22
RTS failed	step 53

NT0X91
in FSP (continued)

24 Busy LCM unit 0 by typing

>BSY UNIT 0
and pressing the Enter key.

25 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

26 Busy the RMM by typing

>BSY
and pressing the Enter key.

At the RLCC FSP

27 Put on a wrist strap.

28 Set CB2 (NT6X53) for LCM unit 0 to the OFF position.

29 Set CB3 as recorded in step 4 to the OFF position.

30 Set CB4 as recorded in step 4 to the OFF position.

31 Unscrew the slotted nut located on the left-hand side of the FSP.

32

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.

33 Remove the NT0X91AE card from the slot identified in step 2.

34 Insert the replacement card.

35 Close the FSP panel.

36 Tighten the slotted nut on the FSP.

NT0X91
in FSP (continued)

37 Proceed as follows to reset the converters in the host interface equipment shelf (HIE), and the RMM.

38 Power up the NT2X70 in slot 26 by toggling the ON/OFF/RESET switch on the power converter faceplate, identified in step 3, to the RESET position and hold while setting CB3, at the FSP, to the ON position. Both the converter FAIL LED and FRAME FAIL lamp at the FSP will go OFF, release the CB and ON/OFF/RESET switch.

39 Set the power switch on the NT2X09 and NT2X06 power converters at the RMM shelf to the ON position.

40 Press and release the RESET button on the NT2X09 power converter while setting CB4, at the FSP to the ON position. Both the converter FAIL LED and FRAME FAIL lamp at the FSP will go off.

41 Set CB2 (NT6X53) for LCM unit 0 to the ON position.

42 Remove the wrist strap.

43 Determine if a Converter Fail LED is lit.

If Converter Fail LED is	**Do**
lit	step 53
not lit	step 44

44 The next action depends on your reason for performing this procedure.

If you were	**Do**
directed to this procedure from a maintenance procedure	step 52
not directed to this procedure from a maintenance procedure	step 45

NT0X91
in FSP (continued)

At the MAP display

45 Post the LCM that is controlled by the alarm and control card you have just replaced by typing

>POST LCM site cabinet lcm
and pressing the Enter key.

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the cabinet number of the RLCC-EDC
lcm	is the number of the LCM

46 Return LCM unit 0 to service by typing

>RTS UNIT 0
and pressing the Enter key.

If unit 0	**Do**
RTS passed	step 49
RTS failed	step 47

47 Load the standby bank of LCM unit 0 by typing

>LOADPM UNIT 0 CC
and pressing the Enter key.

If	**Do**
load passed	step 48
load failed	step 53

48 Return LCM unit 0 to service and activate the load in the standby bank by typing

>RTS UNIT 0 SWLD
and pressing the Enter key.

If unit 0	**Do**
RTS passed	step 49
RTS failed	step 53

NT0X91
in FSP (end)

49 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

50 Load the RMM by typing

>LOADPM
and pressing the Enter key.

If Loadpm	Do
passed	step 51
failed	step 53

51 Return the RMM to service by typing

>RTS
and pressing the Enter key.

If the rmm	Do
RTS passed	step 44
RTS failed	step 53

52 Return to the maintenance procedure that sent you to this procedure and continue as directed.

53 For further assistance, contact the personnel responsible for the next level of support.

54 You have completed this procedure.

NT2X06
in RMM

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT2X06	AB	Power converter common features	RMM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index for a list of cards, shelves, and frames documented in this maintenance manual.

Common procedures

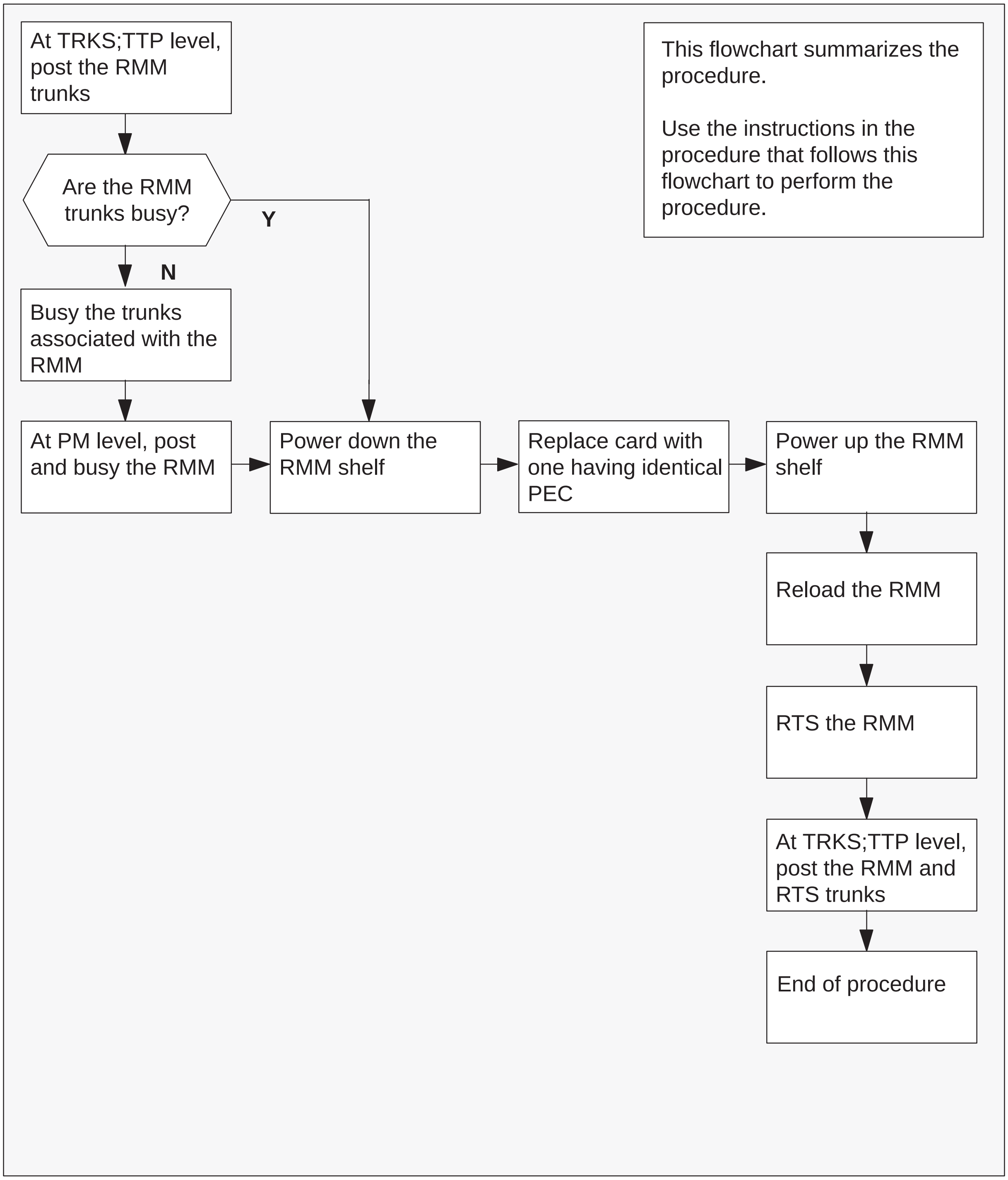
“Replacing a card” is referenced in this procedure.

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
in RMM (continued)

Summary of replacing an NT2X06 card in RMM



NT2X06
in RMM (continued)

Replacing an NT2X06 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 8. Otherwise, continue with step 3.

At the MAP terminal

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:  MTU
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         RMM 0 0     MTU 20          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.

NT2X06
in RMM (continued)

6 Access the PM level of the MAP display 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 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        0        0        0       6

 RMM     0    SysB
```

7 Busy the RMM by typing

>BSY
and pressing the Enter key.

At the RMM

8

> **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 RMM by setting the ON/OFF switch on the power converter faceplates of both the NT2X09 and NT2X06 to the OFF position. Both the CONVERTER FAIL LED and FRAME FAIL LED on the frame supervisory panel (FSP) will go to 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 At the FSP, set the circuit breaker CB4 to the OFF position

10 Replace the NT2X06 card using the procedure “Replacing a card. When you have completed the procedure, return to this point in the procedure.

NT2X06
in RMM (continued)

11 Power up the RMM unit as follows:

Ensure the power converter (NT2X06) is inserted. Set the POWER switch of the NT2X09 and NT2X06 to the ON position.

12 Press the RESET button on the NT2X09 power converter while setting CB4 at the FSP to the ON position. Both the CONVERTER FAIL LED and FRAME FAIL lamp on the FSP will go to OFF.

13 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 14.

At the MAP terminal

14 Load the RMM by typing

>LOADPM
and pressing the Enter key.

If	**Do**
load passed	step 15
load failed	step 20

15 Return the RMM to service by typing

>RTS
and pressing the Enter key.

If RTS	**Do**
passed	step 16
failed	step 20

16 Access the TTP level of the MAP display and post the RMM by typing

>TRKS;TTP;POST P RMM rmm_no
and pressing the Enter key.

NT2X06
in RMM (end)

17 Return to service the circuits busied in step 5 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 18
failed	step 20

18 Send any faulty cards for repair according to local procedure.

19 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 21.

20 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

21 You have completed this procedure.

NT2X09
in RMM

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT2X09	AA, AB	Multioutput Power converter (5V/40A)	RMM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index for a list of cards, shelves, and frames documented in this maintenance manual.

Common procedures

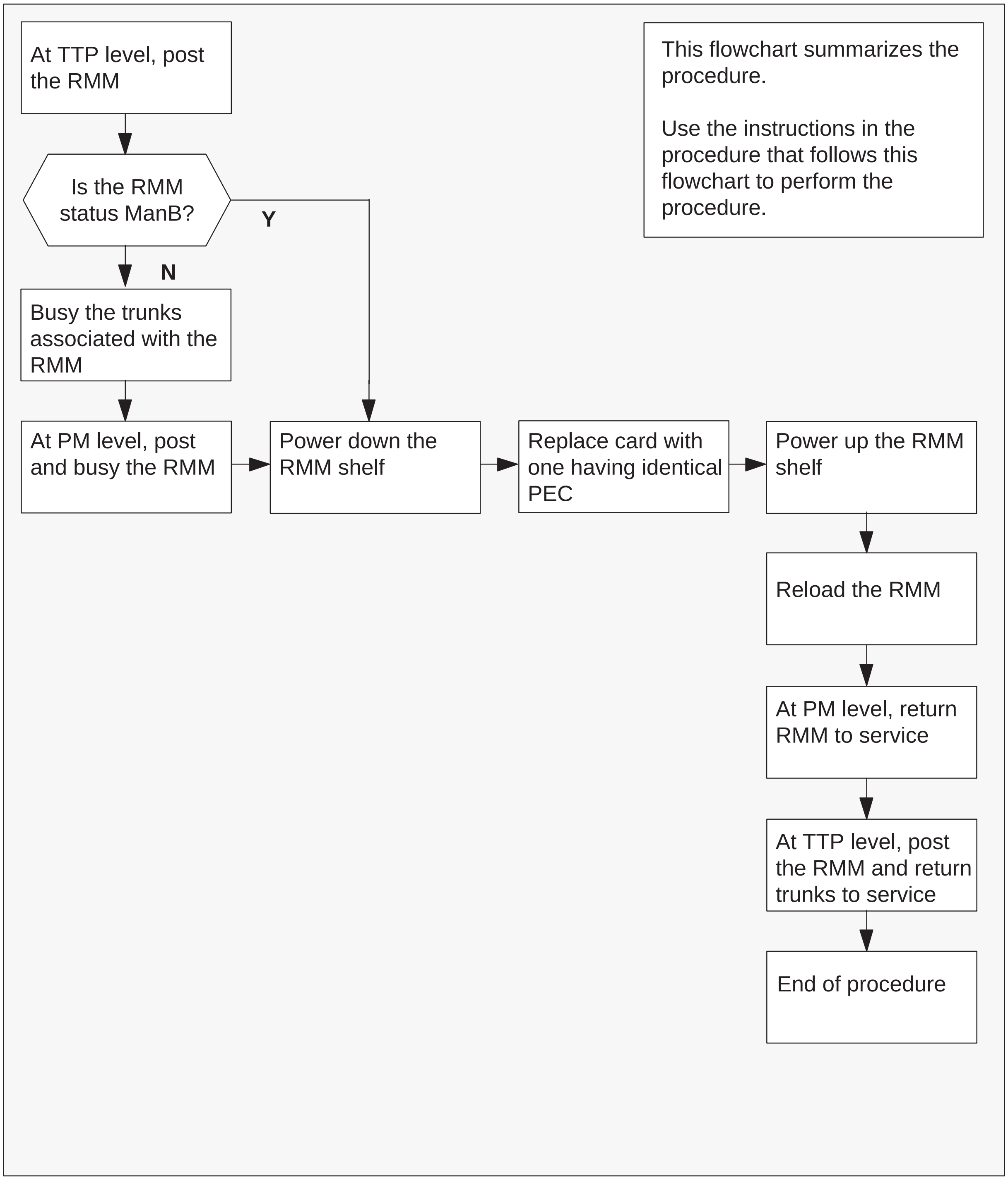
"Replacing a card" is referenced in this procedure.

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.

NT2X09
in RMM (continued)

Summary of replacing an NT2X09 card in RMM



NT2X09
in RMM (continued)

Replacing an NT2X09 in 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 in RMM (continued)

6 Access the PM level of the MAP display 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         1        0        0        0        0        6

RMM      0    SysB
```

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 RMM by setting the ON/OFF switch on the power converter faceplates of both the NT2X09 and NT2X06 to the OFF position. Both the converter FAIL LED and FRAME FAIL lamp at the FSP will go to 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 At the FSP, set the circuit breaker CB4 to the OFF position

10 Replace the NT2X09 card using the procedure ”Replacing a card”. When you have completed the procedure, return to this point.

NT2X09
in RMM (continued)

11 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 of the NT2X09 and NT2X06 to the ON position.

12 Press the RESET button on the NT2X09 power converter while setting the circuit breaker CB4 at the FSP to the ON position. Both the converter FAIL LED and FRAME FAIL lamp at the FSP will go to OFF.

13 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 14.

At the MAP display

14 Load the RMM by typing

>LOADPM
and pressing the Enter key.

If	Do
load passed	step 15
load failed	step 20

15 Return the RMM to service by typing

>RTS
and pressing the Enter key.

If RTS	Do
passed	step 16
failed	step 20

16 Access the TTP level of the MAP display and post the RMM by typing

>TRKS;TTP;POST P RMM rmm_no
and pressing the Enter key.

NT2X09
in RMM (end)

17 Return to service the circuits busied in step 5 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 18
failed	step 20

18 Send any faulty cards for repair according to local procedure.

19 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 21.

20 Obtain further assistance in replacing this card by contacting the personnel responsible for higher level of support.

21 You have completed this procedure.

NT2X10 in RMM

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT2X10	AA, AC, BA	Line Test Unit Analog Card (LTUA)	RMM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index for a list of cards, shelves, and frames documented in this maintenance manual.

Common procedures

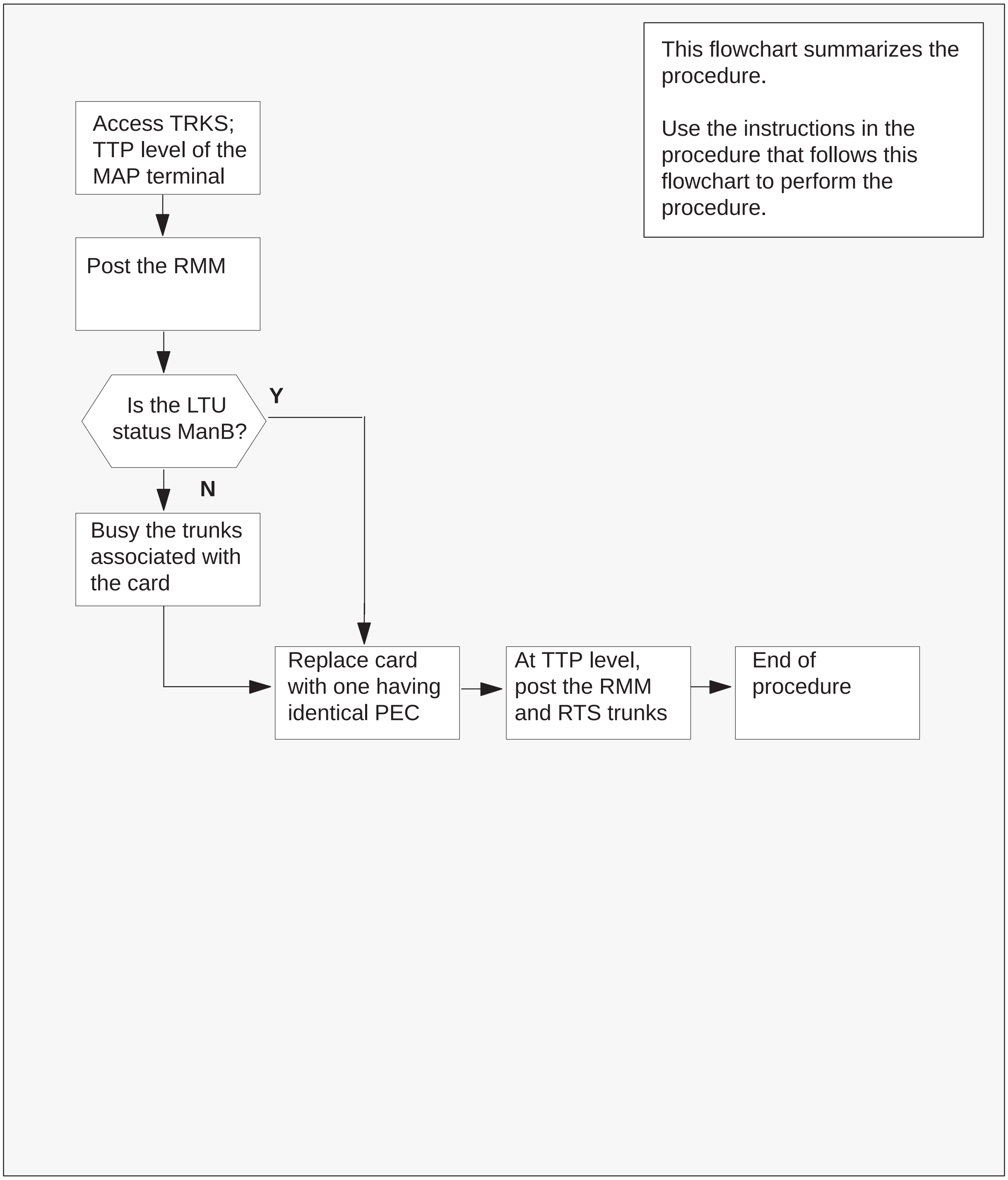
“Replacing a card” is referenced in this procedure.

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.

NT2X10
in RMM (continued)

Summary of replacing an NT2X10 card in RMM



Replacing an NT2X10 card in 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
in 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
in RMM

Application

Use this procedure to replace the card that follows in the shelves or frames identified in the table that follows.

PEC	Suffixes	Cardname	Shelf/frame name
NT2X11	AA, AE	Line Test Unit Digital Card (LTUD)	RMM/RLCC

You cannot always identify the PEC, suffix, and shelf or frame for the card you want to replace. If this event occurs refer to the Index for a list of cards, shelves, and frames documented in this maintenance manual.

Common procedures

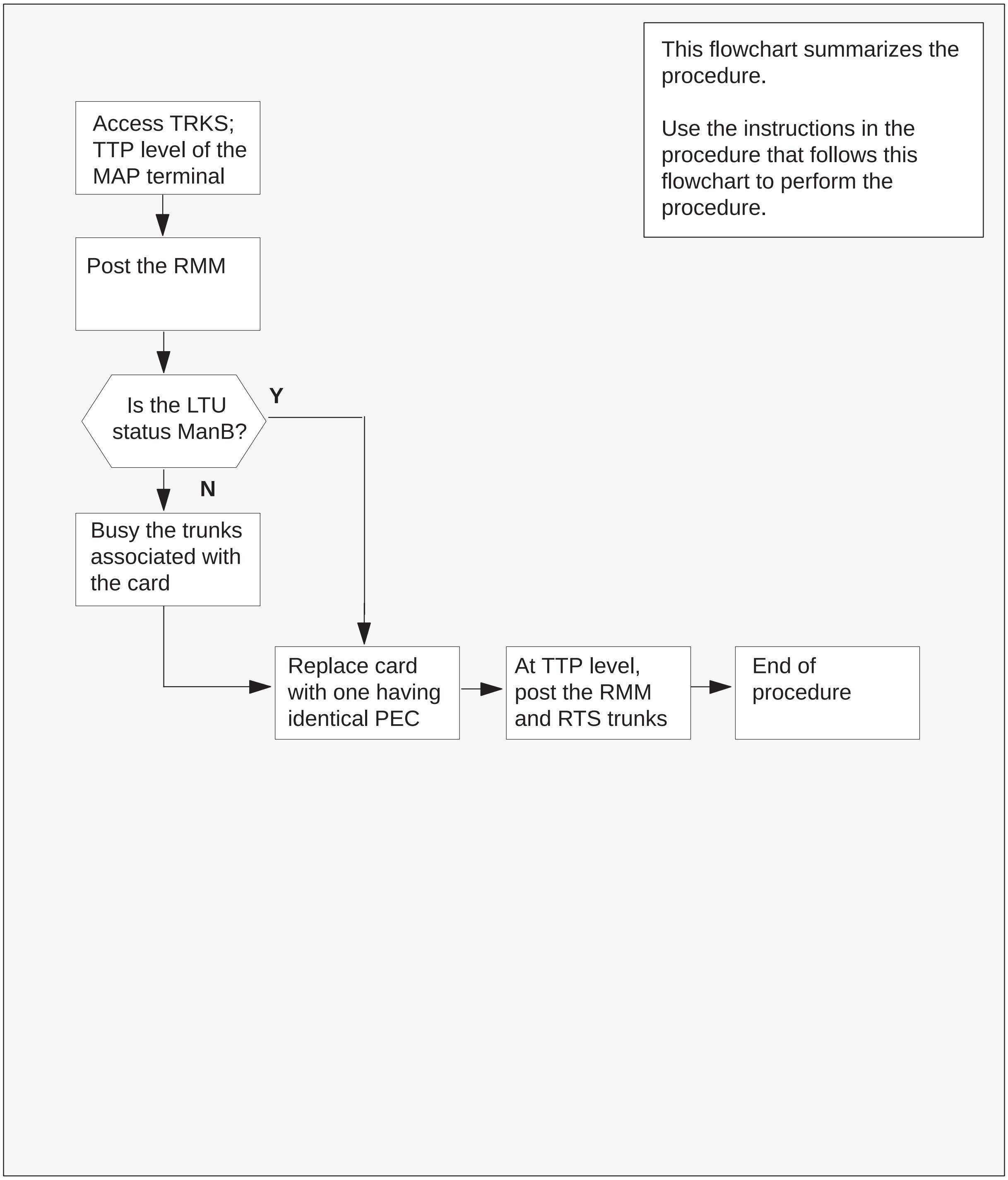
This procedure references ”Replacing a card.”

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.

NT2X11
in RMM (continued)

Summary of Replacing a NT2X11 card in RMM



Replacing a NT2X11 card in RMM

At your current location

1 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC), including suffix, as the removed card.

At the MAP display

2 To access the TTP level of the MAP display and post the line test unit (LTU) associated with the damaged card, type

>MAPCI;MTC;TRKS;TTP;POST T LTU ltu_no
and press the Enter key.

where

ltu_no is the number of the line test unit that has faults

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 To busy the trunks associated with the damaged card, type

>BSY
and press the Enter key.

At the RMM shelf

4 Replace the NT2X11 card with the procedure ”Replacing a card.” When you have completed the procedure, return to this point.

NT2X11
in RMM (end)

At the MAP display

5 To test the new NT2X11 card, type

>TST
and press the Enter key.

If TST	Do
passed	step 6
failed	step 9

6 To return to service the circuits busied in step 3, type

>RTS
and press the Enter key.

If RTS	Do
passed	step 7
failed	step 9

7 To send the damaged cards for repair follow the local procedures.

8 Record the items that follow in office records:

- date the replaced card
- serial number of the card
- indications that prompted replacement of the card

Go to step 10.

9 To replace this card you can obtain additional help. For additional help contact the personnel responsible for next level of support.

10 You have completed this procedure.

NT2X57
in RMM

Application

Use this procedure to replace a card in the shelves or frames identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT2X57	AA	Signal Distribution Card (SD)	RMM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index. Refer to the maintenance manual Index for a list of cards, shelves, and frames.

Common procedures

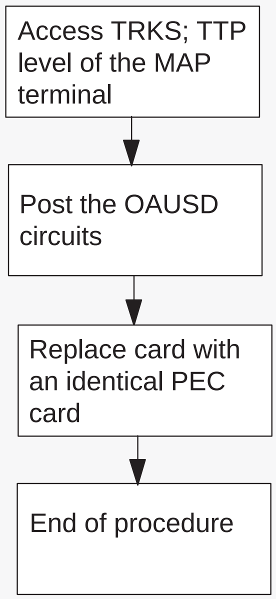
This procedure contains the reference ”Replacing an NT2X57 card.”

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT2X57
in RMM (continued)

Summary of replacing an NT2X57 card in RMM



This flowchart summarizes the procedure. Use the instructions in the procedure that follows this flowchart to perform the procedure.

NT2X57
in RMM (continued)

Replacing an NT2X57

At your current location

1 Obtain a replacement card. Make sure the replacement card has the same product equipment code (PEC), and PEC suffix.

At the MAP display

2 To access the TTP level of the MAP display and post the signal distribution circuits on the card, type

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no ckt_no
and press the Enter key.

where

rmm_no	is the number of the RMM shelf, the location of the card to remove.
ckt_no	is the number of the first circuit and the location of the NT2X57 card.

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) to handle circuit cards. The wrist strap protects the cards against static electricity damage.

To replace the NT2X57 card, use the procedure “Replacing an NT2X57 card. When the procedure is complete, return to this point.

NT2X57 in RMM (end)

At the MAP terminal

4 To verify the signal distribution circuits on the removed card, type

>POST P RMM rmm_no ckt_no
and press the Enter key.

where

rmm_no is the number of the RMM shelf, the location of the replaced card
ckt_no is the number of the first circuit and the location of the NT2X5 card.

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 To send defective cards for repair, follow the local procedures.

6 Record information for office records, as follows:

- date of card replacement
- serial number of the card
- details or reasons for replacement of the card

Go to step 8.

7 For additional help, contact the next level of maintenance.

8 The procedure is complete.

NT2X59 in RMM

Application

Use this procedure to replace a card in the shelves or frames identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT2X59	AA	Group CODEC Card	RMM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index. The maintenance manual index contains a list of cards, shelves, and frames.

Common procedures

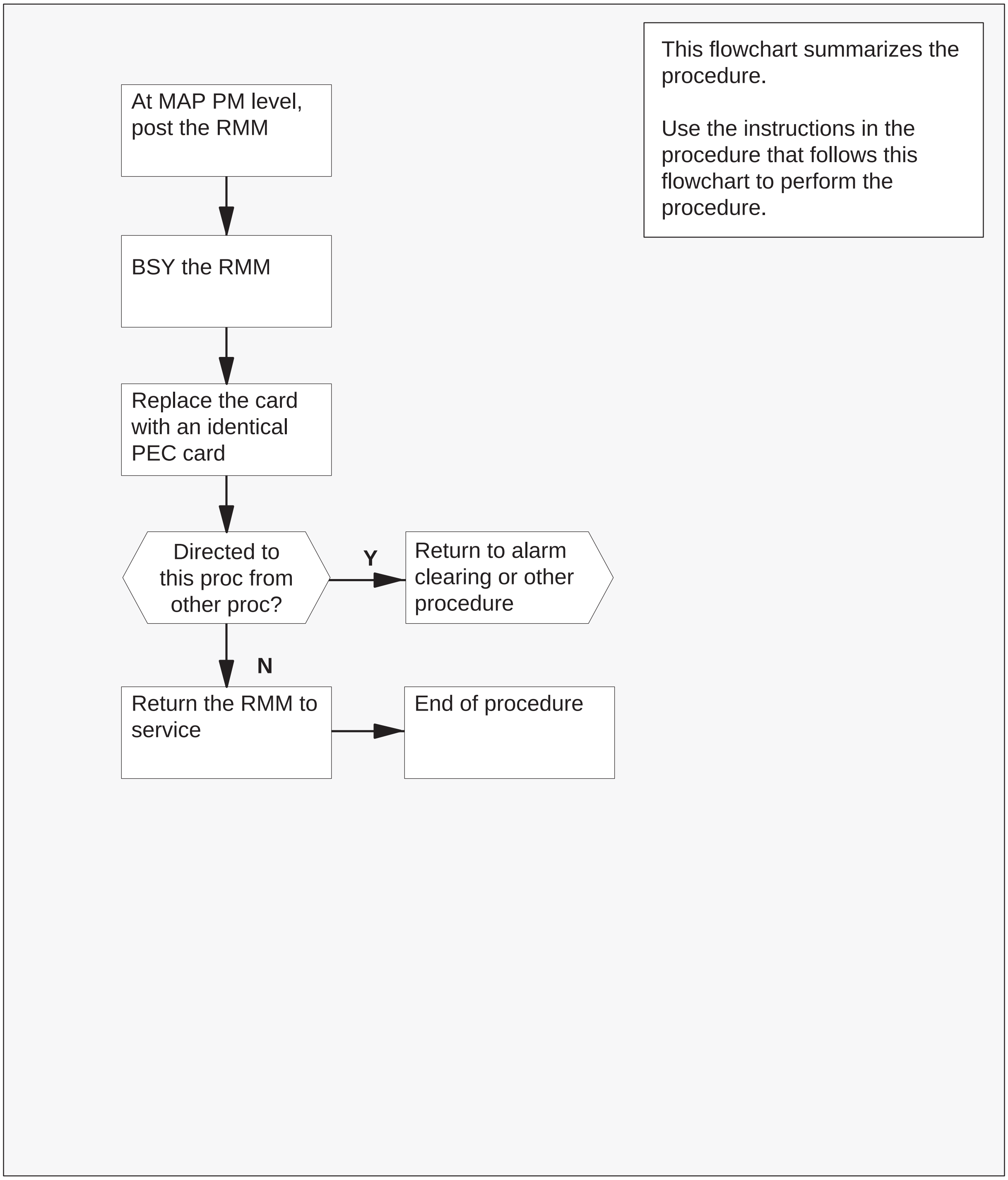
There are no common procedures.

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.

NT2X59
in RMM (continued)

Summary of replacing an NT2X59 card in RMM



NT2X59
in RMM (continued)

Replacing an NT2X59 card in RMM

At your current location

1 Proceed if:

- a step in a maintenance procedure directs you to this card replacement procedure
- you use the procedure to verify or accept cards
- your maintenance support group directs you to this procedure.

2 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC) and PEC suffix, as the removed card.

At the MAP display

3 To access the PM level and post the RMM, type

>MAPCI;MTC;PM;POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM, the location the card to remove

Example of a MAP display:

```
RMM  5  SysB
```

4 To busy the RMM, type

>BSY
and press the Enter key.

Example of a MAP display:

```
RMM  5  ManB
```

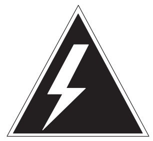
At the RMM shelf

5

> **CAUTION**
> **Static discharge can cause damage to circuit packs**
> Wear a wrist strap and connect the wrist strap to the frame of the RMM. Connect the wrist strap before you remove or insert any cards. The wrist strap protects the RMM against static electricity service degradation.

NT2X59
in RMM (continued)

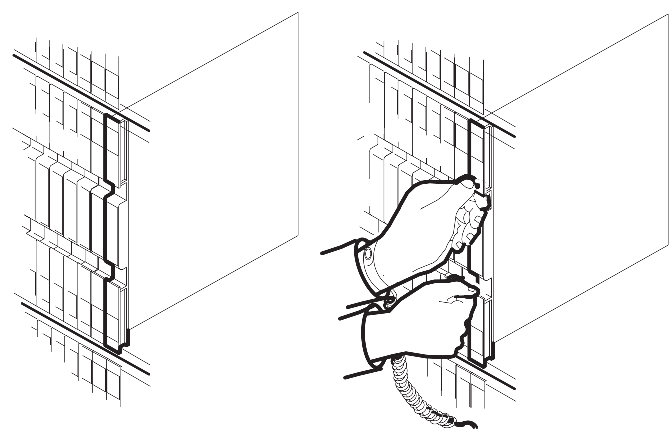
Wear a wrist strap.

6 

WARNING
Equipment damage
Take these precautions when you remove or insert a card:
1. Do not apply direct pressure to the components.
2. Do not force the cards into the slots.

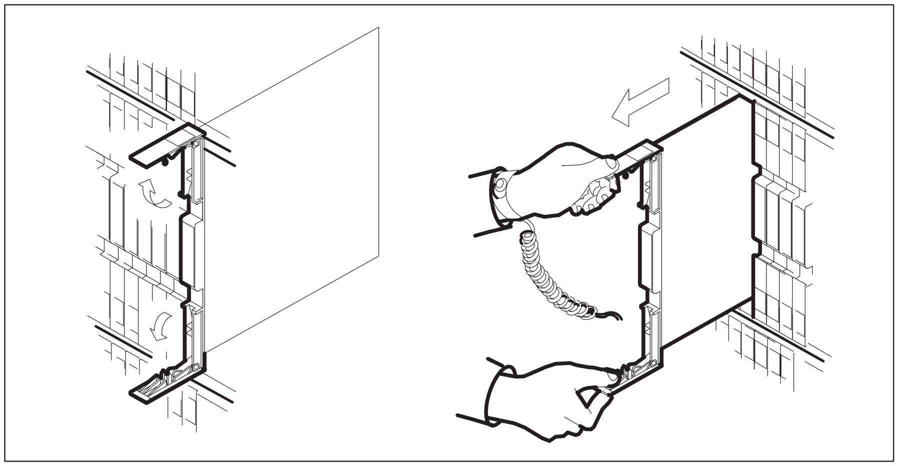
Remove the NT2X59 card as described in the following figures.

a. Locate the card you want to remove on the appropriate shelf.



NT2X59
in RMM (continued)

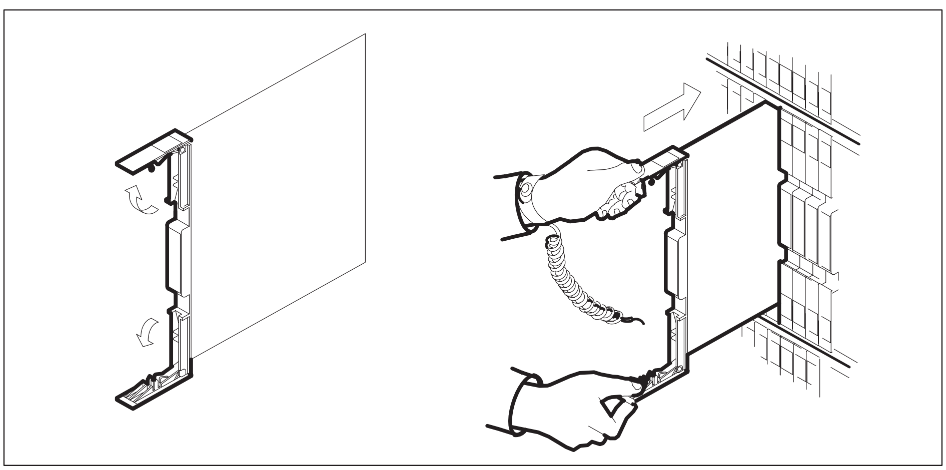
b. Open the locking levers on the card you want to replace. Carefully pull the card toward you until the card clears the shelf.



c. Make sure the replacement card has the same PEC, and PEC suffix, as the removed card.

7 Open the locking levers on the replacement card.

Align the card with the slots in the shelf. Carefully slide the card into the shelf.

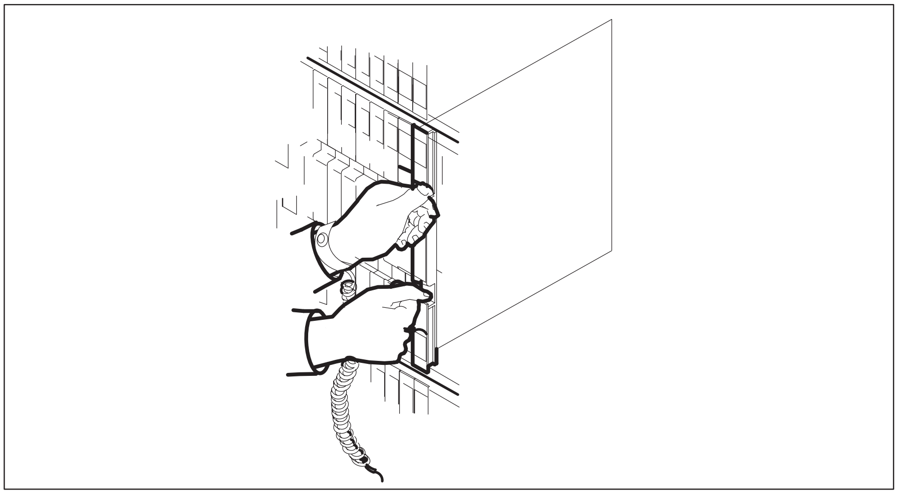


8 Seat and lock the card.

a. Use your fingers to push on the upper and lower edges of the faceplate, reseat the card completely.

NT2X59
in RMM (continued)

b. Close the locking levers.



9 Use the following information to determine the next step in this procedure.

If you enter this procedure from	Do
a procedure that clears an alarm	step 16
other than listed here	step 10

At the MAP display

10 To load the RMM, type

>LOADPM
and press the Enter key.

11 To test the RMM, type

>TST
and press the Enter key.

NT2X59
in RMM (end)

Example of a MAP response:

```
Test Passed
    or
Test Failed
```

If TST	Do
passes	step 12
fails	step 17

12 To return the RMM to service, type

>RTS
and press the Enter key.

If RTS	Do
passes	step 13
fails	step 17

13 To send defective cards for repair, follow the local procedures.

14 Record information for office records, as follows:

- date of the card replacement
- serial number of the card
- details or reasons for replacement of the card

15 Go to step 18.

16 Return to the *Clearing an alarm procedure* that directs you to this card replacement procedure. If necessary, go to the point where the system produces the defective card list. Identify the next defective card on the list. In this manual, go to the appropriate replacement procedure for the card.

17 For additional help, contact the next level of maintenance.

18 The procedure is complete. Return to the maintenance procedure that directs you to this card replacement procedure. Continue as directed.

NT2X70 in HIE

Application

Use this procedure to replace the following card in the shelves or frames that appear in the following table.

PEC	Suffixes	Card name	Shelf/frame name
NT2X70	AF	Power Converter (5V/12V)	HIE/RLCC

For the card to replace, refer to the index for a list of cards, shelves, and frames if you cannot identify:

- the PEC
- the suffix
- the shelf or frame

Use the index documented in this maintenance manual.

Common procedures

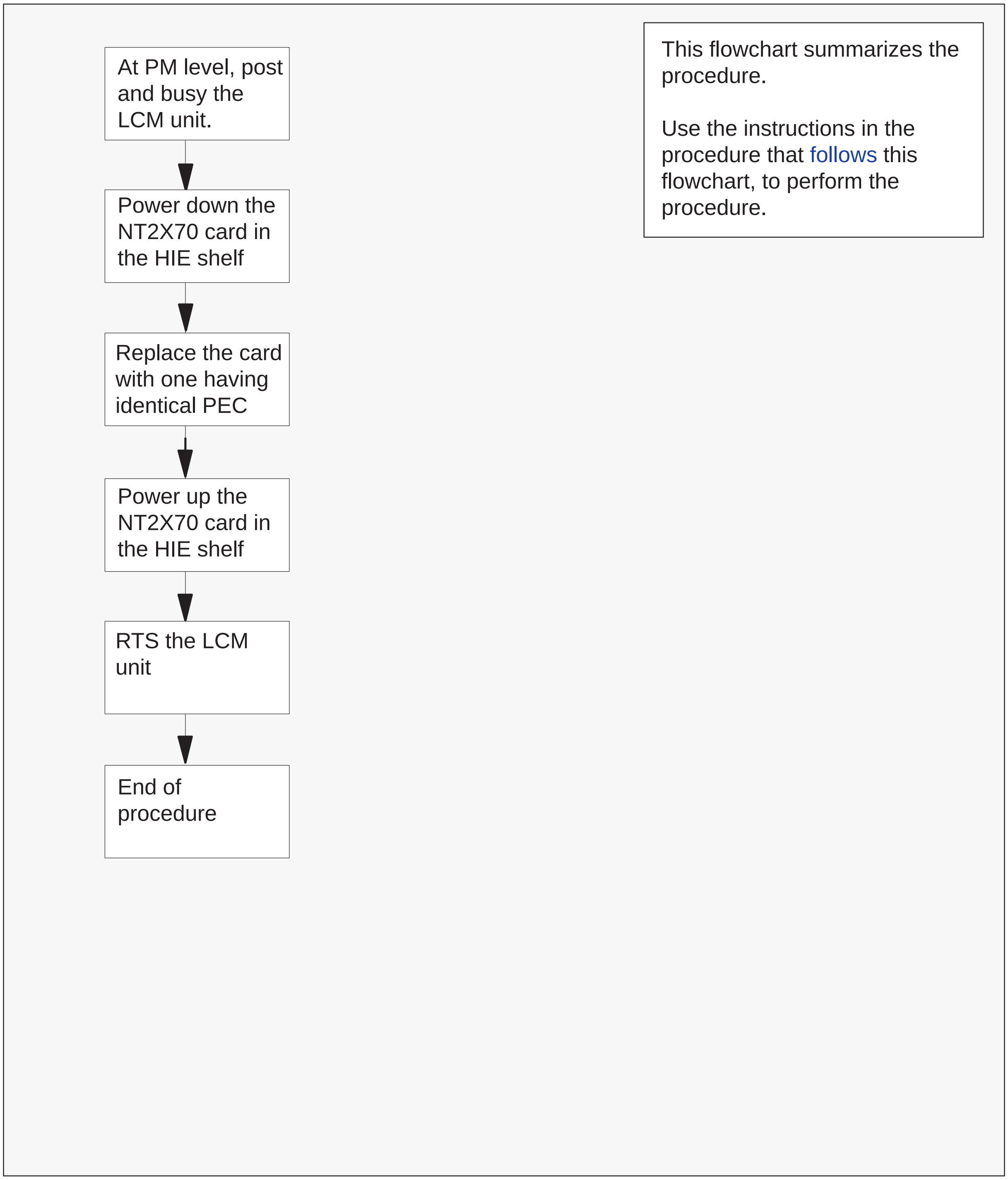
This procedure references “Replacing a card”.

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.

NT2X70
in HIE (continued)

Summary of replacing an NT2X70 card in HIE shelf



NT2X70
in HIE (continued)

Replacing an NT2X70 card in HIE shelf,

At your current location

1 Proceed to step 2 if one of the following conditions applies:

- another maintenance procedure directed you to this card replacement procedure
- you use the procedure to verify or accept cards
- your maintenance support group directed you to this procedure

2 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC), including suffix, as the card you remove.

At the MAP display

3 To access the peripheral module (PM) level of the MAP display and post the Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC) associated with the defective NT2X70 card, type:

>MAPCI;MTC;PM;POST LCM site cabinet lcm
and press the Enter key.

where

site	is the name of the site where the RLCM-EDC is
cabinet	is the number of the cabinet where the LCM is
lcm	is the number of the LCM module in the cabinet

If the NT2X70 card	Do
is in slot 25	step 4
is in slot 22	step 30

4 To display the P-side links of the RLCM, type

>TRNSL P
and press 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
```

NT2X70
in HIE (continued)

5

> **CAUTION**
> **Loss of service**
> This procedure contains directions to busy one or more peripheral modules (PM) in a frame. When you busy a PM, subscriber service is affected. Replace power converters only during periods of low traffic.

To busy unit 0 of the RLCM-EDC, type

>BSY UNIT 0

and press the Enter key.

At the HIE shelf

6

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist strap grounding point of a frame supervisory panel (FSP) when you handle circuit cards. This action protects the cards against static electricity damage.

To power down the NT2X70 card in slot 25 of the HIE shelf, set 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) are ON. An audible alarm can sound. If an alarm sounds, silence the alarm at the MAP terminal. To silence the alarm, type

>SIL

and press the Enter key.

If NT2X70 is in	trip circuit breaker
shelf 33 slot 25	CB3 on FSP
shelf 33 slot 22	CB8 on FSP

7 To replace the NT2X70 card in slot 25 use the procedure “Replacing a card”. When you complete the procedure, return to this point.

NT2X70
in HIE (continued)

8 To power-up the NT2X70 card in slot 25, toggle the ON/OFF/RESET switch on the power converter faceplate to the RESET position. Hold the position while you set 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. Proceed to step 9.

9 If another maintenance procedure directed you to this procedure, return to that procedure and continue as directed. If this action did not occur, proceed to step 10.

At the MAP display

10 To load LCM unit 0, type

>LOADPM UNIT 0 CC
and press the Enter key.

If	Do
you did not receive message “loadfile not found in directory”	step 11
load passed	step 29
load failed	step 39

11 Determine the type of device that contains the PM load files.

If load files	Do
are on tape	step 12
are on IOC disk	step 18
are on SLM disk	step 23

12 Locate the tape that contains the PM load files.

At the IOE frame

13 Mount the tape on a magnetic tape drive.

NT2X70
in HIE (continued)

At the MAP display

14 To download the tape, type

>MOUNT tape_no
and press the Enter key.

where

tape_no is the number of the tape drive that contains the PM load files

15 To list the contents of the tape in your user directory, type

>LIST T tape_no
and press the Enter key.

where

tape_no is the number of the tape drive that contains the PM load files

16 To release the tape drive from your user directory, type

>DEMOUNT T tape_no
and press the Enter key.

where

tape_no is the number of the tape drive mounted in step 14

17 Go to step 28.

18 From office records, determine and note the number of the input/output controller (IOC) disk. Determine the name of the volume that contains the PM load files.

19 To access the disk utility level of the MAP, type

>DSKUT
and press the Enter key.

20 To list the IOC file names into your user directory, type

>LISTVOL volume_name ALL
and press the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 18

21 To leave the disk utility, type

>QUIT
and press the Enter key.

NT2X70
in HIE (continued)

22 Go to step 28.

23 From office records, determine and note the number of the system load module (SLM) disk. Determine the name of the volume that contains the PM load files.

24 Access the disk utility level of the MAP, type

>DISKUT
and press the Enter key.

25 To list the SLM disk volume names, type

>LV CM
and press the Enter key.

26 To list the SLM file names into your user directory, type

>LF volume_name
and press the Enter key.

where

volume_name is the name of the volume that contains the PM load files, obtained in step 23

27 To leave the disk utility, type

>QUIT
and press the Enter key.

28 To load LCM unit 0, type

>LOADPM UNIT 0 CC
and press the Enter key.

If the LOADPM	Do
passes	step 29
fails	step 39

NT2X70
in HIE (continued)

29 To return the LCM unit to service, type

>RTS UNIT 0
and press the Enter key.

If RTS	Do
passes	step 36
fails	step 39

At the MAP display

30 To busy unit 1 of the RLCM-EDC, type

>BSY UNIT 1
and press the Enter key.

At the HIE shelf

31

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist strap grounding point of a frame supervisory panel (FSP) when you handle circuit cards. This action protects the cards against static electricity damage.

Power down the NT2X70 card in slot 22 of the HIE shelf. To power down the card, set the ON/OFF switch on the power converter faceplate to OFF. Both the converter FAIL LED and FRAME FAIL lamp on the frame supervisory panel (FSP) will be ON. An audible alarm can sound. If an alarm sounds, silence it. To silence the alarm, type

>SIL
and press the Enter key.

If NT2X70 is in	trip circuit breaker
shelf 33 slot 25	CB3 on FSP
shelf 33 slot 22	CB8 on FSP

32 To replace the NT2X70 card in slot 22 use the procedure “Replacing a card”. Complete the procedure and return to this point.

NT2X70
in HIE (end)

33 To power-up the NT2X70 card in slot 22, toggle the ON/OFF/RESET switch on the power converter faceplate to the RESET position. Hold the position while you set 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. Proceed to step 34.

34 If another maintenance procedure directed you to this procedure, return to that procedure and continue as directed. If this action does not occur, proceed to step 35.

At the MAP display

35 To return the LCM unit to service, type

>RTS
and press the Enter key.

If RTS	Do
passes	step 36
fails	step 39

36 Send any defective cards for repair according to local procedure.

37 Record the items that follow in office records:

- date that card replacement occurs
- serial number of the card
- problems that prompts replacement of the card

38 Proceed to step 40.

39 For additional help to replace this card, contact the next level of support.

40 The procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure and continue that procedure.

NT2X90 in RMM

Application

Use this procedure to replace the card that follows in the shelves or frames that appear in the table that follows.

PEC	Suffixes	Cardname	Shelf/frame name
NT2X90	AB, AC, AD	Incoming/outgoing Transmission Test Trunk Circuit (TTT)	RMM/RLCC

For the card you replace, refer to the Index for a list of cards, shelves, and frames if you cannot identify:

- the PEC
- the suffix
- the shelf or frame

Use the Index documented in this maintenance manual.

Common procedures

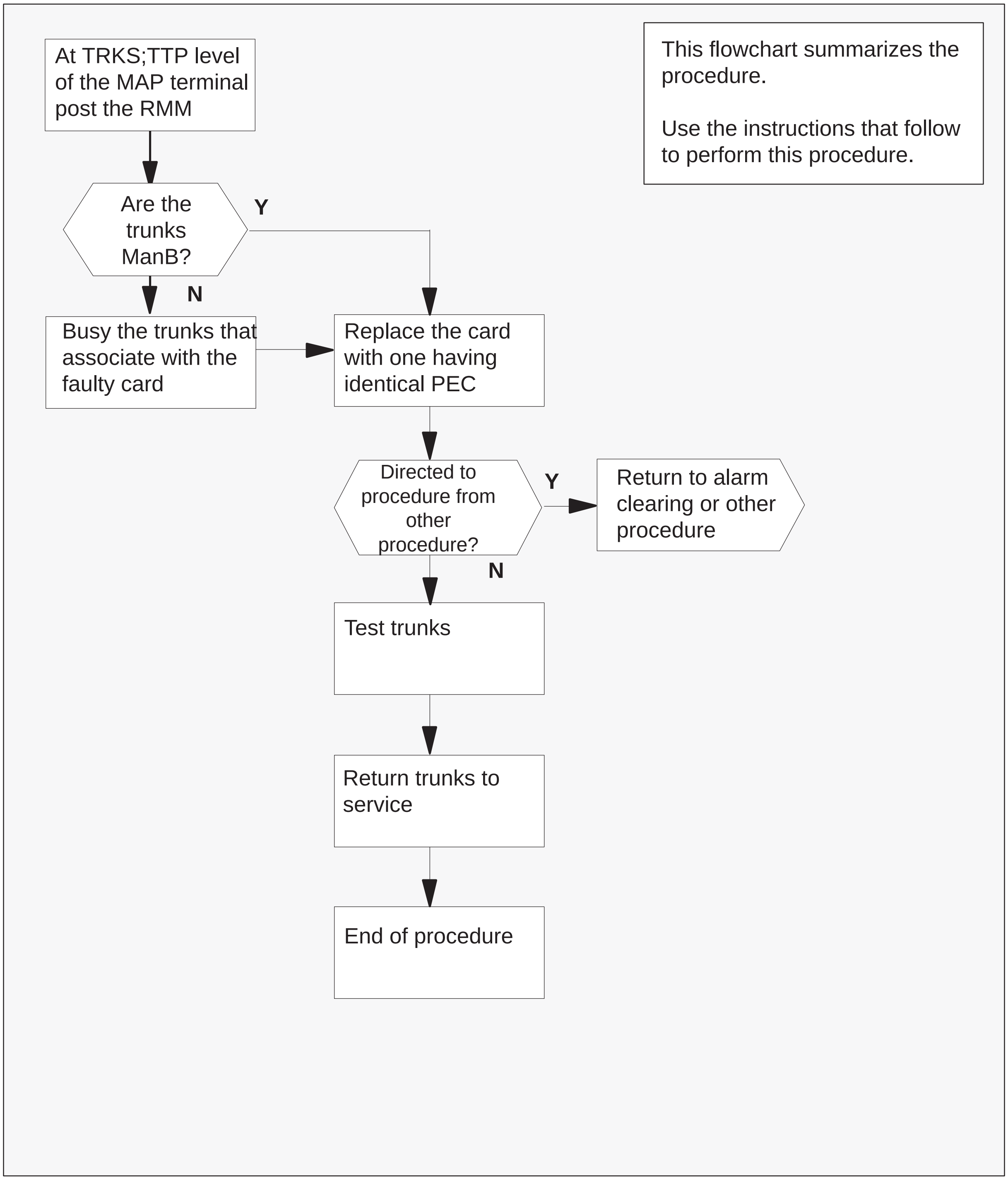
This procedure references Replacing a card.

Action

The flowchart that follows is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows.

NT2X90
in RMM (continued)

Summary of Replacing an NT2X90 card in an RMM



NT2X90
in RMM (continued)

Replacing an NT2X90 card in an RMM

At your current location

1 Proceed only if this card replacement procedure sent you to a step in a maintenance procedure. If you use the procedure to verify or accept cards you may proceed. You may proceed if your maintenance support group sent you to this procedure.

2 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC) including suffix as the card you remove.

At the MAP display

3 To access the TTP level of the MAP display and post the trunk circuits that associate with the card you replace, type:

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no ckt_no ckt_no
and press the Enter key.

where

rmm_no	is the number of the RMM that contains the card you replaced
ckt_no	is the number of the first circuit that associates with the defective card
ckt_no	is the number of the last circuit that associates with the defective card

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  MONTALK
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      MONTALK  21    LO
                                        P_IDL
```

4 To make sure you pull the correct card from the correct card slot, type:

>CKTLOC
and press the Enter key.

5 To busy the trunk circuits that associate with the defective card you replace, type:

>BSY ALL
and press the Enter key.

NT2X90
in RMM (continued)

At the RMM shelf

6

CAUTION
Static discharge may cause damage to circuit packs
Connect a wrist strap to the frame of the RMM before you remove or insert any cards. This protects the RMM against service degradation that static electricity causes.

Put on a wrist strap.

7 To replace the NT2X90 card use the procedure Replacing a card. When you complete the procedure, return to this point.

8 Use the information that follows to determine the next step in this procedure.

If you enter this procedure	Do
from an alarm clearing procedure	step 18
from other	step 9

At the MAP display

9 To post the trunk circuits that associate with the new NT2X90 card, type:

>POST P RMM rmm_no ckt_no ckt_no
and press the Enter key.

where

rmm_no	is the number of the RMM that contains the new NT2X90 card
ckt_no	is the number of the first circuit that associates with the new card
ckt_no	is the number of the last circuit that associates with the new card

Example of a MAP response:

```
LAST CIRCUIT = 27
POST CKT IDLED
SHORT CLLI IS:  MONTALK
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     MONTALK  21    MB
```

10 To place the first circuit on hold and test the second circuit, type:

>HOLD
and press the Enter key,

and then type

>TST
and press the Enter key

If the TST	Do
passed	step 11
failed	step 19

NT2X90
in RMM (continued)

11 To return the tested circuit to service, type:

>RTS
and press the Enter key.

If the RTS	Do
passed	step 12
failed	step 19

12 To place the not tested circuit in the control position, type:

>NEXT 1
and press the Enter key.

13 To test the circuit, type

>TST

If the TST	Do
passed	step 14
failed	step 19

14 To return to service and clear the trunk test position, type:

>RTS;NEXT
and press the Enter key.

15 Send any cards that have faults for repair according to local procedure.

16 Record the items that follow in office records:

- date you replace the card
- serial number of the card
- problems for the replacement of the card

17 Go to step 20.

18 Return to the *Alarm clearing procedures* that sent you to this card replacement procedure. Go to the point where the system produced the damaged card list and identify the next damaged card on the list. Proceed to the correct replacement procedure in this manual for the card.

NT2X90
in RMM (end)

19 For additional help with the replacement of this card, contact the next level of support.

20 The procedure is complete. Return to the maintenance procedure.

NT3X09 in RMM

Application

Use this procedure to replace a card in the shelves or frames identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT3X09	AA, BA	Metallic Test Access (MTA)	RMM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index. The maintenance manual index contains a list of cards, shelves, and frames.

Common procedures

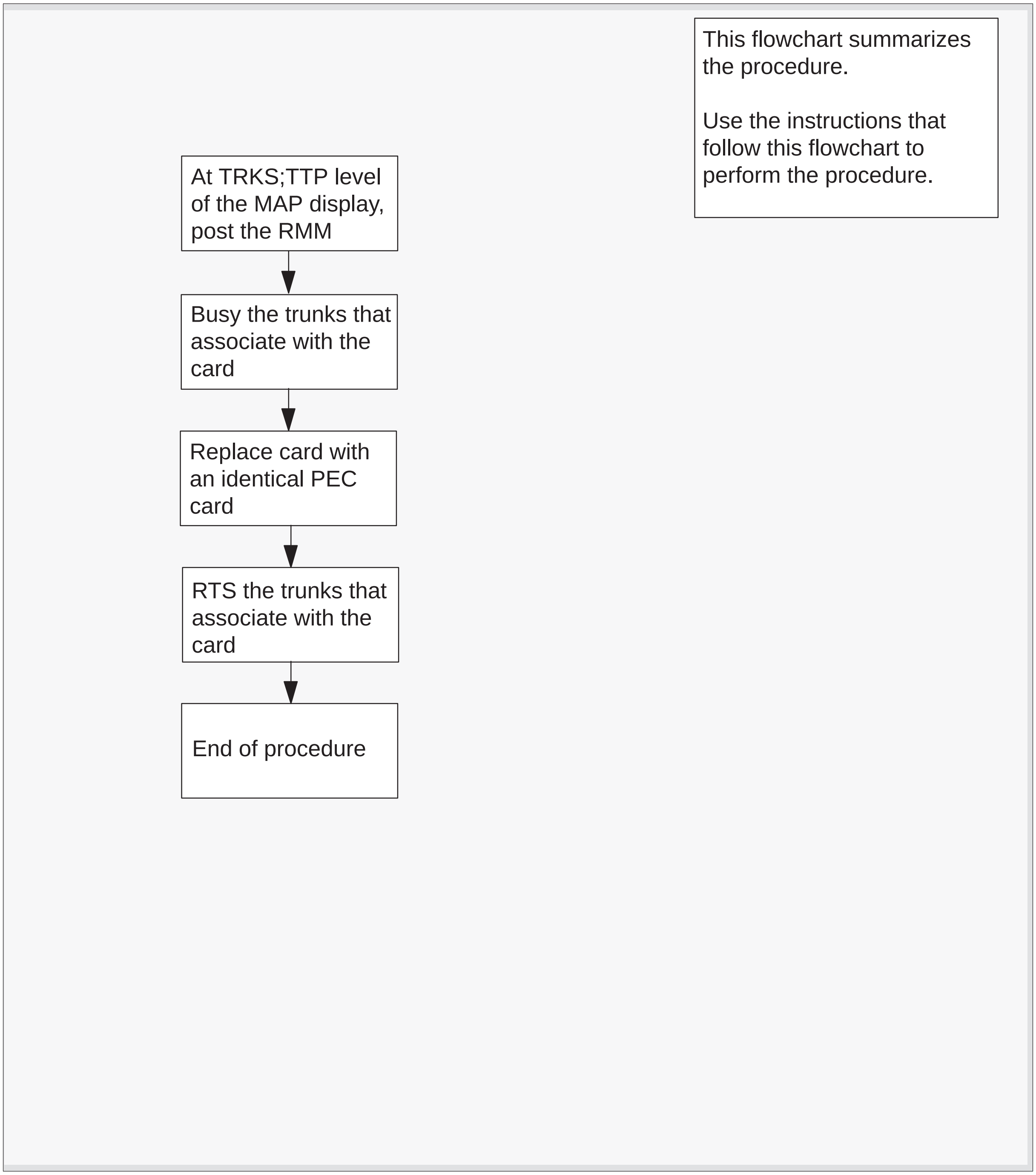
This procedure contains the reference ”Replacing an NT3X09 card.”

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT3X09
in RMM (continued)

Summary of replacing an NT3X09 card in RMM



NT3X09
in RMM (continued)

Replacing an NT3X09 card in an RMM

At your current location

1 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC), and PEC suffix, as the removed card.

At the MAP terminal

2 To access the TTP level of the MAP terminal and post the RMM, type

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no ckt_no

and press the Enter key.

where

rmm_no is the number of the RMM shelf, the location of the card to remove
ckt_no is the number of the first circuit and the location of the NT3X09 card

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 To verify the location of the correct card slot, type

>CKTLOC
and press the Enter key.

4 Check the status of the RMM.

If RMM status is	Do
MB, PMB, RMB	step 6
other than listed here	step 5

5 To busy the trunks that associate with the card, type

>BSY ;NEXT
and press the Enter key.

Note: Repeat this step for all circuits that associate with the defective NT3X09 card you must replace.

NT3X09
in RMM (continued)

At the RLCC cabinet

6

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist-strap grounding point of a frame supervisory panel (FSP) to handle circuit cards. The wrist strap protects the cards against static electricity damage.

To replace the NT3X09 card, use the procedure “Replacing an NT3X09 card”. When the procedure is complete, return to this point.

At the MAP terminal

7 To post the new NT3X09 card, type

>POST P RMM rmm_no ckt_no
and press the Enter key.

where

rmm_no is the number of the RMM shelf, the location of the card to remove
ckt_no is the number of the first circuit and the location of the NT3X09 card

8 To return to service the circuits used in step 5, type

>RTS ;NEXT
and press the Enter key.

Note: Repeat this step for all circuits that associate with the new NT3X09 card.

If RTS	Do
passes	step 9
fails	step 11

9 To send defective cards for repair, follow the local procedures.

10 Record information for office records, as follows:

- date of card replacement
- serial number of the card
- details and reasons for replacement of the card

Go to step 12.

NT3X09
in RMM (end)

11 For additional help, contact the next level of maintenance.

12 The procedure is complete.

NT6X21
in LCM

Application

Use this procedure to replace a card in the shelves or frames as identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT6X21	AA, AB, AC	Line card type C, Meridian Digital Centrex (MDC), electronic business set	LCM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index. The maintenance manual index contains a list of cards, shelves, and frames.

Common procedures

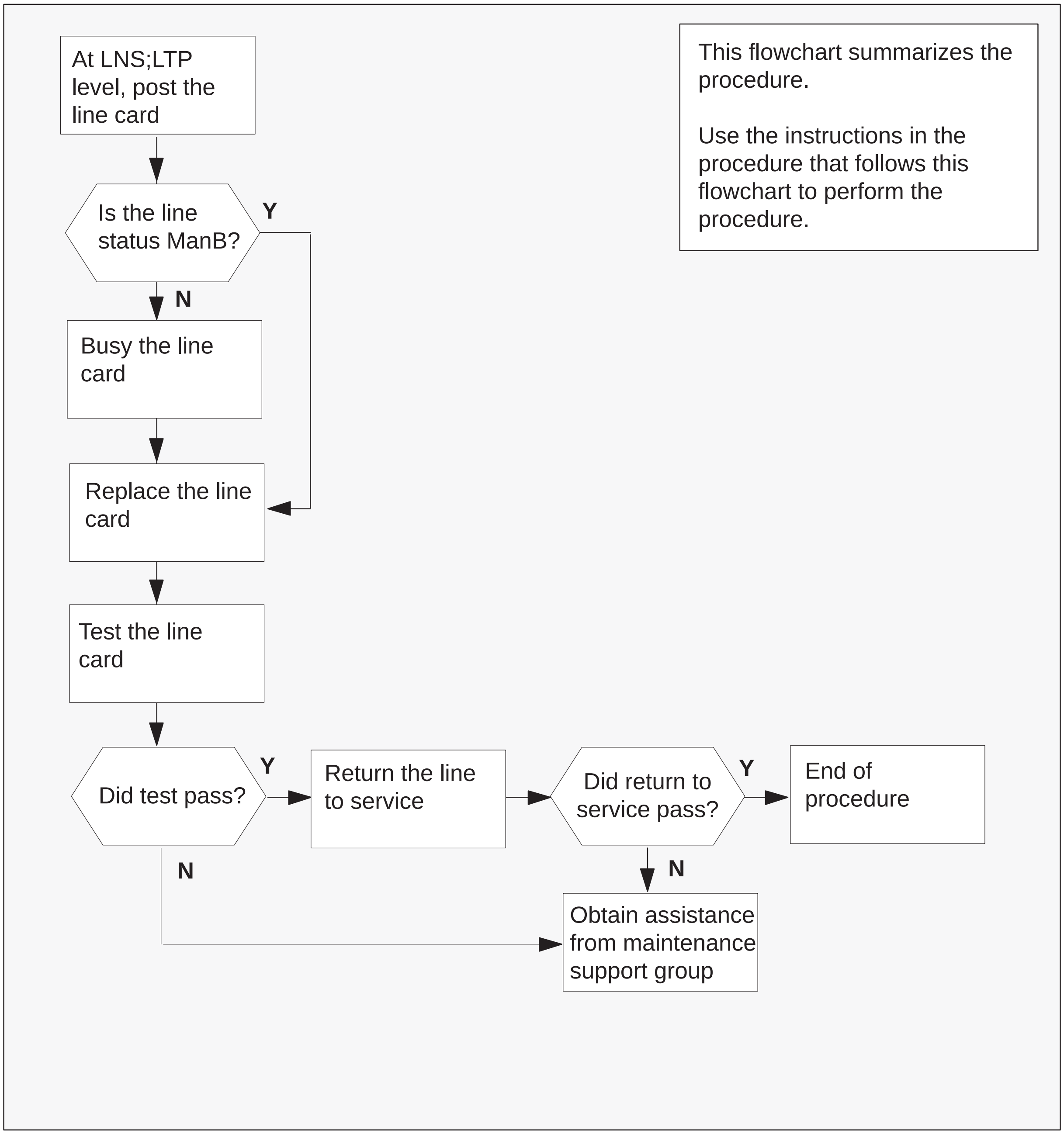
This procedure contains the reference “Replacing a line card.”

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT6X21
in LCM (continued)

Summary of replacing an NT6X21 card in LCM



NT6X21
in LCM (continued)

Replacing an NT6X21 card in an LCM

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 removed card.

At the MAP terminal

2 To access the LTP level of the MAP terminal and post the line, type

>MAPCI;MTC;LNS;LTP;POST L site lcm lsg ckt
and press the Enter key.

where

site	is the name of the site and the location of the RLCM-EDC
lcm	is the number of the RLCM-EDC LCM with the defective card
lsg	is the number of the line subgroup with the defective card
ckt	is the number of the circuit that associates with the defective card

Example of a MAP response:

```
LCC PTY RNG .....LEN.......... DN   STA F S LTA TE RESULT
PPHON      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 To busy the line, type

>BSY
and press the Enter key.

At the RLCC cabinet

5 Go to the procedure “Replacing an NT6X21 card”. When the procedure is complete, return to this point.

NT6X21
in LCM (end)

At the MAP terminal

6 To test the removed line card, type

>DIAG

and press the Enter key.

If the DIAG	Do
passes	step 7
fails	step 10

7 To return the line card to service, type

>RTS
and press the Enter key.

If RTS	Do
passes	step 8
fails	step 10

8 To send defective cards for repair, follow the local procedures.

9 Record information for office records, as follows:

- date of card replacement
- serial number of the card
- details and reason for replacement of the card

Go to step 11.

10 For additional help, contact the next level of maintenance.

11 The procedure is complete.

NT6X36 in FSP

Application

Use this procedure to replace a card in the shelves or frames as identified in the following table.

PEC	Suffixes	Cardname	Shelf/frame name
NT6X36	AA, AB	FSP alarm and control card	FSP/RLCC
NT6X36	AC	Fan alarm and control card	FSP/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the Index. The maintenance manual index contains a list of cards, shelves, and frames.

Common procedures

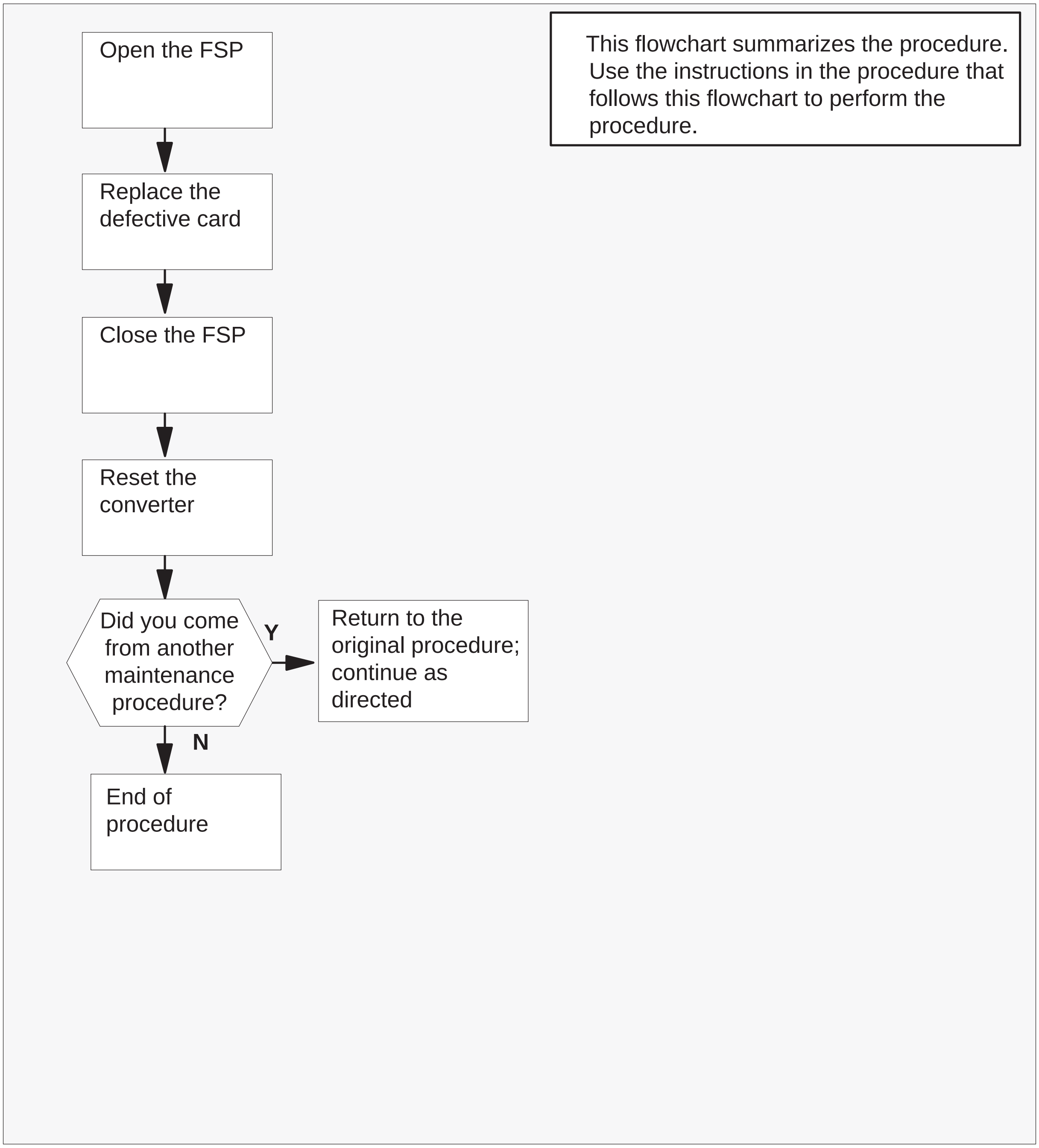
There are no common procedures.

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.

NT6X36
in FSP (continued)

Summary of replacing an NT6X36 card in FSP



Replacing an NT6X36 card in an FSP

At your current location

1 Obtain a replacement card. Make sure that the replacement card has the same product engineering code (PEC), and PEC suffix, as the removed card.

At the RLCC cabinet

2 Unscrew the slotted nut on the left-hand side of the FSP.

3

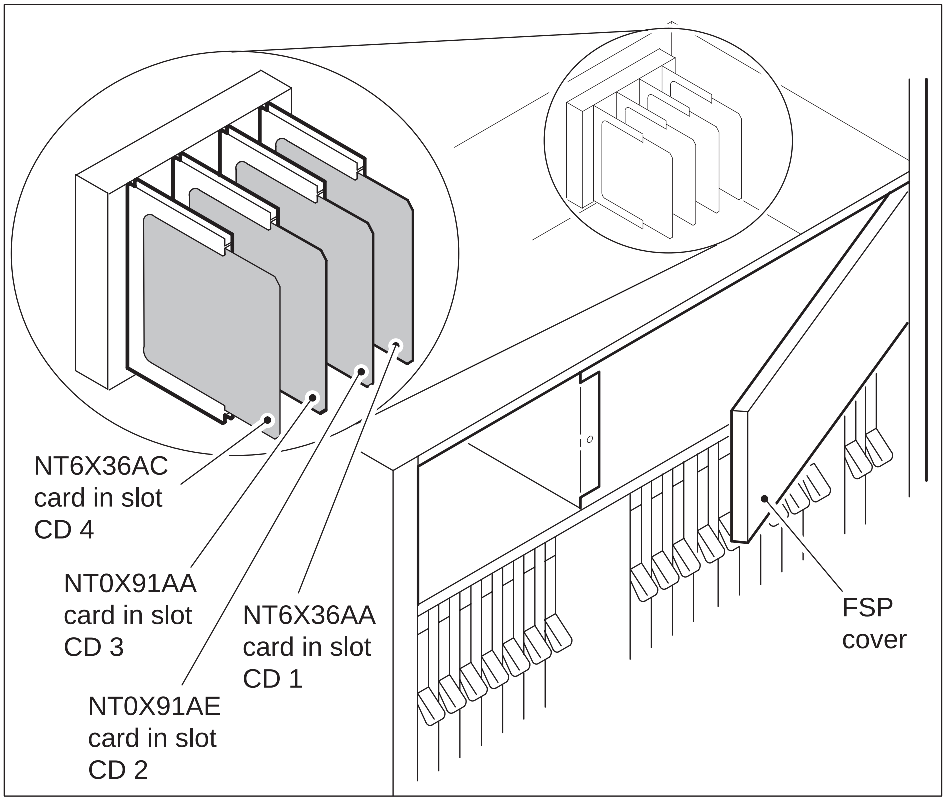
DANGER
Risk of electrocution
Some of the terminals inside the FSP have an electrical potential of -48V dc. Remove jewelry before you replace a card in the FSP. Do not touch the terminals inside the FSP.

Open the FSP panel.

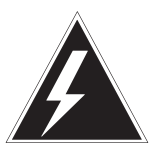
NT6X36
in FSP (continued)

4 Remove the alarm and control or fan card NT6X36.

FSP Alarm and control cards



5



WARNING
Static electricity damage
Wear a wrist strap that connects to the wrist-strap grounding point of a frame supervisory panel (FSP) to handle circuit cards. The wrist strap protects the cards against static electricity damage.

Insert the replacement NT6X36 card.

6 Close the FSP panel.

7 Tighten the slotted nut on the FSP.

To reset the converter for each shelf associated with the card, proceed as follows.

NT6X36
in FSP (end)

8 Press the RESET button.

If the CONVERTER FAIL LED	Do
is lit	step 11
is not lit	step 9

9 The reason for this procedure will determine the next action.

If	Do
maintenance procedure directs you to this procedure	step 10
maintenance procedure does not direct you to this procedure	step 12

10 Return to the maintenance procedure that sends you to this procedure. Continue as directed.

11 For additional help, contact the next level of maintenance.

12 The procedure is complete.

NT6X50 in HIE

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Card name	Shelf/frame name
NT6X50	AB	DS-1 Interface card	HIE/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the index. The index provides a list of cards, shelves, and frames documented in this maintenance manual.

Common procedures

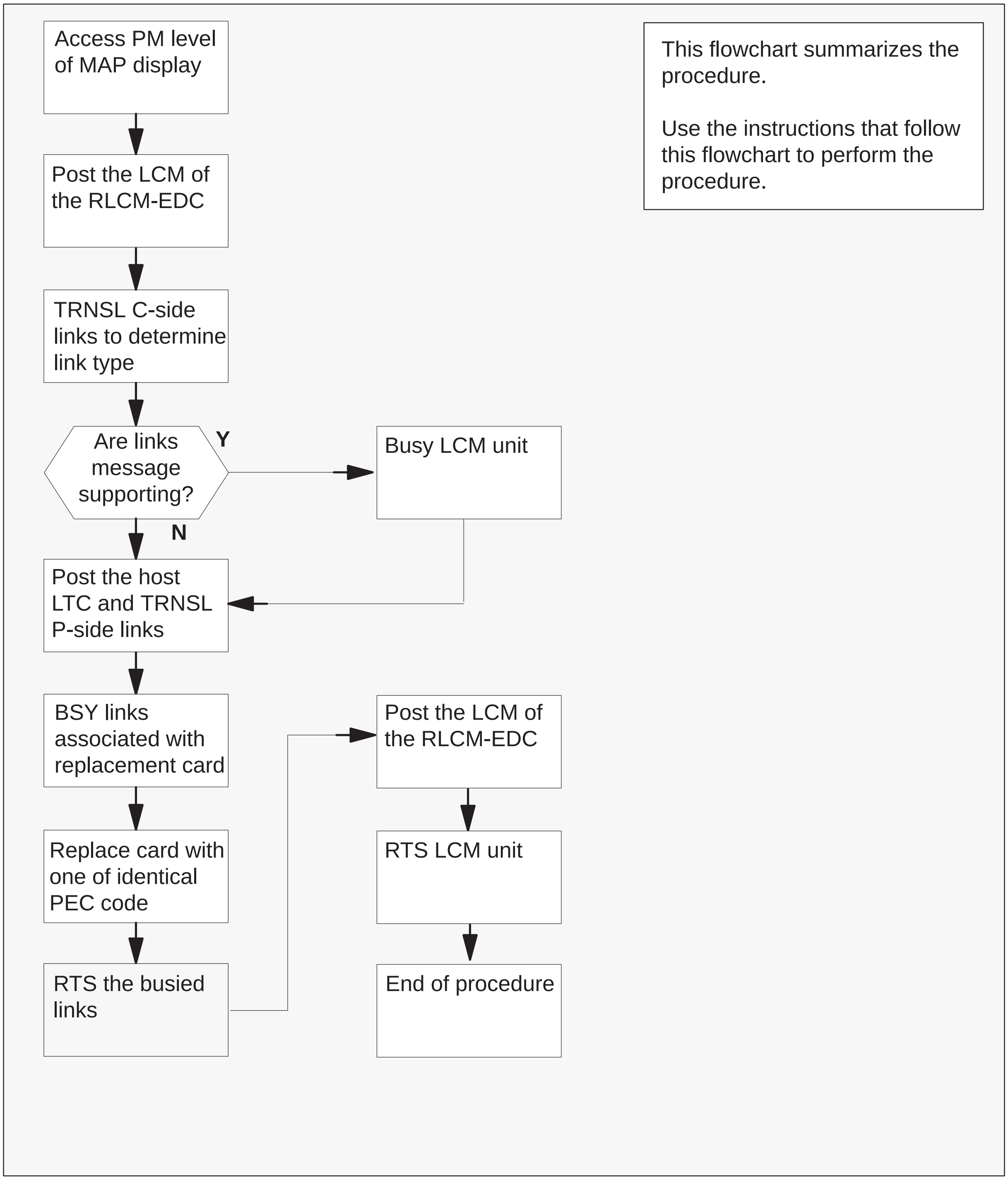
This procedure references “Replacing a card”.

Action

The procedure for card replacement contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT6X50
in HIE (continued)

Summary of replacing an NT6X50 card in HIE



NT6X50
in HIE (continued)

How to replace an NT6X50 card in an HIE

At your current location

1 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC) and suffix as the card to remove.

2 If another maintenance procedure directed you to this procedure, proceed to step 4. If this event did not occur, proceed to step 3.

At the MAP display

3 To access the peripheral module (PM) level and post the line concentrating module (LCM), type

>MAPCI;MTC;PM;POST LCM site cabinet lcm
and press the Enter key.

where

site	is the name of the RLCM-EDC site (alphanumeric)
cabinet	is the number of the RLCC cabinet
lcm	is the number of the LCM

4 To display C-side link information, type

> TRNSL C
and press 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 PM to which the RLCM-EDC connects. To post the C-side PM, type

> POST LTC ltc_no
and press the Enter key.

where

ltc_no	is the number of the host LTC+ (0 to 255)

NT6X50
in HIE (continued)

6 To display P-side link information, type

> TRNSL P
and press the Enter key.

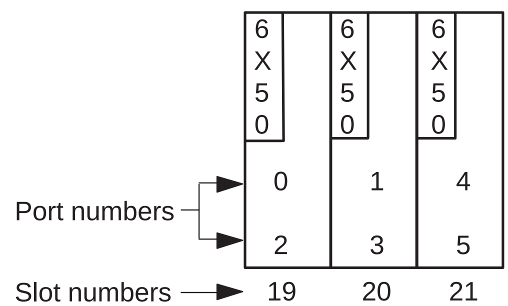
Example of a MAP response:

RLCM-EDC 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 correspond to the links identified as defective in step 6. Note that each NT6X50 card has two ports. For example, the defective link 6 that appears in step 6 connects to port 1 as indicated. Port 1 corresponds to the NT6X50 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

NT6X50
in HIE (continued)

9 To post the LCM, type

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

where

site	is the name of the RLCM-EDC site (alphanumeric)
cabinet	is the number of the RLCC cabinet
lcm	is the number of the LCM

10 To busy LCM unit 0 for card in slot 19 or LCM unit 1 for card in slot 20, type

>BSY UNIT lcm_unit_no
and press the Enter key.

where

lcm_unit_no	is the RLCM-EDC unit (0 or 1) to busy

11 To post the C-side PM, posted before in step 5, where the RLCM-EDC connects, type

>POST LTC ltc_no
and press the Enter key.

where

ltc_no	is the number of the host LTC+ (0 to 255)

12 To busy both links associated with the defective card, use the information collected in steps 6 and 7. 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 RLCE frame

13

WARNING
Possible interruption of calls in progress.
Operating company personnel must wait at least 15 min before removal of the NT6X50 DS-1 interface card. Personnel must wait this time to allow callers to complete calls in progress.

Change dip switch settings on the new replacement card to match the defective card that you remove.

14 Use the procedure “Replacing a card” to replace the NT6X50 card. When the card replacement is complete, return to this point.

At the MAP display

15 To test the links busied 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**
failed	step 24
passed	step16

16 To return to service the links busied in step 12, type

>RTS LINK link_no
and press 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

NT6X50
in HIE (continued)

17 Determine if links remain for you to clear.

If links that you must clear	Do
remain	step 12
do not remain	step18

18 If another maintenance procedure directed you to this procedure, return now to the procedure that directed you here. Continue as directed. If this change in direction did not occur, go to step 19.

19 Determine if an LCM unit is manual busy.

If LCM unit	Do
is ManB	step 20
is not ManB	step 22

20 To post the LCM, type

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

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the number of the RLCC cabinet
lcm	is the number of the LCM

21 To return the busied unit to service, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit	is the RLCM-EDC unit busied in step 10

If RTS	Do
failed	step 24
passed	step 22

NT6X50
in HIE (end)

22 Send defective cards for repair according to local procedure.

23 Record the items that follow in office records:

- date that card replacement occurred
- serial number of the card
- indications that prompted replacement of the card

Proceed to step 25.

24 For additional information for card replacement, contact the next level of support.

25 This procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure. Continue as directed.

NT6X51 in LCM

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Card name	Shelf/frame name
NT6X51	BA	LCM Processor Card	LCM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the index. The index provides a list of cards, shelves, and frames documented in this maintenance manual.

Common procedures

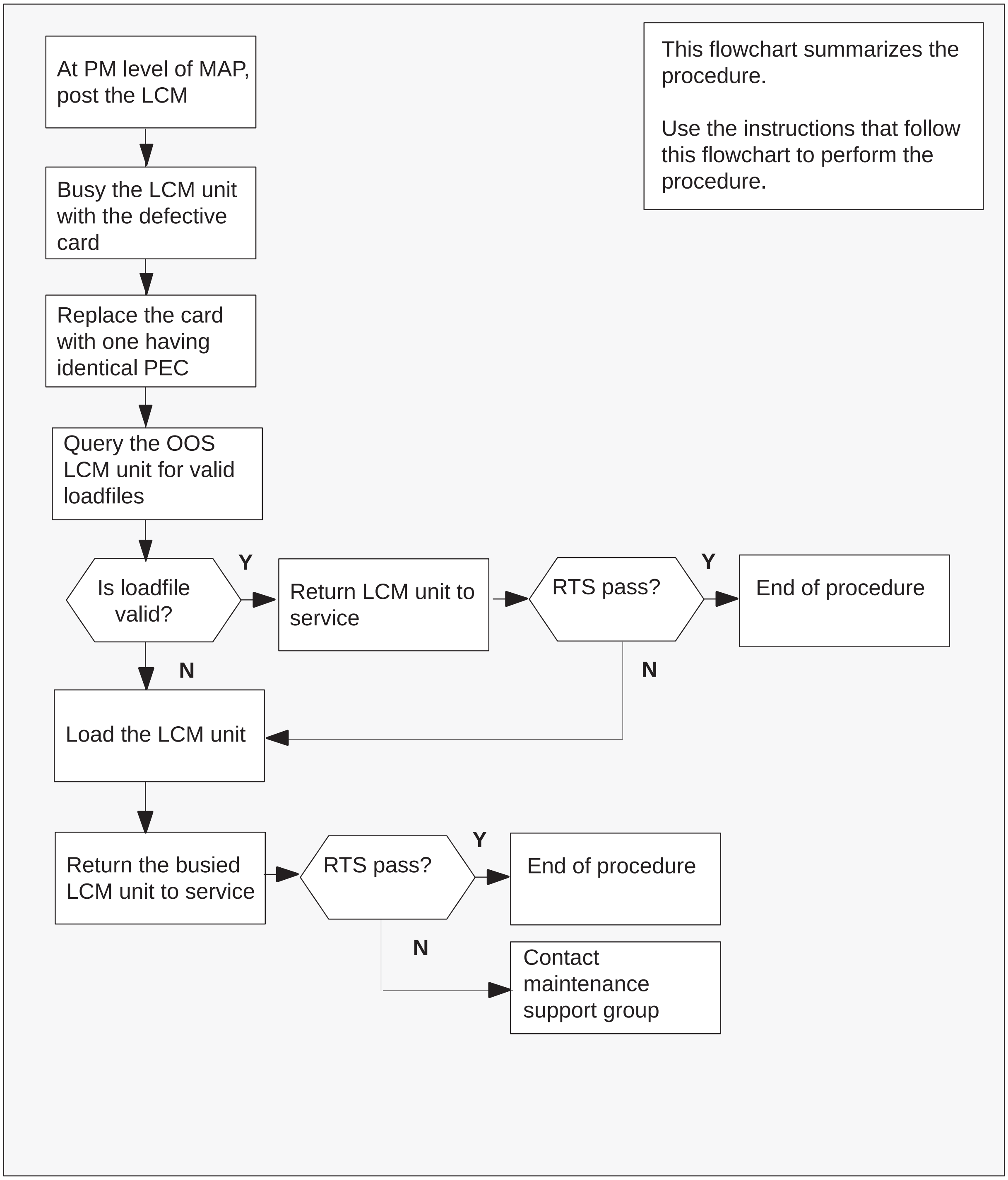
This procedure references “Replacing a card”.

Action

This card replacement procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT6X51
in LCM (continued)

Summary of replacing an NT6X51 card in LCM



NT6X51
in LCM (continued)

Replacing an NT6X51 card in an LCM

At your current location

1 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC) and suffix as the card to remove.

2 If another maintenance procedure directed you to this procedure, proceed to step 5. If this event did not occur, proceed to step 3.

At the MAP display

3 To access the peripheral module (PM) level and post the RLCM-EDC, type

>MAPCI;MTC;PM;POST LCM site cabinet lcm
and press the Enter key.

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the number of the RLCC-EDC cabinet
lcm	is the number of the LCM

4 To busy the LCM unit that contains the defective NT6X51 card, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) associated with the defective NT6X51 card

At the RLCC cabinet

5 Use the procedure “Replacing a card” to replace the NT6X51 card. When the card replacement is complete, return to this point.

6 If another maintenance procedure directed you to this procedure, return now to the procedure that directed you here. Continue as directed. If this event did not occur, proceed to step 7.

NT6X51
in LCM (continued)

7 To query the out-of-service (OOS) LCM unit for valid loadfiles, type

>QUERYPM OOS
and press the Enter key.

Example of a MAP response

```
PM Type: LCM  Int. No.: 9  Status index: 7  Node_No: 40
LCM REM1 02 0  Memory Size – Unit 0: 4M , Unit 1: 4M
ESA equipped: No, Intraswitching is Off
Loadname: LCMINV – REDC07AA
Unit0 Loads: Act– REDC07AB Stby– REDC07AA
Unit1 Loads: Act– REDC07AB  *FLT* Stby– REDC07AA    *FLT*
REX is ON; INCOMPLETE on SAT. 1995/10/28 at 01:35:19
Node Status: {OK, FALSE}
Unit 0 Status: {OK, FALSE}
Unit 1 Status: {MAN_BUSY, FALSE}
Site Flr RPos  Bay_id   Shf  Description   Slot    EqPEC
REM1  01  K03  RLCM 02   04  LCM  02 0             6X04AA
Services : NEUTRAL
```

If loadfile names	Do
are valid	step 8
are invalid or corrupted	step 9

8 To return the LCM unit to service, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit   is the LCM unit (0 or 1) busied in step 4

If RTS	Do
passed	step 11
failed	step 9

NT6X51
in LCM (end)

9 To load the LCM unit, type

>LOADPM UNIT unit_no CC
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) to load

If the load	Do
passed	step 10
failed	step 13

10 To return the LCM unit to service and switch load to the standby bank, type

>RTS UNIT lcm_unit SWLD
and press the Enter key.

where

lcm_unit is the LCM unit (0 or 1) busied in step 4

If RTS	Do
passed	step 11
failed	step 13

11 Send any defective cards for repair according to local procedure.

12 Record the items that follow in office records:

- date that card replacement occurred
- serial number of the card
- indications that prompted replacement of the card

Proceed to step 14.

13 For additional help in this card replacement, contact the next level of support.

14 This procedure is complete.

NT6X52
in LCM

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Card name	Shelf/frame name
NT6X52	AA	Digroup Control Card (DCC)	LCM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the index. The index provides a list of cards, shelves, and frames documented in this maintenance manual.

Common procedures

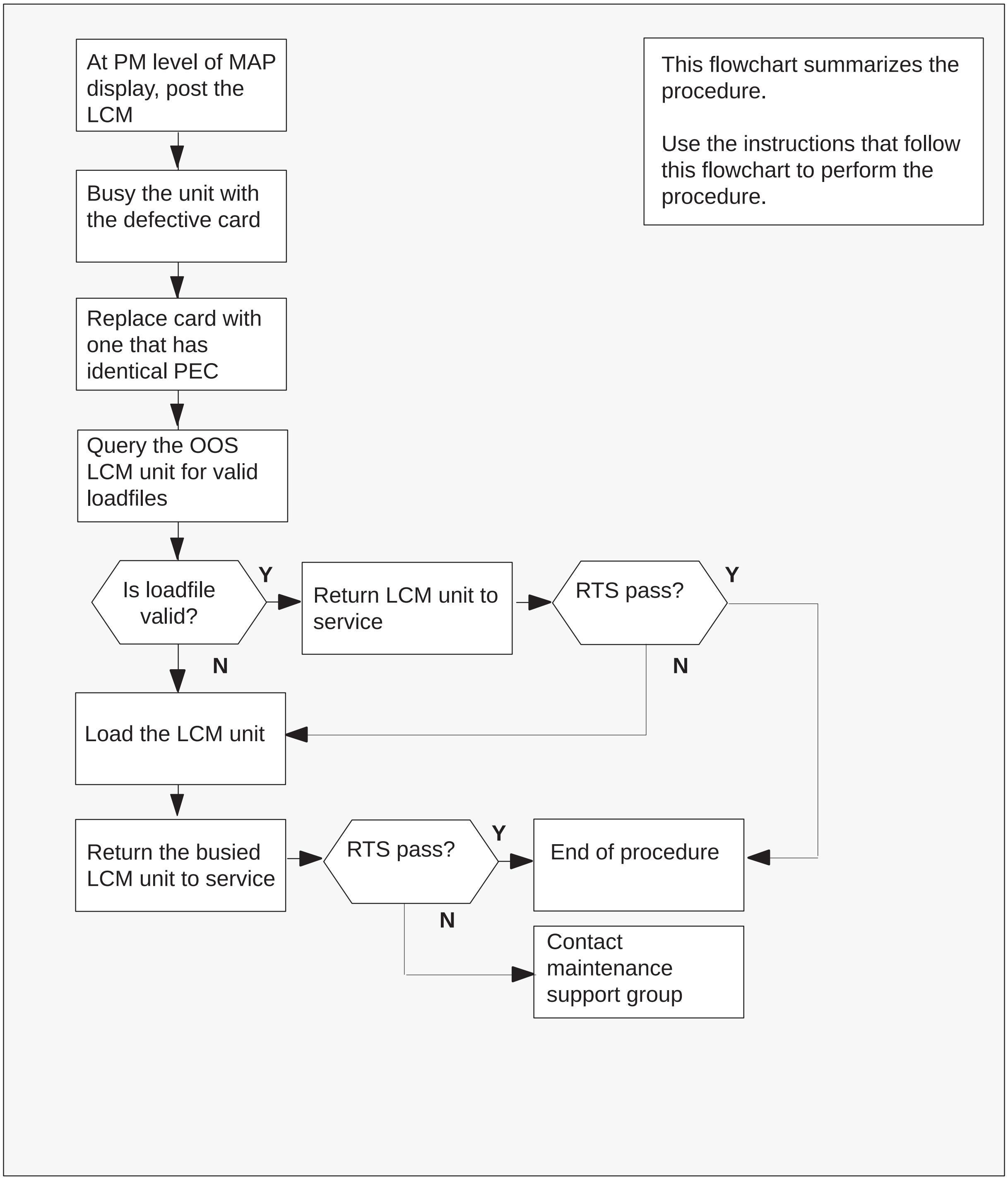
This procedure references “Replacing a card”.

Action

This card replacement procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT6X52
in LCM (continued)

Summary of replacing an NT6X52 card in LCM



NT6X52
in LCM (continued)

Replacing an NT6X52 card in an LCM

At your current location

1 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC) and suffix as the card to remove.

2 If another maintenance procedure, proceed to step 5. If this event did not occur, proceed to step 3.

At the MAP display

3 To access the peripheral module (PM) level and post the line concentrating module (LCM), type

>MAPCI;MTC;PM;POST LCM site cabinet lcm
and press the Enter key.

where

site	is the site name of the RLCM_EDC (alphanumeric)
cabinet	is the number of the RLCC cabinet
lcm	is the number of the LCM

4 To busy the LCM unit that contains the defective card, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) to busy

At the RLCC cabinet

5 Use the procedure “Replacing a card” to replace the NT6X52 card.

6 If another maintenance procedure directed you to this procedure, return now to the procedure that directed you here. Continue as directed. If this event did not occur, proceed to step 8.

NT6X52
in LCM (continued)

7 To query the out-of-service (OOS) LCM unit for valid loadfiles, type

>QUERYPM OOS
and press the Enter key.

Example of a MAP response

```
PM Type: LCM  Int. No.: 9  Status index: 7  Node_No: 40
LCM REM1 02 0  Memory Size – Unit 0: 4M , Unit 1: 4M
ESA equipped: No, Intraswitching is Off
Loadname: LCMINV – REDC07AA
Unit0 Loads: Act– REDC07AB Stby– REDC07AA
Unit1 Loads: Act– REDC07AB  *FLT* Stby– REDC07AA    *FLT*
REX is ON; INCOMPLETE on SAT. 1995/10/28 at 01:35:19
Node Status: {OK, FALSE}
Unit 0 Status: {OK, FALSE}
Unit 1 Status: {MAN_BUSY, FALSE}
Site Flr RPos  Bay_id   Shf  Description   Slot    EqPEC
REM1  01  K03  RLCM 02   04  LCM  02 0             6X04AA
Services : NEUTRAL
```

If loadfile names	Do
are valid	step 8
are invalid or corrupted	step 9

8 To return the LCM unit to service, type

>RTS UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) busied in step 4

If RTS	Do
passed	step 11
failed	step 9

NT6X52
in LCM (end)

9 To load the LCM unit, type

>LOADPM UNIT unit_no CC
and press the Enter key.

where

unit_no   is the LCM unit (0 or 1) to load

If the load	Do
passed	step 10
failed	step 13

10 To return the LCM unit to service and switch load to the standby bank, type

>RTS UNIT lcm_unit SWLD
and press the Enter key.

where

lcm_unit   is the LCM unit (0 or 1) busied in step 4

If RTS	Do
passed	step 11
failed	step 13

11 Send defective cards for repair according to local procedure.

12 Record the items that follow in office records:

- date the card replacement occurred
- serial number of the card
- indications that prompted replacement of the card

Proceed to step 14.

13 For additional help in this card replacement, contact the next level of support,

14 This procedure is complete.

NT6X53 card in LCM

Application

Use this procedure to replace the following card identified in the following table.

PEC	Suffixes	Card name	Shelf/frame name
NT6X53	AA	Power Converter Card (5V/15V)	LCM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the index. The index contains a list of cards, shelves, and frames that this maintenance manual documents.

Common procedures

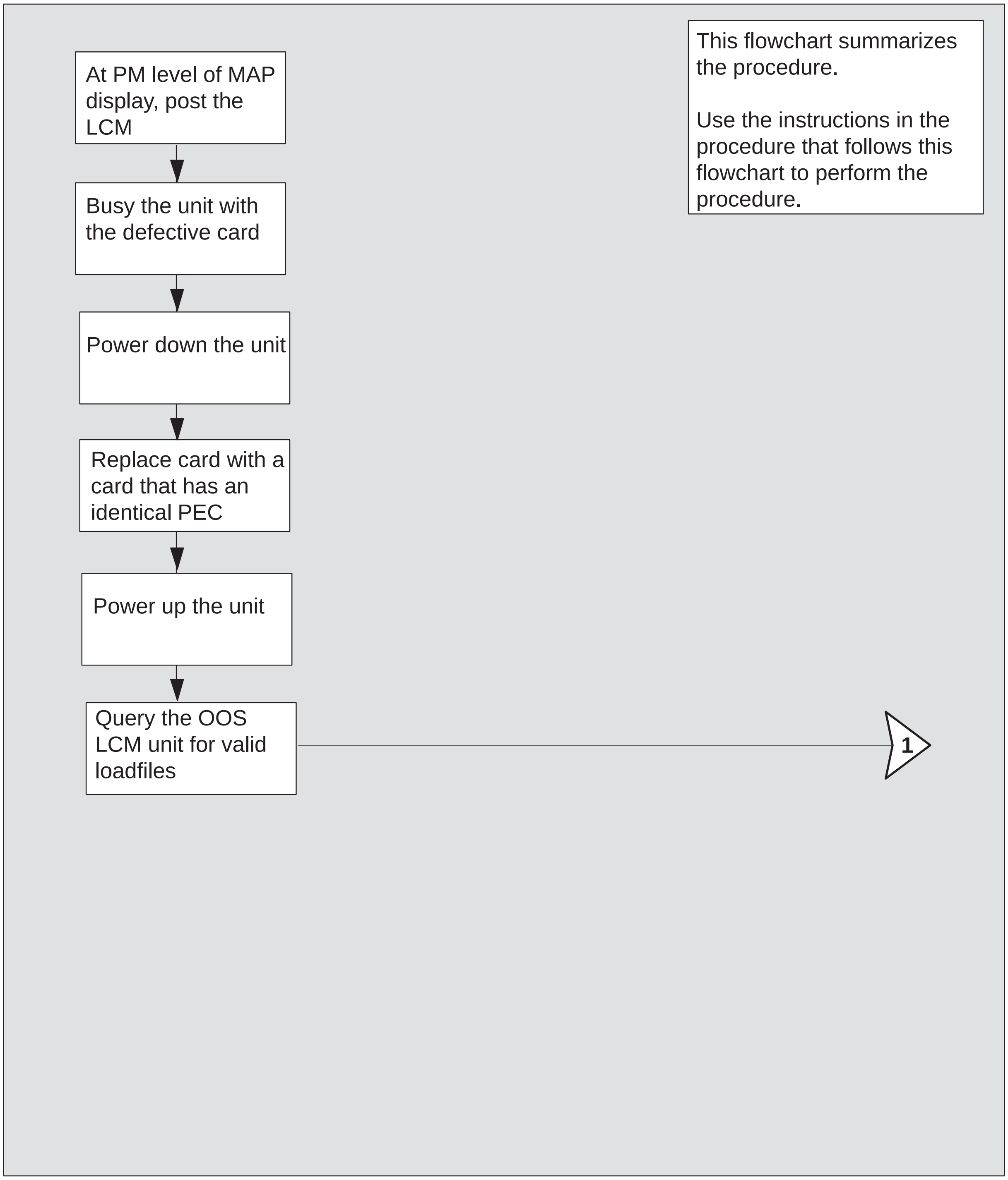
This procedure references “Replacing a card”.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

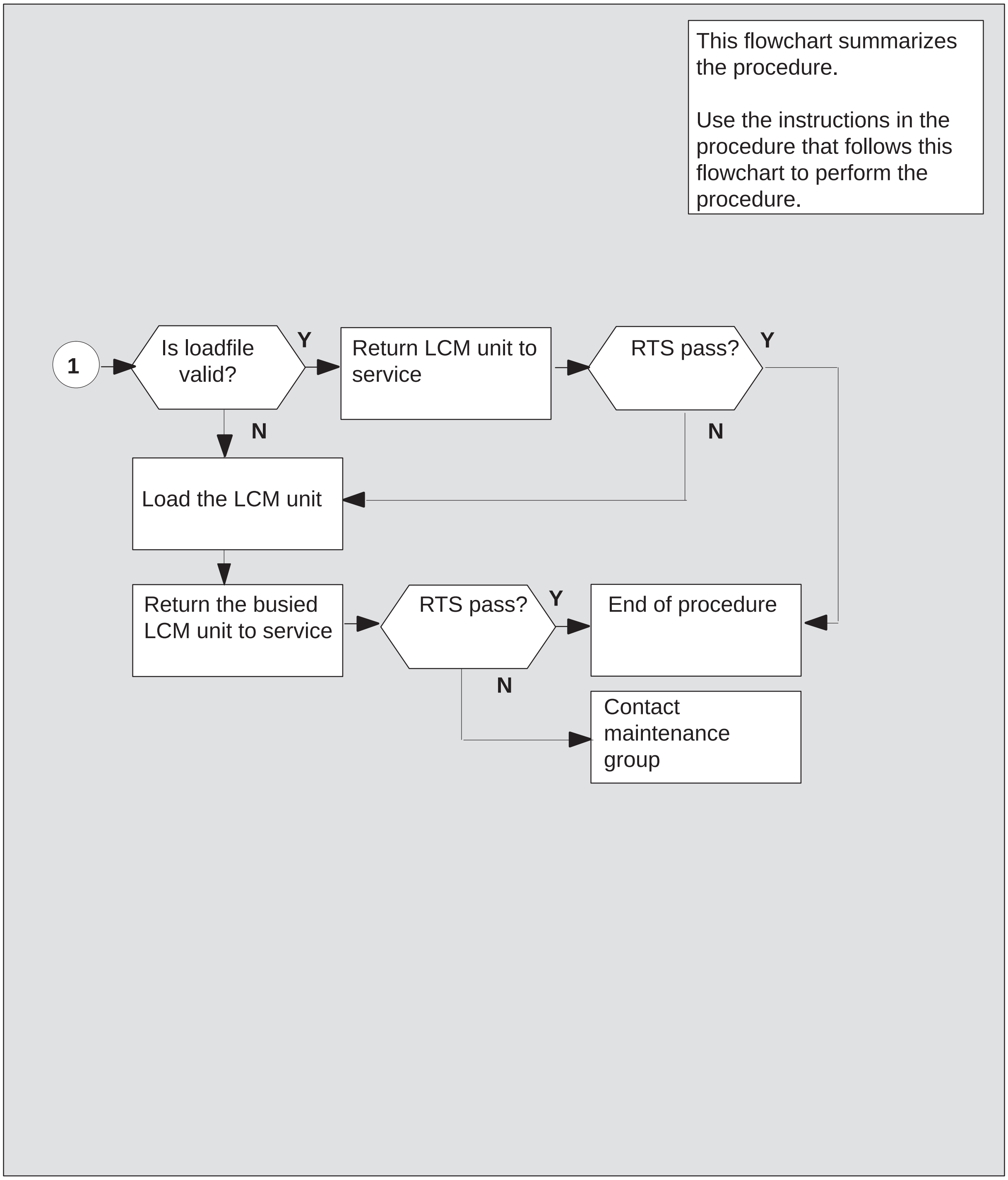
NT6X53 card in LCM (continued)

Summary of replacing NT6X53 card in LCM



NT6X53 card in LCM (continued)

Summary of replacing NT6X53 card in LCM (continued)



NT6X53 card in LCM (continued)

Replacing an NT6X53 card in an LCM

At your current location

1 Proceed to step 2 if one of the following conditions applies:

- another maintenance procedure directed you to this card replacement procedure
- you use this procedure to verify or accept cards
- your maintenance support group directed you to this procedure

2 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC) and suffix as the card to remove.

At the MAP display

3 To access the peripheral module (PM) level of the MAP terminal and post the line concentrating module (LCM), type

>MAPCI;MTC;PM;POST LCM site cabinet lcm
and press the Enter key.

where

site	is the name of the RLCM-EDC site (alphanumeric)
cabinet	is the number of the RLCC-EDC cabinet
lcm	is the number of the LCM

Example of a MAP display:

```
LCM   Rem1  OO O ISTb   Links_OOS: CSide 0 PSide 0
Unit 0:  InSv  Mtce TakeOver
Unit 1:  SysB  Mtce
                     11 11 11 11 11 RG: Uneq
Drwr: 01 23 45 67 89 01 23 45 67 89
      .. .. .. .. .. .. .. .. .. ..
```

4 To busy the LCM unit that contains the defective card, type

>BSY UNIT unit_no
and press the Enter key.

where

unit_no	is the LCM unit (0 or 1) to busy

NT6X53 card in LCM (continued)

At the RLCC cabinet

5 Turn the circuit breaker OFF for the unit in which you must replace the power converter. Use the table below to determine which FSP circuit breaker serves the unit.

Circuit breaker	Unit FED	Locations
CB2	LCA 0	slot 01
CB7	LCA 1	slot 01

6 To replace the NT6X53 card, use the procedure “Replacing a card”. When you replace the card, return to this point.

7 Power-up the LCM unit as follows:

a. Make sure that you insert the power converter (NT6X53). A major audible alarm can sound. This alarm silences when you restore power to the converter.

b. Set the circuit breaker to the ON position. The converter fail LED and frame fail lamp on the FSP are extinguished.

Determine the correct FSP switch for the shelf in which you replace the power converter, from the diagram below. The switch numbers correspond to the shelf position.

Circuit breaker	Unit FED	Locations
CB2	LCA 0	slot 01
CB7	LCA 1	slot 01

c. Turn the circuit breaker on for the unit with the new power converter.

i. The converter fail LED extinguishes.

ii. The frame fail lamp on the FSP extinguishes.

8 If another maintenance procedure directs you to this procedure, return to the procedure that directs you here. Continue as directed. If another maintenance procedure does not direct you to this procedure, proceed to step 9.

NT6X53 card in LCM (continued)

At the MAP display

9 To query the out-of-service (OOS) LCM unit for valid loadfiles, type

>QUERYPM OOS
and press the Enter key.

Example of a MAP response

```
PM Type: LCM  Int. No.: 9  Status index: 7  Node_No: 40
LCM REM1 02 0  Memory Size – Unit 0: 4M , Unit 1: 4M
ESA equipped: No, Intraswitching is Off
Loadname: LCMINV – REDC07AA
Unit0 Loads: Act– REDC07AB Stby– REDC07AA
Unit1 Loads: Act– REDC07AB  *FLT* Stby– REDC07AA    *FLT*
REX is ON; INCOMPLETE on SAT. 1995/10/28 at 01:35:19
Node Status: {OK, FALSE}
Unit 0 Status: {OK, FALSE}
Unit 1 Status: {MAN_BUSY, FALSE}
Site Flr RPos  Bay_id   Shf  Description   Slot    EqPEC
REM1  01  K03  RLCM 02   04  LCM  02 0             6X04AA
Services : NEUTRAL
```

If loadfile names	Do
are valid	step 10
are invalid or corrupted	step 11

10 To return the LCM unit to service, type

>RTS UNIT lcm_unit
and press the Enter key.

where

lcm_unit   is the LCM (0 or 1) busied in step 4

If RTS	Do
passes	step 13
fails	step 11

NT6X53 card in LCM (end)

11 To load the LCM unit, type

>LOADPM UNIT unit_no CC
and press the Enter key.

where

unit_no is the LCM unit (0 or 1) you must load

If load	Do
passes	step 12
fails	step 15

12 To return the LCM unit to service and switch load to the standby bank, type

>RTS UNIT lcm_unit SWLD
and press the Enter key.

where

lcm_unit is the LCM (0 or 1) busied in step 4

If RTS	Do
passes	step 13
fails	step 15

13 Send defective cards for repair according to local procedure.

14 Record the items that follow in office records:

- date that card replacement occurred
- serial number of the card
- indications that prompt replacement of the card

Proceed to step 16.

15 For additional help, contact the next level of maintenance.

16 The procedure is complete.

NT6X54
in LCM

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Card name	Shelf/frame name
NT6X54	AA	Bus Interface Card (BIC)	LCM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the index. The index contains a list of cards, shelves, and frames that this maintenance manual documents.

Common procedures

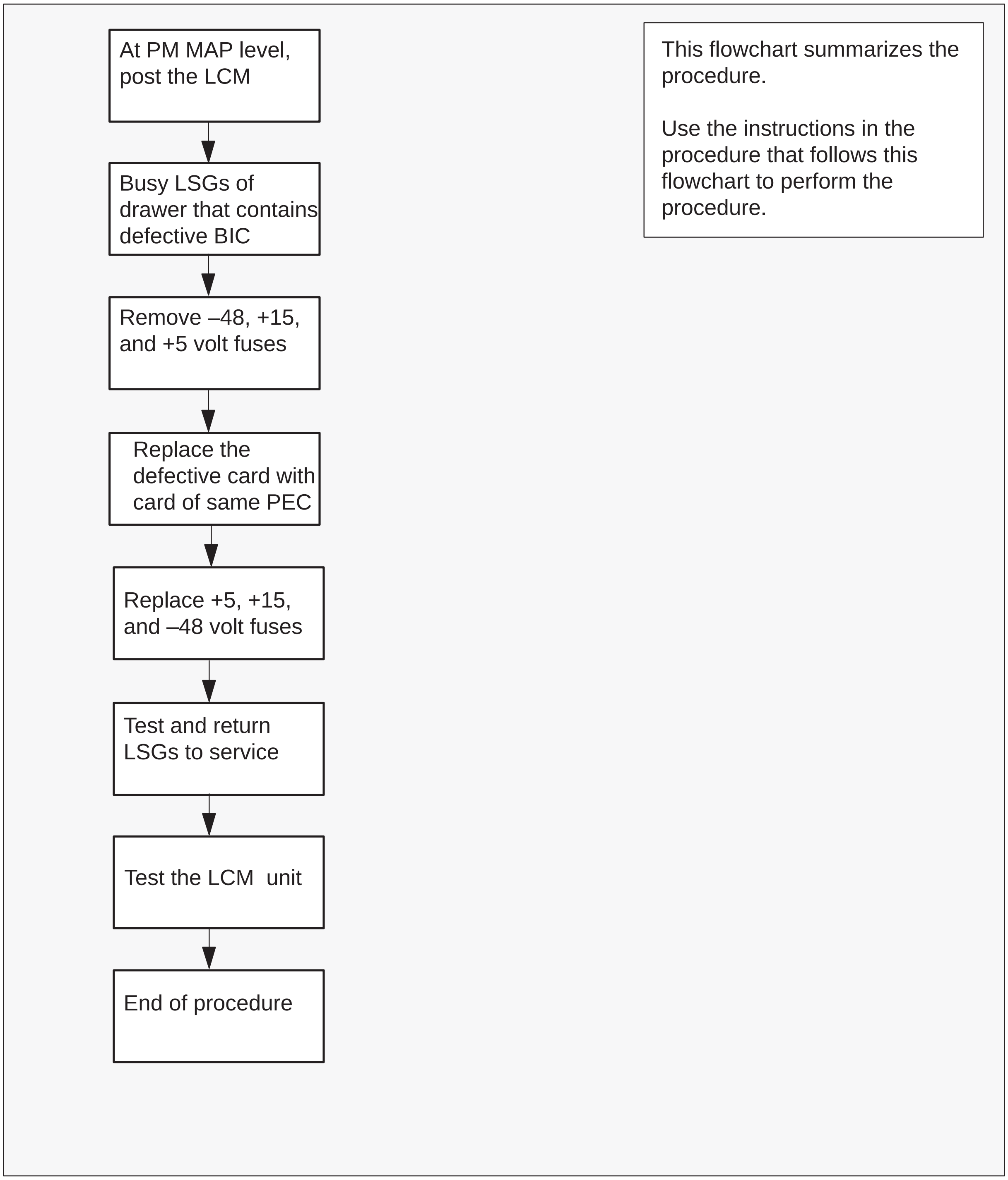
This procedure references “Replacing a card”.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT6X54
in LCM (continued)

Summary of replacing an NT6X54 card in LCM



Replacing an NT6X54 in LCM

At your current location

1

> **ATTENTION**
> If you enter this procedure because of a loss of power in the LCM controller (LTC+), check logutil. Check for PM181 log with reason text: `DCC BIC Looparound`. Go to step 7.

Proceed to step 2 if one of the following conditions applies:

- another maintenance procedure directed you to this card replacement procedure
- you use the procedure to verify or accept cards
- your maintenance support group directed you to this procedure

2 Obtain a replacement card. Make sure the replacement card has the same product equipment code (PEC) and PEC suffix,as the card to remove.

3 If the *Alarm Clearing Procedures* directs you to this procedure, go to step 7. If that procedure does not direct you to this procedure, proceed to step 4.

At the MAP terminal

4 To access the peripheral module (PM) level of the MAP terminal and post the RLCM-EDC, type

>MAPCI;MTC;PM;POST LCM site cabinet lcm
and press the Enter key.

where

site	is the site name of the RLCM (alphanumeric)
cabinet	is the number of the RLCC cabinet
lcm	is the number of the LCM

Example of a MAP response:

```
LCM  REM1 00 0   ISTb   Links OOS: Cside  0 Pside  0
Unit0: InSv Mtce
Unit1: InSv Mtce
                      11 11 11 11 11 RG: Uneq
Drwr:  01 23 45 67 89 01 23 45 67 89
       .. SS .. .. .. .. .. .. .. ..
```

NT6X54
in LCM (continued)

5 Check the status of the affected drawer.

If the drawer status	Do
is S, O, C, I	step 6
is M	step 7

6 To busy the two line subgroups that associate with the RLCM-EDC drawer in which you replace the card, type

>BSY DRWR lsg_no
and press the Enter key.

where

lsg_no is one of two line subgroups (0 to 19) that associates with the drawer.

Note: Repeat this step for the other line subgroup that associates with the drawer.

At the RLCC-EDC cabinet

7 Remove the –48V fuse for the line drawer that contains the defective bus interface card.

8 Remove the +15V fuse for the line drawer that contains the defective bus interface card.

9 Remove the +5V fuse for the line drawer that contains the defective bus interface card.

If the reason for this procedure	Do
is loss of power in LCM controller	step 11
is replacement of BIC	step 10

10 To replace the NT6X54 card, use the procedure “Replacing a card”.

11 Replace the +5V fuse for the line drawer that contains the defective bus interface card.

12 Replace the +15V fuse for the line drawer that contains the defective bus interface card.

NT6X54
in LCM (continued)

13 Replace the –48V fuse for the line drawer that contains the defective bus interface card.

14 If the *Alarm clearing procedure* directs you to this procedure, return to the main procedure that directed you here. If that procedure does not direct you to this procedure, proceed to step 15.

At the MAP terminal

15 To test the line subgroups that associate with the drawer, type

>TST DRWR lsg_no
and press the Enter key.

where

lsg_no is one of two line subgroups (0 to 19) that associate with the drawer

Note: Repeat this step for the other line subgroup that associates with the drawer.

If TST	Do
passes	step 16
fails	step 20

16 To return the line subgroups to service, type

>RTS DRWR lsg_no
and press the Enter key.

where

lsg_no is one of two line subgroups (0 to 19) that associate with the drawer

Note: Repeat this step for the other line subgroup that associates with the drawer.

If RTS	Do
passes	step 17
fails	step 20

NT6X54
in LCM (end)

17 To test the RLCM-EDC unit, type

>TST UNIT unit_no
and press the Enter key.

where

unit_no is the number of the LCM unit (0 or 1) that associates with the new NT6X54 card.

If the TST	Do
passes	step 18
fails	step 20

18 Send defective cards for repair according to local procedure.

19 Record the items that follow in office records:

- date that card replacement occurs
- serial number of the card
- indications that prompt replacement of the card

Proceed to step 21.

20 For additional help, contact the next level of maintenance.

21 The procedure is complete.

NT6X73
in HIE

Application

Use this procedure to replace the following card in the shelves or frames identified in the the following table:

PEC	Suffixes	Cardname	Shelf/frame name
NT6X73	AA	Link Control Card (LCC)	HIE/RLCC

If you cannot identify the:

- Product Engineering Code (PEC)
- PEC suffix
- shelf or frame

For the card you are to replace, refer to the Index. The index in this manual documents a list of cards, shelves and frames.

Common procedures

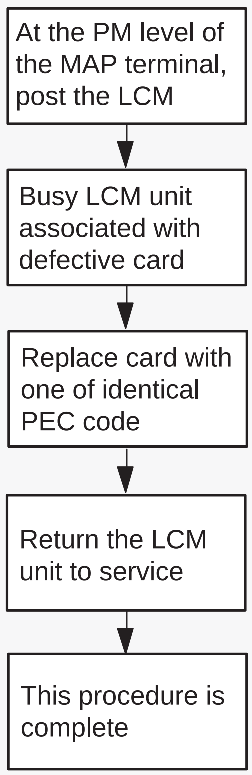
This procedure refers to ”Replacing a card.”

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT6X73
in HIE (continued)

Summary of Replacing an NT6X73 card in HIE



This flowchart is a summary of the procedure.

Use the flowchart review the procedure. Follow the steps to perform the procedure.

Replacing an NT6X73 card in HIE

At your current location

1 Continue with this procedure if:

- a step in a a maintenance procedure directs you to this card replacement procedure
- you use this procedure to verify or accept cards
- your maintenance support group directs you to this procedure.

2 Obtain a replacement card. Make sure the replacement card has the same PEC and PEC suffix of the card to be removed.

3 If another maintenance procedure directed you to this procedure, go to step 7. If another maintenance procedure did not direct you to this procedure, continue with step 4.

At the MAP terminal

4 To access the peripheral module (PM) level and to post the line concentrating module (LCM), type:

>MAPCI;MTC;PM;POST LCM site cabinet lcm
and press the Enter key.

where

site	is the site name of the RLCM-EDC (alphanumeric)
cabinet	is the number of the RLCC-EDC cabinet
lcm	is the number of the LCM

5 Use the following table to determine the LCM unit associated with the defective 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 PMs in a frame. Busying a PM affects subscriber service. Replace power converters during periods of low traffic

NT6X73
in HIE (end)

To busy the LCM unit associated with the damaged NT6X73, type:

>BSY UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit number zero or one associated with the defective card.

At the HIE shelf

7 To replace the NT6X73 card, use the procedure the Replacing a card procedure.

8 If another maintenance procedure directed you to this procedure, return to the alarm clearing procedure that directed you here. If another maintenance procedure did not direct you to this procedure, continue with step 9.

At the MAP terminal

9 To return the busy LCM unit to service, type:

>RTS UNIT unit_no
and press the Enter key.

where

unit_no is the LCM unit zero or one busied in step 6

If RTS	Do
fails	step 12
passes	step 10

10 Send the defective cards for repair according to local procedure.

11 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 13.

12 For additional help, contact the next level of support.

13 This procedure is complete.

NT6X74
in RMM

Application

Use this procedure to replace the following card in the shelves or frames identified in the following table.

PEC	Suffixes	Card name	Shelf/frame name
NT6X74	AB	RMM Control Card	RMM/RLCC

If you cannot identify the PEC, suffix, and shelf or frame for the card you want to replace, refer to the index. The index contains a list of cards, shelves, and frames that this maintenance manual documents.

Common procedures

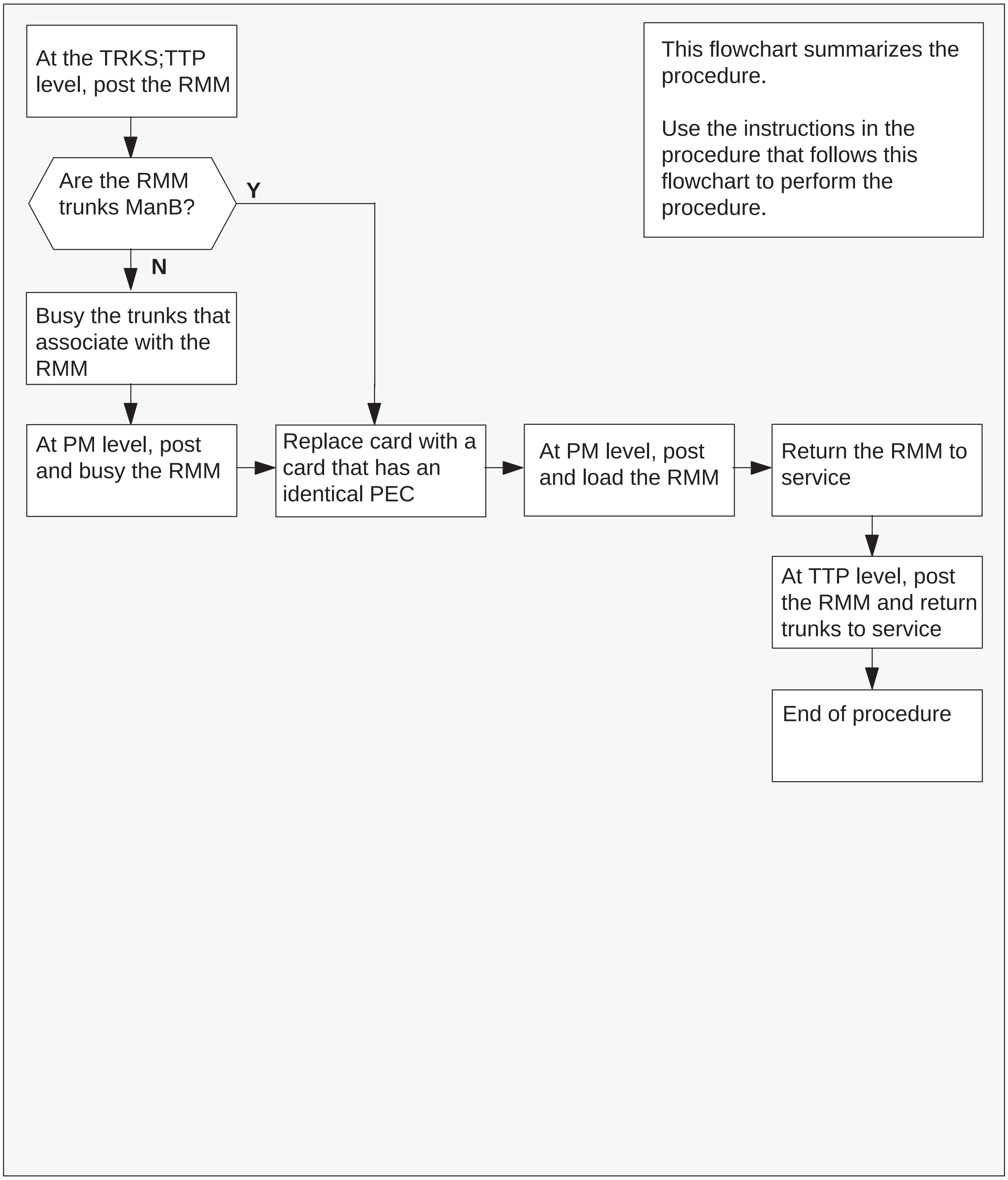
This procedure references “Replacing a card”.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

NT6X74
in RMM (continued)

Summary of replacing an NT6X74 card in RMM



NT6X74
in RMM (continued)

How to replace an NT6X74 card in RMM

At your current location

1 Obtain a replacement card. Make sure that the replacement card has the same product equipment code (PEC) and PEC suffix as the card to remove.

2 If another maintenance procedure directs you to this procedure, go to step 8. If another maintenance procedure does not direct you to this procedure, proceed to step 3.

At the MAP display

3 To access the trunk test position (TTP) level of the MAP terminal and post the remote maintenance module (RMM) that contains the card to replace, type

>MAPCI;MTC;TRKS;TTP;POST P RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM shelf in which you replace the card

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 trunk circuits.

If RMM status	Do
is MB, PMB, RMB	step 6
is other than listed here	step 5

5 To busy the trunks that associate with the card you must replace, type

>BSY ALL
and press the Enter key.

NT6X74
in RMM (continued)

6 To access the peripheral module (PM) level of the MAP terminal and post the RMM, type

>PM;POST RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM shelf in which you replace the card

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 To busy the RMM, type

>BSY
and press the Enter key.

At the RMM

8 To replace the NT6X74 card, use the procedure “Replacing a card”. After you replace the card, return to this point.

9 If another maintenance procedure directed you to this procedure, return to the procedure that directed you here. Continue as directed. If another maintenance procedure does not direct you to this procedure, proceed to step 10.

At the MAP display

10 To load the RMM, type

>LOADPM
and press the Enter key.

where

rmm_no is the number of the RMM shelf in which you replace the card

If	Do
message “loadfile not found in directory” appears	step 11
load passes	step 28
load fails	step 33

NT6X74
in RMM (continued)

11 Determine the type of device that holds the PM load files.

If load files	Do
are on tape	step 12
are on IOC disk	step 17
are on SLM disk	step 22

12 Locate the tape that contains the PM load files.

13 Mount the tape on a magnetic tape drive.

14 To download the tape, type

>MOUNT tape_no
and press the Enter key.

where

tape_no is the number of the tape drive that contains the PM load files.

15 To list the contents of the tape in your user directory, type

>LIST T tape_no
and press the Enter key.

where

tape_no is the number of the tape drive that contains the PM load files.

16 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 that contains the PM load files.

Proceed to step 27.

17 From office records, determine and note the number of the input/output controller (IOC) disk. Determine the name of the volume that contains the PM load files.

18 To access the disk utility level of the MAP display, type

>DSKUT
and press the Enter key.

NT6X74
in RMM (continued)

19 To list the IOC file names into your user directory, type

>LISTVOL volume_name ALL
and press the Enter key.

where

volume_name is the name of the volume that contains the PM load files you obtain in step 17.

20 To leave the disk utility, type

>QUIT
and press the Enter key.

21 Proceed to step 27.

22 From office records, determine and note the number of the system load module (SLM) disk. Determine the name of the volume that contains the PM load files.

23 To access the disk utility level of the MAP, type

>DISKUT
and press the Enter key.

24 To list all disk volumes to user directory, type

>LV CM
and press the enter key.

25 To list the SLM file names into your user directory, type

>LF volume_name
and press the Enter key.

where

volume_name is the name of the volume that contains the PM load files you obtain in step 22

26 To leave the disk utility, type

>QUIT
and press the Enter key.

NT6X74
in RMM (continued)

27 To reload the RMM, type

>LOADPM
and press the Enter key.

If load	Do
fails	step 33
passes	step 28

28 To return the RMM unit to service, type

>RTS
and press the Enter key.

If RTS	Do
passes	step 29
fails	step 33

29 To go to the TTP level of the MAP terminal and post the RMM, type

>TRKS;TTP;POST P RMM rmm_no
and press the Enter key.

where

rmm_no is the number of the RMM shelf in which you replace the card.

30 To return to service the circuits busied in step 5, type

>RTS ALL
and press the Enter key.

If RTS	Do
passes	step 31
fails	step 33

NT6X74
in RMM (end)

31 Send defective cards for repair according to local procedure.

32 Record the items that follow in office records:

- date that card replacement occurred
- serial number of the card
- indications that prompt replacement of the card

Proceed to step 34.

33 For additional help, contact the next level of maintenance.

34 The procedure is complete.

Replacing a card
RLCM-EDC

Application

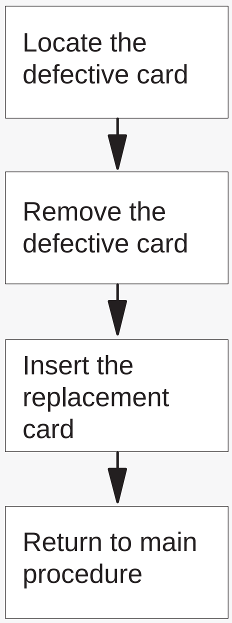
Use this procedure to unseat, remove, and reseat cards.

Action

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Replacing a card
RLCM-EDC (continued)

Summary of common procedures for Replacing a card in an RLCM-EDC



This flowchart is a summary of the procedure. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Replacing a card
RLCM-EDC (continued)

Replacing a card in an RLCM-EDC

At the RLCM-EDC cabinet

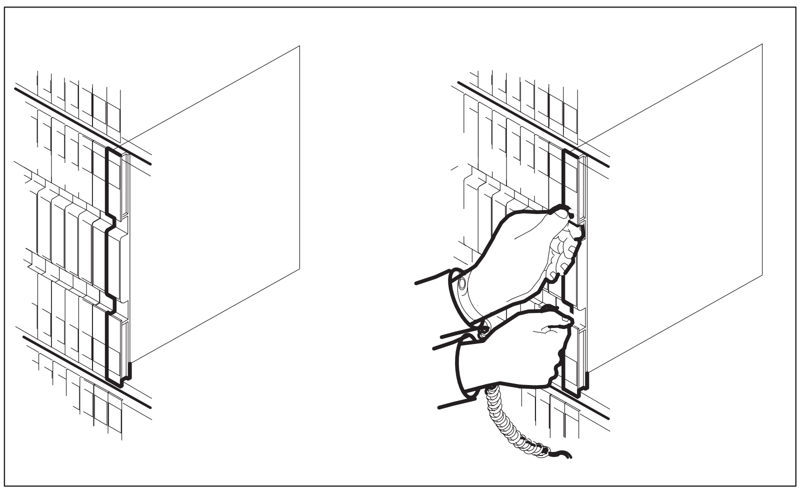
1 Proceed if you have been directed to this procedure from a step in a maintenance procedure. If you use this procedure separately, you can cause equipment damage or loss of service.

2

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist-strap grounding point on the frame supervisory panel (FSP) to handle cards. The wrist strap protects the cards from static electricity damage.

Put on a wrist strap.

3 Locate the card to be removed on the correct shelf.

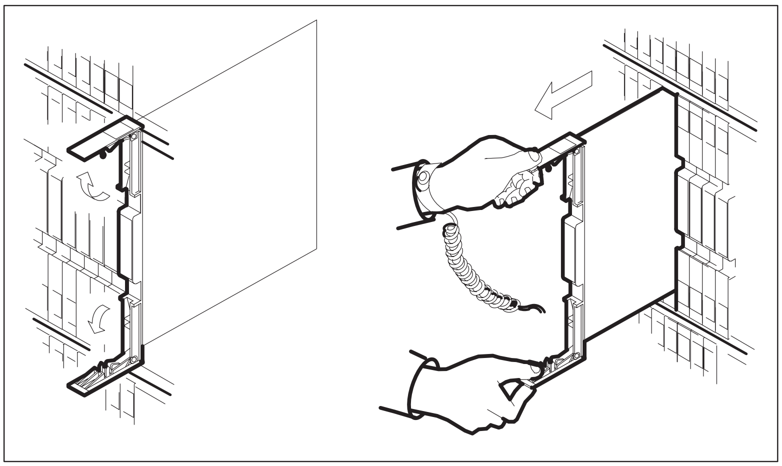


Replacing a card
RLCM-EDC (continued)

4

> **WARNING**
> **Do not hold card by levers only**
> you hold a card by levers, you can damage the lever. When you pull the card halfway out of the shelf, carefully grasp under the card for more secure support. Continue to remove the card from the shelf. Do not touch wires or internal parts on the card.

Open the locking levers on the card to be replaced. Carefully pull the card toward you until the card clears the shelf.



5 Examine the switch settings of the card just removed. Make sure that the switch settings on the replacement card, match those of the card replaced.

6 Place the card you removed in an electrostatic discharge (ESD) protective container.

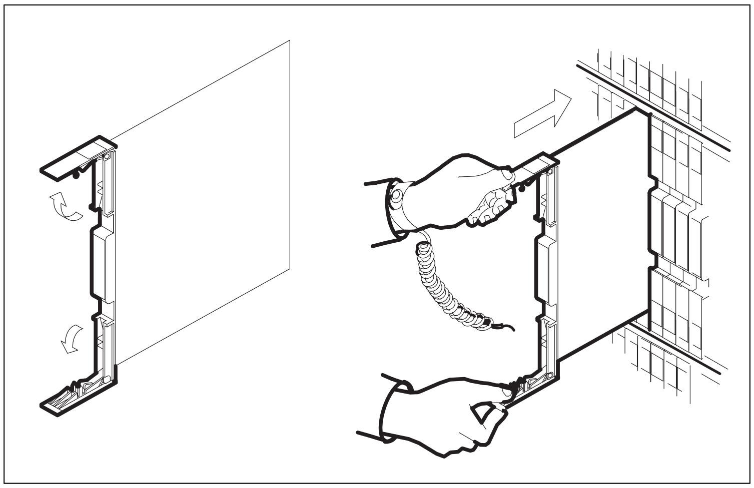
7 Make sure that the replacement card has the same product equipment code (PEC), and PEC suffix, as the card you removed.

8

> **WARNING**
> **Improper insertion can damage circuit packs**
> Do not apply direct pressure to the components. Do not force the cards into the slots.

Replacing a card
RLCM-EDC (continued)

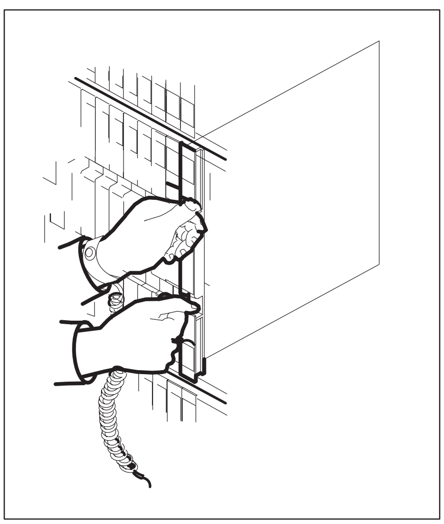
Open the locking levers on the replacement card. Align the card with the slots in the shelf and carefully slide the card into the shelf.



9 Seat and lock the card.

a. Use finger or thumb to pressure to push on the upper and lower edges of the faceplate. Make sure that the card is fully seated in the shelf.

b. Close the locking levers.



10 Remove the wrist strap.

Replacing a card
RLCM-EDC (end)

11 This procedure is complete. Return to the main procedure that directed you to this procedure and continue as directed.

Replacing a line card in an LCM

Application

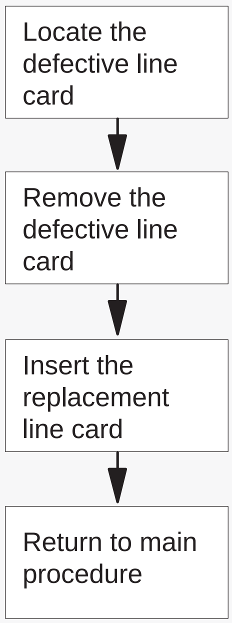
Use this procedure to unseat, remove, and reseat line cards if you have been directed from a maintenance procedure.

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 in an LCM (continued)

Summary of procedure for Replacing a line card in an LCM



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 in an LCM (continued)

Replacing a line card in an LCM

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:
1. Do not apply direct pressure to the components.
2. 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 in an LCM (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.

At the RLCM-EDC cabinet

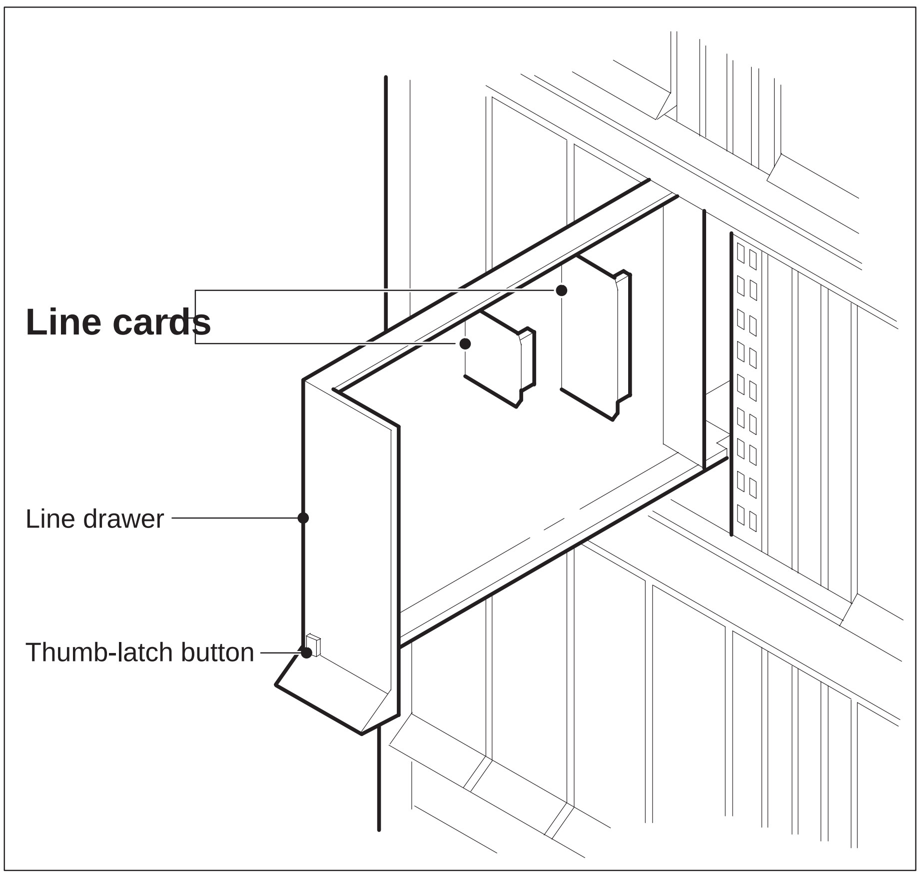
2 Locate the line drawer containing the line card to be removed.

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.

c. Ensure that a card shroud and line card extractor are available. (See note at end of this procedure.)



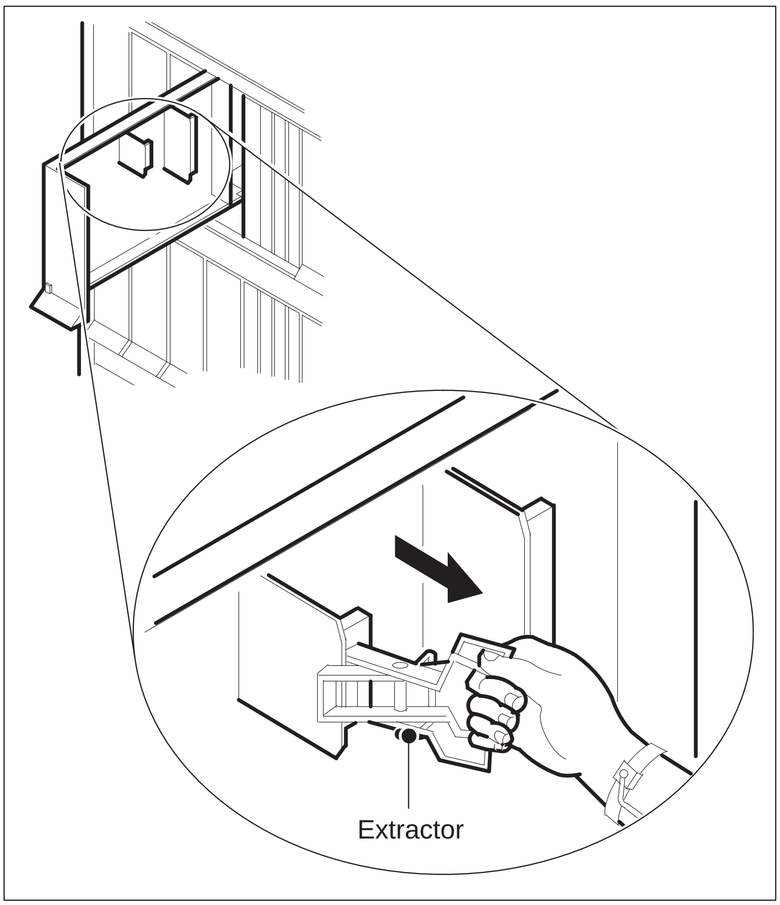
Replacing a line card in an LCM (continued)

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.

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.

Replacing a line card in an LCM (end)

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:

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.

Note: 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.

Descriptions of these shrouds are as follows:

- Line Card Insertion/Withdrawal Tool (3 in.)
  QTH56A (Apparatus Code)

  A0298291 (Common Product Code)
- Line Card Insertion/Withdrawal Tool (6 in.)
  QTH58A (Apparatus Code)

  A0313317 (Common Product Code)
- Card Removal Tool (3 in. or larger)
  QTH57A (Apparatus Code)

  A0298292 (Common Product Code)
- Large grip tool for 4-inch or larger cards is NT tool ITA9953

Locating and clearing RLCM-EDC problem procedures

This problem locate and clear section is for maintenance engineering and field maintenance personnel. Maintenance engineering and field maintenance personnel have a basic knowledge of the DMS-100 Series of switches and the remote line concentrating module with extended distance capability (RLCM-EDC). This section is not for operating personnel that need exact procedures to perform maintenance tasks.

Trouble isolation and correction

Description of troubleshooting procedures

This trouble isolation and correction section is for the use of maintenance engineering and field maintenance personnel. These users must possess a basic knowledge of the DMS-100 Family of switches and the Remote Line Concentrating Module with Extended Distance capability (RLCM-EDC). Operating company personnel require step-by-step procedures to perform maintenance tasks must not use this section.

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, check the performance indicators the system normally generates. Operational measurements (OM), log reports, and alarms indicate error 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 OM threshold feature allows the system to monitor and report key Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC) activity. The primary method of trouble detection consists of daily and weekly reports. Refer to *Operational Measurements Reference Manual* for additional information about the OMs specified to the RLCM-EDC.

Log reports

Logs are analysis tools that provide information about call errors, diagnostic results, and system status. Logs are also good indicators of trouble conditions when any of the following conditions occur:

- 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 with 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* section of this maintenance manual.

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. This 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 RLCM requires a maintenance action. Fault isolation tests determine the location of the fault. The tests correct the fault condition. These tests results must be reported to the appropriate maintenance support. The following sections list the procedures to isolate and correct faults with specified RLCM 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 dificult 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 with precautions during busy service periods.

Procedure 1

Find the vertical connection to the LCM in trouble. Use Table MTAVERT.

Use a buttset with caution on the backplane of the MTADRIVER.

Operating company personnel can hear one of the following:

- dial tone—Operating company personnel draw a dial tone from a 6X21 card. Dial the operator. Ask for the line number you are on. This line number is the defective line.
- talk battery—If possible, hook up a proprietary telephone and call the operator to determine which directory number (DN) is 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

Access the line test position (LTP) level of the MAP display. Post any line equipment number (LEN) located on the defective LCM.

Put a tone on the posted LEN. Go to the mainframe 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.

Load file mismatch

To handle a load file mismatch:

1 Post the RLCM-EDC.

2 Use the QUERYPM command to display the PM load in the RLCM-EDC.

3 Determine the correct RLCM-EDC PM load.

4 Correct Table LCMINV if the table does not have the correct PM load for the RLCM-EDC.

5 If the table does not have a correct PM load for the RLCM-EDC, obtain the correct PM load. Reload the RLCM.

Diagnostic tests

Lines maintenance

Line circuits, subscriber loops, and stations are tested under the lines maintenance (LNS) subsystem. Line circuits and subscriber loops are tested manually and automatically in this subsystem.

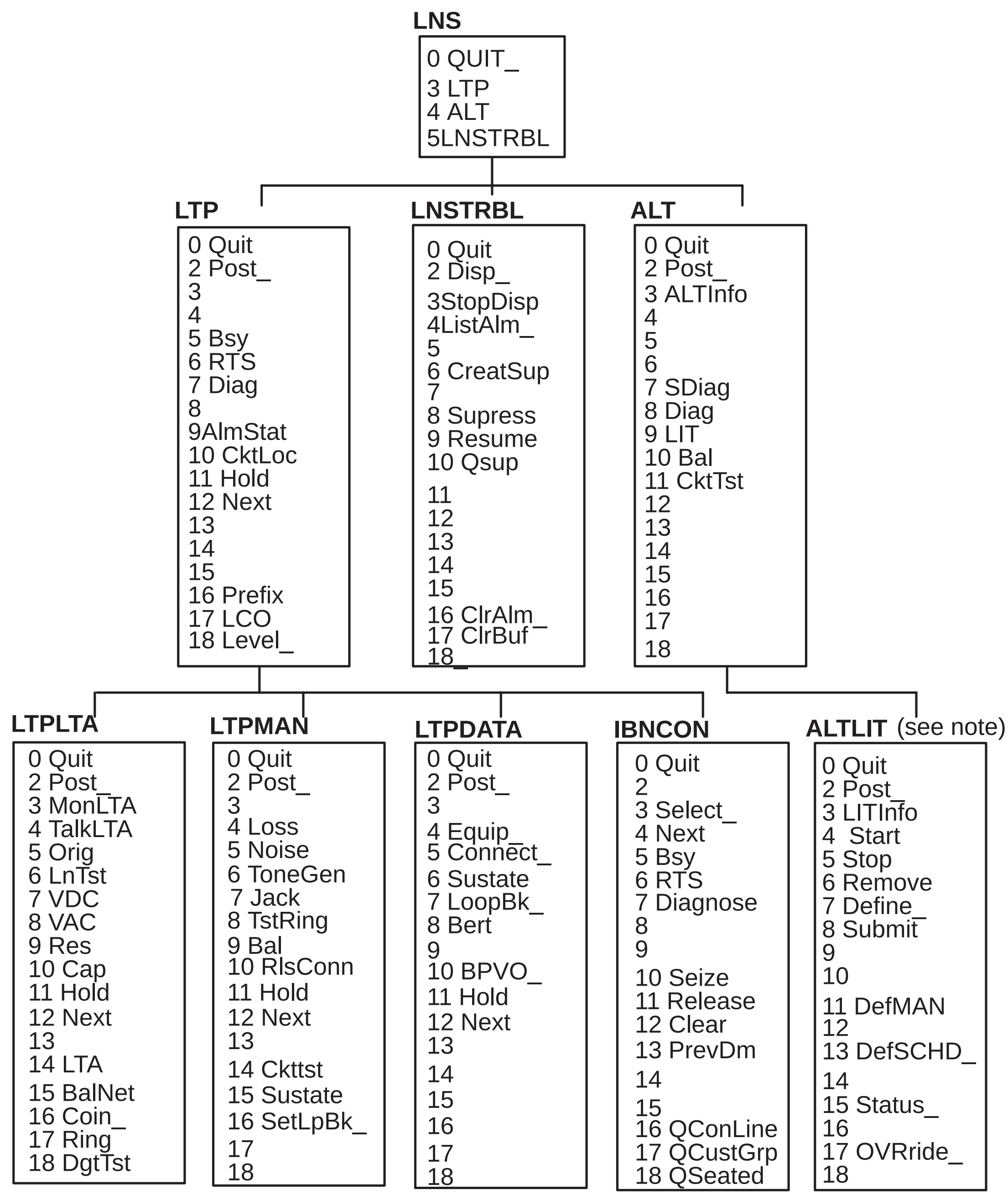
Line testing determines if a line circuit, loop, or line circuit and loop group functions correctly. If the line is defective, line tests also determine if the fault lies in the line circuit or in the attached loop. Another department, like plant maintenance, normally receives faults that occur in the loop. When the fault is in the line circuit, the line card is replaced. The line is retested to verify clearance of the fault.

Automatic line testing

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 an 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



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 testing 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-EDC 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 makes 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 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 under 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 correctly when connected to a loop and line circuit group.

Manual line tests

The switch operator performs manual line 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 the line. Post the line before you place the line in the control position.

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 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 perform 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 with extended distance capability (RLCM-EDC) alarms.

RLCM-EDC 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-EDC alarm clearing (continued)

Alarm condition	Possible cause	Action
Major	Defective LCM processor Defective digroup control card Defective power converter Closed DS30A message port Line trunk controller PLUS (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 LTC+ 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 without a card list, test the defective LCM unit again and RTS the LCM unit.

—continued—

RLCM-EDC alarm clearing (continued)

Alarm condition	Possible cause	Action
Minor	Activity mismatch Data error Diagnostic failure Load file mismatch Self-test failure	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 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 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 the *Alarm Clearing Procedures* section of this maintenance manual for more troubleshooting methods for RLCM-EDC 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 normally 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 are required. Experienced operating company personnel can use MAP terminal responses from troubleshooting attempts that are not successful to formulate a maintenance plan. To repair a fault, operating company personnel can decide to use more advanced step-action procedures.

Powering up the RLCM-EDC

An anticipated power outage like a natural disaster that is about to occur can require operating company personnel to power down the Remote Line Concentrating Module. Operating company personnel power down the Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC) 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. These procedures are described as follows.

Use the following steps to power up the RLCM-EDC:

1 To post the LCM part of the RLCM-EDC at the MAP display terminal, type

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

where

site is the site name of the RLCM-EDC (alphanumeric)
cabinet is the cabinet number of the RLCC-EDC
lcm is the number of the LCM

2 To BSY both LCM units, type

>BSY PM

and press the Enter key.

3 Reference the following table for circuit breaker (CB) and power converter assignments.

FSP circuit breaker assignments

CB	Shelf type	Shelf pos.	Slot pos.	PEC code	Equipment
CB2	LCA	05	01	NT6X53AA	LCM unit 0
CB3	HIE	33	26	NT2X70AF	NT6X50/73
CB4	RMM	47	17/20	NT2X09AA/ NT2X06AB	RMM
CB7	LCA	19	01	NT6X53AA	LCM unit 1
CB8	HIE	33	22	Nt2X70AF	NT6X50/73

4 At the remote site, set the switch on the power converter (NT2X70AF) in slot positions 22 and 26 of the Host Interface Equipment shelf (HIE) to the ON position.

5 While you hold in the reset button on the power converter in slot 26, flip the appropriate circuit breaker up. Do not hold this circuit breaker in the up position. If power is applied to the HIE, the circuit breaker will stay in the ON position. If a problem with the power is present, the circuit breaker will trip back down to the OFF position.

Note: Repeat steps 4 and 5 for the NT2X70AF in slot 22.

Note: Repeat steps 4 and 5 for the other line concentrating module (LCM) unit.

6 To translate the C-side links of the LCM to obtain the host LTC+ node number, type

>TRNSL C

and press the Enter key.

7 To post the host LTC+ step 6 identifies, type

POST LTC ltc_no

and press the Enter key.

where

ltc_no is the number of the host LTC+ (0 to 255)

8 To translate the P-side links to the RLCM-EDC, type

>TRNSL P

and press the Enter key.

9 To busy the LTC+ P-side links that interface the RLCM-EDC, type

>BSY LINK link_no

and press the Enter key.

where

link_no is the number of the P-side links step 8 identifies

10 To test the links busied in step 9, type

TST LINK link_no

and presg the Enter key.

where

link_no is the number of the P-side links that interface the RLCM-EDC

11 To return to service the links busied in step 9, type

RTS LINK link_no

and press the Enter key.

where

link_no is the number of the P-side links that interface the RLCM-EDC

12 To post the LCM part of the RLCM-EDC, type

>POST LCM site cabinet lcm

and press the Enter key.

where

site is the site name of the RLCM-EDC (alphanumeric)
cabinet is the number of the RLCC cabinet
lcm is the number of the LCM

13 Refer to the table, FSP circuit breaker assignments, in step 3. Set the CBs for the NT6X53AA power converters in shelf positions 5 and 19 to the ON position.

14 To query the PM for valid loadfiles, type

>QUERYPM OOS
and press the Enter key.

15 To return to service the LCM part of the RLCM-EDC, type

>RTS PM
and press the Enter key.

16 To post the RMM part of the RLCM-EDC, type

>POST RMM rmm_no
and press the Enter key.

17 To busy the RMM, type

>BSY
and press the Enter key.

18 Refer to the table, FSP circuit breaker assignments, in step 3. Set the CB for the NT2X09AA and NT2X06AB power converters in shelf position 47 to the ON position.

Note: Both power converters are powered through the same CB.

19 Push in and hold the reset switch of either power converter. Set the CB to the ON position and release the CB and reset switch.

20 To list the peripheral module (PM) loads at the input-output (IO) device that you want to use, 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, to 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 located

21 To load the RMM, type

>LOADPM

and press the Enter key.

22 To return the RMM to service, type

>RTS

and press the Enter key.

23 To access the TRKS;TTP level of the MAP display and to post the RMM, type:

TRKS;TTP;POST RMM rmm_no

and press the Enter key.

where

rmm_no is the number of the RMM posted in step 16

24 To busy all RMM trunks, type

>BSY ALL

and press the Enter key.

25 To return to service all RMM trunks, type

>RTS ALL

and press the Enter key.

26 To clear the TRKS;TTP control position and to quit all maintenance levels, type

POST T ckt_name ckt_no;NEXT;QUIT ALL

and press the Enter key.

where

ckt_name	is the CLLI name of the first trunk in the RMM post set
ckt_no	is the number of the first trunk in the RMM post set

27 The procedure is complete.

Powering down the RLCM-EDC

CAUTION
Loss of service
Reserve this procedure for extreme conditions, like an impending natural disaster. This procedure results in a loss of subscriber service.

Power down the RLCM-EDC from the MAP terminal with the use of the following steps:

1 Post the LCM part of the RLCM-EDC.

2 Identify the unit to power down.

3 To busy the RLCM-EDC 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-EDC unit, set CB on the FSP to OFF.

FSP circuit breaker assignments

CB	Shelf type	Shelf pos.	Slot pos.	PEC code	Equipment
CB2	LCA	05	01	NT6X53AA	LCM unit 0
CB3	HIE	33	26	NT2X70AF	NT6X50/73
CB4	RMM	47	17/20	NT2X09AA/ NT2X06AB	RMM
CB7	LCA	19	01	NT6X53AA	LCM unit 1
CB8	HIE	33	22	Nt2X70AF	NT6X50/73

5 You powered down the RLCM-EDC unit.

6 Repeat this procedure for the mate unit.

7 To translate the P-side links of the LCM that interface the RMM, type

>TRNSL P

8 To access the TRKS;TTP level of the MAP display and post the RMM of the RLCM-EDC, type

>TRKS;TTP;POST RMM rmm_no

and press the Enter key.

where

rmm_no is the number of the RMM posted in step 7

9 To installation busy all RMM trunks, type

>BSY INB ALL

10 To access the PM level of the MAP display and to post the RMM of the RLCM-EDC, type

>PM;POST RMM rmm_no

and press the Enter key.

where

rmm_no is the number of the RMM step 7 identifies

11 To busy the RMM ,type

>BSY

and press the Enter key.

12 Refer to the table, FSP circuit breaker assignments, in step 4 and set the CB for the NT2X06AB and NT2X09AA power converters in shelf position 47 to the OFF position.

13 You powered down the RMM.

14 The procedure is complete.

Common procedures

Some common troubleshooting procedures are in the following sections for loading, RTS, dial tone, and ringing generators.

Troubleshooting a loading failure

The following procedure outlines the steps to troubleshoot a failure to load the peripheral program files for the RLCM-EDC.

1 Verify that blown fuses are not present and that power converters are powered up and supply the correct voltages.

2 Unseat the NT6X51, NT6X52, and NT6X53 cards from unit 1. Unseat the 6X50 (slot 20 of HIE shelf), NT6X73 (slot 18 of HIE shelf), and the NT2X70 (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 NT6X51, NT6X52, and NT6X53 cards from unit 0. Unseat the NT6X50 (slot 19 of HIE shelf), NT6X73 (slot 17 of HIE shelf), and the NT2X70 (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 first from the input output controller (IOC) disk drive and load from the system load module (SLM). If the other two fail, load from the original PMLOAD tape.

6 Replace the NT6X51, NT6X52, and NT6X53 cards in unit 0. Unseat the same cards in unit 1. Attempt to load unit 0.

7 If unit 0 fails, replace the NT6X51, NT6X52, and NT6X53 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 NT6X73 (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 NT6X73 (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 NT6X50 cards that correspond in the host Line Trunk Controller PLUS (LTC+).

11 Power down and unseat the NT2X59, NT6X74, NT2X09, and NT2X06 cards in the remote maintenance module (RMM) shelf. Attempt to load each unit.

> **WARNING**
> **Possible service interruption**
> Use caution when you use PMDEBUG on a peripheral that operates. Use only the commands shown.

12 Perform the following actions to determine if links to the RLCM-EDC are defective:

a. Perform a QUERYPM on the RLCM-EDC. Note the node number. Enter TRNSL C and note the host LTC+ number.

b. To PMDEBUG the host LTC+, enter <pmdebug host LTC+> (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 this 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 entry accesses the dl data level.

k. Enter <v dl> (where dl equals the data link number obtained in steps h and i). This entry verifies that you work with the correct link. The output indicates the same type PM as the remote you work with (for example, rlcm_fmt).

l. Enter <r dl> (same as in step k). This entry displays hex values, that correspond to control bytes received from the remote. (To halt, enter return twice.)

m. Remove the DS-1 interface card for the link at the remote end.

n. Verify hex values equal #FF. If not, make sure you remove the correct DS-1 interface card and monitor the proper data link number. If both are correct, check for miswires or shorts on the link. Remove repeater cards until values equal #FF, and correct the problem. If the problem corrects, 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

DMS-X control byte	Value	Meaning
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 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, check the loopback again. Verify that 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-EDC fails to load, SWACT the line group controller (LGC). Contact the next level of support.

Troubleshooting an RTS failure

Implement the RTS FORCE command if the RLCM-EDC fails to RTS. The following procedure describes the RTS FORCE procedure.

1 Check logutil for RTS failure reasons.

2 Replace cards on the card list given at the MAP level or in the logs.

3 Unseat the NT6X51, NT6X52, and NT6X53 cards from unit 1. Unseat the NT6X50 (slot 20 of HIE shelf), NT6X73 (slot 18 of HIE shelf) and the NT2X70 (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 NT6X51, NT6X52 and NT6X53 cards from unit 0. Unseat the NT6X50 (slot 19 of HIE shelf), NT6X73 (slot 17 of HIE shelf), and NT2X70 (slot 22 of the HIE shelf) cards. Reload unit 1 and attempt a RTS FORCE.

5 If the RLCM-EDC returns to service (RTS) and a C-side busy (CBsy) follows, SWACT the LGC and attempt again.

6 If the RLCM-EDC RTS and a system busy (SysB) follows, a defective NT6X54 card, line card or drawer can be present. Check logutil for a possible card list.

7 If both units fail to RTS, contact the next level of support.

8 The procedure is complete.

Troubleshooting dial tone problems

After you power up the RLCM-EDC verify that one or both LCM units are in service. Check the line subgroups (LSG) to verify the subgroups 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 NT6X52 card in unit 0.
2. If the odd LSGs do not have dial tone, reseat and/or replace the NT6X52 card in unit 1.
3. If LSGs 0 through 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.

RLCM-EDC routine maintenance procedures

This chapter contains routine procedures for the remote line concentrating module with extended distance capability (RLCM-EDC). These procedures describe preventive maintenance tasks. These procedures are for maintenance engineering and field maintenance personnel. Maintenance engineering and field maintenance personnel perform these procedures at scheduled intervals.

Inspecting spare fuse holders RLCM-EDC

Application

Use this procedure to inspect spare fuse holders for the Remote Line Concentrating Module with Extended Distance Capability (RLCM-EDC). Refill the fuse holders as needed.

Interval

Perform this procedure each week.

Common procedures

There are no common procedures.

Action

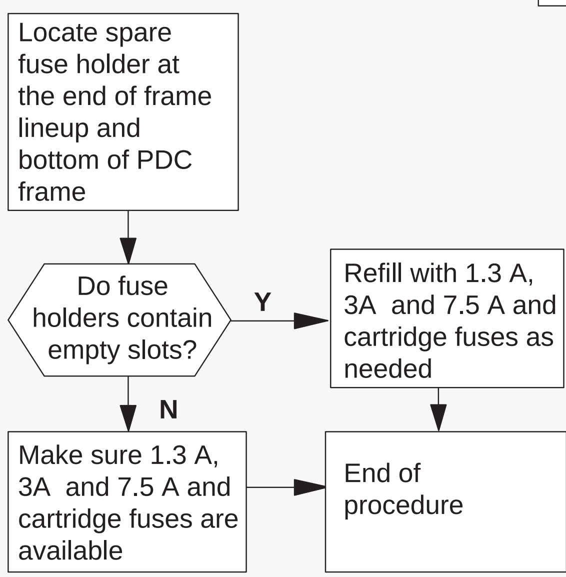
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Inspecting spare fuse holders
RLCM-EDC (continued)

Summary of Iinspecting spare fuse holders

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



Inspecting spare fuse holders
RLCM-EDC (end)

Inspecting spare fuse holders

At the RLCM-EDC 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 Refill the spare fuse holder with the following fuses:

- 1.3 A fuses (White)
- 3 A fuses (Blue)
- 7.5 A 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 equipment shelf (HIE).

Interval

Perform this procedure in six month intervals.

Common procedures

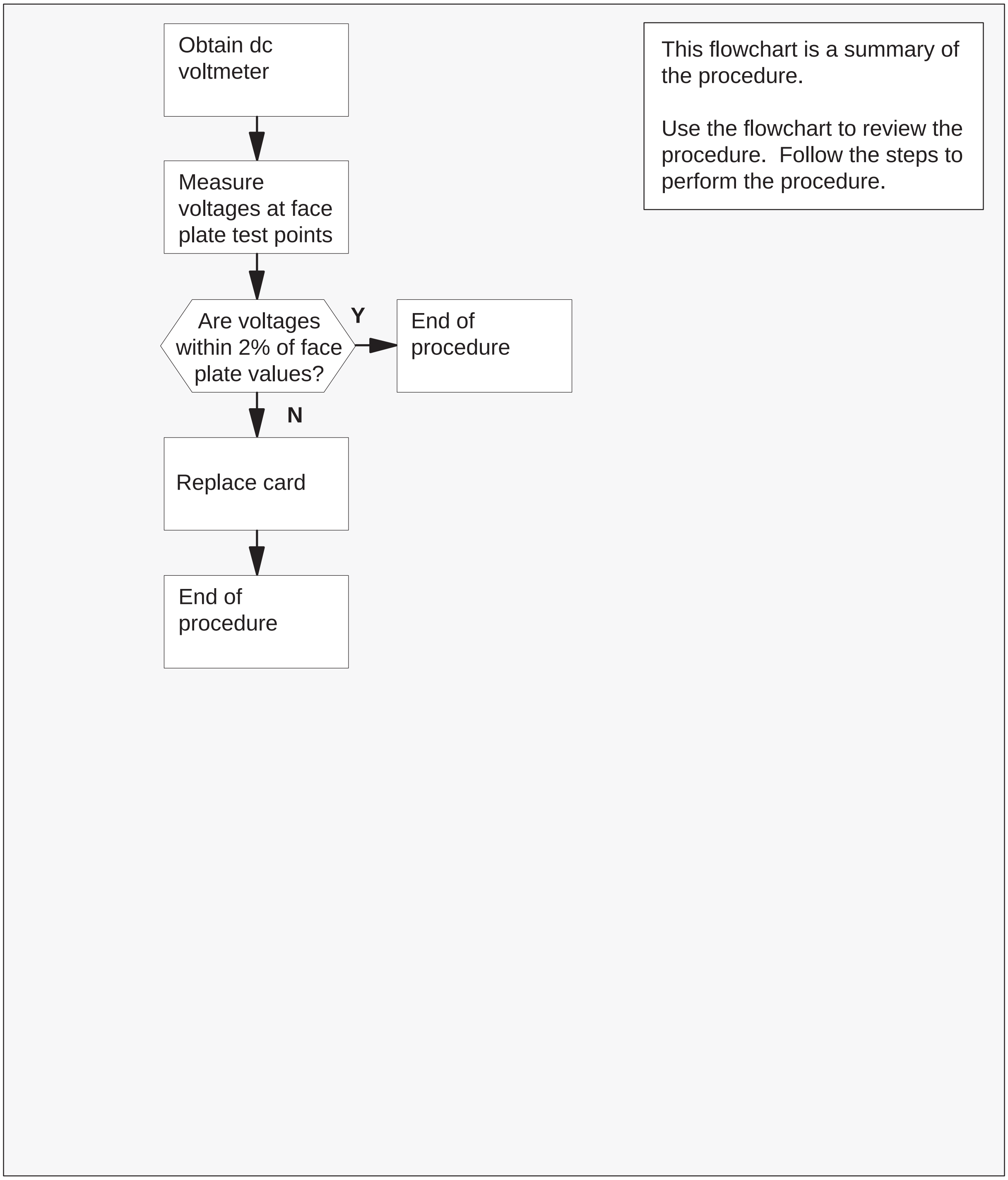
Does not apply

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 acceptable voltage ranges given in the following table:

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 1.

5 This procedure is complete.

Returning a card for repair or replacement RLCM-EDC

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

There are no common procedures.

Action

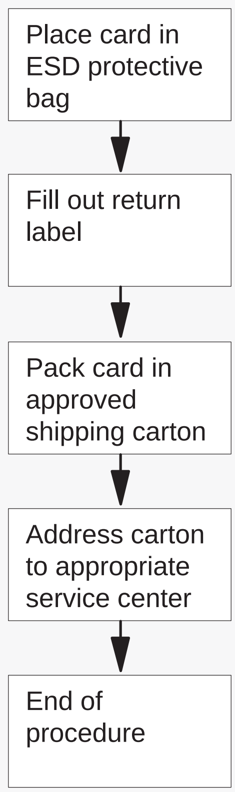
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Returning a card for repair or replacement
RLCM-EDC (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
RLCM-EDC (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 that 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
- secure 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 RLCM-EDC (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 wrist strap grounding cords
RLCM-EDC

Application

Use this procedure to verify the correct resistance of the wrist strap grounding cords. This resistance must be low enough for static electricity to discharge from a person. This resistance must be high enough to prevent electrocution if the equipment develops a short-circuit while a person wears a wrist strap.

Interval

Perform this procedure every month.

Common procedures

There are no common procedures.

Action

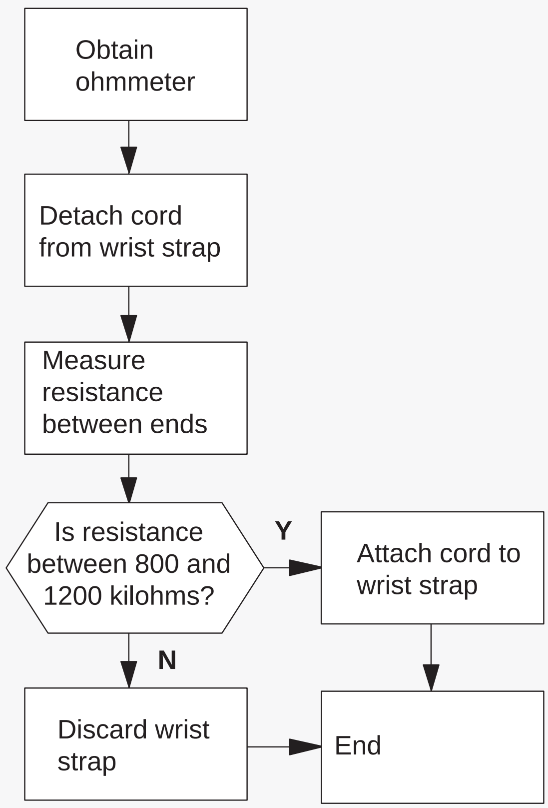
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Testing wrist strap grounding cords
RLCM-EDC (continued)

Summary of Testing wrist strap grounding cords

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



Testing wrist strap grounding cords
RLCM-EDC (continued)

Testing wrist strap grounding cords

At your current location

1 Obtain an ohmmeter.

2

> **DANGER**
> **Risk of electrocution**
> The grounding cord is safe to use if the cord resistance measures higher than 800 kilohms. A lower resistance exposes the person that wears the wrist strap to the risk of electrocution if equipment short-circuits.

> **WARNING**
> **Damage to electronic equipment**
> A grounding cord that has a resistance higher than 1200 kilohms cannot conduct enough static charges to the ground. This cord does not protect sensitive electronic equipment against build-ups of static charges that can cause damage.

Detach the grounding cord from the wrist strap.

3 Measure the resistance between opposite ends of the grounding cord with the ohmmeter.

If resistance	Do
is between 800 kohms and 1200 kohms	step 4
is not between 800 kohms and 1200 kohms	step 5

4 You can use the grounding cord and wrist strap assembly. Assemble the wrist strap to the grounding cord.

Go to step 6.

Testing wrist strap grounding cords RLCM-EDC (end)

5 Discard the whole assembly. *Do not attempt to use the assembly.*

6 The procedure is complete.

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DMS-100 Family

Remote Line Concentrating Module with Extended Distance Capability

Maintenance Manual

Product Documentation—Dept 3423
Northern Telecom
P.O. Box 13010
RTP, NC 27709–3010
1–800–684–2273
(1–800–NTI–CARE)

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