297-8353-550

DMS-100 Family

Star Remote System

Star Remote System Maintenance Manual

XPM15 and up   Standard   05.01   March 2001

NORTEL NETWORKS™

DMS-100 Family

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About this document

How to check the version and issue of this document

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

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

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

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

References in this document

The following documents are referred to in this document:

- *1-Meg Modem Service Network Implementation Manual*, 297-8063-200
- *Business Set Feature Description and Operation*, 297-2011-100
- *Business Set Line Engineering*, 297-2011-180
- *Product Documentation Directory,* 297-8991-001
- *XPM Log Report Reference Manual*, 297-8321-840
- *XPM Operational Measurements Reference Manual*, 297-8321-814
- *XPM Translations Reference Manual*, 297-8321-815

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.

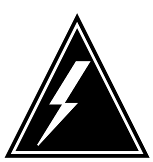
ATTENTION - Information needed to perform a task

> **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.
```

1 Star Remote System introduction

Introduction to the Star Remote System

The Star Remote System is Nortel Network's new line concentrating module (LCM) based remote product. The Star Remote System gives network providers a cost-effective way to provide service to their customers. The Star Remote System fills the need for a flexible remote that supports the following line installations for DMS-100 networks:

- under 200 lines
- 640 to 1100 lines

The Star Remote System accepts up to 16 DS-1 host links at full 1152 line configurations. The Star Remote System provides for traffic volumes of over 10 hundred-call seconds (CCS) and handles extended periods of Internet and work-at-home calling. Up to 1152 lines can connect to the Star Remote System. All services currently made available in Nortel Networks remote product line are also available from the Star Remote System. The Star Remote System includes the

- Star Hub - The Star Hub is an improvement in technology and performance at a reduced cost. The Star Hub builds on the following Nortel Networks products:
  - Remote Line Concentrating Module (RLCM)
  - outside plant module (OPM)
  - outside plant access cabinet (OPAC)
- Star Module - The Star Module connects to the Star Hub through one or two DS-1 links. Up to 16 Star Modules, each supporting 64 lines, connect to the Star Hub. The Star Module exists in an outside or an inside cabinet configuration. The operating company can install the outside cabinet on a cement pad, wooden deck, or telephone pole. The operating company can install the inside cabinet on a wall.

Star Hub introduction

The Star Hub functions like an RLCM in that software, user interface, and functionality are the same. The Star Hub is a remote peripheral that connects to the SuperNode switch through a line trunk controller or line group controller with the NTMX77AA unified processor (LTC+ or LGC+) and the NTSX05AA unified processor (LTC+ or LGC+) that is needed for ISDN service support or remote cluster controller 2 (RCC2). The Star Hub

- supports up to 1152 lines
- has one control shelf configured to support up to 18 local line drawers or up to 16 remote line drawers (RLD)
- provides for integrated services digital network (ISDN) lines when the ISDN line drawer for remotes (ILD-R) is installed where a standard line drawer is installed
- connects to the host office through 2 to 16 DS-1 links
- supports DMS-100 switch-based operations, administration, maintenance, and provisioning (OAM&P)
- supports the 1-Meg Modem service

The Star Hub is in a standard DMS-100 indoor frame, which is called a Star Remote Hub Equipment (SRHE) frame. The control shelf, frame supervisory panel (FSP), and up to three line drawer shelves (each containing up to six line drawers) are in the SRHE frame.

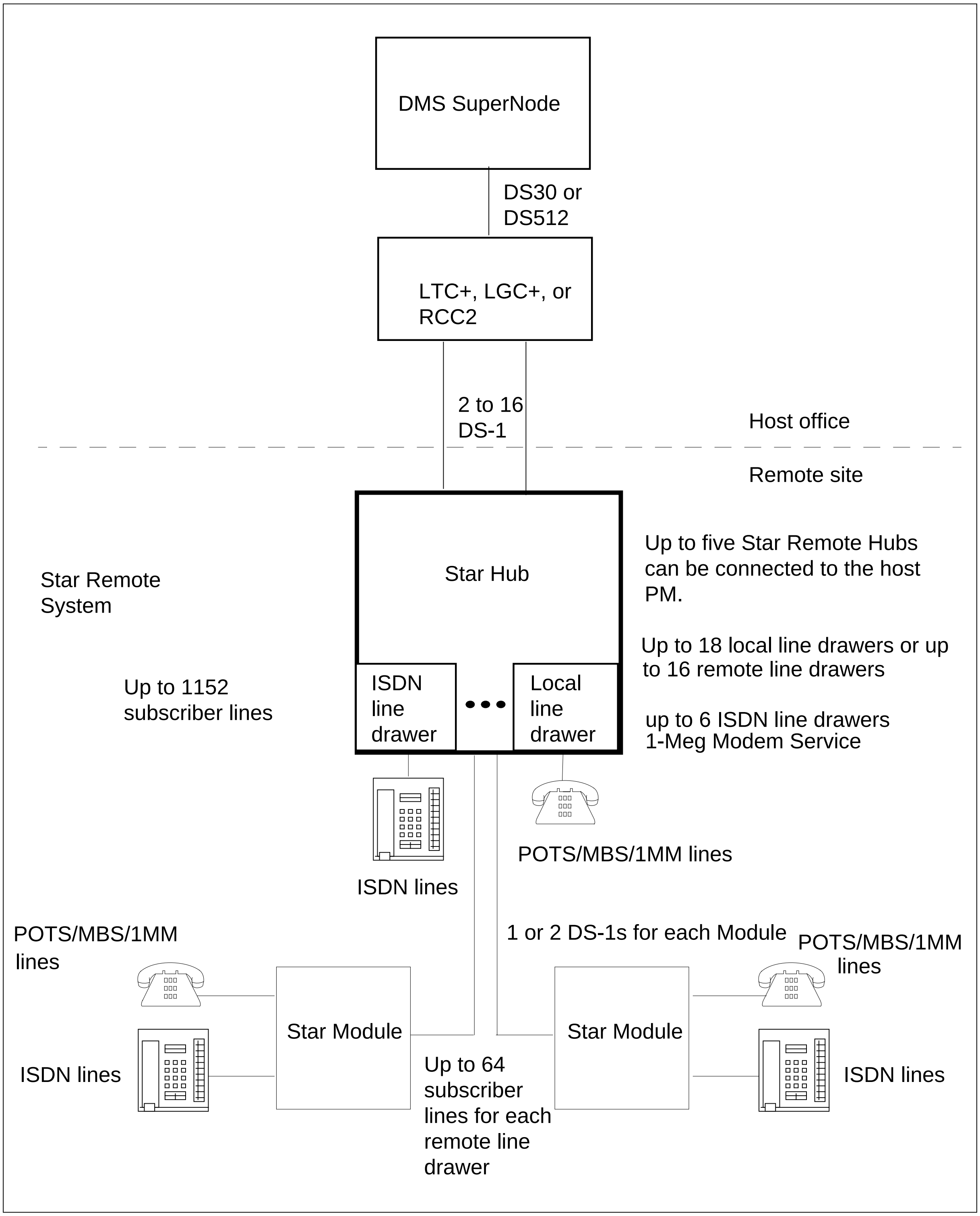
The Star Hub uses existing line cards through a maximum of 18 line drawers, of which 16 can be Star Modules. The local line drawer in the Star Hub is a standard DMS-100 line drawer that supports up to 64 lines.

The Star Hub supports the following types of lines:

- plain old telephone service (POTS)
- custom local area signaling service (CLASS)
- coin
- Meridian Business Set (MBS), also known as proprietary phone (P-phone)
- x digital subscriber line (xDSL) line card (xLC) for 1-Meg Modem service

To support ISDN lines, up to six ILD-Rs can be installed.

Figure 1-1 Star Remote System configuration



Star Hub hardware components

The following components make up the Star Hub:

- standard DMS-100 frame
- control shelf
- frame supervisory panel
- three line drawer shelves that contain up to 18 POTS line drawers. Six of the line drawers can be ILD-Rs, with a maximum of two ILD-Rs in each shelf.

Star Hub software

The Star Hub uses the software Functional Group BAS00012 “Remotes Generic” that provides

- voice and data service - The Star Hub supports POTS, CLASS, coin, and Meridian Digital Centrex (MDC) voice and data from the DMS host office to remote subscribers.
- central operations, administration, and maintenance (OAM) - The host DMS MAP (maintenance and administration position) terminal supports OAM for the Star Hub.
- emergency stand-alone (ESA) - The Star Hub supports warm ESA entry and cold ESA exit. The Star Hub supports non-ISDN calls while in ESA. When the Star Hub enters ESA, ISDN calls are released. Any attempts to originate an ISDN call after ESA entry are ignored.
- intraswitching - This feature enables a remote peripheral to switch calls internally, when both the calling and the called parties are served by the same peripheral. It also saves transmission links to the host. The Star Hub supports intraswitched calls.
- ISDN - The ILD-R using the NTBX27 line card, provides ISDN service for the Star Hub local drawers. Each drawer supports up to 28 ISDN basic rate interface (BRI) loops. There is a maximum of 168 ISDN lines if all six ILD-Rs are provisioned.
- ringing - The Star Hub supports coded, frequency selective, superimposed, distinctive, teen, and automatic number identification (ANI) and coin functions.

The Star Hub also uses the software Functional Group HSTP0002 “HSTP DMS ADSL Capability” for 1-Meg Modem service.

Star Module overview

The following components make up the Star Module:

- indoor or outside cabinet
- telephony subsystem (TSS) which contains
  - card cage with the control card, line maintenance card, and power converter and ringing card
  - backplane
  - up to 64 line cards

Software defines and considers the Star Module a drawer in the Star Hub and not a stand-alone node. The Star Module mixes the functions of a line drawer and a line concentrating device (LCD). The Star Module is a line drawer at a remote site in a cabinet adapted for its location with appropriate connections to power and to subscriber lines. The Star Hub can connect to up to 16 Star Modules.

The Star Module

- supports up to 64 lines. The Star Module supports the same line types as the Star Hub, which was listed earlier in this chapter, except 1MM lines.
- is a remote line drawer (RLD) in a Star Remote Module Equipment (SRME) wall mounted cabinet or a Star Remote Module Outside (SRMO) cabinet
- supports up to 28 ISDN lines
- connects to the Star Hub using one or two DS-1 links
- uses DMS-100 switch-based OAM&P
- supports only coded ringing
- does not support 1 Mega Modem (1MM) drawers

Advantages of the Star Remote System

The Star Remote System has the following advantages. The Star Remote System

- supports line growth from 64 lines to 1152 lines in increments of 64 lines, with no need for equipment or backplane changes
- provides support for 1152 lines in one frame and requires a smaller footprint in the remote site
- makes available a high-traffic performance model for a remote. The Star Hub provides 10 CCS to support Internet and telecommuter bandwidth needs. The Star Module provides for traffic levels up to 20 CCS for each line.

- uses standard DMS line cards
- reduces the number of control cards required in a control shelf
- provides an update for the reliable RLCM platform at a lower cost
- provides a mix of POTS and ISDN drawers for DMS-100 peripherals that are located in remote areas
- supports extended distance capability and 13 msec round-trip signaling delay, when Star Modules are located up to 500 miles from the DMS-100 switch
- uses accepted DMS-100 hardware such as the NTMX81 DS-1 interface cards and the NT6X53AA power converters in the Star Hub
- provides for a remote-off-remote configuration when the Star Remote System connects to a Remote Switching Center-SONET

2 Star Remote System hardware

Introduction

This chapter describes the hardware components of the Star Remote System. The Star Remote System includes the following:

- Star Hub
- Star Module (also known as a remote line drawer [RLD] in this chapter)

Star Hub

The Star Hub includes the following hardware components:

- Star Remote Hub Equipment (SRHE) frame
- a line control shelf that contains all common electronics and associated dc power and ringing distribution and the frame supervisory panel (FSP)
- line drawer shelves

The Star Hub is a remote line concentrating device that connects to

- a line trunk controller or line group controller with an NTMX77AA unified processor (LTC+ or LGC+) in the host office using from two to 16 DS-1 links. In addition, the LTC+ can have the NTSX05AA processor instead of the NTMX77AA unified processor.
- a remote cluster controller 2 (RCC2) with an NTAX74AA processor at a remote site using from two to 16 DS-1 links

The maximum number of Star Hubs that can connect to the host office is 225. This limit represents the maximum number of tuples in the line concentrating module inventory (LCMINV) table. Up to five Star Hubs can connect to any one LTC+, LGC+, or RCC2.

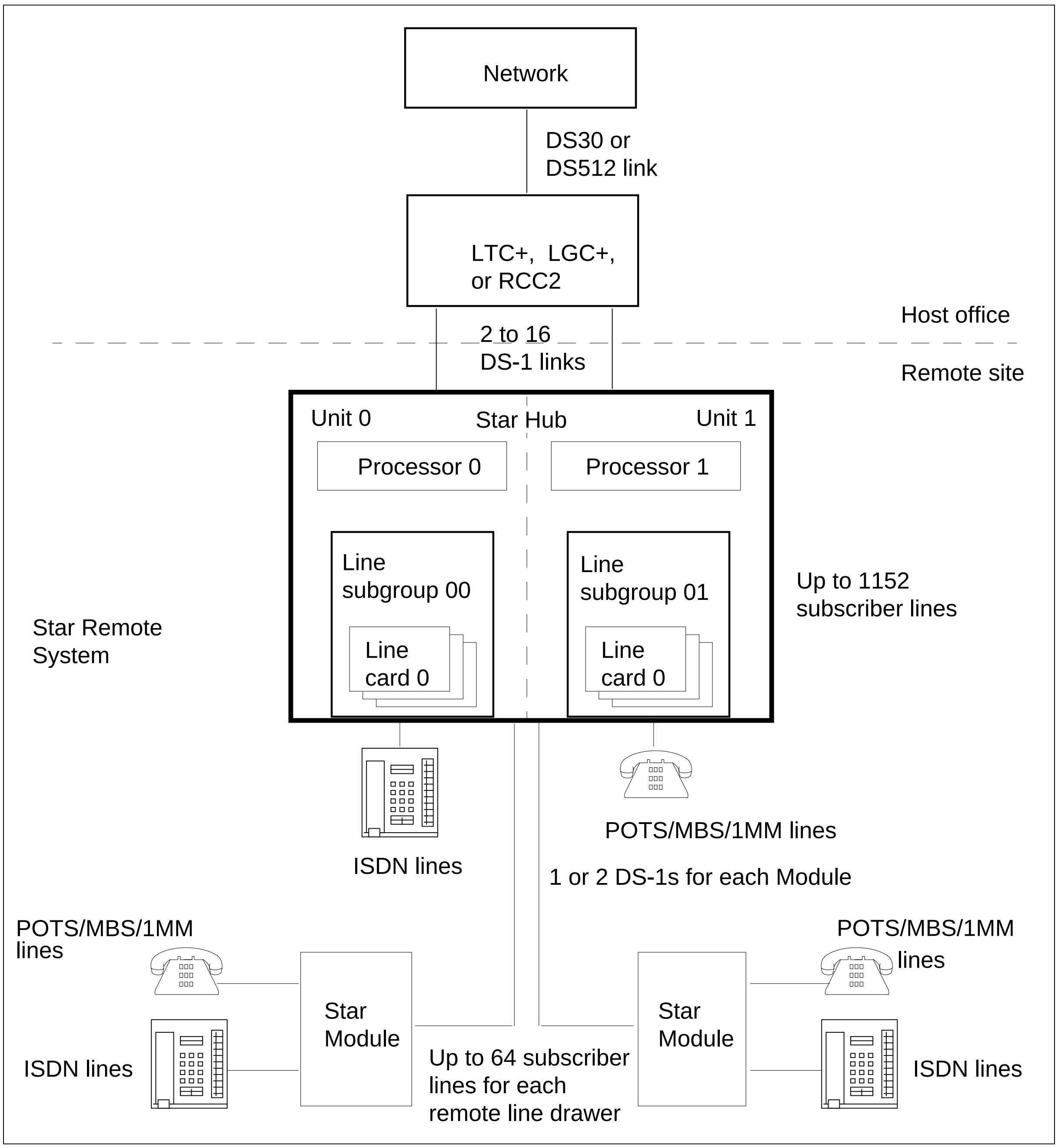
During normal operation, the two units of the Star Hub control the line subgroups as follows:

- unit 0 controls the even-numbered line subgroups in all line drawers
- unit 1 controls the odd-numbered line subgroups in all line drawers

When one of the two units of the Star Hub goes out of service, the in-service unit takes full control of the other unit's line subgroups in addition to its own line subgroups. In addition, the in-service unit has access to the C-side links used by the out-of-service mate unit. This activity is called a mate takeover.

The following figure shows the basic architecture of the Star Remote System.

Figure 2-1 Star Remote System architecture



The characteristics and capabilities of each of the Star Hub components are described in the sections that follow. The characteristics of the Star Module and its components are given after the Star Hub information.

Star Remote Hub Equipment frame

The Star Remote Hub is in an SRHE frame, which is a standard DMS-100 equipment frame (NT0X25AH) that includes

- three shelves supporting up to six line drawers in each shelf
- one control shelf
- one FSP
- from two to 16 C-side DS-1 links that connect to an LTC+, LGC+, or RCC2

The Star Hub communicates with the host LTC+, LGC+, or RCC2 using high level data link control (HDLC) protocol. The host LTC+ or LGC+ must have an NTMX76AB messaging card to support HDLC protocol for the Star Hub. To support 64kb clear channel signaling for integrated services digital network (ISDN), the host LTC+ or LGC+ must have NT6X50AB DS-1 interface cards for connection to the Star Hub on the P-side.

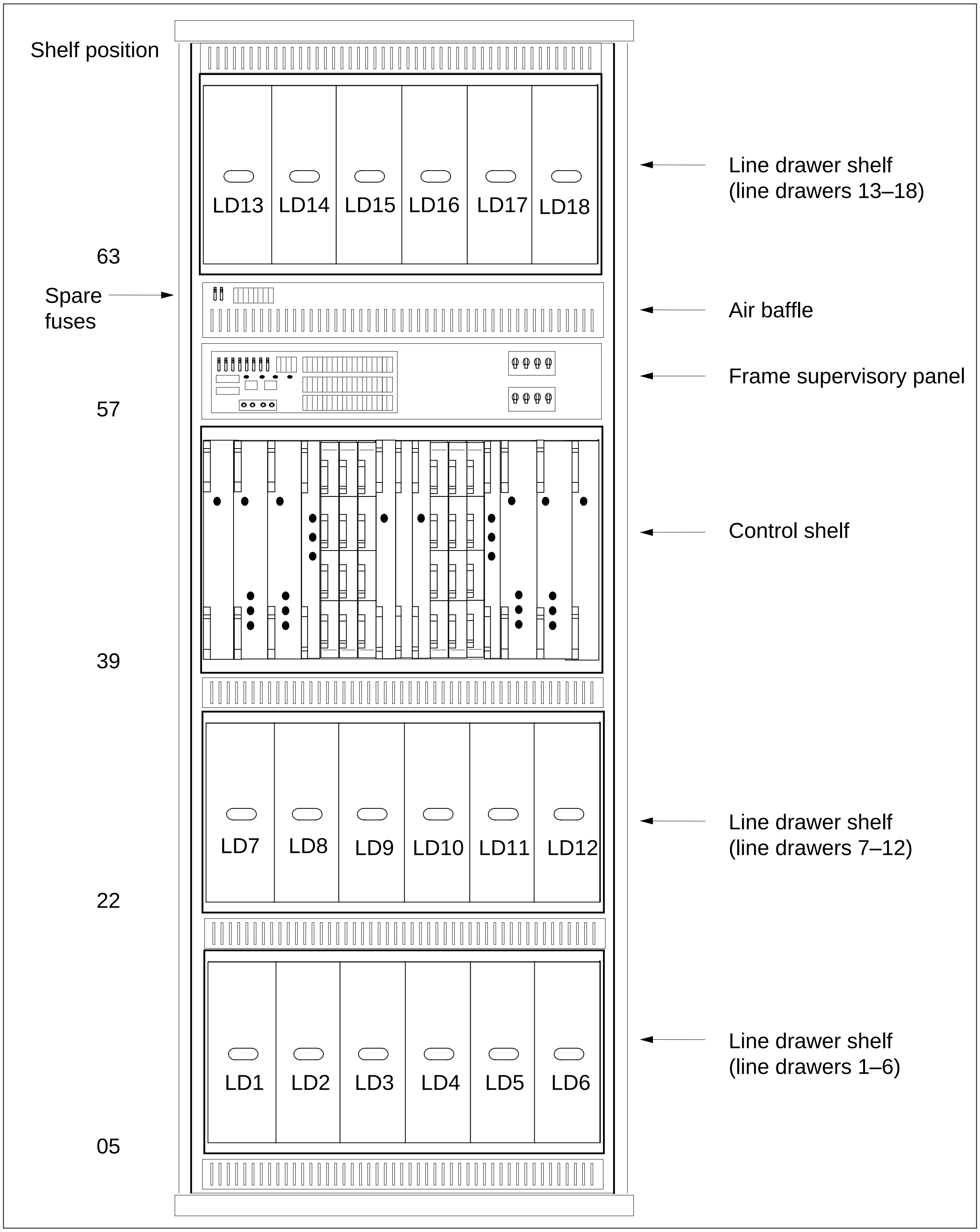
Two dual inline package (DIP) switches are on the backplane of the Star Hub in slot positions slot 4 and 19. The position of these DIP switches determine the protocol used by the Star Hub. The following table identifies the backplane DIP switch settings for the ESFB8ZS protocol. The Star Remote Hub requires the ESF B8ZS protocol to support ISDN 64 Kb/s clear channel.

Table 2-1 Star Hub backplane DIP switch settings

		Backplane dipswitch settings					
Configuration	**Code**	**1**	**2**	**3**	**4**	**5**	**6**
DS-1 extended superframe (ESF) binary eight bit zero substitution (B8ZS) code suppression	ESF B8ZS	Off	Off	Off	On	On	On

The following figure illustrates the SRHE frame layout.

Figure 2-2 SRHE frame layout



Control shelf hardware configuration

The control shelf contains the following circuit cards:

- central side (C-side) and peripheral side (P-side) communication cards, which are the quad frame carrier cards (NTTR87AA). Each NTTR87AA card contains up to four dual DS-1 packlets (NTMX81AA).
- remote controller pack (NTTR77AA)
- universal maintenance pack (NTTR73AA)
- ringing generator card (NTTR60AA)
- power converter (NT6X53AA)

The control shelf also contains the FSP. However, in this chapter, the FSP is discussed separately in the next section.

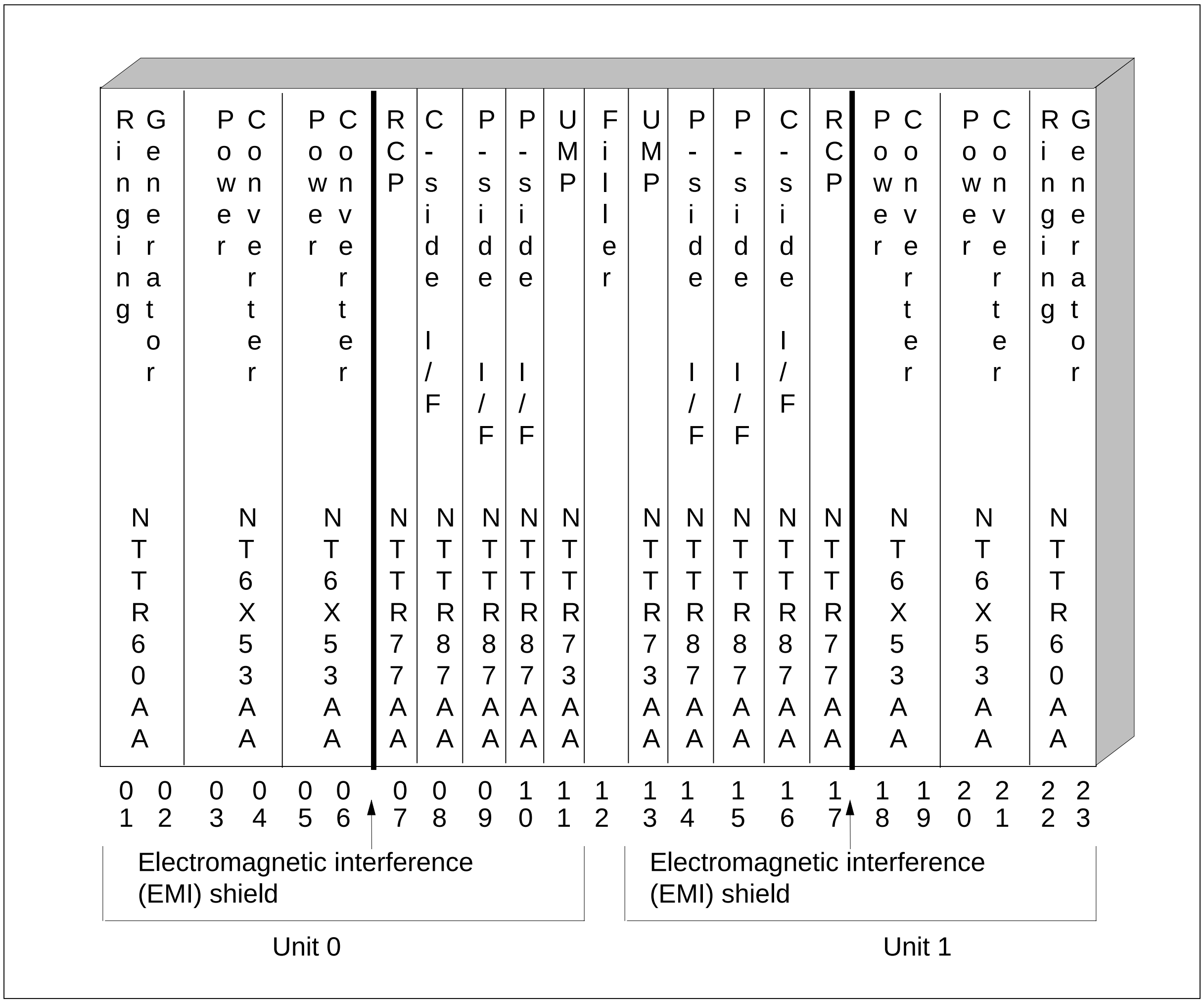
The following table lists all the circuit cards in a control shelf.

Table 2-2 Control shelf cards

Category	PEC	Name	Location
C-side and P-side communication	NTTR87AA	Quad frame carrier DS-1 interface (DS-1) and NTMX81AA-dual DS-1 packlets	Slots 8, 9, 10, 14, 15, and 16
Processor	NTTR77AA	Remote controller pack (RCP)	Slots 7 and 17
Maintenance	NTTR73AA	Universal maintenance pack (UMP)	Slots 11 and 13
Ringing	NTTR60AA	Ringing generator	Slots 1 and 22
Power	NT6X53AA	Power converter	Slots 3, 5, 18, 20

The following figure illustrates the control shelf configuration. A description of each card type is given after the figure.

Figure 2-3 Control shelf configuration



C-side communication cards

The C-side communication cards connect the SRHE to the host LTC+, LGC+, or RCC2 with DS-1 links.

NTTR87AA (quad frame carrier card) The NTTR87AA provides a DS-1 interface between the LTC+, LGC+, or RCC2 and the Star Hub. The NTTR87AA is a normal-sized circuit card that contains four slots in its faceplate. Smaller-sized circuit cards, known as dual DS-1 packlets (NTMX81AA) are inserted into these slots to supply the NTTR87AA with its operating identity. Each NTTR87AA holds a maximum of four dual DS-1 (NTMX81AA) packlets. Each packlet has two ports for a total of eight ports for each NTTR87AA card.

When no NTMX81AA is required, an NTMX83AA a blank filler card is required for open slots.

The quad frame carrier card is located in slots 08, 09, 10, 14, 15, and 16 on the control shelf.

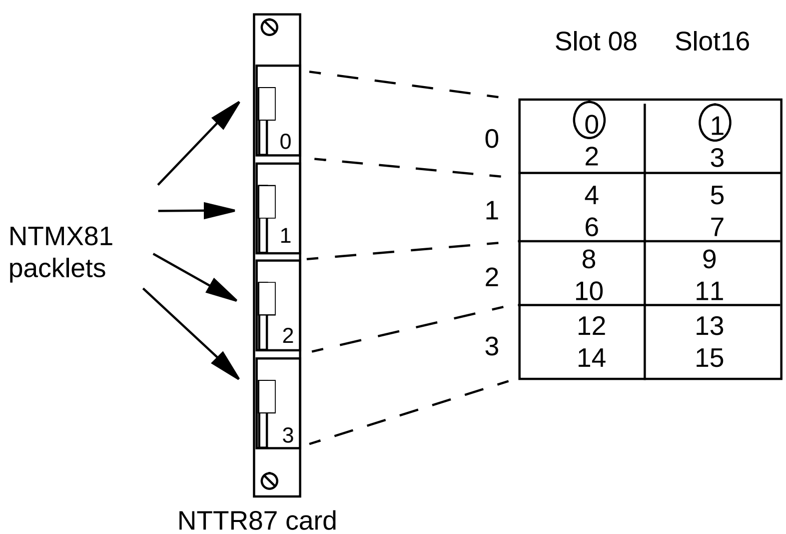
- Slots 08 and 16 connect to the LTC+, LGC+, or RCC2 and support a maximum of 16 DS-1 C-side ports.
- Slots 09, 10, 14, and 15 support DS-1 links on the P-side for up to 16 Star Modules.

To communicate with the C-side host peripheral module (PM) (LTC+, LGC+, or RCC2), the ESF B8ZS DS-1 link uses HDLC protocol.

> ***Note:*** To support HDLC, the host PM must have a message and channel supervision messaging (CSM) card (NTMX76AB) installed.

The following figure shows the C-side link assignments for the NTMX81AA packlets and the C-side message link assignments.

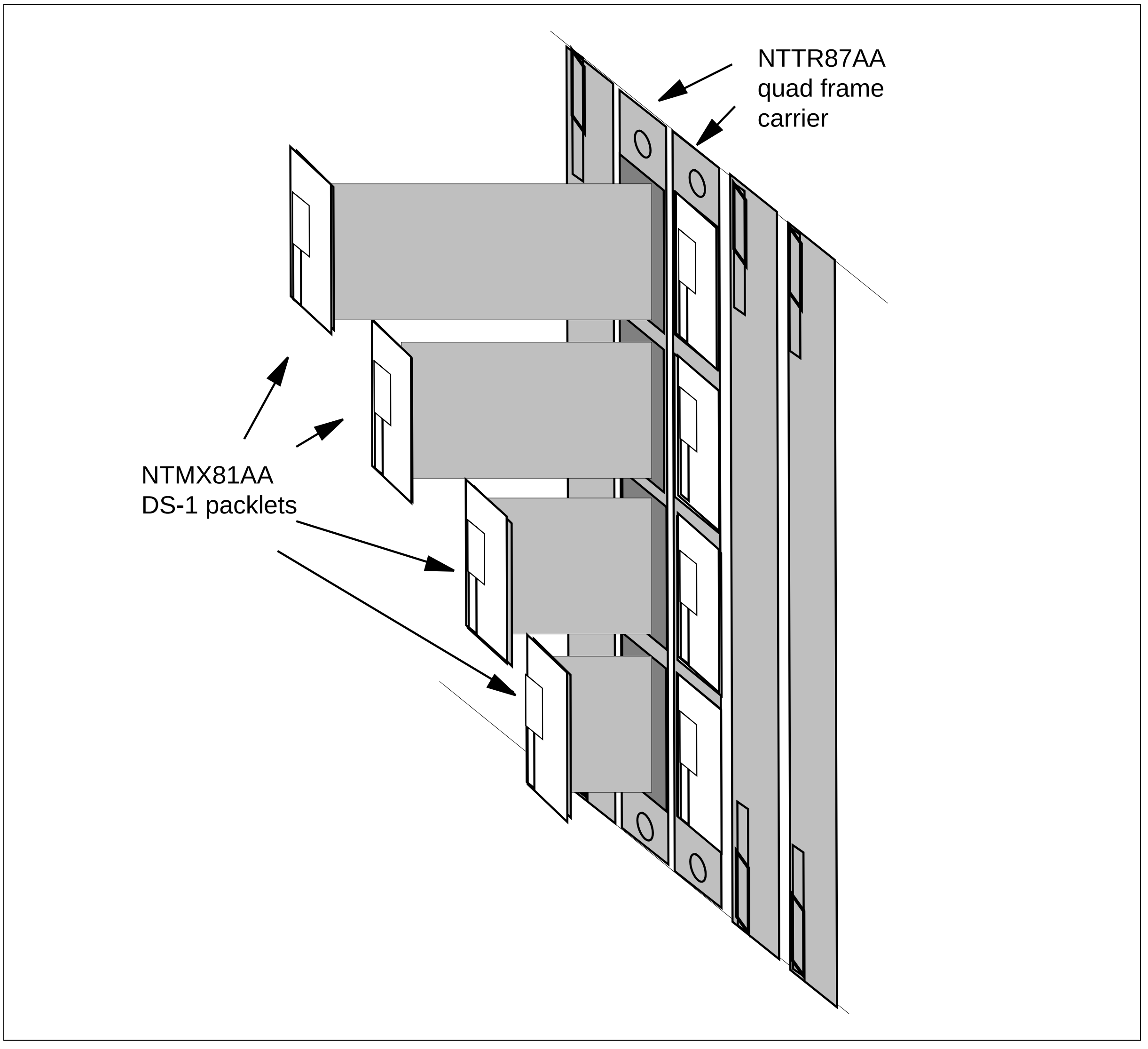
Figure 2-4 C-side link assignments



Note: The circled link numbers are the message links to the host PM. Link 0 is the messaging link for Unit 0 in the Star Hub. Link 1 is the messaging link for Unit 1 in the Star Hub.
.

The following figure shows the NTTR87AA quad frame carrier with NTMX81AA packlets.

Figure 2-5 NTTTR87AA quad frame carrier card with NTMX81AA packlets



NTMX81AA (DS-1 interface card)

The NTMX81AA cards reside in the NTTR87AA quad frame carrier card. The DS-1 interface card has DIP switches for setting the length of the DS-1 link to the cross connect or transmission equipment. The following table identifies the switches and the correct settings based on the length of this part of the DS-1 link.

Table 2-3

Distance to cross connect				
Feet	*Meters*	*S3/6*	*S2/5*	*S1/4*
0-133	0-41	On	Off	Off
133-266	41-81	Off	On	On
266-399	81-122	Off	On	Off
399-533	122-163	Off	Off	On
533-655	163-200	Off	Off	Off
Note: S indicates switch number(s). On S1 dip switch (6 position): S1-S3 belong to even port and S4-S6 belong to odd port.				

P-side communication cards

The P-side communication cards connect the SRHE to Star Modules with DS-1 links. Up to 32 DS-1 links can connect to up to 16 Star Modules. The NTTR87AA and NTMX81AA cards described earlier support these connections on the P-side. One or two DS-1 links connect each Star Module to the Star Hub. Like the C-side links, the links to the Star Hub also use HDLC/LAPD protocol. The paragraph “Star Module to Star Hub DS-1 port mapping" in this chapter describes the DS-1 link configuration.

Processor card

NTTR77AA (remote controller pack) The remote controller pack (RCP) is the time slot assignment controller that is in slots 07 and 17. The NTTR77AA provides

- up to 32 message links
- 8 Mbytes of flash memory
- 8 Mbytes of dynamic random access memory (DRAM)
- processing
- clock synchronization
- switching matrix that switches any of the 40 input port channels to any time slot of the 40 output channels
- connection to local line drawers

- support for the use of P-side DS-1s
- two interlinks between the RCPs that allow communication between the processors and routes inter-calls within the Star Hub (the interlinks support up to 62 calls)

The flash memory enables the RCP to keep its load if the card is removed or the unit is powered down. If a power failure occurs, the Star Hub does not require loading. The Star Hub recovers automatically in less than 4 minutes with a fully installed software load.

Universal maintenance pack (NTTR73AA)

The universal maintenance pack (UMP) is a maintenance card that contains the functionality of several circuit cards of a maintenance trunk module (MTM). For example, the MTM contains a line testing unit (LTU), MONTALK/VER90, and metallic test access (MTA). The UMP supports

- firmware downloading—flash memory to enable the UMP to keep its load if the card is removed or the unit is powered down
- the following maintenance capabilities:
  - four separate test access pairs for each SRHE frame
  - external tester interface, three wires supporting one voice circuit, one sleeve wire interface, and several terminations
  - MONTALK interface for monitoring or talking to a line
  - support for call progress tones generation and 16 dual tone multi frequency (DTMF) receivers when the Star Hub is in ESA
  - access from both processors
  - line card testing
  - subscriber loop testing

- scan and distribution points
  - 8 user-defined distribution points for each UMP card (SD points activate audible or visible devices to give information about alarm conditions) for a total of 16 SD points
  - 12 user-defined scan points for each UMP card (scan points detect problems) for a total of 24 SC points
- ISDN line tests, including
  - feed voltage measurements
  - dc resistance measurements
  - dc capacitance measurements
  - foreign voltage measurements
  - ISDN protocol tests, where the UMP card acts as an external interface

There are two UMP cards in the Star Hub. When one UMP card is out of service, the second card takes over responsibility for all subscriber lines. The UMP card acts as an LTU for measurement tests, as a MTA for metallic test access to the line, and as a MONTALK/VER90 for monitoring/talking to a line. The UMP also acts as an alarm scan and distribution circuit.

The UMP details are defined in table RMPCKT.

Ringing generator (NTTR60AA)

The NTTR60AA ringing generator cards reside in slots 01 and 22. The ringing generators supply ringing voltage to the line drawers. The NTTR60AA generates ringing signals and the dc voltages required for the automatic number identification (ANI) and coin functions. The ring output frequency and amplitude are set manually during installation using the four DIP switches on the card.

Power converter (NT6X53AA)

There are up to four power converters in the Star Hub control shelf in slots 03, 05, 18, and 20. These power converters

- supply +5 V and +15 V from the -48 V office battery input
- provide a relay multiplexer circuit that selects the ringing voltage generator that supplies ringing voltage to the line cards
- supply power to all drawers if a single converter fails

> ***Note:*** The power converters must be installed in matched pairs. This means an AA version of the NT6X53 must be matched with another AA version.

Power converter configurations in the Star Hub The Star Hub can have either two or four power converters. The valid possible configurations are

- full configuration - four power converters to support from 1 line to 1152 lines using line drawers 1 through 18
- half configuration - two power converters to support up to 576 lines in line drawers 1 through 9

To set the power converter configuration, subfield FULL_DRWR_CONF in table LCMINV field LCMTYPE must be entered when the Star Hub is installed. The default value Y indicates a full configuration. When N is entered, the half configuration is chosen.

The half configuration means that only slots 03 and 20 have power converters and supply power to the RCP and to drawers 1 to 9. The full configuration means the other two power converters in slots 05 and 18 supply power to drawers 10 and 18.

The following list describes the behavior of power converters in the Star Hub:

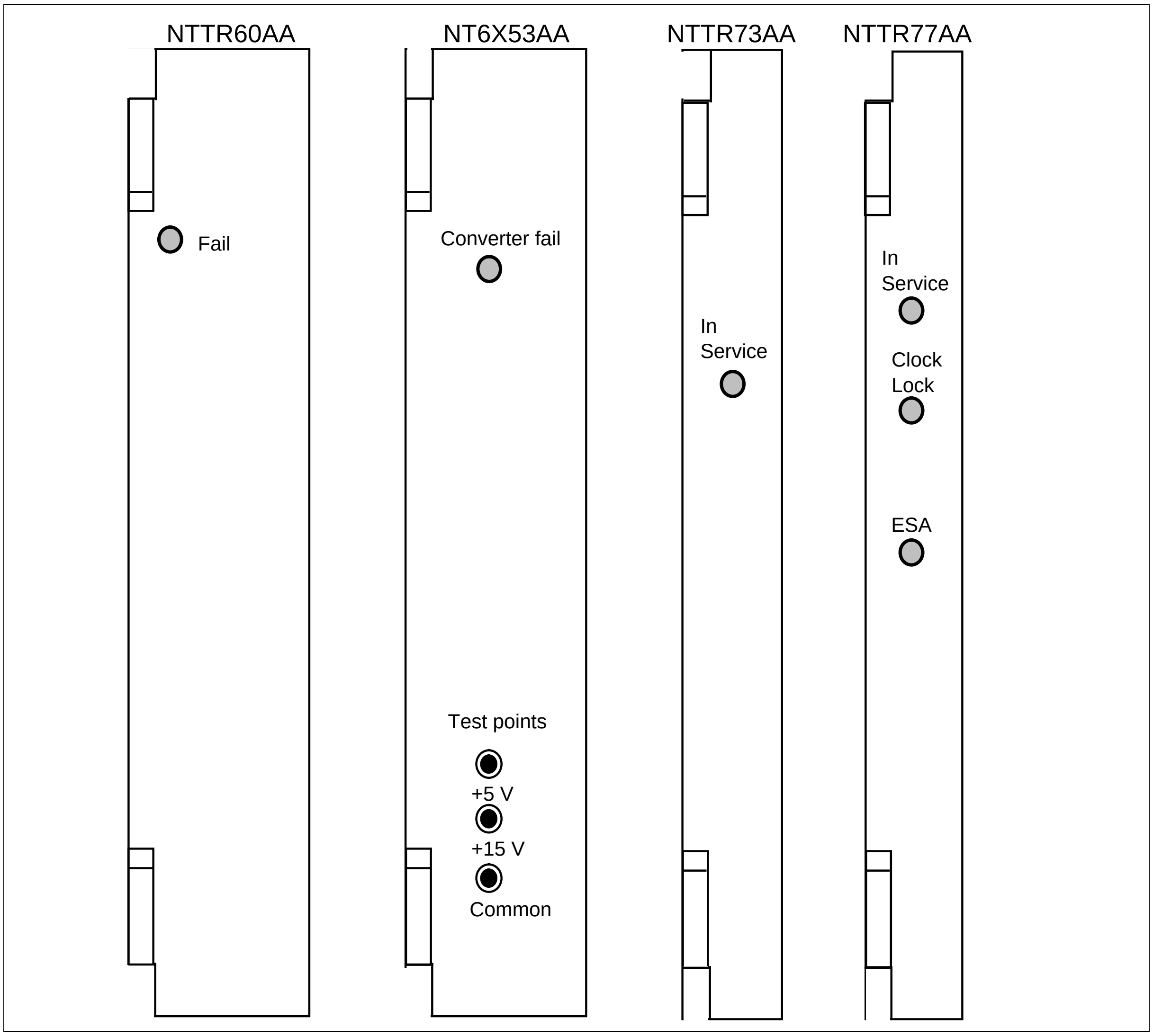
- upgrades from a half to full configuration are not supported while the Star Hub is in ESA mode
- if one of the power converters is removed from the unit, that unit is in the out-of-service state and the other unit works in takeover mode
- if one of the main power converters (in slots 03 or 20) fail, the power converter of the other unit supplies power to the unit with the failed power converter
- in a full configuration, if both of the power converters in slots 05 and 18 fail, the Star Hub do not support lines connected to line drawers 10 to 18
- downgrades from a full to half configuration are not supported

Note: Changes to the power converter configurations, from half to full configuration, cannot be made while the Star Hub is in service.

Circuit card status indicators

The following figure shows the circuit cards with status indicators.

Figure 2-6 Circuit cards with status indicators



The following table lists the status indicators on the circuit cards shown in the previous figure and identifies their functions.

Table 2-4 System status indicators (Sheet 1 of 2)

Indicator name	Circuit card	LED color	Function
In service	NTTR73AA	Green	Indicates this UMP is in service
In service	NTTR77AA	Green	Indicates this unit is in service
ESA	NTTR77AA	Red	Indicates this unit is in ESA mode

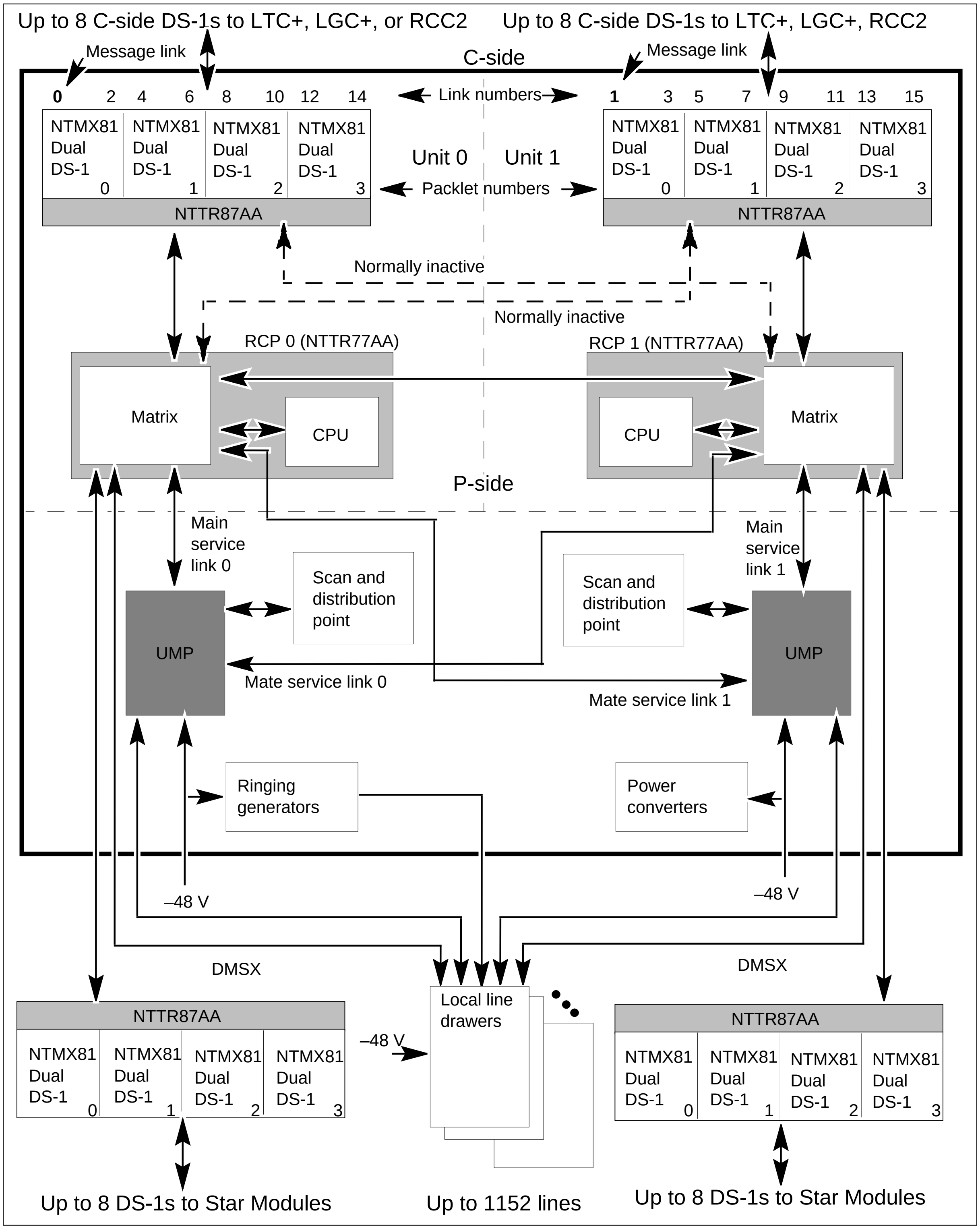
Table 2-4 System status indicators (Sheet 2 of 2)

Indicator name	Circuit card	LED color	Function
Clock lock	NTTR77AA	Green	Indicates clock source is locked to the C-side
Converter fail	NT6X53AA	Red	Identifies a converter failure (either +5 V or +15 V)
Pack failure	NTTR60AA	Red	Identifies a ringing generator failure

Star Hub circuit card interconnections

The following figure shows how the circuit cards functionally interconnect in the Star Hub.

Figure 2-7 Functional block diagram of the Star Hub control shelf



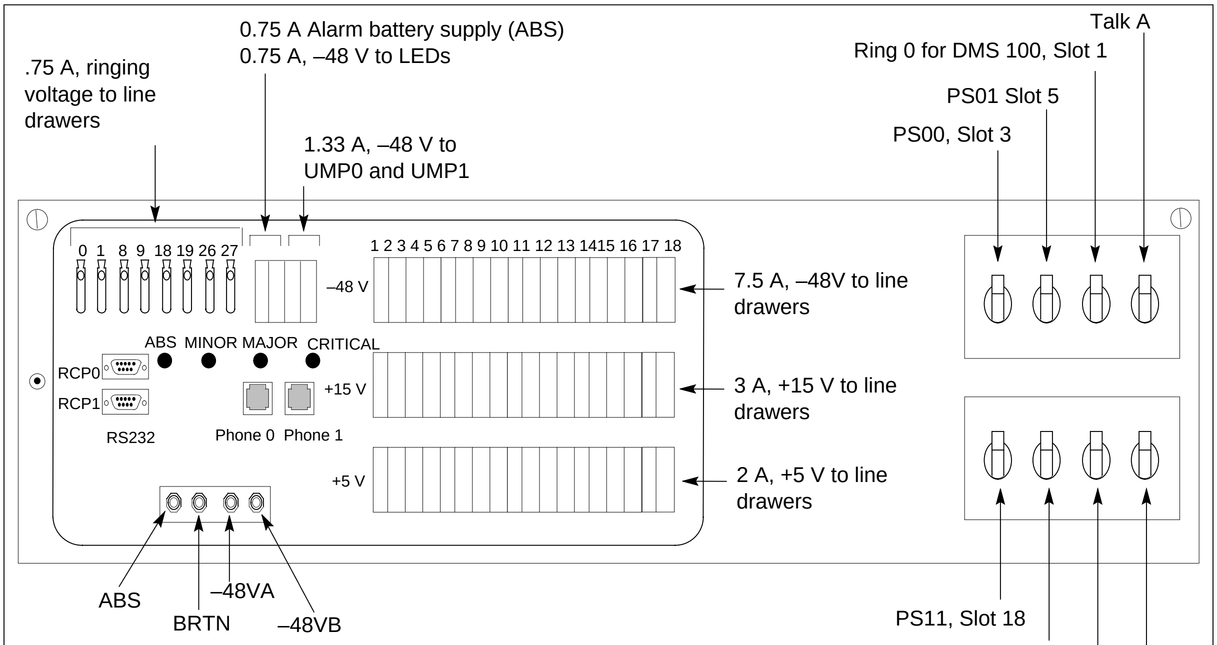
Frame supervisory panel

The FSP is in the top area of the control shelf and provides power and alarm requirements for the

- distribution of -48 V to the power converters
- alarm monitoring and control
- maintenance features (jacks for telephone, data, and alarm battery supply)

The following figure shows the layout of the FSP and lists the circuit breaker and fuse identification.

Figure 2-8 FSP front panel layout



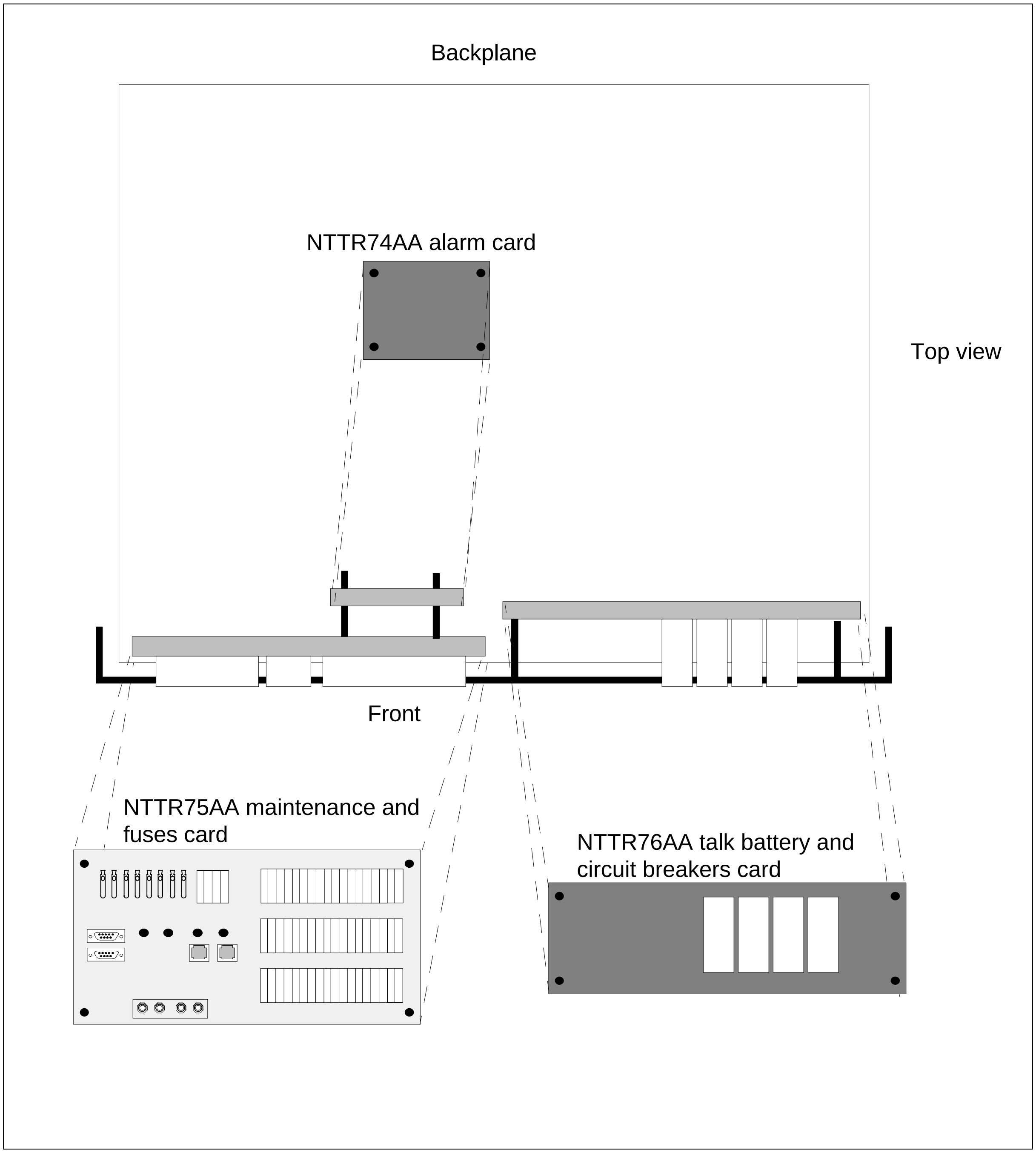
Note: PS00 is the power supply in slot 3.
PS01 is the power supply in slot 5.
PS10 is the power supply in slot 20.
PS11 is the power supply in slot 18.
TALKA is the breaker for talk battery A feed.
TALKB is the breaker for talk battery B feed.

The FSP contains the following components:

- NTTR74AA alarm card
- NTTR75AA maintenance and fuses card
- NTTR76AA talk battery and circuit breaker card

The following figure shows the location of the FSP components. These components are described later in this section.

Figure 2-9 Location of components in the FSP



The following table identifies the status indicators on the FSP front panel.

Table 2-5 FSP status indicators

Indicator name	Circuit card	LED color	Function
CRITICAL Critical alarm)	NTTR75AA	Red	Identifies the following failures: • The -48 V talk battery supply is missing. • Both RCPs are removed. • All four power converter circuit breakers or the two primary circuit breakers (PWS00 and PWS10) are OFF. • The two secondary circuit breakers (PWS01 and PWS11) are OFF. • Both ringing generators have failed.
MAJOR (Major alarm)	NTTR75AA	Orange	Identifies the following failures: • fuse failure • ringing generator failure • alarm battery supply (ABS) power failure • main power is below 41 V.
MINOR (Minor alarm)	NTTR75AA	Yellow	Identifies a UMP failure (one or more)
ABS (DC power)	NTTR75AA	Green	Indicates the presence of ABS power

Alarms card (NTTR74AA)

The NTTR74AA alarms card is behind the NTTR75AA card. The alarms card contains the alarms circuitry and controls the automatic recovery from low battery (ARLB) function.

The ARLB capability means if the voltage supply drops below a certain level, the Star Hub stops functioning but the circuit breakers do not trip. When the power returns to normal level, the Star Hub automatically recovers. This capability is especially important because the Star Hub is located at a distance from the host office.

The alarms card also functions to

- monitor and control the distribution of power to the power converters, ringing generator cards (-48 V from the circuit breakers), and the line drawer units (+5 V, +15 V, and -48 V ringing signals through fuses)
- control the major alarm circuit which activates the MAJ LED on the FSP and operates the major scan point, the fuse alarm scan point, and major alarm signal distribution points. The major alarm activates when
  - any fuse blows
  - the RCP card signals the alarms card of a major alarm condition
- control the critical alarm circuit, which activates the CRIT LED on the FSP and operates the critical scan point and signal distribution points to the main distribution frame (MDF). The critical alarm activates when
  - the circuit breakers (00 and 10) for power converter are turned OFF
  - both RCP cards are disconnected from their card slots
  - the RCP cards signal the alarms card of a critical alarm condition
  - there is no output from at least one of the talk battery circuit breakers

Maintenance and fuses card (NTTR75AA)

The NTTR75AA maintenance and fuses card is in the front of the FSP. The maintenance and fuses card contains

- 66 fuses that protect -48 V, +15 V, and +5 V power to the line drawers, -48 V to UMPs and LEDs, ringing voltage to line drawers, and the alarm battery supply (ABS) that
  - connects the power source (the power converters) with the power destination (the line drawers and UMPs)
  - connects to the alarms circuit for monitoring
- the critical, major, minor, and ABS LEDs
- the RCP RS232 connectors that allow communication with external monitors
- two telephone jacks
- four test points (-48 V ABS, -48 V A-feed, -48V B-feed, and BTRN [battery return]) test points

RS232 connectors Two RS232 9-pin connectors are on the face of the FSP. Each connector connects to one of the RCP cards. These RS232 connectors enable maintenance personnel to access PMDEBUG through a personal computer (PC) and get information without having to access the host MAP terminal in the host office. In the field, operating company personnel must install an optical isolator between the FSP connector and the terminal connector.

Talk battery and circuit breaker card (NTTR76AA)

The NTTR76AA talk battery and circuit breaker card

- contains the circuit breakers that connect to the power sources (-48 V A-feed and -48 V B-feed) to the loads (converter and ringer cards)
- provides talk battery filters to reduce audio frequency cross talk
- protects the whole FSP against voltage transients on the main -48 V feed that can result from lightning or reversed polarity connections
- connects to the alarms card and the maintenance and fuses card

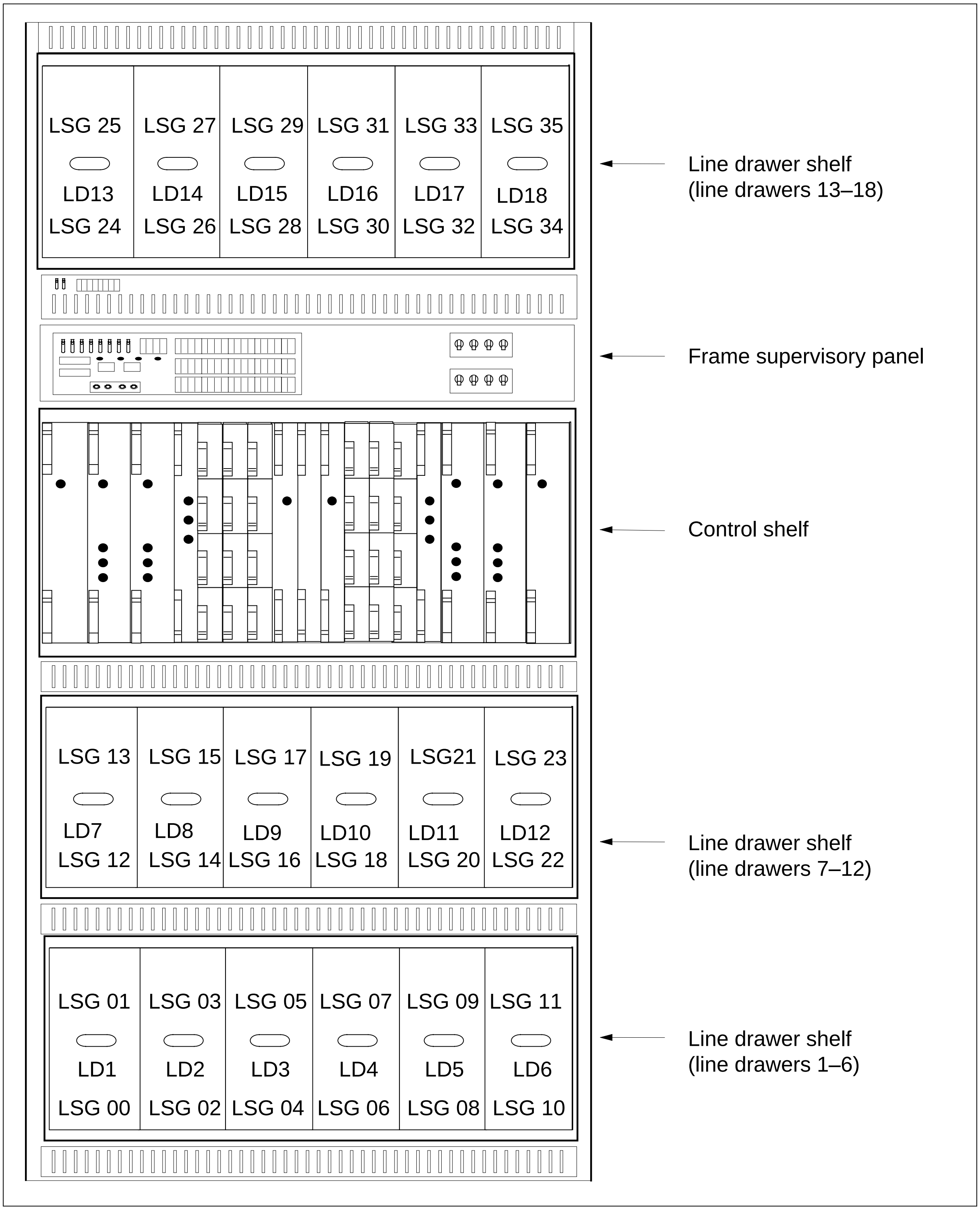
Line drawer shelf

The Star Hub contains three line drawer shelves. Each shelf contains up to six line drawers. A fully equipped Star Hub contains 18 line drawers, of which two drawers on each shelf can be an ILD-R.

Baffle panels above each line drawer shelf permit air circulation for convectional cooling.

The following sections describe the line drawers in the Star Hub shelves. The following figure shows the arrangement of the line drawers and the line drawer and line subgroup numbering arrangement.

Figure 2-10 Line drawer and line subgroup numbering



POTS line drawer (NT6X05AA)

Each line drawer connects up to 64 line cards, one for each analog subscriber line serviced by the Star Hub. The 64 line cards divide into two groups of 32. Each group of 32 line cards is a line subgroup (LSG).

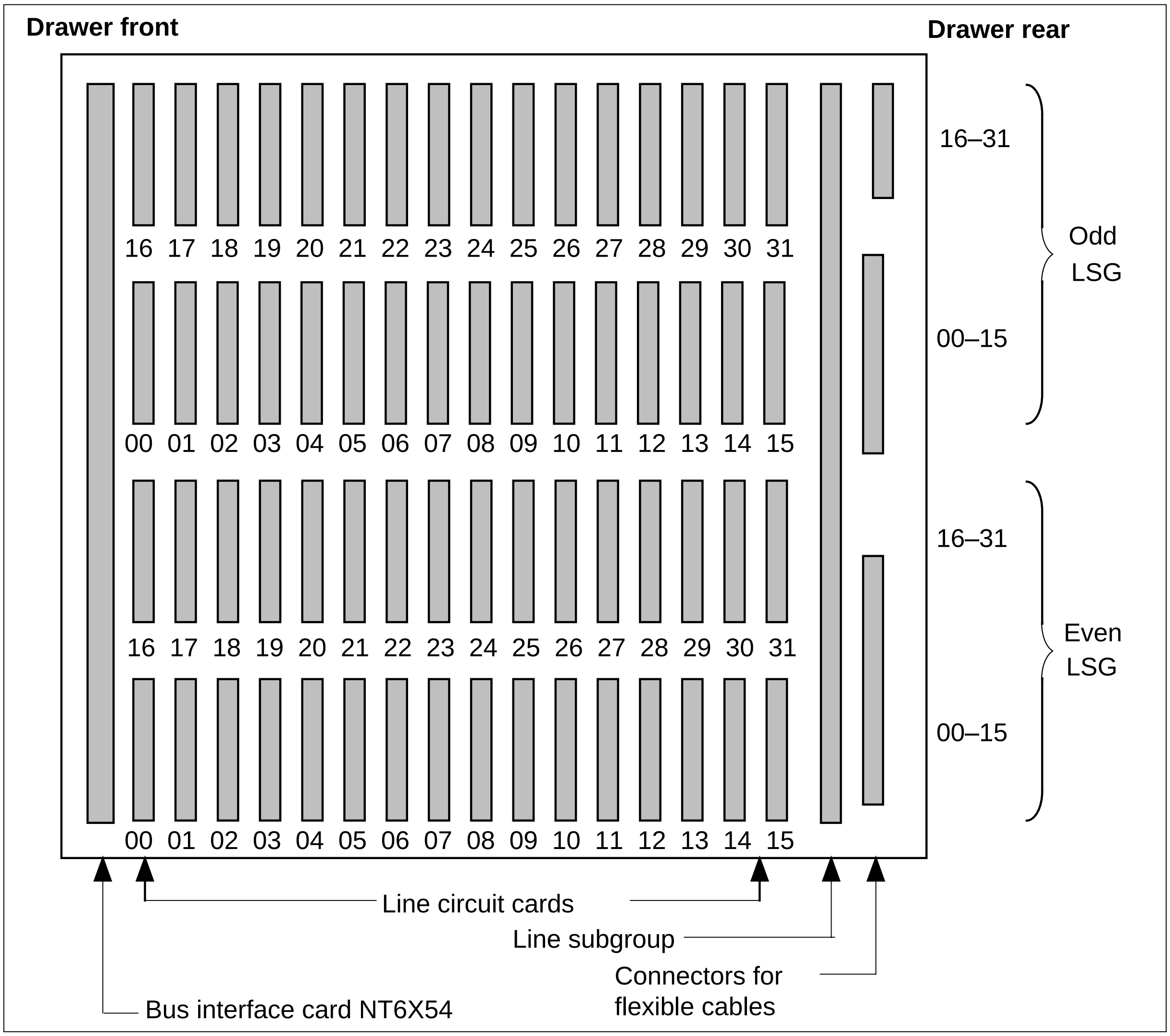
The maximum number of lines (1152) that can connect to a Star Hub is derived from the number of line drawers (18) times the number of line cards for each drawer (64).

The Star Hub connects from 2 to 16 DS-1 C-side links to its 1152 subscriber lines. The Star Hub has a minimum of two DS-1 links because each primary link carries one message channel to the LTC+, LGC+, or RCC2. Each DS-1 link carries 24 speech channels, making a possible of 48 to 384 available channels, two of which are always nailed up to the host controller. Other ports of up to a total of 16 ports can be accommodated, depending on traffic capacity and the concentration ratio required.

Each POTS line drawer (NT6X05) in the Star Hub has one bus interface card (BIC) and a maximum of 64 line cards of various types. The line drawer can be removed from the frame to access line cards, yet remain operating because of flexible cables connected to the receptacles in the back of the line drawer.

The following figure shows the layout of the POTS line drawer and the location and numbering of line cards and the line subgroup arrangements.

Figure 2-11 POTS line drawer NT6X05AA, circuit card location



Bus interface card (NT6X54AA)

The BIC card is at the front of the line drawer, behind the front faceplate. The BIC card 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 line drawers, 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 loop around on command from the maintenance system
- supports communication between the line drawers or between two LSGs. This communication is accomplished through the single BIC in each drawer.

Line cards

The line cards are located behind the BIC 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, unit 1 of the Star Hub control shelf controls the odd LSG of all line drawers; unit 0 of the Star Hub control shelf controls the even LSGs of all line drawers.

Both the LSGs and each line card in the LSGs are numbered. The LSG numbers in a Star Hub range from LSG-00 through LSG-35. 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.

Table 2-6 Parts of LEN for a Star Hub

Part	Description
Site	Four character alphanumeric name that identifies the remote site where the Star Hub is located.
Frame	Numeric (00-511) that identifies the SRHE frame containing the line card.
Unit	For the Star Hub, this is always 0.
LSG	Numeric (00-35) that identifies the line subgroup that contains the line card.
Circuit	Numeric (00-31) that identifies the position of the line card in the LSG.

The following example shows how line cards are numbered for identification within any LSG.

Table 2-7 Example LENs for line cards

Site	Frame	Unit	LSG	Circuit
REM1	00	0	07	30
REM2	00	0	18	26
HOST	01	0	14	6

A complete LEN for a Star Hub line card includes 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 Star Hub-supported lines.

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

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

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

- Line card type B, coin (NT6X18AA, AB, BA). The type B card provides all features of type A, plus multiparty lines. It supports coded ringing, PBX, ground start, hotel/motel, and analog pay telephone sets that require coin control.

  Note: If the suffix of the NT6X18 card is AA or AB, and the line is identified as ground start (field GND=Y in table LNINV), run the diagnostics again if the initial diagnostics fail. This action is possible by adding the service order (SERVORD) option NPGD (Negate Partial Ground Start Diagnostics). Option NPGD allows the line to be tested against a smaller subset of ground start diagnostics. Therefore, when option NPGD is set in table LENLINES, the loop detector, reversal relay, and ground start relay tests are not performed.

- Message-waiting line circuit (NT6X19AA). The message waiting line card provides all the features of the type A line circuit, plus a message-waiting lamp driver circuit. When activated, this circuit causes the message waiting lamp on the related telephone set to flash at 1 Hz, telling the subscriber that a message is being held.

  Note 1: When an NT6X19AA message waiting line card is installed, an NT6X20AA message waiting converter card is required.

  Note 2: When an NT6X19AA message waiting line card is installed, only a metering line card without +48 V can be used.

- Message-waiting converter (NT6X20AA). The message waiting converter provides -150V synchronized pulse for the message-waiting lamp circuit. Synchronization is from the 2.56-MHz clock pulse in the Star Hub. This card must be installed in slot positions 0 and 16 of the odd LSG to function correctly.

- Line card type C Meridian Digital Centrex (MDC) (NT6X21AA, AB, AC, AD, BC, CA). Supports MDC-related electronic multiline telephone sets and operator consoles.

  Note: When an NT6X21AC line card is required, it must be installed at least four slots away from the NT6X99AA IBERT line card.

The NT6X21AD line card provides a voice and signaling interface between a 2-wire, analog subscriber line and one channel of the 4-wire, 32-channel, 2.56 Mb/s bit stream of the DMS-100 Family of the DMS System. The card is in one slot in the line drawer of the Star Hub for use with a proprietary phone (P-phone) telephone set that is connected to the line card with an normal non-loaded (NL) pair of metallic conductors. Simultaneous voice and extended signaling services are provided on the same loop. The transmission bandwidth on the loop divides into two frequency bands:

— voice channel, 300-3400Hz

— signaling channel 6-10kHz. Normal high-voltage signaling (ringing) is replaced with low level signals.

The NT6X21AD is a single-line circuit line card that, with appropriate DIP switch settings, is hardware backward compatible with the NT6X21AC line card. The NT6X21AD provides improved features such as

— reduced messaging noise

— Dual in-line package (DIP) switch selectable balance impedance

— UDLC (universal digital loop carrier) improved operation

— DIP switch selectable (0 or -3.5dB) gain in the D/A (digital to analog) direction

— DIP switch selectable short-loop/long-loop (slp/llp), signaling levels

The NT6X21AD card code, and maintenance and diagnostics on the new, selectable signaling level, voice receive D/A level, and balance impedance can be data filled. The following table lists the recommended DIP switch settings.

Table 2-8 Recommended NT6X21AD DIP switch settings

Recommended application	D/A voice S1		Balance S2		Signaling level S3 and S4			
	Switch position ON	OFF	Switch position ON	OFF	Only S3 ON	Only S4 ON	Both ON	Both OFF
	0dB	**-3.5dB**	**NL**	**9+2**	**0.6Vpp**	**0.8Vpp**	**1.3Vpp**	**0.14Vpp**
P-phone sets long loop: 19-24dB EML	X		X				X	
P-phone sets medium loop: 17-19dB EML	X		X			X		
P-phone sets medium loop: 4-17dB EML		X		X	X			
P-phone sets short loops: 0-4dB EML		X		X				X
Northern Telecom UDLCs		X	X					X
Other vendors UDLCs	X			X	X			
NT6X21AC equivalent mode		X	X				X	

Note: dB=decibel NL = not loaded9+2 = loaded (900 ohm + 2.16 micro-farads) networkVpp = voltage peak to peakEML = estimated measured loss, as defined in *Business Set Line Engineering*, 297-2011-180

The following two tables list the two acceptable limits for transhybrid loss (THL) dependent on the D/A level selected. Because the NT6X21AD uses the same diagnostics as the NT6X21AC, the THL limits are modified for diagnostic purposes. The “NT6X21AC THL limits" table is for the

NT6X21AC line card, the “NT6X21AD THL limits" table is for the NT6X21AD line card.

Table 2-9 NT6X21AC THL limits

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

Table 2-10 NT6X21AD THL limits

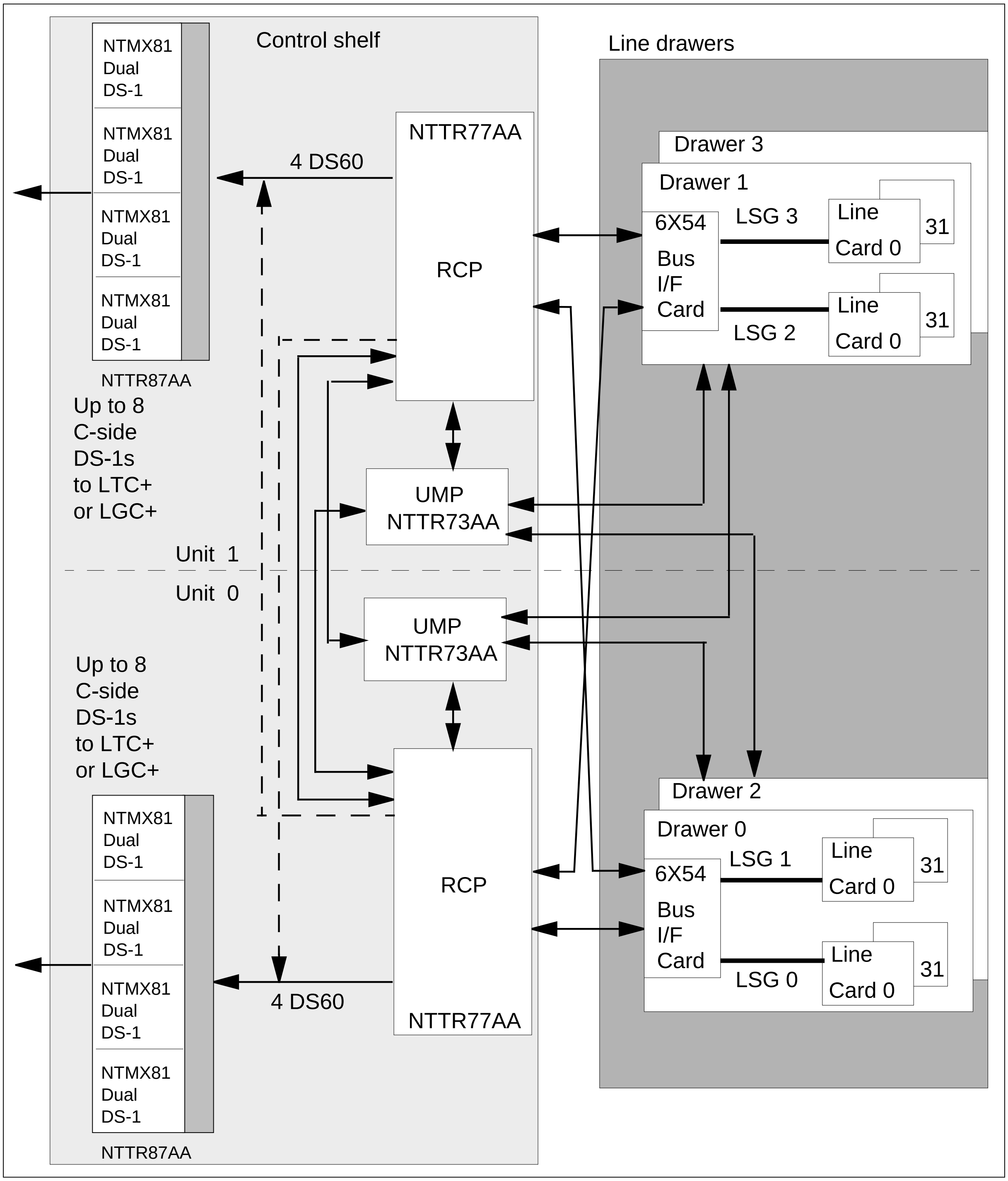
Frequency	304	704	1505	3204
Minimum	-2.7	-2.7	-2.7	-3.7
Maximum	+4.8	+4.3	+4.3	+4.2

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

- Data line card (DLC) (NT6X71AA, AB, AC, BA). The data line card provides data transmission interfaces for operation with computer terminals.
- Asynchronous interface line card (AILC) (NT6X76AA, AC, AD). The AILC provides an interface between a four-wire, RS-422 line and one channel of the 32-channel, 2.56 Mbit/s digital bit stream. The AILC is in two adjacent plug-in line card positions in the line drawer.
- Data above voice line card (DAVLC) (NT6X87AB). The DAVLC provides circuit-switched data for subscribers connected to a SuperNode switch. This card allows simultaneous voice and data service over a single pair of wires between the central office and the subscriber. The DAVLC occupies four slots in the line drawer and requires four vertical slots, two in each of the two logical drawers.
- Integrated bit error rate test (IBERT) line card (NT6X99AA). The IBERT line card provides bit error rate performance (BERP), which tests transmission paths for determining bit error performance of Star Hub hardware components.

See the following figure for a functional block diagram of the standard line drawer. All the components of this figure are discussed in this chapter.

Figure 2-12 Standard line drawer block diagram



ISDN line drawer for remotes (NT6X05DA)

Each ILD-R supports 28 NTBX27AA U-loop ISDN cards. The ILD-R has internal D-channel handlers that allow the drawer to be independent of external

ISDN hardware. For this reason, the host LTC+, LGC+, or RCC2 does not require the installation of the enhanced ISDN signaling preprocessor (EISP) or enhanced D-channel handler (EDCH) cards.

The ILD-R communicates directly with the LTC+, LGC+, RCC2 over two separate message channels that connect the ISDN drawer controller (IDC) to the LTC+, LGC+, or RCC2. These message channels are independent of Star Hub message channels which support

- loading the IDC
- Q.931 signaling messages between the terminal and the LTC+, LGC+, or RCC2
- maintenance and provisioning messages to the IDC
- downloading parameters to ISDN terminals

The IDC provides the LAP-D termination. Circuit-switched messages that originate at the ISDN loop are converted to DMSX protocol by the IDC and transferred to the LTC+ or LGC+. Packet switched messages are converted to frame switching and transferred to the packet handler through the network. The ILD-R has 32 LAPD links, 28 for ISDN loops and four for other purposes.

The ILD-R contains flash memory and can be loaded while in the in-service state.

The ILD-R supports intraswitching in the Star Hub. ISDN lines are not supported during Star Hub emergency stand-alone (ESA). If the Star Hub enters ESA, all ISDN calls are released.

User interface commands are available to support the added functionality required by the ILD-R. These user interface commands are discussed in the “Star Remote Hub user interface" chapter in this manual.

To upgrade a POTS line drawer to an ISDN line drawer in the Star Hub

- delete all lines from that drawer
- remove the POTS line drawer from service
- physically replace the POTS line drawer with an ILD-R
- declare the new ILD-R and return the ILD-R to service

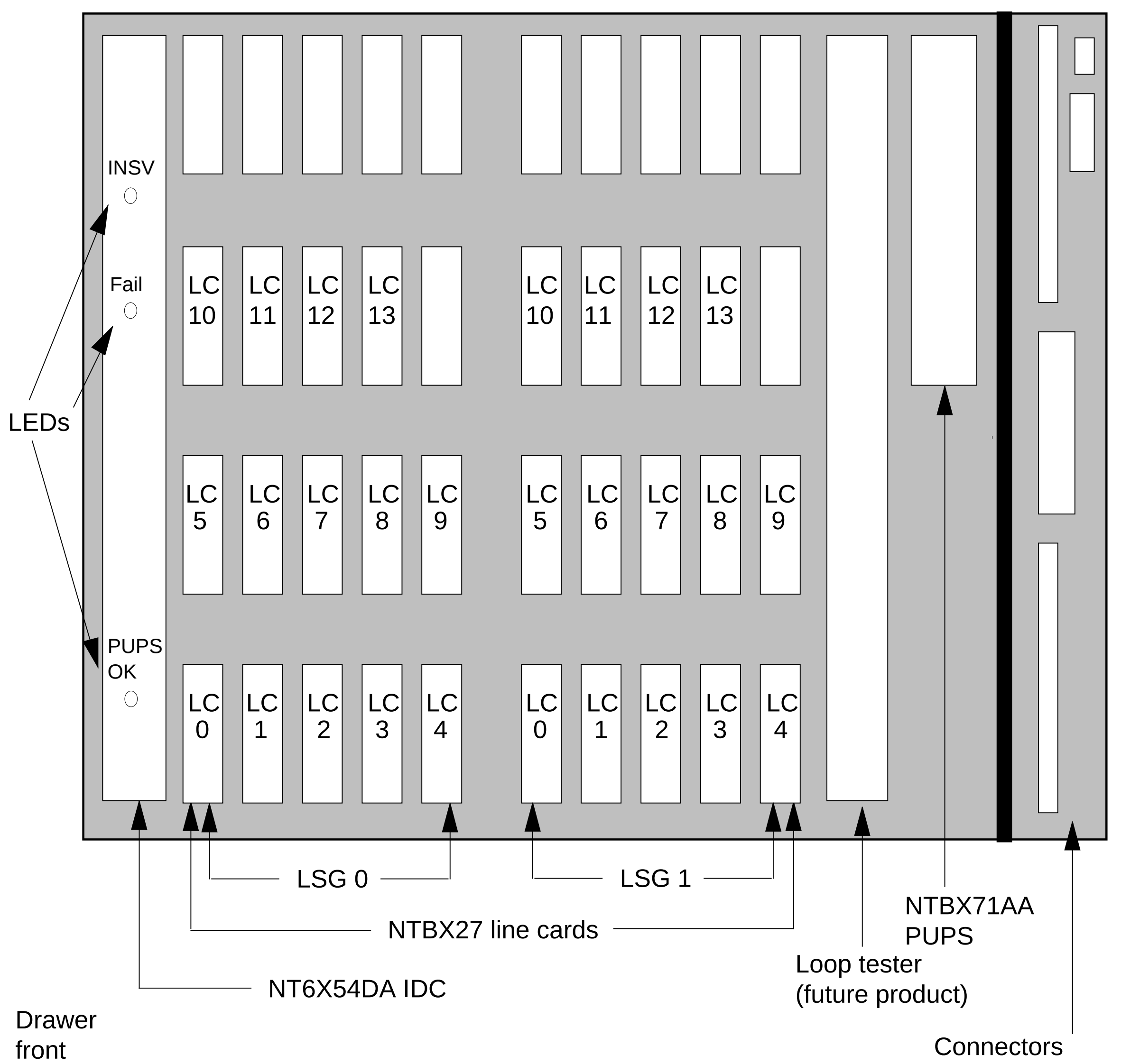
> ***Note:*** This procedure does not cause other drawers to be removed from service.

The ISDN line drawer includes the following key components:

- NT6X54DA - IDC card
- NTBX27AA - ISDN U-interface line card
- NTBX71AA - ISDN point of use power supply (PUPS)

The following figure shows the layout of the ILD-R, the location and numbering of line cards, and the line subgroup arrangements.

Figure 2-13 ISDN line drawer (NT6X05DA) components



Note: This illustration is not drawn to scale.

Each of the components shown in the previous figure are described here.

ISDN Drawer Controller card (NT6X54DA)

The IDC is at the front of the ILD-R, behind the front faceplate. The IDC supports up to 28 ISDN loops and

- provides pulse coded modulation (PCM) and data control functionality
- exchanges D-channel messages between the ISDN line cards and the rest of the SuperNode switch
- provides the processing engine that does the D-channel routing, line card maintenance, loop performance monitoring, and local drawer connection management

Communication between the line drawers, or between two LSGs, is completed through the single IDC in each drawer. If one of the RCP cards fail, the activity is moved to the other RCP card. The IDC communicates with the C-side through a single RCP card.

The IDC card has three LEDs on the faceplate of the IDC card to indicate faults. The three LEDs are

- green InSv LED (operates by software and indicates the card is in service)
- red Fault LED (operates by both software and hardware and indicates a fault condition)
- PUPS OK LED (indicates a +5 V supply problem or a blown fuse)

The following table shows the four states that apply to the ON or OFF condition of the red and green LEDs on the IDC card.

Table 2-11 Fault and InSv indicator LEDs

State	Green (InSv) LED	Red (Fault) LED	Description
State 1	on	off	IDC is active (Do not interrupt the drawer's activity.)
State 2	on	on	Lamp test for 1-2 seconds after card power-up
State 3	off	on	There is a problem in the IDC card. IDC card can be removed.
State 4	off	off	Indeterminate condition, testing required

U-interface line card (NTBX27AA)

The NTBX27 line cards are located behind the IDC in 3 rows of up to 10 line cards in each row. A fourth row of slots at the top is empty. The three rows are arranged into two groups, each containing 15 slots, but supporting up to 14 line cards to form the LSGs. The left group forms the even-numbered LSG and the right group forms the odd-numbered LSG. Unit 0 of the control shelf controls the even LSG and unit 1 controls the odd LSGs.

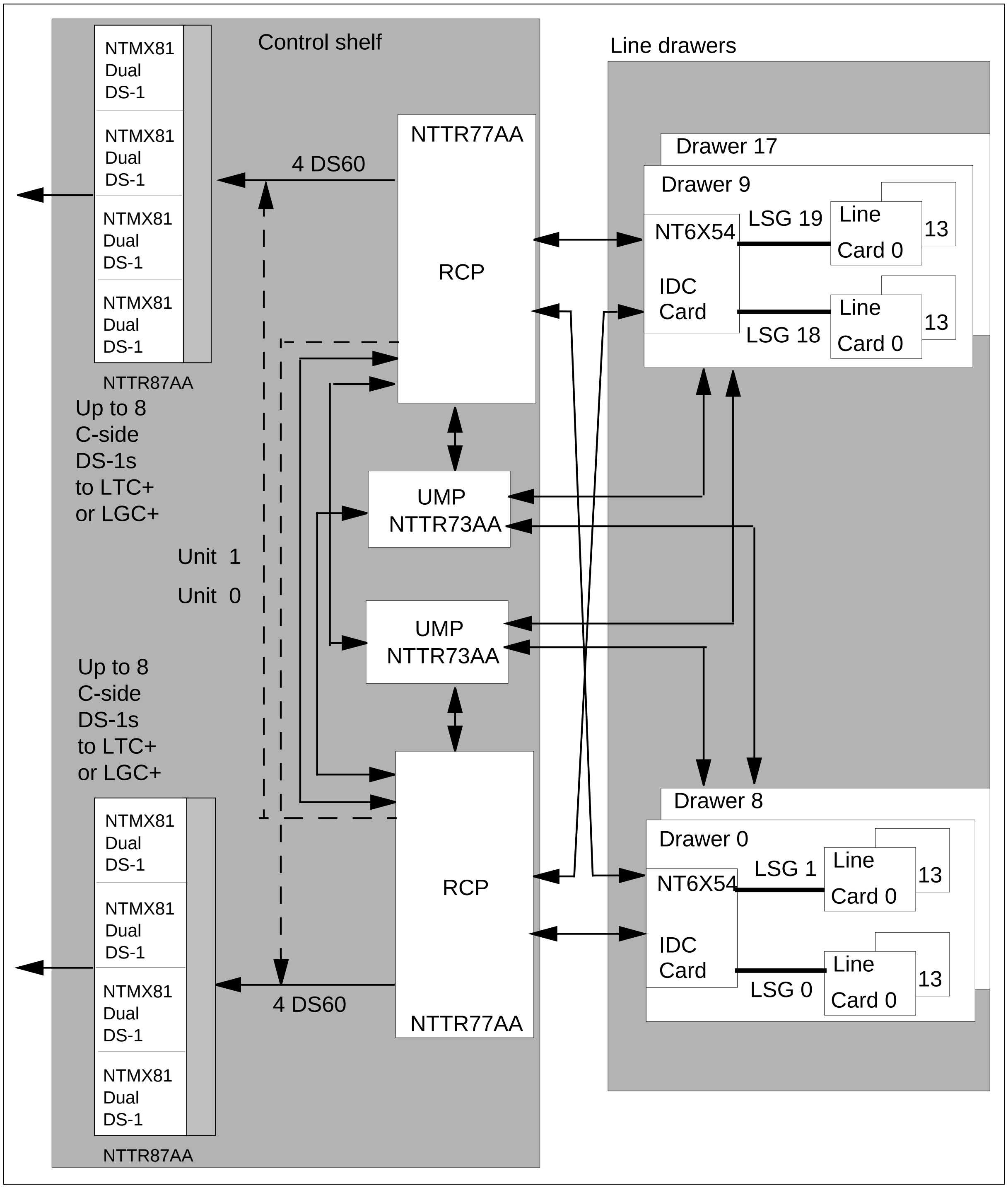
Both the LSGs and the individual line cards in the LSGs are numbered. LSG numbers in a Star Hub range from LSG-00 through LSG-35. ILD-R line card numbers range from 00 through 13. Using these numbers, the line cards are uniquely identified and inventoried in the DMS switch central control (CC) by their line equipment numbers (LEN), as shown in the table titled “Parts of LEN for a Star Hub" presented earlier in this chapter.

Point-of-use power supply (NTBX71AA)

The ISDN point-of-use power supply (PUPS) is a dual slot card in the ILD-R drawer. The PUPS provides +5 V power to the ILD-R line cards in the line drawer. The NTBX71 samples the output voltage and checks for an over voltage condition. If an over voltage condition is detected, the PUPS sends back a signal to the pulse width modulator to power down the NTBX71AA. To reset the card, the power supply must be removed and installed again.

See the following figure for a functional block diagram of the Star Hub with ILD-R. All the components of this figure are described in this chapter.

Figure 2-14 ILD-R block diagram



1-Meg Modem Service

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

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

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

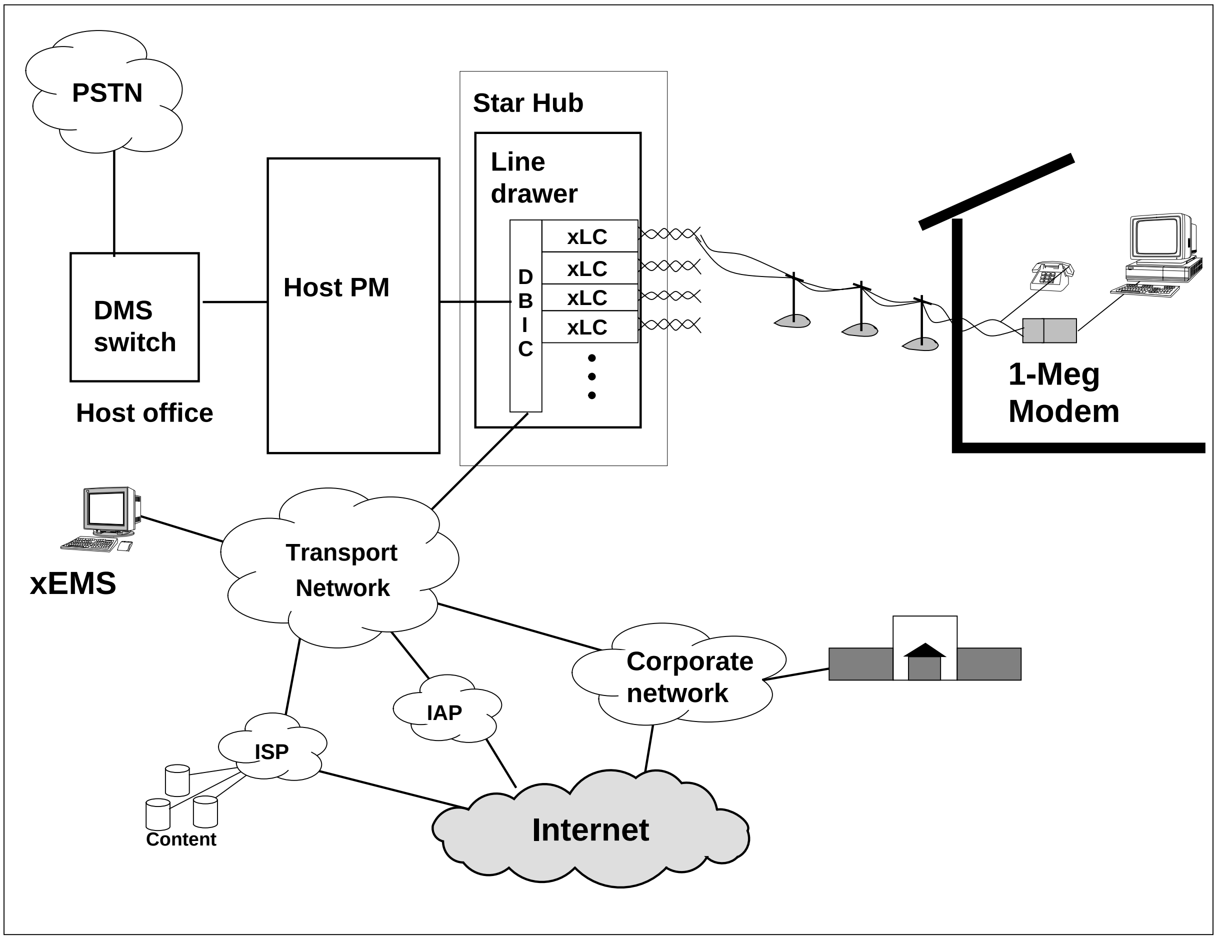
Components

The 1-Meg Modem Service includes the following components:

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

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

Figure 2-15 Telephone network with 1-Meg Modem Service



The Star Hub line drawer contains the DBIC and xLCs. The Star Hub can hold up to 18 line drawers. Each line drawer can hold one DBIC and up to 31 xLCs. Each 1-Meg Modem Service subscriber has an xLC. Each line drawer with xLCs must have a DBIC to provide data service. Each DBIC provides an Ethernet connection to the transport network for all subscribers in the line drawer.

The Star Remote Hub can support a mix of line drawers that support each service. However, a line drawer cannot support a mix of services. A line drawer can support *either* 1-Meg Modem Service with xLCs *or* POTS with POTS line cards.

The Star Hub can have a maximum of 18 Ethernet connections for all its 1-Meg Modem Service subscribers. The configuration of the transport network can require these Ethernet interfaces to connect to a mix of network components. The flexibility of the 1-Meg Modem Service allows you to change the interface to public and private wide area networks (WAN) to meet your requirements. Examples of WANs are Internet access providers (IAP), Internet service providers (ISP), and corporate networks.

Potential applications

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

- work-at-home

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

- Internet access

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

- small office communications

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

Compatibility

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

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

- Star Hub hardware, including power supplies and distribution
- the subscriber's copper loop

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

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

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

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

1-Meg Modem Service components

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

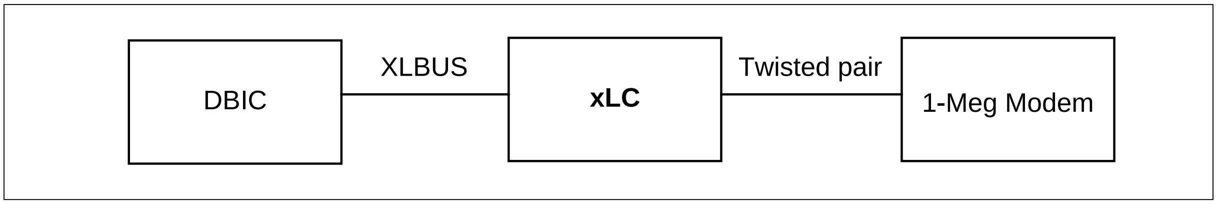
NTEX17DA xDSL line card   The NTEX17DA xDSL line card (xLC) provides full voice service and high speed data communication with a subscriber's 1-Meg Modem.

The xLC has the following features:

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

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

Figure 2-16 xLC in 1-Meg Modem Service



The NTEX17DA supports a transmission rate of 1280 kbit/s downstream and 320 kbit/s upstream. Up to 31 xLC cards can be provided in a line drawer.

Refer to *1-Meg Modem Service Network Implementation Guide*, 297-8063-200, for information on drawer fill.

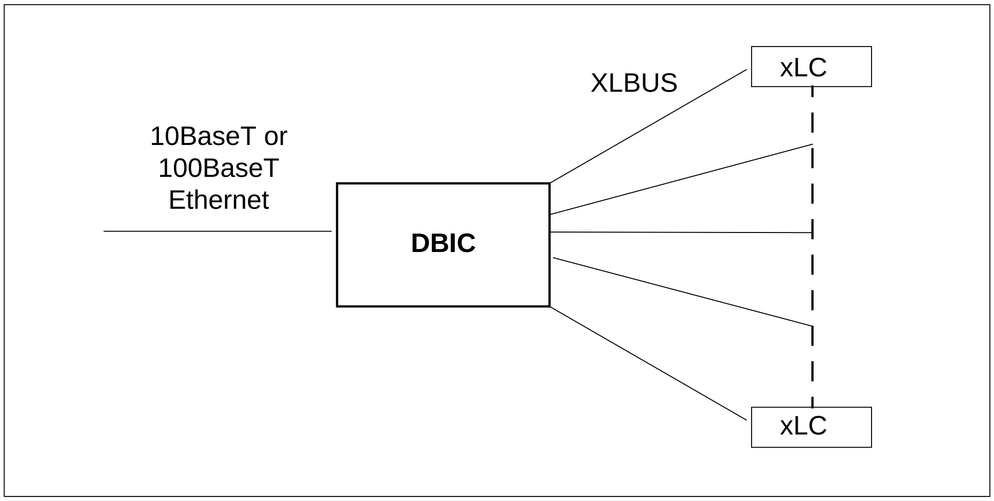
NTEX54CA data-enhanced bus interface card The DBIC replaces the existing BIC in each LCM drawer with an xLC. The DBIC separates the voice and data traffic. The card multiplexes the voice traffic to standard DS-30A interfaces to the existing circuit switched voice network. The card multiplexes the data traffic to one 10BaseT Ethernet connection to the transport network.

The DBIC has the following features:

- half duplex, standard compliant 10BaseT interface
- auto-sensing feature allows DBIC to connect at 10BaseT or 100BaseT
- maximum of 31 xLCs in a drawer
- connected to all line card slots through XLBUS
- backwards compatible with all POTS line cards compatible with the NT6X54AA
- different media access control (MAC) addresses for each xLC and DBIC
- demultiplex 64 voice channels from receive data (RD) links to XLBUS links
- multiplex 64 voice channels from XLBUS links to transmit data (TD) links
- +12.7v CODEC reference to all 64 line positions
- controls ring bus and automatic number ID (ANI)/COIN voltages using relays

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

Figure 2-17 DBIC in 1-Meg Modem Service



The NTEX54CA supports a transmission rate of 1280 kbit/s downstream and 320 kbit/s upstream. The NTEX54CA supports 10Base T or 100BaseT Ethernet interfaces.

Star Module

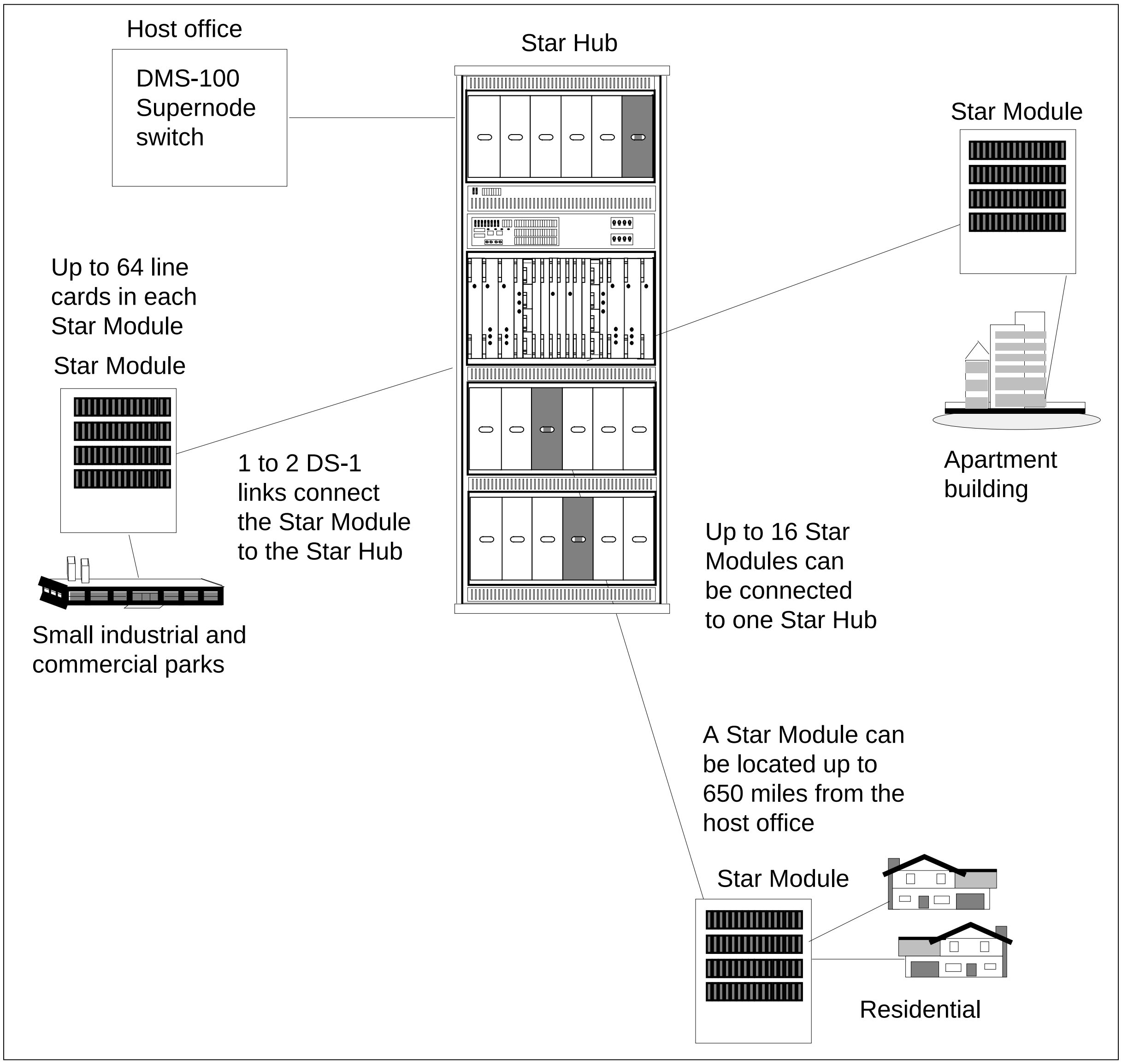
The Star Remote is a line drawer in a cabinet located at a remote site. The Star Module connects to the Star Hub through 1 or 2 DS-1 links. The maximum number of Star Remotes that can connect to one DMS-100 switch is 1,000. Up to 90 Star Modules (RLDs) can connect to a host PM such as RCC2, LTC+, or LGC+.

The Star Remote includes the following hardware components

- telephony subsystem (TSS) includes all control, power, and maintenance cards and the backplane and plastic line card cage
- cabinet
    - Star Remote Module Equipment (SRME) cabinet that is installed on a wall
    - Star Remote Module Outside (SRMO) cabinet that is installed on a pole, concrete pad, or wood deck
- line termination unit (LTU), either copper or fiber, to terminate the DS-1 links from the Star Hub. The Star Hub requires an LTU to receive the DS-1 signals from the Star Module.

The following figure shows the basic architecture of the Star Remote.

Figure 2-18 Star Remote architecture



The following paragraphs describe the characteristics and capabilities of each of the Star Module components.

TSS hardware configuration

The TSS includes

- one control card
- one maintenance card
- one power supply and ringing card
- one dc panel

- one ac/dc rectifier, located on the TSS cover in the SRMO cabinet or below the batteries in the SRME Wall Mount
- a backplane with connections/terminal blocks and a card cage that holds up to 64 line cards

The following table lists the circuit cards in the TSS.

Table 2-12 TSS cards

Category	PEC	Name
EMI filter	NTTR66AA	EMI filter packlet
Power	NTTR67AA	dc panel
	NTTR72AA	Power supply and ringer
	NTTR46AA/AB	ac/dc rectifier
Processor	NTTR70AA/AB	Star Module Controller (SMC) card
Maintenance	NTTR71AA	Line maintenance unit (LMU) card

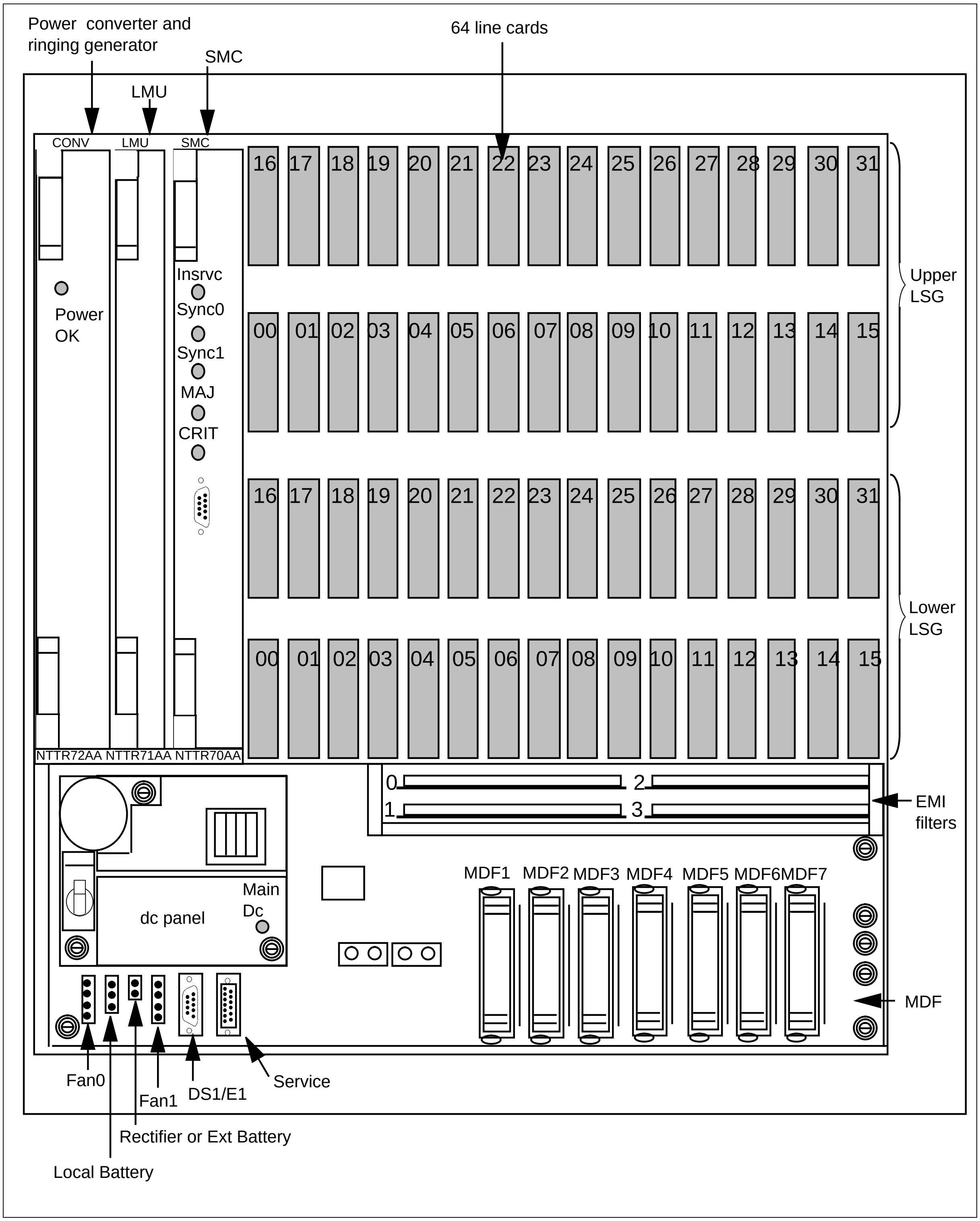
The Star Module Wall Mount can be powered as follows:

- Rectifier and Internal Batteries
- External Batteries

The SRME Wall Mount Class B requires the following packs:

- NTTR46AB - Rectifier
- NTTR70AB - SMC
- NTTR6902 Rel 03 - Backplane

Figure 2-19 Telephony subsystem



NTTR46AA/AB ac/dc rectifier

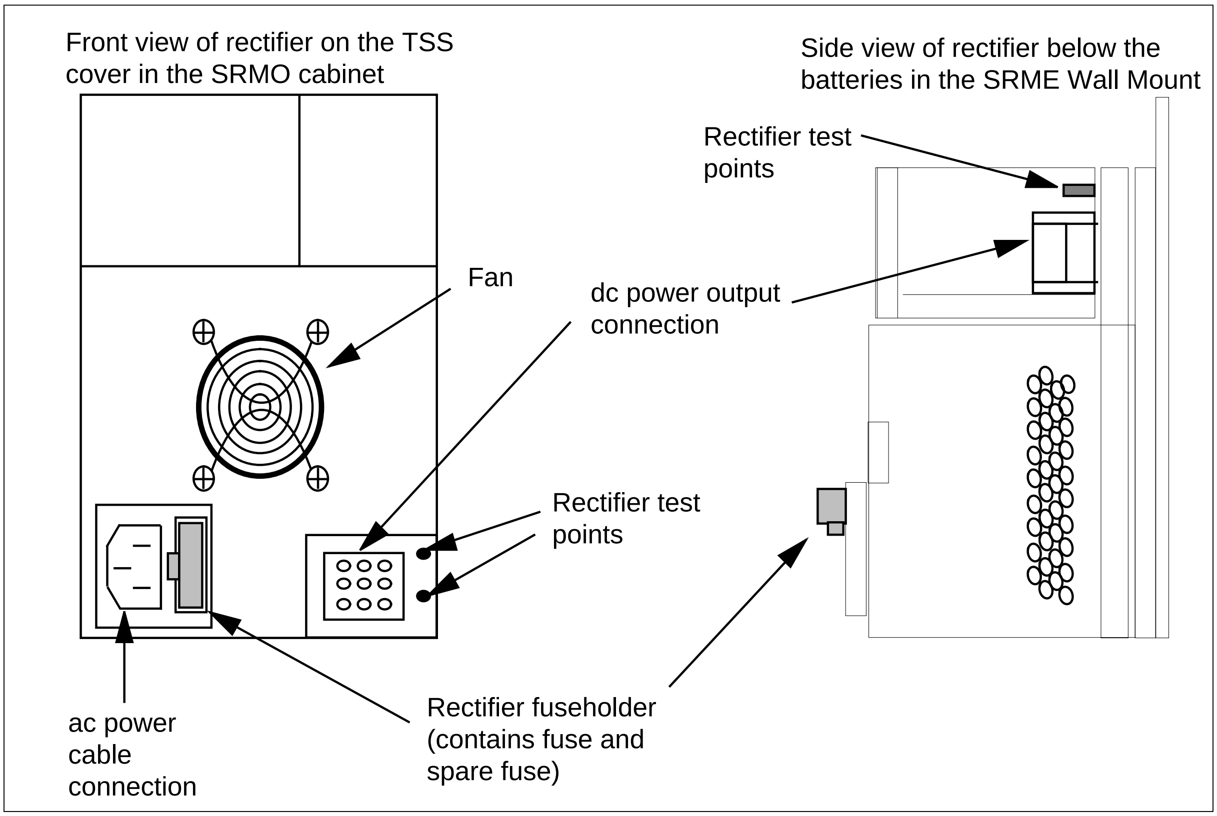
The NTTR46AA/AB ac/dc rectifier is on the TSS cover in the SRMO cabinet. In the SRME Wall Mount, the rectifier is below the batteries. The ac/dc rectifier converts the ac input power to -48 V dc required by the Star Module.

A rectifier alarm is output to the SMC when there is a dc output failure at the rectifier because of

- ac failure
- rectifier failure
- ac circuit breaker trip in the ac panel

The power cord plug on the rectifier also contains a fuse holder. The fuse holder contains one spare fuse and one active fuse. The following figure shows the connectors and fuse holder on the ac/dc rectifier.

Figure 2-20 NTTR46AA/AB ac/dc rectifier



NTTR66AA EMI filter card

The NTTR66AA electromagnetic interference (EMI) filter card is at the bottom of the TSS. There are four EMI filter cards installed to support 64 lines. Each EMI filter card is

- a voice frequency (VF) filter card that attenuates high frequency signals from the voice frequency lines
- an EMI common mode filter for 16 line card pairs
- an EMI filter for the DS-1 links to the TSS

The EMI cards provide filtering for the following line cards

- EMI card 0 filters line cards 0-15 in lower line subgroup
- EMI card 1 filters line cards 16-31 in lower line subgroup
- EMI card 2 filters line cards 0-15 in upper line subgroup
- EMI card 3 filters line cards 16-31 in upper line subgroup

> ***Note:*** All 16 lines connected to the EMI card are taken out of service when the EMI card is removed.

NTTR67AA dc panel

The NTTR67AA dc panel receives power from the ac/dc rectifier and from batteries. The dc panel

- distributes the main -48 V to the
  - NTTR72AA power supply
  - LTU
  - fans
- provides the talk battery filter and fuse
- controls the battery voltage protection
- houses the
  - -48 V, 10 A main power circuit breaker
  - talk battery filters
  - power test points
  - fuses
    - .50 A auxiliary fuse for customer equipment
    - .50 A LTU fuse (for FMT6 use 1.3A)
    - .50 A fans and heaters fuse
    - 5 A talk battery filter fuse

NTTR70AA/AB Star Module control (SMC) card

The NTTR70AA/AB SMC card (processor) is in the TSS card cage and performs the following:

- controls the switching matrix and the connection to the host
- switches 64 line cards to up to 46 DS0 channels (48 channels of two DS-1 links minus two message channels) using a switching matrix
- supports up to two DS-1 links to the Star Hub
- uses 4 Mbytes of flash memory and 16 Mbytes of DRAM for in-service loading
- controls the 64 line cards
- controls and monitors the dc panel and LMU
- supports HDLC/LAPD protocol
- supports ISDN
- supports digital phase lock loop (DPLL)
- monitors scan and distribution points

There are five LEDs on the faceplate that tell operating company personnel about alarms, the service condition, and the synchronization state of the C-side link.

The 4 Mbytes of flash memory enable the SMC card to keep its load if the SMC card is pulled out or the Star Module is powered down. If there is a power failure, the Star Module recovers automatically using the on-board memory and a fully equipped software load.

The SMC card has three DIP switches. The purpose and settings for these switches follow.

DIP switch 3 on the SMC card defines the type of interface the Star Hub uses. To set the distance between the DS-1 card and the cross connect or transmission equipment, to enable ISDN 64 kbit/s clear channel signaling, and to set the DS-1 interface to use ESF/B8ZS, switches for DIP switch 3 must be in the correct positions. The following table identifies the correct positions for DIP switch 3.

Table 2-13 SMC DIP switch S3 settings

Mode	DIP switch settings				Distance to cross connect	
	S3_1	***S3_2***	***S3_3***	***S3_4***	***Feet***	***Meters***
DS-1 extended superframe (ESF) binary eight bit zero substitution (B8ZS) code suppression	Off	Off	Off	Off	0-133	0-41
	Off	Off	Off	On	133-266	41-81
	Off	Off	On	Off	266-399	81-122
	Off	Off	On	On	399-533	122-163
	Off	On	Off	Off	533-655	163-200

DIP switches 1 and 2 define the ground settings for the Star Module. The following table lists the correct settings for DIP switches 1 and 2.

Table 2-14 SMC DIP switches S1 and S2 settings

Function		Switch number	DIP switch settings							
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Grounding receive shield	Disable	1	On	On	On	Off	Off	Off	Off	Off
		2								
	Enable Direct	1	On	On	On	Off	Off	Off	Off	On
		2								
	Enable capacitor	1	On	On	On	Off	Off	Off	Off	Off
		2								On

Star Module to Star Hub DS-1 links

There are up to two DS-1 links that connect the Star Module to the Star Hub. The DS-1 links that connect the Star Module to the Star Hub are, for maintenance purposes, part of the Star Module. These links are not considered P-side links from the Star Hub. From a maintenance point of view, the state of the DS-1 lnks cannot be in a state higher than the RLD state. This means if two links connect to the RLD, then at least one of the RLD links is in the same state as the RLD.

> ***Note:*** If one DS-1 link connects the Star Module to the Star Hub, the Star Module operates in simplex mode. This means if the DS-1 link is cut or

develops faults, there is no other way for calls to be processed and sent to the host for routing.

There is a permanent mapping between the drawer numbers for the Star Module and the DS-1 port numbers for the Star Hub. The following table shows the relationship between the logical drawer number and the Star Hub DS-1 port number.

Table 2-15 Star Hub DS-1 port numbers and the Star Module drawer numbers mapping

Star Hub line drawer number	RLD numbering in table LCMDRINV	Unit 0			Unit 1		
		Logical drawer number	***Unit 0 (own) DS-1***	***Unit 1 (mate) DS-1***	***Logical drawer number***	***Unit 1 (own) DS-1***	***Unit 0 (mate) DS-1***
1	0	0	0	1	1	1	0
2	1	2	2	3	3	3	2
3	2	4	4	5	5	5	4
4	3	6	6	7	7	7	6
5	4	8	8	9	9	9	8
6	5	10	10	11	11	11	10
7	6	12	12	13	13	13	12
8	7	14	14	15	15	15	14
9	8	16	16	17	17	17	16
10	9	18	18	19	19	19	18
11	10	20	20	21	21	21	20
12	11	22	22	23	23	23	22
13	12	24	24	25	25	25	24
14	13	26	26	27	27	27	26
15	14	28	28	29	29	29	28
16	15	30	30	31	31	31	30
17	x	32	-	-	33	-	-
18	x	34	-	-	35	-	-

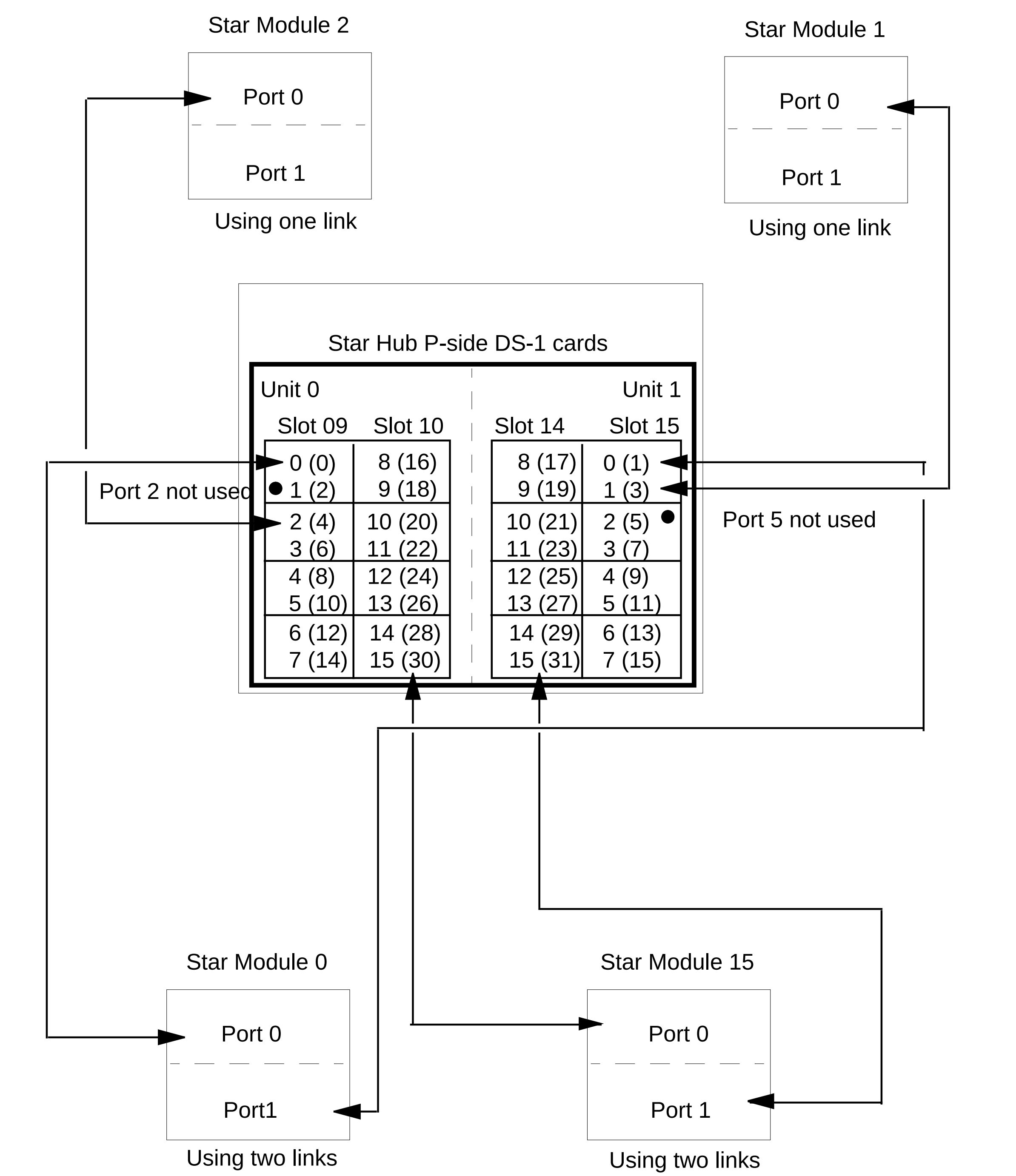
The following table shows the relationship between the Star Modules and the DS-1 ports in the Star Hub.

Table 2-16 Mapping Star Module ports to DS-1 slot and port numbers

Star Module and link numbers	Star Hub DS-1 slot and port numbers	Star Hub P-side port numbers	Star Module and link numbers	Star Hub DS-1 slot and port numbers	Star Hub P-side port numbers
Module 0 link 0	Slot 9, port 0	0	Module 8 link 0	Slot 10, port 8	16
Module 0 link 1	Slot 15, port 0	1	Module 8 link 1	Slot 14, port 8	17
Module 1 link 0	Slot 9, port 1	2	Module 9 link 0	Slot 10, port 9	18
Module 1 link 1	Slot 15, port 1	3	Module 9 link 1	Slot 14, port 9	19
Module 2 link 0	Slot 9, port 2	4	Module 10 link 0	Slot 10, port 10	20
Module 2 link 1	Slot 15, port 2	5	Module 10 link 1	Slot 14, port 10	21
Module 3 link 0	Slot 9, port 3	6	Module 11 link 0	Slot 10, port 11	22
Module 3 link 1	Slot 15, port 3	7	Module 11 link 1	Slot 14, port 11	23
Module 4 link 0	Slot 9, port 4	8	Module 12 link 0	Slot 10, port 12	24
Module 4 link 1	Slot 15, port 4	9	Module 12 link 1	Slot 14, port 12	25
Module 5 link 0	Slot 9, port 5	10	Module 13 link 0	Slot 10, port 13	26
Module 5 link 1	Slot 15, port 5	11	Module 13 link 1	Slot 14, port 13	27
Module 6 link 0	Slot 9, port 6	12	Module 14 link 0	Slot 10, port 14	28
Module 6 link 1	Slot 15, port 6	13	Module 14 link 1	Slot 14, port 14	29
Module 7 link 0	Slot 9, port 7	14	Module 15 link 0	Slot 10, port 15	30
Module 7 link 1	Slot 15, port 7	15	Module 15 link 1	Slot 14, port 15	31

The following figure shows an example of the port mapping scheme.

Figure 2-21 Star Hub P-side links mapping



Note: The two numbers for each port in this figure [for example, 14 (29)] represent the following: the first number (14) is the DS-1 card port number by unit; the second number (29) is the Star Hub P-side port number.

NTTR71AA line maintenance unit

The NTTR71AA line maintenance unit (LMU) card is a digital signal processor controlled by the SMC. The LMU does not require a separate load. Instead it is loaded as part of the SMC loadfile. The LMU

- supports line metallic and loop maintenance for ISDN and POTS lines
- supports temperature and humidity measurements for those Star Modules that are in an SRMO cabinet
- reports the temperature and humidity measurements and alarms to the scan and distribution points
- monitors battery voltage and charging activities
- does not support MONTALK interface for monitoring or talking to a line, meaning the Star Module does not support the MONTALK capability

The CC and the LMU communicate through the Star Hub. If the LMU fails, or there is a communication failure between the SMC and the LMU, the Star Module goes in-service trouble (ISTb). In addition, a major alarm is output for the Star Module.

NTTR72AA power supply and ringing card

The NTTR72AA power supply and ringing card is in two slots in the TSS and supplies

- +5 V and +15 V to the SMC and LMU from the -48 V input
- 12.7 V, 130 V, 52 V coded ringing voltage to POTS lines
- +5 V ISDN power to ISDN line cards, if installed

The power supply has the following features:

- output overvoltage protection
- input dc voltage from -40 to -60 V dc
- output current overload and short circuit protection
- +5.1 V and +15 v over and undervoltage detection. When the monitor detects a failure, the circuit is stopped.
- faceplate mounted LED provides power supply OK indication
- coin current detector
- ring multiplexer
- coin multiplexer

The coin and ringer function of the card provides four dc voltage outputs that are used for coin functions.

The following are features of the coin and ringer function of the card:

- uses input dc voltage of -40 V dc to -60 V dc
- supplies +52 V, -52 V, +130 V, or -130 V coin output voltage
- generates ringing signal
- provides over-voltage protection. The ringing generator stops when the
  - — +52 or -52 V output is ±58.2 V dc
  - — +130 V or -130 V output is ±143.3 V dc
- provides low voltage detection and over current protection on +52 V, -52 V, +130 V, and -130 V outputs

TSS backplane, card cage, and terminal blocks

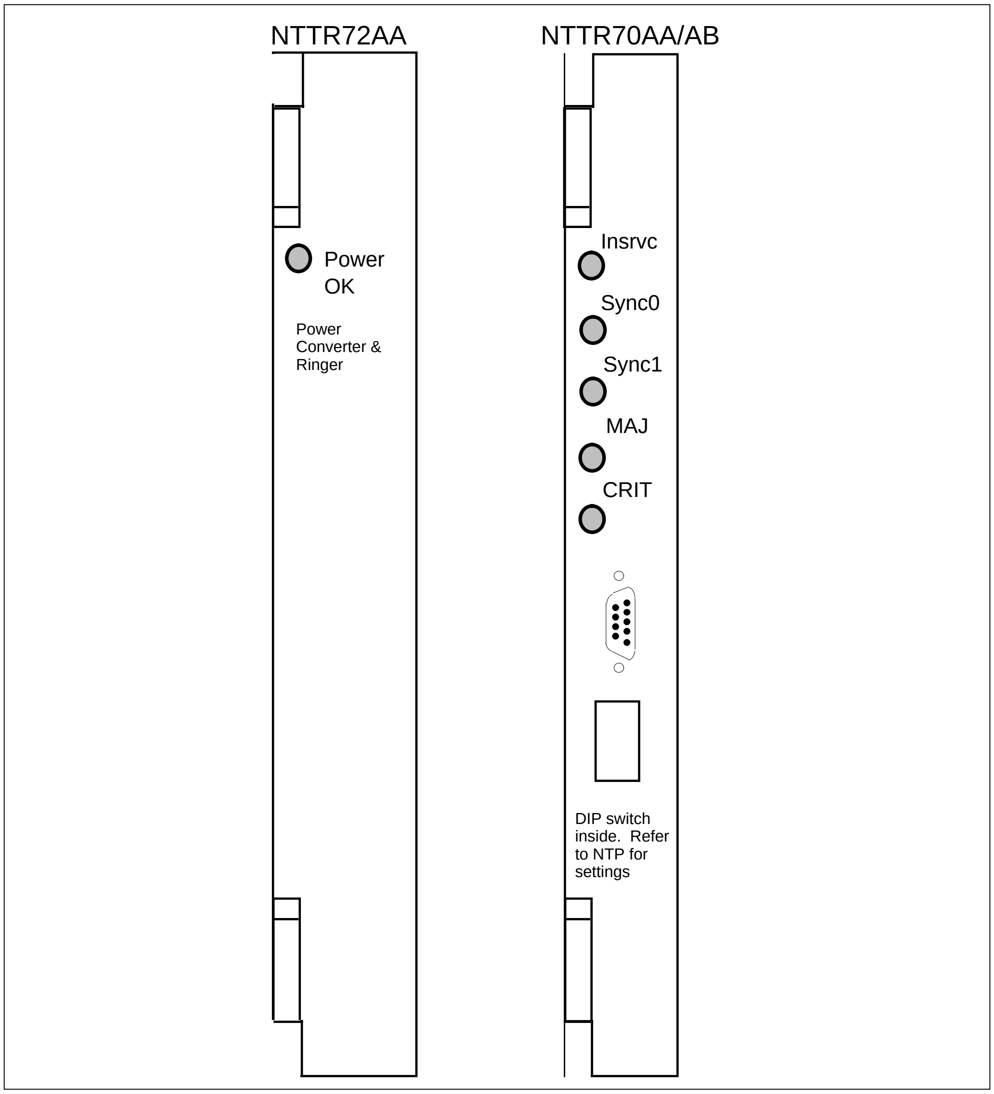
The TSS backplane provides a connection between the following:

- power supply, ringer, and coin card
- SMC card
- LMU card
- 64 line cards
- dc panel
- EMI filter cards
- seven main distribution frame (MDF) blocks. Each block contains ten solid state lightning protectors.

TSS circuit card status indicators

The following figure shows the circuit cards with status indicators.

Figure 2-22 TSS circuit cards with status indicators



The following table lists the status indicators on the TSS circuit cards shown in the previous figure and identifies their functions.

Table 2-17 TSS status indicators (Sheet 1 of 2)

Indicator name	Circuit card	LED color	Function
InSv	NTTR70AA/AB	Green	Indicates the SMC is in service
Sync0	NTTR70AA/AB	Red	Indicates that C-side link 0 has lost sync
Sync1	NTTR70AA/AB	Red	Indicates that C-side link 1 (if equipped) has lost sync

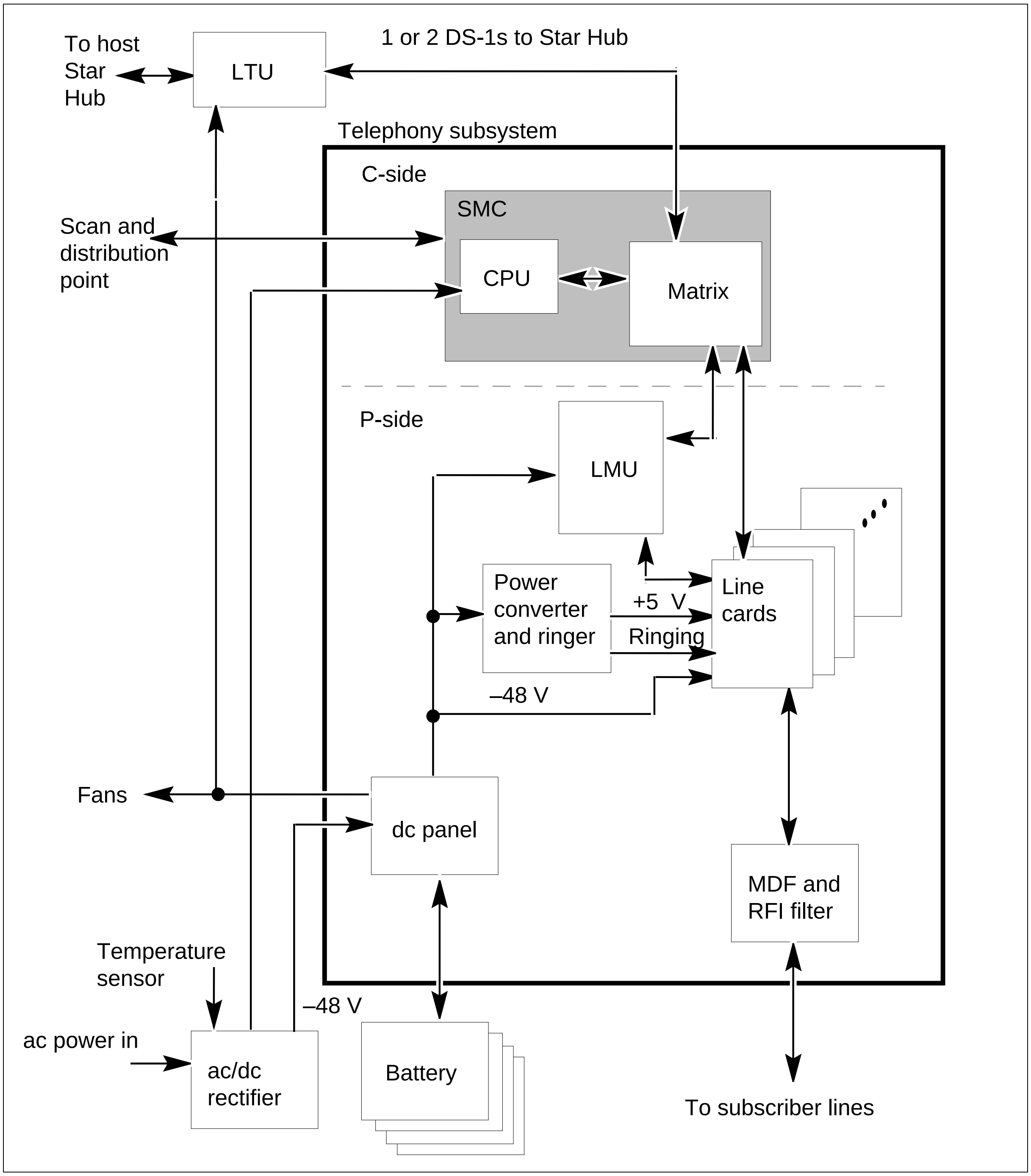
Table 2-17 TSS status indicators (Sheet 2 of 2)

Indicator name	Circuit card	LED color	Function
Major	NTTR70AA/AB	Orange	Indicates a Major alarm status
Critical	NTTR70AA/AB	Red	Indicates a Critical alarm status
Power OK	NTTR72AA	Green	When off, indicates that the card failed because of • overcurrent • overvoltage • undervoltage • main circuit breaker OFF
Main dc	NTTR67AA	Green	Indicates the presence of main -48 V
DC OK	NTTR46AA/AB	Green	Indicates the presence of main -48 V in the output
AC On	NTTR47AA	Green	Indicates the presence of main ac power

Star Module circuit card interconnections

The following figure shows how the circuit cards are functionally interconnected for the Star Module.

Figure 2-23 Functional block diagram of the Star Module



Star Module

The Star Module is in one of two versions depending on the location where the Star Remote is installed:

- NTTR45AA/AB SRME Wall Mount

  Note: The NTTR45AB Wall Mount supports Class B (residential) service. The NTTR45AA is for other indoor wall-mounted use.

- NTTR40AA SRMO cabinet

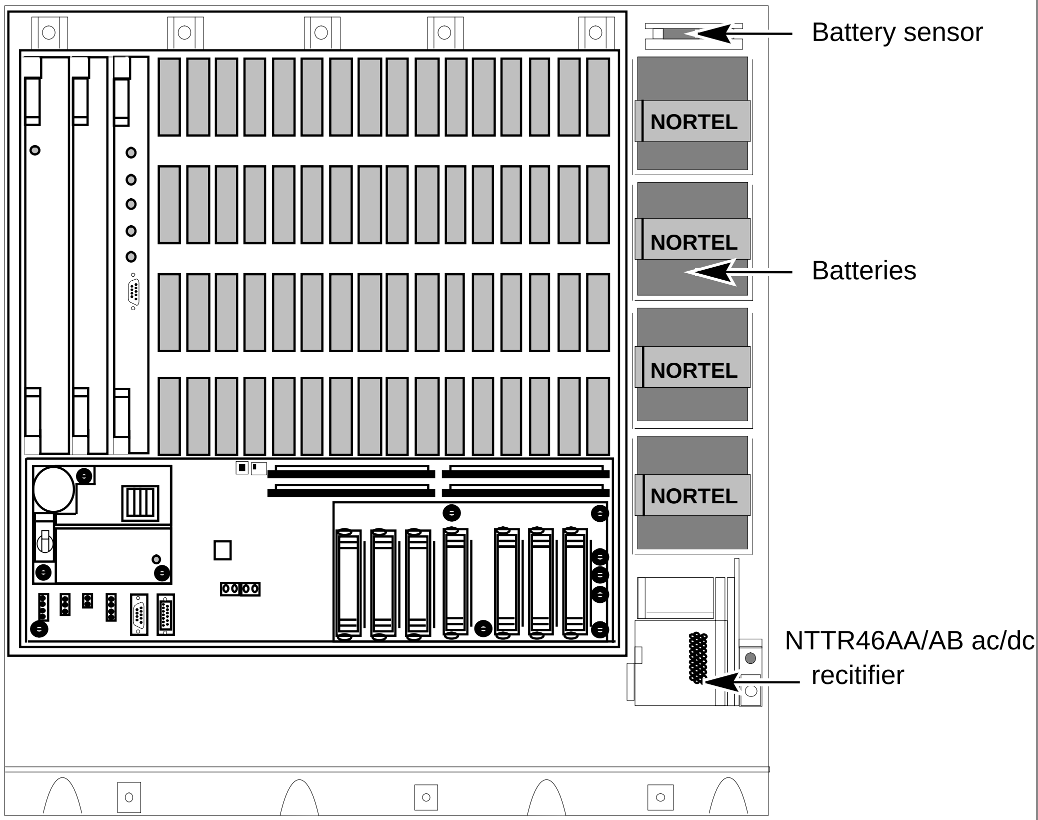
SRME Wall Mount

The SRME Wall Mount is for indoor use and is installed on a wall. The SRME Wall Mount includes the following, in addition to the TSS which was discussed earlier.

- metal enclosure, front cover, and EMI gaskets
- power components, including a 100 V ac/220 V ac to 50 V dc rectifier and four 12 V batteries

The following figure shows the Star Module in an SRME Wall Mount.

Figure 2-24 SRME Wall Mount (shown with cover removed)



When the front cover of the SRME Wall Mount is removed, a door interlock switch opens. A door alarm is sent to the RLD PES system that notifies operating company personnel of the open door condition. Operating company personnel can pull on the interlock switch to silence the alarm while performing maintenance activities. When the cover is replaced, the door interlock switch returns to the closed position.

Batteries There is one string of four lead/acid sealed batteries. The Star Module in the SRME Wall Mount uses

- Eagle Picher batteries, type HE12V17, with a nominal capacity of 12 V, 12 Ah.
- Yuasa batteries, type NP12-12, with a nominal capacity of 12 V, 12.7 Ah.

The batteries are made to support 8 hours of operation for the Star Module with a fully equipped cabinet, running normal traffic. When the input ac voltage drops to 37 to 43 V, the batteries supply voltage to the rectifier to power the

Star Module. When the input ac voltage returns to within the 46 to 50 V range, the batteries are automatically disconnected.

> ***Note:*** Because there is one set of batteries in the Star Module, only one hardware test of the batteries is run every day and every 3 months.

The TSS monitors the batteries for battery voltage and performs a 10-minute battery capacity test once every 3 months. During this test the battery voltage is checked every 15 s to make sure the battery voltage does not fall below 48.2 V dc ± 0.2 V dc. If the battery test fails, the SMC card sends a battery failure alarm to the Star Hub. In addition, one temperature sensor is above the batteries to assist in the battery voltage compensation circuit. Every day the batteries are checked that they are connected and supply power.

Main distribution frame blocks There are seven MDF blocks located at the bottom of the TSS backplane. Each MDF block contains up to ten solid state lightning protectors. There is one protector for each line. The exposed vertical end of each MDF block is easily removed to access subscriber line test points. The test points permit separate testing of the subscriber side and Star Module side of the line. A Nortel Networks provided cable, part number A0766452 that connects to the MDF block, is provided with the Star Module to monitor the subscriber line to the network side and to the subscriber side. In addition, if a lightning protector requires replacement, a tool is available to pull the MDF block.

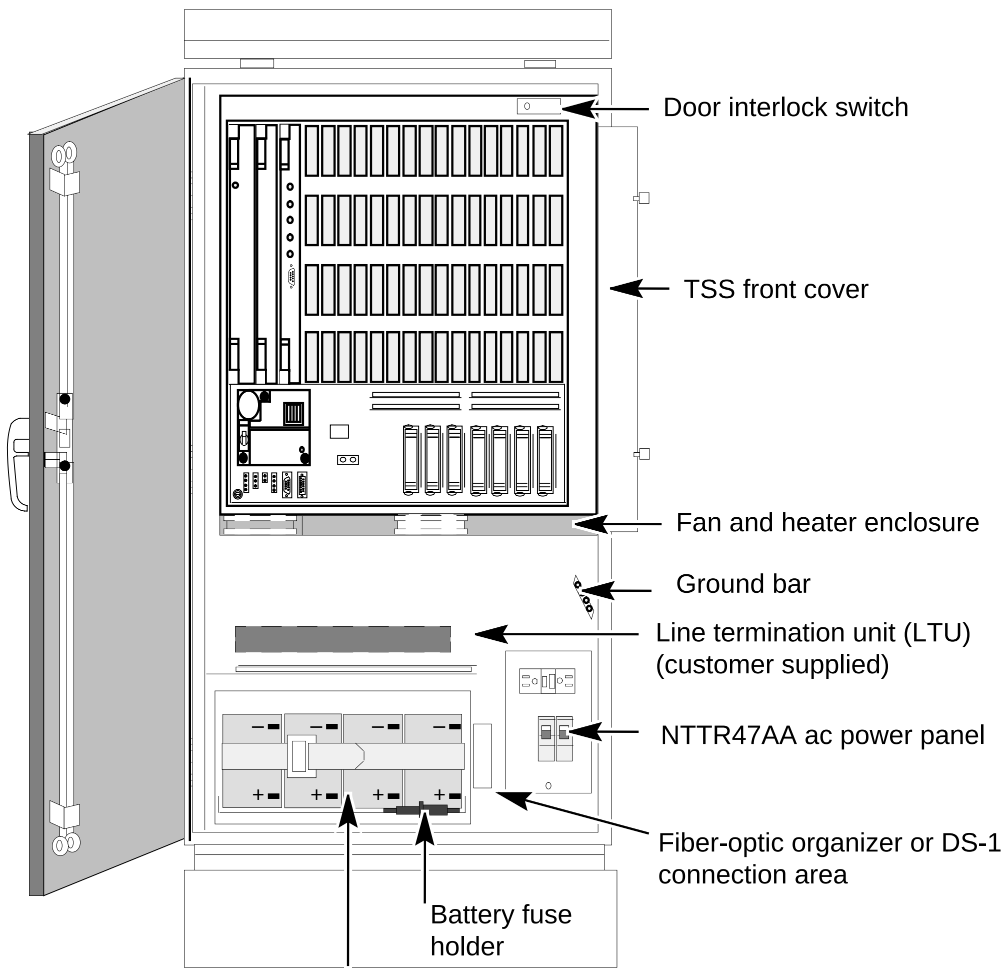
SRMO cabinet

The SRMO cabinet is designed for outside use and can be pad, pole, or deck-mounted. The SRMO cabinet includes the following in addition to the TSS:

- metal enclosure, including front access door and top cover
- power components, including 100 V ac/220 V ac to 50 V dc rectifier and four 12 V batteries, and ac power panel
- transmission components including support for an LTU for fiber optic or copper termination and a fiber optic organizer
- environmental controls, including fans, heaters, temperature sensors, humidity sensors, and thermostats

When the door to the SRMO cabinet is opened, a door interlock switch is opened. A door alarm is sent to the RLD PES system to notify operating company personnel of the open door condition. The interlock can be pulled out to silence the alarm while maintenance activities are performed. When the door is closed the interlock is set to the closed position.

Figure 2-25 SRMO cabinet



Batteries There is one string of four lead/acid sealed batteries. The Star Module in the SRMO cabinet uses Yuasa batteries, type NP18-12BFR, with a nominal capacity of 12 V, 17Ah.

The batteries are made to support 8 hours of operation for the Star Module with a fully equipped cabinet, running normal traffic. When the input ac voltage drops to a range of 37 to 43 V, the batteries supply voltage to the rectifier to power the Star Module. When the input ac voltage returns to within the 46 to 50 V range, the batteries are automatically disconnected.

> ***Note:*** Because there is one set of batteries in the Star Module, only one hardware test is provided every day and every 3 months.

The TSS monitors the batteries for battery voltage and performs a battery capacity test once every 3 months. During this test the battery voltage is checked every 15 s to make sure the battery voltage does not fall below 48.2 V dc ± 0.2 V dc. If the battery test fails, the SMC card sends a battery failure alarm to the Star Hub. Every day the batteries are checked that they are connected and supply power.

For best battery operation, Nortel Network recommends replacing all four batteries if there is a failure in one of the batteries.

NTTR47AA ac panel The NTTR47AA ac panel connects outside 110 or 220 V ac power to the SRMO cabinet. The ac panel contains the following:

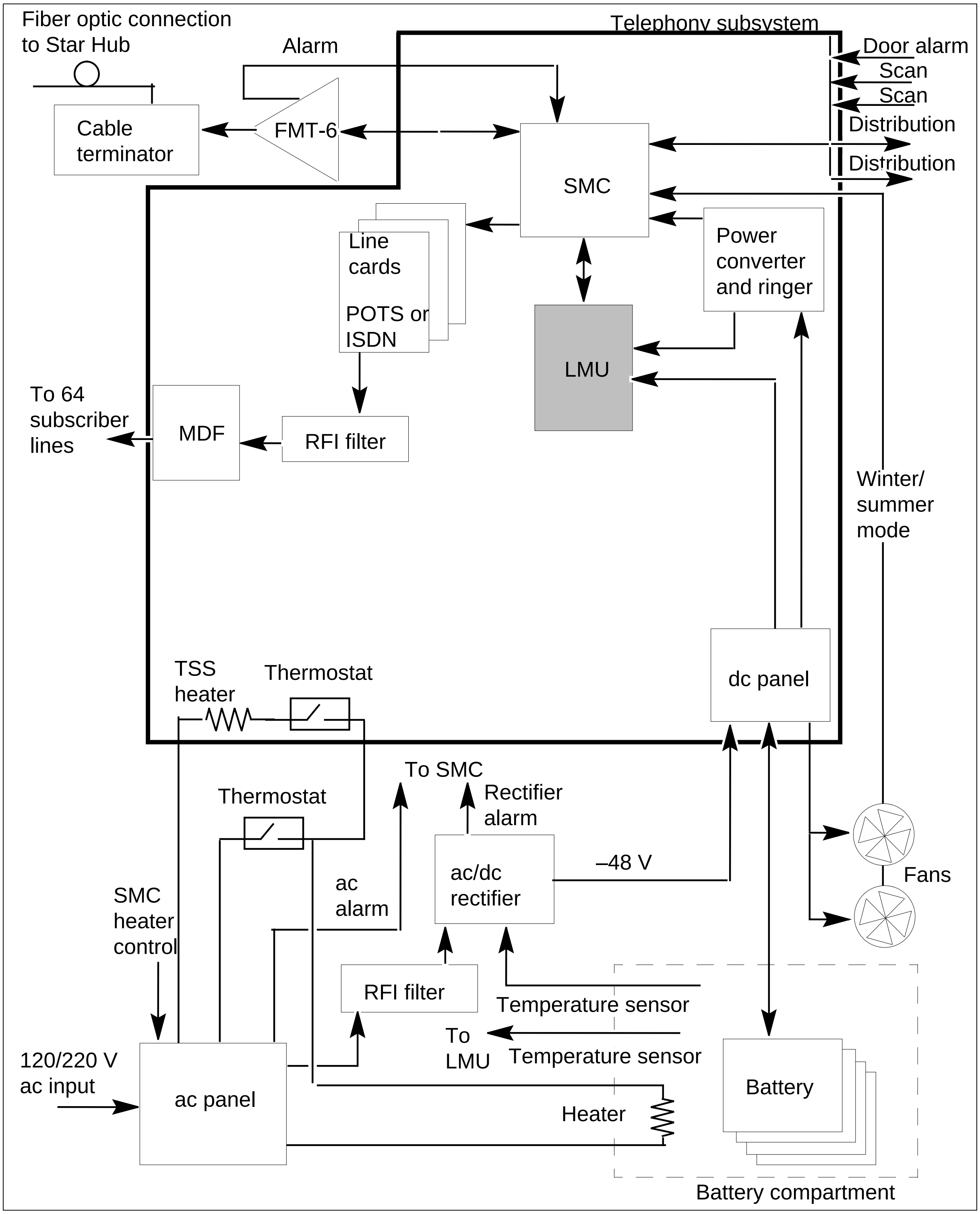
- protection against electrical faults
- relay to activate and deactivate the battery heater. The relay is controlled by the SMC card.
- connections to mechanical thermostats to activate and deactivate the TSS heater and battery heater
- green LED that indicates that ac power is available
- ac bus to distribute power
- two circuit breakers
  - — main circuit breaker, 16 A
  - — telephony equipment circuit breaker, 6 A
- ground fault protection service outlet, 10 A maximum

Main distribution frame blocks There are seven MDF blocks located at the bottom of the TSS backplane. Each MDF block contains up to ten solid state lightning protectors. There is one protector for each line. The exposed vertical end of each MDF block is easily removed to access subsciber line test points. The test points permit separate testing of the subscriber side and Star Module side of the line. A Nortel Networks provided cable, part number A0766452 that connects to the MDF block, is provided with the Star Module to monitor the subscriber line to the network side and to the subscriber side. In addition, if a lightning protector must be replaced, a tool is available to pull the MDF block.

Environmental controls

The environmental controls for the SRMO cabinet are presented in this section. The following figure shows how the different elements of the environmental system are linked.

Figure 2-26 Functional block diagram of the Star Module environmental system



Temperature sensing

The SRMO cabinet is provided with over temperature protection to prevent component damage in case of overheating.

There are three thermostats in the SRMO cabinet:

- If the temperature at the top of the cabinet exceeds 80° C, a thermostat at the top of the SMC card turns off the NTTR72AA power supply and ringing card. This action switches OFF the TSS while the ac power is on.
- one thermostat at the top of the SRMO cabinet that controls the TSS heater.
- one thermostat at the ACP card that controls the battery compartment heater.

In the SMRO, when the temperature drops below 70° C (or 65° C in the SRME), the converters are turned ON without manual intervention.

There are four resistive temperature sensors in the RLD cabinet. The sensors are scanned by the SMC card to check the temperature is within the -30° C to 70° X. If the temperature exceeds 50° C, two fans are activated to cool the air in the cabinet. When the temperature decreases to 30° C, the fans are deactivated. If the temperature goes below -10° C, the right fan is activated at low speed to circulate warm air generated by electronic components. If the battery compartment temperature goes below 0° C, the battery compartment is activated. The heater is turned OFF when the battery compartment temperature is above 5° C. These sensors are located as follows:

- one at the top of the cabinet in the LMU card
- one at the bottom of the cabinet on the dc panel
- one in the battery compartment

An additional temperature sensor is located in the battery compartment that connects to the rectifier to regulate its output voltage.

Circulation fans

The SRMO cabinet is provided with two dc-powered, 90 mm circulation fans. The SMC card controls the fans in the TSS. These fans have two operating modes.

- cooling mode, when both fans are operational
- heating mode, when one fan runs at a reduced voltage to reduce its speed

To keep the cabinet cool, the cabinet has a closed air circulation. Air is pulled through the TSS cage by the circulation fans and routed up to flow along the external metal walls of the cabinet. This allows the transfer of heat through the walls to the outside environment. These two fans are controlled by the SMC card in the TSS. If a fan fails, a fan alarm is generated.

Heaters

Two electric strip heater elements are provided for cold weather. A 100 Watt heater is below the TSS to keep the TSS cards warm in very cold weather. This heater is controlled by a thermostat located a the top of the cabinet. It is powered directly from the ac module.

A 50 Watt heater element is in the battery compartment below the batteries to keep the batteries warm in very cold weather. The battery heater is controlled by the SMC card.

Venting battery gas

Ventilation holes located at the top of the battery compartment allow venting of hydrogen battery gas out the back of the SRMO cabinet.

Humidity control

The atmosphere within the cabinet is closed to prevent the entry of moist polluted ambient air. The LMU measures the cabinet's humidity. If the humidity rises to the point where it becomes a problem, the cabinet provides locations for installing desiccant bags.

Line termination unit

The Star Module is provided with an LTU for copper or fiber connections. The LTU terminates the two DS-1 links toward the C-side (Star Hub).

For copper high speed digital subscriber line (HDSL) connections, the operating company may choose an acceptable LTU vendor to provide the copper DS-1 termination. When an HDSL LTU device is installed in the Star Module, another LTU device is required at the host end to terminate the connections at the Star Hub.

For fiber-optic connections, the Nortel Networks Fiber Multiplexer Terminal-6 (FMT-6) is used. This is a stand-alone multiplexer and 6-Mbit/s light-wave transmission system. The FMT-6 transports up to four DS-1 electric signals by single mode or multimode fiber-optic cable. The Star Hub requires a mate FMT-6 to terminate the fiber DS-1 connections from the Star Module and provide the conversion from optical to electrical signals.

The LTU is maintained through the transmission equipment management network and not by the DMS-100 switch. However, for the Star Module LTU, any critical LTU failure generates a transmission alarm visible at the MAP terminal.

For more information about the FMT-6, refer to *FMT-6 User Guide*, 321-3231-290.

3 Signaling for the Star Remote System

Introduction

This section addresses the following aspects of Star Remote System functionality:

- voice and data communications
- integrated services digital network (ISDN) Basic Rate Interface (BRI) signaling (functional signaling only, no support for stimulus signaling)
- communications protocols
- signaling functions and capabilities

Voice and data communications

Voice and data calls are transferred between the host peripheral module (PM) and the Star Hub, and the Star Hub and Star Module over DS-1 Superframe format links using extended Superframe format (ESF) signaling. The host PM can be a

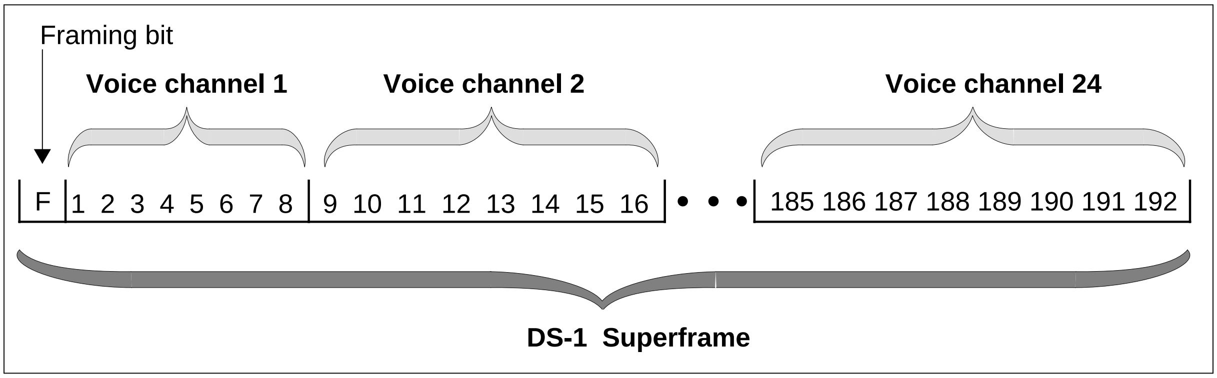
- line trunk controller (LTC) with the NTMX77AA unified processor or NTSX05AA processor (LTC+)
- line group controller (LGC) with the NTMX77AA unified processor (LGC+)
- remote cluster controller 2 (RCC2) with an NTAX74AA processor

DS-1 Superframe format

Information transmits between the host PM and Star Hub over DS-1 links. The Star Module and Star Hub communicate over DS-1 links. DS-1 links operate at a rate of 1.544 Mbyte/s with a sampling frequency of 8000 frames each second.

The DS-1 frame contains 24 8-bit bytes and a framing bit for a total of 193 bits for each frame. The 8-bit bytes fit into time slots or channels for a total of 24 channels in each frame. The framing bit goes before the 24 channels. These channels carry either speech information, signaling information, or operations information. The following figure shows the format of a DS-1 frame.

Figure 3-1 DS-1 Superframe format



The framing bit identifies the location of the first time slot in the frame. When the Star Hub receives a framing bit, the Star Hub is told the eight bits that follow contain information from time slot one. The framing bit provides frame alignment within the superframe and extended superframe alignment configurations.

Superframe format signaling

A superframe contains twelve 24-channel frames. Superframe signaling uses framing bits for frame alignment and superframe alignment. The framing bit identifies the location of the first time slot in the frame. When the Star Hub receives a framing bit, the Star Hub is told that the eight bits that follow contain information from time slot one.

Superframe alignment identifies frames where time-slot-associated signaling bits are present. In superframe alignment, the framing bits, one for each 24-channel frame, form a 12-bit pattern. The following table shows this pattern.

Table 3-1 (Sheet 1 of 2)

Frame number	Framing bit type	Framing bit value
1	Ft	1
2	Fs	0
3	Ft	0
4	Fs	0
5	Ft	1
6	Fs	1
7	Ft	0

Table 3-1 (Sheet 2 of 2)

Frame number	Framing bit type	Framing bit value
8	Fs	1
9	Ft	1
10	Fs	1
11	Ft	0
12	Fs	0

Framing bits from frames 1, 3, 5, 7, 9, and 11 are frame timing (Ft) bits. Framing bits from frames 2, 4, 6, 8, 10, and 12 are frame signaling (Fs) bits.

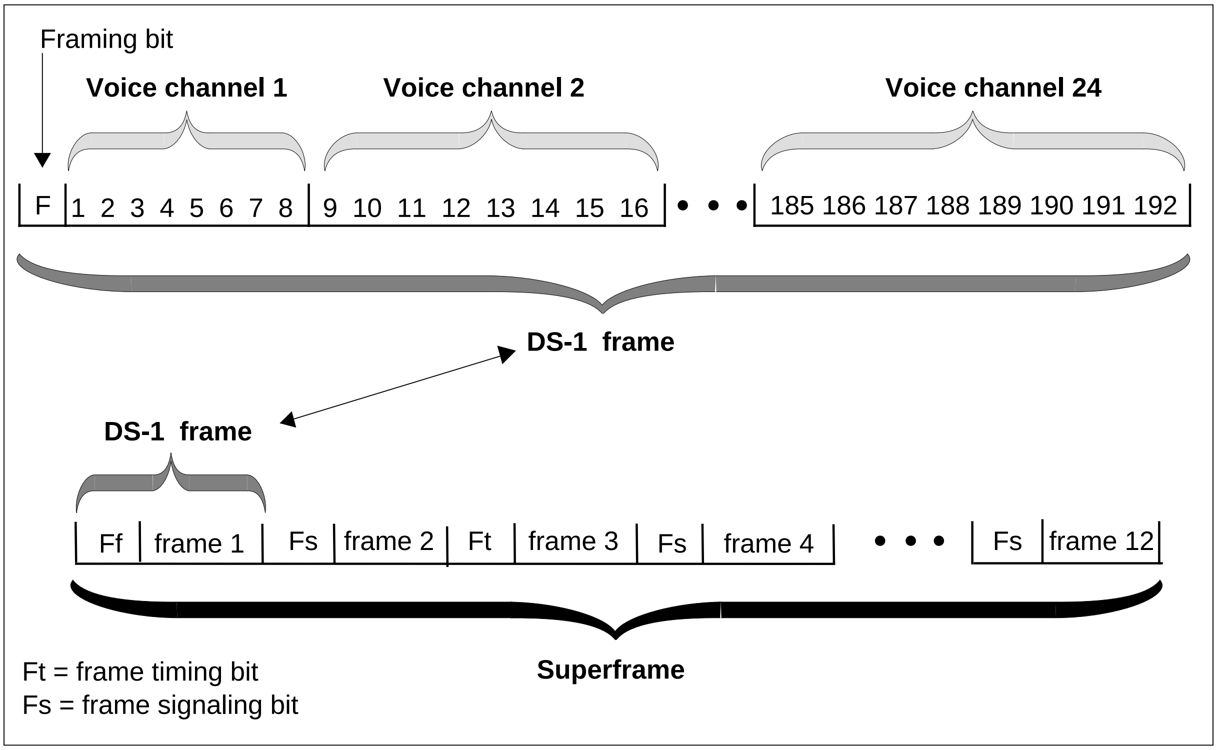
When an Fs bit changes from 0 to 1 (occurs in the change from frame 4 to frame 6), this signals the Star Hub that the sixth frame follows the 1 framing bit. When an Fs bit changes from 1 to 0 (that occurs in the change from frame 10 to frame 12), this notifies the Star Hub that the twelfth frame follows the 0 framing bit.

It is important to identify the sixth and twelfth frames in a superframe because these frames contain time-slot-associated signaling bits. These bits are found on all 24 time slots of the sixth and twelfth frames in the least significant bit position. A speech-signal bit was in this position first, but the speech-signal bit was robbed. The speech-signal bit was replaced with a signaling bit that depends on the direction the data is moving.

Signaling bits located in the sixth frame are called A-bits. Signaling bits located in the twelfth frame are called B-bits.

The following figure shows the format of a DS-1 superframe.

Figure 3-2 DS-1 superframe format



Extended superframe format signaling

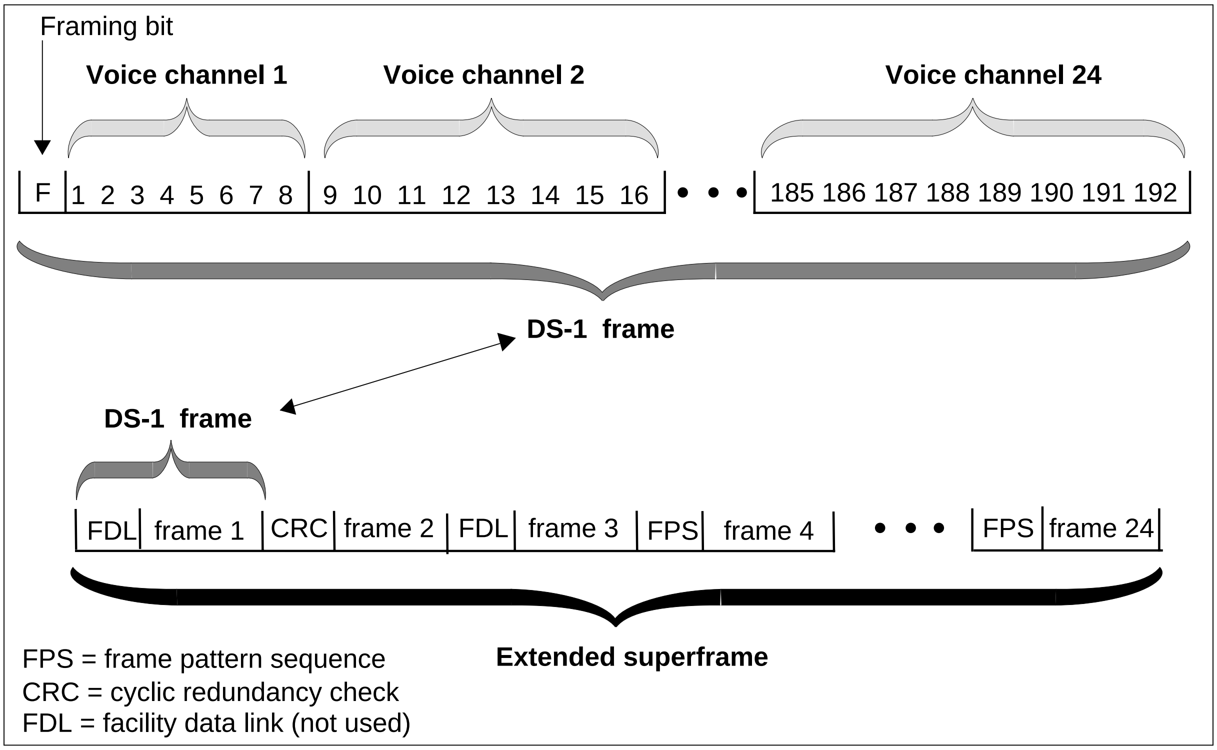
Extended superframe format (ESF) signaling monitors DS-1 link performance and maintenance functions. ESF signaling improves robbed bit signaling messages by allowing messages to be represented by ABCD bits instead of AB bits the superframe format uses.

The ESF contains 24 DS-1 frames. In ESF, the framing bits (one for each 24-channel frame) form a 24-bit pattern. The 24-bit pattern communicates three types of information:

- frame pattern sequence (FPS)—The framing bit carries an FPS value of 001010. The FPS begins at the fourth frame and occurs every fourth frame using the framing bits. The FPS defines an in-frame condition.
- facility data link (FDL) performance (this capability is not used)—The FDL 4 is a Kb/s message. The FDL begins at the first frame and occurs every other frame thereafter using the framing bits. The Star Hub does not support facility protection and does not use FDL messaging bits.
- cyclic redundancy check (CRC)—The CRC is not supported.

The following figure shows the format of a DS-1 ESF.

Figure 3-3 DS-1 ESF format



The following table details the extended superframe alignment pattern.

Table 3-2 Extended superframe alignment pattern (Sheet 1 of 2)

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

m = message bits
CB = check bits

Table 3-2 Extended superframe alignment pattern (Sheet 2 of 2)

Frame number	Framing bit type	Framing bit value
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	0
m = message bits CB = check bits		

ISDN BRI signaling

ISDN basic rate interface (ISDN BRI), commonly referred to as 2B+D, contains two 64-kbit B-channels for voice and data and a 16-kbit D-channel for signaling and packet data. There are two types of ISDN BRI signaling: functional and stimulus.

Software supports functional signaling built into the BRI terminal. The Q.931 protocol (operating in the host XPM), with the signaling control protocol sends call control messages between the terminal and the network. The Star Hub does not support stimulus signaling.

ISDN BRI contains two B-channels for voice and packet data and a D-channel for signaling. The system assigns the B-channels automatically for voice and data use. The D-channel is a permanently assigned network connection, established at provisioning time. Messages over the embedded operations channel (EOC) control the assignment of the D-channel.

Communication protocol

The host XPM and Star Hub communicate with the SuperNode switch over DS-1 links that terminate on the host XPM. The high level data link control (HDLC) protocol communicates between the host XPM and the Star Hub.

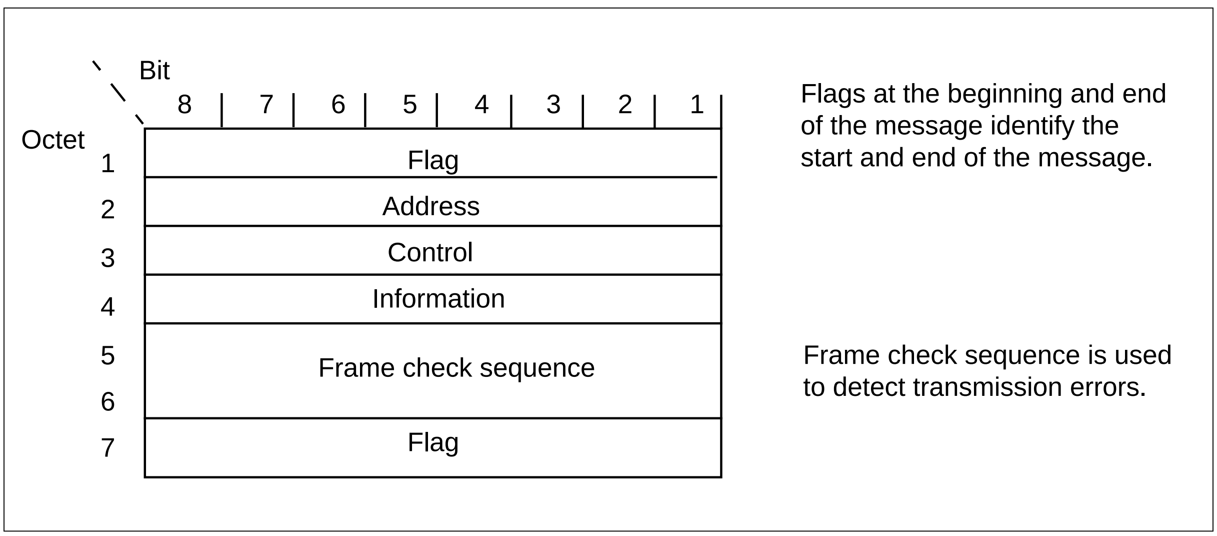
HDLC-based Q.921 CCITT LAPD protocol

HDLC protocol is message protocol used to communicate between the

- host XPM and the Star Hub
- Star Hub and the Star Module

In the host XPM, the NTMX76AB messaging card uses the HDLC protocol. The following figure shows the HDLC message structure.

Figure 3-4 HDLC message format



The Q.921 LAPD protocol

- establishes data link communications between the
  - — host XPM and the Star Hub
  - — Star Hub and the Star Module
- transmits information sent from a higher layer protocol
- receives information for delivery to a higher layer protocol

Signaling functions and capabilities

This section describes the signaling protocols used by the Star Hub to communicate with the DMS SuperNode switch and provide subscriber services. The following paragraphs discuss Star Hub signaling and the types of subscriber services they provide.

Star Hub signaling links

The NTMX81AA DS-1 interface cards in the Star Hub control shelf are the signaling interfaces between the Star Hub and the host XPM.

Each DS-1 interface card accepts up to two DS-1 links from the host XPM. The Star Hub and the host XPM communicate over the DS-1 links through dedicated message channels. This signaling information allows the Star Hub and the host XPM to perform the following tasks

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

The Star Hub is a remote that connects to the DMS SuperNode switch. The host office handles all intersystem (signaling between the host and other systems) and operator (host to subscriber) signaling.

Message channels

The Star Hub requires a minimum of two DS-1 links to the host. These links are primary links. The Star Hub requires two message channels to the host XPM. The message channels are in channel 1 on each of the primary DS-1 links to the host.

The Star Module uses one or two DS-1 links to connect to the host Star Hub. Each DS-1 link contains one message channel to communicate with the Star Hub.

If the Star Module uses one DS-1 link to connect to the Star Hub, that DS-1 link connects according to the Star Module's number. Even numbered Star Modules connect to unit 0 of the Star Hub. Odd numbered Star Modules connect to the unit 1 of the Star Hub. If the Star Module uses two DS-1 links, C-side link 0 connects to unit 0 of the Star Hub and link 1 connects to unit 1 of the Star Hub. These two message links connects to the two line subgroups (LSG) in the Star Module, one for each LSG.

Star Remote System service capabilities

Star Hub signaling maintains call processing activities by allowing the functions of call origination, tone generation, digit collection, and ringing to occur. The following paragraphs describe each of these activities.

Call origination

Star Hub and Star Module signaling transmits the on-hook and off-hook signals that allow the host XPM to identify subscribers requesting service.

When a subscriber goes off hook, a voltage source in the Star Hub or Star Module provides a steady flow of current through the transmitter. The remote controller pack (RCP) processor in the Star Hub or the Star Module Control (SMC) in the Star Module detects this current and sends an off-hook message to the central office (CO). The CO

- uses the off-hook signal as a request for service
- allocates a channel on a DS-1 link to provide service to the subscriber line
- applies dial tone to the line

Depending on the type of telephone, the subscriber line transmits open pulses or dual tone multi frequency (DTMF) signals through the Star Hub to the CO. The CO analyzes the digits and determines an interoffice call was placed. The calling end of the trunk will be seized and a connect signal, which is a sustained off-hook signal, is transmitted forward to the called end of the trunk. This signal indicates a request for service and continues while the connection is held.

Tone generation

The host XPM provides all correct ring cadence tones. The Star Hub applies these tones to subscriber lines when the Star Hub is in emergency stand-alone (ESA) mode. The tones supported by the host are as follows:

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

Digit collection

The Star Hub and Star Module perform the digit collection function of subscriber dialing. The Star Hub and Star Module use dial pulse, or DTMF dialing.

The address of a called party can be transmitted using dial pulsing or multi frequency signaling. Dial pulsing or multi frequency signaling are used for digit transmission only and must join with other types of signaling to provide the DS-1 links with complete signaling capability.

Dial pulse signaling

The Star Hub performs dial pulse digit collection. With dial pulsing, the number of on-hook intervals in a train of pulses represent the number value of each digit.

The on-hook intervals of each digit are separated by short off-hook intervals. The digits are separated by relatively long off-hook intervals. The break time shown as a percent of the pulse period (break + make time) is called percent break.

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

DTMF signaling

Digitone telephones send dial pulse or DTMF signals to transmit address information over a line. During normal operation, the signal is sent to the host. During ESA operation, this information is sent to a Digitone receiver in the UMP.

DTMF signals are distinct combinations of tones which represent digits 0 through 9 and various other special units. The actual decoding of the tones to digits is handled by special trunk interface circuits, the DT and MF receivers.

The UMP in the Star Hub examines the output of these receivers to determine when a digit has been received. The UMP relays the digits from the MF receiver to the host XPM. The host XPM analyzes the digits and then applies a ringing signal to the called line.

End-to-end signaling

End-to-end signaling allows a subscriber to send DTMF signals to the far end using the keypad of a Meridian Digital Centrex (MDC) Meridian business set (MBS). When the customer presses appropriate keys at the MBS set, the subscriber outpulses DTMF signals to the machine that start, stop, rewind, and playback the recordings on tape at the machine. After each 130-millisecond DTMF signal, the pulse code modulation (PCM) signal connects again.

Ringing

The CO determines the type of ringing to apply. The CO sends a ringing signal to the Star Hub over the DS-1 channel associated with the subscriber line being called. This ringing signal tells the Star Hub to connect the ringing generator to that line. The CO provides the following ringing types for the Hub and the Module.

The Star Hub applies:

- superimposed ringing (multiparty)
- coded ringing (cadencing)
- frequency selective ringing (FSR)

The Star Module applies:

- coded ringing (cadencing)

Note 1: The Star Hub ringing definition in table LCMINV does not affect the Star Module ringing. The Star Module supports coded ringing only.

Note 2: For Software release NA11 installations only, the following procedure should be performed to avoid RLD ringing problems:

Procedure 3-1 Table definition in LCMINV for NA11 release only

Table LCMINV

1 Post the Star that contains the RLD.

2 Ensure that the RNGTYPE field in this tuple is “C”.

3 If not, change the tuple to “C”.

Note: Be aware that this change will impact all the lines in the Star Hub.

In the Star Module, the NTTR72AA Power converter and ringer card provide ringing. This card only supports coded ringing. The ringing frequency is provisionable. Operating company personnel can set this value in field RINGER when entering the Star Module in table LCMDRINV.

ESA signaling

The ESA feature is an emergency service that provides a subset of call processing capabilities when communications to the host are lost. This subset includes call processing for basic station-to-station calls within the Star Hub for plain old telephone service (POTS) and MDC lines.

The ESA mode does not support ISDN calls during ESA mode. Any ISDN calls in the talking state in the Star Hub or Star Module are taken down when the Star Hub enters ESA.

The Star Hub in ESA provides the same tones as a correctly functioning Star Hub. The UMP card provides tone cadence, which interrupts the tone by controlling the RCP card. To provide a tone in ESA mode, the UMP sends a start cadence message to the RCP. This message defines the tone required, the terminal identification, and the cadence times.

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

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

The handling of idle tone also uses the start cadence message. The Star Hub connects the receive path to a port that provides idle tone.

MBS signaling

The MBS signaling enables call processing software to communicate directly with the MBS terminal. An above-voice frequency, low-speed data channel transports the actual MBS messages over the loop. This data channel sends signaling information over a separate D-channel between the Star Hub and the host XPM. MBS feature services are described in *DMS-100 Business Set Feature Description and Operation*.

The data channel is an 8-kHz signal with data communicated by the presence or absence of this signal. The following MBS features are supported for the Star Hub:

- Automatic Answer Back
- Automatic Dial
- Automatic Line
- Executive Busy Override
- Call Back Queueing
- Call Forward All Calls
- Call Park
- Call Pickup
- Call Waiting
- End-to-End signaling
- Group Intercom
- Individual Business Line
- Intercom

- Listen on Hold
- Make Set Busy
- Malicious Call Hold
- Multiple Appearance DN
- On-Hook Dialing
- Privacy Release
- Ring Again
- Speed Calling
- 3-Way Call/Call Transfer
- 6-Port Conference
- Feature Display
- Display Called Number
- Display Calling Number
- Query Time
- Business Set Inspect Key
- Automatic Inspect Mode
- Business Set Call Forward Universal Per Key
- Call-Request Enhancement
- Direct Station/Busy Lamp Field for MBS
- Station Camp-On for MBS
- Group Intercom All Call
- MADN Cut-Off on Disconnect (COD)
- MADN Bridging - Three-Way Call
- Multiple Executive Message Waiting Keys per DN

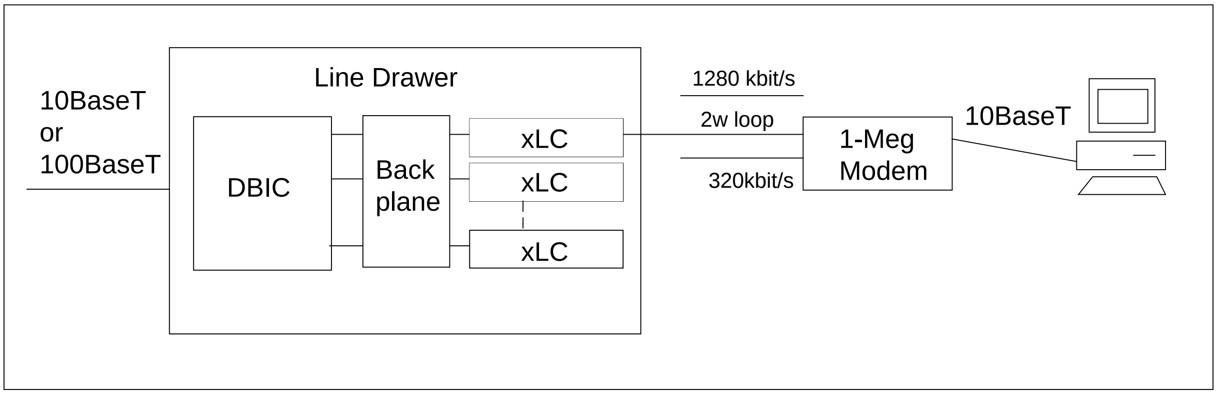
Custom local area signaling service

The Star Hub supports custom local area signaling service (CLASS) features when a CLASS modem resource (CMR) card is installed in the host XPM. Calling number delivery is a CLASS feature that gives single-party subscribers and MDC customers the ability to receive the incoming calling party number, time, and date of the call on the customer premises equipment (CPE).

1-Meg Modem Service supported protocols

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

Figure 3-5 1-Meg Modem Service architecture



DBIC

The following section describes the protocols used by the data-enhanced bus interface card (DBIC), x digital subscriber line (xDSL) line card (xLC), subscriber loop, and 1-Meg Modem.

Ethernet

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

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

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

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

XLBUS

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

xLC and loop

The xLC and subscriber loop use the following protocols.

XDLC

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

XLINK

The XLINK frame has a fixed length for robust framing.

XLOOP

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

1-Meg Modem

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

4 Star Remote System automatic maintenance

The DMS-100 Family of peripheral modules (PM) are made to be reliable under many different fault conditions. PMs contain several hardware redundancies that provide service as backup operations for module, card, and link failures. Therefore, fault conditions can exist that do not require intervention by operating company personnel.

The Star Hub connects to the host PM over DS-1 links to provide call processing, multiplexing, and signaling services for the SuperNode switch. The Star Hub provides for up to 1152 subscriber lines. During normal operation, with both units of the Star Hub in service, unit 0 controls the even-numbered subgroups of both units. Unit 1 controls the odd-numbered subgroups of both units. If one NTTR77AA remote controller pack (RCP) has faults, the other RCP takes control of the complete Star Hub. The Star Hub has bus interface cards (BIC) in each line drawer that connect the line cards to the Star Hub control shelf. The BIC card scans the line cards for a change in state and monitors the line drawer for maintenance purposes.

> ***Note:*** In the description of maintenance in this chapter, the line concentrating module (LCM) is used in a generic sense to refer to any PM like the Star Hub. Therefore, when the term “LCM" is used in this context, the Star Hub is implied.

Automatic maintenance

When fault conditions occur, the host switch and the Star Hub begin audits or other system actions to find the fault and correct it automatically.

This section describes the following types of automatic maintenance issues:

- Star Hub audits
- checksums
- Star Hub to host PM speech path diagnostics
- overload resources

- takeover capability
- emergency stand-alone (ESA) capability
- drawer testing
- BIC relay testing (BRT)
- subscriber line automatic maintenance
- LCM routine exercise (REX) tests

Star Hub audits

Every 5 s, audits are run in the Star Hub to

- refresh the control data for DS-1 and NTTR77AA RCP circuits
- monitor the RCP for faults

A second audit runs every 200 ms to monitor for faults in the C-side DS-1 interface cards. The following paragraphs describe the functions of these system audits, because they have an effect on RCP and DS-1 circuits.

Remote controller pack maintenance

The Star Hub monitors the status of the RCP to make sure that

- control data are being transmitted correctly to the RCP
- the inactive RCP clock is running fault-free

The Star Hub writes control data to the RCP periodically.

DS-1 interface card maintenance

For each of its DS-1 interface cards, the Star Hub automatically monitors the bipolar violation (BpV) counter. The Star Hub notifies the central control (CC) when the count exceeds the threshold of

- 1 BpV per 10^3 bits (10 kb) for the out-of-service (OOS) level
- 1 BpV per 10^6 bits (10 Mb) for the maintenance (MTC) level

The Star Hub also monitors the loss-of-frame indicator for the DS-1 links and turns on an outgoing alarm for any frame loss of more than 2.5 s. The Star Hub removes the outgoing alarm when the frame restores for 10 s. The Star Hub also detects and monitors the alarm indication signal (AIS) and remote carrier group alarms

When the Star Hub detects DS-1 slips, a slip counter increments and provides a message-driven interface. This interface allows the host office to query the counter from the CARRIER level. The system sends control data to the DS-1 cards periodically.

Line drawer maintenance

A system audit runs every 10 min for each Star Hub and tries to return to service any drawers in the system busy (SysB) state. If the Star Hub detects any faults, the system tests and handles drawers in the ISTb state.

The following table lists states for the Star Hub unit and the related tests.

Table 4-1 Full in-service tests

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

Checksums

For the DMS-100 Family PMs, the system uses a number to calculate the checksum (CHKSUM) for each software load. After loading and testing the PM, the system compares the checksum total with the expected checksum total. If the totals match, the load is correct. If there is a mismatch, use the LOADPM command to load the PM again. Each PM type has a different checksum value for each load. The QUERYPM command displays a checksum value for the load of the PM.

Star Hub to host PM speech path diagnostics

The host PM diagnostic program includes the following two tests:

- Speech path diagnostic (SPCHDIAG) program. Tests all internal components of the line trunk controller (LTC) speech path for data integrity, including central side (C-side) and peripheral side (P-side) loop-arounds, and speech bus time slots.
- P-side link diagnostic (PLNKDIAG) program. Tests links between the LTC and any secondary peripherals, including the Star Hub. The system performs these tests on either all links or selected links.

Speech path diagnostic program for the host PM

The speech path diagnostic program includes four separate tests:

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

Each test starts when all previous tests have passed. The following paragraphs describe these four tests.

Hardware presence test This test checks for the presence of formatted (NT6X41), message (NTMX76AB), and timeswitch (NT6X44) cards in the LTC. This hardware is necessary for the remainder of the tests. If any one of these cards is not present, the diagnostic program returns a `No Resources` error message and produces a PM181 log report.

P-side interface presence test This test checks that DS-1 interface (NT6X50) cards, entered in table LTCINV for the LTC, are present. This test prepares for the P-side loop test. The P-side interface test terminates when a failed NT6X50 card is detected or the NT6X50 is removed. The diagnostic program 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 checks the correct operation of these and other dedicated P-side loop-around circuits for the LTC.

If the LTC is in inactive mode, the P-side loop test checks only NT6X48 P-side loops. In the inactive mode, one unit is inactive and the other manual busy (ManB), SysB, or in-service (InSv)

If the LTC is in active mode, both NT6X48 and NT6X50 P-side loops are tested. In the active mode, one unit is active and the other is SysB, ManB, or InSv. The P-side interface test also checks the LTC multiplexer.

Internal loop test This test checks the data integrity of LTC speech channels. If the LTC is 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 pulse-code modulation (PCM) enable/disable gates.

LTC P-side link diagnostic program

The P-side link diagnostic program includes three separate tests:

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

Hardware presence test This test checks for the message (NTMX76AB) and timeswitch (NT6X44) 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 program returns a `No Resources` error message and produces a PM181 log report.

P-side interface presence test This test is identical to the speech path diagnostic program. This test checks that all LTC P-side links to be tested continue to be present. This test flags missing or failed NT6X50 cards in the LTC.

Full peripheral test After the first two tests in the P-side link diagnostic program, this test makes sure necessary hardware is present. The full peripheral test checks one speech channel on each defined LTC P-side link to the Hub. This test is run when the LTC is in active mode.

Star Hub to RCC2 speech path diagnostics

The RCC2 diagnostic program includes the following two tests:

- Speech path diagnostic (SPCHDIAG) program - tests all internal components of the RCC2 speech path for data integrity, including central side (C-side) and peripheral side (P-side) loop-arounds, and speech bus time slots.
- P-side link diagnostic (PLNKDIAG) program - tests links between the RCC2 and any secondary peripherals, including the Star Hub. The system performs these tests on either all links or selected links.

Speech path diagnostic program for the RCC2

The speech path diagnostic program includes four separate tests:

- Hardware presence test
- P-side interface presence test
- P-side loop test
- Internal loop test

Each test starts when all previous tests have passed.

Hardware presence test

This test checks for the presence of message (NTMX76AB) and timeswitch (NTMX75) cards in the RCC2.

This hardware is necessary for the remainder of the tests. If any one of these cards is not present, the diagnostic program returns a No Resources error message and produces a PM181 log report.

P-side interface presence test

This test checks that DS-1 interface (NTMX81) cards, entered in table RCCPSINV for the RCC2, are present. The test prepares for the P-side loop test.

The P-side interface test terminates when a failed NTMX81 card is detected or the NTMX81 is removed. The diagnostic program 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 MX81 cards, the P-side loop test checks the correct operation of these and other dedicated P-side loop-around circuits for the RCC2.

Internal loop test

This test checks the data integrity of RCC2 speech channels. If the RCC2 is OOS, a full test on every channel is run. If the RCC2 is InSv, the test checks two speech channels selected at random. The internal loop test also checks the operation of RCC2 pulse-code modulation (PCM) enable/disable gates.

RCC2 P-side link diagnostic program

The P-side link diagnostic program includes three separate tests:

- Hardware presence test
- P-side interface presence (DS-1 link interfaces)
- Full peripheral test

Hardware presence test

This test checks for the message (NTMX76AB) and timeswitch (NTMX75) cards in the RCC2. These cards are necessary for the other P-side link diagnostic tests to run. If any of these cards are not present, the diagnostic program returns a No Resources error message and produces a PM181 log report.

P-side interface presence test

This test is identical to the speech path diagnostic program. This test checks that all RCC2 P-side links to be tested continue to be present. This test flags missing or failed MX81AA cards in the RCC2.

Full peripheral test

After the first two tests in the P-side link diagnostic program, this test makes sure that necessary hardware is present. The full peripheral test checks one speech channel on each defined RCC2 P-side link to the Hub. This test is run when the RCC2 is in active mode.

Overload resources

When the traffic load on the Star Hub increases so the amount of call processing is greater than RCP cards can handle, the Star Hub accepts calls at a slower rate until the overload clears. Normally, when processing calls, the Star Hub queues the call requests and assigns them priorities in its data store.

As the data store fills near its capacity, the Star Hub overload controls reduce its rate of load acceptance or stops the call process until store is available.

Overload control in the Star Hub occurs for

- C-side communication
- line scanning

When C-side communication reduces or stops, the RCP cards decrease the rate they scan for messages on the C-side. By slowing the incoming load, the demand for data store decreases. The MAP display queries of Star Hub status are slower as are C-side responses to Star Hub-supported terminals.

During overload, the RCP cards also stop scanning the BIC until enough data store is available. When the RCP cards do not scan the BIC, incoming work from the P-side stops. This occurs by queuing the incoming work in the output buffers of the BIC. When the buffers are full, the buffers accept no more work. The results are partial dials or ignored keys on business sets.

Display of overload state

When the Star Hub becomes overloaded, the status display changes to ISTb while both units show InSv. When operating company personnel enter the QUERYPM FLT command at the STAR level, the phrase `LCM Overloaded` is included in the response.

Log reports PM128 and PM181 indicate the overload condition in the Star Hub. When call processing continues, PM128 is output with the phrase `LCM out of Overload`.

Takeover capability

In the takeover mode, the in-service unit takes control of the lines connected to the out-of-service mate unit and its lines. Also, the in-service unit has access to the DS-1 C-side ports formerly used by the out-of-service mate. The RCP card accesses all 36 line subgroups of the in-service unit. Takeover occurs when

- one RCP card fails
- one power converter is not installed
- one C-side message port fails

Calls in process at the time of takeover terminate and the subscriber must redial the number. The RCP card maintains calls already connected and in progress. The RCP card in the mate unit supports all DS-1 links and the line subgroups (LSG) of both units.

If there is a Hub takeover and there is one DS-1 link between the Star Module and the Star Hub, all stable calls and special connections on this DS-1 link remain stable. If there are two DS-1 links between the Star Module and the Star Hub, call takeover occurs. This means all stable calls are routed to the second DS-1, depending on the number of free channels on that DS-1.

Power converter configuration

The method of load sharing the Star Hub uses depends on the power converter configuration. The two power converter configurations are

- full configuration - four power converters to support from 577 lines to 1152 lines using line drawers 10 through 18
- half configuration - two power converters to support up to 576 lines in line drawers 1 through 9

The half configuration means that only slots 3 and 20 have power converters and supply power to the RCP and to drawers 1 to 9. A full configuration is when the other two power converters are in slots 5 and 18 to supply power to drawers 10 and 18.

The following describe the behavior of power converters in the Star Hub remote.

- If one of the power converters is not installed, the unit without the power converter is in the out-of-service state and the other unit works in takeover mode.
- If one of the main power converters (in slots 3 or 20) fail, then the power converter of the other unit supplies power to the unit with the failed power converter.
- In a full configuration, if both of the power converters in slots 5 and 18 fail, the Star Hub cannot support lines connected to line drawers 10-18.

Takeback mode

When the failed unit returns to service, the subscriber lines in takeover are redistributed back to their normal processor. No calls in the talking or ringing state are lost when the unit returns to the normal mode of operation.

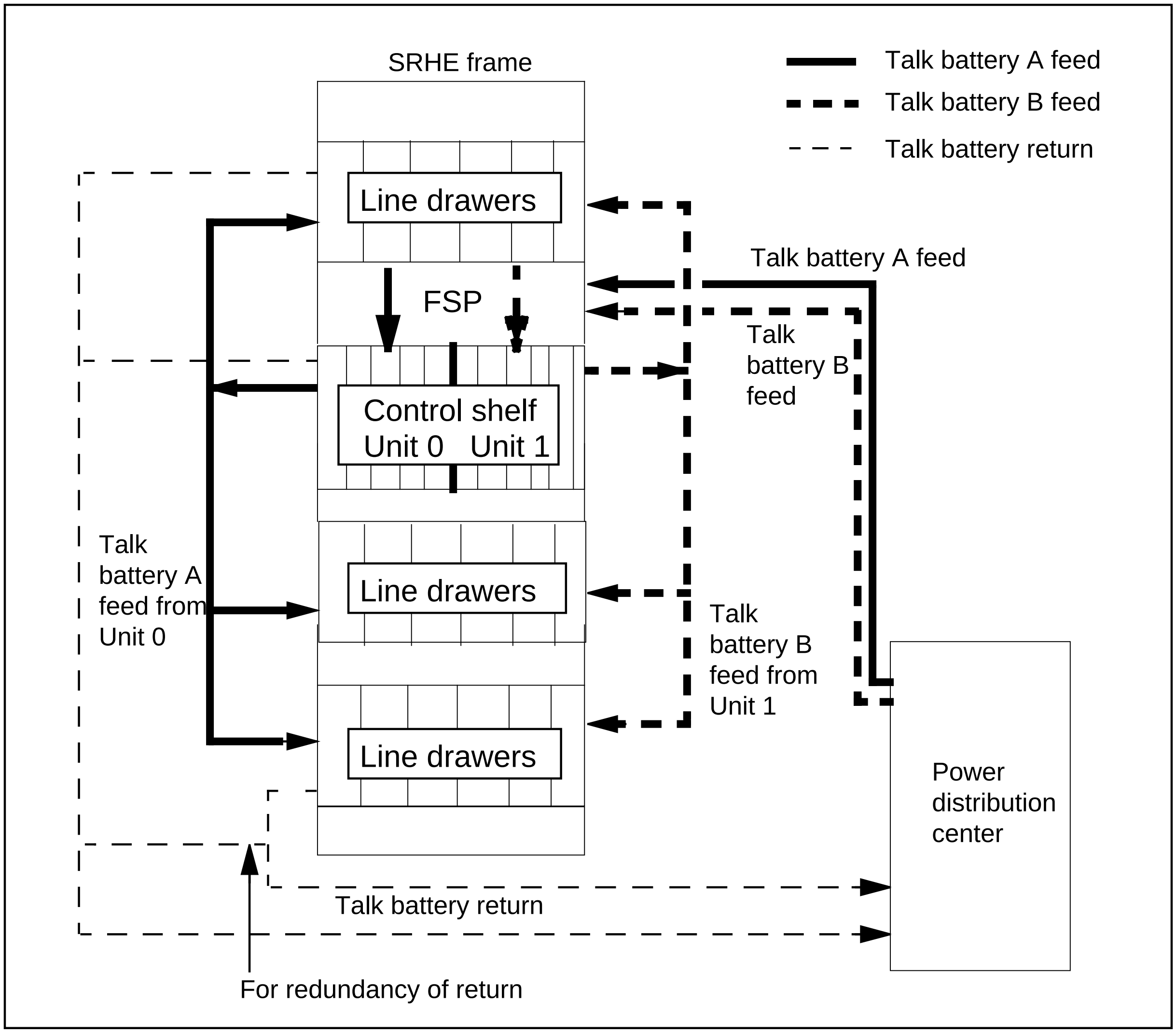
Star Hub talk battery audit

The Talk Battery Alarm feature periodically audits each Star Hub unit for the presence of talk battery. If the audit does not detect talk battery, operating company personnel are notified with a critical alarm log report (PM179).

Loss of talk battery

The following figure shows talk battery power distribution within a Star Remote Hub equipment (SRHE) frame.

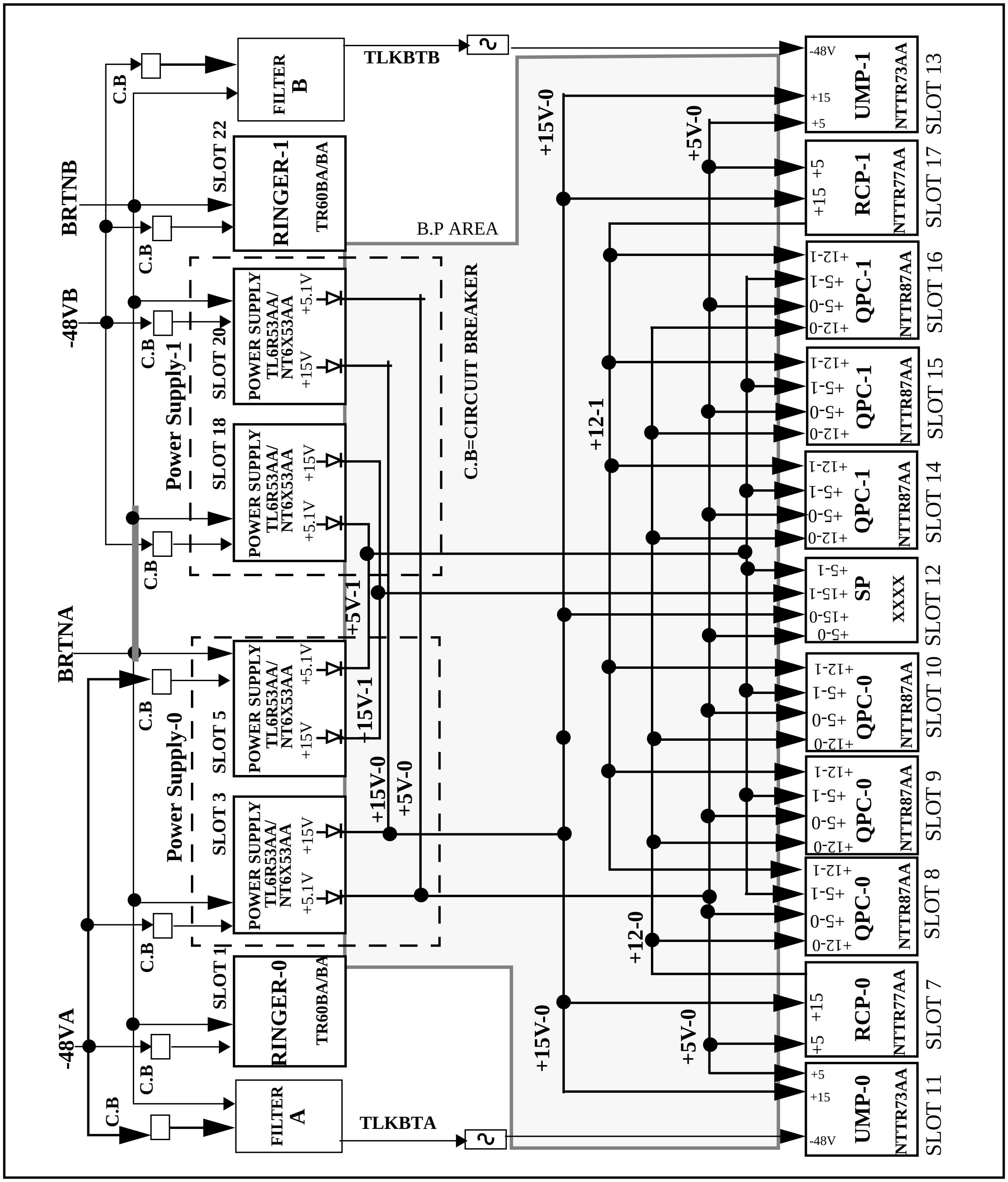
Figure 4-1 Talk battery distribution on SRHE frame



The following figure shows how talk battery distributes within the Star Hub control shelf.

Figure 4-2 Power Supply Distribution Detail in STAR HUB

The A feed provides a talk battery for Unit 0 of the Star Hub. The B feed provides a talk battery for Unit 1 of the Star Hub. The A feed and B feed each provide power to one NT6X53AA power converter in each unit. This



configuration provides a redundancy of power from both power feed sources to each unit of the Star Hub. There is also some redundancy. When the talk battery returns, a single fault may not cause an outage.

If a talk battery fuse blows, the Star Hub indicates `InSv` (in service) at the MAP display. The Star Hub performs a line card audit, but this audit cannot check for loss of a talk battery. The loss of a talk battery may have an effect on one unit of the Star Hub, depending on where the fault occurs.

Without a talk battery, the Star Hub line cards cannot signal an off-hook condition. Thus, the Star Hub detects any off-hook line as being on hook. The system automatically forces any Star Hub calls to the on-hook state when the Star Hub loses talk battery feed. The Star Hub lines cannot originate and terminate calls while talk battery is not available.

Talk battery alarm activation

To activate the Talk Battery Alarm feature, change the value of office parameter TALK_BATTERY_ALARM in table OFCENG. (The system disables the Talk Battery Alarm feature by default.)

When the Talk Battery Alarm feature is enabled, the system performs talk battery testing through diagnostic programs and audits that run as background processes.

If the Talk Battery Alarm feature is disabled, the system automatically clears any talk battery alarms and ISTb reasons introduced by this feature.

Background process audit

The Star Hub can test its shelves for loss of talk battery. When the Talk Battery Alarm feature is disabled, no audits are run to check for the loss of talk battery on any of the LCMs or Star Hubs in the office.

When the audit finds a failure the talk battery test, a critical alarm log report (PM179) is output and places the LCM shelf in an ISTb state. The audit does not report the failure until diagnostic programs clear the alarm and ISTb state.

Diagnostic programs

The InSv and OOS diagnostic programs include the talk battery test for a Star Hub unit. The following commands include the diagnostic programs:

- TST Unit unit_no
- TST PM
- TST REX NOW
- RTS Unit unit_no
- RTS PM

Diagnostic programs report all talk battery failures when the same Star Hub is tested repeatedly. If the talk battery test passes, the diagnostic programs clear the alarm and ISTb reason. This has an effect on both the manual and automatic versions of these commands. The diagnostic programs run talk battery tests while the talk battery alarm feature is enabled.

To support the talk battery alarm feature, each Star Hub shelf must have a world line card (WLC). There are no special provisioning rules with this feature, where the WLC can exist in the shelf. If the maintenance line card in LSG 0 Card 0 for the Star Hub is assigned as a WLC, this card may or may not be able to be used by the feature. This line card tests the ringing generators.

MAP commands that can BSY the last available WLC on a line drawer shelf issue a warning message if this condition should occur. If operating company personnel enter one of these commands, this busies the last available WLC on the Star Hub shelf. The system displays the following warning message:

Example of a MAP response:

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

The commands that can cause this condition include the

- BSY command at the LTP MAP level when posting a WLC
- DIAG command at the LTP MAP level when posting a WLC (DIAG will temporarily ManB the WLC)
- BSY DRWR command at the PM MAP level when posting a Star Hub

The QUERYPM FLT command displays the ISTb reasons by shelf and line equipment number (LEN) for both alarm conditions, as follows:

Example of a MAP response:

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

or

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

MAP commands that can RTS the first available WLC on a Star Hub shelf provide the following notification messages. This notification message tells operating company personnel the minor alarm and ISTb reason for the Star Hub shelf are cleared. A WLC is available to test for talk battery failures. Two commands can cause this condition which include the

- RTS command at the LTP MAP level when operating company personnel post and RTS a WLC. A response to the RTS command follows:

  Example of a MAP response:

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

- RTS Drwr command at the PM level when operating company personnel post an LCM. When entering the RTS Drwr command, the following MAP response displays:

  Example of a MAP response:

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

Emergency stand-alone operation does not have an effect on the Star Hub. ESA operation ignores any talk battery alarm conditions. When the Star Hub exits ESA mode, the computing module (CM) analyzes the Star Hub to determine if talk battery failures exist.

Limits and restrictions

The following limits and restrictions apply to the Talk Battery Alarm feature:

- Talk battery testing uses the same WLC that is used for a subscriber line. If the talk battery test is in progress on a WLC, the WLC goes on-hook to request a call origination, and the subscriber goes off-hook. There may be an additional delay of up to 90 milliseconds (ms) before the subscriber receives dial tone. If the talk battery test is in progress on a WLC, and the WLC receives a call termination request (to ring the line), there may be an additional delay of up to 90 ms before ringing begins. For both originations and terminations, there is no impact on call processing except for this negligible delay.
- The Talk Battery Alarm feature can detect the loss of talk battery feed to a Star Hub shelf. Because of limits the WLC cannot detect the loss of talk battery return. Because of duplicate talk battery returns, return failures are less possible to occur; this limit is not a serious concern. See the previous figure “Talk battery distribution on SRHE frame."

- The CM does not perform talk battery tests while the LCM, Star Hub, or one of its C-side nodes is in the overload condition.
- The Talk Battery Alarm feature is only made to find shelf-level failures of talk battery feed. Therefore, the only talk battery feed failures that are reported are failures that have an effect on talk battery for all lines on the Star Hub shelf. Drawer-level failures may or may not be detected. Detection of failures depend on the drawer where the WLC resides and the drawer where the failure occurs.
- Faults local to the WLC (or its drawer) may prevent the WLC from correctly detecting talk battery failures. These failures include faults that cause the WLC to fail line card diagnostics. In these occurrences, the WLC can incorrectly report talk battery failure and cause a critical alarm, although talk battery may be present for other lines on the shelf. These occurrences are not probable. The critical alarm log report (PM179) gives the location of the WLC to help perform troubleshooting on these instances.
- The Talk Battery Alarm feature does not have an effect on ESA operation on an RCC, RLCM, or Star Hub. Any talk battery alarm conditions or reports are ignored during ESA operation. Talk battery failures are not reported while an LCM or Star Hub is in ESA mode. When the Star Hub exits ESA mode, the CM analyzes the Star Hub to determine if talk battery failures exist.
- When the Talk Battery Alarm feature activates for an office, 10 minutes may pass before every LCM or Star Hub in the office begins testing for talk battery failures. This delay time depends on how long it takes the LCM audit to cycle through every LCM in the office. An office with heavy traffic and a large number of LCMs may take longer than 10 minutes.
- If you use the SERVORD OUT command to delete the directory number (DN) assigned to the last WLC on a line drawer shelf, a minor `Cannot test Talk Battery` alarm occurs. The alarm message identifies the WLC where the last assigned DN was deleted. In this condition, the WLC is hardware assigned/software unassigned (HASU) in a maintenance state that is not normal. This prevents the LCM from using the WLC for

detecting talk battery failures. There are three ways to work around this condition.

- — BSY/RTS the Star Hub. This is not recommended because of the service outage, but the WLC will be in the correct HASU maintenance state so the Star Hub can use it for talk battery testing.
- — Assign a DN to the WLC so the Star Hub can use the WLC for talk battery testing.
- — Assign a second WLC on the same line drawer shelf. This WLC can remain as HASU without a DN assigned.

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

ESA capability

If the Star Hub loses communication with the host because of a message link or DS-1 card failure and detects DS-1 alarms on both links, the Star Hub enters ESA to operate independently. The ESA operation continues until both conditions that initiated the ESA action are removed.

The Star Hub supports ESA warm entry and cold exit. Warm entry means established calls, except for ISDN calls, are maintained during entry into ESA mode. This is because the call processing software (Q.931) resides in the host LTC, line group controller (LGC), or remote cluster controller 2 (RCC2). Cold exit mean that all calls, including established calls and calls being established, are released. Before the Star Hub actually exits ESA, a timeout makes sure the DS-1 alarms or host communication are permanently restored. The timeout is defined in table OFCENG, parameter RLCM_XPMESAEXIT. This timeout prevents the Star Hub from transferring in and out of ESA.

While in ESA, the Star Hub supports all telephones. In addition, the following calls are not supported:

- multiple appearance directory number (MADN) secondary parties
- proprietary phone (P-Phone) keys except for the primary DN (key number 1)
- activation and deactivation of custom calling features
- ISDN calls

Call progress tones are partially supported. Because no features are supported during ESA, many of the call progress tones are not required. The ESA call progress tones and detection of DTMF dialing are supported by the NTTR73AA universal maintenance pack (UMP).

Intraswitching is supported in the Star Hub. When the Hub enters ESA, steady non-ISDN calls that originate and terminate within the Star Remote System are interswitched and maintained during a warm ESA. The Star Module does not support intraswitching or the ESA mode.

See the “ESA maintenance overview" chapter for an overview of ESA operation for the Star Hub.

Drawer testing

To make sure the BIC card can send and receive message and speech data, the Star Hub conducts a BIC looparound test to detect line drawer faults. If the BIC test fails, the CC does a full in-service test on both BICs, to make sure the fault is not transient or from the RCP card.

The BIC or RCP tests failures do not force the Star Hub into takeover mode.

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

Some drawer ISTb conditions can be detected when the drawer or the PM is OOS. These conditions include:

- BIC scan
- BIC inhibit
- BIC connection memory (CM)
- BIC activity

If drawers with these conditions return to service with an ISTb condition, the ISTb state clears when performing the InSv unit or drawer tests. The sequence of events are as follows:

- BIC looparound sets the drawer to the SysB state so it cannot have messages sent to the drawer. All lines to the drawer are made line maintenance busy (LMB), because the call processing is disabled.
- BIC scan sends a scan message to the BIC to make sure the scan chip detects supervision changes on all datafilled lines. Because this activity requires a message, the path through the RCP is like the BIC looparound.
- digroup control card (DCC) looparound tests a loop in the RCP. The looparound does not test all the hardware for the RCP/BIC communication. If a fault exists with this hardware, the DCC looparound passes while the next BIC looparound tests fail, although no drawer fault actually exists.
- RCP/BIC looparound sets the drawer to the ISTb state. A failure on the speech path hardware to the drawer has occurred. Although a distinct channel may have failed the test, the RCP is not sure if all channels are

changed. Call processing may 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 RCP/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 set timeout period.

The list of full InSv tests follows:

- ACTIVITY_READ
- MSG_LOOPAROUND
- ANI_COIN_FAIL
- PARITY_TRAP_FAIL
- BIC_ACT_TEST
- POWER_CONVERTER_FAIL
- BIC_CM_TEST
- RINGING_FAIL
- BIC_INHIBIT_TEST
- RTM_CM_TEST
- BIC_LA_TEST
- RTTS_CM_TEST
- BIC_LOOPAROUND
- SANITY_TIMEOUT_FAIL
- BIC_SCAN_TEST
- SET_MSG_LOOPAROUND
- DCC_LA_TEST
- SUBCYCLE_LENGTH_FAIL
- DS1_LOOPAROUND
- SUBCYCLE_ORDER_FAIL
- IUC_LA_TEST
- TIMING_TEST
- LC_COM_TEST
- WRITE_PROTECT_FAIL
- ZERO_CROSSING_INT_FAST_FAIL

- ZERO_CROSSING_INT_SLOW_FAIL
- MEMORY_TEST

Faults that occur on a BIC drawer have an effect on call processing without regard to which unit is in-service and controlling that drawer. Because the full in-service tests use the DCC, operating company personnel must first determine if 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 although 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 or Star Hub unit out of service. However, the status of the unit continues to be ISTb. The ISTb reason is either `Self Test` or `Diag Fail`, depending on which test failed and caused the ISTb condition. After the CC has detected an LCM unit is ISTb, the unit is made SysB because the CC has received too many unsolicited messages.

BIC relay test

The BRT tests the reversal relay for the tip and ring on each BIC in a Star Hub. The BRT tests allows for both the manual testing of a single drawer of a defined Star Hub or LCM and the scheduled testing of all LCMs or Star Hubs in an office. The QUERYPM FLT command indicates the drawers that failed the manual or system BIC relay test. This test generates a PM181 log and a PM132 log to indicate test results. Refer to *Extended Peripheral Module Log Report Reference Manual*, 297-8321-840 for detailed information about BRT-related logs.

The following paragraphs describe the levels of BRT testing.

Office level

The schedule includes loops over each LCM or Star Hub. A single BRT runs on each drawer of the given LCM or Star Hub. A log report displays the results of the tests that join the results of each drawer test.

STAR level

This test runs from the planned BRT. The planned test selects an LCM or Star Hub that had none of its drawers tested during the BRT window defined by the office parameters. A BRT is run on each drawer of this LCM or Star Hub.

Drawer level

This test runs from the LCM-level planned test or manually from the STAR MAP display level. The drawer level test is a single Star Hub drawer test.

The office-level test loops over the LCMs or Star Hubs in an office and performs the LCM-level test. The LCM-level test, in turn, loops over each drawer of a given LCM and performs the drawer-level test, which actually is a BRT.

Office parameters for test planning

Planning for the BRT uses the information from two new office parameters in table OFCVAR: BICRELAY_XLCM_TEST_SCHEDULE and BICRELAY_NUM_SIMUL_TESTS. These parameters allow the user the flexibility to

- schedule the BRT from one to seven days a week
- define the window size
- define how many tests (LCM-level) run at the same time, as follows:
  - BICRELAY_XLCM_TEST_SCHEDULE
    - This parameter defines the start time (BRTST_START_TIME) and stop time (BRTST_STOP_TIME) for the office-level test. These times cannot be the same. The test window must be at least 10 minutes in length. The last field of this parameter (BRTST_DAYS_OF_TST) indicates the day or days of the week the office-level test runs (MO, TU, WE, TH, FR, SA, SU). The user can datafill up to seven days in any combination, but cannot datafill the same day more than one time.
    - If the start and stop times are the same or if the test window is less than 10 min, an error message displays.
    - If the user tries to make a change during the defined test window (while the test is in progress), a message displays. The message indicates that, if necessary, the user can stop the BRT using the BICRELAY OFF command, make the necessary changes, and restart the BRT using the BICRELAY ON command.
  - BICRELAY_NUM_SIMUL_TESTS
    - This parameter indicates the number of LCM-level tests to run at the same time.
    - The start and stop times of BICRELAY_XLCM_TEST_SCHEDULE, plus this parameter, configure the number of LCMs being tested.
    - If the user tries to make a change during the defined test window (while the test is in progress), a message displays indicating the user must wait until the test stops. If the change is needed immediately, the user can stop the BRT using the BICRELAY OFF command at the command interpreter (CI) level. The user can then make the necessary changes and restart the BRT using the BICRELAY ON command.

Out of service unit tests

BIC tests are run during out-of-service LCM unit tests. Only drawers that have the ISTb or SysB state are tested by drawer tests. For this reason, out-of-service unit tests consider drawers previously identified with faults as follows:

- With both units out of service, any drawers with the SysB state are changed to the ISTb state so they can be tested by the out-of-service test. If the fault remains, the drawer is reset to SysB. If drawers are no longer ISTb, the state changes to InSv.
- With one unit out of service, only the drawers that have the ISTb and the InSv states are tested. This limit is because the mate unit is InSv and now in control of all drawers. Drawers with a SysB state are not changed or tested.

BICRELAY command

The CI level BICRELAY command allows the user to enable, disable, reset, allow, or not allow the PM181 drawer state to change logs when a given LCM or Star Hub undergoes the system BRT. Operating company personnel can

- query the ON or OFF state of the BRT
- determine if the PM181 drawer-state change logs are allowed or suppressed
- query the number of BRTs in progress
- query the next LCM or Star Hub to be tested by the system BRT

> ***Note:*** The PM181 logs associated with the LCM or Star Hub being tested by the BRT are not allowed to be output. Other PM181 logs associated with other LCMs or XPMs are allowed.

The following paragraphs describe the BICRELAY command parameters.

ON The ON parameter enables the test to begin at the planned window. A message displays that indicates the test is ON. If the current date and time is within the planned window, the office-level test starts immediately. If any tests are in progress when this command is supplied a message displays, indicating the user must wait until all tests are complete before restarting the BRT. This option does not change the operation of the manual TST command at the STAR MAP display level.

OFF The OFF parameter does not allow the office-level test to resume. A message displays that indicates the test is OFF. Any system BRTs now in progress are allowed to complete. This parameter is the default.

After the test is disabled, the test does not begin until enabled by using the ON option. Once enabled, the office-level test continues at the point where it was turned OFF. This option does not have an effect on the operation of the manual TST command at the STAR MAP display level.

SUPPRESS When an LCM is tested using a system-initiated BRT, each drawer is busied, tested, and returned to service. When these state changes occur, a PM181 log is output that indicates the change. This parameter allows the user to suppress PM181 logs for any LCM being tested using a system BRT. However, the PM181 logs for an LCM not now being tested by a system BRT are not prevented. Also, SUPPRESS has no effect on a manual BRT run on a single drawer. This parameter can be supplied at any time. A message displays that indicates the logs are prevented.

ALLOW The ALLOW parameter allows the PM181 drawer to change logs caused by the system BRT.

RESET The RESET parameter allows the user to restart an office-level test like no LCMs have been tested. The user must turn the test OFF before using this parameter. If the user tries to reset the BRT while it is ON, a message displays that indicates the BRT must be turned OFF before RESET can be performed. All tests that are running must be completed. This option can be used at any time and does not have an effect on the operation of a manual TST command at the LCM MAP display level.

QUERY The QUERY parameter displays the following:

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

Test operation

The system performs the BRT test on each LCM. If done manually, the BRT is performed on an each drawer. If the BRT test is performed on each LCM, all drawers of the LCM are automatically tested. The single drawer test is activated manually using the TST DRWR drwr_no RELAY command at the LCM MAP display level.

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

- loops over each LCM included in the test schedule
- loops over each drawer for each LCM or Star Hub
- runs one tip-and-ring reversal relay test for each drawer
- generates one logutil report with the results of all 18 drawers
- sets the drawer and node ISTb status

LCM-level test The office-level (automated) test is run when the schedule is entered in the office parameter. Once an LCM is tested, the LCM is not tested again until each LCM in the office is correctly tested. When all LCMs included in the schedule are tested within the window, the BRT stops. Testing continues when the next window arrives. If an LCM is not tested, it is skipped in the current window and a PM181 information log is output that gives the reason the test was not performed. If an LCM test continues to run when the stop time arrives, the current LCM-level test is allowed to complete.

The BRT remembers which LCM was the first to be tested within the given window. The next LCM to be tested is compared to the first LCM. If the LCMs are the same and the current date and time are within the window, the BRT stops. If all LCMs are not tested within the window, the BRT begins where it left off during the last planned window.

Operating company personnel can plan for the BRT to run with the automatic line test (ALT) or the LCM REX test. However, running the BRT and the ALT at the same time is not recommended for the following reasons.

- The use of necessary test equipment by both or all of these tests reduces the number of LCMs that can be tested within the window.
- The completion of the ALT is slowed.

None of these tests run at the same time on the same LCM. The user must define a window that does not conflict with the planned ALT or REX test.

The LCM audit, the manual REX, and the system REX cannot be run on the same LCM that is running the system BRT. Also, the STAR PM/UNIT cannot be made ManB during the system BRT.

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

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

Each drawer is placed in a ManB state before the drawer-level test. Each drawer is out of service for approximately 10 s. This interrupts call processing.

When the tip-and-ring reversal relay test on all drawers completes, the results display as a PM132 log report that includes the results of each drawer test of a given LCM. If a drawer was previously out of service or call processing is currently in progress, the drawer is not tested. The drawer is tested on future passes of the BRT.

Single-drawer test The single-drawer test is for repeat test purposes if a failure occurs during the system test. This test is run from the LCM MAP display level and is part of the TST DRWR command. The RELAY option allows the BRT to run without running the main DRWR test. The BRT is not run unless the RELAY option is defined. The drawer must be ManB by the user before this test is run. The system prompts the user if the drawer is InSv, ISTb, or SysB. The manual BRT cannot be run on a drawer where the LCM node is ManB, SysB, C-side busy (CBsy), or offline (OffL). A message displays indicating the request is invalid and gives the current state of the node.

The single-drawer test displays a PM181 log with the results of the test. A response is also displayed at the MAP terminal with a card list indicating the drawer that failed, if necessary. If a single-drawer test cannot be run, the drawer is not set ISTb and can be returned to service to its previous state.

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

PM132 provides a report of each drawer-level test in an LCM as follows:

- test passed
- reversal test failed
- test was run but drawer failed to RTS after test
- test not run because of
    - — line card not available
    - — problems found using the MTE
    - — being aborted
    - — drawer being previously out of service
    - — call processing being currently in progress
    - — bad hardware
    - — message link problems
    - — unavailable resources
    - — an invalid load in the Star Hub
    - — an unexpected error condition
    - — conflicts in maintenance software

Refer to *Extended Peripheral Module Log Report Reference Manual*, 297-8321-840 for the exact syntax of test result reasons.

If an LCM-level test does not run because of equipment that is not available before the drawer tests, the following activities occur:

- the LCM is not tested
- a PM181 log is output
- the LCM node state is not changed

If a drawer test does not run, the drawer remains in its current state and is tested in a later window.

QUERYPM FLT command

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

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

- warm or cold
  - — All drawer-level tests are aborted.
  - — All ISTb reasons are saved.
  - — All LCM-level tests are aborted, and are system-level only if the tests are within the window. The test will continue after the restart. LCMs already tested are not tested again.
- reload
  - — The BRT is reset as if the RESET option of the BICRELAY command were supplied.
  - — The ON/OFF settings of the BICRELAY command are kept.
  - — The state of the SUPPRESS/ALLOW commands is kept.
  - — ISTb reasons are cleared.

Interactions The BIC relay test uses the test access bus, the metallic test equipment (MTE), and a single NT6X17 card within each drawer to complete testing. An ALT test runs at the same time as a BRT and can delay both tests because the tests compete for the same test equipment.

If REX is running on a given LCM, BRT is not run on that LCM. The LCM remains in its current state, and a PM181 is output, indicating the BRT did not run because of the REX in progress.

Restrictions and limitations

The following restrictions apply to this feature:

- The system test manually busies the logical drawer before running the RELAY test. If there are lines in a call processing busy state, the drawer is skipped for this test cycle.
- Before running a manual BRT on a single drawer, the drawer should be ManB.
- If at least one NT6X17 line card is not datafilled within each logical drawer, the drawer is not tested.
- If the line card selected for testing is removed during the test, the drawer fails.
- If a drawer does not RTS when the system BRT completes, the drawer is set SysB so the system audit tries an RTS.
- This test is not run on an LCM at the same time as an LCM audit and a REX test.
- The BRTST_START_TIME and BRTST_STOP_TIME fields of the BICRELAY_XLCM_TEST_SCHEDULE office parameter cannot have the same value. There must be at least a 10-minute time difference between the parameters.

Subscriber lines automatic maintenance

The system performs automatic subscriber line tests on line circuits and loops, usually on a planned basis, without switch operator involvement except for initial planning. In a DMS-100 switch office, these tests are performed under the lines maintenance subsystem (LNS).

LCM REXTEST

The LCM REXTEST includes running out-of-service diagnostic programs for each LCM or Star Hub unit, and in-service diagnostics for each unit in both normal and takeover modes. Office parameter NODEREXCONTROL and LCDREX_CONTROL in table OFCVAR controls the LCM REXTEST.

REX is performed during the defined interval for one LCM or Star Hub at a time. The REX test occurs in the order the LCMs were entered in the inventory table. It may not be possible to test every LCM or Star Hub in the office during the REX interval. In this event, when the next interval starts, REX starts where it left off during the previous interval. A REX test on an LCM or Star Hub takes up to 15 min.

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 output with the reason `REX in progress`, the LCM node status is made ISTb, and a minor alarm is raised.
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 output.
3. Unit 0 returns to service. Out-of-service and in-service diagnostic programs are run. If out-of-service diagnostics fail, the unit is left SysB, a major alarm is raised, and PM106 is output. If the unit returns to service correctly and the in-service diagnostic program fails, the unit is placed ISTb and a PM181 log is output.
4. If unit 0 returns to service correctly, these steps are repeated for unit 1.

If a REX test fails, the system generates a PM600 log. The PM600 log starts a major alarm for the experimental multiprocessor system (XMS) peripheral module (XPM) that failed the REX test. This major alarm appears at the MAP terminal under the PM banner at the top of the display. A PM181 log generates after a successful REX test.

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

The PM600 log details the

- start time of each step the REX test executed
- unit changed by the REX test step
- failure reason

The REX test steps included in the log after the failed step are recovery actions the REX test initiates as a result of the failure. The unit number is included when the REX test action is unit-specific (BSY unit, RTS unit, TST unit, sync) and not an action that has an effect on the node (SWACT, BSY both units). The additional log data includes a card list and an easy to remember designation of the failed diagnostic program.

The QUERYPM, QUERYPM FLT, TST REX QUERY, and TST REXCOV 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 REX test, or an automated REX test to return the XPM to service from ISTb condition.

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

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

The following restrictions apply to REX tests:

- The system REX test controller runs a REX test on one XPM at a time if the office uses the NT-40 processor. However, SuperNode supports concurrent REX testing for up to ten XPMs with the same REX test class.
- Up to four LCM_REX_TESTs can be run at the same time if the HOST XPM they connect to is not being REX tested.
- The LCM_REXCOV test for converter and ringing voltages in LCM are planned separately by the system routine exercise (SREX) scheduler.
- 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 output because the restart deallocates the temporary data store used to build the PM600 log.

System REX controller

The SREX controller provides the SuperNode switch with a SREX controller that coordinates all system REX tests under a common REX test scheduler. This feature allows LCM REX tests to be planned 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 Star Hub in less time. REX tests are performed to provide early indication of faults that can impact service and to allow operating company personnel to take corrective measures.

The SREX controller 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 that peripherals are tested
- coordinate between manual- and system-initiated REX tests
- receive alarms for the Star Hub 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 stops 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 continues REX testing after interrupting REX testing.
- QUERY returns the status of the REX test (active or suspended).
- HELP returns a brief description of the REX test.

The REX test order for feature AF3771 is critical nodes first, such as the CM and message switch (MS). Secondly, the number of days from the last system or manual REX test. Third, the order of internal PM number.

Table REXSCHED must be datafilled to establish the REX test schedule for the Star Hub. 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 and Star Hub is generated if

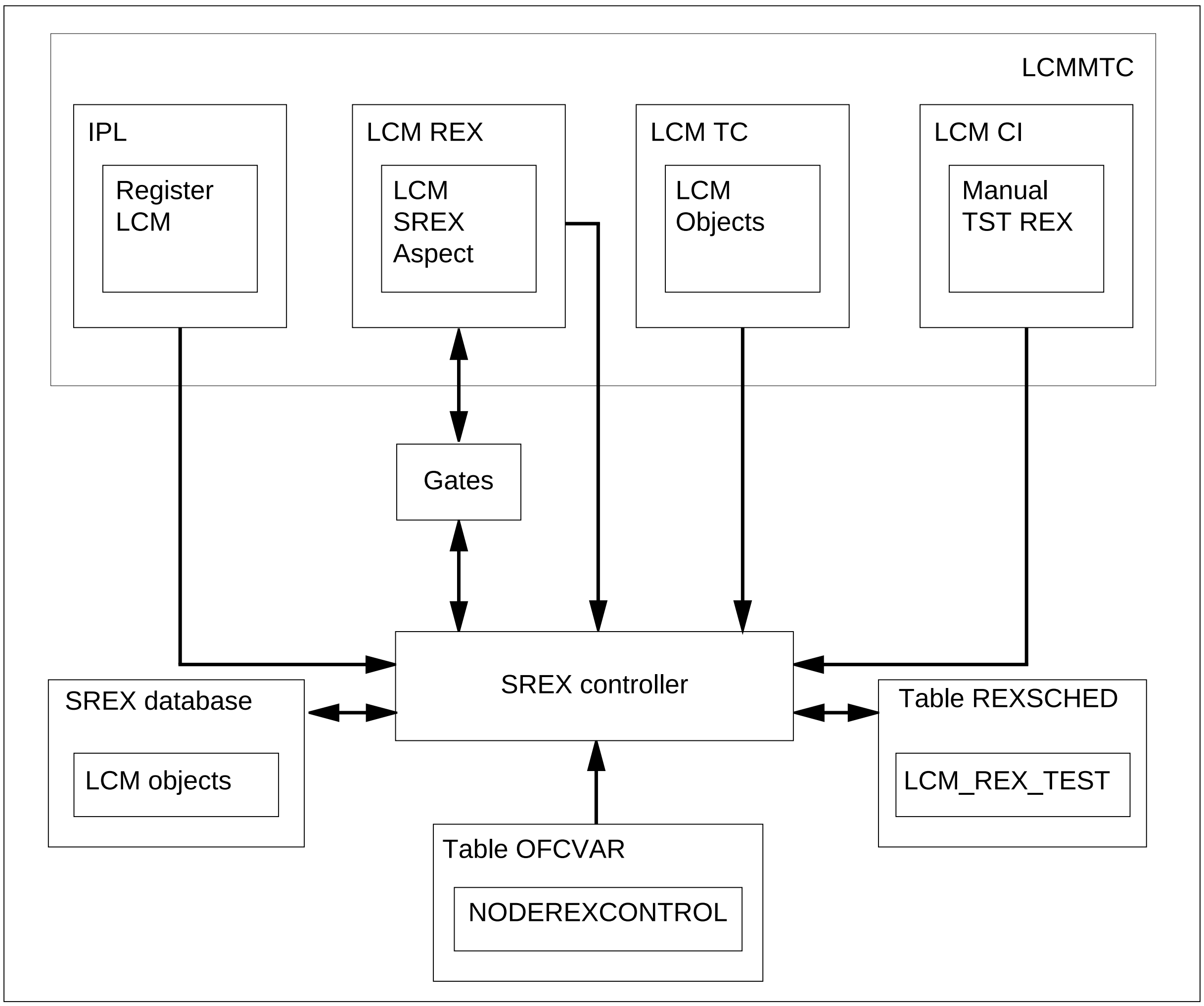
- the Star Hub or LCM has not been REX tested for more than 7 days
- REX test takes longer than indicated
- REX test cannot be started after a defined number of tries

Expanded LCM REX test results

Table REXSCHED controls the scheduling of SREX tests for LCMs. The LCM_REX_TEST task SREX can be executed at the same time in multiples of four together with REX tests of XPMs. The LGC, LTC, and the RCC XPMs can be hosts to LCMs. Conflicts occur when an XPM planned for REX testing is the host of an LCM planned for REX testing.

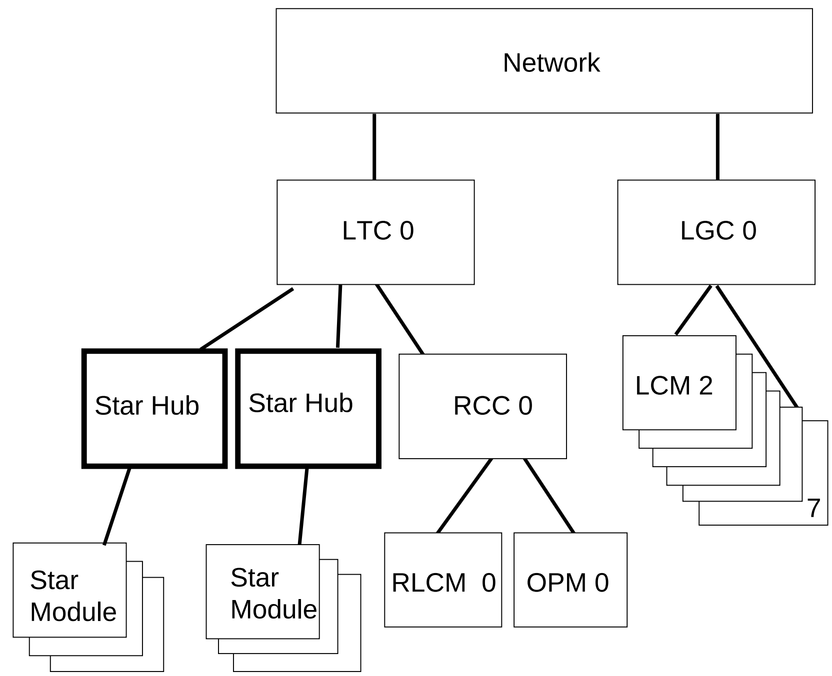
To prevent conflicts, all concurrent REX tests of XPMs and LCMs are planned by the SREX controller, as seen in the following figure SREX system dependencies. The LCM SREX subsystem registers the LCM_REX_TEST class and identifies dependencies with other REX_TEST types during initial program load (IPL).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

Figure 4-3 SREX system dependencies



The converter voltage and ring test sections of LCM_REX_TEST require wait states and distinct test resources that cause delays that are not acceptable in SREX main task execution. LCMCOV_REX_TEST, running at a lower priority, implements these tests separately from the LCM_REX_TEST. LCMCOV_REX_TEST requires logical test unit (LTU) connections in the maintenance line card. An LCM unit can access the single LTU when the other unit is out of service. This resource limitation prevents concurrent LCMCOV_REX_TEST execution. The datafill of the PARALLEL execution field for LCMCOV_REX_TEST, in table REXSCHED, allows a maximum of one.

Figure 4-4 SREX scheduling



Note 1: REX tests can be running on Star Hub 0 and Star Hub 1 concurrently with REX tests running on RCC 0 and LGC 0.

Note 2: REX tests could not be running on LCM 2 through LCM 7 if a REX test was running on LGC 0.

Separating the LCM_REX_TEST and the LCMCOV_REX_TEST allows faster completion of site REX_TEST coverage. LCM_REX_TESTs, without constraints of the converter voltage and ring tests, can be run at the same time and scheduled separately for best execution periods.

> ***Note:*** The LCMCOV_REX_TEST is performed only on LCMs, extended-memory line concentrating modules (XLCM), outside plant modules (OPM), and Remote Line Concentrating Modules (RLCM).

The following tests are also supported for LCM peripherals and its variants:

- ESA REX test
- LCM and ESA-independent REX test
- MAP command for manual REX test

- fault indicators
- REX test maintenance record
- MAP commands to access REX test failures

ESA REX test

The ESA REX tests the ability of Hub units to enter and exit ESA. The ESA REX test begins after the LCM REX test completes.

MAP commands for manual REX tests

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

To post the LCM, type

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

and press the Enter key.

To display information about the LCM node, type

>QUERYPM

and press the Enter key.

When the LCM is posted, to manually enable or disable scheduled LCM or LCMCOV REX tests, type

>TST REX [ON] [OFF][QUERY]

and press the Enter key.

To start LCM REX tests on the posted LCM, type

>TST REX NOW

and press the Enter key.

Example of a MAP response:

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

Line concentrating module and ESA-independent REX test

The scheduler starts REX tests on an LCM and, when completed, the ESA REX test is started. A manually started LCM REX test does not perform an

ESA REX test. If a REX test is not successful, the LCM is set ISTb if InSv diagnostic programs fail. The LCM is set SysB if OOS diagnostic programs fail.

Fault indicators

A REX test that is not successful sets the LCM unit either ISTb or SysB with a reason of REX failed. The system performs audits on LCMs 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 adds to the ISTb list. If the LCM is SysB and a successful system RTS performs, the unit returns to ISTb instead of InSv with the REX failed reason. To remove the ISTb state, the LCM must complete either a successful manual or scheduled REX test.

The node assessment graph log (NAG400) is produced hourly, or in response to the NAG command. The NAG lists all nodes that are not InSv. The REX_INFO field of log NAG400 displays the results of the latest REX test. For LCMs, the LCM_REX_TEST result is listed first, separated by a colon from the LCMCOV_REX_TEST result. Refer to *Extended Peripheral Module Log Report Reference Manual*, 297-8321-840 for more information about NAG400 logs. More information about the NAG command is available in the “Star Remote Hub user interface" chapter in this manual.

REX maintenance records

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

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

Star Module maintenance

The software defines the Star Module as a Star Hub line drawer and not as a node. Therefore, the CM considers the Star Module and its C-side DS-1 links as a line drawer. The software does not consider the Star Hubs P-side DS-1 ports as elements that depend on the link maintenance process. These links are hidden from normal maintenance activities and are not displayed at the TRKS;CARRIER MAP level or by entering the TRNSL P command at the STAR MAP level.

The Star Hub unit that controls a Star Module C-side link is the unit that scans the link and makes the connection on that link. When both Hub units are in service, Unit 0 controls the even numbered Hub DS-1 ports and Unit 1 controls the odd numbered Hub DS-1 ports. Each Hub unit controls its own link to each Module. When the Hub is in takeover mode, the in-service unit controls one of the two links of each Module. The Module link scanned by the in-service unit is the link which is in the higher state.

Star Module states

The Star Module (RLD) can be in one of the following states:

- in service (InSv) or in-service trouble (ISTb)
- C-side (CBsy), this only occurs when the host Star Hub is not in service
- system busy (SysB)
- manual busy (ManB)
- offline (Offl)
- unequipped (Uneq), meaning the Star Module is not in the data tables and the switch does not recognize the Star Module

Star Module ISTb reasons

The following list contains the reasons for the Star Module being in the ISTb state:

- loadfile mismatch
- loadfile was erased from bank
- one of two C-side DS-1 links is out of service (SysB or ManB)
- Bd channel is out of service (SysB or ManB)
- DS-1 static data mismatch

Star Module SysB reasons

The following list contains the reasons for the Star Module being in the SysB state:

- Star Module in-service test failure
- Star Module switch of firmware banks is in progress
- SysB during CM restart
- no response from the Star Module
- RLD fault message received from the Star Hub
- C-side Star Hub RTS

Star Module C-side links states

The C-side links for the Star Module can be in one of the following states:

- InSv
- CBsy
- SysB
- ManB

- Offl
- Uneq

The C-side links for the Star Module cannot be in a state that is higher than the Star Module. At least one of the C-side links for the Star Module is in the same state as the Star Module. For example, when the Star Module is

- InSv, at least one of its links is InSv
- Cbsy, at least one of its links is Cbsy
- SysB, at least one of its links is SysB
- ManB, at least one of its links is ManB
- Offl, (both links), both links are Offl

Star Module audits

The following audits are performed to report the environmental conditions and any alarm conditions at the Star Module.

RLD PES audit

The RLD PES audit runs once every hour in the CM. The audit checks each RLD with a PES system, auditing the SMC alarms. The SMC alarm states are reported to the CM. The audit procedure compares SMC alarms to the stored CM alarms. If a mismatch is detected in any alarm element, a log is output and the CM state changes to match the SMC state for the tested element.

The RLD PES audit is also responsible for the battery test. The batteries must be tested every 3 months. The RLD PES audit in the CM sends the SMC a message that requests battery tests at fixed time periods when the right pre-conditions are met. If the battery test fails, the SMC card sends an alarm message to the CM. As a result, a PES200 log is output, the alarm is displayed at the RLDPES level, or in response to the QUERYPES command at the RLD MAP level.

The SMC monitors the battery voltage and performs battery capacity tests, The test sequence is as follows:

- the dc charging voltage is reduced for 10 minutes. The battery continues to feed the load.
- the battery voltage is measured every 15 seconds
- if the battery voltage is below 48.2 V dc ± 0.2 V dc, the test stops and the battery test failure is sent to the CM

Note: The battery test cannot be performed if the rectifier fails or less than 72 hours have passed since the end of an ac failure that lasted 1 hour or more.

SMC scan audit

When a scan (SC) point detects a fault, a bit is raised in the SMC memory. The SMC software scans all the scan point bits, measures the temperature, and tests the batteries. When a change is detected, an alarm is reported to the CM. The SMC determines when it is necessary to activate an SD point.

Temperature control

There are three temperature sensors in the Star Remote Module Outside (SRMO) cabinet. The sensors are at the top and bottom of the cabinet and in the battery compartment. A fourth temperature sensor is in the battery compartment and connected to the rectifier to regulate its output voltage. This fourth sensor is not scanned by the SMC card.

Every 5 minutes, the SMC monitors the temperature detected by the first three temperature sensors. The fans or the heater is activated depending on the requirement determined by the measured voltage. These components are activated as follows:

- the two fans are activated to cool the air in the cabinet when the temperature exceeds 50° C. When the cabinet temperature decreases to 30°C, the fans are deactivated.
- the right fan is activated to circulate warm air generated by the electronic components when the temperature falls below -10° C
- the heater is activated when the temperature in the battery compartment is below 0° C. The heater is deactivated when the temperature is above 5° C.

Fan test

The SMC card check fan operation during power up. If a fan operation failure occurs, the FAN0 or FAN1 alarm is output. The FANSTAT alarm is output if a fault is detected during normal fan operation.

5 ESA maintenance overview

Functional description

The Star Hub is provided with the Emergency Stand-Alone (ESA) capability. There is no ESA capability for the Star Module.

The Star Hub is a remote line concentrating device. The communication links between the Star Hub and the host site can be damaged or cut. Service can be interrupted. The ESA capability enables the Star Hub to provide stand-alone call processing capability. The Star Hub must provide this call processing ability if loss of communication with the host occurs. With the ESA capability, the Star Hub emulates the call processing functions of the host line trunk controller (LTC), line group controller (LGC), remote cluster controller 2 (RCC2), and central control (CC).

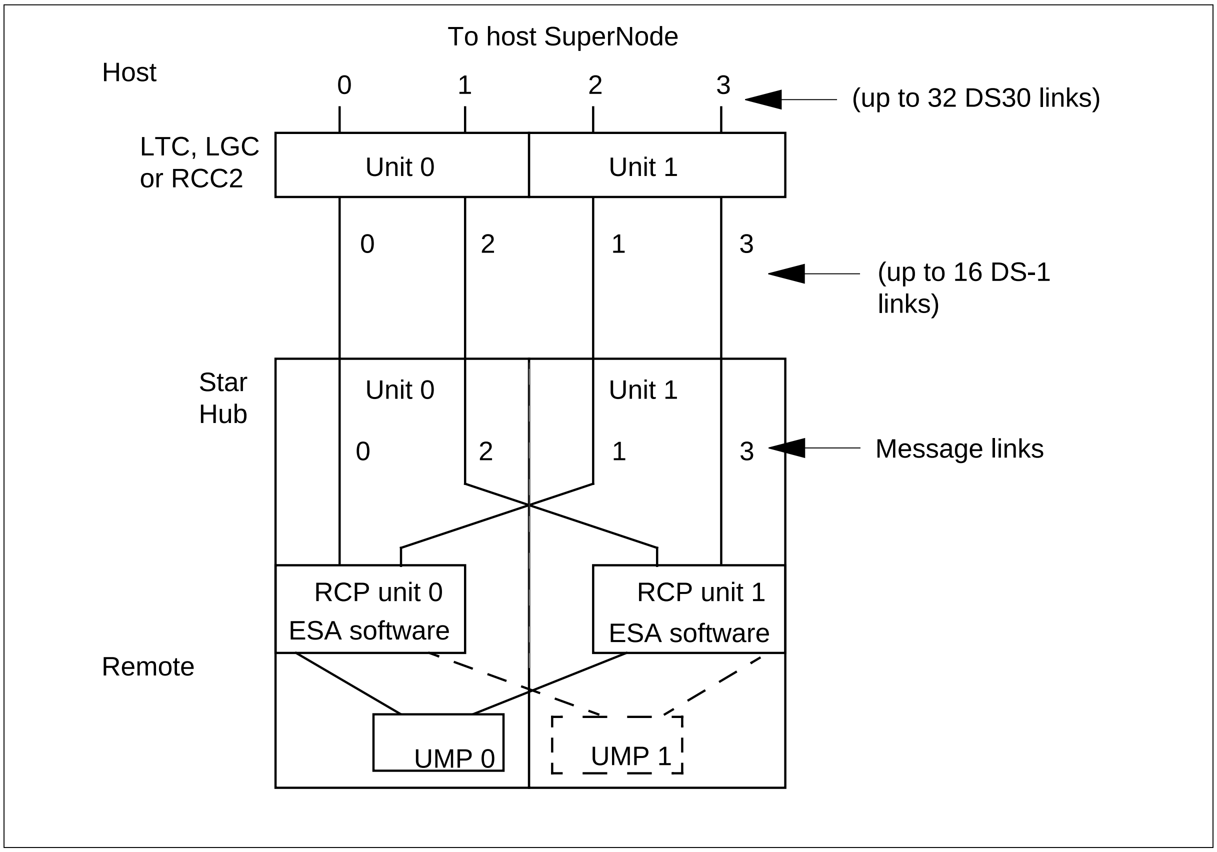
The Star Hub does not have a special card that supports the ESA capability. Instead, ESA is a software capability that is in each of the NTTR77AA remote controller packs (RCP). In the Star Hub, the ESA software running in the RCPs communicate with the Star Hub software processes. This means that ESA software is resident within both units of the Star Hub. Normally, the two units of the Star Hub are active and working by load sharing. However, the ESA software is only active in one unit and is inactive in the other unit.

When operating in the ESA mode, the Star Hub provides limited services to subscribers. Only common line-to-line calls, for both dial pulse and dual tone multifrequency (DTMF) lines, are supported. Subscriber and Automated Message Accounting (AMA) call recording are not supported in ESA.

The Star Hub supports ESA warm entry and cold exit. Warm entry means the Star Hub maintains established calls, except for ISDN calls, during entry into ESA mode. Cold exit means the Star Hub releases all calls, including established calls and calls being established.

A diagram of the ESA capability, from the view of the MAP (maintenance and administration position) terminal, is in the following figure. This diagram describes the Star Hub as a C-side node to the ESA capability. In the diagram, the Star Hub is not in ESA mode.

Figure 5-1 Star Hub ESA capability diagram



When the Star Hub is in ESA mode, the diagram in this figure is not accurate. In ESA mode, the ESA software that is in the RCP acts as the host peripheral module (PM). In this mode, the host PM is the LTC. This figure does not describe the hardware configuration from the view of the MAP terminal. The Star Hub functions separately from the host.

ESA entry

The Star Hub enters the ESA mode when the Star Hub determines that communication with the host site cannot occur. The two conditions that cause the Star Hub to enter ESA are

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

When the Star Hub determines the ESA mode is required, the Star Hub switches the C-side links from the host to the RCP processor. The RCP processor detects the switch of links. The software begins an ESA-entry. The type of failure condition determines the time between loss of communication and ESA mode.

The RCP processor has a nailed-up (direct) communication link with the DMS-100 CC. The RCP processor is the only processor at the Star Hub that can communicate with the DMS-100 CC during an ESA exit. The DMS-100 CC must instruct the RCP processor to exit ESA.

When the Star Hub enters ESA mode, active calls go out of service. This action is known as a cold entry.

During ESA mode, call processing occurs through the RCP processor. The ESA software is in the RCP and is known as the ESA CC. The ESA CC emulates the DMS-100 CC and handles line-to-line call processing. The ESA CC contains part of the translation data from the DMS-100 CC.

This part of the DMS-100 CC data is a snapshot required for all ESA call processing. The translation data in the snapshot are static data. The Star Hub does not enter ESA mode until the ESA software in the RCP receives static data.

The download of the static data to the ESA CC from the DMS-100 CC truncates some translation data. Static data are not true parts of the DMS-100 CC. The system only supports basic calls. When the Star Hub is in ESA mode, the system supports plain old telephone service (POTS) and Meridian Digital Centrex (MDC) subscriber lines.

> ***Note:*** If while in ESA mode, the Star Module is dropped or taken out of service, no recovery is supported. This also applies to DS-1 links that fail between the Star Hub and the Star Module while in ESA mode.

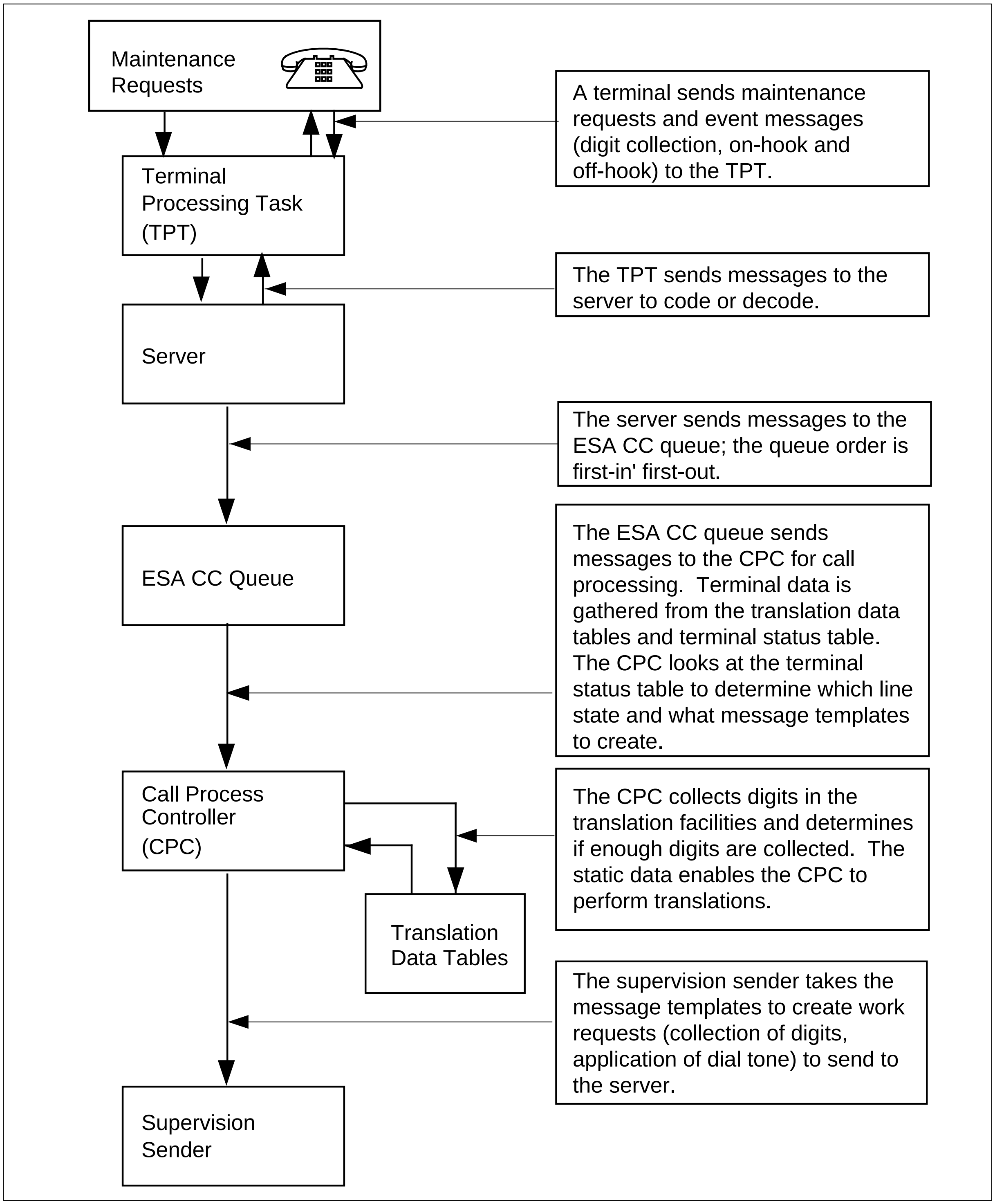
ESA call processing

When the Star Hub is in ESA mode, the ESA CC in the RCP card manages line-to-line call processing.

The ESA CC has one queue. The system sends the messages from the server to this first-in first-out queue for call processing. Before call processing begins, terminal data are required. Terminal data are gathered from the static data downloaded from the DMS-100 CC and the dynamic data from the terminal status table.

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

Figure 5-2 ESA CC basic call processing structure



Terminal status table

The terminal status table (TST) has an entry for each line appearance the ESA software in the RCP can handle. Each entry has two bytes and each byte contains a data structure. The two data structures are

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

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

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

Figure 5-3 Terminal status table

Line	Byte 1								Byte 0							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
0	Error count/cause				Line state				Call processing block index/origination count							
1151	Error count/cause				Line state				Call processing block index/origination count							

The first byte (unprotected line data) in the terminal status table includes the following:

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

- Line state - The last four bits contain the current state of the line. The line states are:
  - — ManB - The line is manually busy. Service is interrupted to the line. The system ignores messages from the line. Calls cannot terminate to this line.
  - — Idle - The line is equipped. The line is call processing idle. The line looks for an off-hook condition. Origination messages from the line are treated as a call origination and calls can terminate to this line.
  - — Originated - The line originates a call, but resources are not available to service the line. If the line remains off-hook, the line originates the call again after a 1 s delay. If an on-hook message is received before the 1 s timer expires, the line goes to the abandon state. The line can originate again three times before the line goes to the lockout state. Calls cannot terminate to this line.
  - — Abandon - The line waits for another origination attempt. Off-hook or on-hook messages put the line in the idle state. When in the idle state, idle scan for an off-hook condition starts. Calls cannot terminate to this line.
  - — Call processing busy - The line is in a call processing busy state. In this state, a CPB associates with the line. The associated CPB index is in the second byte of the TST. The system controls messages the line generates to the related CPB index. Calls cannot terminate to this line.
  - — Lockout - The line is not involved with an active call. A CPB does not associate with the line, but the line is monitored for an on-hook condition. An on-hook message causes the line to return to an idle state. When in the idle state, the idle scan for an off-hook condition starts. Calls cannot terminate to this line.
  - — SysB - The ESA CC system-busies the line because it detects too many errors. The line is removed from service. The last cause of the error is stored in the error count/cause byte of the TST. The system ignores messages from the line.

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

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

The signaling states and call processing data that are part of the CPB are

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

waits for the result of the coin function. Supervision continues on the terminating line.

— Coin disconnect: The terminating coin line goes on hook first. The system performs the coin release function. Call processing waits for the result of the coin function.

- call-processing data
  - — Digit count/digit registers: The registers contain digits the system collects. Digit count indicates the number of collected digits.
  - — Routing information: This byte contains the results of digit translation. The possible results include the following types of termination:
    - – regular
    - – automatic line
    - – revertive
    - – hunt group
    - – reorder termination
    - – busy
  - — Terminator line character. The byte is the result of the digit translation.
  - — Terminator ring character. The byte contains the ringing characteristics as a result of digit translation.
  - — Originator revertive ring character. The byte contains the ringing characteristics of digit translation.
  - — Originator, terminator, DTR. The byte contains the channel numbers of the three types of terminals that use channels in an active call.
  - — Translation and audit-specific data. The data that translations use as flags for audits on a call processing block during the digit collection phase.

Call channel management

The calls at a Star Hub in ESA mode are inter-switched. An inter-switched channel is required to complete a call.

Digitone receiver management

The ESA software in the RCP card must have the location of DTRs in the NTTR73AA universal maintenance pack (UMP) card. The system downloads the DTR data with the static data. Because digitone receivers are allocated in a round method, receivers get equal distribution. The following steps explain the use of a receiver.

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

   If every receiver is assigned, the system waits 3 s to locate a free receiver. If after 3 s the system cannot locate a free receiver, the line goes to the abandon state.
3. After the subscriber dials the digits, the receiver is marked free. The receiver is unassigned and ready for use by another call.

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

ESA CC supervision sender

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

ESA translation data

When the Star Hub is in ESA mode, the ESA CC uses part of the translation data from the DMS-100 CC to perform translations. The DMS-100 CC downloads this part of the DMS-100 CC data required for ESA call processing to the RCP. This type of translation data is static data. The system generates ESA logs when the downloaded data exceeds the Star Hub ESA maximum. Refer to *Extended Peripheral Modules Translations Reference Manual*, 297-8321-815 for additional information about ESA translations.

The ESA CC requires two types of static data:

- general extended peripheral module (XPM)-type
- ESA translations

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

ESA office parameters

The following office parameters are required to define ESA functionality in the Star Hub:

- RLCM_ESAENTRY_BADCSIDE
- RLCM_ESAENTRY_BADLINK
- RLCM_XPMESAEXIT
- RLCM_ESADUPD_BOOL
- RLCM_ESADUPD_HOUR
- RLCM_ESA_NOTIFY_TONE

These office parameters are discussed in detail in *Extended Peripheral Module Translations Reference Manual*, 297-8321-815.

Downloading data to the Star Hub ESA

Translation data is downloaded to the Star Hub ESA as follows:

- manually, using the LOADPM command as presented in the following examples:
  - — LOADPM PM CC ESADATA
  - — LOADPM UNIT 0 CC ESADATA
  - — LOADPM UNIT 1 CC ESADATA
- during return to service (RTS)
- automatically during periods of low traffic. This period is set with the following office parameters
  - — RLCM_ESADUPD_BOOL (can be set to Y)
  - — RLCM_ESADUPD_HOUR (the default is 04:00)

  Because the period of low traffic is 04:00, this period is called the nightly audit.

Supported subscriber line types

When the Star Hub is in ESA mode, the supported subscriber line types are POTS and MDC.

POTS line types

The supported POTS line types include the following:

- 1FR - single party flat rate
- 1MR - single message rate. The lines are considered a single party flat rate line.
- 2FR - two parties flat rate

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

MDC lines

Supported MDC line types include the following:

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

Automatic lines

The following automatic line (AUL) features are supported:

- AUL supports a maximum of 15-digit directory number for POTS and IBN lines.
- AUL must be datafilled by SERVORD. Tthe IBN EBS automatic line feature key is not functional.
- Manual lines are treated as automatic lines with the operator's number for the automatic line DN.

Hunt group

The following Hunt Group features are supported in ESA mode.

- multiline (MLH)
- distributed line (DLH)
- directory number (DNH)
- MLH, DLH, and DNH groups with sequential line hunting

- DLH group is treated the same as the MLH group
- no circular hunting for DNH
- maximum of 26 hunt groups for each Star Hub
- maximum of 520 hunt group members in all hunt groups
- maximum of 520 members for each hunt group
- remote make busy (RMB) is not supported
- stop hunt is not supported

Supported subscriber services

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

POTS subscriber services

The POTS services provided include the following:

- unlimited home numbering plan area (HNPA) code for each Star Hub
- services for single party, multiparty, coin and PBX lines
- three to ten digits local dialing plan
- a maximum of 16 prefix or special numbers for each Star Hub with a maximum of 15 digits, each for special termination (for example, 0-, 0+, 411, and 911)
- invalid or vacant terminations the system routes to reorder or to announcement termination

MDC customer group services

The MDC services include the following:

- maximum 640 members in a customer group
- maximum 32 customer groups for each Star Hub
- a maximum of eight prefix or special numbers for each Star Hub with a maximum of 15 digits each for each customer group (for example, 0+, 411, 9+ that has or does not have second dialtone, prefix fence, and ambiguous numbers)
- station-to-station dialing for one- through six-digit extension numbers
- denied incoming call for a station
- direct outward dialing that has or does not have second dial tone for termination to another customer group or POTS lines in the same Star Hub
- inter-customer group calling by the same dialing plan (except lines with the denied incoming option)

- primary numbers of the multiple appearance directory number (MADN) groups are treated as standard MDC lines
- multiple centrex customer dialing plans

Exiting ESA mode

After communications restore, the DMS-100 CC recovers the Star Hub from the ESA mode. When the Star Hub exits ESA mode, the active calls go out of service. This action is a cold exit.

When C-side communications restore between the Star Hub and the DMS-100 CC, the DMS-100 CC initiates the ESA exit sequence. Before the ESA exit sequence begins, the DMS-100 CC communicates with the ESA software over the nailed-up connection. This communication determines if the Star Hub is in ESA mode and if recovery of the Star Hub can occur immediately. The two methods the Star Hub can recover are a system exit or a manual exit.

ESA system exit

A system exit is an automatic exit from ESA mode the DMS-100 CC starts. This exit does not require operator interference. The DMS-100 CC starts a system exit if the following conditions are present:

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

The following list of steps is the system exit sequence:

1. The C-side communications are restored between the DMS-100 CC and the Star Hub.
2. The DMS-100 CC determines the Star Hub is in ESA mode.
3. The DMS-100 CC enters the ESA time-out period. During this period the CC communicates with the Star Hub every 10 s to determine if the C-side links are still OK. If communication fails again during the time-out period, the CC will not continue with the ESA exit.
4. When the DMS-100 CC time out period expires, the DMS-100 CC sends an ESA-exit request to the Star Hub. The CC does not know which of the units is ESA active, so it sends the exit request to a unit that has a good C-side link. If the message arrives at the ESA inactive unit, this unit transfers the message to the mate unit.
5. The Star Hub and the ESA software in the RCP perform exit operations.
6. The ESA software tells the RCP to return the Star Hub to normal operations.
7. The ESA software in the RCP sends operational measurements (OM), peg counts, and the reason for the entry of ESA mode back to the DMS-100

CC. This information appears in the PM171 log. The system generates the PM181 log if the ESA exit has problems.

8. The DMS-100 CC returns the Star Hub to service.

ESA manual exit

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

- Both units of the Star Hub are in a ManB state.
- RLCM_XPMESAEXIT office parameter time-out value is set to zero.

Operating company personnel override a time-out value different from zero to start a manual exit. Operating company personnel busy the Star Hub units at the STAR MAP level to override the time-out value. Personnel must use the FORCE option with the BSY command.

The following steps describe the manual exit sequence:

1. The C-side communications between the DMS-100 CC and the Star Hub restore.
2. The DMS-100 CC determines the Star Hub is in ESA mode.
3. The DMS-100 CC queries the Star Hub for the number of active calls.
4. The DMS-100 CC displays the number of active calls on the MAP display and queries to confirm the operating company personnel if ESA exit.
5. If operating company personnel confirm the ESA exit, the DMS-100 CC sends the ESA exit request to the ESA software in the RCP.
6. If operating company personnel do not want to continue with the ESA exit, the Star Hub is left ManB. The Star Hub remains in ESA mode.
7. The ESA software in the RCP perform exit operations.
8. The ESA software in the RCP card returns the Star Hub to normal operations.
9. The ESA software sends operational measurements, peg counts, and the reason the Star Hub dropped into ESA mode to the DMS-100 CC. This information appears in the PM171 and PM181 logs.
10. The DMS-100 CC returns to service the Star Hub.
11. The receiver is off-hook.

Tones during ESA mode

The UMP card provides the ESA call progress tones and detection of DTMF dialing. Though call progress tones are partially supported, since no features are supported during ESA, many of the call progression tones are not required.

The following table shows the Star Hub-supported ESA tones, cadence, and frequency.

Figure 5-4 Star Hub supported ESA tones

Tone type	Cadence On	Cadence Off	Frequency	Frequency stability	Frequency level	Frequency level stability
Dial	N/A	N/A	350 Hz + 440 Hz	±0.5%	–13 dBm	±1.5 dB
Busy	0.5 s	0.5 s	480 Hz + 620 Hz	±0.5%	–13 dBm	±1.5 dB
Audible	2.0 s	4.0 s	440 Hz + 480 Hz	±0.5%	–13 dBm	±1.5 dB
Reorder	0.25 s	0.25 s	480 Hz + 620 Hz	±0.5%	–13 dBm	±1.5 dB
Idle	N/A	N/A	7f (hex)	N/A	N/A	N/A
Warble	2.0 s	4.0 s	516.1 Hz + 648.6 Hz	N/A	N/A	N/A
ROH	0.1 s	0.1 s	1400 Hz + 2060 Hz +2450 Hz + 2600 Hz	±2.0%	+3 to –6 dBm	±3 dB
Notify	0.25 s	0.25 s	350 Hz + 440 Hz	±0.5%	–13 dBm	±1.5 dB

Note: Idle tone uses a start cadence message. The Star Hub connects the receive path to a port that provides idle tone.

Providing tones

The following steps provide tone to a subscriber:

1. The UMP card defines the tone required, the terminal identification and the cadence times.
2. When the UMP card receives the start cadence message, the card performs the following:
   a. If necessary, the current receive path connection of the terminal is broken.
   b. The receive path of the terminal connects to the appropriate port.
   c. The indicated cadence for that tone is set up.

The following steps clear the tone:

1. The ESA software in the RCP card sends a stop-cadence message to the UMP card. This message indicates the terminal identification.
2. When the stop cadence message is received by the UMP card, the card sends stop cadence messages to disconnect the terminal connection.

Ringing during ESA mode

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

- coded ringing
- frequency-selective ringing
- superimposed ringing

Treatments during ESA mode

The treatments supported during Star Hub ESA mode are:

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

ESA limits

The following limits apply to the Star Hub in ESA mode.

Limits during the ESA mode

Limits during the ESA mode for POTS lines and features are

- The system provides for the three-to-ten digit POTS dialing plan
- The system provides for unlimited HNPA code for each Star Hub

Limits during the ESA mode for MDC lines and features are

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

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

Restrictions during ESA mode

Global restrictions during ESA mode are

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

Restrictions during ESA mode for POTS lines and features are

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

Restrictions during ESA mode for MDC lines and features are

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

Fault conditions

The fault condition of unusable communication links triggers the ESA mode of operation. The possible reasons for this fault condition are described in the following paragraphs.

Unusable communication links

Communication links from the Star Hub to the DMS-100 CC become unusable because of the following conditions:

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

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

Looparound message audit failure

The Star Hub enters ESA mode when the looparound message audit detects the failure of messaging between the Star Hub and the DMS-100 CC. The failure occurs because of the following conditions:

- An extended loss of communication occurs with the DMS-100 CC for longer than the time-out period defined in the RLCM_ESAENTRY_BADCSIDE office parameter.
- The two LTC units (C-side peripherals) are ManB.
- Network planes of the LTC+ are ManB.

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

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

- line errors
  - too many originations
  - confusion message received
  - line translation error
  - dial pulse error (bad digits)
  - Digitone error (bad digits)
  - ringing error
  - coin error
- faulty Digitone receivers
- static data failure

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

Automatic ESA maintenance

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

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

ESA line audits

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

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

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

Digitone receiver audit

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

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

Automatic static data downloading and system maintenance

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

At a time determined by the office parameter RLCM_ESADUPD_HOUR, the system updates the static translations data in the ESA CC. The system performs the equivalent to the LOADPM PM CC ESADATA command in sequence on each Star Hub with the ESA option. This ESA option is set in table LCMINV.

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

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

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

Routine exercise test

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

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

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

Takeover and takeback on a Star Hub unit affects calls the system starts to connect. These processes do not affect connected calls. The Star Hub unit returns to service before a REX test checks the other unit.

The following actions occur during a REX test:

1. A REX test checks the messaging ability of the peripherals, ESA software, Star Hub units, and UMP. If one of these preliminary tests fails, REX tests are not run.
2. If the preliminary tests pass, one Star Hub unit goes to the SysB state and the other unit goes to the takeover mode. The unit in the SysB state has messaging links switched from the host to the ESA module.
3. The ESA software in the RCP card tests the ability of the Star Hub units to message to the ESA software under ESA conditions.
4. The system performs other diagnostics of the ESA capability including the tones test, a comparison of RCP control, and ESA software status bytes.
5. After the tests are complete, the unit goes out of the ESA mode and returns to service.
6. If the REX tests pass, the system tests the ESA module that uses the other Star Hub unit.

Escalation to manual maintenance

Manual maintenance may be required for certain testing conditions. There is no MAP display to indicate if a Star Hub is in ESA mode because the CC cannot query the state of the Star Hub when the communication between them is broken. When the Star Hub is in ESA, the Star Hub is marked as SysB or CBsy. This is a transient state which will change to SysB.

During the exit time-out period, the STAR MAP display shows the unit that was requested to leave ESA in the time-out countdown. This status is updated approximately every 10 s. When the exit process begins, the time-out countdown is replaced by an ESA EXIT flag. In manual exit, no time out status is displayed.

During both the time-out period and the exit, the mate unit runs in a lockout state to prevent other maintenance actions from occurring during the exit. This lock-out state indicates the mate unit cannot start an exit process of its own while the exit process on the first unit is running. The following figure shows a MAP display of a Star Hub waiting for ESA EXIT time out to expire. In this example, there are 40 seconds left before the exit begins.

Figure 5-5 Example of a Star Hub waiting for ESA EXIT time-out to expire

```
      CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
       .     .     .      .   1STAR   .      .        .       .     .
                               *C*
STAR
0  Quit                       SysB     ManB     OffL     CBsy     ISTb      InSv
2  Post_               PM      0        0        2        0        1         12
3  ListSet           STAR      0        0        2        0        1          9
4  SwRg_          STAR HOST 00 0  SysB  Links_OOS: CSide 0 PSide 0 UMP OOS:0
5  Trnsl_        Unit 0:  SysB MTCE    /RG: 0 ESA T.O.  40
6  Tst_          Unit 1:  SysB MTCE    /RG: 0 Lockout                   RG
7  Bsy_          Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
8  RTS_          01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
9  Offl                -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
10 LoadPM_
11 Disp_
12 Next
13
14 QueryPM
15
16
17
18
      userid
  TIME  hh : mm>
```

The following paragraphs identify manual maintenance activities regarding the ESA capability in the Star Hub.

Loading ESA static translations data

This section describes how to manually load the ESA static translations data into the NTTR77AA RCP card. Static translations data are part of DMS-100 CC translation data the system downloads to the ESA software in the RCP card.

The steps to manually download static data are

1. Post the STAR at the PM level.
2. Ensure the STAR is InSv or ISTb.

3. Load the ESA static data into the RCP card by typing

   >LOADPM PM CC ESADATA

   and pressing the Enter key.

   Example of a MAP display

   ```
   WARNING:  PM cannot enter ESA while loading ESADATA to both
   units simultaneously.  Do you wish to continue loading both
   units? Please confirm (“Yes", “Y", “No", or “N"):
   ```

4. Respond to the confirmation request. If N is entered, only one unit is loaded with ESADATA.

   If this process fails, the Star Hub becomes ISTb.

Manual exit

A manual exit from ESA is necessary if operating company personnel have busied the Star Hub before the recovery of communication or during the system exit time-out period. Both units must be busied, otherwise the CC attempts a system exit on the unit which is in a SysB state as soon as communication is restored.

Use the RTS command to perform a manual exit from the ESA mode at the STAR MAP level. A manual exit is required when the

- two Star Hub units are in a ManB state
- time-out value for the RLCM_XPMESAEXIT office parameter is set to zero

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

The manual exit sequence is described in the “ESA manual exit" section in this chapter.

LTC maintenance to prevent ESA mode

When the two LTC units are ManB, communication between the Star Hub and DMS-100 CC is interrupted. When communication between the Star Hub and the DMS-100 CC is interrupted, the Star Hub enters ESA mode. The Star Hub enters this mode after the time-out period in the RLCM_ESAENTRY_BADCSIDE office parameter expires. The following warning message displays when an attempt is made to manually busy an LTC.

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

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

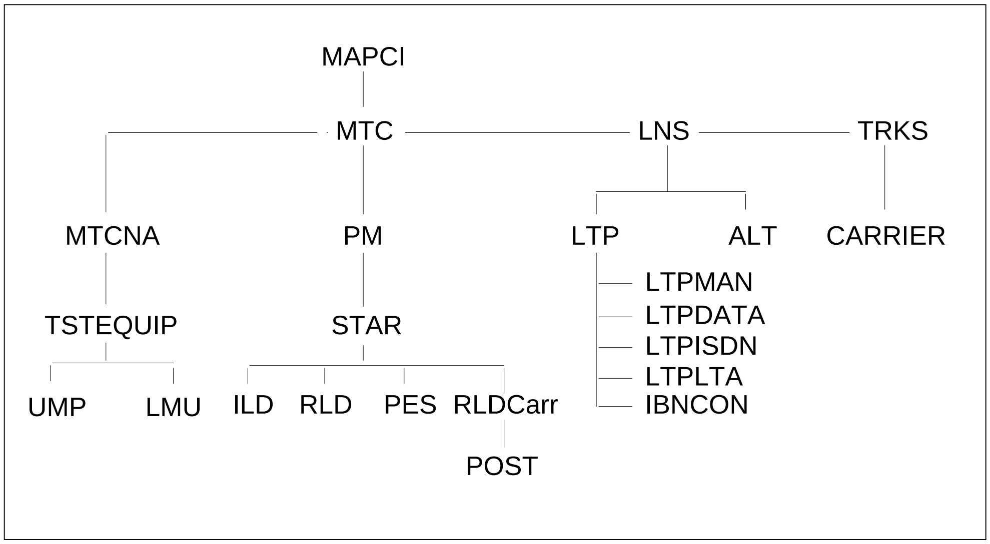
6 Star Remote System user interface

This section introduces commands operating company personnel use to maintain and troubleshoot the Star Remote System.

In the descriptions of the user interface given in this chapter, the term line concentrating module (LCM) is used in a generic sense to refer to any peripheral module like the STAR. Therefore, when the term LCM is used, STAR (Star Hub) is indicated. The actual MAP-level directory used to maintain the Star Hub is called the STAR level. The Star Module is maintained at the RLD (remote line drawer) level because the Star Module is a line drawer located at a remote site.

The following figure shows the directory structure for the command levels used to monitor and maintain elements of the Star Remote System at the MAP (maintenance and administration position) terminal.

Figure 6-1 MAP directory structure



Obtaining help at the MAP terminal

To receive online help information for commands at the MAP terminal, enter H or HELP and the command name you need help with at the command line. Online help provides the following information for a command:

- description of the function of the command
- defaults for unspecified information
- command syntax for required and optional parameters

The following example shows how to access online help using the HELP command:

```
>help nag
This NAG command will display the nodes that are not in
service.  The offline nodes can be included by using the
ALL parameter.  It also allows the nag log to be turned
ON or OFF.
Parms:[<OPTIONS>{ON,
                 OFF,
                 ALL}]
```

Understanding command syntax

The standard command entry sequence is as follows:

- command
- required parameter
- optional parameter

Online help provides information for parameters using the following special formatting and symbols:

- parameters appear on separate lines
- square brackets [ ] indicate the parameter is optional
- angle brackets < > enclose the name of a required parameter
- underscore character (_) in a parameter name indicates the value of the parameter is one word or string
- curly braces { } contain a complete list of possible values for the parameter
- information about the acceptable values for the parameter follow the name of the parameter

CI level user interface

This section describes the commands at the CI level:

- NAG
- QLEN
- QLENWRK
- STARDCSD

NAG command

This section describes the CI level NAG command useful in assessing node states in the office.

Display all nodes not in service using NAG command

The command interpreter (CI) level NAG (node assessment graph) command enables operating company personnel to display all nodes that are not in service. The MAP response to the NAG command is like that given in the NAG400 log report. The command and log report are part of the NAG feature which provides a brief view of nodes in the system that are not in service or have a routine exercise (REX) test issue. Operating company personnel 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 and 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)
- manually 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, ATP appears in the REX column which means all tests passed.

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

```
Front End Load: LECOB006
Level   Node        Status  REX INFO        UNIT 0  UNIT 1
----------------------------------------------------------
   CPU      1         ACT
CM                  NORMAL
MS MS               NORMAL
IOD                 NORMAL
NET                 NORMAL
PM RCCI     0        SYSB   ATP             SYSB    SYSB
   LCM  KOPM 12 0    SYSB   PASS:   PASS    SYSB    SYSB
   RMM      1        SYSB   ----             --      --
   ESA      4        SYSB   ----             --      --
    :       :         :       :               :       :
   LTC      0        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
   STAR REM1 01 1    ISTB   ATP             ISTB    ISTB
    :       :         :       :               :       :
   LCM KRCM 03  0     .     PASS:   ----      .       .
Offline Node count:  3
```

Line Equipment Number Query

For RLD lines only, a line in the output from commands QLEN and QLENWRK indicates the site name of the RLD as well as that of the hosting STAR Hub. This line is printed next to the RLD site indication.

Query line equipment number (QLEN) for RLD line

The QLEN command output prints the RLD site name and the STAR Hub site in a line, next to the RLD site.

Query line equipment number (QLENWRK) for RLD line

The changes mentioned above are also visible in the output of the QLENWRK command which is basically a sequence of QLEN results.

Table 6-1 Map outputs with associated meanings and actions

RLD LINE LOCATION: aaaaaaaa SITE: bbbb HUB SITE: xxxx
Meaning: The line is an RLD line, located at “aaaaaaaa”. Site name used for line definitions is “bbbb”. The hosting STAR Hub of the RLD is located at site “xxxx”. System or user actions: None needed.

Table 6-2 Usage examples for QLEN command

Description of task:	Query the LEN " ARPT 4 3 6 0"
Command:	QLEN ARPT 4 3 6 0
MAP response	--- LEN: APRT 04 03 06 00 RLD LINE LOCATION:AIRPORT SITE:ARPT HUB SITE: LORN TYPE: SINGLE PARTY LINE SNPA: 613 . . . .

Scan points and distribution points (SCSD) test tool for RLD/HUB

A test tool called STARSCSD is available to test the SC and SD points that reside in the NTTR70AA Star Module Controller (SMC) in the Star Module. The scan points report alarms to the SMC. The distribution points activate environmental components to control temperature conditions in the outside plant cabinet. The tool's commands are:

- HELP - to list the commands supported by the program.
- SET - set ON single/all points or function in a SD-group.
- RESET - set OFF single/all points or function in a SD-group.
- READ - get a single/all points or function of a SC-group.
- TEST - this command has several subcommands:
  - — SDONSET - set a single SD-point ON.
  - — SDOFSET - set single SD-point OFF.
  - — SETSD - set a SD-group to a 'masked' state map.
  - — GETSC - read the state of SC-group (all points).
  - — SCSMON - set a monitor on 'masked' state map (for SC-groups) to be in the selected state, for X time, in Y time frame.
- LEAVE - to exit the program.

PM level user interface

The PM (peripheral module) level directories and commands presented in this section are used to monitor and perform maintenance on the Star Hub.

PM states

The following table lists PM states seen at the MAP terminal.

Table 6-3 Overview of PM states

PM state	Code	Description
Central side busy	CBsy	PM is unable to communicate with the central control (CC) because the network interface links, used to carry messages between PM and the DMS SuperNode network, are unavailable.
In service	InSv	PM is in service and able to support any intended process, such as call processing.
In-service trouble	ISTb	PM is in service but has a minor fault.
Manual busy	ManB	PM is busy because the BSY command is entered at the MAP terminal.
Offline	Offl	PM is removed from service to allow commissioning tests or to temporarily hold the Star Hub out of service.
System busy	SysB	PM is removed from service by system maintenance.

STAR level user interface

The STAR level is used to monitor and maintain the Star Hub.

The Star Hub is integrated into the peripheral module (PM) level MAP display using the STAR level. The following figure shows a typical response at the MAP display when posting a Star Hub.

Figure 6-2 Posting a Star Hub at the STAR level

```
     CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
      .     .     .      .   4 SysB  .      .        .       .     .
                                M
STAR
0  Quit                          SysB     ManB     OffL     CBsy     ISTb      InSv
2  Post_                  PM      4        0        10        3        3          3
3  ListSet              STAR      0        0         0        0        1          1
4  SwRg_          STAR REM1 00 0  SysB  Links_OOS: CSide 0 PSide 0 UMP OOS:0
5  Trnsl_        Unit 0:  ISTb              /RG: 0
6  Tst_          Unit 1:  ManB              /RG: 0                  RG
7  Bsy_          Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
8  RTS_          01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
9  Offl                -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
10 LoadPM_
11 Disp_
12 Next
13
14 QueryPM
15 RLSPES
16 ILD
17 RLD
18 RLDCarr
     userid
  TIME  hh : mm>
```

In the previous figure, the MAP display contains universal maintenance pack-(UMP) related information that is output. The MAP display changes each time a BSY or RTS of the Star Hub is performed. The UMP OOS (out of service) counter identifies the number of UMP cards that are not in service.

The STAR level commands supported for the Star Hub at the PM level are shown in alphabetical order in the following table.

Table 6-4 Overview of STAR commands (Sheet 1 of 2)

Command	Function	Description
BSY	Busy	Busies a posted Star Hub or a unit of the posted Star Hub.
DISP	Display	Displays a group of Star Hubs in a specified state when used with the STATE option. Also displays diagnostic history of the Star Hub when used with the DIAGHIST option.
ILD	ISDN line drawer	Accesses the ISDN line drawer (ILD) level where maintenace commands reside to maintain the ILD. This command appears only when an ILD has been datafilled on the host switch.
LISTSET	Lists posted set	Lists the contents of the posted set.

Table 6-4 Overview of STAR commands (Sheet 2 of 2)

Command	Function	Description
LOADPM	Load PM	Loads software and data into one or both units of a posted Star Hub.
NEXT	Next	Posts the next Star Hub in a displayed set.
OFFL	Offline	Sets a posted Star Hub offline.
POST	Post	Posts a specific Star Hub, all Star Hubs in a specified state, or Star Hub peripherals as a group.
QUERYPM	Query PM	Displays information about a posted Star Hub, including physical location, node number, associated peripheral load name, and any associated faults. Also displays information about faults when used with the FLT option, and information about the diagnostic history when used with the DIAGHIST option. Options CNTRS and DRWR can also be used.
QUIT	Quit	Quits the current PM level of the MAP terminal or cancels a Star Hub selection.
PES	Power and environmental system	Acccess the power and environmental system (PES) level. This command appears only when an RLD has been datafilled on the host switch and the RLD is in a Star Remote Module Outside (SRMO) cabinet.
RLD	Remote line drawer	Accesses the RLD level where maintenace commands reside to maintain the RLD. This command appears only when an RLD has been datafilled on the host switch.
RLDCarr	RLD carrier	Accesses the RLDCarr level where maintenace commands reside to maintain DS-1 links connecting the Star Module to the Star Hub. This command appears only when an RLD is datafilled on the host switch.
RTS	Return to service	Returns to service, one or both units of a posted Star Hub or drawers.
SWRG	Switch ringing generator	Causes the ringing generator that is serving the specified unit of a specified Star Hub to be switched to serve the other unit.
TRNSL	Translate	Displays information about the interface links between the Star Hub and the Host.
TST	Test	Tests one or both units of a posted Star Hub.

LOADPM command

When ESA data needs to be downloaded to in-service Star Hub units, the following commands can be entered, depending on requirements, for updating ESA data

- LOADPM PM CC ESADATA to update the ESA data for the entire Star Hub
- LOADPM UNIT unit_no CC ESADATA to update the ESA data in a specific unit of the posted Star Hub

QUERYPM command

When the QUERYPM command is entered at the MAP terminal, information about ESA and the UMP cards are displayed, in addition to the regular information provided with the QUERYPM command response. An example of a MAP display showing the system response to the QUERYPM command follows.

Figure 6-3 Example of a QUERYPM command at the STAR level

```
     CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
      .     .     .      .   4 SysB  .      .        .       .      .
                               M
STAR
0  Quit                          SysB     ManB     OffL     CBsy     ISTb      InSv
2  Post_                  PM      4        0       10        3        3          3
3  ListSet              STAR     0        0        0        0        1          1
4  SwRg_           STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
5  Trnsl_         Unit 0:  ISTb              /RG: 0
6  Tst_           Unit 1:  ManB              /RG: 0                     RG
7  Bsy_           Drwr:         11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
8  RTS_           01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
9  Offl           .. .. -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
10 LoadPM_        QUERYPM
11 Disp_          PM Type:  STAR Int. No.:5 Status index: 5 Node_No: 42
12 Next           STAR REM1 00 0 Memory size – Unit 0: 8M , unit 1: 8M
13                ESA Equipped: No, Intraswitching is Off
14 QueryPM        Loadnames: LCMINV – RSRD0811, Unit 0: NLCN0700
15                Node Status: {OK, FALSE}
16 ILD            UNIT 0 Status: {OK, FALSE}
17 RLD            Unit 1 Status: {MAN_BUSY, FALSE}
18 RLDCarr        Site Flr RPos  Bay_id  Shf Description  Slot  EqPEC
                  STAR  00  A00  SRHE 00  00  STAR 00 00         NT8602
     userid       Services: NEUTRAL
  TIME  hh : mm>  UMP 0 OffL Loadnames: RMPCKT – RSRD0811 Real * Unknown
                  This PM is: STAR
```

An example of the QUERYPM FLT command that displays the Star Hub or unit-related ISTb reasons and any UMP-related ISTb reasons follows.

Figure 6-4 Example of a QUERYPM FLT command at the STAR level

```
     CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
      .     .     .      .   4 SysB  .       .       .       .     .
                                M
STAR
0  Quit                        SysB     ManB     OffL     CBsy     ISTb      InSv
2  Post_                PM      4        0        10        3        3          3
3  ListSet            STAR      0        0         0        0        1          1
4  SwRg_          STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
5  Trnsl_        Unit 0:  ISTb               /RG: 0
6  Tst_          Unit 1:  ManB               /RG: 0                    RG
7  Bsy_          Drwr:         11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
8  RTS_          01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
9  Offl          .. .. -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
10 LoadPM_       QUERYPM FLT
11 Disp_         Node inservice troubles exist:
12 Next              One or both Units inservice trouble
13               STAR UNIT 0 ISTB
14 QueryPM       STAR UNIT 1 MANB
15 PES               PM overloaded
16 ILD
17 RLD
18 RLDCarr

     userid
  TIME  hh : mm>
```

When the command string QUERYPM FLT is entered, one of the following unit-related or node-related ISTb reasons can also be displayed.

- STAR Node ISTb reasons
  - — One or both MTC packs out of service
  - — MTC pack load file mismatch
  - — Fuse card fault
  - — ESA option is blocked within both LCM units
  - — Inter Unit Communication fault
- STAR Unit ISTb reasons
  - — LCM ESA Static Data or EXECs invalid
  - — LCM ESA translation data invalid
  - — All other LCM relevant faults that related to LCM self testing i.e. drawers testing

Line drawer state display

At the STAR level of the MAP display, the status of the drawers is displayed below the status of the Star Hub units. The drawers are numbered from 1 through 18. For the Star Hub, the MAP display shows the line subgroups

(LSG), which are numbered 0 to 35. The LSGs are essentially one half of the line drawer. The following display shows an example of drawer status:

Example of a MAP response:

```
                    11 1111 1111 2222 2222 2233 3333
DRWR:  0123 4567 8901 2345 6789 0123 4567 8901 2345
       ..S. ..MM .MOO ..-- SSI. .... .... .... ....
```

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

The codes used to display line drawer states, or in the Star Hubs case LSG states at the MAP terminal, are listed in the following table. This text uses standard abbreviations rather than code to describe line drawer states.

Table 6-5 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

ILD menu descriptions

When an integrated services digital network (ISDN) line drawer for remote (ILD-R) data is entered, the ILD command appears on the STAR menu. The ILD command allows operating company personnel to access the ILD level. The ILD level supports maintenance actions on the ISDN line drawers. The ILD level shows the state of the ILD banks (memory areas) and the ILD Bd channels (low speed packet data). From this level an ILD can be posted and action can be performed on the posted drawer. For example, LOADPM is used to load the ILD firmware.

The ILD drawer numbers are shown in reverse video mode to distinguish them from a standard plain old telephone service (POTS) line drawer. An example of the ILD command availability at the STAR level follows.

Figure 6-5 Example of a Star Hub equipped with ILD-R

```
                     CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
                     .     .     .      .    4 SysB .       .       .       .     .
                                                M
 ILD
 0  Quit                              SysB      ManB      OffL      CBsy      ISTb      InSv
 2  Post_                      PM      4         0         10         3         3          3
 3  ListSet                  STAR      0         0          0         0         1          1
 4                    STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
 5  Trnsl_           Unit 0:  ISTb               /RG: 0
 6  Tst_             Unit 1:  ManB               /RG: 0                    RG
 7  Bsy_             Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
 8  RTS_             01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
 9  Offl             .. .. .. .. .. .. .. .. .. II .. .. .. -- -- -- -- --
 10 LoadPM_
 11
 12 Next
 13
 14 QueryPM
 15
 16 QueryCH
 17 SwBnk_
 18

      SHIMON
  TIME  hh : mm>
```

The following MAP example shows the ILD level with ILD drawer 18 posted.

Figure 6-6 Example of posting an ILD

```
                     CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
                     .     .     .      .    4 SysB .       .       .       .     .
 ILD                                            M
 0  Quit                              SysB      ManB      OffL      CBsy      ISTb      InSv
 2  Post_                      PM      4         0         10         3         3          3
 3  ListSet                  STAR      0         0          0         0         1          1
 4                    STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
 5  Trnsl_           Unit 0:  ISTb               /RG: 0
 6  Tst_             Unit 1:  ManB               /RG: 0                    RG
 7  Bsy_             Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
 8  RTS_             01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
 9  Offl             .. .. .. .. .. .. .. .. .. II.. .. .. -- -- -- -- --
 10 LoadPM_
 11                    ILD DRWR 18              Links OOS: CSide 0
 12 Next               BANK_1: Active         BDchnls:    Bd1  Bd2
 13                    BANK_2: Stby                          .     0
 14 QueryPM
 15
 16 QueryCH
 17 SwBnk
 18

      SHIMON
  TIME  hh : mm>
```

The following table provides an alphabetical list of the menu commands related to the ILD.

Table 6-6 Overview of ILD commands (Sheet 1 of 2)

Command	Function	Description
BSY	Busy	Moves the ILD-R or Bd-channel to ManB.
LIST_SET	Lists posted set	Displays the ILD-Rs included in the posted set.
LOADPM	Load PM	Loads the ILD-R. Used to load either a single drawer (LOADPM) or all the drawers on the same Star Hub (LOADPM ALL). The steps of the LOADPM procedure, and the amount of memory already loaded will appear at the MAP display during the LOADPM command.
NEXT	Next	Displays the next ILD-R in the post set.
OFFL	Off line	Moves the ILD-R or Bd-channel to offline (Offl).
POST	Post	Posts one or all ILDs located in the same Star Hub. When POST ALL is invoked, all ILD-Rs located in the Star Hub (up to six) are added to the list.
QUERYCH	Query channel	Displays information about the Bd-channel. It displays the XLIU/XSG number and channel of the Bd special connection, the Bd-channel, and the ILD-R BD operational measurement (OM) index.
QUERYPM	Query PM	Displays information about the ILD-R. Two optional parameters, FLT and CNTRS can be used.
RTS	Return to service	Returns to service the ILD-R or a Bd-channel.
SWBNK	Switch memory bank	Switches activity between the two flash memory banks. Currently, only cold switch bank is supported.
TRNSL	Translate	Displays the ILD-Rs C-side links with their status and message condition.
TST	Test	Tests the ILD-R or its Bd-channels. When BD1 or BD2 is typed, a continuity test between the ILD-R and the packet handler is performed. The test sends a message at the ILD-R, loops it at the integrated packet handler (IPH), and verifies it again at the ILD-R.

Table 6-6 Overview of ILD commands (Sheet 2 of 2)

Command	Function	Description
QILD	New	This nonmenu command displays all the D-packet switching logical terminal identifiers (LTID) that are mapped into a given ILDR's Bd-channels. This command can request a certain Bd-channel if one is selected, or request information of both ILDR's Bd-channels.
QSCONN	Changed	This nonmenu command displays SPECCONN endpoints and segments, depending on the command's parameter. A new option, ILDCHNL, is added to the QSCONN SEG command.

QUERYPM command

When the QUERYPM command is entered without parameters, the following ILD-R information is displayed:

- ILD-R name, node, and internal number
- loadname
- ILD-R status and physical location

When the command string QUERYPM FLT is entered and the ILDs status is ISTb or SysB, the ISTb/SysB reasons are displayed. The following is a list of the possible ISTb or SysB reasons.

- ISTb reasons
  - one DMSX channel is unavailable
  - incoming message overload
  - load name mismatch
  - noncritical inservice test failed
  - one or both Bd-channels are out of service
  - invalid load file
  - load in progress
- SysB reasons
  - incoming message overload
  - critical inservice test failed
  - no response from ILD-R
  - call process activity mismatch
  - LCM activity mismatch
  - unsolicited message limit exceeded
  - software error message limit exceeded
  - who-am-I (WAI) received
  - cold Swbnk in progress
  - CC restart has occurred
  - C-side node return to service (RTS)
  - active bank mismatch
  - ILD bus interface card (BIC) loop failure
  - fault message received from ILD

When the command string QUERYPM CNTRS is entered, the following ILD-R information is displayed:

- loadnames of the active and inactive banks
- number of unsolicited messages and swerrs received and their limits
- contents of the ILDMSGCNT's registers

RLD level user interface

Operating company personnel use the RLD level of the MAP display to monitor and maintain the Star Module (or remote line drawer). The RLD command accesses the RLD level. The RLD level only appears when a STAR is posted and at least one Star Module is defined in table LCMDRINV.

The RLD is accessed by entering RLD at the STAR level. The following figure shows a normal response at the MAP display when posting a STAR. The line drawers in reverse video represent the Star Module.

Figure 6-7 Posting a Star Module at the RLD level

```
     CM     MS     IOD     Net     PM     CCS     Lns      Trks     Ext    Appl
      .      .      .       .     4 SysB  .        .        .        .       .
                                     M
 RLD
 0  Quit                       SysB      ManB      OffL      CBsy      ISTb       InSv
 2  Post_              PM       4         0         10         3         3            3
 3  ListSet           STAR      0         0          0         0         1            1
 4                STAR REM1 00 0 Istb Links_OOS: CSide 0 PSide 0 UMP OOS:0
 5  Trnsl        Unit 0:  ISTb                /RG: 0
 6  Tst_         Unit 1:  ManB                /RG: 0                          RG
 7  Bsy_         Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
 8  RTS_         01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
 9  Offl_        MM .M -- -- -- -- -- -o .. -- -- -- -- -- -- -- -- --
 10 LoadRLD_
 11              REM9 RLD DRWR  8                         LogDrwr:  16  17
 12 Next         BANK_0:  Active                          Links_OOS: 2
 13              BANK_1: Stby                             RLD BDch:  -
 14 QueryRLD
 15 QueryPES
 16 QueryCH
 17 SwBnk_
 18
      userid
  TIME  hh : mm>
```

In the previous figure, the MAP display shows that Module 8 is posted and includes logical drawers 16 and 17. The Star Module is InSv and both logical drawers indicate they are in the InSv state by the dots in reverse video.

> ***Note:*** Maintenance operations are not supported on one Star Module logical drawer (line subgroup). Maintenance operations can only be performed on a physical Star Module, that is, on both logical drawers (line subgroups). Therefore, an RLD is posted by the drawer number that appears in the STAR line drawer display. As in the previous example, access Module 8 by entering POST 16 at the RLD level.

The RLD level commands supported for the Star Module at the PM level are shown in alphabetical order in the following table.

Table 6-7 Overview of RLD commands (Sheet 1 of 2)

Command	Function	Description
BSY	Busy	Busies a posted Star Module.
LISTSET	Lists posted set	Lists all Star Modules in the posted set.
LOADRLD_	Load remote line drawer	Loads software and data into one bank of a posted Star Module. ***Note 1:*** When one bank of the Star Module needs to be loaded, enter one of the following commands: • LOADRLD CC to load the posted Star Module from the computing module (CM) • LOADRLD MATE to load the inactive bank of the posted Star Module from its active bank. The optional ALL parameter can be entered with the previous commands to load all modules in a posted set that are connected to the same STAR. ***Note 2:*** Engineering limitation: more than 4 modules in a posted set is not recommended.
NEXT	Next	Posts the next Star Module in a posted set.
OFFL	Offline	Sets a posted Star Module offline.
POST	Post	Posts a specific Star Module, all Modules in a specified state, or all Star Modules as a group.
QUERYRLD_	Query remote line drawer	Displays information about a posted Star Module, including module internal number, load name from table LCMDRINV, line maintenance unit (LMU) card status, ringer status, and module status and physical location. Also displays information about faults when used with the FLT option, and information about original bank loadnames, bank status and RLD activity when used with the CNTRS option.
QUERYPES	Query power and environmental system	Displays PES alarms for the posted Star Module.
QUERYCH	Query Bd channel	Displays special connection information for the Bd channel.
QUIT	Quit	Quits the current PM level of the MAP terminal or cancels a Star Module selection.

Table 6-7 Overview of RLD commands (Sheet 2 of 2)

Command	Function	Description
RTS	Return to service	Returns to service a posted Star Module or its Bd channel.
SwBnk	Switch bank	Switches activity between the two loadable firmware banks of the Star Module. When the SwBnk command is entered, the following message is output at the MAP terminal: `WARNING: A COLD switch Bank will be performed. All existing calls will be dropped. Do you wish to continue? Please confirm ("YES", "Y", "NO", or "N")`
TRNSL	Translate	Displays link status and message condition for the interface links between the Star Module and the Star Hub.
TST	Test	Tests the posted Star Module or its Bd channel.

Module state display

At the STAR and RLD levels of the MAP display, the status of the Star Modules are displayed below the status of the STAR units. The drawers and Star Modules are numbered from 1 through 18. The MAP display shows the LSGs, which are numbered 0 to 35. The LSGs are essentially one half of the line drawer. The states of the line drawers and Star Modules are listed below the drawer and Star Module numbers.

The codes used to display RLD (LSG) states at the MAP terminal are listed in the following table. The state codes are standard abbreviations to describe line drawer states.

Table 6-8 Drawer states

Code	Definition (abbreviation)
• (dot)	In service (InSv)
I	In-service trouble (ISTb)
C	C-side busy, when the host STAR is not in service
M	Manual busy (ManB)
O	Offline (OffL)
S	System busy (SysB)
-	Unequipped

LOADRLD command

When one bank of the Star Module needs to be loaded, enter one of the following commands

- LOADRLD CC to load the posted Star Module from the comuting module (CM)
- LOADRLD MATE to load the inactive bank of the posted Star Module from its active bank

The optional ALL parameter can be entered with the previous commands to load all Modules in a posted set that are connected to the same STAR.

The optional NOWAIT parameter allows operating company personnel to run the LOADRLD activity in the background while performing other operations at the MAP terminal.

> ***Note:*** The RLD loading progress is output in the status line for STAR Unit 0. The system identifies the RLD Stby bank as “loading" when loading occurs.

QUERYPES command

The QUERYPES command at the RLD level displays alarm information about the posted Star Module. The QUERYPES command can be entered with no parameters or with the FLT (fault) parameter.

- when no parameter is used with the QUERYPES command, the system responds with the Module PES condition and lists all the alarms
- the FLT parameter displays only the fault alarms
- in all alarms but the DOOR alarm, a period (.) means no alarm and “F" means fault
- in the DOOR alarm, a period (.) means door closed and “O" means open door

The following figure provides an example of the QUERYPES command.

Figure 6-8 Example of a QUERYPES command at the RLD level

```
     CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext    Appl
      .      .       .       .    4 SysB  .        .        .        .      .
                                    M
RLD
0  Quit                       SysB      ManB      OffL      CBsy      ISTb      InSv
2  Post_               PM       4         0        10         3         3         3
3  ListSet            STAR      0         0         0         0         1         1
4                 STAR REM1 00 0 Istb Links_OOS: CSide 0 PSide 0 UMP OOS:0
5  Trnsl_        Unit 0:  ISTb              /RG: 0
6  Tst_          Unit 1:  ManB              /RG: 0                   RG
7  Bsy_          Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
8  RTS_          01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
9  Offl          MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --
10 LoadRLD_
11               REM9 RLD DRWR  8 SYSB                    LogDrwr:  16  17
12 Next          BANK_0:  Active                          Links_OOS: 2
13               BANK_1: Stby                             RLD BDch:  -
14 QueryRLD      QUERYPES
15 QueryPES      CONDITION GREEN    HUMIDITY 0%
16 QueryCH       DCFAIL .  FIBFAIL .  FIBLOSS .  RMS .    ACTCOIN
17 SwBnk_        FAIL15V .  RELAYS .  ACFAIL  .  LMUINSRT .  FUSE15V .  DOOR .
18               ISDN100V .  TBFFUS .  DCPFUS .  TEMPHIGH .  TEMPLOW .  BATTERY .
                 TOPSENS .  BOTSENS .  BATTSENS .  HUMDSENS .  FAN0 .  FAN1 . ACFAIL
     userid
 TIME  hh : mm>
```

Note: The alarm conditions in the box apply to the outside SRMO cabinet.

RLDPES level user interface

The RLDPES level at the STAR level displays the Star Module environmental alarms. The RLDPES level commands are shown in alphabetical order in the following table.

Table 6-9 Overview of RLDPES commands

Command	Function	Description
BATTERY	Battery	Displays information about the last and next battery test dates when used with the QUERY parameter. Activates a battery test manually when used with the TEST parameter.
DOOR	Door	Turns on, turns off, and queries the door alarm for the posted RLD.
NEXT	Next	Posts the next RLD in a posted set or displays the next screen of the set.
POST	Post	Posts a PES member by RLD name or condition indicator.
QUIT	Quit	Quits the current level and returns to STAR level.

Figure 6-9 Example of a RLDPES level output

```
     CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
      .     .     .      .   4 SysB  .       .        .       .     .
                                M
RLDPES
0  Quit                        SysB     ManB     OffL     CBsy     ISTb      InSv
2  Post_                PM      4        0        10        3        3          3
3                      STAR     0        0         0        0        1          1
4                 STAR REM1 00 0 Istb Links_OOS: CSide 0 PSide 0 UMP OOS:0
5                Unit 0:  ISTb                /RG: 0
6                Unit 1:  ManB                /RG: 0                    RG
7                Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
8                01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
9                MM .M -- -- -- -- -- -o SS -- -- -- -- -- -- -- -- --
10
11               REM9 RLD DRWR  8 SYSB                    LogDrwr:  16  17
12 Next          BANK_0:  Active                          Links_OOS: 2
13 DOOR          BANK_1: Stby                             RLD BDch:  -
14               Disp red
15               RED:  REM9 RLD Drwr 8
16
17
18 Battery_
     userid
 TIME  hh : mm>
```

There are two condition indicators for the RLDPES as follows:

- green - no alarms
- red - critical or major alarm condition detected for one or more environmental elements

Operating company personnel can display PES information by RLD name or by a condition indicator. Only RLDs connected to the posted Star Hub can be posted.

After posting an RLD at the RLDPES level, the RLDPES level appears. The following figure provides an example of the RLDPES level showing the PES alarms for the posted RLD.

Figure 6-10 Example of a RLDPESPost level output

```
                       CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
                       .     .     .      .    4 SysB   .      .       .       .     .
                                                  M
RLDPES
0  Quit                             SysB     ManB     OffL     CBsy     ISTb      InSv
2  Post_                    PM       4        0        10       3        3          3
3                          STAR      0        0        0        0        1          1
4                       STAR REM1 00 0 Istb Links_OOS: CSide 0 PSide 0 UMP OOS:0
5                      Unit 0:  ISTb                /RG: 0
6                      Unit 1:  ManB                /RG: 0                    RG
7                      Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 Istb
8                      01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
9                      MM .M -- -- -- -- -- -o SS -- -- -- -- -- -- -- -- --
10
11 Disp
12
13
14
15
16
17
18
     userid
 TIME  hh : mm>
```

To conduct a test of the batteries in the RLD, operating company personnel must enter the BATTERY TEST command. The following are responses to the BATTERY TEST command:

- If the test fails, a PES200 log is output and the system response to the QUERYPES command at the RLD level and the MAP display at the RLDPES level report the test failure.
- If no faults exist, the MAP display message is `A battery test may reduce the battery capacity. Please confirm (“Yes", “Y", “No", or “N")`.
- If a DCFAIL alarm is on, the system does not perform the test and the following message is output: `DCFAIL alarm is on. A battery test cannot be done.`
- If an ACFAIL alarm was raised in the last 3 days, the following message is output: `Less than 3 days passed since the last AC failure. Test anyway? Please confirm (“Yes", “Y", “No", or “N")`.
- If the RLD is out of service the following message is output: `The RLD is out of service. A test message cannot be sent.`

The following figure provides an example of the RLDPESPost level showing the BATTERY QUERY command for the posted RLD.

Figure 6-11 Example of a BATTERY QUERY output at the RLDPESPost level

```
                      CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
                      .     .     .      .    4 SysB  .      .       .       .     .
                                                 M
RLDPESPOST
0  Quit                             SysB     ManB     OffL     CBsy     ISTb      InSv
2  Post_                     PM       0        0       10        3        3         3
3                           STAR       0        0        0        0        1         1
4                      STAR REM1 00 0 Istb Links_OOS: CSide 0 PSide 0 UMP OOS:0
5                     Unit 0:  ISTb                /RG: 1
6                     Unit 1:  ManB                /RG: 1                            RG
7                     Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 ISTb
8                     01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
9                     MM .M -- -- -- -- -- -o SS -- -- -- -- -- -- -- -- --
10
11                    PES CLASS_B RLD DRWR  8 CONDITION GREEN
12 Next               DCFAIL .    RELAYS .   HIGHTEMP .  SENSORS: TOP    .
13 DOOR               FAIL100V .  TBFFUS .   LOWTEMP . .          BOTTOM .
14                    FAIL15V .   DCPFUS .   FAN0 .               BATTERY.
15                    FUSE15V .   ACTCOIN .  FAN 1 .     HUMIDITY.
16                    DOOR .      RMS .      ACFAIL .    BATTERY .
17 FansTST            LMUINSRT .
18 Battery_
                      Battery query
     userid           The last battery test was held on :  1999/06/17 14:08:55.704 THU
 TIME  hh : mm>       The next test is scheduled on:       1999/09/15 14:08:55.704 WED
```

RLDCarr level

The RLDCarr level accessible from the STAR level provides commands to enable operating company personnel to query and maintain the C-side and P-side of RLD DS-1 links. The RLDCarr level displays carrier information about up to four carriers. The maximum number of RLDCarr screens displayed is eight, since the Star Hub supports up to 32 DS-1 “hidden" carriers. Each RLDCarr screen shows the total number of links in the posted set. The following figures provide examples of DS-1s posted at the RLDCarr level.

> ***Note:*** Maintenance operations on RLD links are allowed if they do not change the RLD status.

Figure 6-12 Posting all DS-1 link from the Star Hub using the Trnsl command

```
                     CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
                     .     .     .      .    4 SysB  .      .       .       .     .
                                                M
POST
0  Quit                             SysB     ManB     OffL     CBsy     ISTb      InSv
2  Post_                     PM       0        0       10        3        3         3
3                           STAR      0        0        0       0         1         1
4
5  Trnsl             STAR REM1 00 0 InSv Links_OOS: CSide 0 PSide 0 UMP OOS:1
6  Tst_              Unit 0: Insv               /RG:1
7  Bsy_              Unit 1: Insv               /RG:1 RG
8  RTS_              Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
9  OffL_             01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
10 DispOpt_          -- -- -- -- -- .. -- -- -- -- -- -- -- -- -- -- -- -
11                   N Site      RLD PORT CARD ALRM SLIP FRME BER ES SES STATE
12 Next              0 CLASS_B     5    0   IN         0    0   0  0   0  Insv
13                   1 CLASS_B     5    1   IN         0    0   0  0   0  Insv
14
15
16                   Posted by drawer number
17
18                   POST:
     userid
 TIME  hh : mm>
```

When operating company personnel enter the POST command for an RLD at the RLDCarr level, the system changes the MAP display to the RLDCarr;POST level. The following MAP display examples show the RLD posted by drawer number with the P option and without the P option.

Figure 6-13 P-side DS-1 link from the Star Hub posted by drawer number with P option

```
       CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext    Appl
        .      .      .       .     4 SysB  .        .        .       .      .
                                      M
 POST
 0  Quit                                 SysB     ManB     OffL     CBsy     ISTb      InSv
 2  Post_                        PM       4        0       10        3        3           3
 3                              STAR      0        1        0        0        1           1
 4                       STAR REM1 00 0  ManB  Links_OOS: CSide 0 PSide 0 UMP OOS:1
 5  Trnsl               Unit 0:  ManB              /RG:0
 6  Tst_                Unit 1:  ManB              /RG:0                        RG
 7  Bsy_                Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
 8  RTS_                01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
 9  Offl                MM .M -- -- -- -- -- -o CC o. -- -- -- -- -- -- -- oo
 10 DispOpt_
 11                     N SITE  STAR  PORT  CARD  ALRM  SLIP  FRME  BER   ES  SES  STATE
 12 Next                0 REM1  13-3  20    IN          0     0     5.0   0   0    Cbsy
 13                     1 REM1  13-3  21    IN    LCGA  0     0     ML    0   0    Cbsy
 14
 15                     Posted by drawer number with P option
 16
 17
 18
      userid
  TIME  hh : mm>
```

Figure 6-14 P-side DS-1 link from the Star Hub posted by drawer number

```
       CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext    Appl
        .      .      .       .     4 SysB  .        .        .       .      .
                                      M
 POST
 0  Quit                                 SysB     ManB     OffL     CBsy     ISTb      InSv
 2  Post_                        PM       4        0       10        3        3           3
 3                              STAR      0        1        0        0        1           1
 4                       STAR REM1 00 0  ManB  Links_OOS: CSide 0 PSide 0 UMP OOS:1
 5  Trnsl               Unit 0:  ManB          /RG:0
 6  Tst_                Unit 1:  ManB          /RG:0                            RG
 7  Bsy_                Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
 8  RTS_                01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
 9  Offl                MM .M -- -- -- -- -- -o CC o. -- -- -- -- -- -- -- oo
 10 DispOpt_
 11                     N  SITE  STAR  PORT  CARD  ALRM  SLIP  FRME  BER  ES  SES  STATE
 12 Next                0  REM1  13-3  20     IN          0     0     5.0  0   0    Cbsy
 13                     1  REM1  13-3  21     IN    LCGA  0     0     ML   0   0    Cbsy
 14
 15
 16                     Posted by drawer number
 17
 18
      userid
  TIME  hh : mm>
```

The RLDCarr level commands for the Star Module are listed in alphabetical order in the following table.

Table 6-10 Overview of RLDCarr commands

Command	Function	Description
POST	Post	Displays RLD C-side carriers based on the state, maintenance limit or out-of-service limit, ALL, or an RLD number. When an RLD is posted, the system changes to the POST level.
QUIT	Quit	Quits the current level and returns to RLD level.
TRNSL	Translate	Displays the carrier status, message condition, port number on the Star Hub, port number on the Star Module, and the master Hub unit for all (up to 32) P-side DS-1 links of a specified Star Hub.

The RLDCarr;POST level commands for the Star Module are listed in alphabetical order in the following table.

Table 6-11 Overview of RLDCarr;POST commands (Sheet 1 of 2)

Command	Function	Description
BSY	Busy	Busies a specified carrier or carriers in a posted set. A message displays, warning the Bsy command changes the RLD state.
DISPOPT	Display option	Displays all maintenance attributes of the specified carrier (information from table CARRMTC).
NEXT	Next	Posts the next RLD in a posted set or displays the next screen of the set.
OFFL	Offline	Sets a busied carrier to the Offl state.
QUIT	Quit	Quits the current level and returns to RLD level.
POST	Post	Displays RLD C-side carriers based on the state, maintenance limit or out-of-service limit, ALL, or an RLD number.
RTS	Return to service	Returns a posted carrier to service.

Table 6-11 Overview of RLDCarr;POST commands (Sheet 2 of 2)

Command	Function	Description
TST	Test	Tests the DS-1 interface card for a specific Star Hub P-side DS-1 carrier and enables or disables alarm detection for a specific DS-1 link.
TRNSL	Translate	Displays the carrier status, message condition, port number on the Star Hub, port number on the Star Module, and the master Hub unit for all (up to 32) P-side DS-1 links of a specified Star Hub.

TSTEQUIP level user interface

The MTCNA level contains the TSTEQUIP level. The TSTEQUIP level is used to display and post stand-alone test equipment such as the following cards:

- NTTR73AA UMP card in the Star Hub is posted at a UMP sublevel
- NTTR71AA LMU card in the Star Module is posted at the LMU sublevel

UMP level

Posting the UMP card takes you to the UMP level where maintenance activities such as BSY, RTS, and LOADTE are performed. In addition, diagnostics are performed at the UMP level. The following figure provides an example of a UMP card posted at the UMP level.

Figure 6-15 Example of a UMP level MAP display

```
   CM     MS     IOD     Net     PM     CCS     Lns      Trks     Ext    Appl
    .      .      .       .    4 SysB    .       .        .        .      .
                                 M
  UMP                          SysB     ManB     Offl    CBsy     Szd   Idle
  0  Quit              TstEquip  4        1        1       0        0      3
  2  Post_             HUB       0        1        3       0        0      1
  3
  4                        PM         MTE       STATE
  5  Host            STAR URM  1 0   UMP 0     Idle
  6  Tst
  7  Bsy
  8  RTS
  9  OffL
  10 LoadTE
  11
  12 Next
  13 CSinfo
  14 QueryTE
  15 Frls
  16
  17
  18
     userid
  TIME  hh : mm>
```

In the previous MAP example, note the possible UMP states, which are listed as follows:

- SysB - system busy
- ManB - manual busy
- Offl - offline
- CBsy - C-side busy
- Szd - seized
- Idle - in service

The following table provides an alphabetical listing of the UMP level commands supported by the Star Hub UMP card maintenance activities.

Table 6-12 Overview of UMP level commands (Sheet 1 of 2)

Command	Function	Description
BSY	Busy	Busies a posted UMP circuit.
CSINFO	C-side information	Queries the name and status of the associated PM in which the UMP resides.

Table 6-12 Overview of UMP level commands (Sheet 2 of 2)

Command	Function	Description
FRLS	Forced release	Forces the release of a posted UMP circuit.
HOST	Host	Posts UMPs that reside in a specific host.
LOADTE	Load test equipment	Loads software into the UMP card.
NEXT	Next	Posts the next UMP in a posted set.
OFFL	Offline	Sets a UMP circuit offline.
POST	Post	Posts specific test equipment for maintenance.
QUERYTE	Query test equipment	Queries a UMP circuit.
QUIT	Quit	Quits the current TSTEQUIP level.
RTS	Return to service	Returns the UMP circuit to service.
TST	Test	Performs diagnostics on a UMP card.

LMU level

Posting the NTTR71AA LMU card takes you to the LMU level where maintenance activities such as BSY and RTS are performed. In addition, diagnostics are performed on the LMU level. The following figure provides an example of a LMU card posted at the LMU level.

Figure 6-16 Example of a LMU level MAP display

```
  CM     MS     IOD     Net     PM     CCS     Lns      Trks     Ext    Appl
   .      .      .       .     4 SysB    .       .        .        .       .
                                  M
LMU                            SysB     ManB     Offl    CBsy     Szd   Idle
0  Quit              TstEquip    4         1         1      0        0      3
2  Post_             HUB         0         1         3      0        0      1
3
4                       PM         MTE       STATE
5  Host              STAR URM   1 0   LMU 0      Idle
6  Tst
7  Bsy
8  RTS
9  OffL
10
11
12 Next
13 CSinfo
14 QueryTE
15 Frls
16
17
18
   userid
TIME  hh : mm>
```

In the previous MAP example, note the possible LMU states, which are listed as follows:

- SysB - system busy
- ManB - manual busy
- Offl - offline
- CBsy - C-side busy
- Szd - seized
- Idle - in service

The following table provides an alphabetical listing of the LMU level commands supported by the Star Module LMU card maintenance activities.

Table 6-13 Overview of LMU level commands (Sheet 1 of 2)

Command	Function	Description
BSY	Busy	Busies a posted LMU or group of LMUs into the ManB state.
CSINFO	C-side information	Queries the name and status of the associated PM in which the LMU resides, and displays the LMU status.

Table 6-13 Overview of LMU level commands (Sheet 2 of 2)

Command	Function	Description
CONVERT	Convert	Converts from external formats to NN and TN for the posted test equipment. This command is mainly used for debugging.
FRLS	Forced release	Forces the release of a posted LMU and puts it in the ManB state.
HOST	Host	Posts an LMU or LMUs that reside in a specified host by host identifier.
NEXT	Next	Posts the next LMU in a posted set.
OFFL	Offline	Sets a posted LMU or group of LMUs offline.
POST	Post	Posts an LMU or group of LMUs by the LMU number.
QUERYTE	Query test equipment	Queries an LMU .
QUIT	Quit	Quits the current TSTEQUIP level.
RTS	Return to service	Returns the LMU or LMUs to service.
TST	Test	Performs diagnostics on an LMU card.

LNS level user interface for the Star Remote System

Star Remote System lines maintenance involves using commands from various MAP levels depending on the type of testing desired or, in some cases, the type of line to be tested. This section presents the LNS-(lines) level user interface for Star Remote System lines maintenance.

LTP level

By using the line test position (LTP) level of the MAP terminal, the operating company can run various tests on lines off the Star Hub and Star Module.

The “LTP level commands" table lists the commands available at the various MAP levels for line maintenance. Each command is described in terms of whether it is supported and whether a specific configuration is required.

Table 6-14 LTP level commands (Sheet 1 of 2)

Command	Line types	Description	Configuration notes
QUIT	All	Quits the current level.	Not applicable
POST	All	Places the line in the control position.	Not applicable

Table 6-14 LTP level commands (Sheet 2 of 2)

Command	Line types	Description	Configuration notes
BSY	All	Busies the line in the control position.	Not applicable
RTS	All	Returns the line in the control position to idle.	Not applicable
DIAG	All	Invokes the long diagnostic series of end-to-end signaling and transmission tests.	Refer to the “Line diagnostics functionality for POTS and P-phone" table in the next section.
ALMSTAT	All	Displays status of the LNS subsystem and allows the user to change thresholds.	Not applicable
CKTLOC	All	Identifies the line circuit in the control position and displays its attributes.	Not applicable
HOLD	All	Places line in the control position to the hold position.	Not applicable
NEXT	All	Places the next line in the posted set in the control position.	Not applicable
FULLDN	All	Displays the full national number.	Not applicable
PREFIX	All	Sets or changes prefix digits.	Not applicable
LCO	None	Operates or releases the cutoff relay in the line circuit.	Not supported
LEVEL	All	Accesses another LTP level.	Not applicable
LTPRSRC (non-menu)	All	Excludes or includes users or display information from the LTP resource release mechanism.	Not applicable
FRLS (non-menu)	All	Forcibly disconnects the line circuit from test equipment (or another circuit) and changes the line state to manually busy (MB).	Not applicable
RECORD_DTSR (non-menu)	All	Enables, disables, or queries dial tone speed recording.	Not applicable
EBSMSG (non-menu)	P-Phone	Enables or disables the EBS warning message and prompt.	Not applicable

Supported Star Remote System line diagnostic tests

The following table lists the diagnostic tests performed as part of the line card diagnostics initiated using the LTP level DIAG command according to the line type, whether POTS or proprietary phone (P-phone).

Table 6-15 Line diagnostics functionality for POTS and P-phone lines (Sheet 1 of 2)

Test	**Line card type**	
	POTS	*P-Phone*
Transhybrid loss	Y	
Attenuation pad	Y	
Noise	Y	Y
Loop signal at line card (note 1)		Y
Loop signal at keyset		Y
Add-on and extension		Y
Flux cancellation	Y	Y
Loop detector	Y	
Equalization current detector		Y
Buffer full flag		Y
Battery feed resistor	Y	Y
Reversal relay (note 2)	Y	
+48 V reversal relay (note 3)	Y	
Ground start relay	Y	
Cutoff relay	Y	Y
Ring and supervision (note 4)	Y	

Note 1: This test requires the NT6X99AA IBERT line card.

Note 2: This test is for the NT6X18BA.

Note 3: This test is for the NT6X18AB.

Note 4: This test requires that table OFCOPT parameter NRTEST is set to Y.

Note 5: This test is only run if one of the prior tests failed.

Table 6-15 Line diagnostics functionality for POTS and P-phone lines (Sheet 2 of 2)

Test	Line card type	
Test access relay	Y	Y
Subscriber loop (note 5)	Y	

Note 1: This test requires the NT6X99AA IBERT line card.

Note 2: This test is for the NT6X18BA.

Note 3: This test is for the NT6X18AB.

Note 4: This test requires that table OFCOPT parameter NRTEST is set to Y.

Note 5: This test is only run if one of the prior tests failed.

The following table lists the diagnostics performed as part of the line card diagnostic using the LTP level DIAG command for ISDN lines.

Table 6-16 Line diagnostics functionality for ISDN lines (Sheet 1 of 2)

Test
PUPS 5V power failure
Line card occupancy
DR stuck
Relay
BF stuck
Line card restore
Self test
NT1 restore test
Status
U-loop
Termination
Sealing current
NEBE
FEBE

Table 6-16 Line diagnostics functionality for ISDN lines (Sheet 2 of 2)

Test
Error register
Hard reset

LTPMAN level

The following table lists the LTPMAN level commands. LTPMAN level commands are used to access the line test position of the manual test commands level. When the command is supported by POTS, coin, and ISDN lines, the word All appears in the Line types column.

Table 6-17 LTPMAN level commands (Sheet 1 of 2)

Command	Supported by Star Hub?	Supported by Star Module?	Line types	Configuration dependent?
QUIT	Yes	Yes	All	No
POST	Yes	Yes	All	No
LOSS (note 1)	Yes	Yes	All, except ISDN	Yes
NOISE (note 1)	Yes	Yes	All, except ISDN	Yes
TONEGEN (note 1)	Yes	Yes	All, except ISDN	Yes
TONEGEN METALLIC (note 1)	Yes	No	All	Yes
JACK	Yes	No	All, except ISDN	Yes
JACK METALLIC	Yes	No	All, except ISDN	Yes
TSTRING	Yes	Yes	All	Yes
BAL	Yes	Yes	All	Yes
RLSCONN (notes 1 and 2)	Yes	Yes	All	No
HOLD	Yes	Yes	All	No
NEXT	Yes	Yes	All	No
CKTTST	Yes	Yes	MBS, ISDN	No

Note 1: Uses external equipment.

Note 2: RLSCONN cleans up and releases the line under test and uses EOC messaging.

Table 6-17 LTPMAN level commands (Sheet 2 of 2)

Command	Supported by Star Hub?	Supported by Star Module?	Line types	Configuration dependent?
SUSTATE	Yes	Yes	MBS, ISDN	No
SETLPBK	No	No	Not applicable	Not applicable
DCHCON (non-menu)	Yes	Yes	ISDN	No
GAINSLOPE (non-menu)	Yes	Yes	LTD lines	Yes

Note 1: Uses external equipment.

Note 2: RLSCONN cleans up and releases the line under test and uses EOC messaging.

LTPLTA level

The following table contains a list of LTPLTA commands. LTPLTA level commands are used to verify loop characteristics such as impedance, capacitance, and voltage for lines connected to a Star Hub and Star Module. When the command is supported by POTS, coin, and ISDN lines, the word All appears in the Line types column.

Table 6-18 LTPLTA level commands (Sheet 1 of 2)

Command	Supported by Star Hub?	Supported by Star Module?	Line types	Configuration dependent?
QUIT	Yes	Yes	All	No
POST	Yes	Yes	All	No
MONLTA (note 1)	Yes	No (note 2)	POTS, Coin, MBS	Yes
TALKLTA (note 1)	Yes	No (note 2)	POTS, Coin, MBS	Yes
ORIG	Yes	No (note 2)	All	Yes
LNTST	Yes	Yes	All	Yes
VDC (and VDC C)	Yes	Yes	All	Yes

Note 1: MONLTA and TALKLTA are also supported for POTS and COIN lines through a pulse-code modulation (PCM) connection, where they are not configuration dependent. The ORIG command cannot be used with a PCM MONLTA or TALKLTA connection.

Note 2: The LMU in the Star Module only supports one metallic connection that is connected to all 64 lines. MONTALK is not supported in the LMU and therefore other commands that require the MONTALK connection such as RING, ORIG, DGTTST, and TALKLTA are not supported.

Table 6-18 LTPLTA level commands (Sheet 2 of 2)

Command	Supported by Star Hub?	Supported by Star Module?	Line types	Configuration dependent?
VAC (and VAC C)	Yes	Yes	All	Yes
RES (and RES C)	Yes	Yes	All	Yes
CAP (and CAP C)	Yes	Yes	All	Yes
HOLD	Yes	Yes	All	No
NEXT	Yes	Yes	All	No
LTA	Yes	Yes	All	No
BALNET	Yes	Yes	All	Yes
COIN	Yes	Yes	Coin	Yes
RING	Yes	No (note 2)	POTS, Coin	Yes
DGTTST	Yes	No (note 2)	POTS, Coin	Yes

Note 1: MONLTA and TALKLTA are also supported for POTS and COIN lines through a pulse-code modulation (PCM) connection, where they are not configuration dependent. The ORIG command cannot be used with a PCM MONLTA or TALKLTA connection.

Note 2: The LMU in the Star Module only supports one metallic connection that is connected to all 64 lines. MONTALK is not supported in the LMU and therefore other commands that require the MONTALK connection such as RING, ORIG, DGTTST, and TALKLTA are not supported.

LTPISDN level

The following table contains a list of LTPISDN commands. LTPISDN level commands are used to monitor and maintain ISDN lines. When the command is supported by POTS, coin, and ISDN lines, the word All appears in the Line types column.

Table 6-19 LTPISDN level commands (Sheet 1 of 3)

Command	Supported?	Line types	Configuration dependent?
QUIT	Yes	ISDN	No
POST	Yes	ISDN	No
SUSTATE	Yes	ISDN	No
BCHCON	Yes	ISDN	No
LTLOOPBK	No	ISDN	No

Table 6-19 LTPISDN level commands (Sheet 2 of 3)

Command	Supported?	Line types	Configuration dependent?
DCHCON	Yes	ISDN	No
TEST	Partially supported	ISDN. Refer to the “Line card testing capabilities" and the “Subscriber loop testing capabilities" tables that follow this table.	Not applicable
HOLD	Yes	ISDN	No
NEXT	Yes	ISDN	No
TSTSGNL	No	Not applicable	Not applicable
TEI	Yes	ISDN	No
QLOOP	Yes	ISDN	No
QLAYER	Yes	ISDN	No
RLAYER	Yes	ISDN	No
QPHINFO (non-menu)	No	Not applicable	Not applicable
L1BLMALM (non-menu)	Yes	ISDN	No
L1THRSH (non-menu)	Yes	ISDN	No
DCSIG (non-menu)	Yes	ISDN on RLD only	No
COLDST (non-menu)	No	ISDN	No
ALM (non-menu)	Yes	ISDN	No
IMP (non-menu)	No	ISDN	No
NSE (non-menu)	No	ISDN	No
ILOSS (non-menu)	No	ISDN	No
THR (non-menu)	Yes	ISDN	No; Test NT1 is not supported for Star Module

Table 6-19 LTPISDN level commands (Sheet 3 of 3)

Command	Supported?	Line types	Configuration dependent?
SCUR (non-menu)	Yes	ISDN on RLD only	No
DET (non-menu)	Yes	ISDN	No

The following tables list the line card and subscriber loop testing capabilites of the UMP and LMU card.

Table 6-20 Line card testing capabilities of the UMPand LMU

Feature	ISDN	POTS
Feed voltage measuresment	International	x
Feed resistors measurement	x	x
Return loss measurement	-	x
Flux cancellation measurement	-	x
Off-hook test	-	x
Origination	-	x
Ring presence test	-	x
Relays test	x	x
Pulse dialing test	-	x
DTMF dialing test	-	x for Star Hub- for Star Module
Sealing current measurement	Domestic	x
Note: x means testing capability supported by the UMP or LMU.- means testing capabililty not supported by the UMP or LMU.		

Table 6-21 Subscriber loop testing capabilities of the UMP or LMU (Sheet 1 of 2)

Feature	ISDN	POTS
LIT	x	x
FEMF measurement	x	x
Resistance measurement	x	x

Table 6-21 Subscriber loop testing capabilities of the UMP or LMU (Sheet 2 of 2)

Feature	ISDN	POTS
Capacitance measurement	x	x
DC signature measurement	x	x (only on lines connected to the Star Module)
Note: x means testing capability supported by the UMP or LMU.- means testing capabililty not supported by the UMP or LMU.		

LTPDATA level

The following table contains a list of LTPDATA commands used to maintain control position data, posted set information, system status updates, and perform additional maintenance action on lines in the control position.

Table 6-22 LTPDATA level commands

Command	Supported?	Line types	Configuration dependent?
QUIT	Yes	ISDN	No
POST	Yes	ISDN	No
SUSTATE	Yes	ISDN, MBS	No
LOOPBK	Yes	ISDN	Yes
BERT	Yes	ISDN	Yes
EQUIP (see note)	No	Not applicable	Not applicable
CONNECT (see note)	No	Not applicable	Not applicable
BPVO (see note)	No	Not applicable	Not applicable
HOLD	Yes	All	No
NEXT	Yes	All	No
BERTTIME (non-menu)	Yes	ISDN	No
Note: These tests are only applicable to Datapath lines.			

ALT level

The automatic line test (ALT) is used to run specific tests on specific lines terminating on a Star Hub. The schedule for these tests is defined by the operating company in table ALTSCHED. These tests are available at the ALT level of the MAP terminal. The following table lists the commands available at this level.

> ***Note:*** The commands at the ALT level that involve specific tests (SDIAG, DIAG, LIT, CKTTST, and BAL) are used to set the schedule to run these tests. The actual running of these tests occurs according to the schedule set.

Table 6-23 ALT level commands

Command	Supported?	Configuration dependent?
QUIT	Yes	No
POST	Yes	No
ALTINFO	Yes	No
SDIAG	Yes	No
DIAG (see note)	Yes	Yes
LIT (see note)	Yes	Yes
BAL	Yes	No
CKTTST	Yes	No
LCDCUT	Yes	No

EXT level user interface

The EXT MAP level is used to track active FSP alarms. By entering the EXT MAP level and typing the command string LIST CRIT, LIST MAJ, LIST MIN, or LIST NOALM, active alarms are listed. Active Star Hub signal distribution (SD) points are displayed by typing DISP SDALARM at the EXT MAP level.

The following figure illustrates the EXT level example of an FSP alarm seen through the EXT level.

Figure 6-17 EXT MAP level display

```
   CM     MS     IOD     Net     PM     CCS     Lns      Trks     Ext    Appl
    .      .      .       .    1 IDT     .       .        .      1FSP     .
                                *C*                                M
EXT
0  Quit                  Ext Alarms  Crit     FSP      Major    Minor    NoAlm
2                                       1       0         0        0         8
3
4
5
6
7  List
8  TstDSAlm_
9  SetSD_
10 SetSC_
11 Disp_
12
13 _Crit
14 _FSP
15 _Maj
16 _Min
17 _NoAlm
18
   userid
TIME  hh : mm>
```

TRKS level user interface

The CARRIER level, part of the TRKS subsystem, is used to monitor DS-1 links, isolate faults, and conduct repair verification on DS-1 links between the host XPM and the Star Hub. The CARRIER level is not used to monitor the DS-1 links between the Star Hub and the Star Module. The RLDCarr level is used for that purpose.

The CARRIER level commands are used to remove a DS-1 link from service and perform various manually activated tests, including hardware diagnostics for the DS-1 interface card and a loopback test. The loopback test can be used to determine if a DS-1 problem resides in the Star Hub or in external equipment.

Periodic monitoring of DS-1 links can detect performance trends indicating equipment failure. This allows the network provider to take corrective action before a service outage occurs. To facilitate this type of proactive maintenance and to help diagnose link failures, the Star Hub supports a variety of performance statistics related to DS-1 links. This information can be accessed from the CARRIER level of the MAP and includes the following parameters:

- loss of frame count
- estimated bit error rate (BER)

- severe errored seconds (SES)
- slip count
- errored seconds (ES)
- alarm count

User-definable thresholds can be datafilled in table CARRMTC to trigger an alarm when a performance parameter reaches a predetermined point. Thresholds can also be defined to automatically remove a DS-1 link from service if performance reaches an unacceptable level.

The CARRIER level of the MAP terminal, part of the TRKS subsystem, is used to post the carriers for the DS-1 links on the C-side of the Star Hub. Once at the carrier level, the Star Hub is posted the same way other PM types are posted.

The following figure provides a sample of a CARRIER level MAP display.

Figure 6-18 Example CARRIER level POST display

```
   CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext    Appl
    .     .       .       .       .      .       .        .        .       .
POST
0  Quit      CLASS   ML   OS   ALARM  SYSB  MANB  UNEQ  OFFL  CBSY  PBSY  INSV
2  Post_     TRUNKS   0    0       0     0     0     0     0     0     0    26
3            REMOTE   0    0       0     0     0     0     0     0     0    12
4            TIMING   0    0       0     0     0     0     0     0     0     2
5  Loop        DS-1
6  Tst_
7  Bsy_       N CLASS SITE   HUB  CKT  D  ALRM  SLIP  FRME  BER  ES  SES  STATE
8  RTS_       0 REMOTE HOST    0    0  C          1     0  1.0  2    0   INSV
9  Offl_      1 REMOTE HOST    0    1  C          1     0  1.0  2    0   INSV
10 DispOpt    2 REMOTE HOST    0    2  C          0     0  1.0  1    0   INSV
11 Disp_      3 REMOTE HOST    0    3  C          1     0  1.0  1    0   INSV
12 Next       4 REMOTE HOST    0    4  C          1     0  1.0  1    0   INSV
13
14 Detail_    SIZE OF POSTED SET  :   5
15
16
17
18
     userid
  TIME  hh : mm>
```

7 Star Remote System manual maintenance

This chapter introduces manual maintenance and troubleshooting methods which are useful for resolving problems with the Star Remote System or the subscriber lines connected to the Star Hub or Star Module.

In the discussions of manual maintenance in this chapter, the term line concentrating module (LCM) is used in a generic sense to refer to any peripheral module like the Star Hub. Therefore, when the term LCM is used in this context, the Star Hub is implied.

Troubleshooting methods

Under normal circumstances, a faulty unit of the Star Hub is busied and tested. As a result of this testing, the maintenance and administration position (MAP) terminal may display a list of cards. The card at the top of the list often is the cause of the problem. Once the problem card is replaced, the originally faulty unit is tested again. If the unit passes this test, it is returned to service (RTS) and the troubleshooting procedure is complete.

However, if normal troubleshooting procedures do not restore a unit to service, advanced troubleshooting procedures may be required. Experienced operating company personnel may use MAP terminal responses from unsuccessful troubleshooting attempts to formulate a maintenance strategy. The troubleshooting methods presented in this chapter are designed to assist in formulating a maintenance strategy.

Basic troubleshooting methods include

- monitoring performance indicators
- locating and clearing faults
- performing fault isolation tests
- monitoring results of diagnostic tests
- testing subscriber lines

Monitoring performance indicators

The first step in locating faults is to examine the performance indicators the system routinely generates. The existence of fault conditions is indicated by operational measurements (OM), log reports, and alarms.

Operational measurements

OMs are a data collecting system that tracks certain types of events and how often they occur. The OM data give an overall indication of performance and usage and are an excellent means for detecting both actual and potential system troubles. The OM thresholding feature should be used to monitor and report key STAR activity. These reports should be made routinely (daily or weekly) and should be the primary method of trouble detection. See *Extended Peripheral Module Operational Measurements Reference Manual*, 297-8321-814 for more information about the OMs that are specific to the Star Remote System.

Log reports

Logs, used primarily as an analysis tool, provide detailed information on call errors, diagnostic results, and system status. They are also good indicators of trouble conditions, especially when any of the following conditions exist:

- sudden increase in volume of logs
- message-not-printed reports
- large number of similar logs

Alarms

Audible and visual alarms indicate that something requires corrective action. Proper performance of routine system maintenance and use of OMs and logs should minimize the occurrence of alarms.

Alarm severity and corresponding urgency for corrective action is indicated by the level of the alarm, and is expressed as minor, major, or critical. The following table describes alarm conditions.

Table 7-1 Alarm description

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

The following guidelines are followed when responding to alarms:

- When more than one alarm of the same severity is displayed on the MAP display screen, clear the alarms from the left of the screen to the right.
- If, while fixing an alarm, an alarm of greater severity occurs, respond to the new alarm. Do not continue attempts to clear the less severe alarm.

For alarm clearing procedures, see the “Star Remote System Alarm clearing procedures" chapter in this manual.

Alarms are generated as a result of

- peripheral module (PM) failure (both units)
- unit failure (takeover)
- DS-1 link errors
- ringing generator failure
- circuit card failure
- dc/dc converter failure
- dc panel failure
- threshold of out-of-service (OOS) lines exceeded (software alarm)

Star Hub alarms

The following table identifies the alarms that are supported by the Star Hub.

Table 7-2 Star Hub alarms (Sheet 1 of 2)

Failure	Alarm	Set by	LED name	Location
Fuse failure	Major (note 1)	Hardware	Major	FSP
Missing -48 V talk battery supply (note)	Critical (note 3)	Hardware	Critical	FSP
Both NTTR77AA remote control processors (RCP) removed	Critical	Hardware	Critical	FSP
All converter breakers OFF or at least the two main breakers (00 and 10) are OFF	Critical	Hardware	Critical	FSP

Note 1: When a major alarm is activated, the MAJ light emitting diode (LED) on the frame supervisory panel (FSP) is lit, the major signal distribution (SD) point is set, and the major scan point is set.

Note 2: The level of scanning for the talk battery loss is on an individual shelf basis.

Note 3: When a critical alarm is activated, the dc panel LED is lit, the critical SD point is set, and the CRIT scan point is also activated.

Table 7-2 Star Hub alarms (Sheet 2 of 2)

Failure	Alarm	Set by	LED name	Location
The two secondary breakers (01 and 11) are OFF	Critical	Software	Critical	FSP
Ringing generator failure	Major	Software	Major	FSP
Power supply failure	According to host alarm	Software	-	-
Both ringing generators fail	Critical	Software	Critical	FSP
NTTR73AA universal maintenance pack (UMP) failure (one or both)	Minor	Software	Minor	FSP
Single unit out-of-service (not off-line)	According to host alarm	Software	-	-
Both units out-of-service (not off-line)	According to host alarm	Software	-	-
Alarm batter supply (ABS) power failure	Major	Hardware	Major	FSP
Main power down below 41 V	Major	Hardware	Major	FSP

Note 1: When a major alarm is activated, the MAJ light emitting diode (LED) on the frame supervisory panel (FSP) is lit, the major signal distribution (SD) point is set, and the major scan point is set.

Note 2: The level of scanning for the talk battery loss is on an individual shelf basis.

Note 3: When a critical alarm is activated, the dc panel LED is lit, the critical SD point is set, and the CRIT scan point is also activated.

If a component fails in the Star Hub, the following table identifies Star Hub response and general recovery methods.

Table 7-3 Star Hub component failure and general recovery methods (Sheet 1 of 2)

Hub component failure	Star Hub response and general recovery methods
RCP card failure	The remote controller pack (RCP) card in the mate unit takes over control of the C-side links, UMPs, line drawers, and ringing generators.
C-side message link	When a message link fails, the unit connected to it drops activity. The mate unit takes control over all other C-side links, ringing generators, UMPs, and line drawers.

Table 7-3 Star Hub component failure and general recovery methods (Sheet 2 of 2)

Hub component failure	Star Hub response and general recovery methods
C-side speech links	Calls on the affected links drop and the C-side capacity is reduced, if the reason is a C-side link failure.
Removing main power converter in slot 3 or 20	One unit drops activity and the second unit takes over control of C-side links, line drawers, and UMPs. Note that even though the Star Hub has up to two power converters in each unit, removing one of the main power converters causes the whole unit to drop.
Secondary converter in slot 5 or 18	The unit would drop activity if there is at least one drawer in the range of 10-18.
Ringing generator failure	Traffic is routed through the second ringing generator which limits the number of calls that can ring simultaneously to 30 in each ringing phase (there are four ringing phases). No service is provided in emergency stand-alone (ESA) mode. ***Note:*** If automatic number identification (ANI) or coin services are required, a ringing generator failure causes the entire unit to drop activity.
UMP card failure	If one UMP card fails, the second UMP card takes over control of all lines giving service to all lines. This limits the number of simultaneous lines that can be treated to one instead of two. If only one UMP card is provisioned, no lines can be tested and SC and SD points will fail. In addition, no call processing is supported while the STAR is in ESA mode.

Star Hub power converter impact on alarms

The followIng table identifies the alarms visible at the MAP terminal for a Star Hub with two power converters. The alarms raised are based on the states of the power converters.

Table 7-4 Power converter half configuration (Sheet 1 of 2)

Power convertor in slot 3	Power converter in slot 20	Unit 0	Unit 1	Alarms
Installed	Installed	InSv	InSv	None
Not installed	Installed	SysB	InSv	Critical
Installed	Not installed	InSv	SysB	Critical
Failed	Failed	SysB	SysB	Critical

Table 7-4 Power converter half configuration (Sheet 2 of 2)

Power convertor in slot 3	Power converter in slot 20	Unit 0	Unit 1	Alarms
Failed	Installed	ISTb	ISTb	Major
Installed	Failed	ISTb	ISTb	Major

The following table lists the RTS actions of the Star Hub units, based on the states of the power converters in the Star Hub.

Table 7-5 Power converter half configuration, RTS process

Power convterter in slot 3	Power converter in slot 20	RTS, Unit 0	RTS, Unit 1
Installed	Installed	RTS passed, InSv	RTS passed, InSv
Not installed	Installed	RTS failed	RTS passed, InSv
Installed	Not installed	RTS passed, InSv	RTS failed
Failed	Failed	RTS failed	RTS failed
Failed	Installed	RTS passed, ISTb	RTS passed, ISTb
Installed	Failed	RTS passed, ISTb	RTS passed, ISTb

The followng table identifies the alarms visible at the MAP terminal for a Star Hub with four power converters. The alarms raised are based on the states of the power converters.

Table 7-6 Power converter full configuration unit status (Sheet 1 of 2)

Power convertor in slot 3	Power converter in slot 20	Power convertor in slot 5	Power converter in slot 18	Unit 0	Unit 1	Alarms
Installed	Installed	Installed	Installed	InSv	InSv	No
Not installed	Installed	Installed	Installed	SysB	InSv	Critical
Installed	Not installed	Installed	Installed	InSv	SysB	Critical
Installed	Installed	Not installed	Installed	SysB	InSv	Critical

Table 7-6 Power converter full configuration unit status (Sheet 2 of 2)

Power convertor in slot 3	Power converter in slot 20	Power convertor in slot 5	Power converter in slot 18	Unit 0	Unit 1	Alarms
Installed	Installed	Installed	Not installed	InSv	SysB	Critical
Failed	Failed	Installed	Installed	SysB	SysB	Critical
Installed	Installed	Failed	Failed	ISTb	ISTb	Critical
Failed	Installed	Installed	Failed	ISTb	ISTb	Major
Installed	Failed	Failed	Installed	ISTb	ISTb	Major
Failed	Installed	Failed	Installed	ISTb	InSv	Minor
Installed	Failed	Installed	Failed	InSv	ISTb	Minor
Failed	Installed	Installed	Installed	ISTb	InSv	Minor
Installed	Failed	Installed	Installed	InSv	ISTb	Minor
Installed	Installed	Failed	Installed	ISTb	InSv	Minor
Installed	Installed	Installed	Failed	InSv	ISTb	Minor

The following table lists the RTS actions of the Star Hub units based on the states of the power converters in the Star Hub.

Table 7-7 Power converter full configuration unit status (Sheet 1 of 2)

Power convertor in slot 3	Power converter in slot 20	Power convertor in slot 5	Power converter in slot 18	RTS activity for unit 0	RTS activity for unit 1
Installed	Installed	Installed	Installed	RTS passed, InSv	RTS passed, InSv
Not installed	Installed	Installed	Installed	RTS failed	RTS passed, InSv
Installed	Not installed	Installed	Installed	RTS passed, InSv	RTS failed
Installed	Installed	Not installed	Installed	RTS failed	RTS passed, InSv
Installed	Installed	Installed	Not installed	RTS passed, InSv	RTS failed

Table 7-7 Power converter full configuration unit status (Sheet 2 of 2)

Power convertor in slot 3	Power converter in slot 20	Power convertor in slot 5	Power converter in slot 18	RTS activity for unit 0	RTS activity for unit 1
Failed	Failed	Installed	Installed	RTS failed	RTS failed
Installed	Installed	Failed	Failed	RTS passed, ISTb	RTS passed, ISTb
Failed	Installed	Installed	Failed	RTS passed, ISTb	RTS passed, ISTb
Installed	Failed	Failed	Installed	RTS passed, ISTb	RTS passed, ISTb
Failed	Installed	Failed	Installed	RTS passed, ISTb	RTS passed, InSv
Installed	Failed	Installed	Failed	RTS passed, InSv	RTS passed, ISTb
Failed	Installed	Installed	Installed	RTS passed, ISTb	RTS passed, InSv
Installed	Failed	Installed	Installed	RTS passed, InSv	RTS passed, ISTb
Installed	Installed	Failed	Installed	RTS passed, ISTb	RTS passed, InSv
Installed	Installed	Installed	Failed	RTS passed, InSv	RTS passed, ISTb

ILD-R alarms

The ISDN line drawer for remotes (ILD-R) does not generate any alarms. As a result of ILD-R failure or problems, the ILD-R either goes into ISTb or SysB states. This, in turn, causes the STAR level to generate an alarm. The QUERYPM FLT command at the ILD MAP level indicates what problems are causing the alarm.

Star Hub alarm reporting

Each UMP card supports twelve scan (SC) points and eight SD points that are user-defined. In addition, three SD points and four SC points are hardcoded for activating the critical, major, and minor lamps on the FSP dc front panel, detecting major and critical failures. Minor alarms do not have scan points for software to detect since hardware never activates a minor alarm.

Scan points are used to detect alarm conditions such as loss of loop, ground, or battery. Distribution points report alarm conditions audibly (bells) or visually (lights).

Each SD point consists of two wires that can be normally open or closed. When the SD point is set, it closes or opens the loop (depending on what the normal state is). The external equipment detects either the open or shorted circuit. Operating company personnel determine what the normal state is by defining the state in the software alarm tables.

The type of distribution point is a two-contacts type. The SC and SD points are testable. If the SC or SD points are faulty, the UMP fails diagnostics tests.

The following table lists the SC and SD point alarms.

Table 7-8 Scan point alarms

Scan point	Definition	Location
0	Major alarm	RCP
1	Fuse failure, power is below 41 V, or an absence of ABS voltage	RCP
2	Critical alarm	RCP
3	At least one of the talk battery breakers is open	RCP
4	NTTR74AA Alarm card missing	RCP
5-16	User defined	UMP

Note: The SuperNode switch detects each scan point as a separate entity so the switch can differentiate between remote alarms.

Table 7-9 Distribution point alarms (Sheet 1 of 2)

Distribution point	Definition	Location
0	Critical lamp and main distribution frame (MDF)	RCP
1	Major lamp and MDF	RCP
Note: The minor alarm is not connected to the MDF since minor alarms are not connected to the maintenance center.		

Table 7-9 Distribution point alarms (Sheet 2 of 2)

Distribution point	Definition	Location
2	Minor lamp (see note)	RCP
3-10	User defined	UMP

Note: The minor alarm is not connected to the MDF since minor alarms are not connected to the maintenance center.

Star Module alarms

The NTTR70AA/AB Star Module Controller (SMC) card in the Star Module controls the scan and distribution points. The remote line drawer (RLD) environmental system uses scan and distribution points to detect and handle alarms. The alarms are detected by the scan points. The scan points are controlled by the SMC card. When an action is required to balance an environmental abnormality, such as high or low temperature, the SMC determines which distribution point should be activated.

Two categories of scan points are used, system scan points and user defined.

Table 7-10 Star Module alarms and scan points (Sheet 1 of 2)

Failure	Alarm	Set by	Impact
+15 V output fails	Critical	Hardware	Plain old telephone service (POTS) line cards will not operate
Coin output voltage fails	Major	Power and ringing card	Coin features are not supported
Low ringing voltage condition	Major	Power and ringing card	Ringing features are not supported
At least one of the fans is not operating	Major	SMC card	Cabinet temperature
Both fans are not operating	Critical	SMC card	Cabinet temperature
Talk battery fuse blown	Critical	dc panel	POTS line cards are not supported
Fan fuse is blown	Critical	dc panel	
Customer fuse blown	Critical	dc panel	Customer equipment is not supported

Table 7-10 Star Module alarms and scan points (Sheet 2 of 2)

Failure	Alarm	Set by	Impact
Line termination unit (LTU) fuse blown	Critical	dc panel	
Indication that the front door is open	Major	Door	
Indication that there is no ac power input	Critical	ac to dc converter	
Indication of an LTU failure	Critical	LTU	
User defined scan point 0	User defined	MDF	
User defined scan point 1	User defined	MDF	

The distribution points for the Star Module are a two-contact type. Two types of SD points are supported:

- system control points
- two user-defined distribution points, one used as a critical SD point, the other remains user defined.

The following table lists the distribution points for the Star Module

Table 7-11 Star Module distribution points (Sheet 1 of 2)

Function	Alarm	From	To	Type
Set the major alarm (MAJ LED) to ON, close the Major relay to MDF	Major	SMC	SMC card	Alarm and distribution
Set the critical alarm (CRIT LED) to ON, close the Critical relay to MDF	Critical	SMC	SMC card	Alarm and distribution
Set the user defined distribution point relay		SMC	MDF	Distribution
Operate the heater	Heatset	SMC	ac panel	Control
Operator the fans in summer mode	Fans	SMC	Fans	Control
Operate the fans in winter mode	Fans	SMC	Fans	Control
Operate the battery test relay		SMC	dc panel	Control

Table 7-11 Star Module distribution points (Sheet 2 of 2)

Function	Alarm	From	To	Type
Select the coin voltage polarity		SMC	Power, ringer, and coin	Control
Select the coin test			Power, ringer, and coin	Control
Select the coin voltage type			Power, ringer, and coin	Control
Select the coin voltage or ringer voltage			Power, ringer, and coin	Control
Reverse the selected voltage			Power, ringer, and coin	Control
Shut down ringer and coin			Power, ringer, and coin	Control

If a component fails in the Star Module, the following table identifies Star Module response and general recovery methods.

Table 7-12 Star Module component failure and general recovery methods (Sheet 1 of 2)

Module component failure	Star Module response and general recovery methods
Star Module message link	If only one DS-1 is provided, the Star Module will drop. Otherwise, all the calls will be routed to the second link (up to 23, one channel is used for messaging).
One C-side link	Calls on the affected link will drop.
Line cards	Calls on the affected line card will drop
Power converter and ringer card	Because of a failure in the following voltage • +15 V power supply failure results in no support for POTS line cards. The Critical alarm is set. • Coin failure means that only coin features are not supported. The Major alarm is set. • Ringer failure means the ringing features are not supported. The Major alarm is set. In each case, a message is sent to the host switch.

Table 7-12 Star Module component failure and general recovery methods (Sheet 2 of 2)

Module component failure	Star Module response and general recovery methods
LMU	The subscriber's metallic line can not be tested.
Fuses	The following identify the actions the system takes when a blown fuse is detected: • talk battery fuse - POTS line cards will not operate. The Critical alarm is set. • Fans and heater fuse - fans and heater will not operate. The Critical alarm is set. • LTU fuse - subscriber lines will not operate. THe Critical alarm is set. • customer fuse - customer equipment will not operate. The Major alarm is set. In each case, a message is sent to the host switch.

Star Module log reports

The Star Module reports on various conditions using ISDN and PM logs. The following table lists the log reports and the conditions that cause the switch to output these log reports.

Table 7-13 Star Module log reports (Sheet 1 of 4)

Log report	Reason for output	Meaning	Action
PM179	Hardware exception report	Carrier line failure, carrier link recovery, DS-1 alarm	Perform diagnostic and maintenance procedures on suspect hardware.
PM180	Hardware or software exception report	If a hardware exception, the report can be one of the following: • RLD drawer alarms • scan point alarm • P-side link alarms • RLD links alarms • RLD diagnostic failed • RLD failure • RLD link failure • RLD link recovery Software failed to execute properly.	No action required. Retain the log for trend analysis.

Table 7-13 Star Module log reports (Sheet 2 of 4)

Log report	Reason for output	Meaning	Action
PM181	State change or process failure	This log is output for the following reasons • RLD state changed — for ISTb and SysB, a failure reason text is output — for ISTb, a log is output for every reason added or removed • switch bank is completed whether successful or not • RLD test failed • file is loaded to the RLD or the load attempt has failed • static data updated failed or was successful • RLD enters or exits overload (congestion)	For RLD state changes to ISTb or SysB, switch bank failure, static data download failure, or congestion entry proceed according to failure reason. No action is required if the file loads successfully. If the load operation fails, proceed according to the failure reason.
PM182	RLD link status changed to ManB.	The state of the RLD link changes to ManB.	No action required.
PM183	RLD link status changed to SysB.	The state of the RLD link changes to SysB.	No action required.
PM184	RLD link status changed to RTS.	The state of the RLD link changes to RTS.	No action required.
ISDN100	RLD detects a terminal that is not available for message traffic.	An ISDN terminal does not support traffic.	Determine the reason why the terminal is not available for message traffic. Contact the next level of maintenance.

Table 7-13 Star Module log reports (Sheet 3 of 4)

Log report	Reason for output	Meaning	Action
ISDN101	Subscriber loop is not available	The subscriber loop is not available for message traffic.	Check the following: • Verify the data in tables LTDEF and LTMAP related to the RLD and LEN in the log report. Correct any errors. • Check other log reports related to the RLD or LEN with the problem. • Make sure the RLD has the correct load and reload if necessary. • Busy and RTS the RLD.
ISDN102	Terminal endpoint identifier (TEI) removed from service	The RLD detects a duplicate TEI on the same loop and has removed it from service.	Restore the TEI using the TEI command at the LTPDATA level of the MAP. If the duplicate TEI remains, the RLD audit will remove the TEI from service.
ISDN103	RLD Bd-channel state change	Manual action has changed the state of the RLD Bd-channel. The reason for the new state is displayed only for SysB.	If the Bd-channel state changes to SysB, check the reason and try to fix the problem.
ISDN106	ISDN D-channel layer 1 failure	The ISDN subsystem generated this log report when layer 1 of the specified D-channel fails and the fail flag is set.	Determine the reason of the failure and contact the next level of maintenance.
ISDN107	TEI restore failed	This log report is output when the system fails to restore a TEI.	Determine the reason of the failure and contact the next level of maintenance.

Table 7-13 Star Module log reports (Sheet 4 of 4)

Log report	Reason for output	Meaning	Action
ISDN108	TEI restore successful	This log report is output when the system restores a TEI.	Run a SUSTATE test to ensure communication has been established with the restored D-channel.
ISDN109	D-channel restored	This log report is output when the system restores a D-channel.	Run a SUSTATE test to ensure communication has been established with the restored D-channel.
ISDN115	Subscription limits exceeded	This log report is output when the subscription counters that represent the maximum allowable links for a specific set of TEI values would be exceeded by the attempted TEI assignment.	Perform the TEI audit.
ISDN116	TEI has not been assigned	This log report is output when the action identifier is a TEI value that has not previously been assigned to a terminal on the loop.	Identify the denied message and perform a TEI audit.

Locating and clearing faults

The standard troubleshooting steps for locating and clearing faults follow:

1. Silence audible alarms caused by the system when alarm conditions are detected.
2. Isolate the fault by reading status displays and tracing fault codes to the menu level needed to clear the fault.
3. Busy the hardware to remove system access to the faulty component. This allows maintenance activity to be performed without system interference.
4. Test the faulty component and identify the card to be replaced. Replace the faulty card and test it again.
5. Return the hardware to service.

Performing fault isolation tests

When a fault condition is detected in the Star Hub, a maintenance action is required. Fault isolation tests are used to determine which component is causing the fault. It also corrects the fault condition or reports it to the appropriate maintenance support organization. The following sections list the procedures involved to isolate and correct faults with specific Star Remote System components.

Faulty line drawer

Procedure 7-1

To handle a faulty line drawer in the Star Hub

1 Post, busy, test, and RTS the drawer

2 If a test or RTS fails with a card list, replace the cards with an appropriate card replacement procedure, test, and RTS the drawer.

3 If a test or RTS fails without a card list, perform the appropriate tests that are indicated by the MAP response and RTS the drawer.

Faulty shelf circuit pack

Procedure 7-2

To handle a faulty shelf circuit pack

1 Post the Star Hub.

2 Determine if there are any fault indicators.

3 Busy the unit with the faulty card.

4 Perform the appropriate card replacement procedures.

5 Test and RTS the Star Hub unit.

Faulty line card

During line card diagnostics, if a single card fails, the failure causes an entire Star Hub unit to fail. Finding the single faulty card can be difficult. Usually only one unit of the Star Hub is affected. There are two procedures that are useful in identifying the faulty card. Procedures 3 and 4 are described in the following paragraphs.

Perform this procedure during a maintenance window to avoid possible service interruptions. Experienced technicians can perform this procedure during the day if proper precautions are taken.

Procedure 7-3 To identify a faulty line card - method 1

1 Find the vertical connection to the Star Hub in trouble. Use table MTAVERT.

2 Carefully use a Lineman's test set on the backplane of the MTADRIVER.

Operating company personnel may hear the following things:

- dial tone - In this case, operating company personnel have drawn dial tone from an NT6X17 card. Dial the operator and ask what number you are on. This will be your faulty line.
- 8 khz tone - This is data line card NT6X71 or NT6X76.
- talk battery - If possible, try hooking up a proprietary phone and calling the operator to see what directory number (DN) is being used.

Perform this procedure during a maintenance window to avoid possible service interruptions. Experienced technicians can perform this procedure during the day if proper precautions are taken.

Procedure 7-4 To identify a faulty line card - method 2

1 Access the line test position (LTP) level of the MAP display.

2 Post any line equipment number (LEN) located on the faulty STAR.

3 Put a tone on the posted LEN, and go to the mainframe with the lineman's test set and listen to all other LENs on the Star Hub.

> ***Note:*** Operating company personnel will find two LENs with tone; one will be the LEN originally posted at the LTP level. The second will be the faulty line card.

Faulty DS-1 link

Procedure 7-5 To handle a faulty DS-1 link

1 Post the Star Hub.

2 Determine if there are any fault indicators.

3 Display the central side (C-side) links.

4 Post the host PM (line trunk controller or line group controller with an NTMX77 processor [LTC+ or LGC+] and NTSX05 processor [LTC+ or LGC+] or remote cluster controller 2 [RCC2]) and determine the peripheral module (PM) state of the host XPM.

5 If the PM is in service (InSv), display peripheral side (P-side) links. Busy, test, and RTS the host PM.

6 If the PM 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 PM.

Faulty ringing generator (RG) frequency generator circuit

Procedure 7-6

To handle a faulty RG frequency generator circuit:

1 Test the RG.

2 If the test fails, replace the RG.

Load file mismatch

Procedure 7-7

To handle a load file mismatch

1 Post the Star Hub.

2 Use the QUERYPM command to display the PM load that resides in the STAR.

3 Determine the correct Star Hub PM load.

4 Correct table LCMINV if the table has the wrong PM load for the Star Hub.

5 If the table has an incorrect PM load for the STAR, obtain the correct PM load and reload the Star Hub.

Monitoring results of diagnostic tests

This section describes the bit error rate performance test tool.

Bit error rate performance testing

Bit error rate performance (BERP) tests are used for testing transmission paths through the network and for providing the operating company with a tool for assessing the bit error performance of the DMS-100 switch and its subtending nodes. BERP testing is provided with feature package NTX881AB and requires the NT6X99AA IBERT line card provisioned in a Star Hub line drawer or a Star Module.

The BERP test is composed of many individual bit error rate tests (BERT). Operating company personnel perform a BERT by connecting an integrated bit error rate tester (IBERT) either to itself or to a specified endpoint, such as a data line card (DLC), and transmitting a known bit pattern. This bit pattern is reflected back to the IBERT and compared to what was sent. Any errors in the returned bit stream are recorded. The results of these individual BERTs comprise the result of the BERP test.

The BERP test is accessed from the maintenance (MTC) level of the MAP terminal. Commands at the BERP level are used to set up tests continuously or for a fixed duration.

Link testing

BERP testing can be performed on the DS-1 links connecting the host controller to the Star Hub. To perform the BERP test on a DS-1 link, it is necessary to have a loopback at some point on the transmission path. The DS-1 loopback is at the peripheral side (P-side) of the host LTC. All 24 channels on the DS-link are looped back. When a DS-1 loopback is used, the DS-1 link being tested must be removed from service.

XPM bit error ratio test

The host LTC+, LGC+, or RCC2 performs the XPM bit error ratio test (XBERT) for the Star Hub. The XBERT is a diagnostic test that does the following:

- detects and measures pulse code modulation (PCM) bit errors that occur in XPM and Star Remote System cards
- commissions DS-1 links and trunks that are physically looped back at the remote end without the use of a remote node

The XBERT detects bit errors in the transmission of high-speed data in the cards of the host XPM and cards in the Star Remote System. All XBERT testing requires the NT6X99AA IBERT line card provisioned in a Star Hub or Star Module line drawer.

Test conditions

For accurate fault detection, the XBERT tests are run on an active in-service XPM unit. They can also be run on an out-of-service unit. At least one unit of the Star Hub must be in service.

> ***Note:*** The XBERT should not be used as a tool for providing accurate bit error ratio assessments. The XBERT does not use the International Telegraph and Telephone Consultative Committee (CCITT) standard test patterns in its test procedure. Instead, it uses XPM tone PCM to provide the 64-kbps test bit stream.

Test types

XBERT runs two tests, with the use of the INITIATE (I) command, which specifically involve the STAR. The test names and their corresponding cards are shown in the following table.

Table 7-14 XBERT tests

Test name	Related cards
XBERTBIC	NT6X44, NT6X50, NTMX76, NT6X54, NT6X73
XBERTDCC	Not applicable

The ISOLATE command automatically runs tests to isolate a fault to a particular set of cards. The number of cards in its card list can vary from one to three depending on the individual test results.

The P-side ports of the host XPM or the Star Hub bus interface cards (BIC) can be tested sequentially by one manual request.

Test XBERTBIC (bus interface cards)

For testing BICs, the XBERTBIC test path travels through the following cards:

- messaging card (NTMX76AB)
- timeswitch card (NT6X44)
- DS-1 interface card (NT6X50)
- BIC (NT6X54)

XBERTBIC sets up the test path by attempting to establish a looparound of the manually specified P-side port at an Star Hub BIC. With BIC, the test loop to terminate must be manually specified. If the attempt is unsuccessful, a response is displayed and the test is aborted. If the NT6X54 looparound is successfully allocated, the test is run.

Entering XBERT

The XBERT level can be entered at any level of the MAP terminal. The user enters one of the following commands:

- XBERT <<PM>> <<PM#>>
- XBERT N <<node#>>

By entering the command XBERT N <<node#>>, the user is entering XBERT through the PMs node-assignment number. Node-assignment numbers may be found in table NNASST or by posting the PM to be tested at the PM MAP display level using the QUERYPM command.

Testing subscriber lines

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 helps determine if a line circuit, loop, or line circuit and loop combination are functioning properly. If the line proves faulty, line tests also determine if the fault lies in the line circuit or the attached loop. When a fault is in the loop, it is usually referred to another department (for example, plant maintenance). When the fault is in the line circuit, the line card is replaced and the line is retested to verify the fault is cleared.

Automatic line testing

Automatic line tests (ALT) are performed on line circuits and loops, usually on a scheduled basis, without switch operator involvement other than for initial scheduling. Automatic line tests are also performed when a line shows a fault.

The ALT subsystem commands are discussed in the “Star Remote System user interface commands" chapter in this manual.

Station testing

Station testing is performed either under the LNS subsystem at a MAP terminal or, for the silent switchman (SSMAN) and station ringer (SR) tests, from a station. Stations are tested manually.

Station test results are displayed at the video display unit (VDU), except for the station ringer and silent switchman tests. The results of these tests are returned to the station.

Station testing helps determine if a station is functioning properly while connected to a loop and line circuit combination.

Manual line testing

Manual line tests are performed by the switch operator on line circuits, loops, and stations. Line circuits and loops are tested individually. The results of the test are displayed to the switch operator, immediately after testing, at a video display unit (VDU).

Lines are tested manually as part of routine maintenance, when a customer report is generated or when an ALT failure occurs. Manual line testing is performed at the LTP level using any of the following levels of the LNS subsystem:

- ALT
- LTP
- LTP manual (LTPMAN)
- LTP line test access (LTPLTA)
- LTP data (LTPDATA)
- LTP ISDN (LTPISDN)

Manual line testing at the ALT level defines one line to be tested immediately. At the other levels, manual testing is performed by placing the line to be acted upon in the control position. The switch operator controls this line, which may be manipulated. A line must be posted first before being placed in the control position.

The NTTR73AA UMP performs line testing on Star Hub lines. The UMP has four metallic connections to Star Hub lines. Each line is connected to only one of four group of lines and can be used only for that group. The metallic connections are used for measurements of the lines and for monitoring the lines. Lines connected to the Star Module are tested through the LMU.

There are three groups of line tests

- LTP level tests - includes line tests and diagnostics
  - measurement tests, including VDC, VAC, resistance (RES), capacitance (CAP) that are performed by the test head in the UMP in the Star Hub
  - monitor/talk (MON/TALK) tests including RING, ORIG, DGTTST, TSTRING, and metallic TONEGEN (only applies to Star Hub)
- ALT level tests - includes line test conducted on a scheduled basis, such as DIAG, SDIAG, LIT, BAL, and CKTTST
- station ringer and VER90 tests (only applies to Star Hub)
  - station ringer test, executed from the subscriber premises by dialing an access code and the last four digits of the subscriber number
  - VER90 test, initiated from the operator telephone set by dialing an access code and the last four digits of the subscriber number

The MAP level maintenance commands used to activate the test capabilities of the UMP card are discussed in the “Star Remote System user interface" chapter in this manual.

Connection to metallic test access

There are four metallic bus accesses in the Star Hub. A metallic matrix in the UMP card controls access to the metallic bus. Since two UMPs are provisioned in the Star Hub, two metallic bus tests can be performed simultaneously on lines that are on two separate metallic buses. Each UMP card performs one test at a time. That is, a single UMP card does not support simultaneous requests for metallic test access, test trunk access, and MONTALK access. The same metallic bus cannot be used by both UMP cards simultaneously.

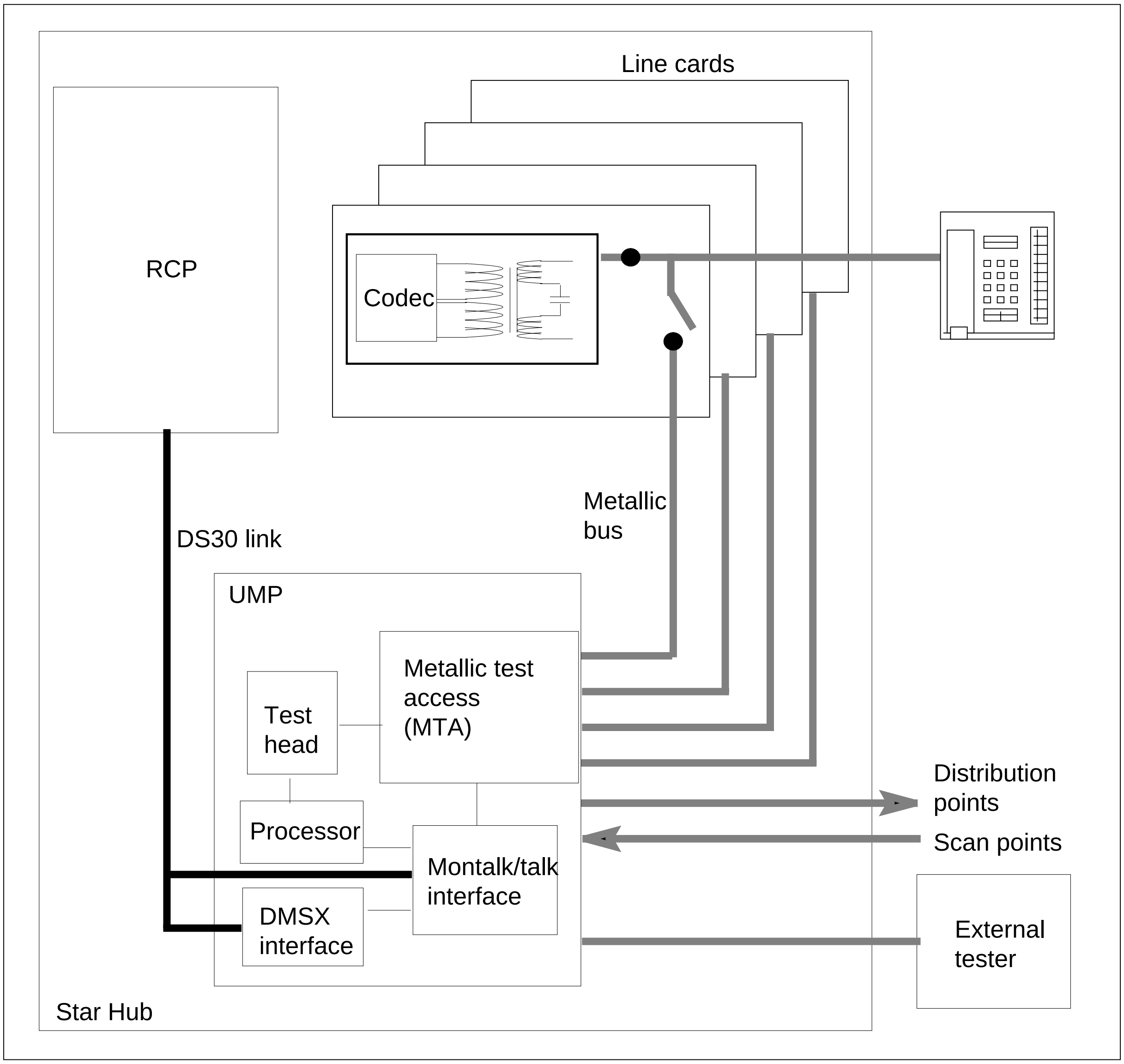
As shown in the following table, a maximum of 5 drawers are connected to a metallic bus. Each drawer supports up to 64 lines. This means that no more than 320 lines can be connected to the metallic test access.

Table 7-15 Metallic test access configuration

Metallic bus number	Physical line drawer numbers
1	1, 2, 3, 4
2	5, 6, 7, 8, 9
3	10, 11, 12, 13
4	14, 15, 16, 17, 18

The following figure shows the UMP connections in the control shelf for subscriber line test access.

Figure 7-1 UMP connections for subscriber line test access



Line testing from a test desk

The Star Hub supports external line testing using a Centralized Automated Loop Reporting System (CALRS) test desk or Teradyne 4TEL line test equipment. The CALRS or 4TEL central equipment controls the testing by means of a tip, ring and sleeve interface to the NTT card NT2X90 in an MTM.

The Peripheral Test Unit of CALRS or 4TEL at the remote site has two kinds of connections:

- messaging through a modem
- a testing connection

Both of them are connected to the Star Hub.

The CALRS test desk or 4TEL device connects to the metallic test access (MTA) in the host office. The MTA connects through the MDF to tip, ring, and sleeve connections on the external tester (digital remote test unit [DRTU]) at the remote site.

To perform testing, the central equipment informs the Host about which loop is going to be tested. The Host selects the corresponding HUB, Line card and UMP and sends the commands needed to create a connection between the Test Unit testing bus and the Loop Under Test.

To begin a test on an odd-numbered line drawer, a relay activates to disconnect the UMP that connects to the even-numbered line drawers and enables the external test device to connect to the correct UMP. The UMP connects to a metallic bus back to the MTM in the host over external tip, external ring, and sleeve connections to the MDF.

The Host or the central equipment dials the corresponding Test Unit. Then the central equipment sends the command to perform the measurement. The Test Unit returns the measurement results to the central equipment and all the above mentioned connections are disconnected.

The following diagrams show this testing configuration.

Figure 7-2 Star HUB Line testing configuration

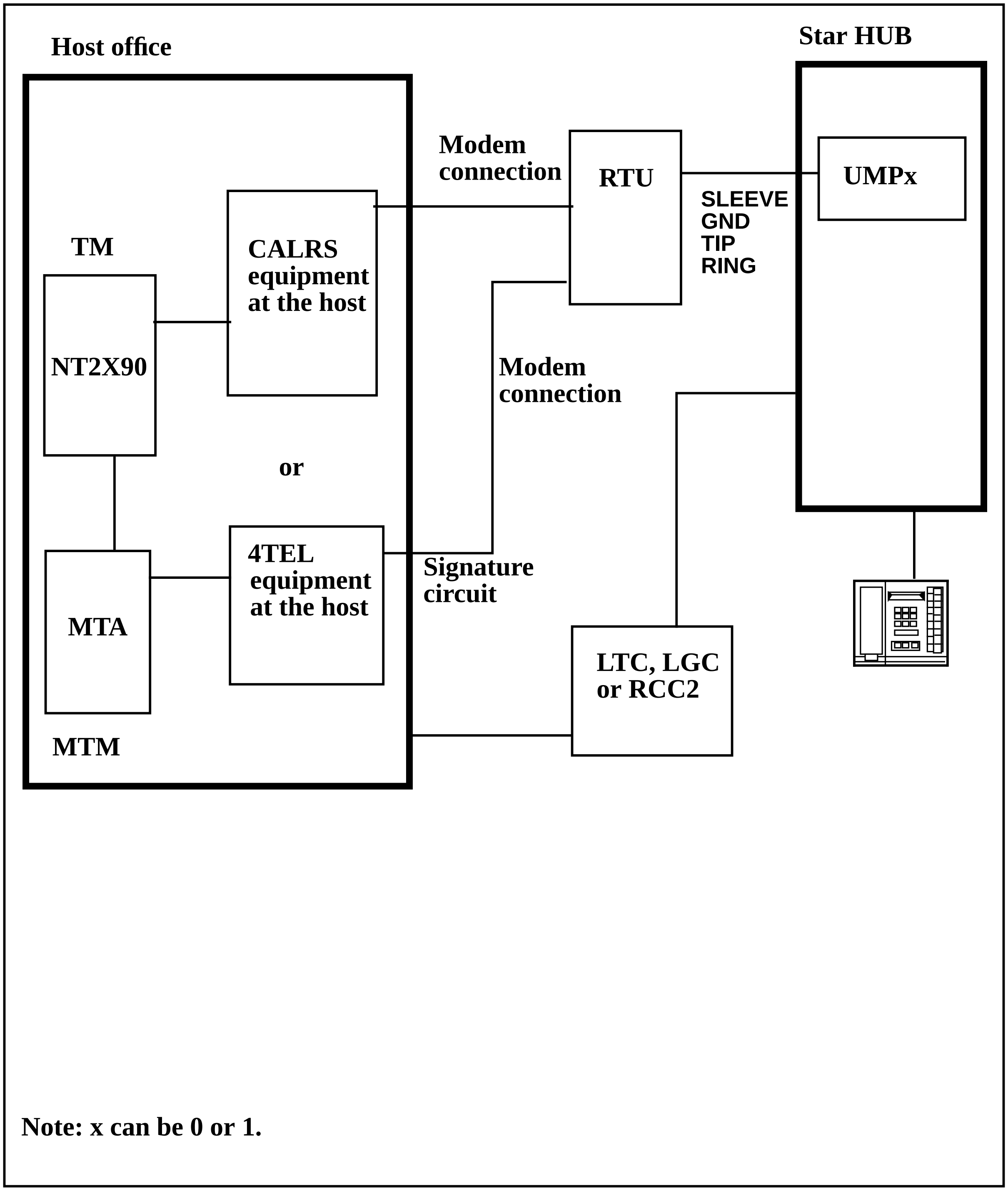


Figure 7-3 Star HUB Line testing configuration with DMS-1U

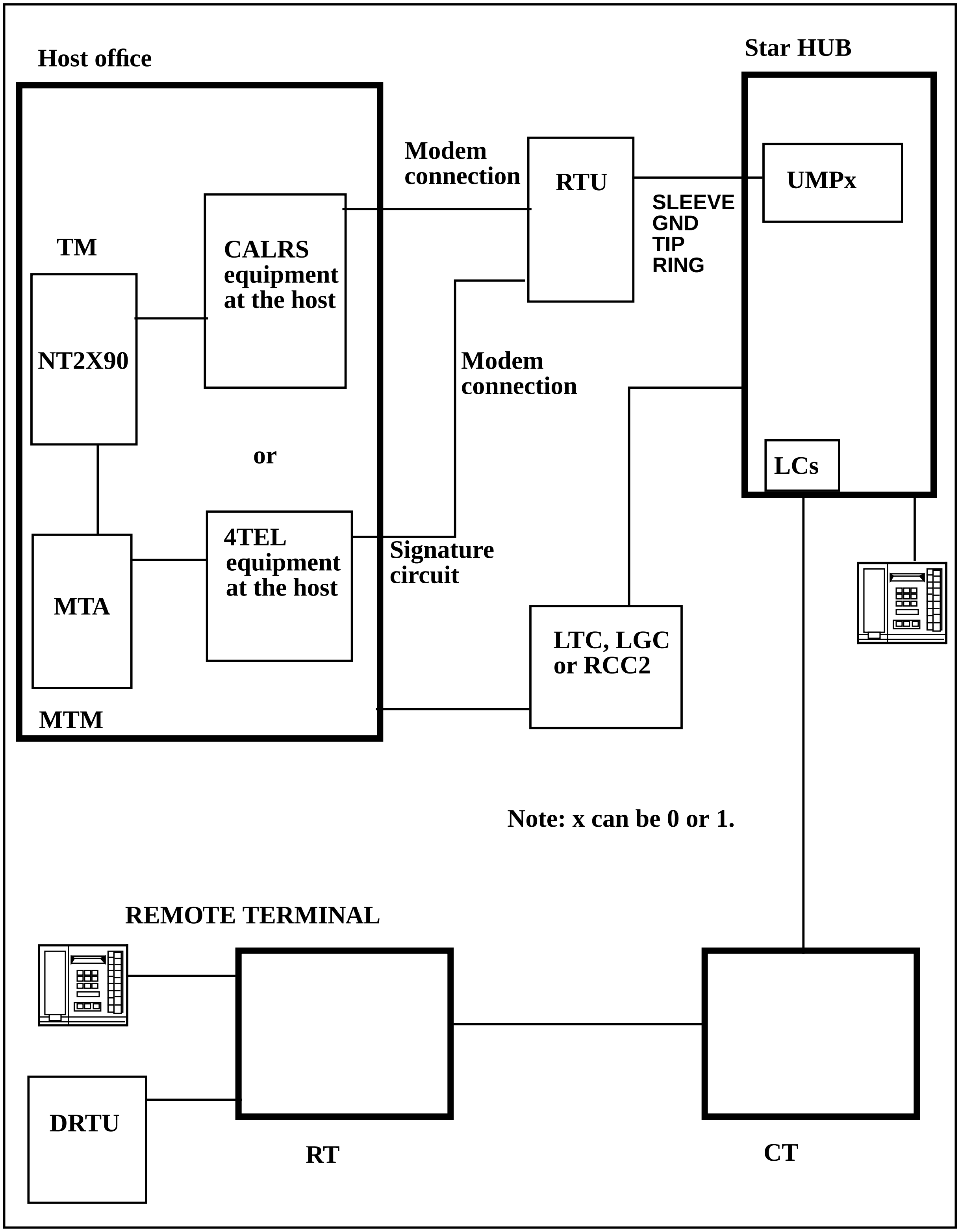
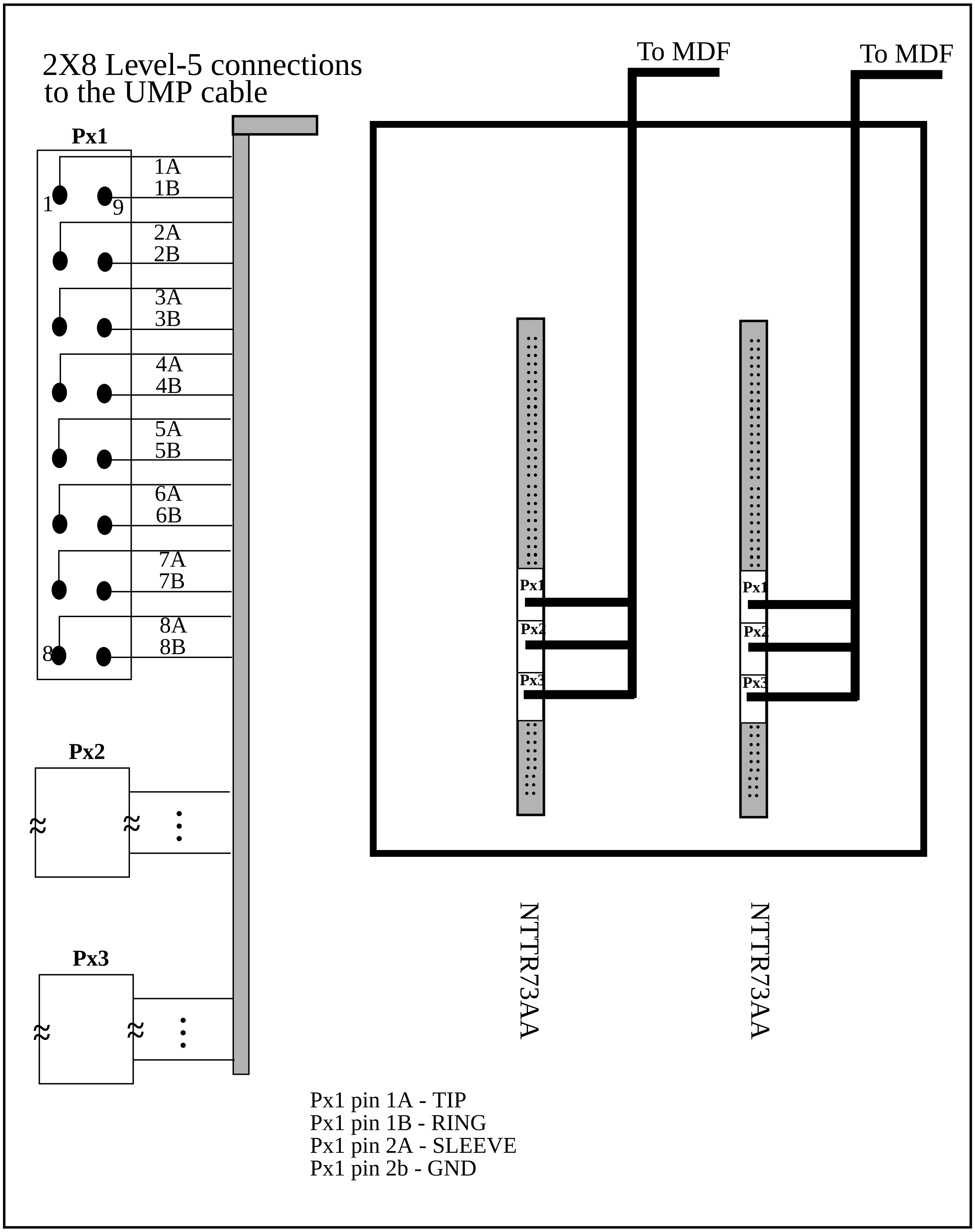


Table 7-16 UMP to External tester Pins Description

Signal name	UMP pin#	Connector #	Pin#	Wire Color
Tip	41A	1	1	Blue
Ring	41B		9	White
Sleeve	42A		2	Orange
Ground	42B		10	White

The corresponding wires of the RTU should be connected to the same pins on the MDF.

Figure 7-4 UMP Cables (NTTR73AA) Rear View



Note: There are two UMP to MDF cables in the Star Remote HUB configuration. The UMP cables run to slots 11 and 13 in the controller shelf.

Figure 7-5 RTU to MDF Cable Assembly

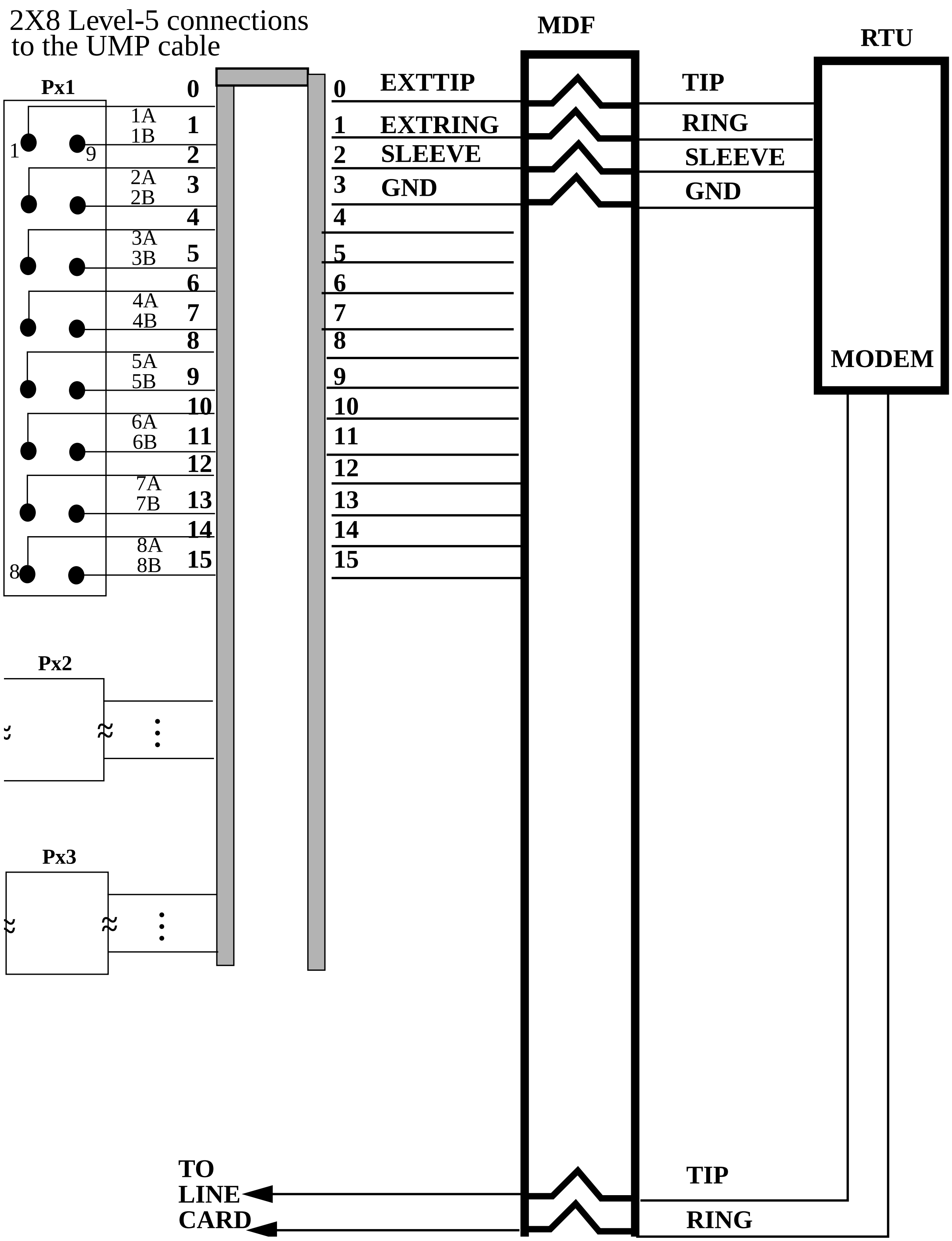
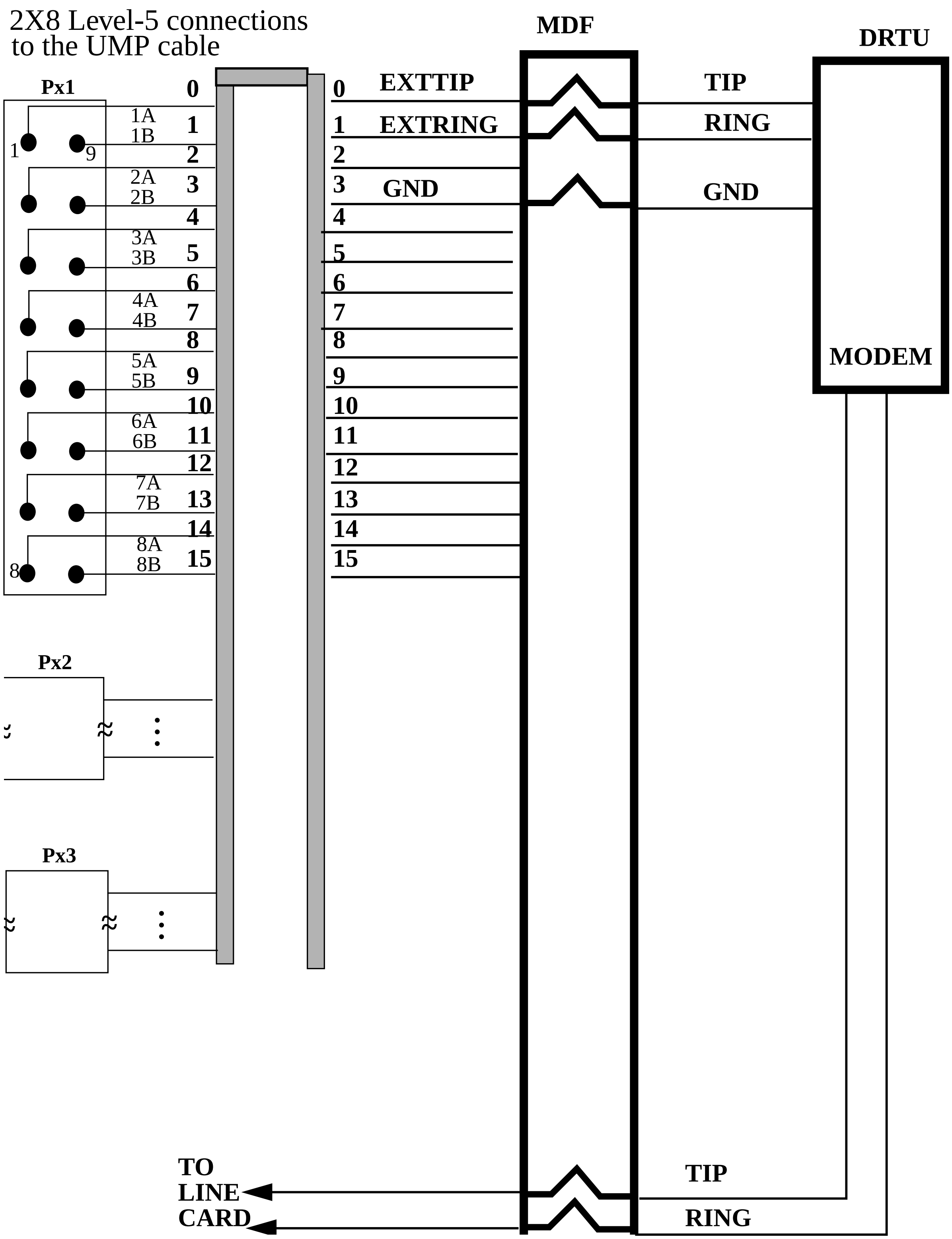


Figure 7-6 DRTU to MDF Cable Assembly



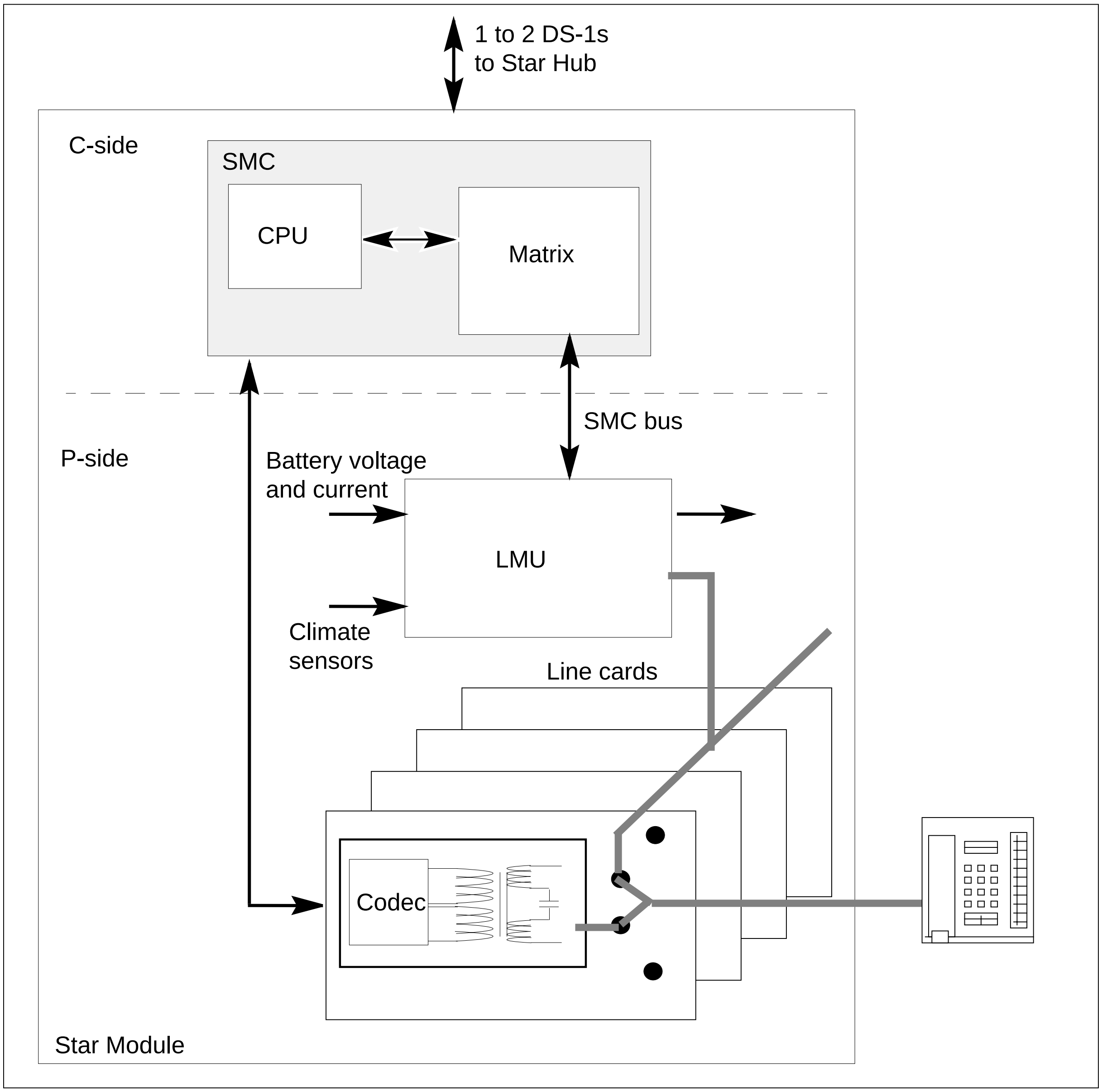
The following tables must have the correct data entered to enable line testing: tables CLLI, TRKGRP, TRKSGRP, TRKMEM, RECEIVER, MTAMDRVE, MTAVERT, and MTAHORIZ. The entry in table MTAVERT is a dummy entry because there is no connection to the vertical. The software requires this entry. In the 4TEL configuration, a signature circuit automatically dials the test head at the Star Hub and establishes a modem connection between the host and remote test heads.

LMU connections in the Star Module

The NTTR71AA line maintenance unit (LMU) card is used in the Star Module for line testing and diagnostics. The LMU is connected in parallel by one metallic bus to all 64 lines in the Star Module. To perform a test on a specific line the metallic bus relay on the LMU must be operated to connect to the LMU. The test access relay on the line card must also be operated.

The LMU is defined in table RMPCKT and is maintained through the MAPCI;MTC;MTCNA;TSTEQUIP MAP level.

Figure 7-7 LMU connections in the Star Module



LMU subscriber loop measurements

The LMU is able to perform various measurements of the subscriber loop as directed from the various line testing commands at the MAP terminal. The following table identifies the types of measurements and the capabilities of these tests.

Table 7-17 LMU loop measurement capabilities

Type of test	Function	Range or capability
dc foreign voltage measurements	Test mode	Two terminal (tip to ground, ring to ground)
	Range	± 100 V
	Accuracy	0.2 VRMS ± 5% (whichever is greater)
	Input resistance	100 kΩ
ac foreign voltage measurements	Test mode	Test terminal (tip to ground, ring to ground)
	Range	0 to 150 VRMS, single frequency of 20 to 60 Hz
	Accuracy	0.2 VRMS ± 5% (whichever is greater)
	Input impedance	100 kΩ with parallel capacitance of 100 pF
dc resistance measurements	Test mode	Three terminal (tip to ring, tip to ground, ring to ground)
	Range and accuracy	
	• 10Ω to 100 k	• ± 2Ω or 5% (whichever is greater)
	• 10 kΩ to 1 MΩ	• ± 2%
	• 1 MΩ to 5 MΩ	• ± 5%
	dc immunity	± 6 V
	ac immunity	10 VRMS, single frequency from 20 to 60 Hz
Capacitance measurements	Test mode	Three terminal (tip to ring, tip to ground, ring to ground)
	Range and accuracy10 nF to 5 µ F	± 2 nF or 5% (whichever is greater)
	dc immunity	± 6 V
	ac immunity	10 VRMS, single frequency from 20 to 60 Hz

Digital test access line testing for Star Module ISDN lines

Digital test access (DTA) is a method of digital monitoring of ISDN lines. DTA provides a refined method of accessing the subscriber loop information.

Instead of using a metallic path between the subscriber line and the test equipment, access is established by replicating the digital data streams on the line.

A DTA monitors the following data on an Star Module ISDN line

- D-channel
- circuit-switched B-channels
- packet-switched B-channels

Two streams of digital data are monitored:

- the data flowing toward the subscriber (downstream data)
- the data flowing away from the subscriber (upstream data)

The monitoring capability has no effect on the streams being monitored.

Monitoring is performed with a commercially available protocol analyzer. Two streams of digital data are derived from the monitored channel:

- downstream - the data flowing toward the subscriber and away from the switch
- upstream - the data flowing toward the switch and away from the subscriber

Each of these streams is made available to the protocol analyzer through

- two channels of a DS-1 interface supported by the host XPM
- the B1 and B2 channels of an ISDN line card in the Star Module

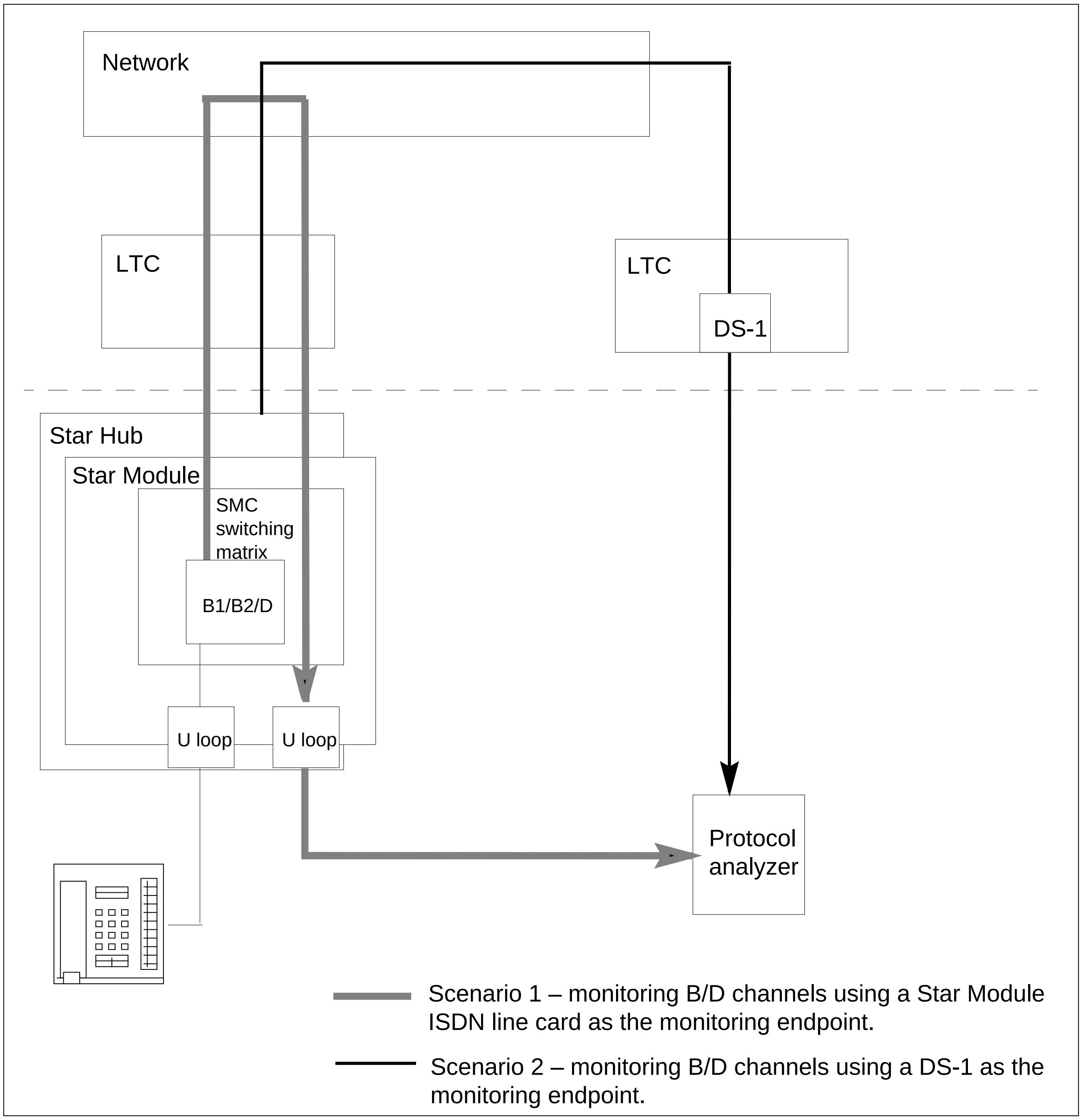
The monitoring point for the upstream and downstream data of the loop channels (B or D) is the switching matrix portion of the SMC card in the Star Module. The monitoring point for the upstream data of the Bd channels is the timeswitch of the host XPM. The downstream data is derived from the timeswitch at the DS-1.

The following restrictions apply for use of DTA connections on a Star Module:

- only one DTA connection on each Star Module is allowed
- DTA monitoring on a Bd channel is not supported

The following figure identifies the two scenarios for DTA monitoring of Star Module ISDN lines.

Figure 7-8 DTA monitoring scenarios



After the protocol analyzer is reserved for DTA use, connect the protocol analyzer to the BRI channel using the EQUIP and CONNECT commands at the LNS;LTP;LTPDATA level. The connection between the protocol analyzer and the monitored channel is established using nailed-up connections that remain in place until being removed by operating company personnel using MAP commands.

8 Troubleshooting chart

Troubleshooting actions

Basic troubleshooting actions for the Star Hub, accessed at the MAP (maintenance and administration position) terminal through the STAR level alarms, are listed in the following table.

Table 8-1 Star Hub alarm clearing (Sheet 1 of 3)

Alarm Condition	Possible cause	Action
Critical	Star Hub remote controller pack (RCP) cards in both Star Hub units has faults. Power converter cards in both Star Hub units have faults. All DS-1 message ports are closed. At least one of the Talk Battery filters circuit breakers is down.	Identify and post the system busy (SysB) Star Hub. Busy both units of the Star Hub with faults. Test and return to service (RTS) the Star Hub with faults. Replace cards in card list, if displayed. Use the correct card replacement procedures. If an RTS fails, load the Star Hub. RTS the Star Hub.

Table 8-1 Star Hub alarm clearing (Sheet 2 of 3)

Alarm Condition	Possible cause	Action
Major	Star Hub RCP processor has failed. Power converter has failed. Ringing generator (RG) circuit card has failed. Closed DS-1 message port Line trunk controller (LTC) forces activity switch in Star Hub.	Identify and post the in-service trouble (ISTb) Star Hub. Identify fault indicators with QUERYPM FLT command. If the Star Hub is C-side busy (CBsy), identify C-side links to host peripheral module (PM). Post host PM for P-side links that have failed. Busy, test, and RTS the P-side links that have failed. Post, busy, test, and RTS the Star Hub with faults. If the Star Hub unit is SysB, busy and test the Star Hub unit with faults. If the test fails with no card list, retest and RTS the Star Hub unit with faults. If the Star Hub is manually busy (ManB), test the Star Hub unit with faults. If the test fails with a card list, replace any cards with faults. Test, and RTS the Star Hub unit with faults. RTS the Star Hub unit.

Table 8-1 Star Hub alarm clearing (Sheet 3 of 3)

Alarm Condition	Possible cause	Action
Minor	RG circuit has failed. Activity mismatch Data error Diagnostic failure Load file mismatch Self-test failure	Identify and post the ISTb Star Hub. Identify fault indicators with QUERYPM FLT command. If Star Hub is Cbsy, identify C-side links to the host PM. Post the host PM for P-side links with faults. Busy, test, and RTS the P-side links with faults. Post, busy, test, and RTS the Star Hub with faults. If Star Hub unit is SysB, busy and test the Star Hub unit with faults. If the test fails with card list, replace any cards. Test and RTS the Star Hub unit with faults. If the test fails with no card list, re-test and RTS the Star Hub unit with faults. If the Star Hub is ManB, test the Star Hub unit with faults. If the test fails with a card list, replace any faulty cards. Test and RTS the Star Hub unit with faults. If the test fails with no card list, re-test and RTS the Star Hub unit with faults.

More complete troubleshooting methods for Star Hub alarms are provided in “Star Remote System alarm clearing procedures."

Basic troubleshooting procedures for the Star Module, accessed at the MAP terminal through the remote line drawer (RLD) level alarms, are listed in the following table.

Table 8-2 Star Module alarm clearing

Alarm condition	Possible cause	Action
Critical (when the CRIT light emitting diode [LED] on the Star Module Controller (SMC) card is lit)	The +15 V power converter has failed. Both fans are not operating. Talk battery fuse is blown. Fans and heater, LTU, or ISDN power supply fuse is blown. No ac power input available. The ac to dc converter failed. LTU failure	Identify and post the SysB RLD. Busy the RLD with faults. Test and RTS the RLD with faults. Check for blown fuses, tripped circuit breakers, or disconnected cables in the Star Module. Replace cards in card list, if displayed. Use the correct card replacement procedures. If an RTS fails, load the RLD with faults. RTS the RLD.
Major (when the MAJ LED on the SMC card is lit)	The power converter has failed and does not supply Coin voltage. Low ringing voltage output from the power converter. One fan is not operating. Cabinet front door is open.	Identify and post the ISTb RLD. Identify fault indicators with QUERYPM FLT command. If the RLD is CBsy, identify C-side links to Star Hub. Post Star Hub for P-side links with faults. Busy, test, and RTS the P-side links with faults. Post, busy, test, and RTS the Star Hub with faults. If the RLD is SysB, busy and test the RLD with faults. If the test fails with no card list, retest and RTS the Star Hub unit with faults. If the RLD is ManB, test the RLD with faults. If the test fails with a card list, replace any faulty cards. Test and RTS the RLD. RTS the RLD.

More complete troubleshooting methods for Star Module (RLD) alarms are provided in "Star Remote System alarm clearing procedures."

9 Star Remote System power up and power down procedures

Power up and power down procedures

An expected power outage, such as a natural disaster that is about to occur, may require operating company personnel to power down the Star Hub or Star Module, or both, for the duration of the event to minimize damage to the equipment. This allows the operating company to bring the power back up in sequence. These procedures are described here.

Star Hub

Procedure 9-1 Powering up the Star Hub

To power up the Star Hub, use the following steps:

1 Post the Star Hub from the MAP (maintenance and administration) terminal.

2 Activate the power supply for the -48 V alarm battery supply (ABS).

3 Verify the ABS light emitting diode (LED) on the frame supervisory panel (FSP) lights.

4 Activate the power supply for the main -48 V at the power distribution center (PDC).

5 Set circuit breakers PS00 and PS01 to the ON position.

6 Set circuit breakers PS10 and PS11 to the ON position.

7 Make sure the output voltages are within acceptable range.

8 Busy both Star Hub units.

9 Return to service the Star Hub.

10 Install the fuses in the FSP for the line drawers

11 You have correctly completed this procedure.

Procedure 9-2 Powering down the Star Hub

> **CAUTION**
> **Loss of service**
> This procedure is reserved for extreme conditions such as impending natural disasters. It will result in a complete loss of subscriber service.

To power down the Star Hub, use the following steps:

1 Post the Star Hub.

2 Identify the unit to be powered down.

3 Busy the Star Hub unit by typing

`>BSY UNIT unit_no`

and pressing the Enter key.

where

unit_no
is the number of the unit to be powered down

4 Remove the power from the busied Star Hub unit by setting the circuit breaker (CB) on the FSP to OFF.

Table 9-1

if unit to be powered down is	Trip circuit breaker
Unit 0	PS00 for power converter in slot 3 and PS01 for power converter in slot 5
Unit 1	PS10 for power converter in slot 20 and PS11 for power converter in slot 18

5 The Star Hub unit is now powered down.

6 Repeat this procedure for the mate unit.

7 You have correctly completed this procedure.

Common procedure

A common troubleshooting procedures is given in this section for troubleshooting dial tone problems.

Procedure 9-3 Troubleshooting dial tone problems

After powering up the Star Hub and one or both units are in service, the line subgroups (LSG) must be checked for dial tone. If they do not have dial tone, use the following procedure to troubleshoot the source of dial tone failure.

1 If the LSG do not have dial tone, check for alarms at the host peripheral module (PM).

2 If the line drawers 1 - 4, 9 - 13 do not have dial tone, use a voltmeter to check that the voltage at the -48 VA lug on the backplane reads -48 V. Check the Talk Battery filter circuit breaker in the Star Hub FSP. This voltage comes from the power distribution center (PDC) for this frame. Check the fuse and circuit breaker in the PDC if the voltage is not present.

3 If the line drawers 5 - 8, 14 - 18 do not have dial tone, use a voltmeter to check that the voltage at the -48 VB lug on the backplane reads -48 V. Check the Talk Battery filter circuit breaker in the Star Hub FSP. This voltage comes from the power distribution center (PDC) for this frame. Check the fuse and circuit breaker in the PDC if the voltage is not present.

4 If you do not have dial tone, contact your next level of support.

5 You have correctly completed this procedure.

Star Module

Procedure 9-4 Powering up the Star Module

To power up the Star Module, use the following steps:

1 Post the Star Module (accessed at the MAP terminal as a remote line drawer [RLD]) from the MAP terminal.

2 Provide ac power to the Star Module as follows:

- If the Star Module is in an indoor wall-mounted Star Remote Module Equipment (SRME), enable power from a local ac power panel.
- If the Star Module is in an outside pad or pole-mounted Star Remote Module Outside (SRMO), set the Main circuit breaker on the ac panel to the ON position. Then set the Rectifier circuit breaker on the ac panel to the On position.

Note: To make sure the Star Module powers up properly, do not supply dc power to the Star Module before connecting ac power. If dc power is connected first, the low voltage disconnect circuit prevents the Star Module from using ac power.

3 Set the circuit breaker on the dc panel to the ON position.

4 Busy the Star Module (RLD).

5 Return to service the Star Module.

6 You have correctly completed this procedure.

Procedure 9-5 Powering down the Star Module

> **CAUTION**
> **Loss of service**
> This procedure is reserved for extreme conditions such as impending natural disasters. It will result in a complete loss of subscriber service.

To power down the Star Module, use the following steps:

1 Post the Star Module (RLD).

2 Busy the Star Module.

3 Remove power from the busied Star Module by setting circuit breaker on the dc panel to OFF.

4 Remove ac power from the Star Module as follows:

- if an indoor wall-mounted SRME, remove power at the local ac power panel
- if an outdoor pad or pole-mounted SRMO, set the Rectifier circuit breaker on the ac panel to the OFF position. Then set the Main circuit breaker on the ac panel to the OFF position.

5 The Star Module is now powered down.

6 You have correctly completed this procedure.

10 Star Remote System recovery procedures

This chapter contains recovery procedures for the Star Remote System, and references to recovery procedures. These procedures describe how to recover a Star Hub and Star Module manually. These procedures are defined for use by maintenance engineering and field maintenance personnel.

Star Hub recovery procedure

Application

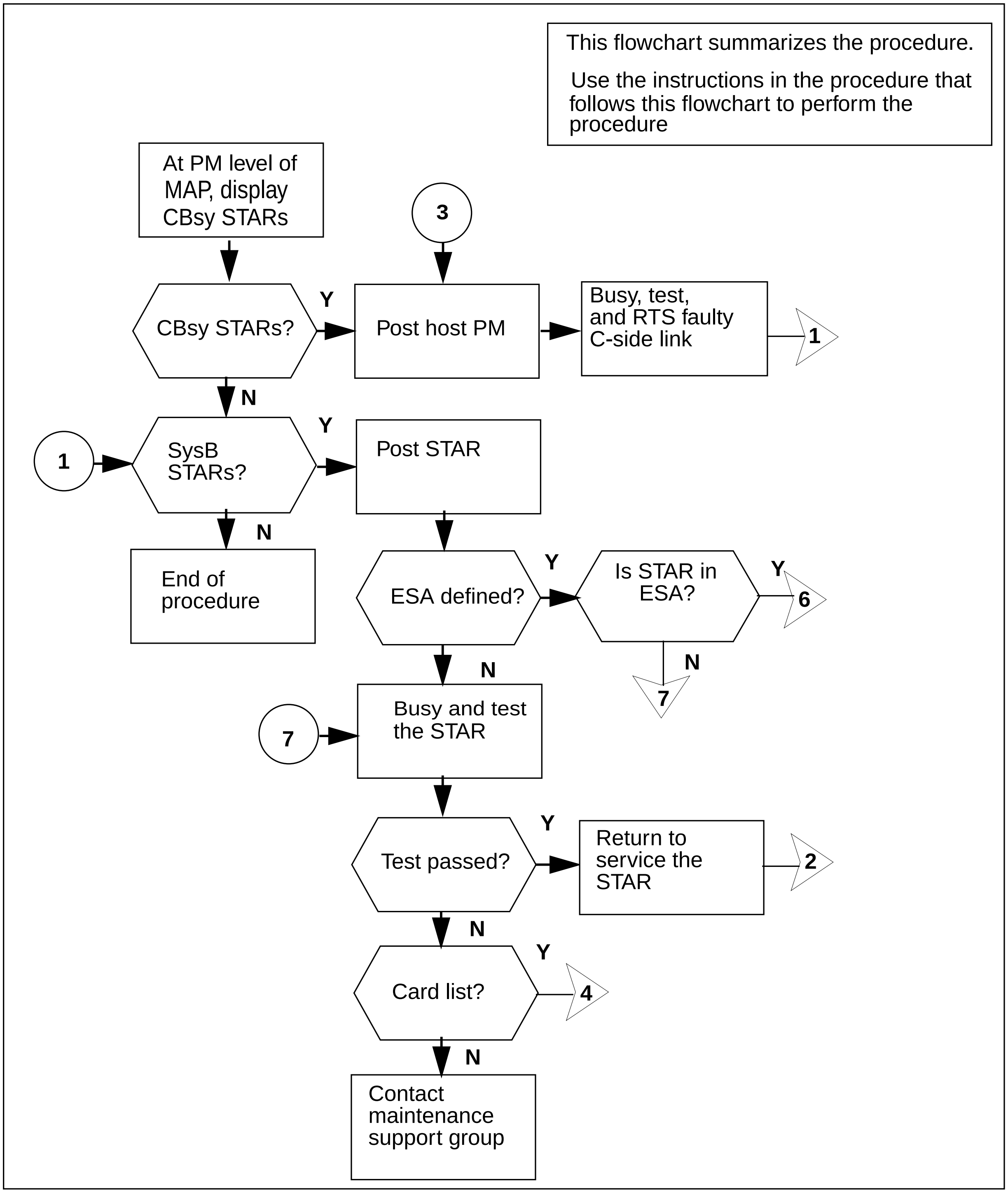
Use this procedure to recover service in a STAR when both units of the STAR are out of service. This condition always produces a central side (C-side) busy (CBsy) alarm. Use this procedure wnen referred to by an alarm clearing procedure.

Action

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

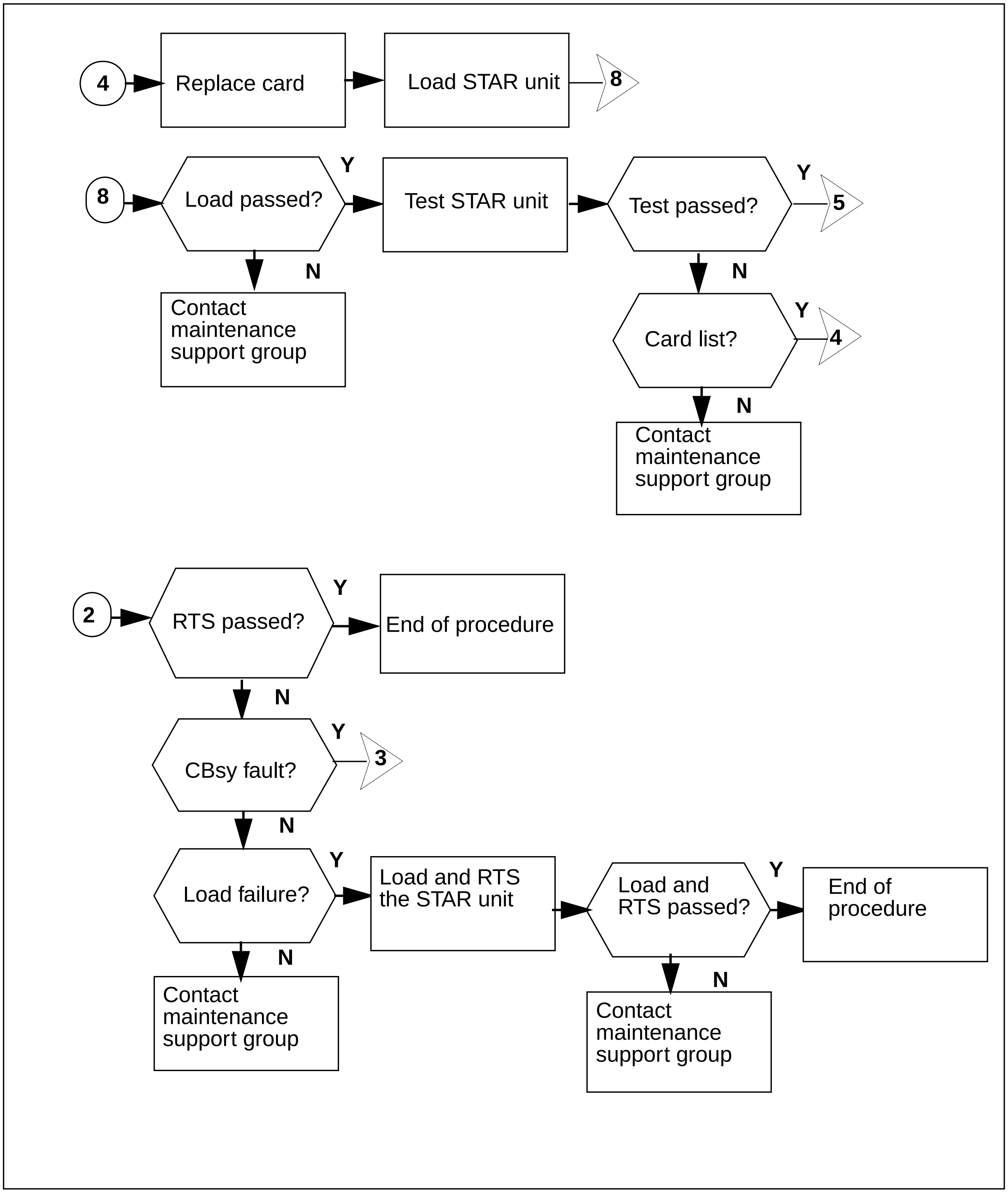
Star Hub recovery procedure (continued)

Summary of a STAR HUB recovery procedure



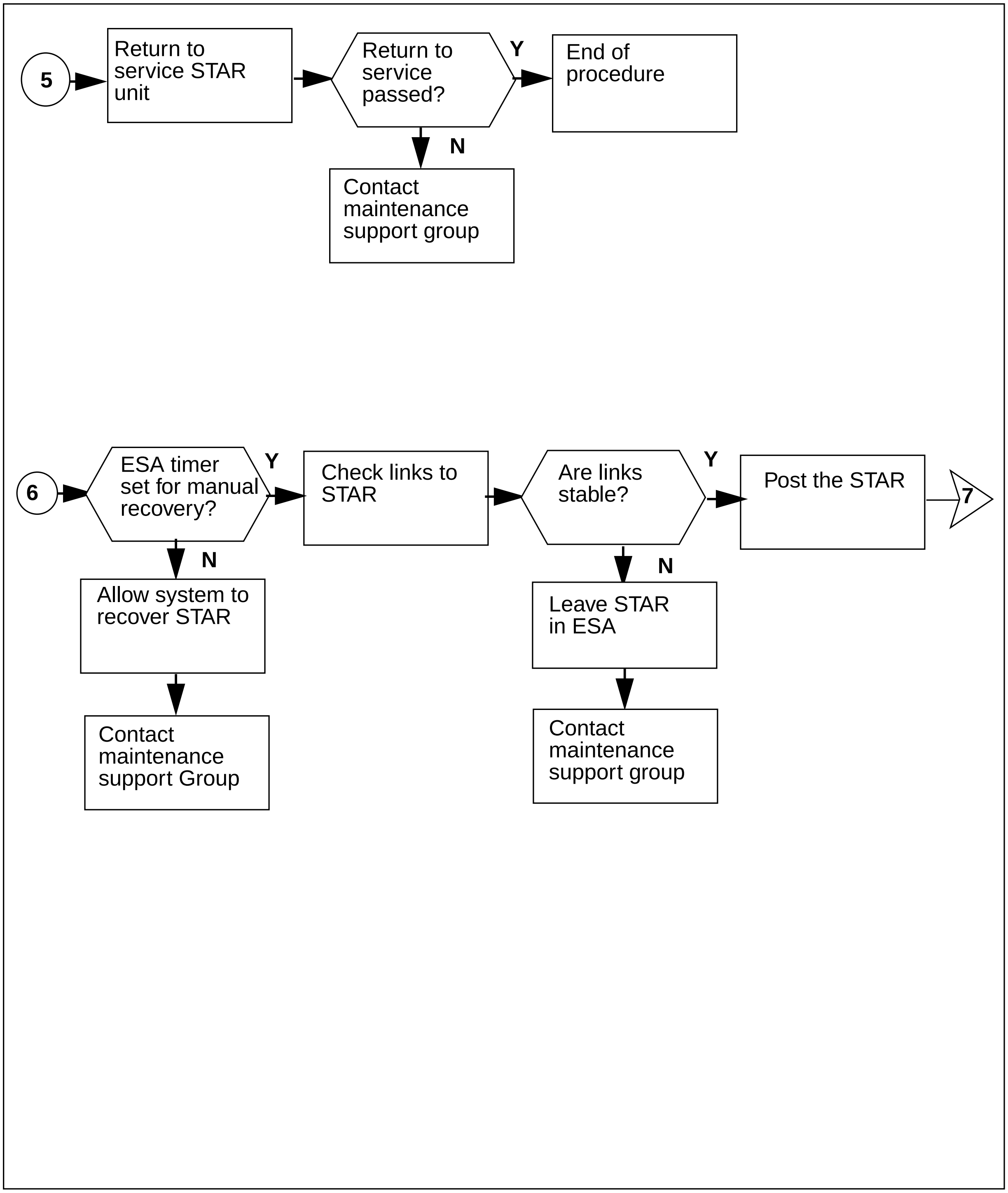
Star Hub recovery procedure (continued)

Suimmary of a STAR recovery procedure (continued)



Star Hub recovery procedure (continued)

Summary of STAR recovery procedure (continued)



Star Hub recovery procedure (continued)

Star Hub recovery procedure

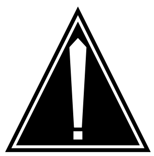
At the MAP display

1 To silence an audible alarm, type

>MAPCI;MTC;SIL

and press the Enter key.

2



CAUTION
Failing to allow sufficient time may cause false alarm indication.
Allow 3 to 5 minutes for the system to clear the alarm before proceding to the next step.

To access the peripheral module (PM) level of the MAP display, type

>PM

and press the Enter key.

3 To identify a STAR with faults, type

>DISP STATE CBSY STAR

and press the Enter key.

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

4 To post the STAR with the alarm condition, type

>POST STAR CBSY

and press the Enter key.

5 To identify C-side links to the host PM, type

>TRNSL C

and press the Enter key.

Example of a MAP response:

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

6 To post the host PM, type

>POST pm_type pm_no

and press the Enter key.

where

Star Hub recovery procedure (continued)

pm_type
is the type of host PM such as line trunk controller (LTC), line group controller (LGC), or remote cluster controller 2 (RCC2)

pm_no
is the number of the host pm

7 To display the P-side links, type

>TRNSL P

and press the Enter key.

Example of a MAP response:

```
Link 5: STAR REM1 00 0 0; Cap MS; Status: SysB; MsgCond: CLS
Link 6: STAR REM1 00 0 1; Cap MS; Status: SysB; MsgCond: CLS
```

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

8 To busy the link with 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 7

9 To test the busied link, type

>TST LINK link_no

where

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

If test	Do
passed	step 10
failed	step 29

10 To return the busied link to service, type

>RTS LINK link_no

and press the Enter key.

where

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

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

Star Hub recovery procedure (continued)

If test	Do
fails	step 29

11 To identify the STAR with faults, type

>DISP STATE SYSB STAR

and press the Enter key.

If response indicates	Do
no SysB STARs	step 34
SysB STARs	step 12

12 To post the STAR with the alarm condition, type

>POST STAR SYSB

and press the Enter key.

13 To determine if the STAR is provided with emergency stand-alone (ESA), type

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM Type:  STAR Int .  No. :5  Status  index:  5  Node_No:  42
STAR REM1 00 0 Memory size - Unit  0:  8M  ,  unit  1:  8M
ESA Equipped:  No,  Intraswitching is Off
Loadnames:  LCMINV - RSRD0811, Unit 0:  NLCN0700
Node Status:  {OK,  FALSE}
Unit 0 Status: {OK, FALSE}
Unit 1 Status: {MAN_BUSY, FALSE}
Site Fir RPos  Bay_id  Shf Description  Slot  EqPEC
STAR  00  A00  HUB  00  00  STAR 00  00    NT8602
Services:  NEUTRAL
UMP  0  OffL  Loadnames:  RMPCKT - RSRD0811 Real *  Unknown
This PM is:  STAR
```

If STAR is	Do
provided with ESA	step 14
not provided with ESA	step 21

14 Determine if the STAR is in ESA by manually checking for dial tone at the remote site. A PM alarm appears on the MAP screen indicating the STAR is in ESA. The system generates PM106 logs when the PM goes SysB. The system generates PM110 logs for DS-1 link alarms. The system generates PM128 logs when there is a change of state in the PM.

If the STAR	Do
has dial tone	step 15

Star Hub recovery procedure (continued)

If the STAR	Do
does not have dial tone	step 21

15 Determine if the STAR has the ESA timer set for manual recovery from ESA. To access table OFCENG, type

>TABLE OFCENG

and press the Enter key.

16 To check the STAR exit time, type

>POS RLCM_XPMESAEXIT

and press the Enter key.

Example of a MAP response:

```
PARMNAME                PARMVAL
-------------------------------------------
          RLCM_XPMESAEXIT     3
```

If PARMVAL is	Do
set to zero	step 17
greater than zero	Allow the system to recover the STAR. Go to step 29

17 Before manually restoring the STAR from ESA, check to see if links to the STAR are stable. To find the link numbers for this STAR, type

>TRNSL C

and press the Enter key.

Example of a MAP response:

```
      Host XPM P-side link number
                 |
                 v
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
```

18 To access the CARRIER level of the MAP, type

>TRKS;CARRIER

and press the Enter key.

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

>POST pm_type pm_no link_no

and press the Enter key.

Star Hub recovery procedure (continued)

where

pm_type
is the type of host PM such as LTC, LGC, or RCC2

pm_no
is the number of the host pm_type (0 to 255)

link_no
is the number of the link connected the host PM (see the MAP display in step 17)

Repeat the POST command for each link.

Example of a MAP response:

```
     Host XPM P-side link number
                           ▼

N CLASS SITE LTC    CK  D ALRM SLIP FRME BER ES SES STATE
0 REMOTE HOST  1    0   C         0    0   1   0  0   INSV
```

Note: This MAP response shows carrier facilities from the host XPM to the STAR. The carrier facilities must also be checked from the remote site and back to the host PM.

If link conditions show	Do
a high number of SLIP and FRME	Leave the STAR in ESA. Go to step 29.
a very low number of SLIP and FRME	step 20

20 To post the STAR with the alarm condition, type

>POST STAR site frame unit

and press the Enter key.

where

site
is the site of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

21 To busy both units of the STAR, type

>BSY PM

and press the Enter key.

22 To respond to a system request for verification, type

>YES

and press the Enter key.

Star Hub recovery procedure (continued)

23 To test both units of the STAR, type

>TST PM

and press the Enter key.

If test	**Do**
passes	step 25
fails, and the system produces a card list	step 24
fails, but the system does not produce a card list	step 29

24 The card list identifies the cards most likely to have faults. Replace the cards one at a time in the order listed as indicated by this procedure.

If last card on list has	**Do**
not been replaced	step 30
been replaced	step 25

25 To try to return the STAR to service, type

>RTS PM

and press the Enter key.

If MAP prompt indicates	**Do**
RTS is sucessfull	step 34
CBsy	step 5
Load failure	step 27
All other	step 29

26 Identify the card type that was replaced.

If an NTTR77 remote controller pack (RCP) card	**Do**
was replaced	step 27
was not replaced	step 28

27 To reload the STAR, type

>LOADPM PM CC

and press the Enter key.

If load	**Do**
is sucessfull	step 28

Star Hub recovery procedure (continued)

If load	Do
is not sucessfull in one unit	step 31
is not sucessfull	step 29

28 To again try to return the STAR to service, type

>RTS PM

and press the Enter key.

If return to service for either unit	Do
is sucessfull	step 34
is not sucessfull	step 29

29 Contact your maintenance support group for additional instructions in clearing this fault.

30 Go to the “Star Remote System card replacement procedures” to replace the first (or next) card on the card list. Notify outside plant personnel of the card to be changed. Go to step 26 when the last card is replaced.

31 To try to load the STAR unit, type

>LOADPM UNIT star_unit

where

star_unit
is the STAR unit (0 or 1) that failed to load in step 27

If load is	Do
sucessfull	step 32
not sucessfull	step 29

32 To test the STAR unit, type

>TST UNIT star_unit

where

star_unit
is the STAR unit (0 or 1) to be tested

If test	Do
passes	step 33
fails, and the system produces a card list	step 24
fails, but the system does not produce a card list	step 29

Star Hub recovery procedure (end)

33 To try to return the STAR unit to service, type

`>RTS UNIT star_unit`

where

star_unit
is the STAR unit (0 or 1) to be returned to service

If RTS	Do
passes	step 34
fails	step 29

34 You have correctly completed this procedure. If additional alarms are displayed, go to the appropriate alarm clearing procedure.

11 Star Remote System alarm clearing procedures

This chapter contains alarm clearing procedures for the Star Remote System. These procedures describe the clearing of alarms in the Star Hub and the Star Module (also known as a remote line drawer [RLD]) and are intended for use by maintenance engineering and field maintenance personnel.

Ext FSP
SRHE frame major

Alarm display

CM	MS	IOD	Net	PM	CCS	Lns	Trks	**Ext**	Appl
.	.	.	.	.	.	.	.	**1FSP**	.
								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) major alarm.

Meaning

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

The number of frames affected is indicated by the number under the EXT header of the alarm banner.

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

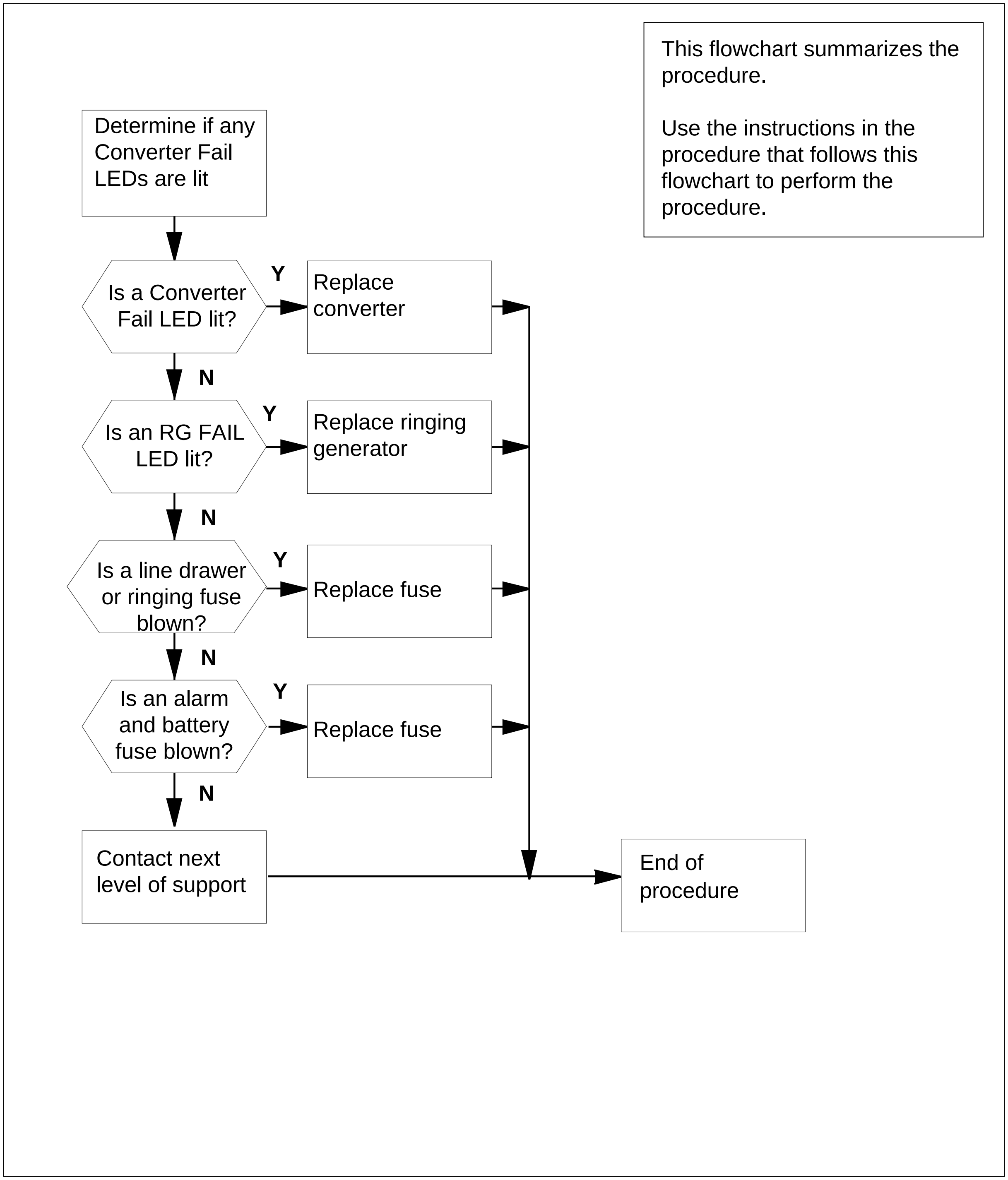
None

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
SRHE frame major (continued)

Summary of clearing an Ext FSP SRHE frame major alarm



Ext FSP
SRHE frame major (continued)

Clearing an Ext FSP SRHE frame major alarm

At the Star Remote Hub Equipment (SRHE) frame

1 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 53
no Converter Fail LEDs are lit	step 2

2 Determine if any of the ringing generator (RG) Fail LEDs on both RGs, located in the control shelf, are lit.

If	Do
any ringing generator Fail LEDs are lit	step 39
no ringing generator Fail LEDs are lit	step 3

3 Determine if any of the +5 V, +15 V, or -48 V line drawer or ringing fuses located on the FSP are blown.

If	Do
a fuse is blown	step 8
no fuses are blown	step 4

4 Determine if an alarm battery supply (ABS) fuse , located on the FSP, is blown that is, the fuse indicator extends and the in-service LED on UMP 0/1 is not lit.

If	Do
a fuse is blown	step 5
no fuses are blown	step 68

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

6 Remove the blown fuse.

Ext FSP
SRHE frame major (continued)

7

> **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 68
does not blow	step 63

8 Determine which fuse is blown.

Note: The line drawer fuses are grouped and labeled as +5 V, +15 V, and -48 V and are numbered from 0 to 17. The line drawers are numbered from 1 to 18. Any +5 V, +15 V, or -48 V fuse in position 0 is associated with line drawer 1 and any fuse in position 1 is associated with line drawer 2, and so forth.

If the blown fuse is any one of	Do
+5 V fuses	step 12
+15 V or -48 V fuses	step 9
ringing fuses	step 12

9 Remove the blown fuse and its associated fuse. For example, if the blown fuse is a -48 V fuse in position 17, then remove the +15 V fuse in position 17 as well.

10 Get a replacement fuse with the same voltage and amperage as the blown fuse.

11

> **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.

Ext FSP
SRHE frame major (continued)

If you replaced a +15 V or -48 V fuse, insert the +15V fuse, then the -48V fuse.

If the fuse	Do
blows again	step 15
does not blow	step 63

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

13 Remove the blown fuse.

14

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 17
does not blow	step 63

15 Remove the blown fuse and its associated fuse. For example, if the blown fuse is a -48 V fuse in position 17, then remove the +15 V fuse in position 17 as well.

16 Get a replacement fuse with the same voltage and amperage as the blown fuse.

Ext FSP
SRHE frame major (continued)

17 Use the following table to determine which line drawer or LSG in the Star Hub is associated with the blown fuse.

Note: Ringing fuses supply ringing voltage to a group of LSGs that are part of local line drawers in the Star Hub.

Line drawer		Fuse numbers			Ringing fuse supplies ringing voltage to the following LSGs			
STAR Unit 0	**STAR Unit 1**	**+5 V**	**+15 V**	**-48 V**	**Ringing fuse number**	**LSG**	**Ringing fuse number**	**LSG**
	1	00	00	00	0	00	1	01
2		01	01	01		02		03
	3	02	02	02		04		05
4		03	03	03		06		07
	5	04	04	04		08		09
6		05	05	05	8	10	9	11
	7	06	06	06		12		13
8		07	07	07		14		15
	9	08	08	08		16		17
10		09	09	08		18		19
	11	10	10	10	18	20	19	21
12		11	11	11		22		23
	13	12	12	12		24		25
14		13	13	13		26		27
	15	14	14	14	26	28	27	29
16		15	15	15		30		31
	17	16	16	16		32		33
18		17	17	17		34		35

Ext FSP
SRHE frame major (continued)

18

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

Pull out the line drawer you have just identified.

Note: When dealing with a blown ringing fuse (56 to 63), begin with the first LSG in the group.

19

> **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 +5 V fuses	step 21
any one of +15 V or -48 V fuses	step 20
any one of ringing fuses	step 21

20

> **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.

Ext FSP
SRHE frame major (continued)

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

If the fuse	Do
blows again	step 24
does not blow	step 26

21 Get a replacement fuse with the same voltage and amperage as the blown fuse.

22 Remove the blown fuse.

23

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 24
does not blow	step 26

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

If there are	Do
loose or short-circuited wires	step 68
no loose or short-circuited wires, the fuse you are dealing with is a ringing fuse and you have not inspected all of the LSGs in the group	step 25
no loose or short-circuited wires, the fuse you are dealing with is a ringing fuse and you have inspected all of the LSGs in the group	step 68
no loose or short-circuited wires, the fuse you are dealing with is one of the line drawer fuses	step 68

25 Reseat all the line cards in the drawer and repeat steps 18 and 19 for the next LSG in the group.

26 Reseat the line cards one at a time.

Ext FSP
SRHE frame major (continued)

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

If after reseating	Do
any line card, the fuse blows again	step 28
all of the line cards, the fuse does not blow	step 63

28

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

Remove the line card from the drawer.

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

30 Insert the replacement line card into the drawer.

If you are dealing with	Do
any one of the +5 V fuses	step 34
any one of the +15 V or -48 V fuses	step 31
any one of the ringing fuses	step 34

31 Get a replacement fuse with the same voltage and amperage as the blown fuse.

32 Remove the blown fuse and its associated fuse. For example, if the blown fuse is a -48 V fuse in position 17, then remove the +15 V in position 17 as well. Refer to the table in step 17.

Ext FSP
SRHE frame major (continued)

33

> **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 68
does not blow	step 37

34 Get a replacement fuse with the same voltage and amperage as the blown fuse.

35 Remove the blown fuse.

36

> **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 68
does not blow	step 37

37 Reseat all the other line cards in the drawer.

38 Push the drawer back in and go to step 63.

Ext FSP
SRHE frame major (continued)

39 Use the following table to identify which circuit breaker located on the FSP is associated with the RG that has a Fail LED lit.

RG number	Circuit breaker number
0 in slot 1	Ring 1, Slot 1
1 in slot 22	Ring 2, Slot 22

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

If the circuit breaker is	Do
ON	step 50
OFF	step 41

41 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the Fail LED on the RG is lit	step 42
remains ON, and the Fail LED on the RG is not lit	step 63
remains ON, and the Fail LED on the RG is lit	step 50

At the PDC frame

42 Locate the fuse that powers the unit in the SRHE frame.

43 Determine if the fuse is blown.

If the fuse is	Do
blown	step 44
not blown	step 69

44 Remove the fuse holder that contains the blown fuse.

45 Replace the cartridge fuse inside the fuse holder.

Ext FSP
SRHE frame major (continued)

46

> **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.

47 Install the fuse holder back onto the PDC frame.

48 Determine if the fuse blows again.

If the fuse	Do
blows again	step 68
does not blow again	step 49

At the SRHE frame

49 Set the circuit breaker to ON.

If the circuit breaker	Do
turns OFF, and the RG fail LED is lit.	step 51
remains ON, and the RG fail LED is not lit	step 63
remains ON, and the RG fail LED is lit	step 50

50 Set the circuit breaker to OFF.

51 Replace the RG by performing the appropriate procedure in “Star Remote Hub card replacement procedures" in this manual. When you have completed the procedure, return to this point.

52 Determine if the Fail LED for the RG you have just replaced is lit.

If the Fail LED is	Do
lit	step 68
not lit	step 63

Ext FSP
SRHE frame major (continued)

53 Use the following table to identify which circuit breaker located on the FSP, is associated with the power converter in the unit with a lit Converter Fail LED.

IfSlot number	DoCircuit breaker number
03, in unit 0	PS00, Slot 3
05, in unit 0	PS01, Slot 5
18, in unit 1	PS11, Slot 18
20, in unit 1	PS10, Slot 20

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

If the circuit breaker is	Do
ON	step 56
OFF	step 55

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

If the circuit breaker	Do
turns OFF, and the Converter Fail LED is lit	step 57
remains ON, and the Converter Fail LED is lit	step 56
remains ON, and the Converter Fail LED is not lit	step 63

56 Set the circuit breaker to OFF.

57 Replace the converter by performing the appropriate procedure in “Star Remote System card replacement procedures" in this manual. When you have completed the procedure, return to this point.

58 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 59
no bent or short-circuited pins	step 61

59 Set the circuit breaker to OFF.

60 Straighten or replace bent or short-circuited pins. Then go to step 54.

Ext FSP
SRHE frame major (end)

61 Set the circuit breaker to ON.

If the converter fail LED is	Do
lit	step 62
not lit	step 63

62 Replace the NTTR74AA alarm card by performing the appropriate procedure in “Star Remote System card replacement procedures" in this manual. When you have completed the procedure, return to this step.

63 Determine if the Major alarm LED on the FSP is lit.

If the Major alarm LED 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 68
not lit	step 64

At the MAP terminal

64 To access the EXT level of the MAP display, type

>MAPCI;MTC;EXT

and press the Enter key.

65 Determine if 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 66
present, and you have accessed all the frames with an FSP alarm	step 68
not present	step 69

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

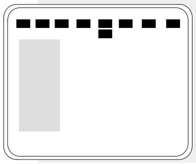
67 Go to the “Star Remote System alarm clearing procedures" in this manual and perform the talk battery alarm clearing procedure. Return to this step when completed.

68 For additional help, contact the personnel responsible for the next level of support.

69 You have correctly completed this procedure.

PM STAR critical

Alarm display



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

Indication

Use this procedure to recover service in a STAR when both units of the STAR are out of service. This condition always produces a central side busy (CBsy) alarm.

The STAR alarm appears under the PM header in the MAP display. This alarm indicates an alarm condition exists in the STAR. The *n* indicates the number of STARs with alarms. The **C** appearing under the alarm indicates the alarm class is critical.

Meaning

The STAR is either system busy (SysB) or C-side busy (CBsy). A STAR is SysB if both units are SysB or if one unit is SysB and the other unit is manual busy (ManB). A STAR is CBsy when both units of the STAR are CBsy. When both units of the STAR are SysB, this may indicate that both main power converters in slots 3 and 23 have failed.

Impact

When a STAR is in the SysB or CBsy state, a loss of call processing with a critical alarm indication will result.

Common procedures

None

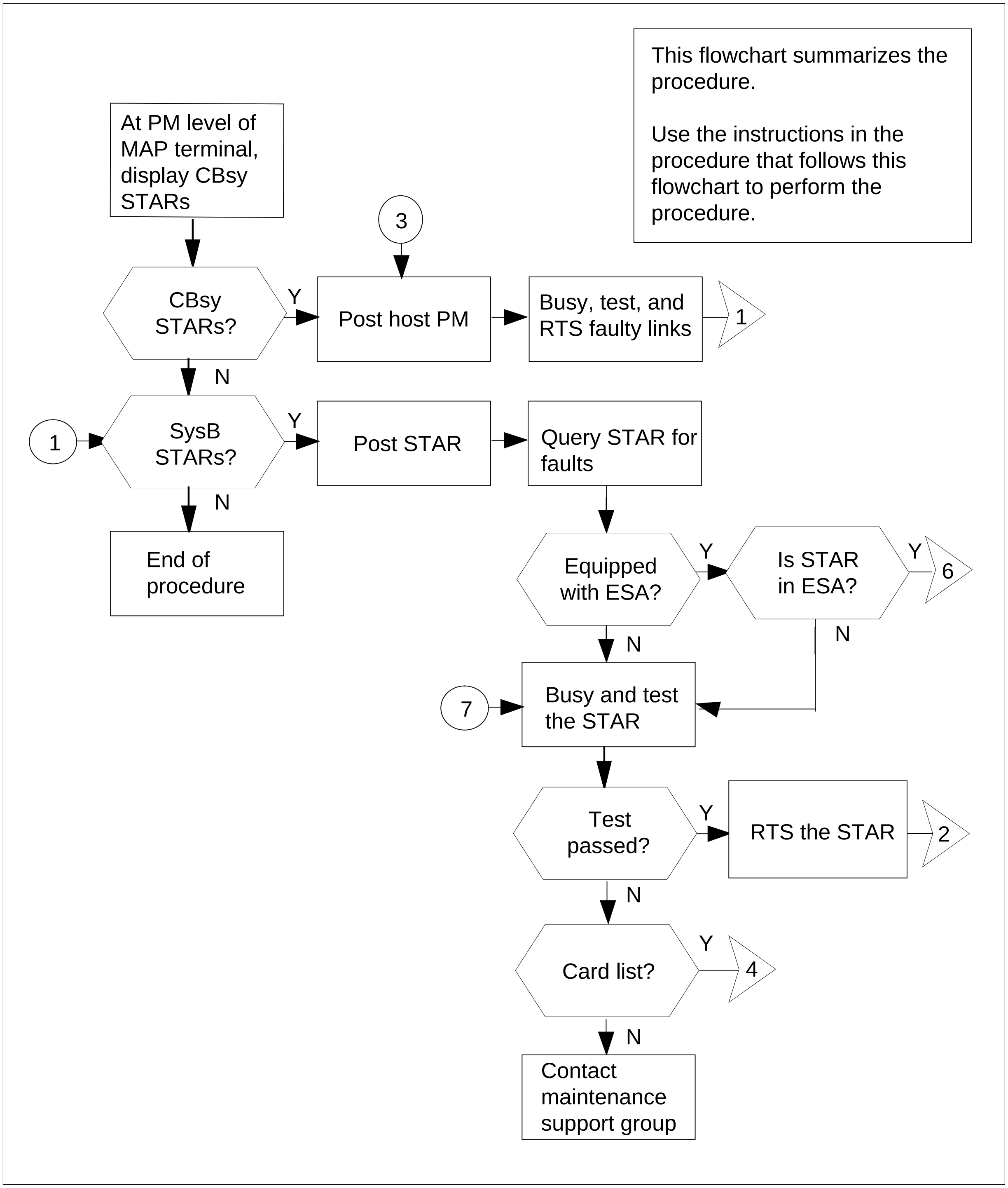
Action

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. Instead, the numbers indicate navigation within the flowchart.

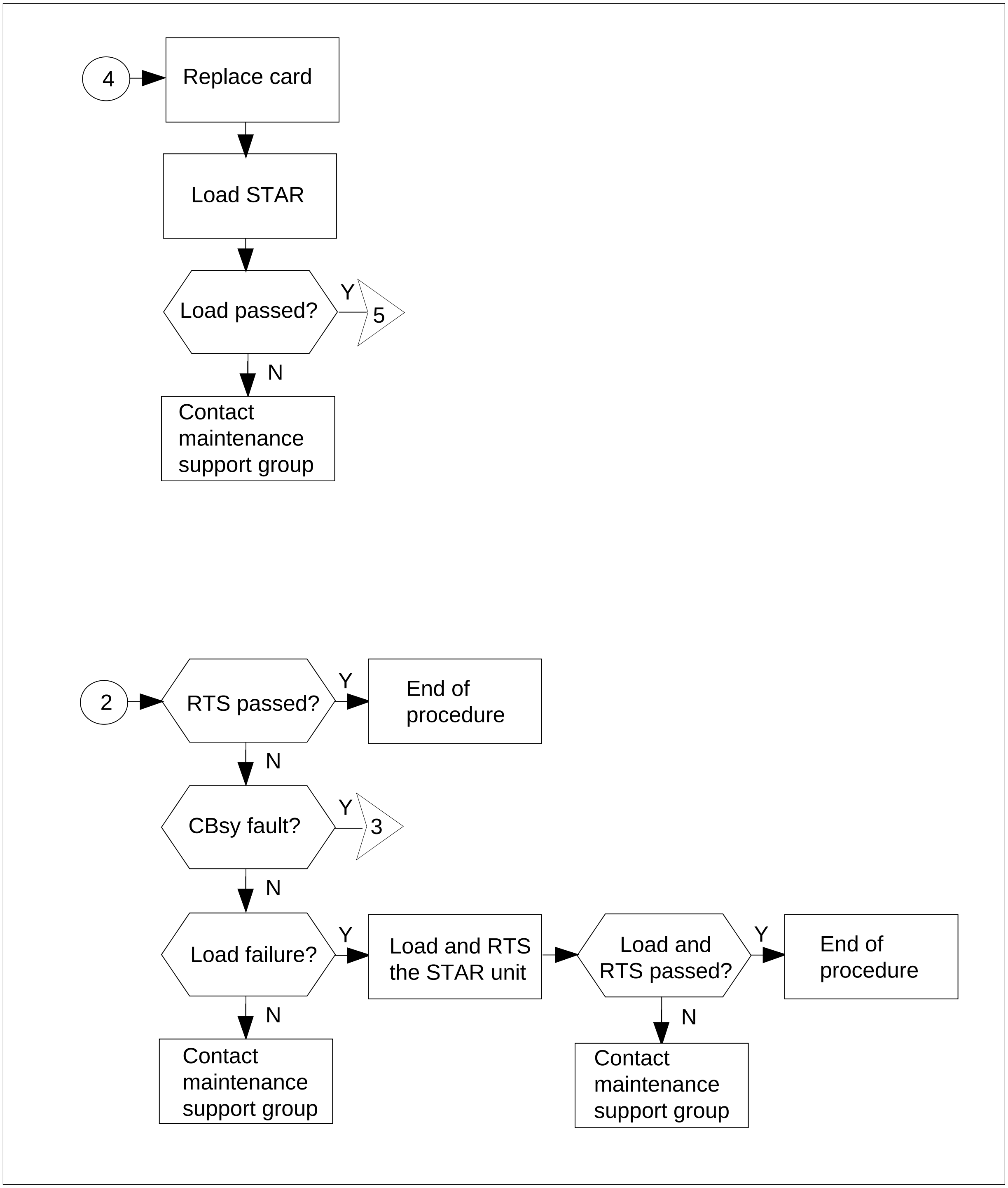
PM STAR
critical (continued)

Summary of clearing a PM STAR critical alarm



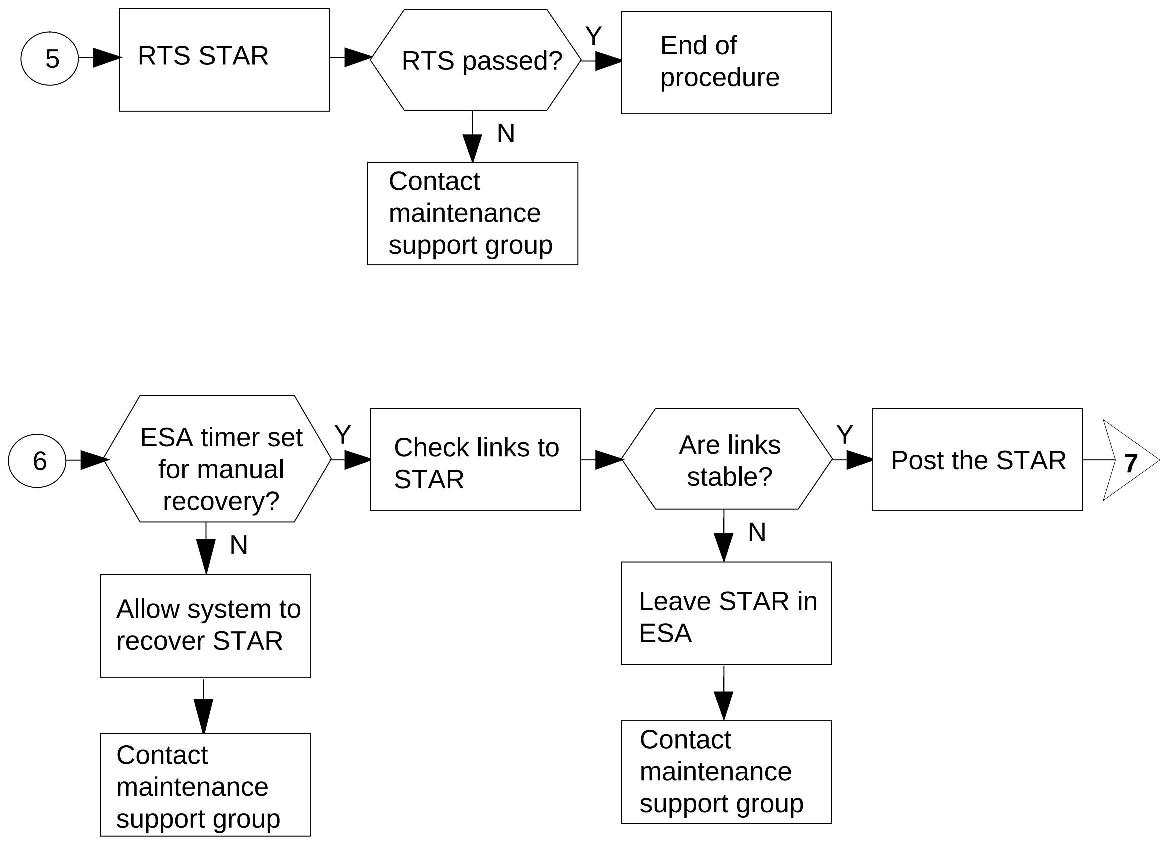
PM STAR
critical (continued)

Summary of clearing a PM STAR critical alarm (continued)



PM STAR
critical (continued)

Summary of clearing a PM STAR critical alarm (continued)



PM STAR
critical (continued)

Clearing a PM STAR critical alarm

At the MAP terminal

1 Ensure that the STAR is receiving power.

2 If an alarm is still audible, silence it by typing

>MAPCI;MTC;SIL;PM

and pressing the Enter key.

3

> **CAUTION**
> **Failing to allow sufficient time may cause false alarm indication.**
> Allow 3 to 5 minutes for the system to clear the alarm before proceeding to the next step.

Identify the faulty STAR by typing

>DISP STATE CBSY STAR

and pressing the Enter key.

If response indicates	Do
no CBsy STARs	step 14
CBsy STARs	step 4

4 Post the STAR with the alarm condition by typing

>POST STAR CBSY

and pressing the Enter key.

Note: Note the name and number of this STAR.

5 Identify central side (C-side) links to the host PM by typing

>TRNSL C

and pressing the Enter key.

Example of a MAP response:

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

6 Post the host LTC by typing

>POST LTC ltc_no

and pressing the Enter key.

where

ltc_no
is the number of the LTC

7 Display the peripheral side (P-side) links by typing

>TRNSL P

and pressing the Enter key.

Example of a MAP response:

```
Link 2: STAR REM1 00 0    2; Cap MS; Status: SysB ;MsgCond: CLS
Link 6: STAR REM1 00 0    1; Cap MS; Status: SysB ;MsgCond: CLS
```

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

8 Busy the faulty link by typing

>BSY LINK link_no

and pressing the Enter key.

where

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

9 Test the busied link by typing

>TST LINK link_no

and pressing the Enter key.

where

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

If test	Do
passed	step 10
failed	step 30

10 Return to service (RTS) the busied link by typing

>RTS LINK link_no

and pressing the Enter key.

where

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

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

PM STAR
critical (continued)

If RTS	Do
failed	step 30

11 Post the STAR that you noted in step 4 with the alarm condition by typing

>POST STAR site frame unit

and pressing the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is the unit number of the STAR (0)

12 Busy both units of the STAR by typing

>BSY PM

and pressing the Enter key.

13 Return to service (RTS) the PM by typing

>RTS PM

and pressing the Enter key.

If RTS	Do
passed	step 35
failed	step 30

14 Identify the faulty STAR and display the STAR by site by typing

>DISP STATE SYSB STAR

and pressing the Enter key.

If response indicates	Do
no SysB STARs	step 35
SysB STARs	step 15

15 Post the STAR with the alarm condition by typing

>POST STAR SYSB

and pressing the Enter key.

PM STAR
critical (continued)

16

> **CAUTION**
> **Failing to allow sufficient time may cause false alarm indication.**
> Allow 3 to 5 minutes for the system to clear the alarm before proceeding to the next step.

Determine if the STAR is equipped with emergency stand-alone (ESA) by typing

>QUERYPM

and pressing the Enter key.

Example of a MAP response:

```
PM Type:  STAR Int. No.:5 Status index: 5 Node_No: 42
STAR REM1 00 0 Memory size – Unit 0: 8M , unit 1: 8M
ESA Equipped: No, Intraswitching is Off
Loadnames: LCMINV – RSRD0811, Unit 0: NLCN0700
Node Status: {OK, FALSE}
UNIT 0 Status: {OK, FALSE}
Unit 1 Status: {MAN_BUSY, FALSE}
Site Flr RPos  Bay_id  Shf Description  Slot  EqPEC
STAR  00  A00 HUB 00  00  STAR 00 00          NT8602
Services: NEUTRAL
UMP 0 OffL Loadnames: RMPCKT – RSRD0811 Real * Unknown
This PM is: STAR
```

If STAR is	Do
equipped with ESA	step 17
not equipped with ESA	step 24

17 Determine if the STAR is in ESA by manually checking for dial tone at the remote. A PM alarm appears on the MAP screen indicating the STAR is in ESA. PM106 logs are generated when the PM goes SysB. PM110 logs are generated for DS-1 link alarms. PM128 logs are generated when there is a change of state in the PM.

If the STAR	Do
has dial tone	step 18
does not have dial tone	step 24

PM STAR
critical (continued)

18 Determine if the STAR has the ESA timer set for manual recovery from ESA. Access table OFCENG by typing

>TABLE OFCENG

and pressing the Enter key.

19 Check the STAR exit time by typing

>POS RLCM_XPMESAEXIT

and pressing the Enter key.

Example of a MAP response:

```
        PARMNAME            PARMVAL
---------------------------------------------
RLCM_XPMESAEXIT               6
```

If PARMVAL is	Do
set to zero	step 20
greater than zero	Allow the system to recover the STAR. Go to step 30.

20 Before manually restoring the STAR from ESA, check to see if links to the STAR are stable. Find the link numbers for this STAR by typing

>TRNSL C

and pressing the Enter key.

Example of a MAP response:

```
Link  0:    LTC 1       0;Cap MS;Status:OK     ;MsgCon:OPN
Link  1:    LTC 1       2;Cap MS;Status:OK     ;MsgCon:OPN
Link  2:    LTC 1       3;Cap  S;Status:OK
Link  3:    LTC 1       4;Cap  S;Status:OK
```

21 Access the CARRIER level of the MAP terminal by typing

>TRKS;CARRIER

and pressing the Enter key.

22 Post the host XMS-based peripheral module (XPM) links and check link conditions for slips and framing errors by typing

>POST LTC pm_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 (see step 20 display)

Repeat the POST command for each link.

Example MAP response:

```
N CLASS  SITE LTC CK D ALRM SLIP FRME  BER   ES SES STATE
0 REMOTE HOST   1  0 C         0    0     1     0   0   INSV
```

Note 1: The number that appears under the CK (circuit) header is the host XPM link number.

Note 2: This display shows carrier facilities from the host XPM to the STAR. Using the Detail REM option, the carrier facilities should also be checked from the remote site back to the host XPM.

If link conditions show	Do
a high number of SLIP and FRME	Leave the STAR in ESA. Go to step 29.
a very low number of SLIP and FRME	step 23

23 Post the STAR with the alarm condition by typing

`>PM; POST STAR site frame unit`

and pressing the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

24 Busy both units of the STAR by typing

`>BSY PM`

and pressing the Enter key.

25 Test both units of the STAR by typing

`>TST PM`

and pressing the Enter key.

If test	Do
passed	step 27

PM STAR
critical (continued)

If test	Do
failed, and a card list is generated	step 26
failed, and no card list was generated	step 30

26 The card list identifies the cards most likely to be faulty. Replace the cards one at a time in the order listed as directed by this procedure.

If last card on list has	Do
not been replaced	step 31
been replaced	step 27

27 Attempt to return the STAR to service by typing

>RTS PM

and pressing the Enter key.

If MAP prompt indicates	Do
RTS is successful	step 35
CBsy	step 5
load failure	step 28
all other	step 30

28 Attempt to reload the STAR by typing

>LOADPM PM CC

and pressing the Enter key.

If load is	Do
successful	step 27
not successful	step 30
not successful in one unit	step 32

29 Contact the carrier maintenance support group for maintenance on the open/unstable links. When carriers are restored, go to step 22.

30 Contact your maintenance support group for further instructions in clearing this fault.

PM STAR
critical (continued)

31 Go to the “Star Remote Hub card replacement procedures" in this manual. Replace the first (or next) card on the card list. Notify outside plant personnel the card is to be changed. Go to step 28 when the card is replaced.

32 Attempt to load the STAR unit by typing

>LOADPM UNIT star_unit

and pressing the Enter key.

where

star_unit
is the unit of the STAR to be loaded (0 or 1)

If load is	**Do**
successful	step 33
not successful	step 30

33 Test the STAR unit by typing

>TST UNIT star_unit

and pressing the Enter key.

where

star_unit
is the unit of the STAR to be tested (0 or 1)

If test	**Do**
passed	step 34
failed, and a card list is generated	step 26
failed, but no card list was generated	step 30

34 Attempt to return the STAR unit to service by typing

>RTS UNIT star_unit

and pressing the Enter key.

where

star_unit
is the unit of the STAR to be returned to service (0 or 1)

If RTS	**Do**
passed	step 35
failed	step 30

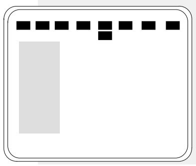
PM STAR
critical (end)

35 You have successfully completed this procedure.

If additional alarms are displayed, proceed to the appropriate alarm clearing procedure in this manual.

PM STAR major

Alarm display



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

Indication

The alarm code STAR under the PM subsystem header indicates an STAR alarm. The *M* under the STAR indicates a major alarm. The number *n* before STAR indicates the number of STARs with a major alarm.

Meaning

The *n* is the number of STARs that are in the in-service trouble (ISTb) state. Both units of the STAR in the ISTb state may indicate that one of the main and one of the secondary power converters have failed.

Impact

One unit of the STAR in the ManB or SysB state does not directly affect service because one unit of the STAR continues to provide service. However, there is no local backup. If the other unit of the STAR fails, service is interrupted. A CBsy condition may interrupt communication between the STAR and the host. This interruption reduces the service provided by the STAR to the local area only.

Common procedures

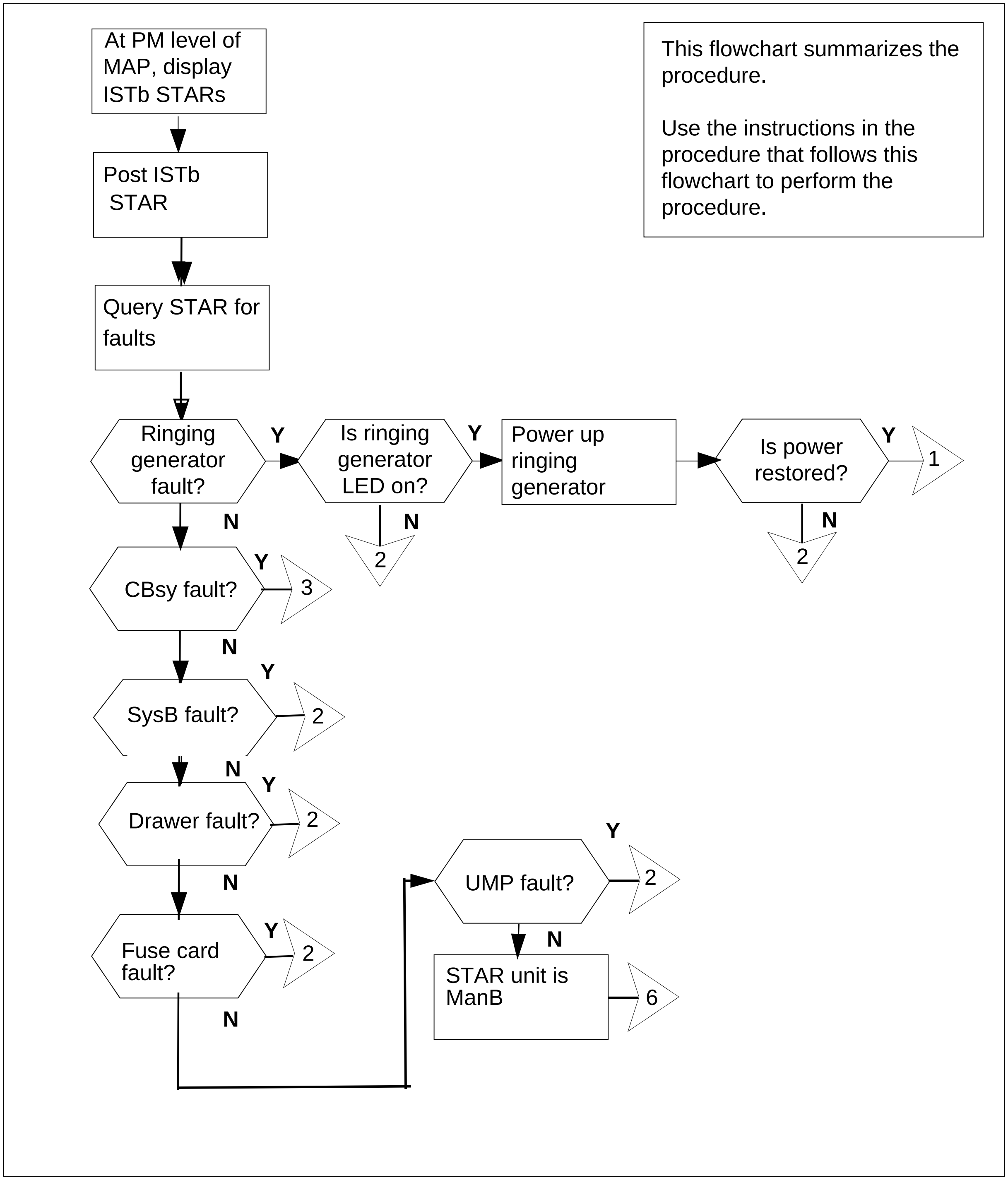
None

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.

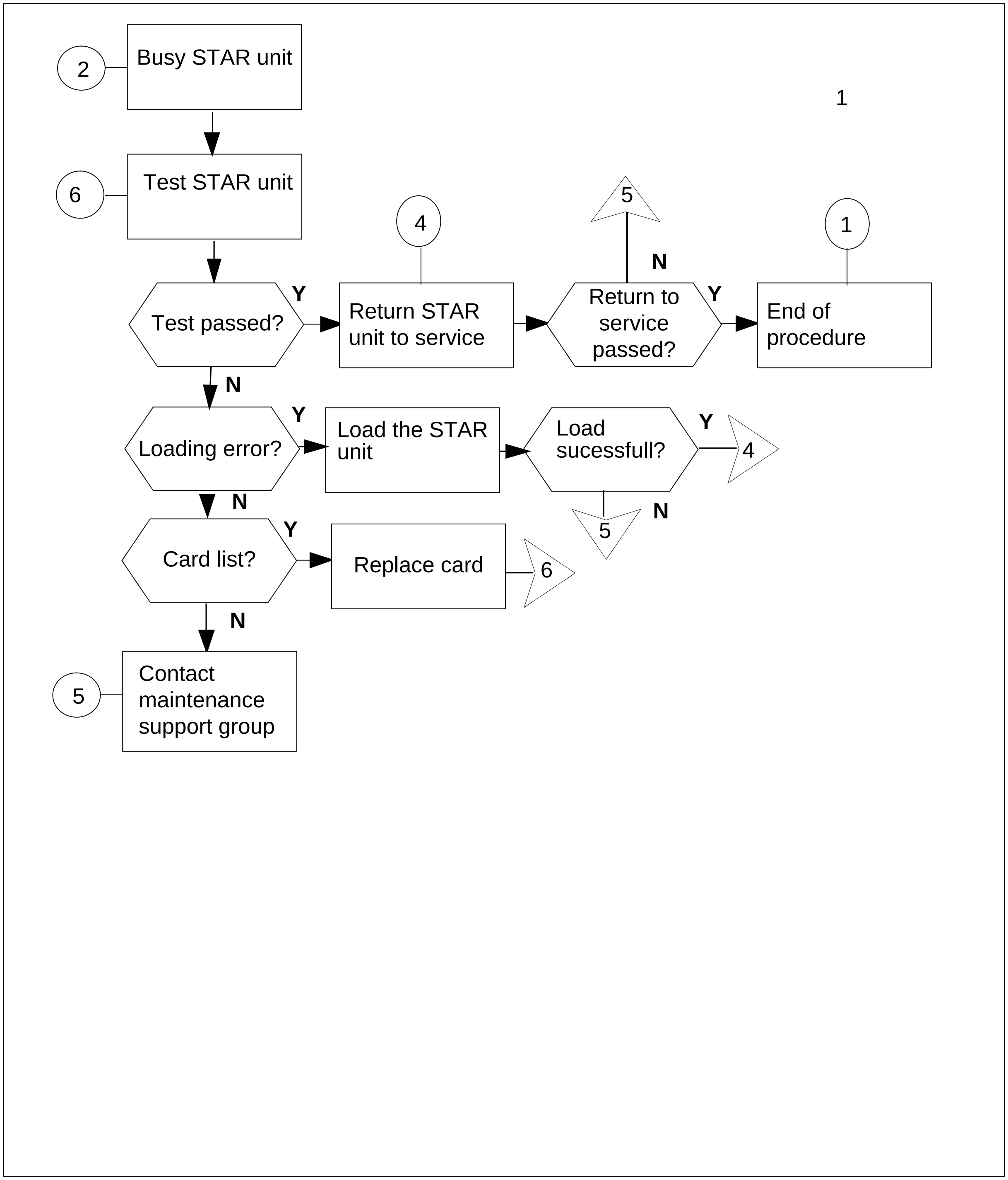
PM STAR
major (continued)

Summary of clearing a PM STAR major alarm



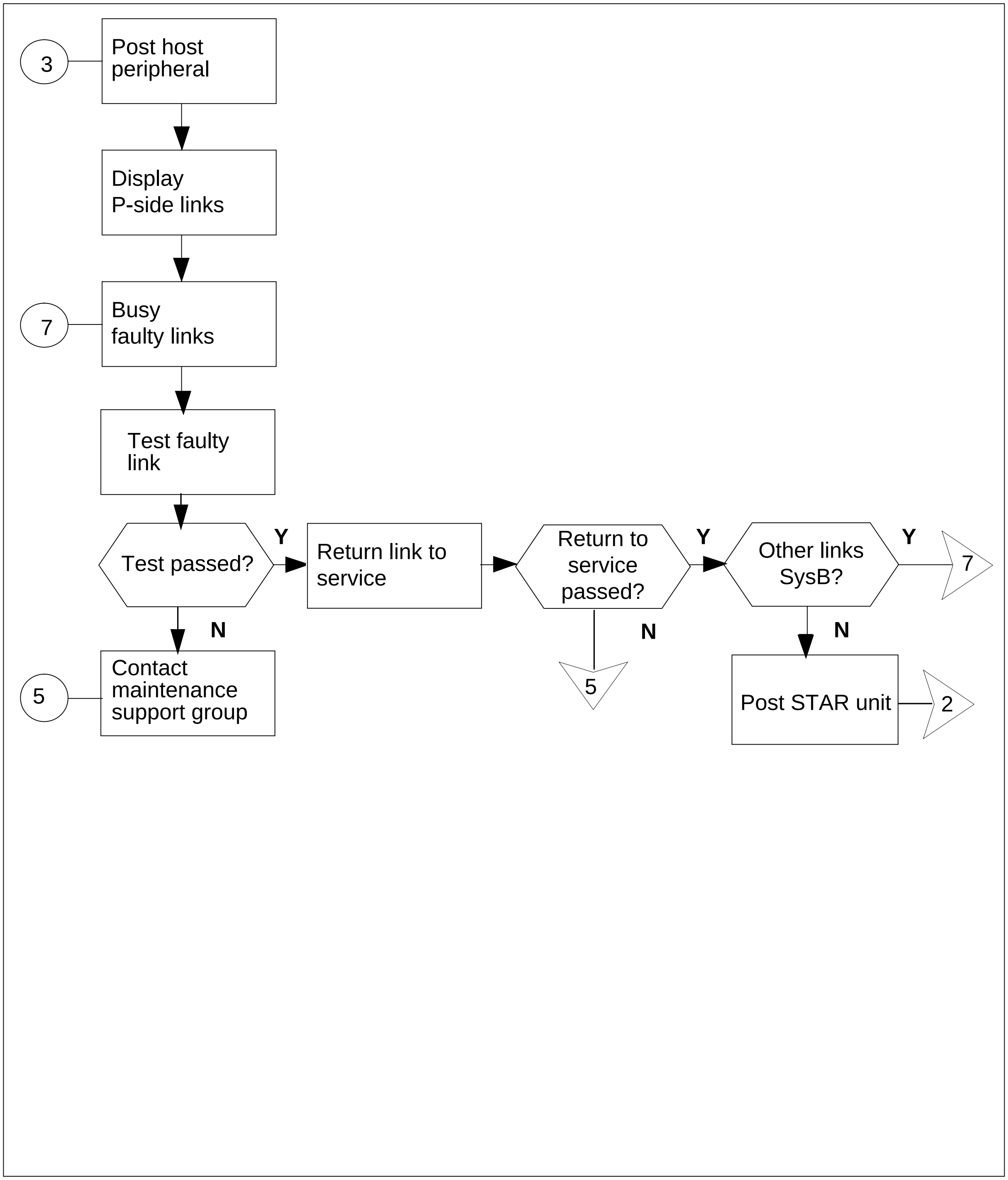
PM STAR
major (continued)

Summary of clearing a PM STAR major alarm (continued)



PM STAR
major (continued)

Summary of clearing a PM STAR major alarm (continued)



Clearing a PM STAR 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 STAR with faults, type

>DISP STATE ISTB STAR

and press the Enter key.

4 To post the STAR with the alarm condition, type

>POST STAR STATE ISTB

and press the Enter key.

5 To determine the fault indicators, type

>QUERYPM FLT

and press the Enter key.

If fault indicated is	Do
ringing generator (RG)	step 6
CBsy (C-side busy)	step 10
SysB	step 17
ManB	step 18
drawer fault	step 21
fuse card fault	step 21
one or both NTTR73AA universal maintenance pack (UMP) cards are out of service	step 21
fuse card failure	step 21

PM STAR
major (continued)

At the STAR site

6 Inspect the ringing generator to see if the light-emitting diode (LED) is lit.

If the LED light is	Do
lit	step 7
not lit	step 17

7 Power up the ringing generator by setting the circuit breakers on the FSP to the ON position. (The LED should turn OFF.) These circuit breakers are identified as follows:

- circuit breaker marked Ring0, Slot1 controls the ringing generator in unit 0, slot 1
- circuit breaker marked Ring1, Slot22 controls the ringing generator in unit 1, slot 22

8 Determine if the circuit breaker restores power to the ringing generator.

If power	Do
restores and neither unit is SysB	step 29
restores and one unit is SysB	step 17
does not restore	step 17

9 To perform an in-service test on the STAR to clear the RG fault, type

>TST PM

and press the Enter key.

If the TST	Do
passes	step 29
fails and produces card list	step 28

At the MAP terminal

10 To identify C-side links to the host 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
```

11 To post the host LTC, type

>POST LTC pm_no

and press the Enter key.

where

pm_no
is the number of the host LTC

12 To identify the P-side links with faults, type

>TRNSL P

and press the Enter key.

Example of a MAP response:

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

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

13 To busy the link with faults, type

>BSY LINK link_no

and press the Enter key.

where

link_no
is the number the P-side link identified in step 12

14 To test the busied link, type

>TST LINK link_no

and press the Enter key.

where

link_no
is the number of the P-side link busied in step 13

If test	Do
passes	step 15
fails	step 27

15 To return the busied link to service, type

>RTS LINK link_no

and press the Enter key.

where

PM STAR
major (continued)

link_no
is the number of the P-side link busied in step 13

If RTS	Do
passes and no other links are SysB and the alarm remains	step 16
passes and the alarm clears	step 29
passes but other links are SysB	step 13
fails	step 27

16 To post the STAR with the alarm condition, type

>POST STAR site frame unit

and press the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

17

CAUTION
Failing to allow sufficient time may cause false alarm indication.
Allow 3 to 5 minutes for the system to clear the alarm before proceeding to the next step.

To busy the STAR unit associated with the alarm, type

>BSY UNIT star_unit

and press the Enter key.

where

star_unit
is the STAR unit to be busied (0 or 1)

18 To test the busied unit, type

>TST UNIT star_unit

and press the Enter key.

where

PM STAR
major (continued)

star_unit
is the STAR unit to be tested (0 or 1)

If test	Do
passes	step 20
fails because of a loading error	step 19
fails, and generates a card list	step 26
fails, but does not generate a card list	step 27

19 To try to load the STAR unit, type

>LOADPM UNIT star_unit CC

and press the Enter key.

where

star_unit
is the STAR unit to be loaded (0 or 1)

If load is	Do
successful	step 20
not successful	step 27

20 To try to return the STAR unit to service, type

>RTS UNIT star_unit

and press the Enter key.

where

star_unit
is the STAR unit to be returned to service (0 or 1)

If RTS	Do
passes	step 29
fails	step 27

21 Check the fuses on the FSP.

If fuses are	Do
blown (indicator protruding)	step 22
not blown	step 18

PM STAR
major (continued)

22 Determine which fuse is blown.

> ***Note:*** The line drawer fuses are grouped and labeled as +5 V, +15 V, and -48 V and are numbered from 1to 18. The line drawers are numbered from 1 to 18. Any +5 V, +15 V, or -48 V fuse in position 1 is associated with line drawer 1 and any fuse in position 2 is associated with line drawer 2, and so forth.

If the blown fuse is any one of	Do
+5 V fuse	Remove the blown fuse and go to step 24
+15 V or -48 V fuse	step 23
ABS fuse	Remove the blown fuse and go to step 24

23 Remove the blown fuse and its associated fuse. For example, if the blown fuse is a -48 V fuse in position 17, then remove the +15 V fuse in position 17 also.

24 Get a replacement fuse with the same voltage and amperage as the blown fuse.

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.

If you replaced a +15 V or -48 V fuse, insert the +15V fuse, then the -48V fuse.

If the fuse	Do
blows again	step 27
does not blow	step 29

26 The card list identifies the cards most likely to have faults. Replace the cards one at a time in the order listed as directed below:

If last card on list has	Do
not been replaced	step 28
been replaced	step 27

PM STAR
major (end)

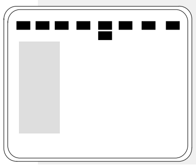
27 Contact your maintenance support group for additional instructions in clearing this fault.

28 Go to the “Star Remote System card replacement procedures" in this manual to replace the first (or next) card on the card list. Go to step 18 when the card is replaced.

29 You have correctly completed this procedure. If additional alarms are displayed, go to the appropriate alarm clearing procedure in this manual.

PM STAR minor

Alarm display



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

Indication

The alarm code STAR under the PM subsystem header indicates a STAR alarm. The absence of **C** or *M* under the STAR indicates a minor alarm. The number *n* before STAR indicates the number of STARs with a minor alarm.

Meaning

The number *n* of STARs are in the in-service trouble (ISTb) state.

Impact

The in-service trouble condition does not have a direct effect on service because one unit of the STAR continues to provide service. However, there is no local backup. If the alarm indicates a local line drawer or remote line drawer (RLD) is affected, subscribers connected to the line drawer or RLD are affected. If the other unit of the STAR fails, service is interrupted.

Common procedures

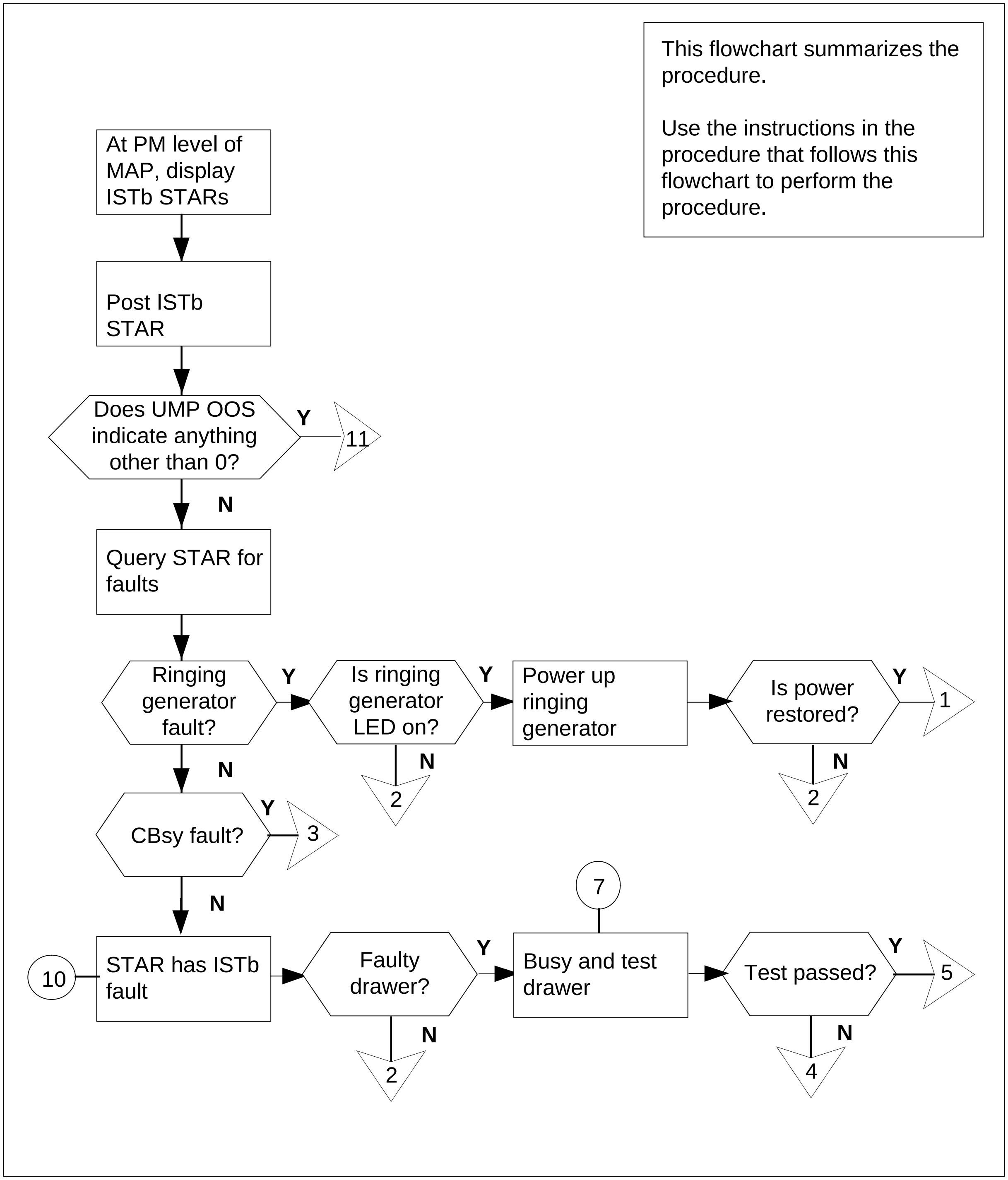
None

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.

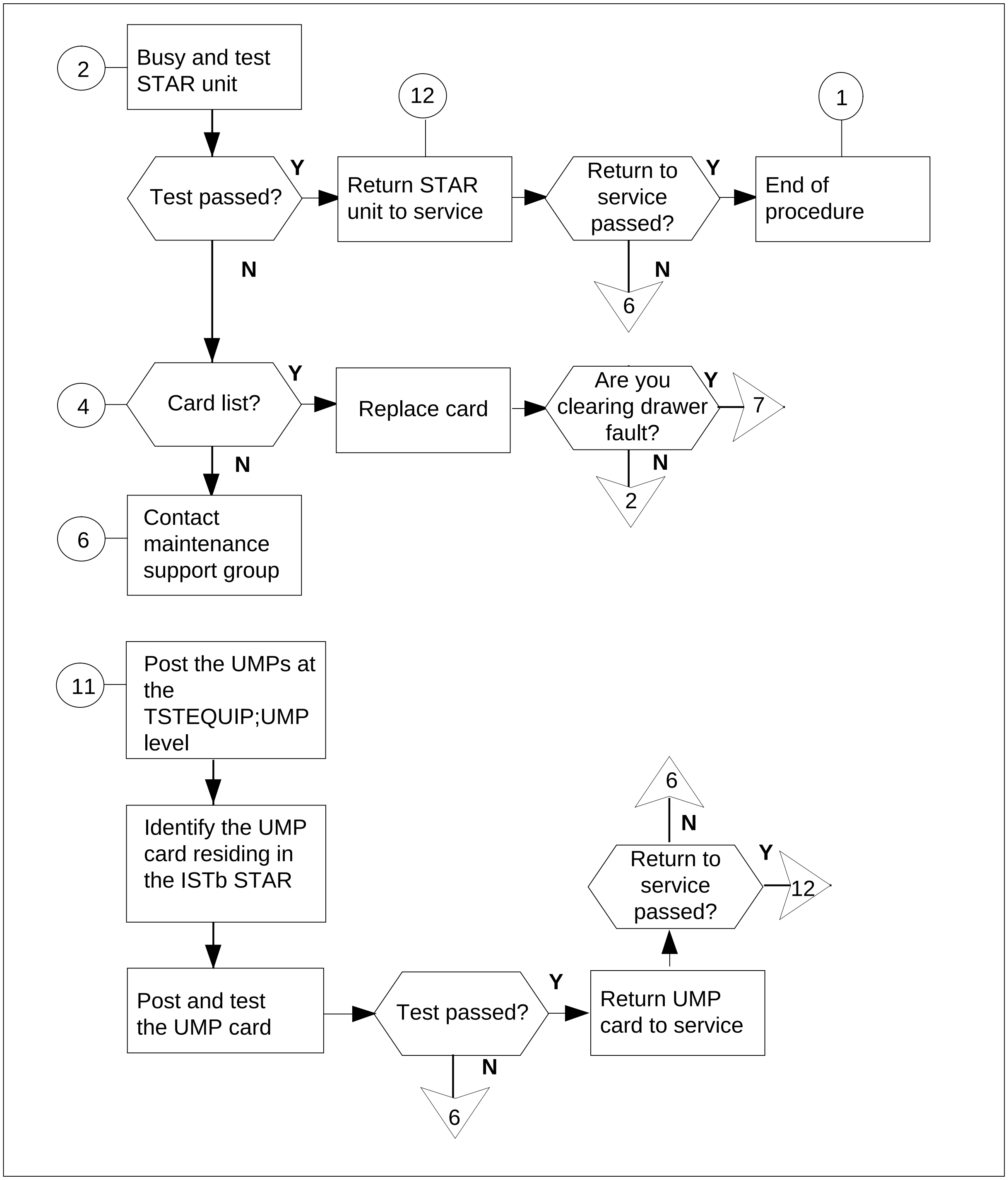
PM STAR
minor (continued)

Summary of clearing a PM STAR minor alarm



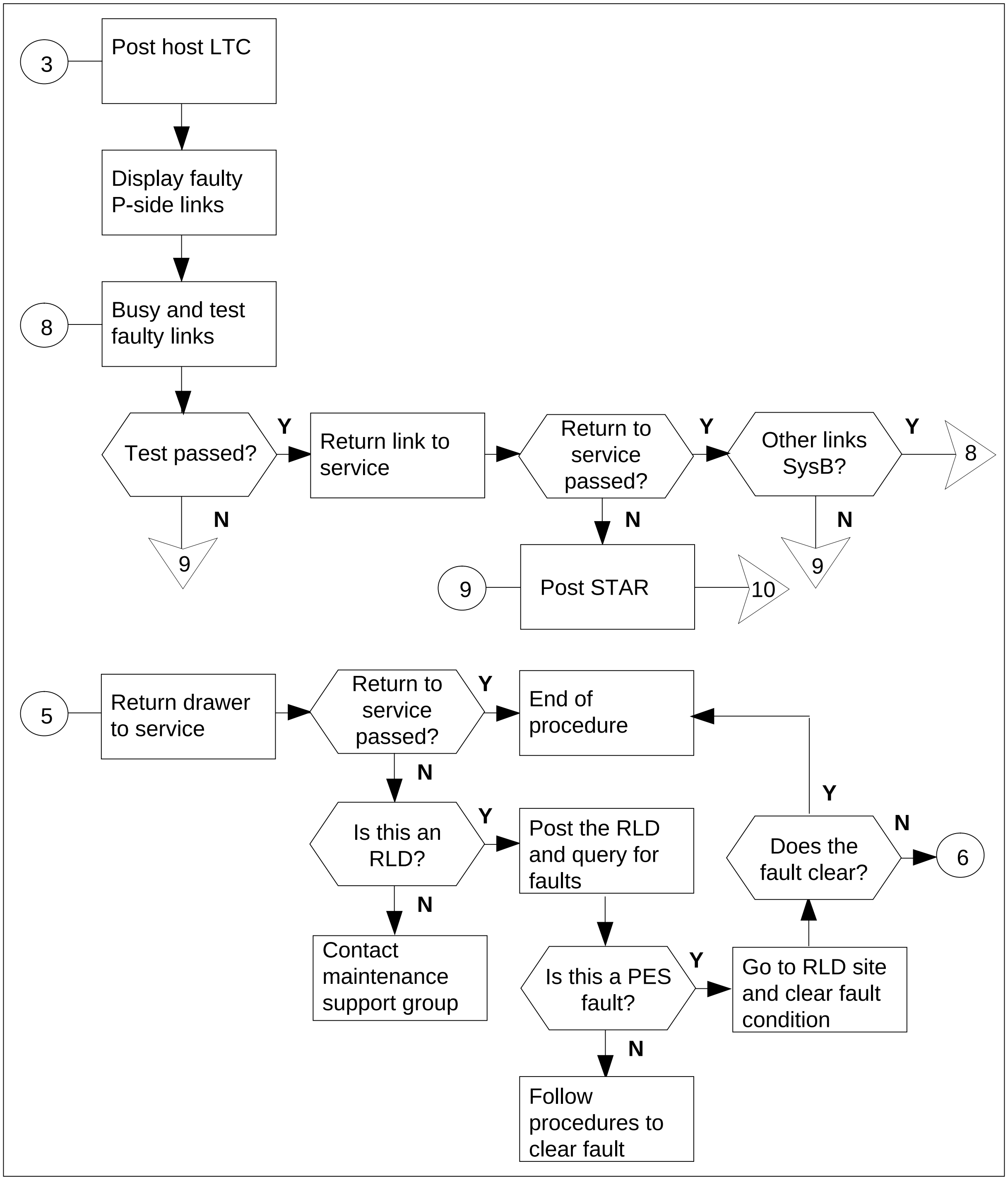
PM STAR
minor (continued)

Summary of clearing a PM STAR minor alarm (continued)



PM STAR
minor (continued)

Summary of clearing a PM STAR minor alarm (continued)



PM STAR
minor (continued)

Clearing a PM STAR minor alarm

At the MAP terminal

1 If alarm is still audible, silence it. 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 STAR with faults, type

>DISP STATE ISTB STAR

and press the Enter key.

4 To post the STAR with the alarm condition, type

>POST STAR site frame unit

and press the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

5 To determine the fault indicators, type

>QUERYPM FLT

and press the Enter key.

If the fault indicated is	Do
ringing generator	step 6
CBsy (C-side busy)	step 10
DRWR FLT (drawer fault)	step 16
ISTb (In-service trouble)	step 49
one or both universal maintenance packs (UMP) are out of service	step 53

PM STAR
minor (continued)

If the fault indicated is	Do
UMP load file mismatch	step 53

At the STAR site

6 Inspect the ringing generator to see if the Fail light-emitting diode (LED) is lit.

If the Fail LED is	Do
lit	step 7
not lit	step 49

7 Power up the ringing generator by setting the circuit breaker on the FSP to the ON position. (The Pack failure LED light should go OFF.) These circuit breakers are identified as follows:

- circuit breaker marked Ring0, Slot1 controls the ringing generator in unit 0, slot 1
- circuit breaker marked Ring1, Slot22 controls the ringing generator in unit 1, slot 22

8 Determine if power is restored to the ringing generator.

If power	Do
restores and neither unit is SysB	step 61
restores and one unit is SysB	step 49
does not restore	step 49

9 To perform an in-service test on the STAR to clear the RG fault, type

`>TST PM`

and press the Enter key.

If the TST	Do
passes	step 61
fails and a card list is produced	step 60

At the MAP terminal

10 To identify C-side links to the host PM, type

`>TRNSL C`

and press the Enter key.

Example of a MAP response:

PM STAR
minor (continued)

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

11 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

12 To identify the P-side links with faults, type

>TRNSL P

and press the Enter key.

Example of a MAP response:

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

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

13 To select and busy the link with faults, type

>BSY LINK link_no

and press the Enter key.

where

link_no
is the number of the faulty P-side link identified in step 12

14 To test the busied link, type

>TST LINK link_no

and press the Enter key.

where

link_no
is the number of a faulty P-side link busied in step 13

If test	Do
passes	step 15
fails	step 59

15 To return the busied link to service, type

>RTS LINK link_no

and press the Enter key.

where

PM STAR
minor (continued)

link_no
is the number of a faulty P-side link busied in step 13

If RTS	Do
passed and no other links are SysB	step 61
passed but other links are SysB	step 13
failed	step 59

16

CAUTION
Failing to allow sufficient time may cause false alarm indication.
Allow 3 to 5 minutes for the system to clear the alarm before proceeding to the next step.

Determine if the problem is a drawer with faults. A drawer with faults is indicated by letters appearing under the line subgroup numbers associated with a physical drawer.

Example of a MAP response:

```
STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  InSv                /RG: 0
Unit 1:  InSv                /RG: 0                    RG
Drwr           11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
.. .. .. .. .. .. .. .. SS .. .. .. .. .. .. .. .. ..
```

If problem indicated is	Do
a drawer with faults	step 17
not a drawer with faults	step 49

17 Determine if the line drawer with faults is in the Hub or is a remote line drawer (RLD).

Note: At the MAP display, line drawers in reverse video represent an RLD.

If the line drawer with faults is	Do
in the Star Hub	step 18
an RLD	step 21

PM STAR
minor (continued)

18 To busy both line subgroups associated with the drawer with faults, type

>BSY DRWR lsg

and press the Enter key

where

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

Example of a MAP response:

```
STAR  REM1 00 0   Drwr 16 Bsy Passed
```

Repeat this step for the other line subgroup associated with the drawer with faults.

19 To test both line subgroups associated with the drawer with 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 with faults

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

If test	Do
passed	step 20
failed, and a card list is produced	step 52
failed, but no card list is produced	step 59

20 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 thedrawer with faults

Example of a MAP response:

```
OSvce Tests Initiated
STAR  REM1 00 0   Drwr 16 Tst Passed
STAR  REM1 00 0   Drwr 16 Rts Passed
```

PM STAR
minor (continued)

> ***Note:*** Repeat this step for the other line subgroup associated with the drawer with faults.

If return to service	Do
passed	step 61
failed	step 59

21 Access the RLD level. To access the RLD level, type

>RLD

and press the Enter key.

22 Identify and post the line drawer with faults. To post the line drawer type

>POST drawer_number

and press the Enter key.

where

drawer_number
is the drawer number that represents the two line subgroups

Example of a MAP response:

```
                SysB     ManB     OffL     CBsy     ISTb      InSv
         PM      4        0       10        3        3           3
        STAR     0        0        0        0        1           1
 STAR REM1 00 0  ISTB  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb               /RG: 0
Unit 1:  ManB               /RG: 0                    RG
Drwr:         11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
.. .. -- -- -- -- -- -- II -- -- -- -- -- -- -- -- --
REM9 RLD DRWR  8                          LogDrwr:  16  17
BANK_0:  Active                           Links_OOS: 1
BANK_1: Stby                              RLD BDch: Uneq
```

In this example, RLD DRWR 8 is known by the STAR as drawers 16 and 17.

If the RLD is	Do
SysB	step 48
ISTb	step 23

23 To determine the ISTb reasons for the RLD, type

>QUERYRLD FLT

and press the Enter key.

If the fault indicated is	Do
load mismatch	step 26

PM STAR
minor (continued)

If the fault indicated is	Do
load file erased from a firmware bank	step 36
link busy	step 39
Bd channel busy	step 43
DS-1 static data mismatch	step 24
none of the above	step 45

24 To busy the RLD, type

>BSY DRWR

and press the Enter key.

25 To return the RLD to service, type

>RTS DRWR

and press the Enter key.

If RTS	Do
passed	step 61
failed, and a card list is produced	step 52
failed, but no card list is produced	step 59

26 From office records, determine the correct load name that should be entered and running in the RLD.

27 To determine the load file entered in table LCMDRINV for the posted RLD, type

>QUERYRLD

and press the Enter key.

If the load file entered in table LCMDRINV and office records	Do
match	step 28
do not match	step 29

28 To display the load file in the RLD, type

>QUERYRLD CNTRS

PM STAR
minor (continued)

and press the Enter key.

If the load file in the RLD and the load file entered in table LCM-DRINV and the load identified in office records	Do
match	step 23
do not match	step 35

29 To access table LCMDRINV, type

>TABLE LCMDRINV

and press the Enter key.

30 To position on the tuple for the RLD that has faults, type

>POS STAR site frame unit

and press the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

31 To change the tuple for the RLD that contains the load, type

>CHA DRWRTAB drwrtab_no

and press the Enter key.

where

drwrtab_no
is the RLD drawer number plus 1 (for example, if the RLD drawer to be changed is 8, then enter 9)

32 Retype the tuple with the correct loadname information.

Note: The name entered must be present in table PMLOAD.

Example of a MAP response:

PM STAR
minor (continued)

```
TUPLE TO BE CHANGED:
REM1 01 0
(0 NT6X54AA NT6X05AA) (1 NT6X54DA NT6X05DA)
(2 NT6X54AA NT6X05AA) (3 NT6X54AA NT6X05AA) (4 NILDRWR)
(5 NT6X54AA NT6X05AA) (6 NT6X54AA NT6X05AA)
(7 NT6X54AA NT6X05AA) (8 NTTR70AA NTTR40AA 14 RLD11DC 2 DS1HUB 20
LAKE9) (9 NT6X54AA NT6X05AA) (10 NT6X54AA NT6X05AA) (11 NT6X54AA
NT6X05AA) (12 NT6X54AA NT6X05AA) (13 NT6X54AA NT6X05AA) (14 NT6X54AA
NT6X05AA) (15 NT6X54AA NT6X05AA) (16 NT6X54AA NT6X05AA) (17 NT6X54AA
NT6X05AA)$

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

33 To respond affirmatively to the confirmation request, type

>Y

and press the Enter key.

34 To leave table LCMDRINV, type

>QUIT

and press the Enter key.

IfThe alarm	Do
clears	step 61
does not clear	step 26

35 To load the RLD, type

>LOADRLD CC

and press the Enter key.

If LOADRLD	Do
passes	step 61
fails	step 59

36 To load the inactive RLD bank from the active bank, type

>LOADRLD MATE

and press the Enter key.

If LOADRLD	Do
passes	step 61
fails	step 37

37 To load the inactive RLD bank from the CM, type

>LOADRLD CC

PM STAR
minor (continued)

and press the Enter key.

If LOADRLD	Do
passes	step 38
fails	step 59

38 Determine if the mate bank has a load.

If the mate bank	Do
has a load	step 61
does not have a load	step 36

39 To display information on the C-side links for the posted RLD, type

>TRNSL

and press the Enter key.

Example of a MAP response:

```
                 SysB     ManB     OffL     CBsy     ISTb      InSv
          PM       4        0       10        3        3          3
         STAR      0        0        0        0        1          1
  STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
 Unit 0:  ISTb                /RG: 0
 Unit 1:  ManB                /RG: 0                       RG
 Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
 01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
 .. .. -- -- -- -- -- -- II -- -- -- -- -- -- -- -- --

 REM9 RLD DRWR  8                          LogDrwr:  16  17
 BANK_0:  Active                           Links_OOS: 1
 BANK_1: Stby                              RLD BDch:  Uneq
 Trnsl
 Port 16: HUB Owner Unit 0 RLD 8 Link 0; Cap MS; Status: InSv
 Port 18: HUB Owner Unit 1 RLD 8 Link 1; Cap MS; Status: SysB
```

If the DS-1 link status is	Do
SysB	step 40
ManB	step 42

40 To post the link, type

>RLDCARR;POST DRWR drwr_no P

and press the Enter key.

where

drwr_no
is the number of the RLD drawer to be posted

PM STAR
minor (continued)

41 To manually busy the link, type

>BSY rldcarrier_no

and press the Enter key.

where

rldcarrier_no
is the number of the DS-1 link (0 or 1) as viewed by the RLD

42 To return the ManB link to service, type

>RTS rldcarrier_no

and press the Enter key.

where

rldcarrier_no
is the number of the DS-1 link (0 or 1) as viewed by the RLD

If RTS LINK	Do
passes	step 61
fails	step 59

43 To display information on the Bd channel, type

>QUERYCH

and press the Enter key.

Example of a MAP response:

```
               SysB     ManB     OffL     CBsy     ISTb      InSv
        PM      4        0       10        3        3           3
       STAR     0        0        0        0        1           1
 STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb              /RG: 0
Unit 1:  ManB              /RG: 0                    RG
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --

REM9 RLD DRWR  8 ISTb                     LogDrwr:  16  17
BANK_0:  Active                           Links_OOS: 1
BANK_1: Stby                              RLD BDch:  -
QUERYCH
RLD BD
```

44 To return the Bd channel to service, type

>RTS BD

and press the Enter key.

If the RTS	Do
passes	step 61

PM STAR
minor (continued)

If the RTS	Do
fails	step 59

45 To display RLD power and environmental system (PES) alarms, type

>QUERYPES FLT

and press the Enter key.

If the display indicates	Do
there are PES faults	step 46
no PES faults	step 59

46 Compare the PES fault with the faults listed in the following table. Perform the actions listed in the table at RLD site.

If the PES condition is Red and a fault (F) is indicated for	DoAction at the RLD site
FAIL15V (indicates a +15 V output failure from the power and ringing card; lights the Critical LED on the SMC card)	Check the LED on the power and ringing card; if not lit, this indicates a card failure—replace the card.
ACTCOIN (indicates coin voltage output failure; lights the Major LED on the SMC card)	Check the power and ringing card LED; if not lit, this indicates a card failure—replace the card.
RMS (indicates low ringing voltage; lights the Major LED on the SMC card)	Check the power and ringing card LED; if not lit, this indicates a card failure—replace the card.
FAN0/FAN1 (indicates that at least one fan is not operating; lights the Critical LED on the SMC card)	Check fan operation based on cabinet temperature conditions.
TBFALRM (indicates the talk battery fuse is blown)	Check for a blown talk battery fuse on the dc panel and replace fuse.
DCPFUS (indicates a dc panel fuse is blown)	Check for a blown fuse on the dc panel and replace fuse.

PM STAR
minor (continued)

If the PES condition is Red and a fault (F) is indicated for	DoAction at the RLD site
DOOR (indicates the door is open)	Check the condition of the RLD, close the cabinet door.
ACFAIL (indicates there is no ac input)	Check the ac supply to the cabinet and check the main circuit breaker on the ac panel.
HIGH temp (indicates a high temperature condition exists in the cabinet)	Check that both fans are operating in high temperature condition.
LOW temp (indicates a low temperature condition exists in the cabinet)	Check that one fan is not operating or heaters not operating.
BATTERY (indicates a battery fault exists)	Check the battery fuse, battery condition, and battery capacity.

At the RLD site

47 Check for conditions or equipment failure related to PES failure alarm and refer to the routine maintenance procedures or card replacement procedures in this maintenance manual to replace failed equipment.

If, after taking action at the RLD site, the fault	Do
clears	step 61
does not clear	step 59

48 To determine the SysB reasons for the RLD, type

and press the Enter key.

>QUERYRLD FLT

and press the Enter key.

If the fault indicated is	Do
RLD in-service test failure	step 24
RLD switch bank is in progress	Wait until switch bank clears. If the switch bank does not clear, go to step 59.

If the fault indicated is	Do
RLD babbling	step 24
System busy over CM restart	Wait for CM restart to clear.
No response from RLD	step 39
RLD fault message received from Star Hub	step 24
C-side (Star Hub) RTS	Wait for RTS of STAR to complete.

At the MAP terminal

49 Busy the STAR unit associated with the alarm. To busy the STAR unit, type

>BSY UNIT star_unit

and press the Enter key.

where

star_unit
is the STAR unit to be busied (0 or 1)

50 To test the busied unit, type

>TST UNIT star_unit

and press the Enter key.

where

star_unit
is the STAR unit to be tested (0 or 1)

If test	Do
passed	step 51
failed, and a card list is produced	step 52
failed, but no card list is produced	step 59

51 To try to return the STAR to service, type

>RTS UNIT star_unit

and press the Enter key.

where

PM STAR
minor (continued)

star_unit
is the STAR unit to be returned to service (0 or 1)

If RTS	Do
passed	step 61
failed	step 59

52 The card list identifies the possible cards with faults. Replace the cards one at a time in the order listed. Go to the next step as indicated in the following table.

If last card on list has	Do
not been replaced	step 60
been replaced	step 59

53 To access the UMP level of the MAP, type

>MAPCI;MTC;MTCNA;TSTEQUIP;POST UMP

and press the Enter key.

54 Identify the UMP cards that are in the STAR in an alarm state. To identify the cards, type

>HOST STAR site frame unit

and press the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

Example of a MAP response:

```
    PM          MTE      STATE
STAR REM  1 0  UMP 0      SysB
```

Use the NEXT command to cycle through the UMPs until the SysB UMP appears.

55 To busy the UMP card in the SysB state, type

>BSY

and press the Enter key.

56 To test the posted UMP card, type

>TST

PM STAR
minor (end)

and press the Enter key.

If TST	Do
passed	step 58
failed	step 60
failed and a load failure is reported	step 57

57 To load the UMP card, type

>LOADTE

and press the Enter key.

58 To return to service the posted UMP card, type

>RTS

and press the Enter key.

If RTS	Do
passed	step 61
failed	step 59

59 Contact your maintenance support group for additional instructions in clearing this fault.

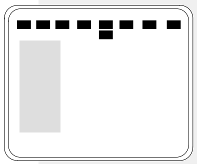
60 Go to the “Star Remote System card replacement procedures" in this manual to replace the first (or next) card on the card list. When the card is replaced, return to the appropriate step in this procedure as indicated here.

If you are clearing	Do
drawer faults in a Star Hub	step 19
drawer faults in an RLD	step 25
all other alarms	step 50
UMP with faults	step 56

61 You have correctly completed this procedure. If additional alarms are displayed, go to the appropriate alarm clearing procedure in this manual.

PM STAR RG critical

Alarm display



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

Indication

A critical alarm involving a STAR ringing generator is indicated by *n*LRG under the PM subsystem header with an **C** beneath it at the MTC level of the MAP display.

Meaning

Both of the ringing generator units are in the in-service trouble (ISTb) state.

Impact

If both ringing generator units fail, automatic switching to an active ringing generator (SwRG) unit will not occur and, therefore, ringing cannot be generated and subscriber service is affected.

Common procedures

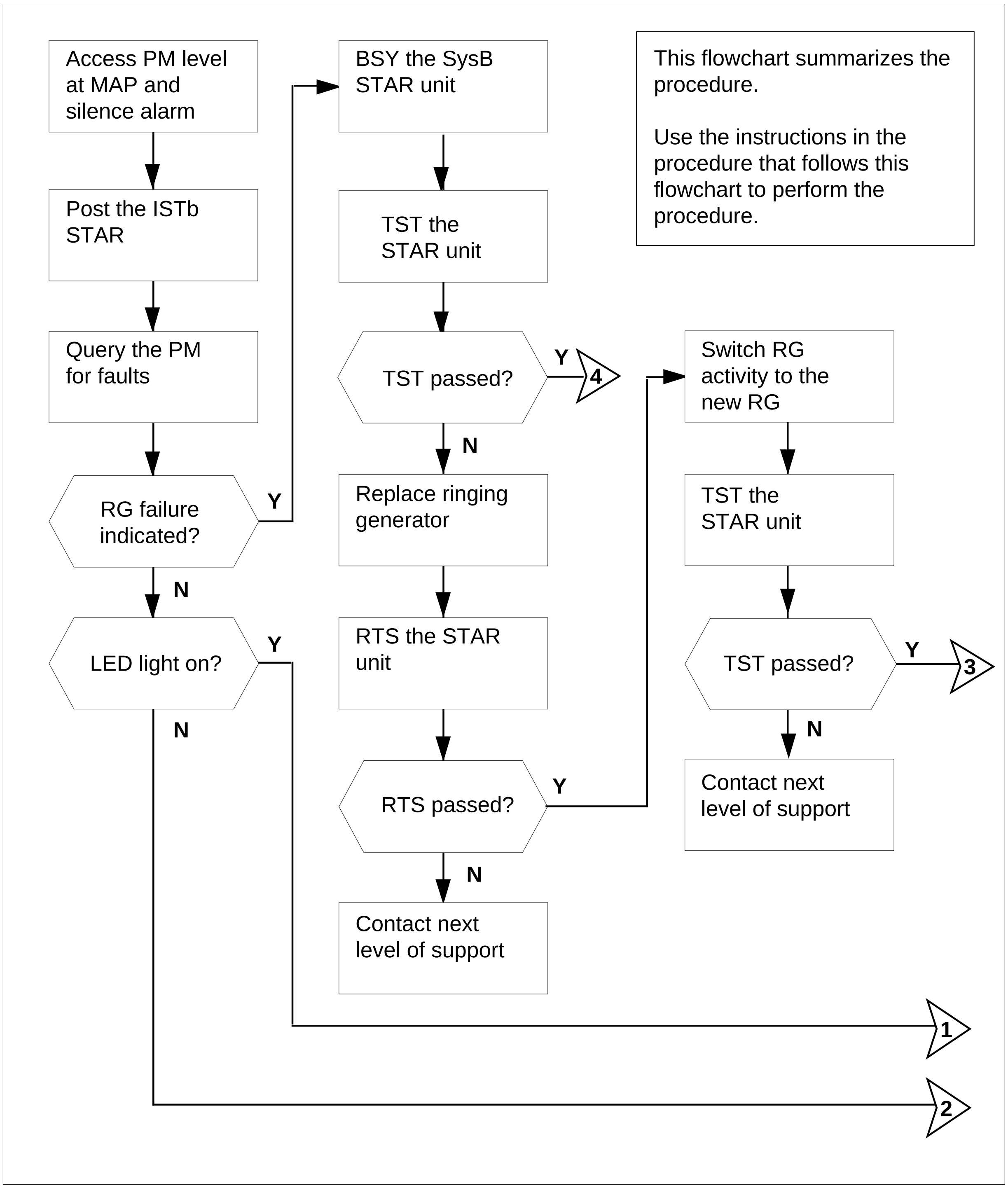
None

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.fs

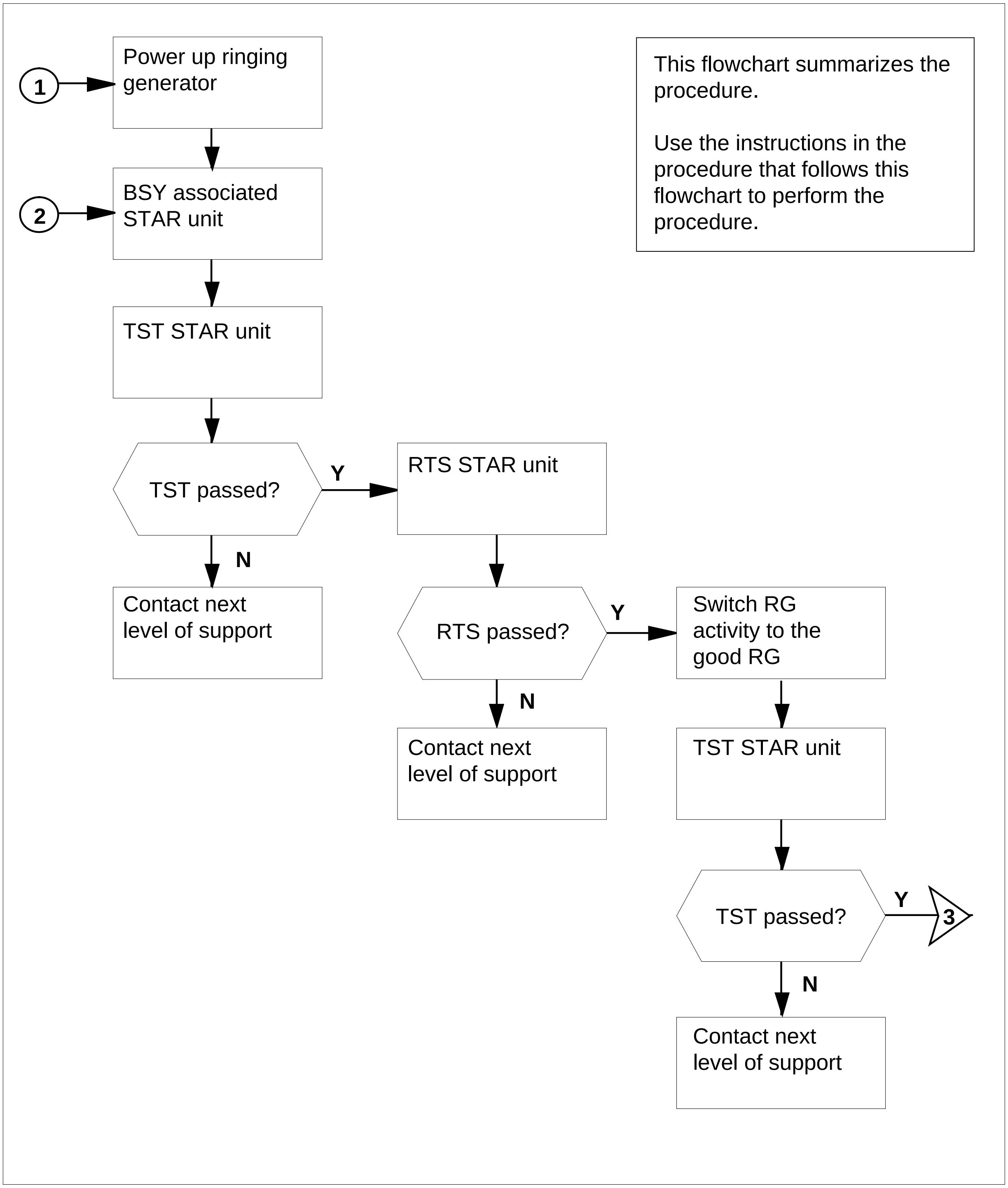
PM STAR RG critical (continued)

Summary of clearing a PM STAR RG critical alarm



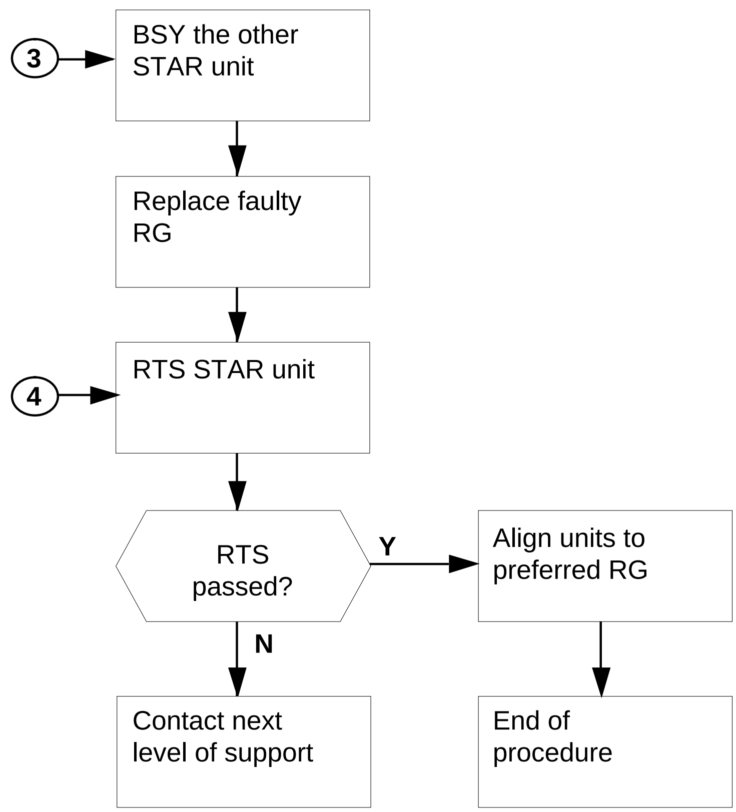
PM STAR RG
critical (continued)

Summary of clearing a PM STAR RG critical alarm (continued)



PM STAR RG
critical (continued)

Summary of clearing a PM STAR RG critical alarm (continued)



PM STAR RG
critical (continued)

Clearing a PM STAR RG critical alarm

> **ATTENTION**
> You should be entering this procedure from the PM system level alarm clearing procedure step that identified a STAR-associated fault.

At the MAP terminal

1 Silence the alarm by typing

>MAPCI;MTC;PM;SIL

and pressing the Enter key.

2 Identify the faulty STAR by typing

>DISP STATE ISTB STAR

and pressing the Enter key.

Example of a MAP response:

```
ISTb  STAR REM1 00 0
```

3 Post the ISTb STAR identified in step 3 by typing

>POST STAR site frame unit

and pressing the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the number of the frame (00 to 511)

unit
is 0 for the STAR

Example of a MAP display:

```
        SysB     ManB     OffL     CBsy     ISTb   InSv
 PM      0        0        2        0        1       12
 STAR    0        0        2        0        1        9

STAR REM1 00 0 Istb Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  SysB                /RG: 0
Unit 1:  ISTb                /RG: 0                  RG:
Drwr:         11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 ISTb
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 ISTb
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

4 Check for fault indicators by typing

>QUERYPM FLT

and pressing the Enter key.

PM STAR RG
critical (continued)

Example of a MAP display:

```
Node inservice troubles exist:
    One or both Units inservice trouble
 STAR   UNIT 0  Inservice troubles Exist:
Ringing Generator Failure:Ring Generator ANI/COIN Fault
 STAR   UNIT 1  Inservice Troubles Exist:
Ringing Generator Failure:Ring Generator in Excess load
```

If RG failure is	Do
indicated	step 6
not indicated	step 5

At the STAR site

5 Make a visual inspection of the ringing generator. Check to see if the LED is lit.

If the LED is	Do
lit	step 6
not lit	step 7

6 Power up the ringing generator by moving the circuit breaker on the FSP to the ON position. (The LED should go off.) These circuit breakers are identified here as follows:

- breaker labeled Ring 0, Slot1 controls the ringing generator in unit 0, slot 1
- breaker labeled Ring1, Slot 22 controls the ringing generator in unit 1, slot 22

If power is	Do
restored and the alarm clears	step 17
not restored	step 7

At the MAP terminal

7 Manually busy one of the faulty STAR units identified in step 4 by typing

>BSY UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the SysB STAR unit (0 or 1)

PM STAR RG
critical (continued)

8 Test the ManB STAR unit by typing

>TST UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the ManB STAR unit (0 or 1)

If cardlist is	Do
generated	step 9
not generated	step 16

9 Observe the card listing shown on MAP display.

Example of a MAP response:

```
SITE   FLR  RPOS   BAY_ID  SHF DESCRIPTION SLOT   EQPEC
REM1    01   A00   SRHE 00  37    HUB   000  22     TR60
REM1    01   A00   SRHE 00  37    HUB   000  17     TR77
```

10 Determine if the NTTR60 card was replaced.

If the NTTR60 card has	Do
been replaced and the alarm is still present	step 16
not been replaced	step 15 to replace the ringing generator

11 Return the STAR unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

unit_no
is the number of the ManB STAR unit (0 or 1)

If RTS	Do
passed and another RG is still ISTb	step 14
passed and the alarm is clear	step 17
failed	step 12

12 Align RG activity to the new RG by typing

>SWRG UNIT unit_no

PM STAR RG
critical (end)

and pressing the Enter key.

where

unit_no
is the STAR unit (0 or 1) associated with the new RG

Example of a MAP display:
STAR REM1 14 1 Unit 1 SWRG Passed

If the SWRG command	Do
passed, and RG activity must be switched for the other unit	step 13
passed, and RG activity is acceptable for both units	step 17
failed	step 16

13 Repeat step 12 for the other STAR unit.

14 Repeat steps 7 through step 13 for the other STAR unit.

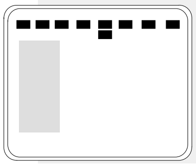
15 Go to the “Star Remote Hub card replacement procedures" in this manual. Begin by replacing the first card on the list. When you have finished with the card replacement procedures, go to step 11 of this procedure.

16 Obtain further assistance in clearing this alarm by contacting personnel responsible for higher level support.

17 You have successfully completed this procedure. If there are other alarms displayed, reference the appropriate alarm clearing procedures for the indicated alarms in this manual.

PM STAR RG
major, minor

Alarm display



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

Indication

A major alarm involving a STAR is indicated by *n*LRG under the PM subsystem header with an *M* beneath it at the MTC level of the MAP display.

Meaning

One of the ringing generator units is in the system busy (SysB) state.

Impact

Service is not affected since a switching of support to a backup ringing generator (SwRG) automatically occurs. However, if the backup ringing generator fails, ringing will not be produced.

Common procedures

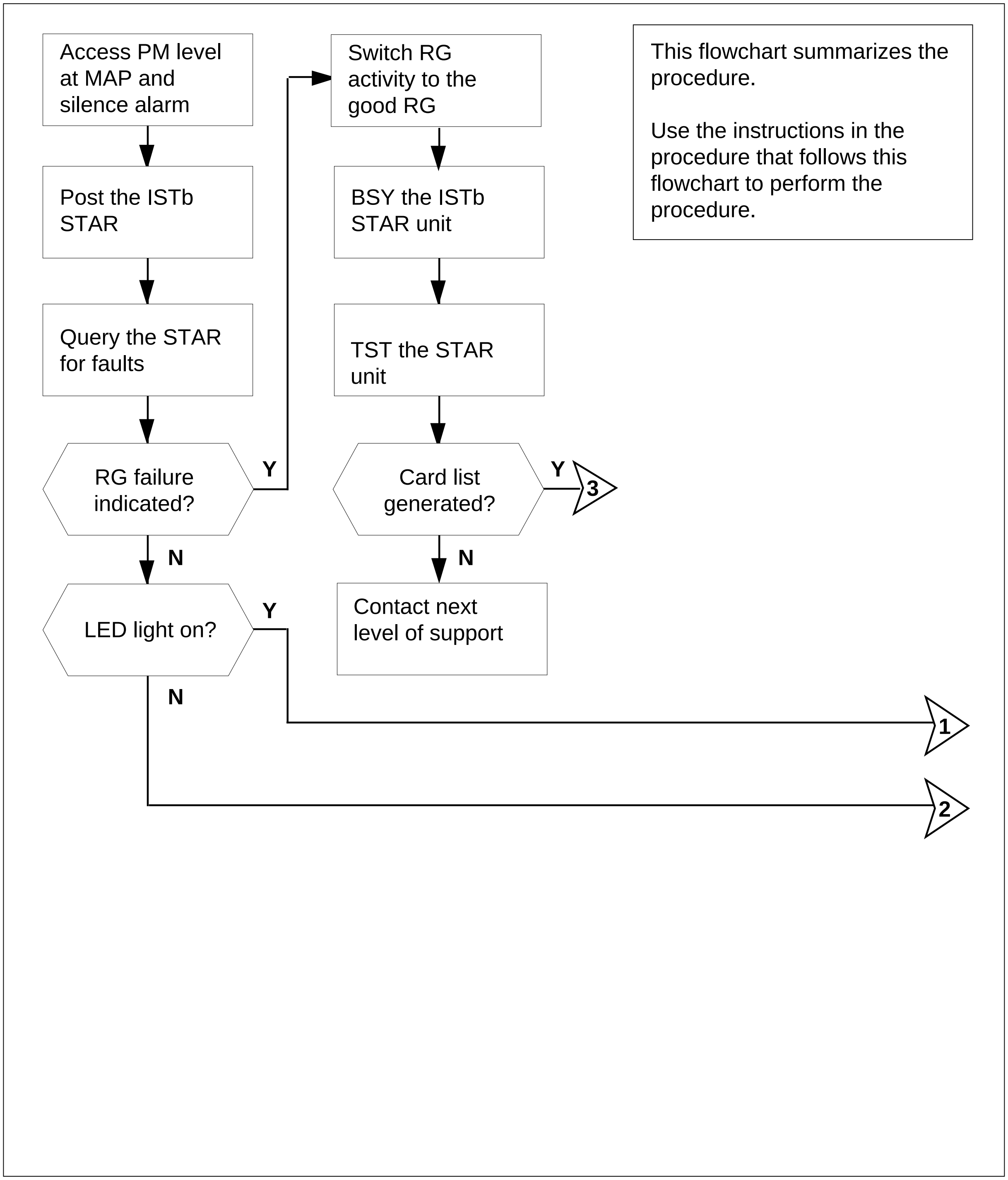
None

Action

The following flowchart is only a summary of the procedure. Use the instructions in the step-action procedure that follows the flowchart to clear the alarm.

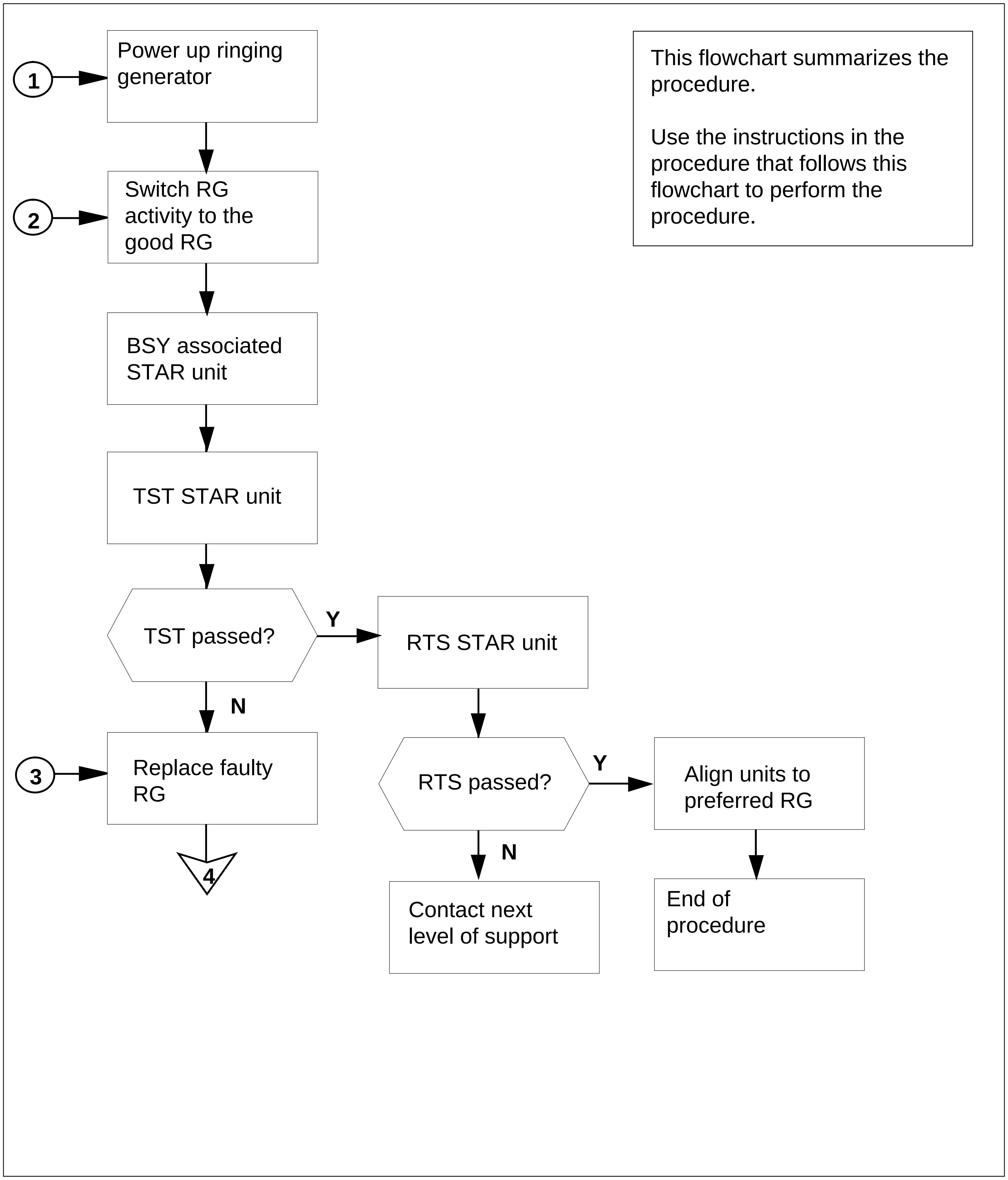
PM STAR RG
major, minor (continued)

Summary of clearing a PM STAR RG major, minor alarm



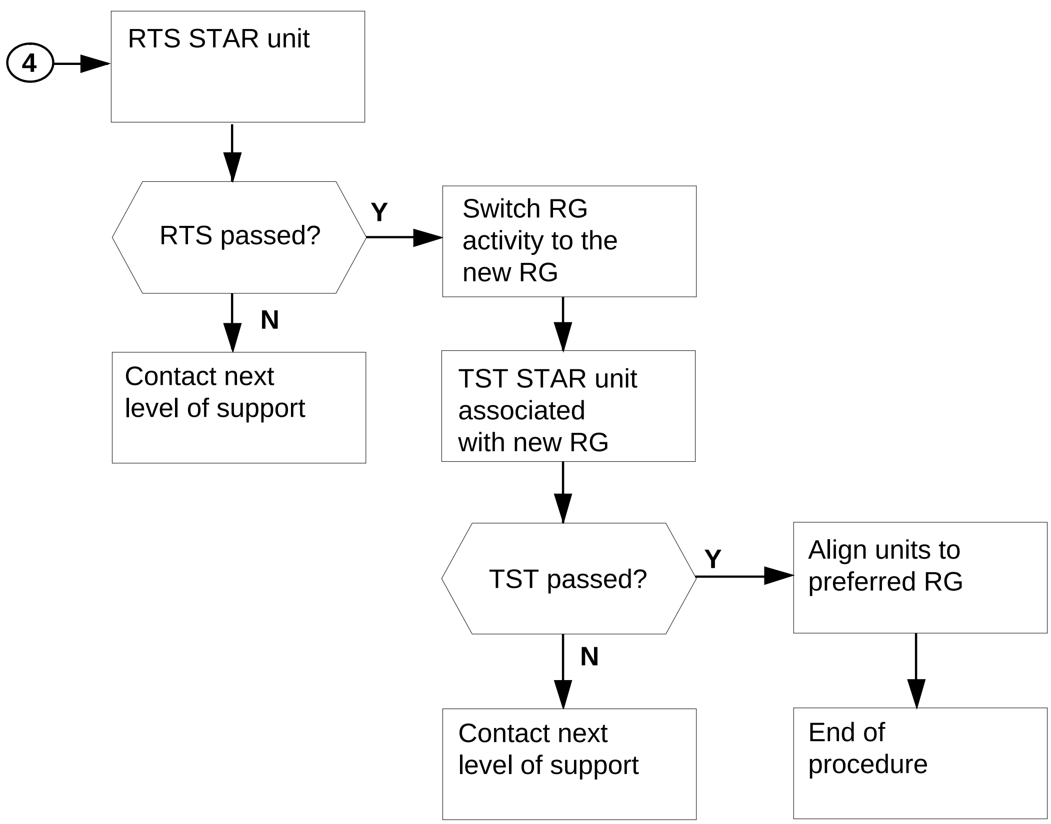
PM STAR RG
major, minor (continued)

Summary of clearing a PM STAR RG major, minor alarm (continued)



PM STAR RG
major, minor (continued)

Summary of clearing a PM STAR RG major, minor alarm (continued)



PM STAR RG
major, minor (continued)

Clearing a PM STAR RG major, minor alarm

At the MAP terminal

1

> **ATTENTION**
> You should be entering this procedure from the PM system level alarm clearing procedure step which identified a PM alarm associated with a STAR ringing generator fault.

To silence the alarm, type

>MAPCI;MTC;PM;SIL

and press the Enter key.

2 To identify the STAR with faults, type

>DISP STATE ISTB STAR

and press the Enter key.

Example of a MAP response:

```
ISTb:  REM1 14 1
```

3 To post the ISTb STAR identified in step 2, type

>POST STAR site frame unit

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the number of the frame (00 to 511)

unit
is 0 for the STAR

Example of a MAP response

PM STAR RG
major, minor (continued)

```
       SysB     ManB     OffL     CBsy     ISTb      InSv
 PM     0        0        2        0        1          12
 STAR   0        0        2        0        1           9

STAR REM1 14 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb              /RG: 0
Unit 1:  ISTb              /RG: 0                  RG:
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 ISTb
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45 Stby 1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

4 To check for fault indicators, type

>QUERYPM FLT

and press the Enter key.

Example of a MAP display:

```
QUERYPM FLT
Node inservice troubles exist:
    One or both Units inservice trouble
 STAR   UNIT 0  Inservice troubles Exist:
Ringing Generator Failure:Ring Generator ANI/COIN Fault
 STAR   UNIT 1  Inservice Troubles Exist:
Ringing Generator Failure:Ring Generator in Excess load
```

If ringing generator (RG) failure is	Do
indicated	step 8
not indicated	step 5

At the STAR site

5 Make a visual inspection of the ringing generator. Check to see if the LED is lit.

If the LED is	Do
lit	step 6
not lit	step 8

PM STAR RG
major, minor (continued)

6 Power up the ringing generator by setting the circuit breaker on the FSP to the ON position. The LED should go out. These circuit breakers are identified here as follows:

- breaker labeled Ring0, Slot1 controls the ringing generator in unit 0, slot 1
- breaker labeled Ring1, Slot22 controls the ringing generator in unit 1, slot 22

If the RG LED	Do
goes out	step 16
remains lit	step 7

At the MAP terminal

7 Determine if one of the STAR units is aligned to the faulty RG.

If	Do
one unit is aligned to the faulty RG	step 8
no units are aligned to the faulty RG	step 9

8 To make sure both STAR units are aligned to the good RG, type

`>SWRG UNIT unit_no`

and press the Enter key.

where

unit_no
is the STAR unit (0 or 1) associated with the faulty RG

Example of a MAP display:
STAR REM1 14 1 Unit 1 SWRG Passed

Note: Repeat this step until both units of the STAR are on the good RG.

If the SWRG command	Do
passes	step 9
fails	step 19

9 To manually busy the ISTb STAR unit identified in step 2, type

`>BSY UNIT unit_no`

and press the Enter key.

where

PM STAR RG
major, minor (continued)

unit_no
is the number of the ISTb STAR unit.

10 To test the ManB STAR, type

>TST UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the ManB STAR unit.

If cardlist	Do
generate	step 11
does not generate and the alarm is still present	step 19

11 Observe the card listing shown on the MAP display.

Example of a MAP response:

```
SITE FLR RPOS BAY_ID   SHF DESCRIPTION SLOT EQPEC
REM1 01  A00  SRHE 00   37  STAR:000    :01  TR60
REM1 01  A00  SRHE 00   37  STAR:000    :15  TR77
```

12 Determine if the NTTR60 circuit card was replaced.

If the NTTR60 card has	Do
been replaced and the alarm is still present	step 19
not been replaced	step 18 to replace the ringing generator

13 To return the STAR unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the ManB STAR unit (0 or 1).

If	Do
RTS PASSED	step 14
RTS FAILED	step 19

PM STAR RG
major, minor (continued)

14 To align RG activity to the new RG, type

>SWRG UNIT unit_no

and press the Enter key.

where

unit_no
is the STAR unit (0 or 1) associated with the new RG

Example of a MAP display:

```
STAR  REM1 14 1 Unit 1 SWRG Passed
```

If the SWRG command	Do
passes, and RG activity must be switched for the other STAR unit	step 15
passes, and RG activity is acceptable for both STAR units	step 20
fails	step 19

15 Repeat step 14 for the other STAR unit in this frame.

16 To test the new RG, type

>TST UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the STAR unit (0 or 1)

Example of a MAP response:

```
STAR  REM1 14 1 Unit 1  InSvce Tests Initiated
STAR REM1 14 1 Unit 1  Tst  Passed
```

Note: Repeat this step for the other STAR unit.

If TST	Do
passes	step 17
fails	step 19

17 To align RG activity to the preferred RG, type

>SWRG UNIT unit_no

and press the Enter key.

PM STAR RG
major, minor (end)

where

unit_no
is the STAR unit (0 or 1) assigned to the new RG

Example of a MAP display:

```
STAR REM1 14 0 InSv Links  OOS: Cside 0 Pside 0
Unit 0: InSv      /RG:0
Unit 1: InSv      /RG:0                           RG
Drwr:         11 11 11 11 11 22 22 22 22 22 33 33 33 Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45 Stby 1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

Note: Repeat this step until both units of the STAR are on the preferred RG.

If the SWRG command	Do
passes	step 20
failes	step 19

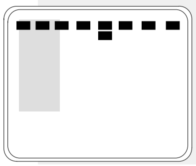
18 Go to the appropriate procedure in the “Star Remote System card replacement procedures" in this manual. When you have finished with the card replacement procedures, go to step 13 of this procedure.

19 Get additional help in clearing this alarm by contacting the personnel responsible for higher level support.

20 You have correctly completed this procedure. If there are other alarms displayed, reference the appropriate alarm clearing procedures for the indicated alarms in this manual.

STAR talk battery critical

Alarm display



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

Indication

A critical alarm involving a STAR is indicated by *n*TBAT under the PM subsystem header with a **C** beneath it at the MTC level of the MAP display.

Meaning

One or both units of the STAR has no talk battery.

Impact

A loss of call processing and a critical alarm when circuit breaker TalkA or TalkB on the FSP is affected.

Common procedures

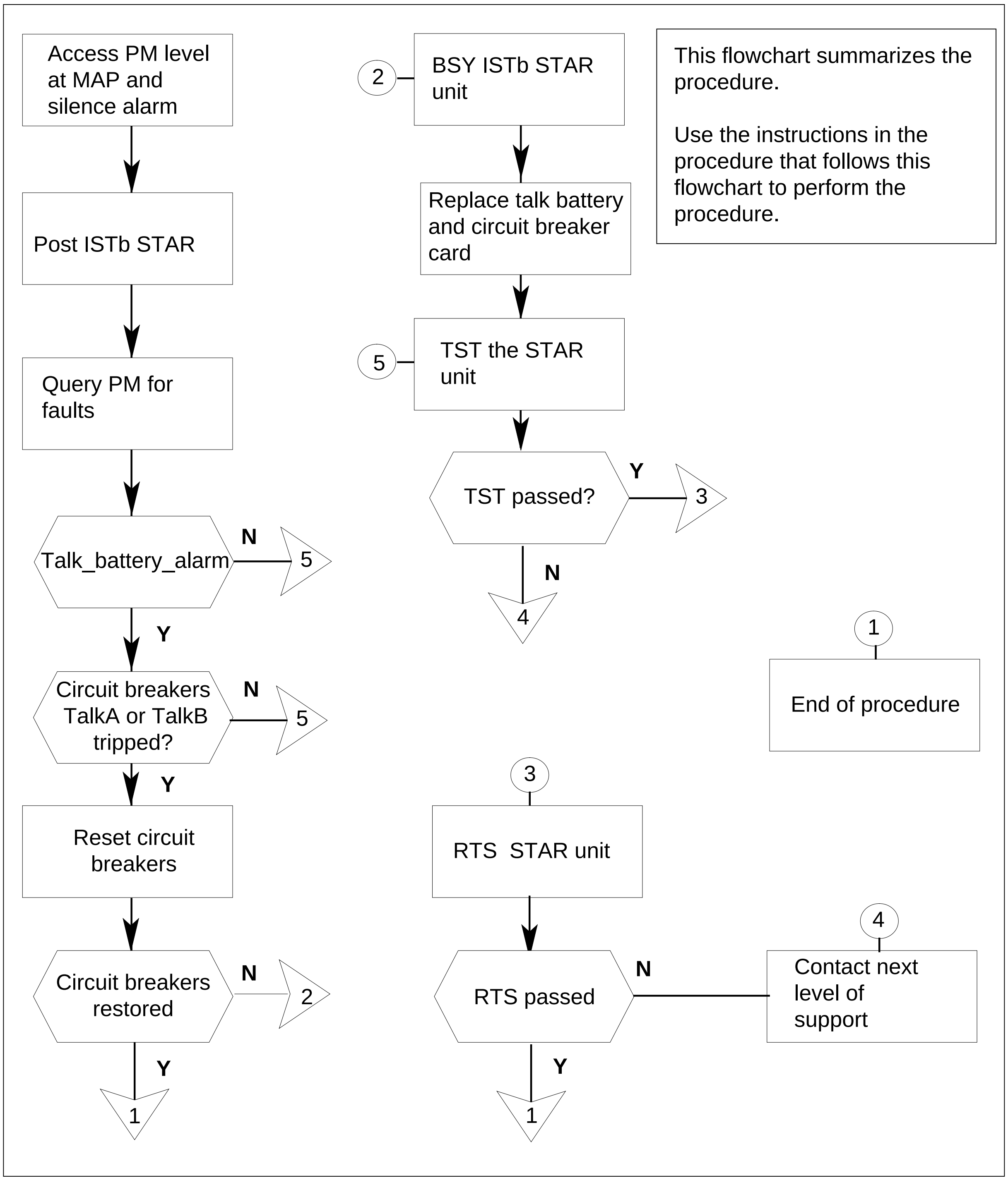
None

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.

STAR talk battery critical (continued)

Summary of clearing a STAR talk battery critical alarm



STAR talk battery critical (continued)

Clearing a STAR talk battery critical 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 STAR with faults, type

>DISP STATE ISTB STAR

and press the Enter key.

4 To post the STAR which has lost talk battery, type

>POST STAR site frame unit

and press the Enter key.

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

Example of a MAP display:

```
        SysB   ManB   OffL   CBsy   ISTb   InSv
PM       0      0      2      0      1     12
STAR     0      0      2      0      1      9

STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb          /RG: 0
Unit 1:  ISTb          /RG: 0            RG:
Drwr:            11 11 11 11 11 22 22 22 22 22 33 33 33 Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45 Stby 1 InSv
..  ..  .. ..  .. ..  ..  ..  ..  ..  ..  ..  .. ..  ..  ..  ..  ..
```

5 To check for fault indicators, type

>QUERYPM FLT

and press the Enter key.

Example of a MAP response:

STAR talk battery critical (continued)

```
Node inservice troubles exist:
   One or both units inservice trouble
STAR  UNIT 0
STAR  UNIT 1
Self Test Failed:  Talk Battery Failure
```

6 Examine PM179 logs in LOGUTIL

At the STAR site

7 Make a visual inspection of the FSP. Check circuit breakers TalkA and TalkB.

If circuit breakers are	Do
tripped	step 15
not tripped	step 8

At the PDC frame

8 Locate the fuses powering the STAR talk battery circuits.

9 Determine if the fuse is blown.

If the fuse is	Do
blown	step 10
not blown	step 16

10 Remove the fuse holder that contains the blown fuse.

At the STAR site

11 Trip the circuit breaker TalkA or TalkB to remove the talk battery and circuit breaker card out of the circuit and prevent blowing the cartridge fuse.

If affected unit is	DoTrip circuit breaker
Unit 0	TalkA
Unit 1	TalkB

At the PDC frame

12 Replace the cartridge fuse inside the fuse holder.

STAR talk battery critical (end)

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.

Replace the blown fuse.

14 Install the fuse holder back onto the PDC frame.

At the STAR site

15 Reset circuit breaker TalkA or TalkB by moving the switch to the ON position. The LED should go off.

If circuit breaker	Do
trips again	step 16
remains ON, LED goes off	step 17

16 Get additional help in clearing this alarm by contacting the personnel responsible for higher level support.

17 You have successfully completed this procedure. If there are other alarms displayed, reference the appropriate alarm clearing procedures for the indicated alarms in this manual.

12 Star Remote System card replacement procedures

This chapter contains card replacement procedures for the Star Remote System. These procedures describe the removal and replacment of faulty cards in the Star Hub and the Star Module (also known as a remote line drawer [RLD]) and are intended for use by maintenance engineering and field maintenance personnel.

NT6X17
in a STAR or RLD

Application

Use this procedure to replace the following card in a STAR or remote line drawer (RLD).

PEC	Suffixes	Name
NT6X17	AA, AB, AC	Standard Line Circuit Type A (POTS)
NT6X17	BA	World Line Card Type A

The NT6X17BA World Line Card Type A replaces the NT6X17AC in North America.

Common procedures

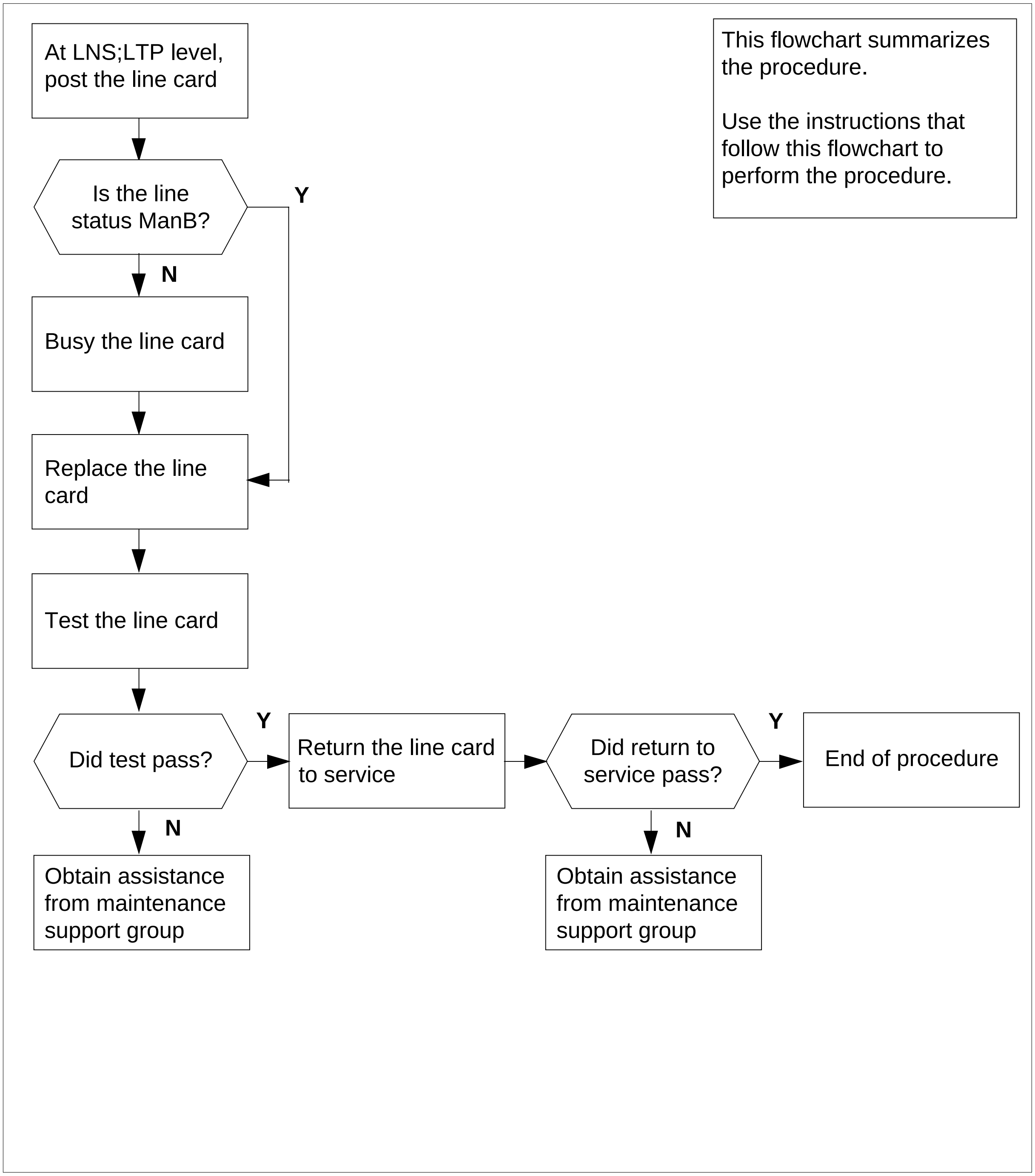
The common replacing a line card procedure is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X17
in a STAR or RLD (continued)

Summary of replacing an NT6X17 card in a STAR or RLD



NT6X17
in a STAR or RLD (continued)

Replacing an NT6X17 card in a STAR or RLD

At your current location

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

At the MAP terminal

2 To access the LTP level of the MAP terminal and post the line associated with the card to be replaced, type

>MAPCI;MTC;LNS;LTP;POST L site frame unit lsg ckt

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0-35)

ckt
is the number of the circuit associated with the faulty card (0-31)

Example of a MAP response:

```
LCC PTY RNG .....LEN.........  DN   STA F S LTA TE RESULT
RES      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.

5 Go to the common replacing a line card procedure in this document. When you have completed the procedure, return to this point.

NT6X17
in a STAR or RLD (end)

At the MAP terminal

6 To test the line card just replaced, type

>DIAG

and press the Enter key.

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

9 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 11.

10 Get additional assistance in replacing this card by contacting the personnel responsible for higher level of support.

11 You have correctly completed this procedure.

NT6X18
in a STAR or RLD

Application

Use this procedure to replace the following card in a STAR or remote line drawer (RLD).

PEC	Suffixes	Name
NT6X18	AA, AB	Line Card Type B (Coin/Ground Start)
NT6X18	BA	World Line Card Type B

Common procedures

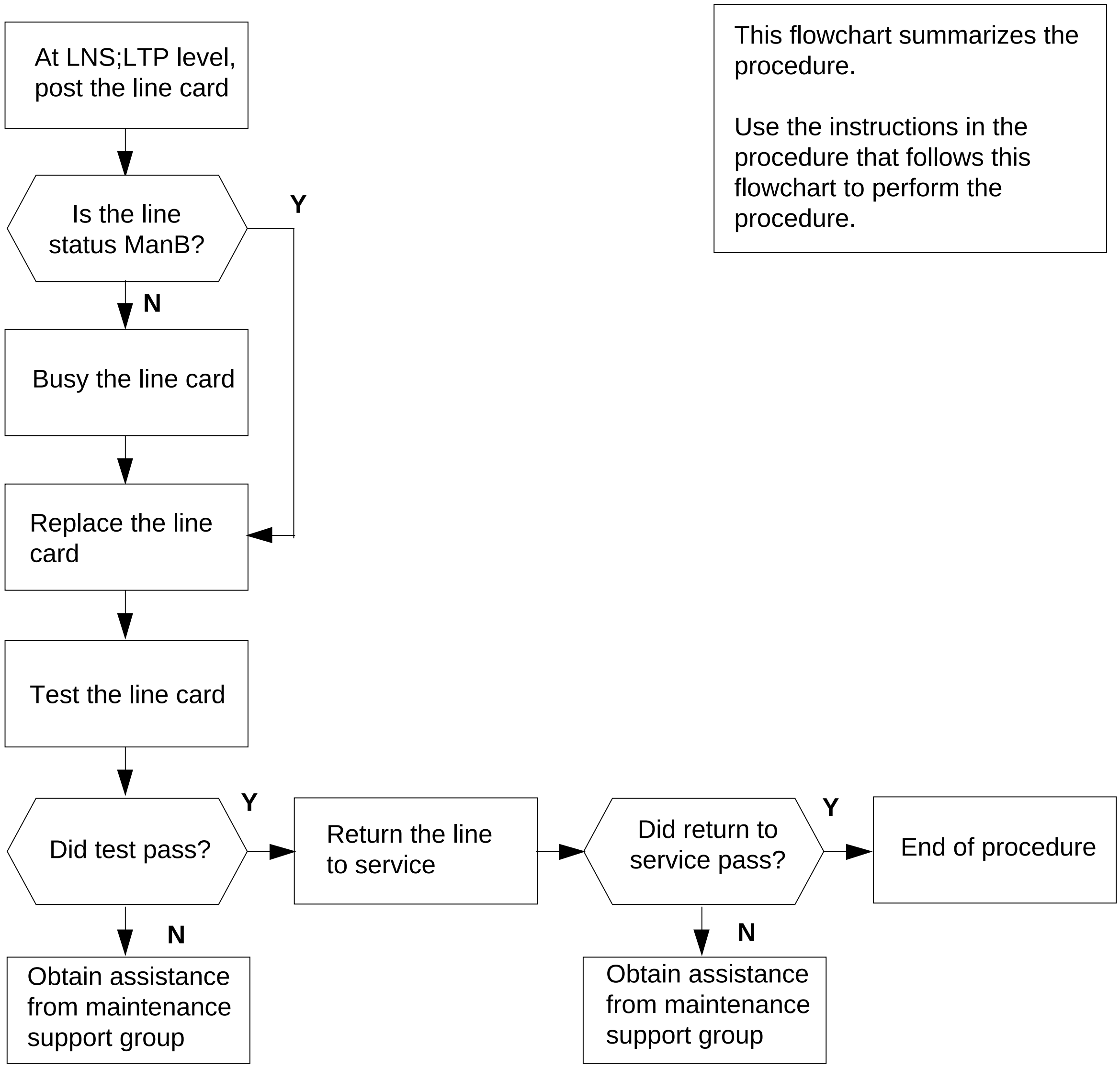
The common replacing a line card procedure is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X18
in a STAR or RLD (continued)

Summary of replacing an NT6X18 card in a STAR or RLD



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

NT6X18
in a STAR or RLD (continued)

Replacing an NT6X18 card in a STAR or RLD

At your current location

1 Get a replacement card. Ensure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

2 To access the LTP level of the MAP and post the line associated with the card to be replaced, type

>MAPCI;MTC;LNS;LTP;POST L site frame unit lsg ckt

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the number of the STAR with the faulty card

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0-35)

ckt
is the number of the circuit associated with the faulty card (0-31)

Example of a MAP response:

```
LCC PTY RNG .....LEN.........  DN   STA F S LTA TE RESULT
RES         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.

5 Go to the common replacing a line card procedure in this document. When you have completed the procedure, return to this point.

NT6X18
in a STAR or RLD (end)

At the MAP terminal

6

> **ATTENTION**
> There is an enhanced diagnostics test for NT6X18AA and NT6XAB cards. This NT6X18 card may be good. See the description of the NT6X18 line card in the “Star Remote System hardware" chapter in this manual for information on enhanced diagnostics.

To test the line card just replaced, type

>DIAG

and press the Enter key.

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

9 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 11.

10 Get additional help in replacing this card by contacting the personnel responsible for a higher level of support.

11 You have correctly completed this procedure.

NT6X19
in a STAR or RLD

Application

Use this procedure to replace the following card in a STAR.

PEC	Suffixes	Name
NT6X19	AA	Message Waiting Line Card

Common procedures

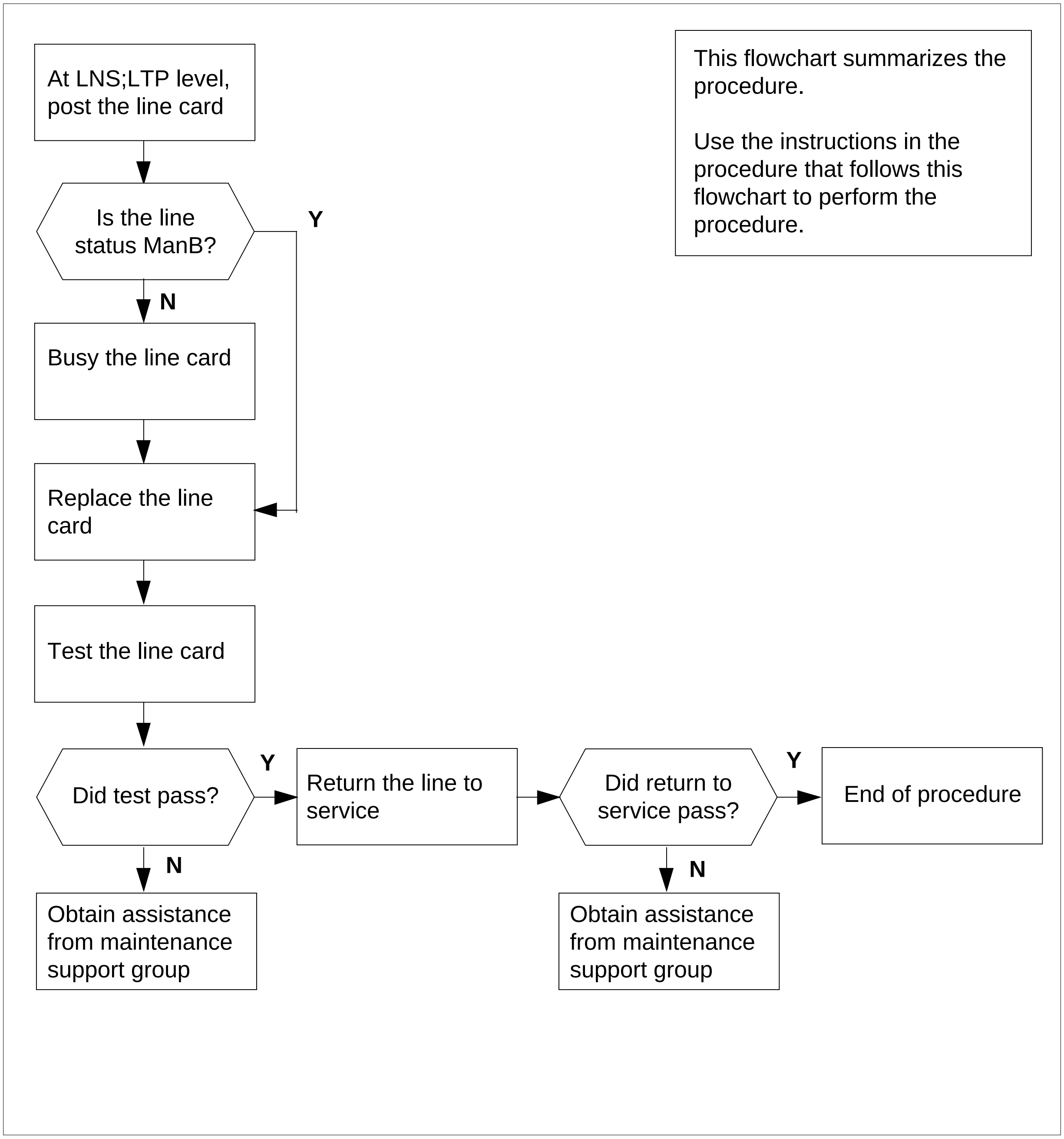
The common replacing a line card procedure is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X19
in a STAR or RLD (continued)

Summary of replacing an NT6X19 card in a STAR or RLD



NT6X19
in a STAR or RLD (continued)

Replacing an NT6X19 card in a STAR or RLD

At your current location

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

At the MAP terminal

2 To access the LTP level of the MAP and post the line associated with the card to be replaced, type

`>MAPCI;MTC;LNS;LTP;POST L site frame unit lsg ckt`

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0-35)

ckt
is the number of the circuit associated with the faulty card (0-31)

Example of a MAP response:

```
LCC PTY RNG .....LEN.......... DN   STA F S LTA TE RESULT
RES      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.

5 Go to the common replacing a line card procedure in this document. When you have completed the procedure, return to this point.

NT6X19
in a STAR or RLD (end)

At the MAP terminal

6 To test the line card just replaced, type

>DIAG

and press the Enter key.

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

9 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 11.

10 Get additional help in replacing this card by contacting the personnel responsible for a higher level of support.

11 You have correctly completed this procedure.

NT6X20
in a STAR or RLD

Application

Use this procedure to replace the following card in a STAR or remote line drawer (RLD).

PEC	Suffixes	Name
NT6X20	AA	Message Waiting Converter

Common procedures

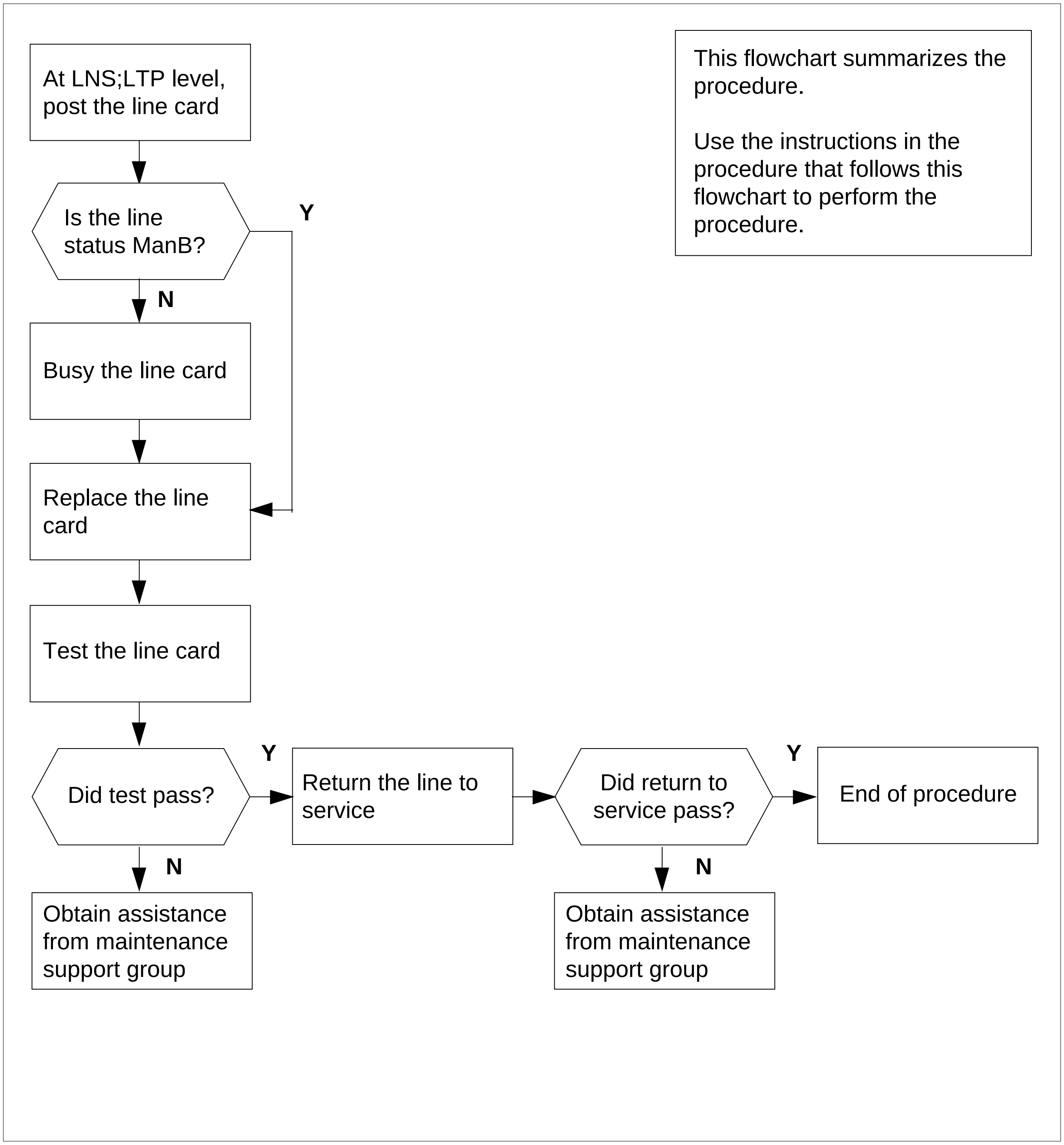
The common replacing a line card procedure is referenced in this procedure.

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.

NT6X20
in a STAR or RLD (continued)

Summary of card replacement procedure for an NT6X20 card in a STAR or RLD



NT6X20
in a STAR or RLD (continued)

Replacing an NT6X20 card in a STAR or RLD

At your current location

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

At the MAP terminal

2 To access the LTP level of the MAP terminal and post the line associated with the card to be replaced, type

>MAPCI;MTC;LNS;LTP;POST L site frame unit lsg ckt

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0-35)

ckt
is the number of the circuit associated with the faulty card (0-31)

Example of a MAP response:

```
LCC PTY RNG .....LEN.......... DN   STA F S LTA TE RESULT
RES      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.

5 Go to the common replacing a line card procedure in this document. When you have completed the procedure, return to this point.

NT6X20
in a STAR or RLD (end)

At the MAP terminal

6 To test the line card just replaced, type

>DIAG

and press the Enter key.

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

9 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 11.

10 Get additional help in replacing this card by contacting the personnel responsible for a higher level of support.

11 You have correctly completed this procedure.

NT6X21
in a STAR or RLD

Application

Use this procedure to replace the following card in a STAR or remote line drawer (RLD).

PEC	Suffixes	Name
NT6X21	AA, AB, AC, AD, BC, CA	Line card type C, Meridian Digital Centrex (MDC), electronic business set

Common procedures

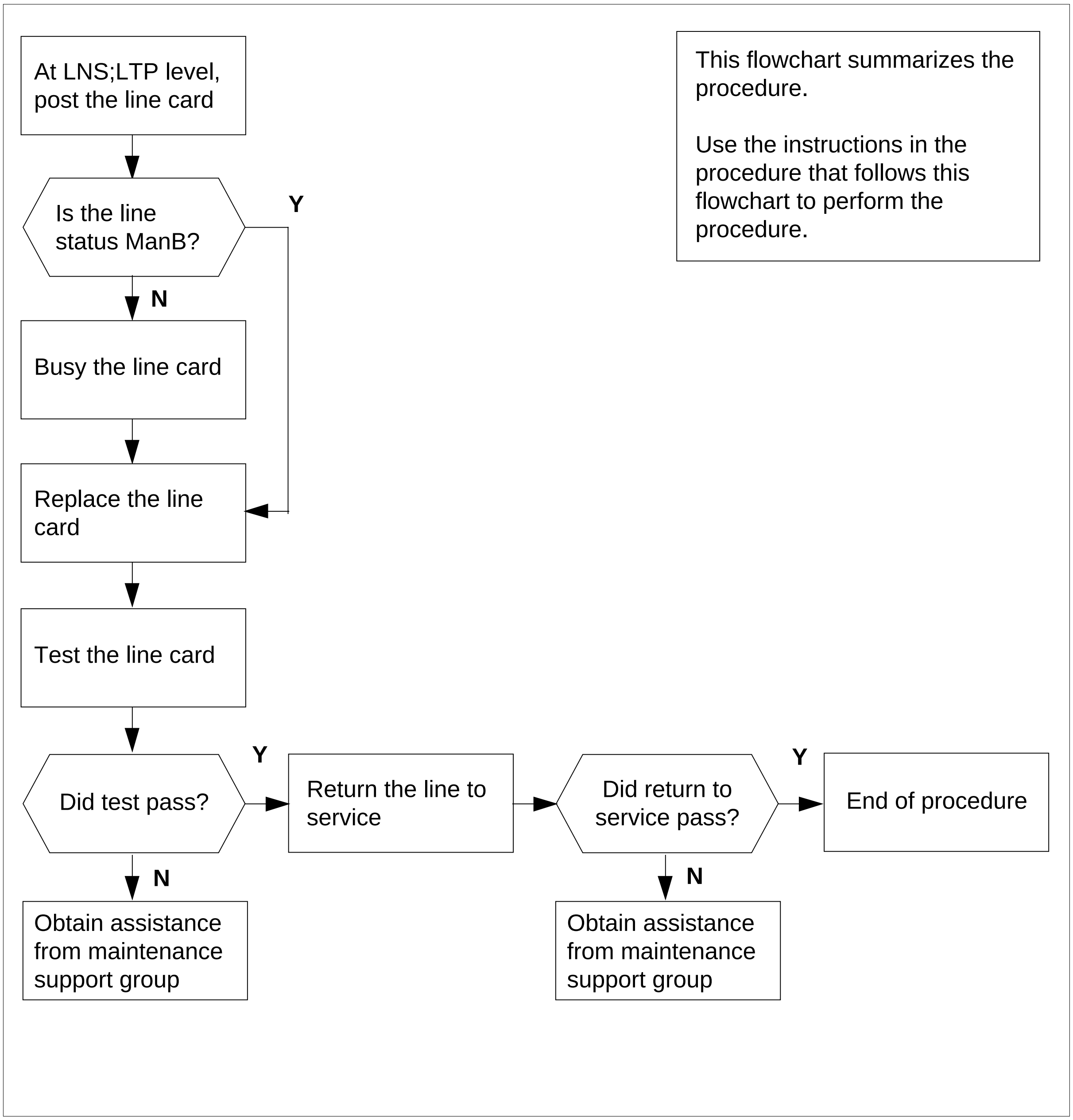
The common replacing a line card procedure is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

NT6X21
in a STAR or RLD (continued)

Summary of replacing an NT6X21 card in a STAR or RLD



NT6X21
in a STAR or RLD (continued)

Replacing an NT6X21 card in a STAR or RLD

At your current location

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

2 Make DIP switch changes for the line card.

If the line card code is	Do
AA, AB, AC	step 4
AD	step 3

3 Make DIP switch settings as described in the “Recommended NT6X21AD DIP switch settings" table located in the “Star Remote System hardware" chapter in this manual.

At the MAP terminal

4 To access the LTP level of the MAP terminal and post the line associated with the card to be replaced, type

>MAPCI;MTC;LNS;LTP;POST L site frame unit lsg ckt

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0-35)

ckt
is the number of the circuit associated with the faulty card (0-31)

Example of a MAP response:

```
LCC PTY RNG .....LEN.......... DN   STA F S LTA TE RESULT
IBN      REM1 00 0 03 03     7213355 MB
```

5 Check the status of the posted line.

If the line status is	Do
manual busy (ManB)	step 7
not ManB	step 6

NT6X21
in a STAR or RLD (end)

6 To busy the line, type

>BSY

and press the Enter key.

At the STAR site

7 Go to the common replacing a line card procedure in this document. When you have completed the procedure, return to this point.

At the MAP terminal

8 To test the line card just replaced, type

>DIAG

and press the Enter key.

If the DIAG	Do
passes	step 9
fails	step 12

9 To return the line card to service, type

>RTS

and press the Enter key.

If RTS	Do
passes	step 10
fails	step 12

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

11 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 13.

12 Get additional help in replacing this card by contacting the personnel responsible for a higher level of support.

13 You have correctly completed this procedure.

NT6X53
in a STAR

Application

Use this procedure to replace the following card in a STAR.

PEC	Suffixes	Name
NT6X53	AA	Power Converter Card (5V/15V)

Common procedures

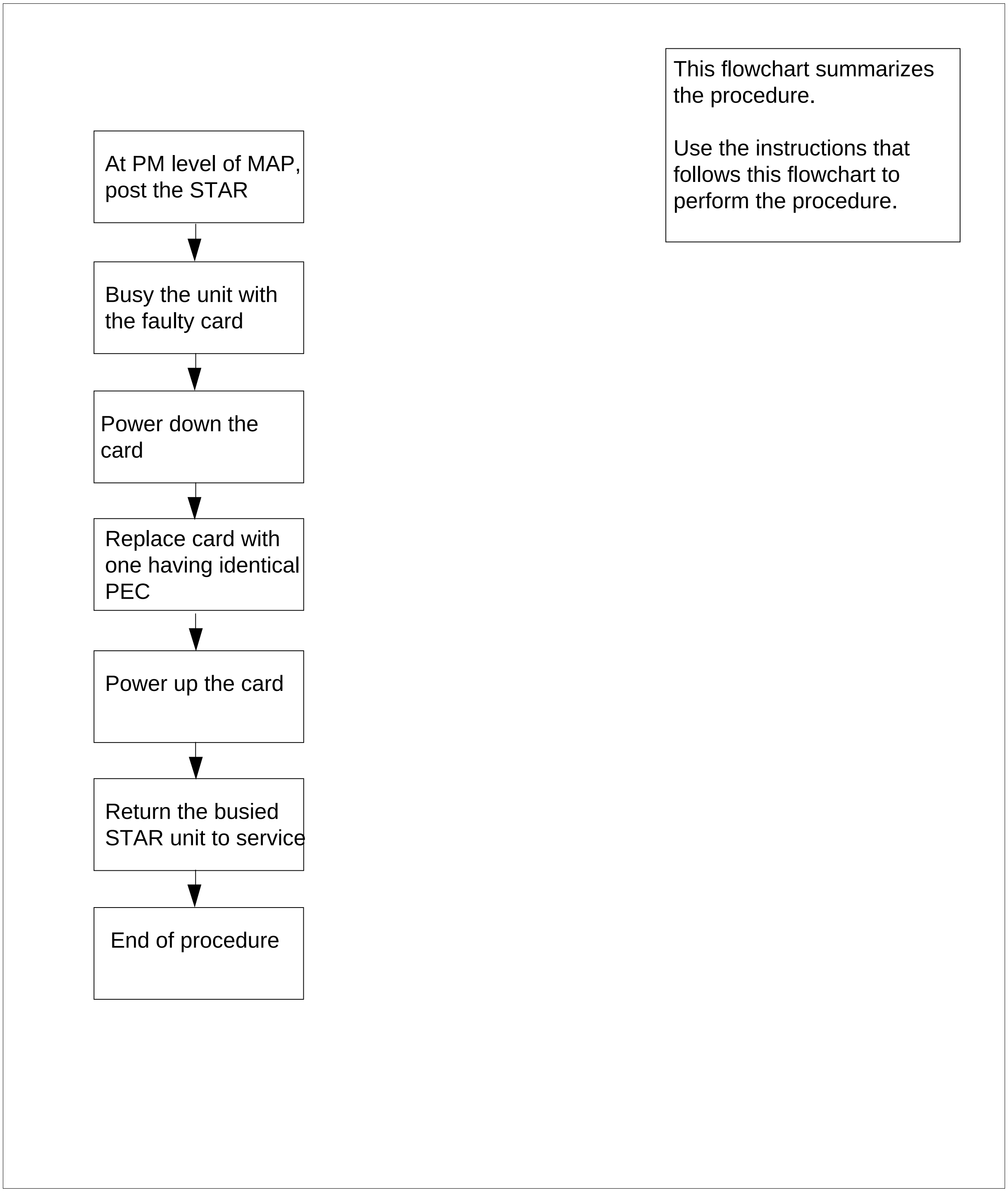
The common replacing a card procedure is referenced in this procedure.

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.

NT6X53
in a STAR (continued)

Summary of card replacement procedure for an NT6X53 card in a STAR



NT6X53
in a STAR (continued)

Replacing an NT6X53 in a STAR

At your current location

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to verify or accept cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

3 To access the PM level of the MAP and post the STAR, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the name of the STAR site

frame
is the frame number of the STAR (0 to 511)

unit
is 0 for the STAR

Example of a MAP display:

```
              SysB     ManB     OffL     CBsy     ISTb    InSv
         PM    0        0        0        0        1       130
         STAR  0        0        0        0        1        10
  STAR   Rem1  OO 0 ISTb   Links_OOS: CSide 0 PSide 0
Unit 0:  InSv  Mtce TakeOver    /RG:  0
Unit 1:  SysB  Mtce             /RG:  0              RG:
DRwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref  0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby  1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

4 To busy the STAR unit containing the faulty card, type

>BSY UNIT STAR_unit

and press the Enter key.

where

star_unit
is the STAR unit (0 or 1) to be busied

Example of a MAP display:

NT6X53
in a STAR (continued)

```
            SysB     ManB     OffL     CBsy     ISTb    InSv
        PM    0        0        0        0        1       130
        STAR  0        0        0        0        1        10
 STAR   Rem1  OO O ISTb   Links_OOS: CSide 0 PSide 0
Unit 0:  InSv  Mtce TakeOver    /RG:  0
Unit 1:  ManB  Mtce             /RG:  0             RG:
DRwr:         11 11 11 11 11 22 22 22 22 22 33 33 33  Pref  0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby  1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

At the SRHE frame

5 Turn the circuit breaker OFF for the unit where the power converter is being replaced. Use the table below to determine which FSP circuit breaker serves the faulty power converter.

IfCircuit breaker labeled	DoNT6X53 slot number
PS00	3
PS01	5
PS10	20
PS11	18

6

DANGER
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel (FSP) of the STAR. This protects the equipment against damage caused by static electricity.

Replace the NT6X53 card using the common replacing a card procedure in this document. When the card has been replaced, return to this point.

7 Power up the STAR unit as follows:

a Make sure the power converter (NT6X53) is inserted. A major audible alarm may sound. This alarm is silenced when power is restored to the converter.

b Set the circuit breaker to the ON position. The Converter Fail LED on the power converter and the MAJ LED on the FSP will be extinguished.

NT6X53 in a STAR (continued)

Determine the correct FSP circuit breaker for the power converter that was replaced from the following table.

IfCircuit breaker	DoNT6X53 slot number
PS00	3
PS01	5
PS10	20
PS11	18

c Set the circuit breaker to the ON position for the new power converter.

i The Converter Fail LED on the power converter will be extinguished.

ii The MAJ LED on the FSP will be extinguished.

8 Use the following information to determine the next step in this procedure.

If you entered this procedure from	Do
an alarm clearing procedure	step 12
other	step 9

9 To return the STAR unit to service, type

>RTS UNIT star_unit

and press the Enter key.

where

star_unit
is the STAR (0 or 1) busied in step 4

If RTS	Do
passes	step 10
fails	step 13

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

11 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 14.

12 Return to the alarm clearing procedure that directed you to this procedure. If necessary, go to the point where the faulty card list was produced, identify the

NT6X53
in a STAR (end)

next faulty card on the list, and go to the appropriate card replacement procedure for that card in this manual.

13 Get additional help replacing this card by contacting the personnel responsible for a higher level of support.

14 You have correctly completed this procedure.

NT6X54 in a STAR

Application

Use this procedure to replace the following card in a STAR.

PEC	Suffixes	Name
NT6X54	AA	Bus interface card (BIC)
NT6X54	DA	ISDN drawer controller (IDC) card (BIC)
		Note: The ISDN line drawer for remotes (ILD-R) must use the NT6X54DA card.

Common procedures

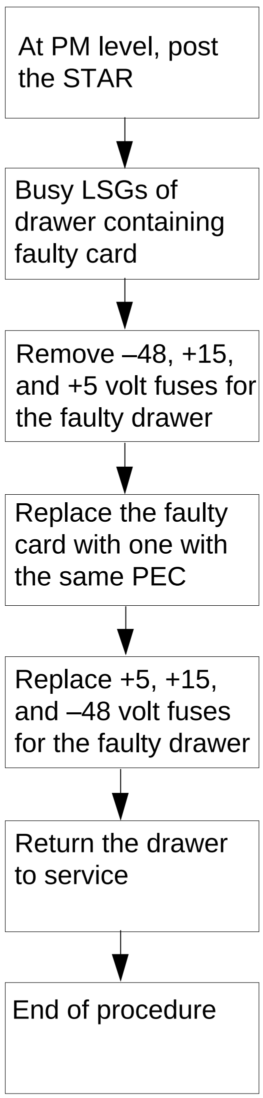
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X54
in a STAR (continued)

Summary of card replacement procedure for an NT6X54 card in a STAR



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

NT6X54
in a STAR (continued)

Replacing an NT6X54 card in an STAR

At your current location

1

> **ATTENTION**
> If you are entering this procedure because of a loss of power in the STAR's NTTR77AA RCP card, check logutil for PM181 log with reason text of: DCC BIC Looparound and go to step 12.

Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

3 If you were directed to this procedure from an alarm clearing procedure in this manual, go to step 12. Otherwise, continue with step 4.

At the MAP terminal

4 To access the peripheral module (PM) level of the MAP (maintenance and administration position) display and post the STAR, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the site name (alphanumeric) of the STAR

frame
is the frame number (0 through 511) of the STAR

unit
is 0 for the STAR

Example of a MAP display:

NT6X54
in a STAR (continued)

```
 CM    MS    IOD    Net     PM   CCS   LNS   Trks    Ext    Appl
  .     .     .      .    1STAR   .      .     .      .      .

  STAR             SysB     ManB     OffL     CBsy     ISTb      InSv
 0 Quit      PM     0        1        0        0        0       130
 2 Post_     STAR   0        1        0        0        0         0
 3 Listset
 4 SwRg   STAR   Rem1  OO O ISTb   Links_OOS: CSide 0 PSide 0 UMP OOS: 0
 5 Trnsl  Unit 0:  InSv  Mtce       /RG:  0
 6 Tst    Unit 1:  InsV  Mtce       /RG:  0                    RG
 7 Bsy                  11 11 11 11 11 22 22 22 22 22 33 33 33 Pref 0 InSv
 8 RTS   01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45 Stby 1 InSv
 9 OffL  .. .. SS .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
10 LoadPM
11 Disp_
12 Next
13
14 QueryPM
15
16
17
18
```

Note: ILD-R drawers are identified in reverse video on the MAP display.

5 Determine whether or not you need to access the ILD level on the MAP terminal.

If the card you are replacing is	Do
NT6X54DA	step 6
NT6X54AA	step 10

6 To access the ILD level on the MAP terminal, type

>ILD

and press the Enter key.

7 To post the ILD-R drawer in which the card is being replaced, type

>POST drawer_no

and press the Enter key.

where

drawer_no
is the ILD drawer number (0 through 17) in the STAR

NT6X54
in a STAR (continued)

8 To busy both line subgroups associated with the STAR drawer where the card is being replaced, type

>BSY DRWR

and press the Enter key.

Example of a MAP response;

```
Please confirm (“YES,” “Y,” “NO,” or “N”):
```

9 To confirm the system prompt, type

>YES

and press the Enter key.

Go to step 12.

10 To busy both line subgroups associated with the STAR drawer where the card is being replaced, type

>BSY DRWR lsg

and press the Enter key.

where

lsg
is one of two line subgroups (0 through 35) associated with the drawer

Example of a MAP response:

```
STAR REM1 00 0  Drwr 4 will be taken out of service
Please confirm (“YES,” “Y,” “NO,” or “N”):
```

11 To confirm the system prompt, type

>YES

and press the Enter key.

Note: Repeat this step for the other line subgroups associated with the line drawer.

Example of a MAP display:

```
 STAR  Rem1  OO O ISTb   Links_OOS: CSide 0 PSide 0  UMP OOS: 0
 Unit 0:  InSv  Mtce       /RG:  0
 Unit 1:  InsV  Mtce       /RG:  0                    RG:
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33 Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45 Stby 1 InSv
.. .. MM .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

At the SRHE frame

12 Remove the -48V fuse for the line drawer containing the faulty bus interface card.

Note: The line drawer fuses are grouped and labeled as +5 V, +15 V, and -48 V and are numbered from 1 to 18. The line drawers are numbered from 1 to 18. Any +5 V, +15 V, or -48 V fuse in position 1 is associated with line

NT6X54
in a STAR (continued)

drawer 1 and any fuse in position 2 is associated with line drawer 2, and so forth.

13 Remove the +15V fuse for the line drawer containing the faulty bus interface card. The +15 V fuse for the line drawer is numbered the same as the -48 V fuse removed in step 12.

14 Remove the +5V fuse for the line drawer containing the faulty bus interface card. Determine the correct fuse number by using the table in step 12.

If entry into this procedure is because of	Do
replacement of BIC	step 15
loss of power in STAR's controller	step 19

15

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel (FSP) of the STAR. This protects the equipment against damage caused by static electricity.

WARNING
Card damage—transport
Take the following precautions to protect circuit cards from electrical and mechanical damage during transport:

When handling a circuit card not in an electrostatic discharge (ESD) protective container, stand on a conductive floor mat. Wear a wrist strap connected, through a 1-megohm resistor, to a suitably grounded object, such as a metal workbench or a DMS switch cabinet (Nortel Networks Corporate Standard 5028). Store and transport circuit cards in an ESD protective container.

NT6X54
in a STAR (continued)

> **WARNING**
> **Equipment damage**
> Take the following precautions when removing or inserting a card:
>
> 1. Do not apply direct pressure to the components.
> 2. Do not force the cards into the slots.

> **DANGER**
> **Hot materials**
> Exercise care when handling the line card. The line feed resistor may be very hot.

Put on a wrist strap.

16 To open the line drawer, follow these substeps:

- **a** Face the drawer shelf and grasp the lip at the bottom of the drawer.
- **b** Push up on the drawer latch with your thumb and pull the drawer out approximately 15.0 cm (about 6.0 in).

17 To remove the BIC to be replaced, follow these substeps:

- **a** Open the levers on the BIC.
- **b** Grasp the open locking levers and remove the card from the line drawer in one steady motion. The card will unplug from its socket.

  Note: Do not use a rocking motion to remove the card.

18 To replace the card with faults, follow these substeps:

- **a** Remove the replacement card from the ESD container.
- **b** Close the levers on the card.
- **c** Position the card in its backplane socket. In one steady motion, push against the top and bottom of the card with your thumbs until the card plugs fully into the backplane socket.

  Note: Do not use a rocking motion to insert the card.

- **d** Close the line drawer.

19 Replace the +5V fuse for the line drawer containing the faulty bus interface card.

20 Replace the +15V fuse for the line drawer containing the faulty bus interface card.

21 Replace the -48V fuse for the line drawer containing the faulty bus interface card.

NT6X54
in a STAR (continued)

22 If you were directed to this procedure from an alarm clearing procedure in this manual, return now to the alarm clearing procedure that directed you here. Otherwise, continue with step 23.

At the MAP terminal

23 Determine which procedure to use to return the line subgroups to service.

If the card you are replacing is	Do
NT6X54AA	step 24
NT6X54DA	step 25

24 To return the line subgroups to service, type

`>RTS DRWR  lsg`

and press the Enter key.

where

lsg
is one of two line subgroups (0 through 35) associated with the drawer

Note: Repeat this step for the other line subgroups associated with the line drawer.

If RTS	Do
passed	step 26
failed	step 28

25 To return the line subgroups to service, type

`>RTS DRWR`

and press the Enter key.

If RTS	Do
passed	step 26
failed	step 28

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

27 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 29.

28 Get additional help replacing this card by contacting the personnel responsible for higher level of support.

NT6X54
in a STAR (end)

29 You have correctly completed this procedure.

NT6X71
in a STAR or RLD

Application

Use this procedure to replace the following card in a STAR or remote line drawer (RLD).

PEC	Suffixes	Name
NT6X71	AA, AB, AC	Standard line card type D
NT6X71	BA	Data line card

Common procedures

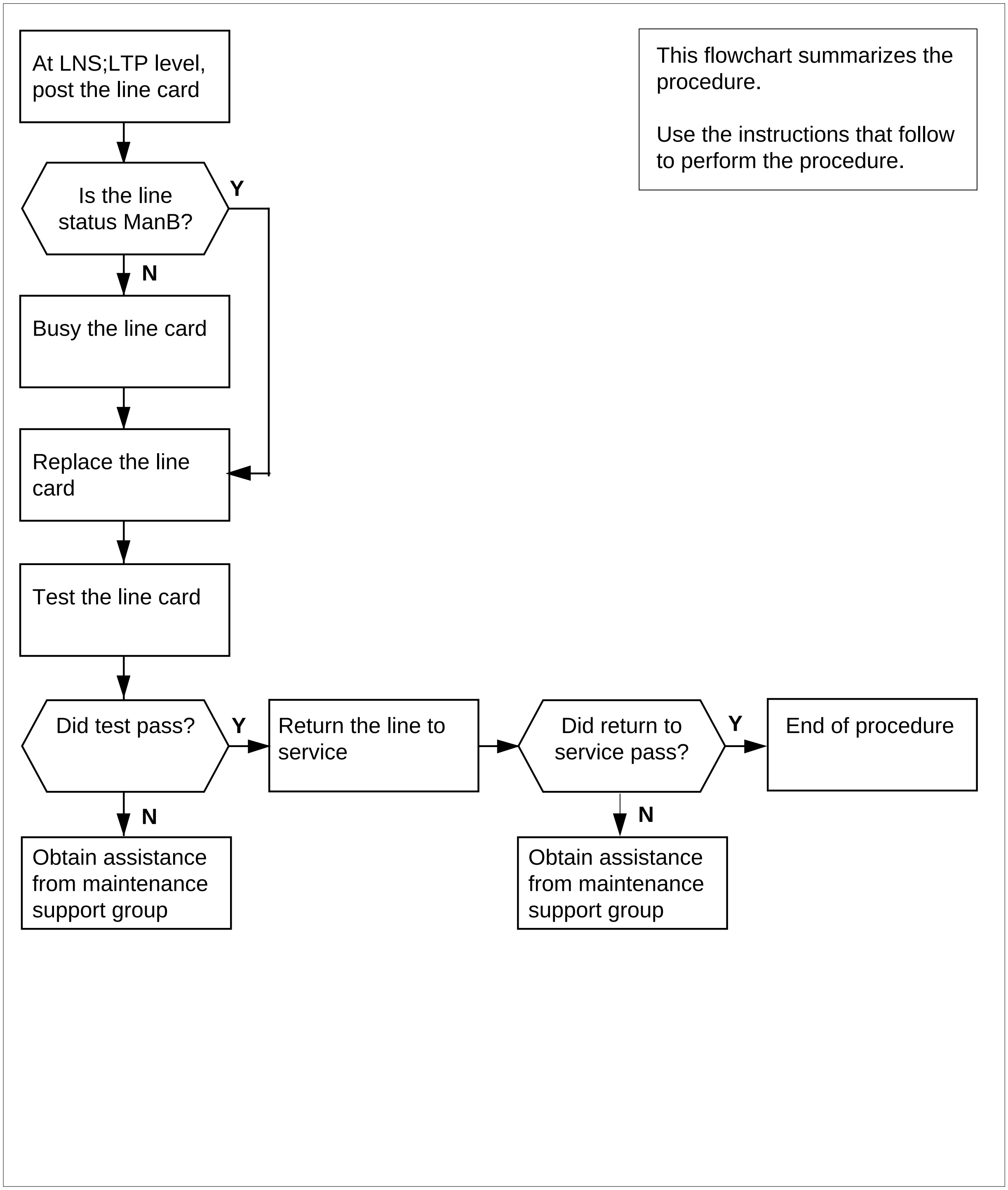
The common replacing a line card procedure is referenced in this procedure.

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.

NT6X71
in a STAR or RLD (continued)

Summary of card replacement procedure for an NT6X71 card in a STAR or RLD



NT6X71
in a STAR or RLD (continued)

Replacing an NT6X71 card in a STAR or RLD

At your current location

1 Get a replacement card. Mke sure the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP terminal

2 To access the line test position (LTP) level of the MAP display and post the line associated with the card to be replaced, type

>MAPCI;MTC;LNS;LTP;POST L site frame unit lsg ckt

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card (0 to 511)

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0 to 35)

ckt
is the number of the circuit associated with the faulty card (0 to 31)

Example of a MAP display:

```
LCC PTY RNG .....LEN.........DN   STA F S LTA TE RESULT
RES      REM1 00 0 03 03    7213355 MB
```

3 Check the status of the posted line.

If the line status is	Do
ManB	step 5
not ManB	step 4

4 To busy the line, type

>BSY

and press the Enter key.

5 Go to the common replacing a line card procedure in this document. When you have completed the procedure, return here.

NT6X71 in a STAR or RLD (end)

At the MAP

6 To test the line card just replaced, 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 Send any faulty cards for repair according to local procedure.

9 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 11.

10 Get additional help replacing this card by contacting the personnel responsible for a higher level of support.

11 You have correctly completed this procedure.

NT6X76
in a STAR or RLD

Application

Use this procedure to replace an NT6X76 card in a STAR or remote line drawer (RLD).

PEC	Suffixes	Name
NT6X76	AA, AC, AD	Asynchronous interface line card

Common procedures

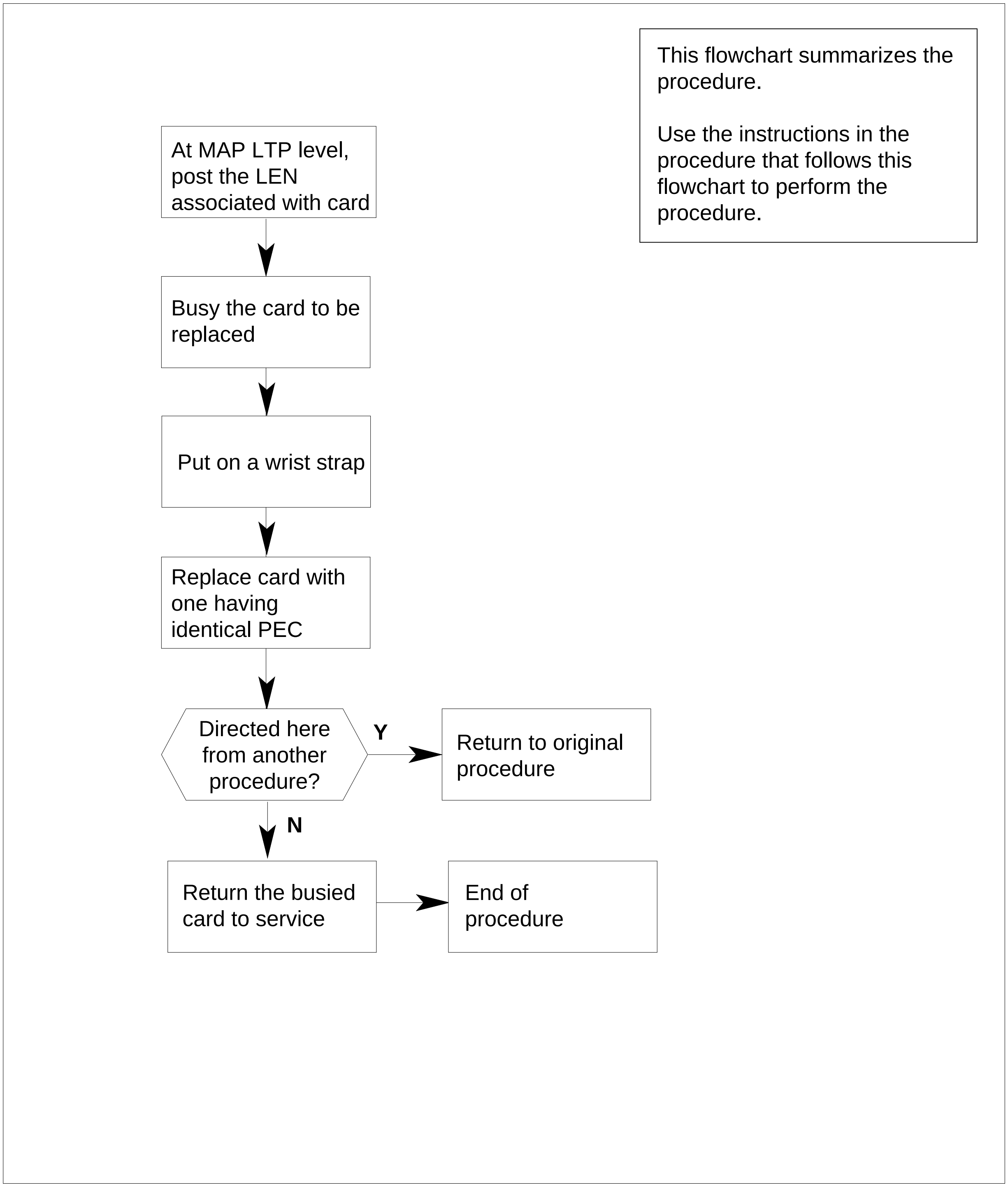
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X76
in a STAR or RLD (continued)

Summary of card replacement procedure for an NT6X76 card in a STAR or RLD



NT6X76
in a STAR or RLD (continued)

Replacing an NT6X76 card in a STAR or RLD

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

3 To post the LEN of the card to be replaced, type

>MAPCI;MTC;LNS;LTP; POST STAR site frame unit lsg ckt

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card (0 to 511)

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0 to 35)

ckt
is the number of the circuit associated with the faulty card (0 to 31)

Example of a MAP response:

```
Post        DELQ        BUSYQ        PREFIX

LCC PTY RNG....LEN...      DN     STA F S LTA TE RESULT
CKT TYPE FL    HOST 00 0 03 03
```

4 To busy the NT6X76 line card, type

>BSY

and press the Enter key.

Example of a MAP display:

```
Post        DELQ        BUSYQ        PREFIX

LCC PTY RNG....LEN......   DN     STA F S LTA TE RESULT
CKT TYPE FL  HOST 00 0 03 03
```

NT6X76
in a STAR or RLD (continued)

At the SRHE frame

5

DANGER
Card damage—transport
Take these precautions to protect the circuit cards from electrical and mechanical damage while transporting cards.

When handling a circuit card not in an electrostatic discharge (ESD) protective container, 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 switch frame (Nortel Networks Corporate Standard 5028).

Store and transport circuit cards in an ESD protective container.

DANGER
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.

DANGER
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, see the following notes.

NT6X76
in a STAR or RLD (continued)

Put on a wrist strap.

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 follow.

Line card insertion / removal tool for	Apparatus code	Common product code
3-inch cards	QTH56A	A0298291
6-inch cards	QTH58A	A0313317

Note: The card removal tool is required for removing cards from line drawers. A descriptions of this tool follows.

Card removal tool for	Apparatus code	Common product code
3-4 inch cards	QTH57A	A0298292
Note: For 4-inch or larger cards, use the large grip tool ITA9953.		

6 To prepare to remove the card with faults, open the line drawer and follow these substeps:

- **a** Face the drawer shelf and grasp the handle at the bottom of the drawer with your right hand.
- **b** Push up on the drawer latch with your thumb and pull the drawer out until fully withdrawn. It is fully withdrawn when the drawer stop, at the top, prevents further travel.
- **c** Maintain a slight pull on the handle and lift the faceplate of the drawer approximately 2.5 cm (1 in).
- **d** While holding the drawer in this position, push the bottom of the drawer nearest the shelf, with your left hand, to a position about 1 cm (.5 in) to the right.
- **e** Hold the drawer in this position with your left hand and lower the faceplate of the drawer by releasing the grip of your right hand.
- **f** Make sure a card shroud and line card extractor are available.

7 To remove the line card to be replaced, follow these substeps:

- **a** Slide a card shroud over the card to be removed and an adjacent card. If there is not an adjacent card on either side, do not use the card shroud.
- **b** Grasp the edge of the card with a line card extractor at a point midway between the top and bottom edges. Hold the extractor in your right hand.
- **c** Squeeze the handles of the extractor together to grasp the card tightly.
- **d** Hold the front cover of the line drawer to steady it using your left hand.

NT6X76
in a STAR or RLD (continued)

- **e** Pull the extractor away from the drawer and the card will become unplugged from its socket on the drawer backplane.
- **f** Continue pulling the card with the extractor until the card is clear of the shroud.
- **g** Insert the card removed into the ESD container and store using local procedures.

8 To replace the card with faults, follow these substeps:

- **a** Remove the replacement card from the ESD container.
- **b** Slide the card in the shroud guide slots toward the drawer backplane.
- **c** Hold the front cover of the line drawer with your left hand to steady it.
- **d** Grasp the top and bottom edges of the card with the fingers of your right hand.
- **e** Push the card toward the backplane until it plugs fully into the backplane socket.

9 Use the following information to determine where to proceed.

If you entered this procedure from	Do
alarm clearing procedures	step 14
other	step 10

At the MAP terminal

10 To test the NT6X76 line card, type

>DIAG

and press the Enter key.

If DIAG	Do
passes	step 11
fails	step 15

11 To return the NT6X76 card to service, type

>RTS

and press the Enter key.

If RTS	Do
passes	step 12
fails	step 15

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

NT6X76
in a STAR or RLD (end)

13 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 16.

14 Return to the procedure that directed you to this procedure. If necessary, go to the point where a faulty card list was produced, identify the next faulty card on the list, and go to the appropriate card replacement procedure for that card in this manual.

15 Get additional help replacing this card by contacting the personnel responible for a higher level support.

16 You have correctly completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT6X99 in a STAR or RLD

Application

Use this procedure to replace the following card in a STAR or remote line drawer (RLD).

PEC	Suffixes	Name
NT6X99	AA	Datapath Bit Error Rate Tester Line Card

Common procedures

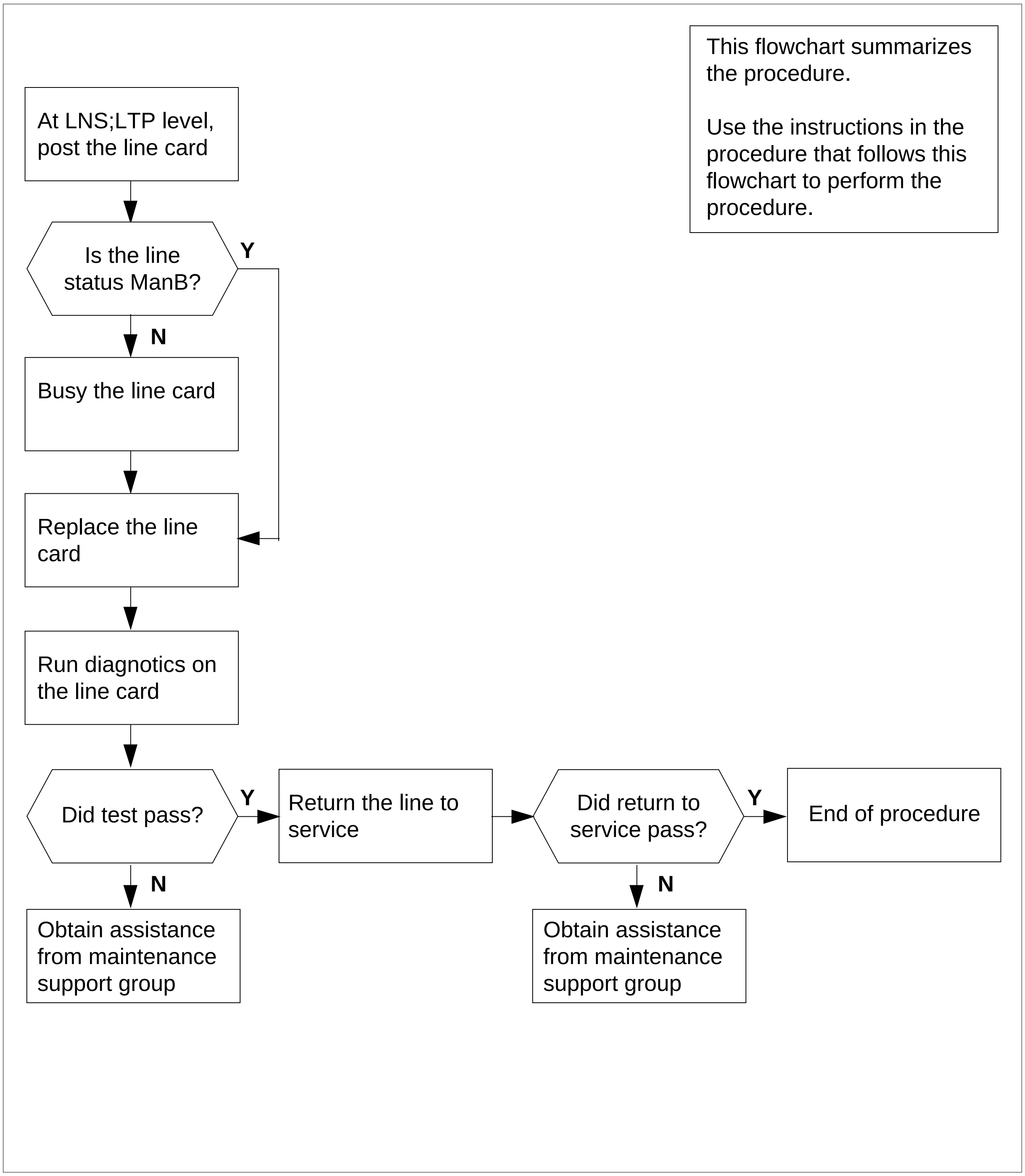
The common replacing a line card procedure is referenced in this procedure.

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.

NT6X99
in a STAR or RLD (continued)

Summary of card replacement procedure for an NT6X99 card in a STAR or RLD



NT6X99
in a STAR or RLD (continued)

Replacing an NT6X99 card in a STAR or RLD

At your current location

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

At the MAP display

2 To access the LTP level of the MAP and post the line associated with the card to be replaced, type

>MAPCI;MTC;LNS;LTP;POST L site frame unit lsg ckt

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card (0 to 511)

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0 to 35)

ckt
is the number of the circuit associated with the faulty card (0 to 31)

Example of a MAP display:

```
LCC PTY RNG .....LEN..........DN   STA F S LTA TE RESULT
RES        REM1 00 0 03 03  IBERT MB
```

3 Check the status of the posted line.

If the line status is	Do
manual busy (MB)	step 5
not MB	step 4

4 To busy the line, type

>BSY

and press the Enter key.

5 Go to the common replacing a line card procedure in this document. When you have completed the procedure, return to this point.

NT6X99
in a STAR or RLD (end)

At the MAP display

6 To test the line card just replaced, 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 the RTS	Do
passes	step 8
fails	step 10

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

9 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 11.

10 Get additional help replacing this card by contacting the personnel responsible for a higher level of support.

11 You have correctly completed this procedure.

NTBX27 in a STAR or RLD

Application

Use this procedure to replace an NTBX27 card in a STAR or remote line drawer (RLD).

PEC	Suffixes	Name
NTBX27	AA	ISDN 2B1Q U Interface Line card

Common procedures

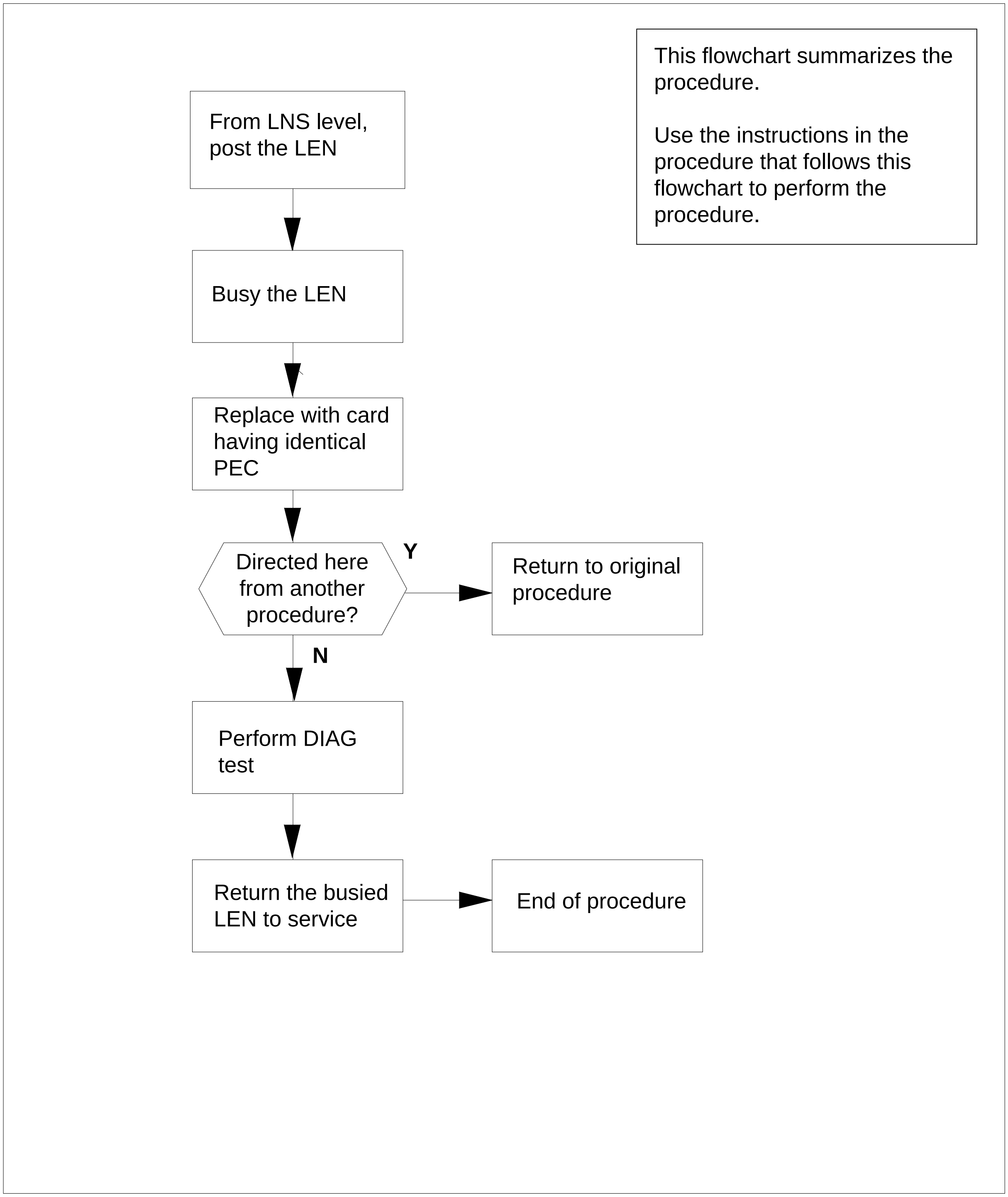
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTBX27
in a STAR or RLD (continued)

Summary of card replacement procedure for an NTBX27 card in a STAR or RLD



NTBX27
in a STAR or RLD (continued)

Replacing an NTBX27 card in a STAR or RLD

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

3 To post the LEN of the card to be replaced, type

***>mapci;mtc;lns;ltp;post l* site frame unit lsg ckt**

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card (0 to 511)

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0 to 35)

ckt
is the number of the circuit associated with the faulty card (0 to 31)

Example of a MAP display:

```
Post       DELQ       BUSYQ        PREFIX
LCC PTY RNG....LEN......DN       STA F S LTA TE RESULT
ISDN Loop    HOST 00 0 03 03  4931082  IDL
```

4 To busy the NTBX27 line card, type

>BSY

and press the Enter key.

Example of a MAP display:

```
Post       DELQ       BUSYQ        PREFIX
LCC PTY RNG....LEN......DN       STA F S LTA TE RESULT
ISDN Loop  HOST 00 0 03 03 4931082  MB
```

NTBX27
in a STAR or RLD (continued)

At the SRHE frame

5

DANGER
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.

DANGER
Card damage—transport
Take these precautions to protect the circuit cards from electrical and mechanical damage while transporting cards.

When handling a circuit card not in an electrostatic discharge (ESD) protective container, 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 switch frame (Nortel Networks Corporate Standard 5028).

Store and transport circuit cards in an ESD protective container.

DANGER
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.

NTBX27
in a STAR or RLD (continued)

Put on a wrist strap.

Note: A card shroud is required for inserting or removing cards in line drawers. A description of this shroud follows.

Line card insertion / withdrawal tool for	Apparatus code	Common product code
3-inch cards	QTH56A	A0298291

Note: A card removal tool is required for removing cards from line drawers. A descriptions of this tool follows.

Card removal tool for	Apparatus code	Common product code
3-4 inch cards	QTH57A	A0298292
Note: For 4-inch or larger cards, use the large grip tool ITA9953.		

6 To prepare to remove the faulty card, open the line drawer and follow these substeps:

- **a** Face the drawer shelf and grasp the handle at the bottom of the drawer with your right hand.
- **b** Push up on the drawer latch with your thumb and pull the drawer out until fully withdrawn. It is fully withdrawn when the drawer stop, at the top, prevents further travel.
- **c** Maintain a slight pull on the handle and lift the faceplate of the drawer approximately 2.5 cm (1 in).
- **d** While holding the drawer in this position, push the bottom of the drawer nearest the shelf, with your left hand, to a position about 1 cm (.5 in) to the right.
- **e** Hold the drawer in this position with your left hand and lower the faceplate of the drawer by releasing the grip of your right hand.
- **f** Mke sure a card shroud and line card extractor are available.

7 To remove the line card to be replaced, follow these substeps:

- **a** Slide a card shroud over the card to be removed and an adjacent card. If there is not an adjacent card on either side, do not use the card shroud.
- **b** Grasp the edge of the card with a line card extractor at a point midway between the top and bottom edges. Hold the extractor in your right hand.
- **c** Squeeze the handles of the extractor together to grasp the card tightly.
- **d** Hold the front cover of the line drawer, to steady it, using your left hand.
- **e** Pull the extractor away from the drawer and the card will become unplugged from its socket on the drawer backplane.

NTBX27
in a STAR or RLD (continued)

f Continue pulling the card with the extractor until the card is clear of the shroud.

g Insert the card removed into the ESD container and store using local procedures.

8 To replace the card with faults, follow these substeps:

a Remove the replacement card from the ESD container.

b Slide the card in the shroud guide slots toward the drawer backplane.

c Hold the front cover of the line drawer with your left hand to steady it.

d Grasp the top and bottom edges of the card with the fingers of your right hand.

e Push the card toward the backplane until it plugs fully into the backplane socket.

9 Use the following information to determine where to proceed.

If you entered this procedure from	Do
alarm clearing procedures	step 15
other	step 10

At the MAP terminal

10 To test the NTBX27 line card, type

>DIAG

and press the Enter key.

11 Use the following information to determine how to proceed.

If DIAG	Do
passes	step 12
fails	step 16

12 To return the NTBX27 card to service, type

>RTS

and press the Enter key.

If RTS	Do
passes	step 13
fails	step 16

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

NTBX27 in a STAR or RLD (end)

14 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 17.

15 Return to the procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

16 Get additional help replacing this card by contacting personnel responsible for a higher level of support.

17 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTEX17
in a STAR

Application

Use this procedure to replace the following card in a Star Hub line drawer.

PEC	Suffixes	Name
NTEX17	DA	xDSL line card

Common procedures

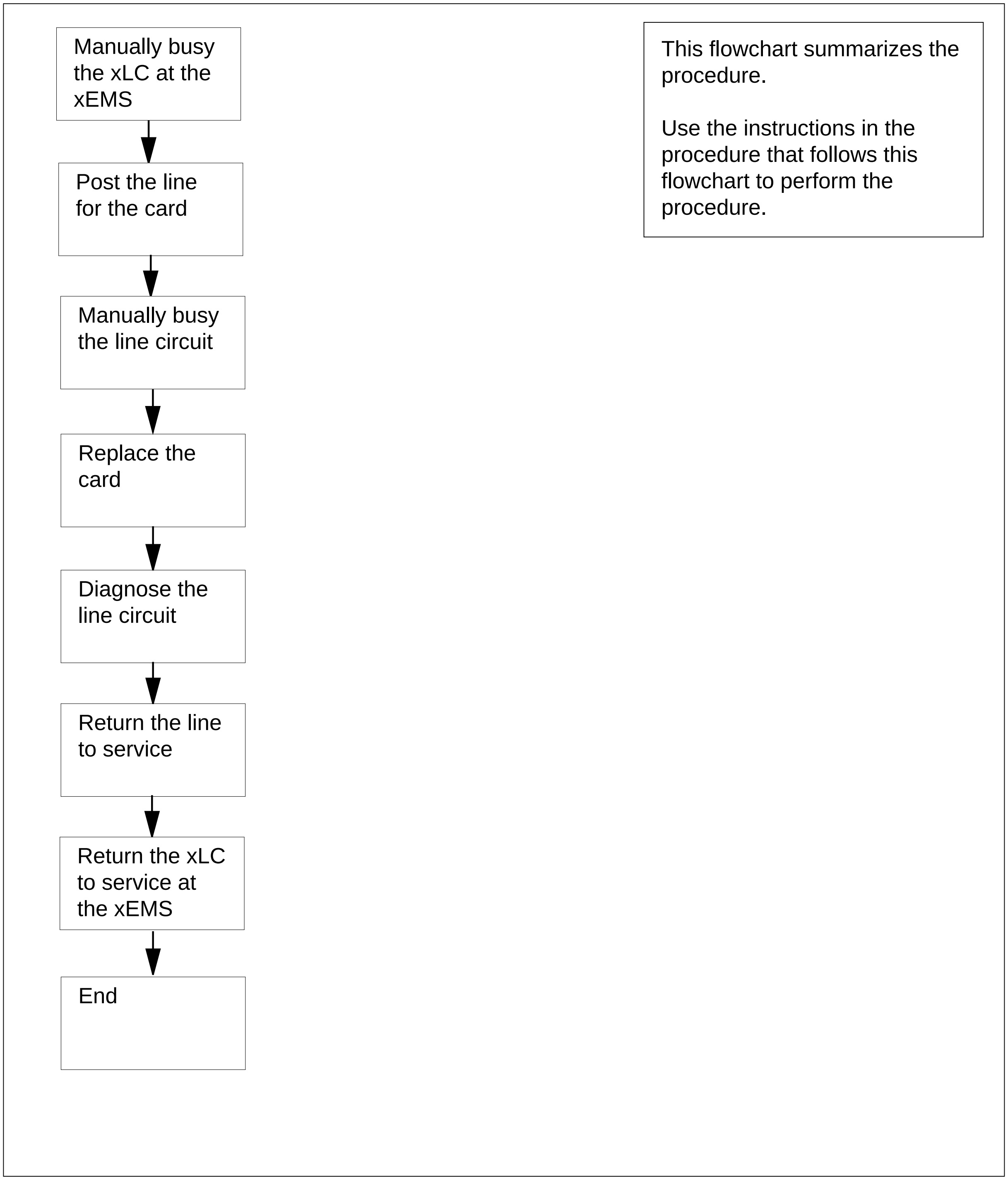
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTEX17
in a STAR (continued)

Summary of replacing an NTEX17 in a STAR



NTEX17
in a STAR (continued)

Replacing an NTEX17 in a STAR

At your current location

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for checking or accepting cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure that the replacement card and the card that you remove have the same product engineering code (PEC) and PEC suffix.

At the xEMS workstation

3 Go to the submap of the STAR line drawer with the NTEX17 card to be replaced.

4 Place the cursor on the XLC you want to busy and use the mouse to select

`Maintenance : XLC -> MB`

and press the Enter key.

At the MAP terminal

5 To access the LTP level of the MAP display, type

`>MAPCI;MTC;LNS;LTP`

and press the Enter key.

Example of a MAP display:

```
POST        DELQ           BUSYQ        PREFIX

LCC PTY RNG .....LEN.........DN    STA F S LTA  TE  RESULT
```

> ***Note:*** If you worked at the LTP level of the MAP display, a posted line can be present. A posted line does not interfere with this maintenance procedure.

6 To post the line for the card to be replaced, type

`>POST L site frame_no unit_no drawer_no slot_no`

and press the Enter key.

where

site
is the PM location (alphanumeric)

frame_no
is the frame number (0 to 511)

unit_no
is the PM unit number (0 or 1)

NTEX17
in a STAR (continued)

drawer_no
is the line drawer number (0 to 19)

ckt_no
is the card slot number (0 to 31)

Example of a MAP display:

```
LCC PTY RNG .....LEN..........     DN    STA F S LTA  TE  RESULT
1FR          REM1 01 0 01 01     621 1134 IDL
```

7 Determine the state of the posted line.

If the state of the line	Do
is CPB, CPD	step 8
is CUT, HAZ, IDL, LO, PLO, SB	step 9
is MB	step 10
is NEQ	To determine why the component is offline or not equipped, consult operating company personnel. Continue as directed by operating company personnel.
is DEL, DMB, INB, LMB	step 23

8 Wait until the line state changes. Go to step 7.

9 To manually busy the line circuit, type

>BSY

and press the Enter key.

Example of a MAP display:

```
LCC PTY RNG .....LEN..........     DN    STA F S LTA  TE  RESULT

1FR           REM1 01 0 01 01     621 1134 MB
```

Note: Observe that the state that appears under the STA header changed to MB.

If BSY command	Do
passes	step 10
fails	step 23

NTEX17
in a STAR (continued)

At the MAP terminal

10 To display the cabinet location of the line card with faults, type

>CKTLOC

and press the Enter key.

Example of a MAP display:

```
Site Flr RPos  Bay_id   Shf  Description    Slot      EqPEC
REM1  01  B04  SRHE01   03  HUB  01 0     01:00     EX17DA

 GRD START   2DB LOSS   BANETWORK   MAN OVR SET
   NO          NO       NON LOADED        NO
```

Note: In the example MAP display, the line card is an NTEX17DA and the location of the card is

Site
in the remote site

Flr
on the 1st floor

RPos
row B is the location of the Star Hub bay 04

Bay_id
in Star Remote Hub Equipment (SRME), bay 01

Shf
in shelf 03

Description
in hardware device HUB, bay 01

Slot
in line drawer 01, slot 00

NTEX17
in a STAR (continued)

At the shelf

11

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to a wrist-strap grounding point to handle circuit cards. The wrist-strap grounding point is on the frame supervisory panel (FSP). The wrist strap protects the cards against static electricity damage.

> **WARNING**
> **Risk of equipment damage**
> Take these precautions when removing or inserting a card:
>
> 1. Do not apply direct pressure to the components.
> 2. Do not force the card into its slot.

> **WARNING**
> **Risk of equipment damage**
> Proceed only if a step in a maintenance procedure directs you here. If you perform this procedure without permission, equipment damage can occur.

> **DANGER**
> **Risk of electrocution**
> Proceed only if a step in a maintenance procedure directs you here. If you perform this procedure without permission, personal injury can occur.

Put on an ESD wrist strap.

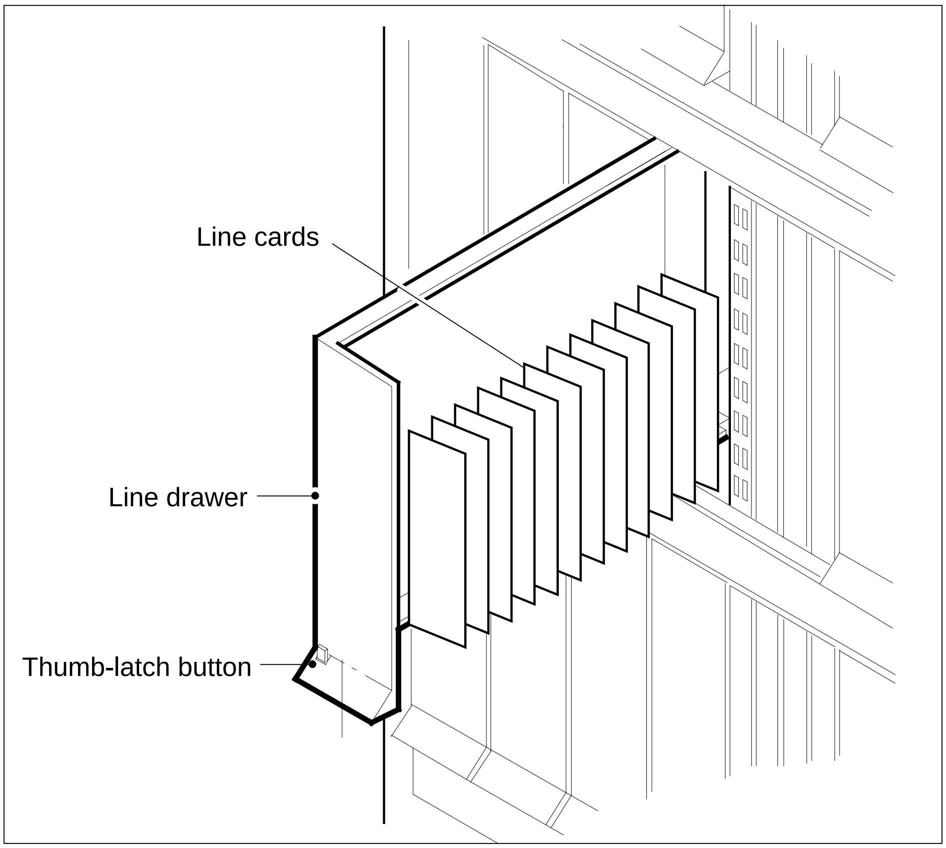
Note 1: A card shroud is required to insert or remove an NTEX17 card in line drawers. This is a 6-inch (152 mm) card, and requires the card shroud with apparatus code QTH58A and common product code A0313317.

Note 2: A card removal tool is required to remove the NTEX17 card from line drawers. The apparatus code for the grip tool is QTH57A, and the common product code is A0298292. You can also use the large grip tool ITA9953.

12 Use the information you obtained in step 6 to locate the physical location of the line card.

NTEX17
in a STAR (continued)

13 Prepare to remove the faulty card identified in step 6 by opening the line drawer and following these substeps.



a Face the drawer shelf and hold the handle at the bottom of the drawer with your right hand.

b Push up on the drawer latch with your thumb and pull the drawer out until fully withdrawn. It is fully withdrawn when the drawer stop, at the top, prevents further travel.

c Maintain a slight pull on the handle and lift the faceplate of the drawer approximately 2.5 cm (1.0 in.).

d While holding the drawer in this position, push the bottom of the drawer nearest the shelf with your left hand to a position about 1.0 cm (0.5 in) to the right.

e Hold the drawer in this position with your left hand and lower the faceplate of the drawer by releasing the grip of your right hand.

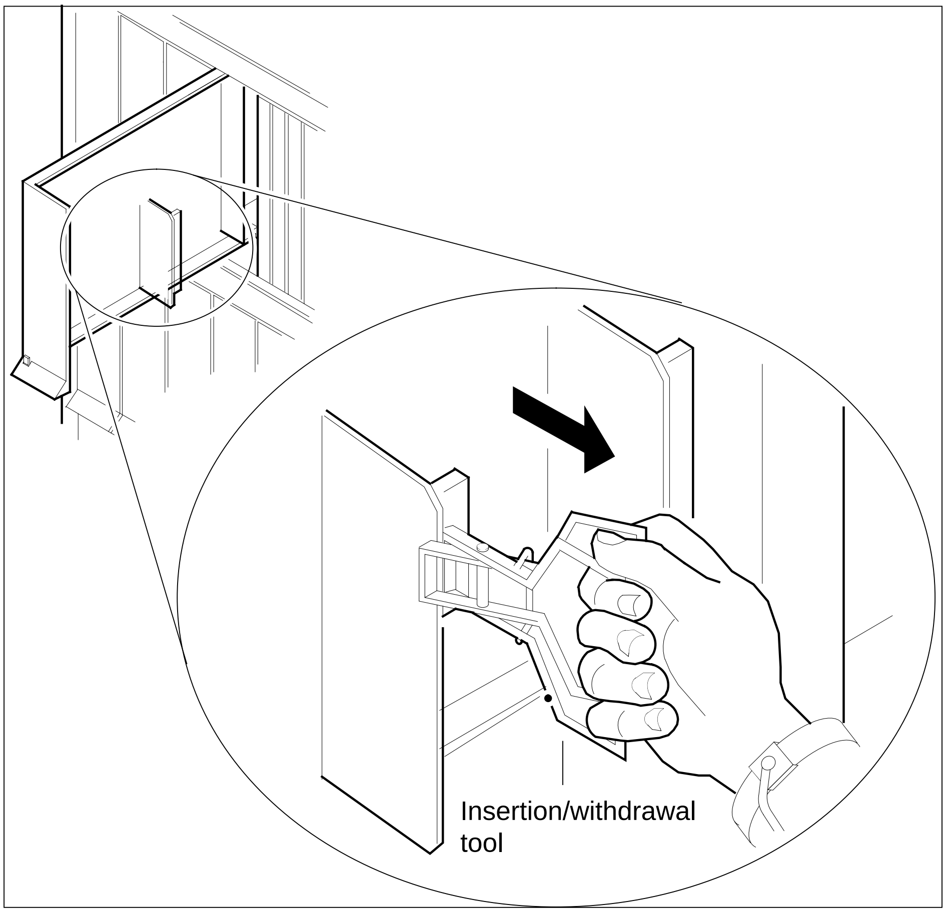
f Make sure a card shroud and line card extractor are available.

NTEX17
in a STAR (continued)

14

DANGER
Risk of personal injury
Make sure you handle the line card carefully. The line feed resistor can be very hot. To avoid injury, use the insertion/withdrawal tool to remove the card as shown in the figure that follows.

Remove the line card to be replaced by using the following substeps:



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 Hold the edge of the card with a line card extractor at a point in the center between the top and bottom edges. Hold the extractor in your right hand.

c Squeeze the handles of the extractor together to hold the card tightly.

NTEX17
in a STAR (continued)

d Hold the front cover of the line drawer to steady it using your left hand.

e Pull the extractor away from the drawer, and the card disconnects from its socket on the drawer backplane.

f Continue pulling the card with the extractor until the card is clear of the shroud.

g Insert the card removed into the ESD container and store using local procedures.

15 Replace the faulty card using the following substeps:

a Remove the replacement card from the ESD container.

b Slide the card in the shroud guide slots toward the drawer backplane.

c Hold the front cover of the line drawer with your left hand to steady it.

d Hold the top and bottom edges of the card with the fingers of your right hand.

e Push the card toward the backplane until it plugs fully into the backplane socket.

16 Close the line drawer.

At the MAP terminal

17 To perform a diagnostic test on the line, type

>DIAG

and press the Enter key.

Example of a MAP response:

```
ECOME004AH ***+LINE100 JUL17 10:04:26 0200 PASS LN_DIAG
         LEN REM1 01 0 01 01       NO DIRN
         DIAGNOSTIC RESULT   Card Diagnostic   OK
         ACTION REQUIRED  None
         CARD TYPE  EX17DA
```

If the DIAG command	Do
passes	step 18
fails	step 23

18 To return the line to service, type

>RTS

and press the Enter key.

If RTS command	Do
passes	step 19
fails	step 23

NTEX17 in a STAR (end)

At the xEMS workstation

19 At the submap of the LCM line drawer with the NTEX17 card that you replaced.

20 Place the cursor on the the XLC card you want to return the card to service and use the mouse to select

`Maintenance : XLC -> IDL`

and press the Enter key.

21 Send any cards with faults for repair according to local procedure.

22 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 24.

23 Get additional assistance in replacing this card by contacting personnel responsible for a higher level of support.

24 The procedure is complete.

NTEX54
in a STAR

Application

Use this procedure to replace the following cards in a Star Hub line drawer.

PEC	Suffixes	Name
NTEX54	CA	Data enhanced bus interface card (DBIC)

Common procedures

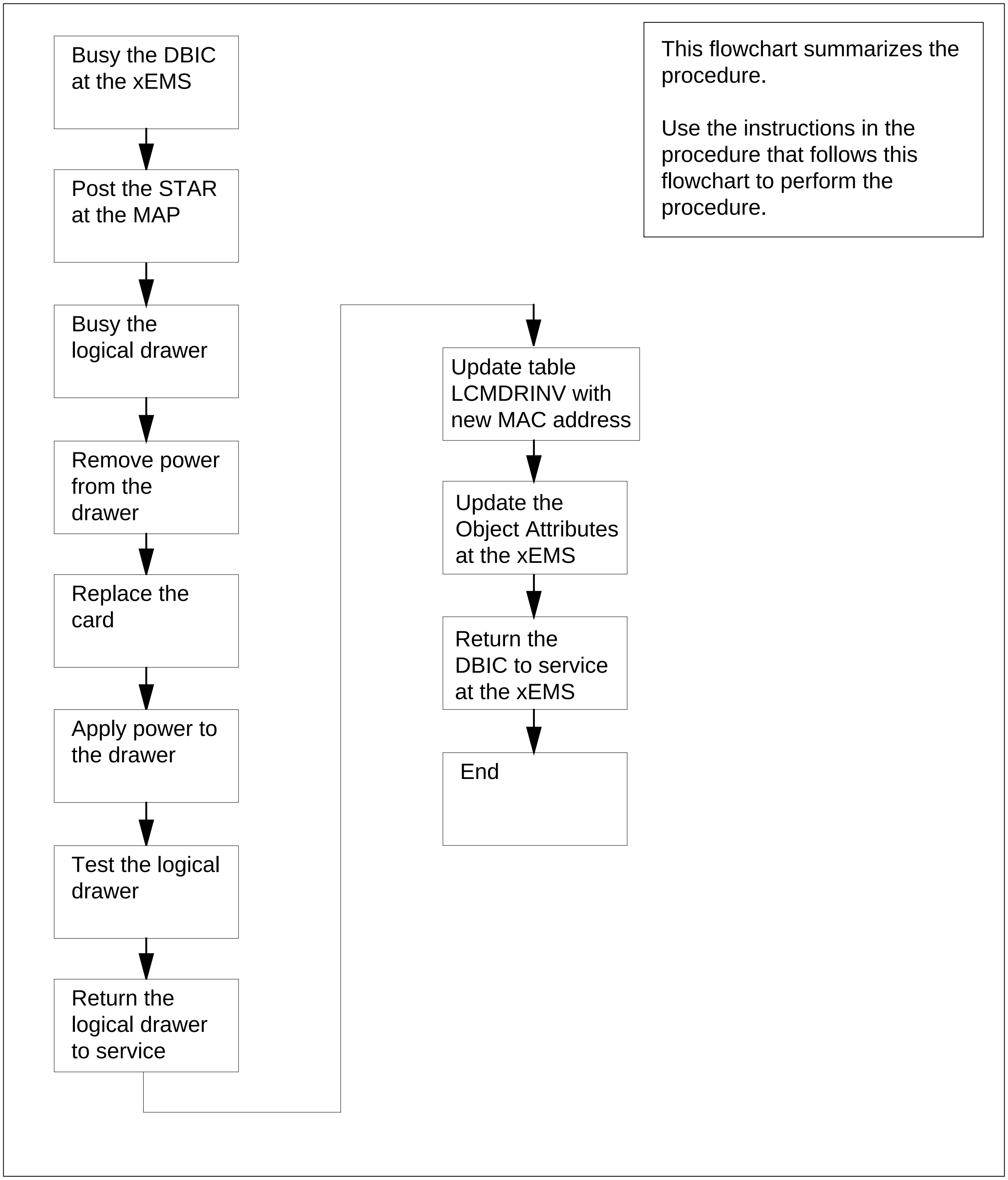
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTEX54 in a STAR (continued)

Summary of replacing an NTEX54 in a STAR



NTEX54
in a STAR (continued)

Replacing an NTEX54 in STAR

At your current location

1

> **CAUTION**
> **Loss of service**
> This procedure directs you to manually busy a line drawer. Removal of a line drawer from service can cause the system to drop calls in progress. Perform this procedure only if you need to restore out-of-service components. Unless it is urgent, perform this procedure during periods of low traffic.

Get a replacement card. Make sure that the replacement card and the card that you remove have the same product engineering code (PEC) and PEC suffix.

2

> **CAUTION**
> **Transport network must know new MAC address**
> Work with the network administrator during this procedure. The transport network must know the MAC address of the new DBIC before the DBIC can support 1-Meg Modem Service.

Write down the 12-digit number stamped on the new NTEX54 card. This number is the media access control (MAC) address. You will use the MAC address later in this procedure.

At the xEMS workstation

3 Go to the submap of the STAR line drawer with the NTEX54 card to be replaced.

4 Place the cursor on the data-enhanced bus interface card (DBIC) you want to busy and use the mouse to select

`Maintenance -> DBIC -> ManB`

from the pop-up menu.

NTEX54
in a STAR (continued)

At the MAP terminal

5 To access the peripheral module (PM) level of the MAP (maintenance and administration position) display and post the STAR, type

>MAPCI;MTC;PM;POST STAR site frame_no unit_no

and press the Enter key.

where

site
is the site name (alphanumeric) of the STAR

frame_no
is the equipment frame number (00 to 511) of the STAR

unit_no
is 0 for the STAR

Example of a MAP display:

```
STAR  REM1  O1 1 ISTb   Links_OOS: CSide 0 PSide 0 UMP OOS: 0
Unit  0:  InSv  Mtce      /RG:  0
Unit 1:  InsV  Mtce      /RG:  0                RG

                        11 11 11 11 11 22 22 22 22 22 33 33 33 Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45 Stby 1 InSv
..   ..  SS  ..  ..  ..   ..   ..        ..  ..  ..  .. ..  ..  ..  ..  ..  ..
```

6 Record the numbers of the logical drawers for the NTEX54.

Note: Logical drawers configure in pairs for the physical drawer. The NTEX54 services the physical drawer. Both logical drawers must be manually busy to perform this card replacement procedure.

7 Check the state of the affected logical drawers.

If the state for	Do
one or both logical drawers is I,S, or . (dot)	step 8
both logical drawers is M	step 11
one or both logical drawers is 0 or -	Determine why the drawer is offline. If necessary, contact the next level of support.

8 To manually busy the logical drawer, type

>BSY DRWR drwr_no

and press the Enter key.

where

NTEX54
in a STAR (continued)

drwr_no
is the logical drawer number (0 to 23)

Example of a MAP response:

STAR REM1 01 Drwr 4 will be taken out of service
Please confirm (“YES”, “Y”, “NO”, or “N”):

9 To confirm the command, type

>YES

and press the Enter key.

Example of a MAP response:

STAR REM1 01 1 Drwr 4 Bsy Passed

If	Do
you must busy the other logical drawer of the pair	step 10
both logical drawers are now M	step 11

10 Busy the other logical drawer of the pair.

>BSY DRWR drwr_no

and press the Enter key.

where

drwr_no
is the logical drawer number (0 to 23)

Example of a MAP response:

STAR REM1 01 1 Drwr 5 Bsy Passed

NTEX54
in a STAR (continued)

At the SRHE frame

11

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist-strap grounding point to handle circuit cards. The wrist-strap grounding point is on the frame supervisory panel (FSP). The wrist strap protects the cards against static electricity damage.

> **WARNING**
> **Potential equipment damage**
> Note the fuses that you remove from the fuse panel. If you do not insert fuses in the correct location on the fuse panel, equipment damage occurs.

> **WARNING**
> **Equipment damage**
> Take these precautions when removing or inserting a card:
>
> 1. Do not apply direct pressure to the components.
> 2. Do not force the card into its slot.

Remove fuses for the line drawer containing the faulty DBIC. Refer to the figure and table that follow to identify the correct fuses. Perform the following steps.

a Remove the -48V fuse for the line drawer that contains the faulty DBIC.

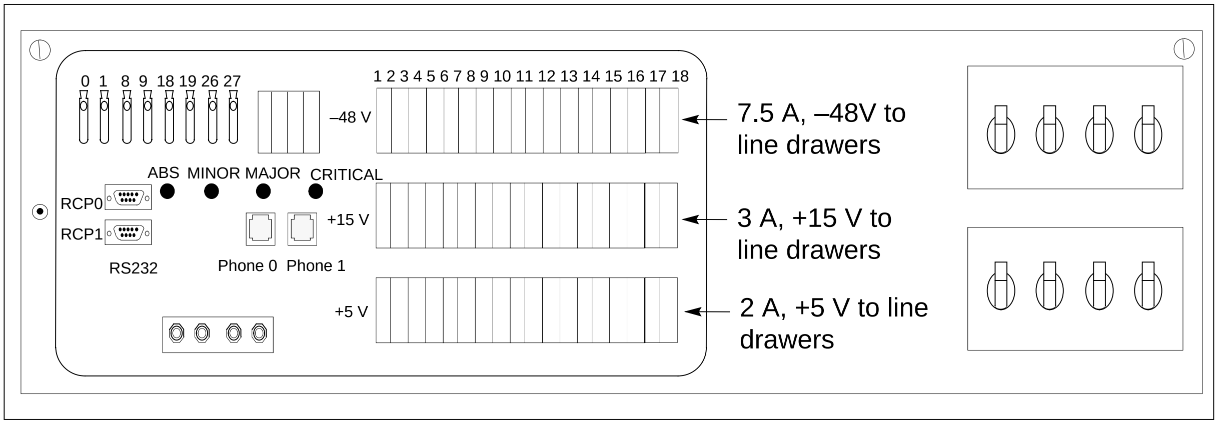
b Remove the +15V fuse for the line drawer that contains the faulty DBIC.

c Remove the +5V fuse for the line drawer that contains the faulty DBIC.

Note: The line drawer fuses are grouped and labeled as +5 V, +15 V, and -48 V and are numbered from 1 to 18. The line drawers are numbered from 1 to 18. Any +5 V, +15 V, or -48 V fuse in position 1 is associated with line drawer 1 and any fuse in position 2 is associated with line drawer 2, and so forth.

NTEX54
in a STAR (continued)

FSP front panel layout



Relationship of line drawer to FSP fuse numbers (Sheet 1 of 2)

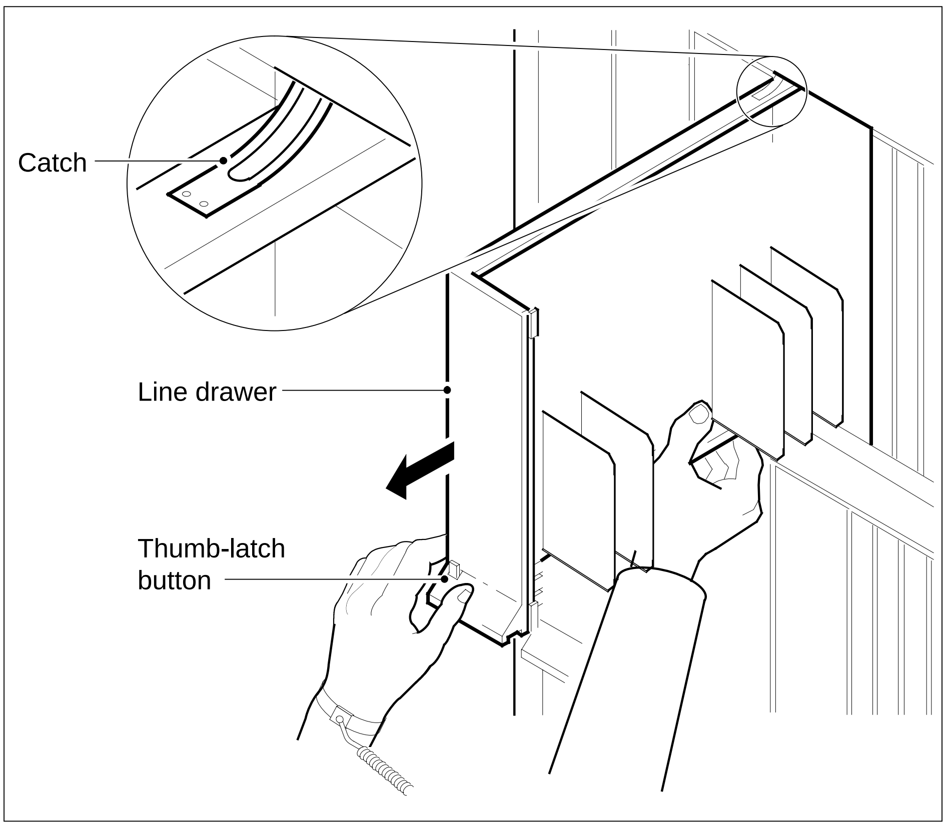
	FSP FUSE numbers		
Line drawer	**+5 V**	**+15 V**	**-48 V**
1	01	01	01
2	02	02	02
3	03	03	03
4	04	04	04
5	05	05	05
6	06	06	06
7	07	07	07
8	08	08	08
9	09	09	09
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14

NTEX54
in a STAR (continued)

Relationship of line drawer to FSP fuse numbers (Sheet 2 of 2)

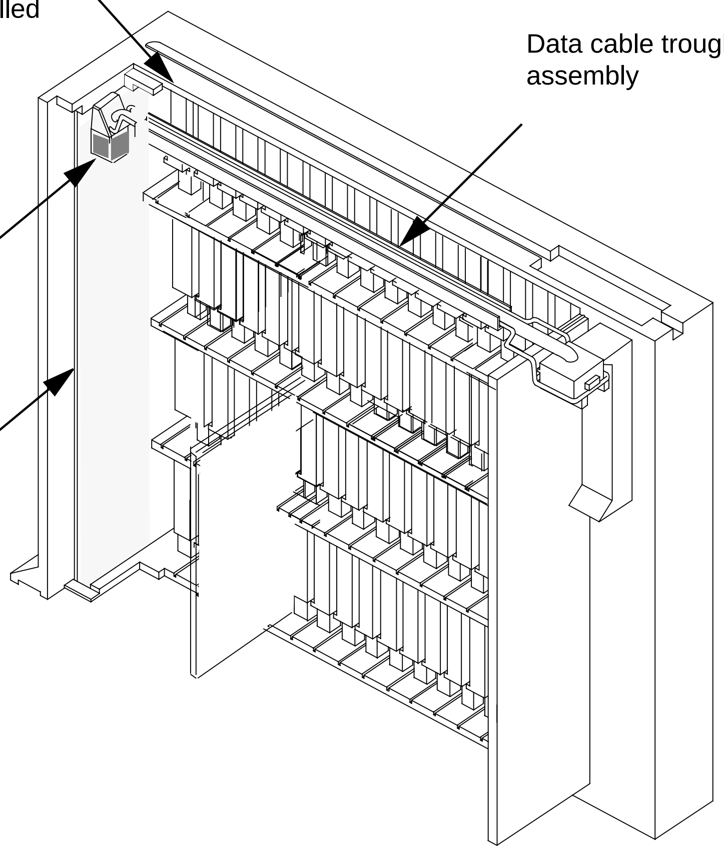
	FSP FUSE numbers		
Line drawer	**+5 V**	**+15 V**	**-48 V**
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18

12 Identify the drawer. Press the small thumb-latch button on the lower left edge of the drawer. Pull the drawer out. To secure the drawer in a steady horizontal position, tip the drawer until the catch rests on the line drawer track.



13 Disconnect the data cable from the RJ-45 connector on the DBIC. The RJ-45 connector is located at slot position 16 of the odd LSG (connector slot). Refer to the following figure.

NTEX54
in a STAR (continued)

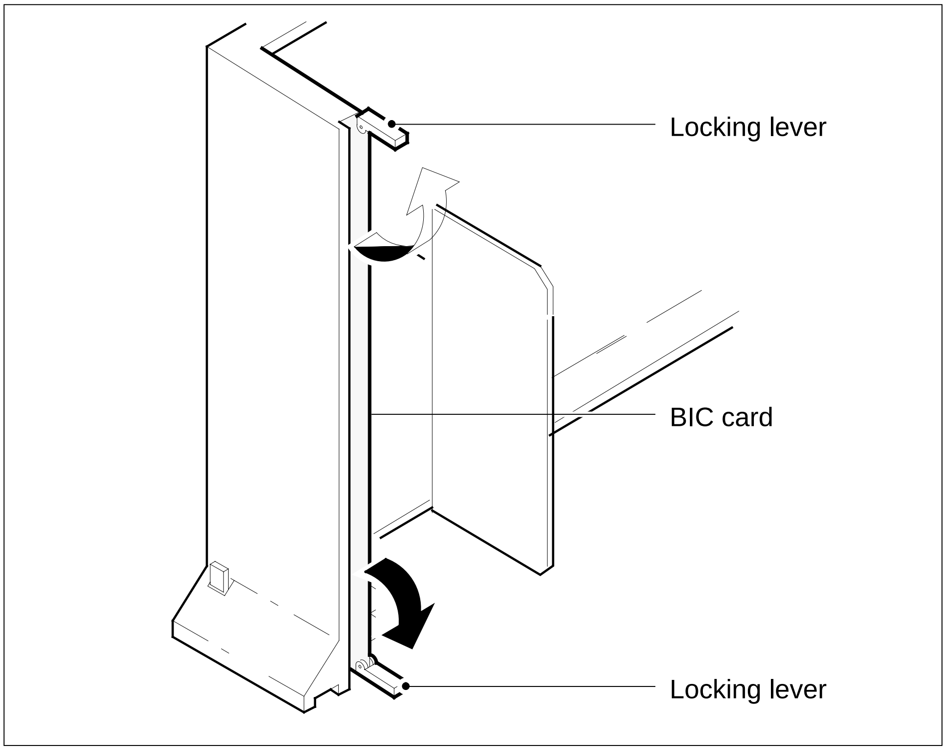


14

WARNING
Do not hold the card by the levers only
If you hold a card by the locking levers only, the levers can break. Pull the card half way out of the slot. Carefully grasp the card from below for more support. Continue to remove the card from the drawer. Make sure that you do not touch any wires or internal parts on the card.

NTEX54
in a STAR (continued)

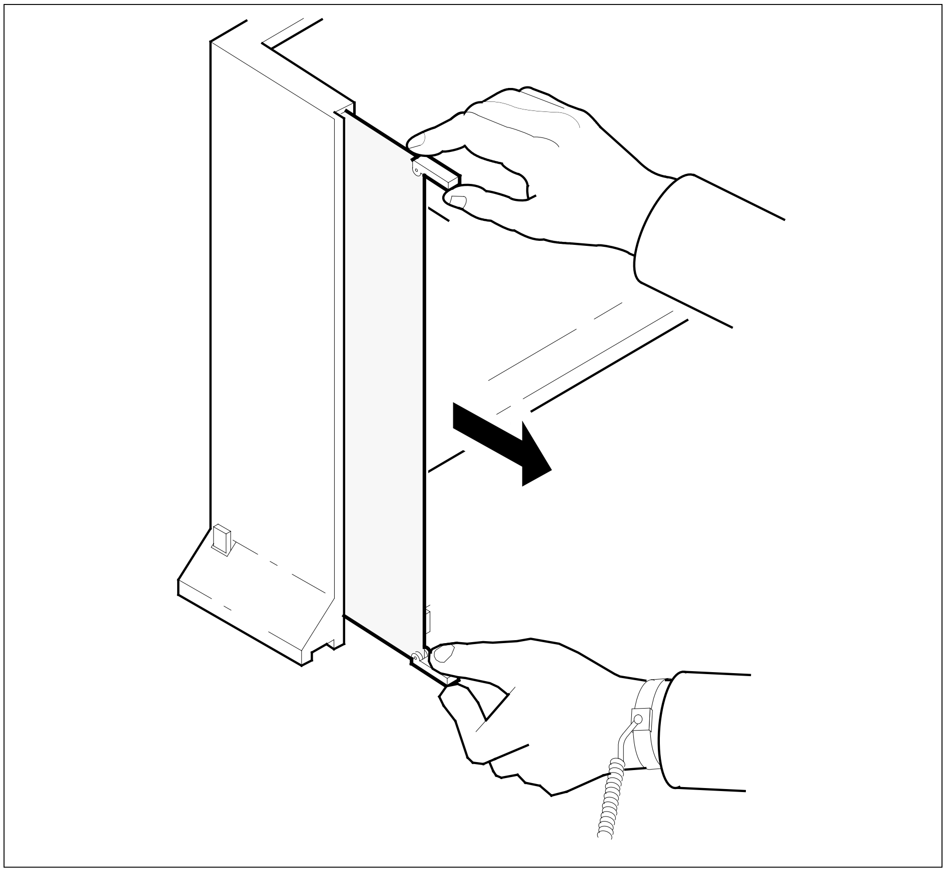
Open the locking levers on the face of the card.



15 Hold the locking levers. Carefully pull the card toward you until the card clears the drawer.

Note: Do not use a rocking motion to remove the card.

NTEX54
in a STAR (continued)



16 Place the card that you removed in an electrostatic discharge (ESD) protective container.

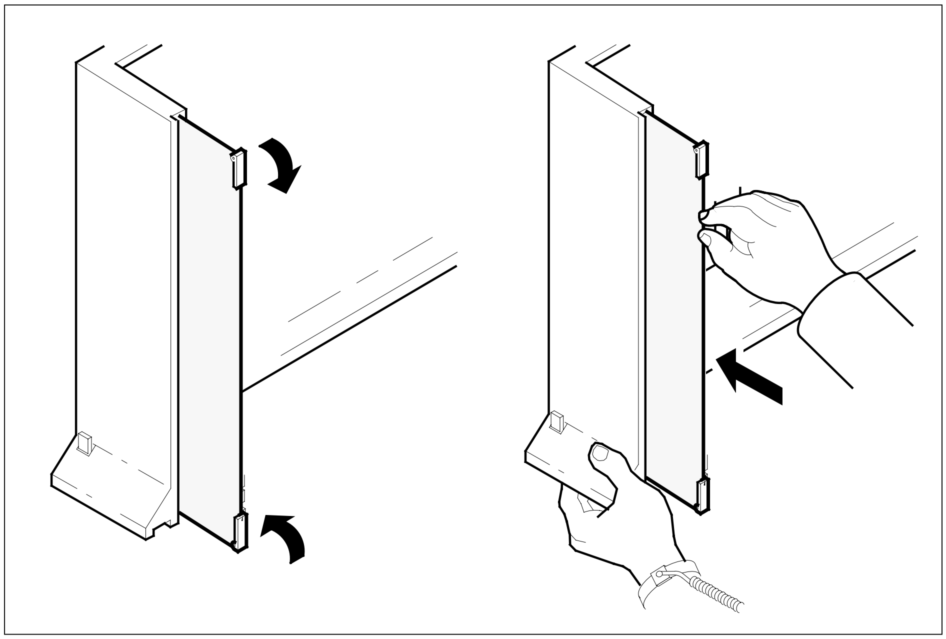
17 Make sure that the replacement card and the card that you remove have the same PEC and PEC suffix.

18 Close the locking levers on the replacement card. Align the card with the pin slots in the drawer. Carefully slide the card into the drawer.

19 Support the drawer with your left hand. Use your right hand to push on the upper and lower edges of the card. Make sure that the card sits completely in the drawer.

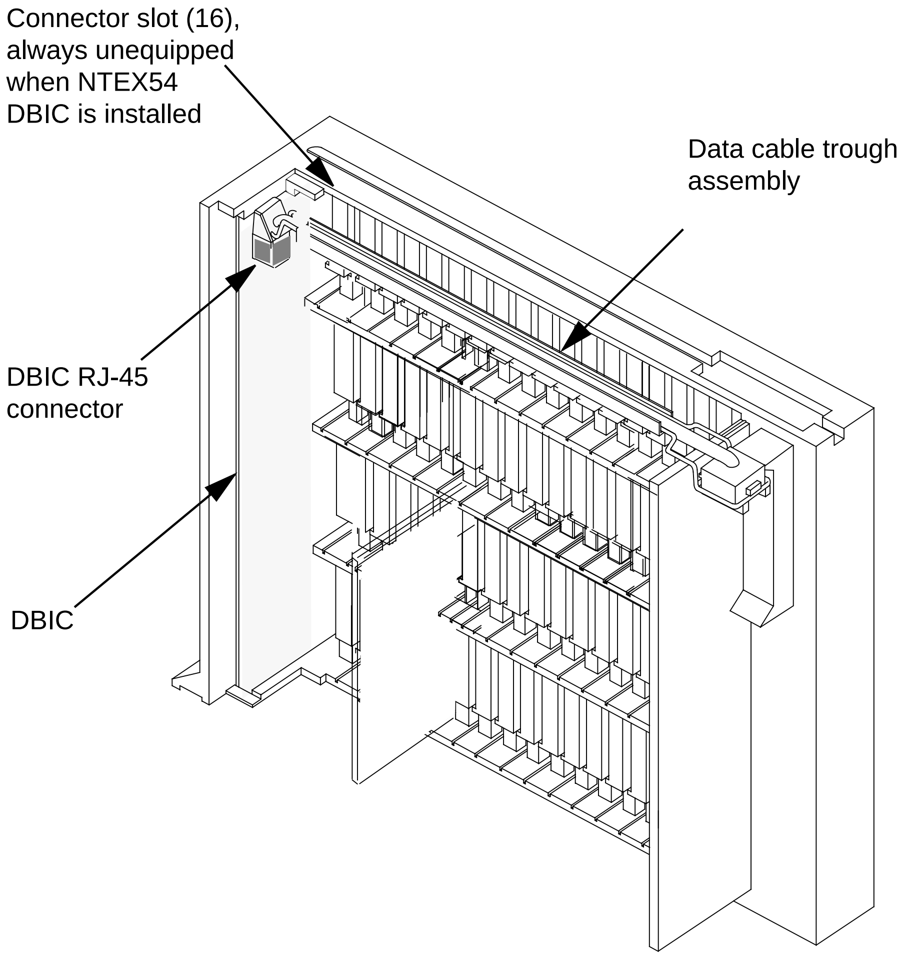
Note: Do not use a rocking motion to insert the card.

NTEX54
in a STAR (continued)



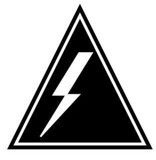
20 Connect the data cable to the RJ-45 connector that you disconnected in step 13. Refer to the following figure.

NTEX54
in a STAR (continued)



21 Close the line drawer.

22



WARNING
Potential equipment damage
Make sure you insert the fuses in the correct location on the fuse panel to prevent equipment damage.

Insert the fuses that you removed in step 11. Refer to the following figure.

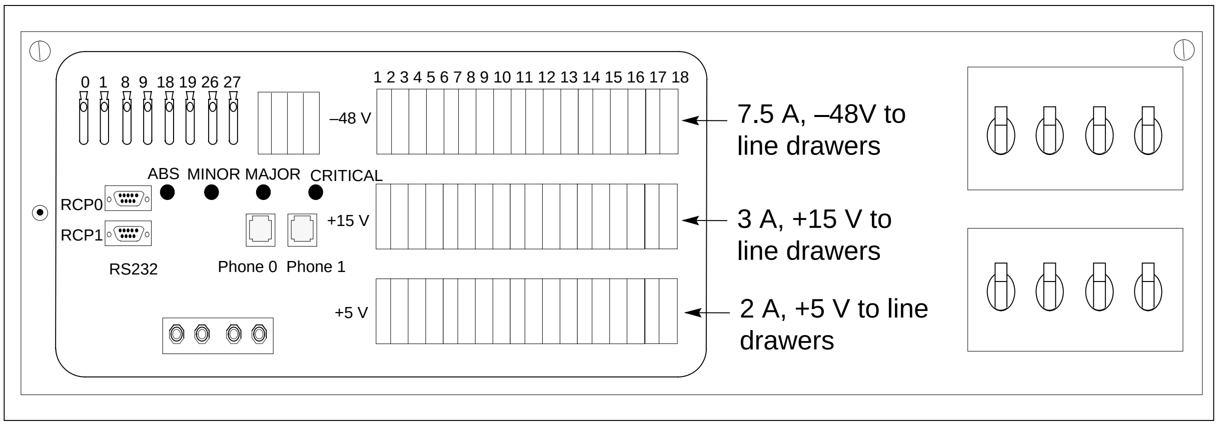
NTEX54
in a STAR (continued)

a Insert the +5V fuse.

b Insert the +15V fuse.

c Insert the -48V fuse.

FSP front panel layout



At the MAP terminal

23 A maintenance flag (Mtce) can appear. This flag indicates that system-initiated maintenance tasks are in progress. To stop the system-initiated maintenance tasks, type

>ABTK

and press the Enter key.

24 To return the logical drawer to service, type

>RTS DRWR drwr_no

and press the Enter key.

where

drwr_no
is the logical drawer number (0 to 17)

Example of a MAP response:

```
OSvce Tests Initiated
STAR REM1 00 0 Drwr 4 Tst Passed
STAR REM1 00 0 Drwr 4 Rts Passed
```

If the RTS command	Do
passes, and you must return the other logical drawer to service	step 25
passes, and the other logical drawer is in service	step 26

NTEX54
in a STAR (continued)

If the RTS command	Do
fails	step 39

25 Repeat step 24 for the other logical drawer in the pair.

26 Update table LCMDRINV.

Note: Make sure you have the new MAC address from the replacement card as recorded in step 2.

a To open table LCMDRINV, type

`>TABLE LCMDRINV`

and press the Enter key.

b To position on the tuple for the STAR, type

`>POS site_name frame_no lcm_no`

and press the Enter key.

where

site_name
is the name of the site

frame_no
is the number of the frame

lcm_no
is the number of the STAR

c To begin changing the tuple, type

`>CHA`

and press the Enter key.

d To continue processing, type

`>Y`

and press the Enter key.

e Press the Enter key to scroll through the fields until you access the field with the MAC address.

f Enter the new MAC address. Type

`>drwr_id card_pec drwr_pec mac_address ip_address`

and press the Enter key.

where

drwr_id
is the physical number of the drawer

card_pec
is NTEX54AA, NTEX54AB, NTEX54BA, or NTEX54CA

drwr_pec
is the PEC of the drawer

NTEX54
in a STAR (continued)

mac_address
is the MAC address of the new NTEX54

ip_address
is the IP address of the new NTEX54

g Press the Enter key to scroll through remaining fields.

h Confirm the change. Type

>Y

and press the Enter key.

i Exit the table. Type

>QUIT

and press the Enter key.

At the xEMS workstation

27

> **CAUTION**
> **Transport network must know new MAC address**
> Before you return the DBIC to service, you must provide the MAC address for the DBIC to the transport network. Contact the network administrator for assistance.

Go to the submap of the STAR line drawer with the new NTEX54 card.

28 Select the card by placing the cursor on the DBIC.

29 From the pop-up menu select Describe/Modify Object. The Object Description dialog box appears.

30 From the Object Description dialog box, select HSTP Application from the fields under Object Attributes.

31 Select View/Modify Object Attributes.

32 Enter the new MAC address in the %LAC MAC Address field, for example, 0060381120a1.

33 Click the Verify button to check the information.

34 Click the OK button to close the Attributes dialog box.

35 Click OK to close the Object Description dialog box.

36 Place the cursor on the DBIC you want to return to service and use the mouse to select

Maintenance -> DBIC -> Rts

from the pop-up menu.

37 Send any cards with faults for repair according to local procedure.

NTEX54
in a STAR (end)

38 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 40.

39 Get additional help in replacing this card by contacting the personnel responsible for higher level of support.

40 You have correctly completed this card replacement procedure.

NTMX81
in a STAR

Application

Use this procedure to replace an NTMX81 card in a STAR.

PEC	Suffixes	Name
NTMX81	AA	Dual DS-1 Interface

Common procedures

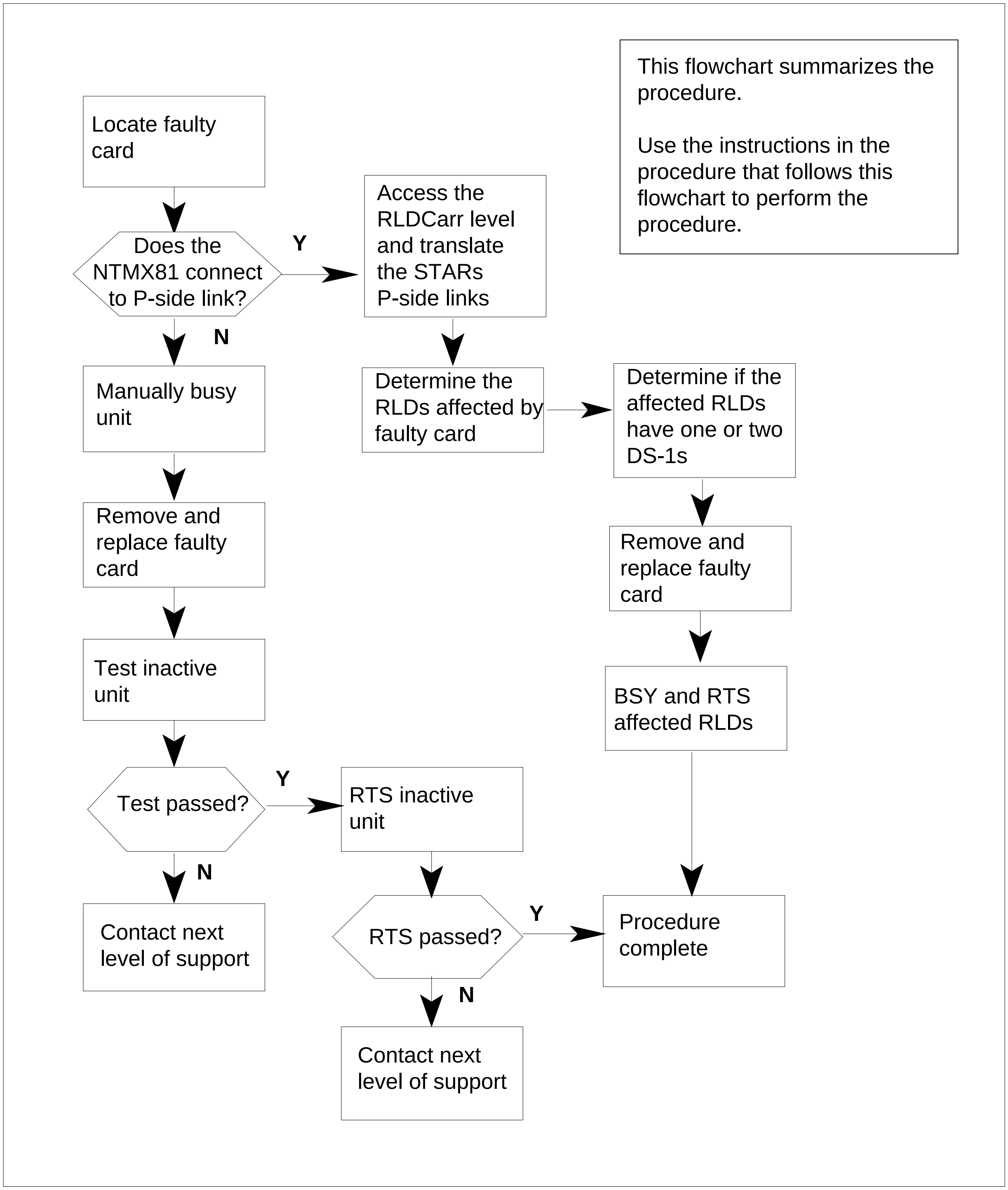
None

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.

NTMX81
in a STAR (continued)

Summary of card replacement procedure for an NTMX81 card in a STAR



NTMX81
in a STAR (continued)

Replacing an NTMX81 card in a STAR

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for checking or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

3 To access the PM level and post the STAR, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card (0 to 511)

unit
is 0 for the STAR

Example of a MAP response:

```
SysB     ManB     OffL     CBsy     ISTb      InSv
PM      0        0        2        0        1          12
STAR     0        0        2        0        1           9

STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb                /RG: 0
Unit 1:  InSv                /RG: 0                   RG:
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

4 Determine the slot location of the NTMX81 with faults.

If the NTMX81 is in an NTTR87 in slot	Do
8 or 16 (C-side DS-1 links to host PM)	step 5
9, 10, 14, or 15 (P-side DS-1 links to Star Module)	step 11

NTMX81
in a STAR (continued)

5 To display the C-side link information, type

>TRNSL C

and press the Enter key.

Example of a MAP response

```
LINK  0   LTC  0    0;CAP     MS:STATUS OK        MSGCOND   OPN
LINK  1   LTC  0    1;CAP      S:STATUS SBsy
LINK  2   LTC  0    2;CAP     MS:STATUS OK        MSGCOND   OPN
LINK  3   LTC  0    3;CAP      S:STATUS OK
LINK  4   LTC  0    4;CAP      S:STATUS OK
LINK  5   LTC  0    5;CAP      S:STATUS SBsy
```

6 To busy the inactive STAR unit, type

***>bsy unit* unit_no**

and press the Enter key.

where

unit_no
is the number of the inactive unit (unit 0 or 1)

7 From the display in step 5, determine the C-side host PM where the STAR is connected. To post the host PM, type

>POST pm_type pm_no

and press the Enter key.

where

pm_type
is the host PM type, such as LTC, LGC, RCC2

pm_no
is the number of the host PM

Example of a MAP display:

```
       SysB     ManB     OffL     CBsy     ISTb      InSv
PM        0        0        1        0        4        12
LTC       0        0        2        0        2         9
LTC   0 ISTb  Links_OOS:  CSide  0, PSide   4
Unit0:   Act InSv
Unit1:   Inact InSv
```

8 To display the P-side link information for the host PM, type

>TRNSL P

and press the Enter key.

Example of a MAP response

NTMX81
in a STAR (continued)

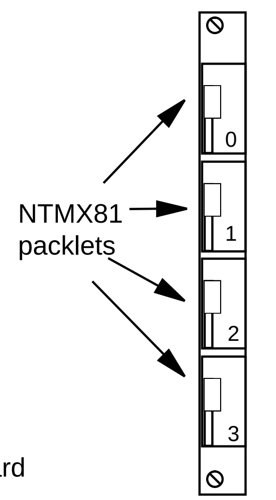
```
LINK 0: STAR REM1 00 0 0;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 1: STAR REM1 00 0 1;CAP  MS:STATUS SBsy MSGCOND: CLS
LINK 2: STAR REM1 00 0 0;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 3: STAR REM1 00 0 1;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 4: STAR REM1 00 0 0;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 5: STAR REM1 00 0 1;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 6: STAR REM1 00 0 0;CAP  MS:STATUS SBsy MSGCOND: CLS
LINK 7: STAR REM1 00 0 1;CAP  MS:STATUS OK   MSGCOND: OPN
```

9 Record the numbers of the links with status not OK.

After identifying the link with faults, use the following chart to determine which NTMX81 to remove by matching the STAR link number with the slot number and the packlet number to the left of the table.

	C-side link number	
	Slot 8	Slot 16
0	0 2	1 3
1	4 6	5 7
2	8 10	9 11
3	12 14	13 15

NTMX81 packlet slot number in the NTTR87 card located in the specified card slots.



NTTR87 card

10 To manually busy the links connected to the card with faults, type

>BSY LINK link_no

and press the Enter key.

where

link_no
is the number of the link connected with the NTMX81 card withfaults, from step 9

Note: Each NTMX81 card has two links connected to it. Each link must be manually busied. Possible link number pairs are as follows: 0,2; 1,3; 4,6; 5,7; 8,10; 9,11; 12,14; or 13,15.

Go to step 17.

NTMX81
in a STAR (continued)

At the MAP terminal

11 To access the RLDCarr level and display the C-side links from all RLDs to the posted STAR, type

>RLDCARR;TRNSL

and press the Enter key.

Example of a MAP display:

```
Port  0: Unit 0 RLD 0 0;CAP   MS;STATUS: InSv
Port  1: Unit 1 RLD 0 1;CAP   MS;STATUS: InSv
Port  2: Unit 0 RLD 1 0;CAP   MS;STATUS: InSv
Port  3: Unit 1 RLD 1 1;CAP   MS;STATUS: InSv

Port 14: Unit 0 RLD 7 0;CAP   MS;STATUS: InSv
Port 15: Unit 1 RLD 7 1;CAP   MS;STATUS: InSV
Port 16: Unit 0 RLD 8 0;CAP   MS;STATUS: SysB
Port 17: Unit 1 RLD 8 1;CAP   MS;STATUS: InSv
Port 18: Unit 0 RLD 9 0;CAP   MS;STATUS: SysB
Port 19: Unit 1 RLD 9 1;CAP   MS;STATUS: InSv
```

Record the RLDs with link faults that connect to the STAR posted in step 3.

12 To access the RLD MAP level, type

>RLD

and press the Enter key.

13 Post the RLD. To post the RLD, type

>POST rld_no

and press the Enter key.

where

rld_no
is the number of the RLD with the C-side link that has faults

Example of a MAP display:

```
        SysB     ManB     OffL     CBsy     ISTb      InSv
PM      4        0       10        3        3           3
STAR     0        0        0        0        1           1
STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb                /RG: 0
Unit 1:  ManB                /RG: 0                    RG
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --

REM9 RLD DRWR  8 SYSB                         LogDrwr:  16  17
BANK_0:  Active                               Links_OOS: 1
BANK_1: Stby                                  RLD BDch:  -
```

14 To display the posted RLDs C-side links, type

>TRNSL

NTMX81
in a STAR (continued)

and press the Enter key.

Example of a MAP response

```
Port 16: HUB Owner Unit 0 RLD 8 Link 0; Cap MS; Status: SysB
Port 17: HUB Owner Unit 1 RLD 8 Link 1; Cap MS; Status: InSv
```

15 Use the following table and figure to determine which NTMX81 card to remove by matching the provisioned link number with the slot number.

Note: When replacing an NTMX81 card at the Star Hub, determine if the RLDs affected by the card change have one or two DS-1 links. If the RLDs have one link, then each RLD must be posted, busied, and returned to service. If the RLD has two DS-1 links, the system automatically returns to service the DS-1 link.

Mapping Star Module ports to DS-1 slot and port numbers (Sheet 1 of 2)

Star Module and link numbers	Star Hub DS-1 slot and port numbers	Star Hub P-side port numbers	Star Module and link numbers	Star Hub DS-1 slot and port numbers	Star Hub P-side port numbers
Module 0 link 0	Slot 9, port 0	0	Module 8 link 0	Slot 10, port 8	16
Module 0 link 1	Slot 15, port 0	1	Module 8 link 1	Slot 14, port 8	17
Module 1 link 0	Slot 9, port 1	2	Module 9 link 0	Slot 10, port 9	18
Module 1 link 1	Slot 15, port 1	3	Module 9 link 1	Slot 14, port 9	19
Module 2 link 0	Slot 9, port 2	4	Module 10 link 0	Slot 10, port 10	20
Module 2 link 1	Slot 15, port 2	5	Module 10 link 1	Slot 14, port 10	21
Module 3 link 0	Slot 9, port 3	6	Module 11 link 0	Slot 10, port 11	22
Module 3 link 1	Slot 15, port 3	7	Module 11 link 1	Slot 14, port 11	23
Module 4 link 0	Slot 9, port 4	8	Module 12 link 0	Slot 10, port 12	24
Module 4 link 1	Slot 15, port 4	9	Module 12 link 1	Slot 14, port 12	25
Module 5 link 0	Slot 9, port 5	10	Module 13 link 0	Slot 10, port 13	26
Module 5 link 1	Slot 15, port 5	11	Module 13 link 1	Slot 14, port 13	27
Module 6 link 0	Slot 9, port 6	12	Module 14 link 0	Slot 10, port 14	28
Module 6 link 1	Slot 15, port 6	13	Module 14 link 1	Slot 14, port 14	29

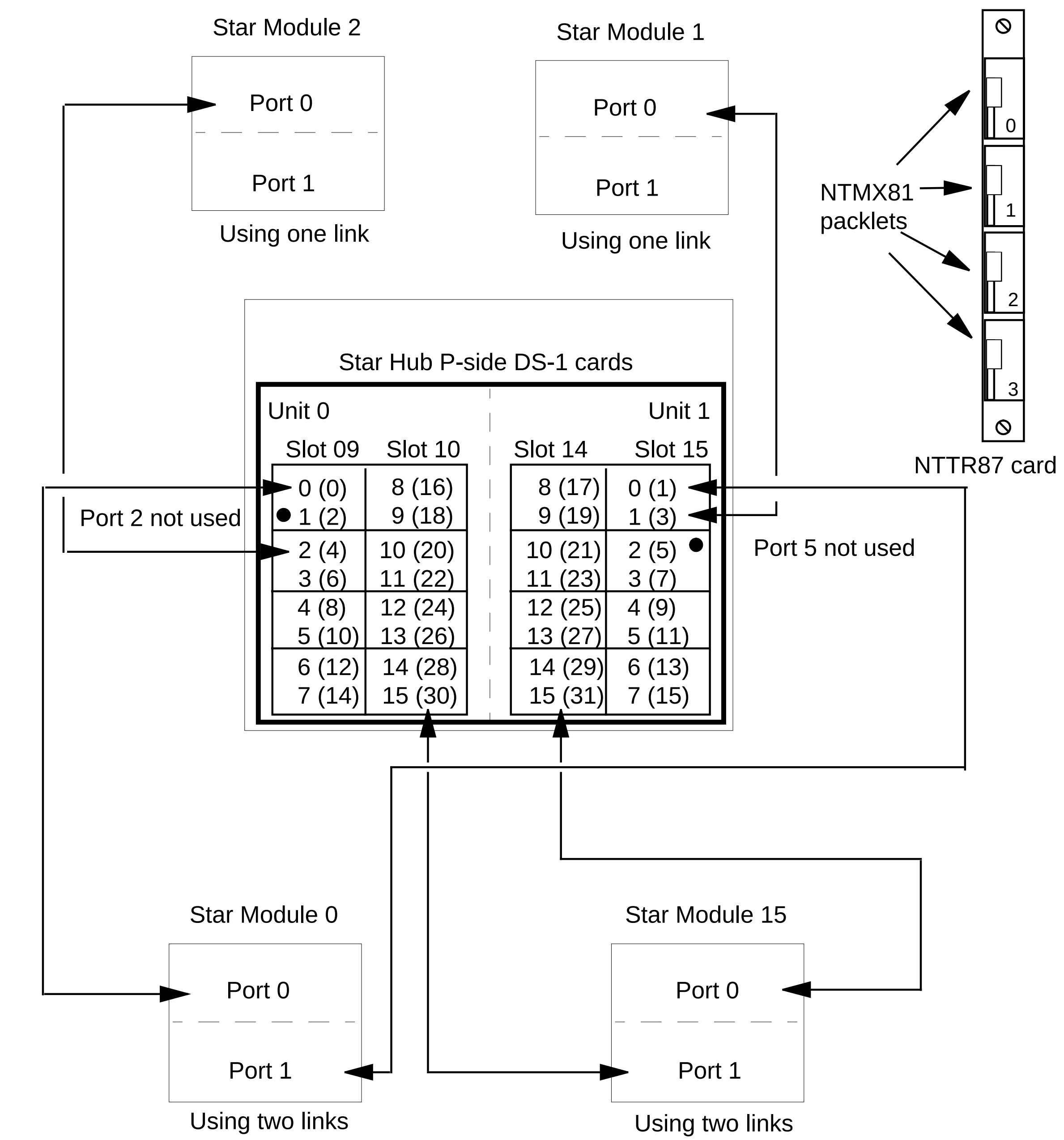
NTMX81
in a STAR (continued)

Mapping Star Module ports to DS-1 slot and port numbers (Sheet 2 of 2)

Star Module and link numbers	Star Hub DS-1 slot and port numbers	Star Hub P-side port numbers	Star Module and link numbers	Star Hub DS-1 slot and port numbers	Star Hub P-side port numbers
Module 7 link 0	Slot 9, port 7	14	Module 15 link 0	Slot 10, port 15	30
Module 7 link 1	Slot 15, port 7	15	Module 15 link 1	Slot 14, port 15	31

NTMX81
in a STAR (continued)

Star Hub P-side links mapping



Note: The two numbers for each port in this figure [for example, 14 (29)] represent the following: the first number (14) is the DS-1 card port number by unit; the second number (29) is the Star Hub P-side port number.

NTMX81
in a STAR (continued)

16 Determine if an additional RLD connects to the NTMX81 card.

If an additional RLD is	Do
connected	step 13
not connected	step 17

At the SRHE frame

17

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel (FSP). This protects the equipment against damage caused by static electricity.

WARNING
Equipment damage
Take the following precautions when removing or inserting a card.

1. Do not apply direct pressure to the components.
2. Do not force the cards into the slots.

Put on a wrist strap.

Remove the NTMX81 card as described in the following steps:

a Locate the packlet to be removed on the appropriate NTTR87 card slot.

b Open the locking lever on the packlet to be replaced. Carefully pull the card toward you until it clears the shelf.

c Make sure the replacement card has the same PEC, including suffix, as the card you just removed.

NTMX81
in a STAR (continued)

18 Before inserting the replacement card, set the DS-1 switch settings according to the following table.

Distance to cross connect				
Feet	**Meters**	**S3/6**	**S2/5**	**S1/4**
0-133	0-41	On	Off	Off
133-266	41-81	Off	On	On
266-399	81-122	Off	On	Off
399-533	122-163	Off	Off	On
533-655	163-200	Off	Off	Off
Note: S indicates switch number(s). On S1 dip switch (6 position): S1-S3 belong to even port, and S4-S6 belong to odd port.				

19 Open the locking lever on the replacement packlet.

a Align the packlet with the slots in the shelf.

b Carefully slide the packlet into the card slot in the NTTR87 card.

20 Seat and lock the packlet.

a Use your fingers or thumbs to push on the upper and lower edges of the faceplate of the packlet to make sure the packlet is fully seated in the slot.

b Close the locking lever.

21 Use the following information to determine the next step in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 33
other	step 22

22 Use the following table to determine the next step in this procedure.

If you replaced an NTMX81 that connects DS-1 links for the	Do
Star Hub C-side	step 23
Star Hub P-side	step 27

NTMX81
in a STAR (continued)

At the MAP terminal

23 To test the busied links from step 10, type

>TST LINK link_no

and press the Enter key

where

link_no
is the number of the link that was manually busied in step 10.

Note 1: This step must be performed for each link that is manually busied.

Note 2: To test the other links connected to the STAR, execute this step for each link until all links are tested.

If TST	Do
passes	step 24
fails	step 34

24 To return to service the P-side links, type

>RTS LINK link_no

and press the Enter key.

where

link_no
is the number of the link that was tested in step 23.

Note: To RTS the other links connected to the STAR, perform this step for each link until all links are returned to service.

If RTS	Do
passes	step 25
fails	step 34

25 To post the STAR where the NTMX81 card is located, type

>POST STAR site frame unit

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the card with faults (0 to 511)

unit
is 0 for the STAR

NTMX81
in a STAR (continued)

26 To return the inactive STAR unit to service, type

>RTS UNIT **unit_no**

and press the Enter key.

where

unit_no
is the number of the STAR unit busied in step 6

If RTS	Do
passes	step 31
fails	step 34

27 Determine how many DS-1 links connect to the RLD affected by the NTMX81 card replacement.

If the RLD affected by the card replacement has	Do
one DS-1 link	step 28
two DS-1 links, the affected link returns to service automatically	step 31

Note: If there are two RLDs, each with one DS-1 link affected by this card replacement, both RLDs must be busied and returned to service.

28 To busy the posted RLD, type

>BSY DRWR

and press the Enter key.

Example of a MAP display:

```
Warning:  Calls on RLD may be affected.
Do you wish to continue?
Please confirm ("YES", "Y", "NO", "N")
```

29 To respond affirmatively to the confirmation request, type

>Y

and press the Enter key.

30 To return the RLD to service, type

>RTS DRWR

NTMX81
in a STAR (end)

and press the Enter key.

If RTS	Do
passes and there are no more RLDs to RTS	step 31
passes and there is another RLD to return to service	step 28
fails	step 34

31 Send any cards with faults for repair according to local procedure.

32 Record the following items in office records

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 35.

33 Return to “Star Remote System alarm clearing procedures" in this manual or another procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

34 Get additional help replacing this card by contacting the personnel responsible for a higher level support.

35 You have correctly completed this procedure. Remove the sign from the active unit and return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTTR46
in an RLD

Application

Use this procedure to replace an NTTR46 in a Star Remote Module Equipment (SRME) cabinet or Star Remote Module Outside (SRMO) cabinet as identified in the following table.

PEC	Suffixes	Name
NTTR46	AA	ac to dc rectifier

Common procedures

No common procedures are referenced in this procedure.

Action

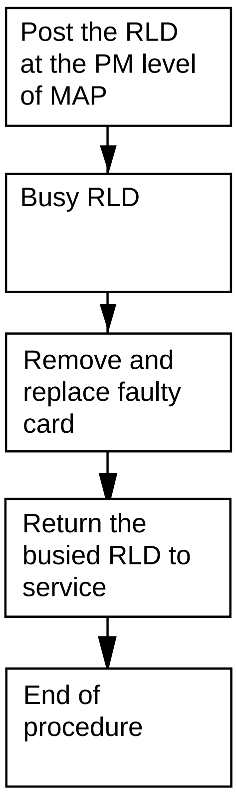
The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR46
in an RLD (continued)

Summary of replacing an NTTR46 in an RLD

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.



NTTR46
in an RLD (continued)

Replacing an NTTR46 in an RLD

At your current location:

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to check or accept cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

3 To post the Star Hub the RLD is connected to, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the name of the STAR site

frame
is the frame number of the STAR (0 to 511)

unit
is 0 for the STAR

Example of a MAP display:

```
             SysB     ManB     OffL     CBsy     ISTb     InSv
         PM    0        0        0        0        1       130
         STAR  0        0        0        0        1        10
STAR   Rem1  OO 0 ISTb   Links_OOS: CSide 0 PSide 0
Unit 0:  InSv  Mtce TakeOver    /RG:  0
Unit 1:  SysB  Mtce             /RG:  0               RG:
DRwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref  0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby  1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

4 To post the RLD, type

>RLD;POST rld_no

and press the Enter key.

where

rld_no
is the RLD number to be posted

Example of a MAP display:

NTTR46
in an RLD (continued)

```
                SysB     ManB     OffL     CBsy     ISTb      InSv
          PM     4        0        10       3        3          3
        STAR     0        0         0       0        1          1

   STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb              /RG: 0
Unit 1:  ManB              /RG: 0                     RG
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref  0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby  1 InSv
MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --

REM9 RLD DRWR  8 SYSB                    LogDrwr:  16  17
BANK_0:  Active                          Links_OOS: 2
BANK_1: Stby                             RLD BDch:  -
```

5 To busy the posted RLD, type

>BSY DRWR

and press the Enter key.

Example of a MAP display:

```
Warning:  Calls on RLD may be affected.
Do you wish to continue?
Please confirm ("YES", "Y", "NO", "N")
```

6 To respond affirmatively to the confirmation request, type

>Y

and press the Enter key.

At the SRME or SRMO site

7 The type of enclosure for the Star Module determines your next action.

Note: Because the rectifier has failed, the RLD is on battery power. The batteries support subscribers for up to 8 hours, depending on traffic.

If the RLD is in an	Do
SRME (inside) cabinet	step 8
SRMO (outdoors) cabinet	step 10

8 Use a flat blade screwdriver and turn the three 1/4-turn fastening screws at the bottom of the cover. Hold the cover by the left and right sides, lift up, and pull the cover towards you. Set the cover against a vertical surface with the inside facing out. This makes the equipment location diagram visible.

NTTR46
in an RLD (continued)

9

> **DANGER**
> **Static electricity damage**
> Before removing the rectifier, put on a wrist strap and connect it to the wrist strap grounding point in the top right corner of the TSS. This protects the equipment against damage caused by static electricity.

The rectifier is in the lower right corner of the telephony subsystem (TSS). Perform the following steps to remove and replace the rectifier:

a To remove power from the rectifier, disconnect the gray power cord. Disconnect the dc output connector.

b Use a Phillips screwdriver to remove the five screws that hold the rectifier in its holding bracket.

c Remove the rectifier.

d Install a replacement rectifier with one of the same PEC and suffix.

e Use a Phillips screwdriver to install and tighten the screws to the rectifier holding bracket.

f Connect the dc output connector that was disconnected in step a.a

g To supply power to the rectifier, connect the ac supply cable that was disconnected in step a.a

h Go to step 13.

10 Unlock and open the cabinet door. The door alarm generates a Major alarm at the MAP terminal. Silence the alarm. Use a flat blade screwdriver to unscrew the two large knurled screws at the left side of the inside TSS cover.

11

> **DANGER**
> **Static electricity damage**
> Before removing the rectifier, put on a wrist strap and connect it to the wrist strap grounding point in the top left corner of the TSS. This protects the equipment against damage caused by static electricity.

The rectifier is at the bottom center of the telephony subsystem (TSS) cover. Perform the following steps to remove and replace the rectifier.

a Remove power from the rectifier by setting the Rectifier breaker on the ac panel to the OFF position. Disconnect the rectifier output connector. Disconnect the power cord from the rectifier. Use a 7mm nutdriver to loosen the nut that secures the ground strap. Remove the ground strap.

b Open the TSS cover.

NTTR46
in an RLD (end)

c Use a Phillips screwdriver to loosen and remove the three screws that hold the rectifier to the TSS cover.

d Remove the rectifier.

e Install a replacement rectifier with one of the same PEC and suffix.

f Use a Phillips screwdriver to tighten the three screws that hold the rectifier to the TSS cover.

g Close the TSS cover.

h Install the ground strap and nut. Tighten the nut with a 7mm nutdriver. Connect the rectifier output connector and the power cord that were disconnected in step a.a

i Supply power to the rectifier by setting the Rectifier breaker on the ac panel to the ON position.

12 Open the TSS cover.

13 Note the condition of the indicator lights on the faceplate of the NTTR70AA Star Module control (SMC) card. Check that the Critical alarm light emitting diode (LED) is no longer lit. Also make sure the green LED on the rectifier is lit.

14 Close the TSS cover. Close and lock the SRMO front door.

At the MAP terminal

15 To return the RLD to service, type

`>RTS DRWR`

and press the Enter key.

If the RTS	Do
passes	step 16
fails	step 18

16 Send any cards with faults for repair according to local procedure.

17 Record the following items in office records:

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

Go to step 19.

18 Get additional support for replacing this card by calling operating company personnel responsible for a higher level of support.

19 You have correctly completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTTR47
in an RLD

Application

Use this procedure to replace an NTTR47 in a remote line drawer (RLD) in Star Remote Module Outside (SRMO) as identified in the following table.

PEC	Suffixes	Name
NTTR47	AA	ac panel

Common procedures

This procedure does not refer to any common procedures.

Action

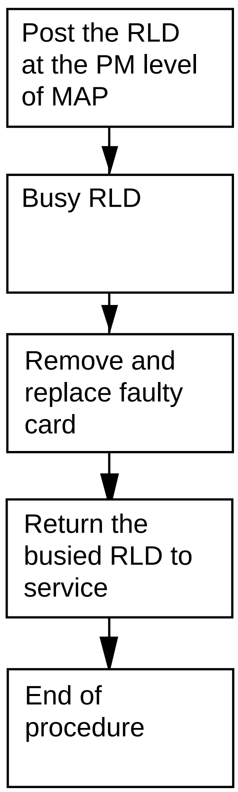
The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to replace the card.

NTTR47
in an RLD (continued)

Summary of replacing an NTTR47 in an RLD

This flowchart provides a summary of the procedure.

Use the instructions in the step-action procedure that follows this flowchart to perform the procedure.



NTTR47
in an RLD (continued)

Replacing an NTTR47 in an RLD

At the current location

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to check or accept cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

3 To post the Star Hub the RLD is connected to, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the name of the STAR site

frame
is the frame number of the STAR (0 to 511)

unit
is 0 for the STAR

Example of a MAP display:

```
              SysB     ManB     OffL     CBsy     ISTb    InSv
         PM    0        0        0        0        1       130
         STAR  0        0        0        0        1        10
STAR   Rem1  OO O ISTb   Links_OOS: CSide 0 PSide 0
Unit 0:  InSv  Mtce TakeOver    /RG:  0
Unit 1:  SysB  Mtce             /RG:  0               RG:
DRwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref  0 InS
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby  1 InS
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

4 To post the RLD, type

>RLD;POST rld_no

and press the Enter key.

where

rld_no
is the RLD number to be posted

Example of a MAP display:

NTTR47
in an RLD (continued)

```
                 SysB     ManB     OffL     CBsy     ISTb         InSv
           PM      4        0       10        3        3            3
          STAR     0        0        0        0        1            1
 STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb               /RG: 0
Unit 1:  ManB               /RG: 0                  RG
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref
0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby
1 InSv
MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --

REM9 RLD DRWR  8 SYSB                    LogDrwr:  16  17
BANK_0:  Active                          Links_OOS: 2
BANK_1: Stby                             RLD BDch:  -
```

5 To busy the posted RLD, type

>BSY DRWR

and press the Enter key.

Example of a MAP display:

```
Warning:  Calls on RLD may be affected.
Do you wish to continue?
Please confirm ("YES", "Y", "NO", "N")
```

6 To respond affirmatively to the confirmation request, type

>Y

and press the Enter key.

At the SRMO site

7

> **WARNING**
> **Static electricity damage**
> Before removing the ac panel, put on a wrist strap and connect it to the wrist strap grounding point on the TSS. This protects the equipment against damage caused by static electricity.

NTTR47
in an RLD (continued)

8

> **DANGER**
> **Risk of electrocution**
> To eliminate the risk of electrical shock, remove external ac power to the SRMO cabinet before accessing the ac panel.

Set the circuit breaker that supplies external ac power to the SRMO cabinet to the OFF position.

9 Unlock and open the cabinet door. The door alarm generates a Major alarm at the MAP terminal. Silence the alarm by pulling the interlock switch out.

10 Set the main and rectifier circuit breakers on the ac panel to the OFF position.

11 Use a flat blade screwdriver to loosen the screw to open the ac panel. Swing the ac panel cover out and lift up to release the cover from the mounting bracket. Put the cover on the SRMO cabinet floor.

12 Disconnect the main ac input load (L) wire that connects to CB1, the 16 A main circuit breaker. Loosen the locking screw at the bottom of the circuit breaker to release the wire.

13 Disconnect the ac neutral cable from J3-1 (TB1) on the ac panel.

14 Use a 7 mm nutdriver to loosen the ground wire nut. Remove the green and yellow ground wire from the ac panel (not the ac panel cover).

15 Disconnect the ac panel output connectors J1 and J2.

16 Use a 10 mm nutdriver to loosen the nut that secures the ac panel to the back wall of the SRMO cabinet. Remove the nut. Lift up on the ac panel to remove it from the mounting bracket.

17 Install the replacement ac panel on the ac panel mounting bracket.

18 Install the 10 mm nut that was removed in step 16. Use a 10 mm nutdriver to tighten the nut and secure the ac panel to the rear wall of the SRMO cabinet. Make sure the flat washer and lock washer are behind the nut and not behind the ac panel.

19 Connect the ac panel output connectors J1 and J2.

20 Install the ground wire. Use a 7 mm nutdriver to tighten the nut that secures the green and yellow ground wire to the ac panel.

21 Connect the ac neutral cable to J3-1 (TB1) on the ac panel.

22 Connect the main ac input load (L) wire to CB1, the 16 A main circuit breaker. Tighten the locking screw at the bottom of the circuit breaker to secure the wire.

23 Install the ac panel cover. Use a flat blade screwdriver to tighten the screw to secure the ac panel.

24 Close the circuit breaker that supplies external ac power to the SRMO cabinet.

NTTR47
in an RLD (end)

25 Set the main and rectifier circuit breakers on the ac panel to the ON position.

26 Make sure the green power light emitting diode (LED) on the ac panel is lit.

27 Open the TSS front panel. Note the condition of the indicator lights on the faceplate of the NTTR70AA/AB Star Module control (SMC) card. Check that the Critical alarm LED is no longer lit.

If alarm LEDs on the SMC card are	Do
lit	step 32
not lit	step 28

28 Close the TSS front cover.

At the MAP terminal

29 To return the posted RLD to service, type

`>RTS DRWR`

and press the Enter key.

If RTS	Do
fails	step 32
passes	step 30

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

31 Record the following items in office records:

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

Go to step 33.

32 Get additional support in replacing this card by contacting operating company personnel responsible for a higher level of support.

33 You have correctly completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTTR60
in a STAR

Application

Use this procedure to replace the following card in STAR.

PEC	Suffixes	Name
NTTR60	AA, BA	Ring Generator

Common procedures

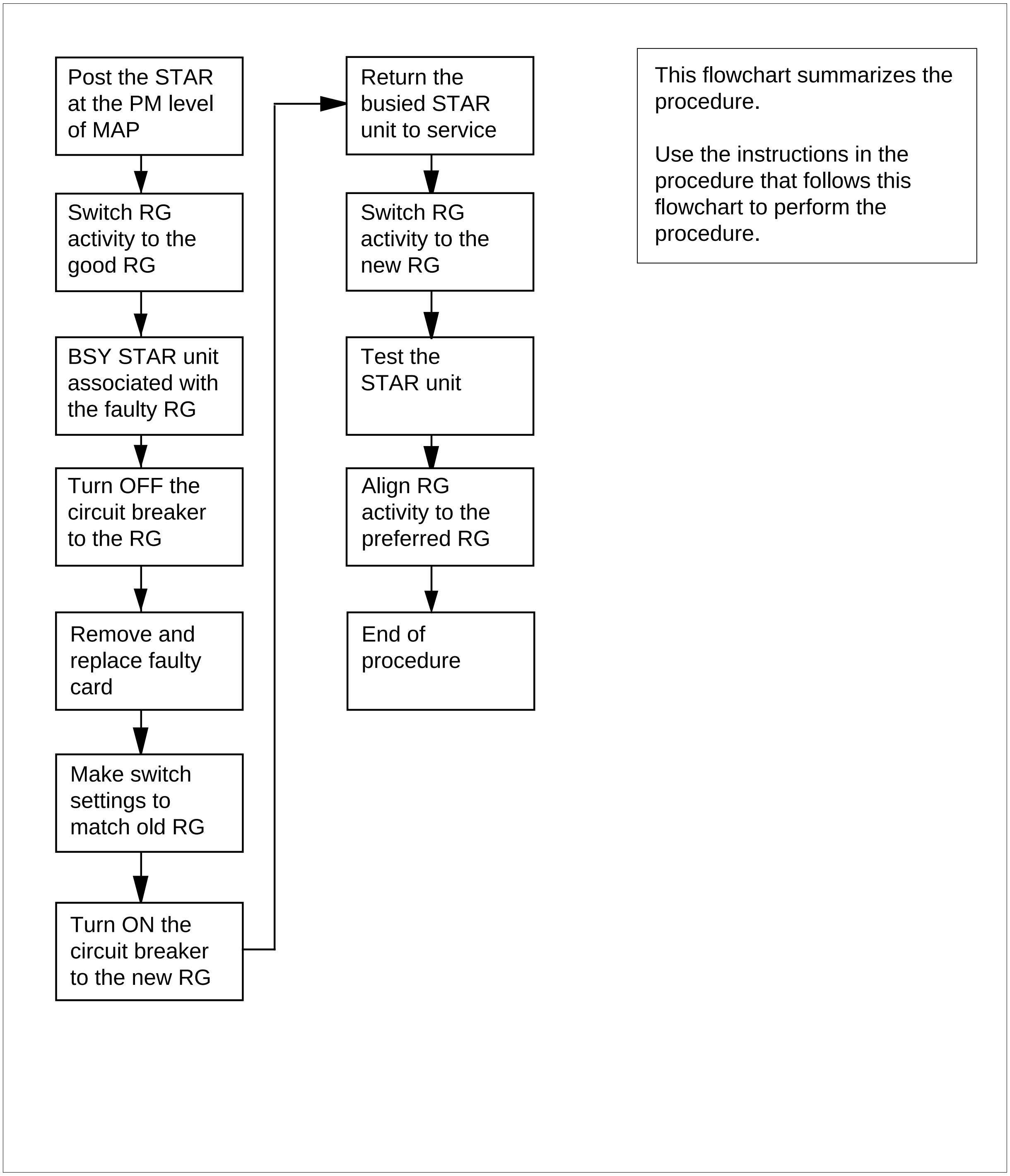
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR60
in a STAR (continued)

Summary of card replacement procedure for an NTTR60 card in a STAR



NTTR60
in a STAR (continued)

Replacing an NTTR60 card in a STAR

At your current location

1

> **CAUTION**
> **Loss of service**
> This procedure includes directions to manually busy one or more peripheral module (PM) units. Since manually busying a PM unit can cause service degradation, perform this procedure only if necessary to restore out-of-service components. Otherwise, carry out this procedure during periods of low traffic.

Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

3 If you were directed to this procedure from an alarm clearing procedure in this manual, go to step 9. Otherwise, continue with step 4.

At the MAP terminal

4 To post the STAR containing the card to be replaced, type

`>MAPCI;MTC;PM;POST STAR site frame unit`

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card (0 to 511)

unit
is 0 for the STAR

Example of a MAP response:

NTTR60
in a STAR (continued)

```
      SysB      ManB      OffL      CBsy      ISTb       InSv
 PM     0         0         2         0         1          12
 STAR   0         0         2         0         1           9

STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb                /RG: 0
Unit 1:  ManB                /RG: 0                    RG:
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33 Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45 Stby 1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

5 Determine the unit associated with the NTTR60 card to be replaced by using the following table.

If STAR unit	Do RG card
0	0 in slot 1
1	1 in slot 22

6 Check the state of the STAR units.

If the STAR units are	Do
OFFL or SysB	step 8
One unit is InSv or ISTb the other unit is ISTB or SysB	step 7

7 To switch ringing generator activity to the good NTTR60 card, type

>SWRG UNIT unit_no

and press the Enter key.

where

unit_no
is the STAR unit (0 or 1) aligned to the faulty RG

Note: If necessary, repeat this step until both units of the STAR are on the good RG.

If the SWRG command	Do
passes	step 8
fails	step 21

8 To busy the STAR unit associated with the faulty RG, type

>BSY UNIT unit_no

and press the Enter key.

NTTR60
in a STAR (continued)

where

unit_no
is the STAR unit (0 or 1) as seen in step 5

At the FSP

9 Turn OFF the circuit breaker for the ringing generator to be replaced by using the information in the following table.

IfCircuit breaker label	DoRinging generator
Ring 0	0 in slot 1
Ring 1	1 in slot 22

10

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel (FSP) of the STAR. This protects the equipment against damage caused by static electricity.

WARNING
Equipment damage
Take these precautions when removing or inserting a card.1. Do not apply direct pressure to the components.2. Do not force the cards into the slots.

Put on a wrist strap.

At the STAR

11 Remove the NTTR60 card as follows:

- **a** Locate the card to be removed on the appropriate shelf.
- **b** Open the locking levers on the card to be replaced and gently pull the card towards you until it clears the shelf.
- **c** Place the card you have removed in an electrostatic discharge (ESD) protective container.
- **d** Ensure the replacement card has the same product equipment code (PEC), including suffix, as the card you just removed.

12 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.

13 Seat and lock the card.

NTTR60
in a STAR (continued)

a Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b Close the locking levers.

At the FSP

14 Turn ON the circuit breaker turned OFF in step 9.

15 Remove the wrist strap.

16 If you were directed to this procedure from an alarm clearing procedure in this manual, return now to the alarm clearing procedure that directed you here. Otherwise, continue with step 17.

At the MAP terminal

17 To return the STAR unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the STAR unit (0 or 1) busied in step 8

If RTS	Do
passes	step 18
fails	step 21

18 To switch ringing generator activity to the new NTTR60 card, type

>SWRG UNIT unit_no

and press the Enter key.

where

star_unit
is the STAR unit (0 or 1) where the RG was replaced

If the SWRG command	Do
passes	step 19
fails	step 21

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

20 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 22.

NTTR60
in a STAR (end)

21 Get additional help replacing this card by contacting personnel responsible for a higher level of support.

22 You have correctly completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTTR66 in an RLD

Application

Use this procedure to replace an NTTR66 in a remote line drawer (RLD) in a Star Remote Module Equipment (SRME) wall mount or Star Remote Module Outside (SRMO) cabinet as identified in the following table.

PEC	Suffixes	Name
NTTR66	AA	Electromagnetic interference (EMI) filter pack

Common procedures

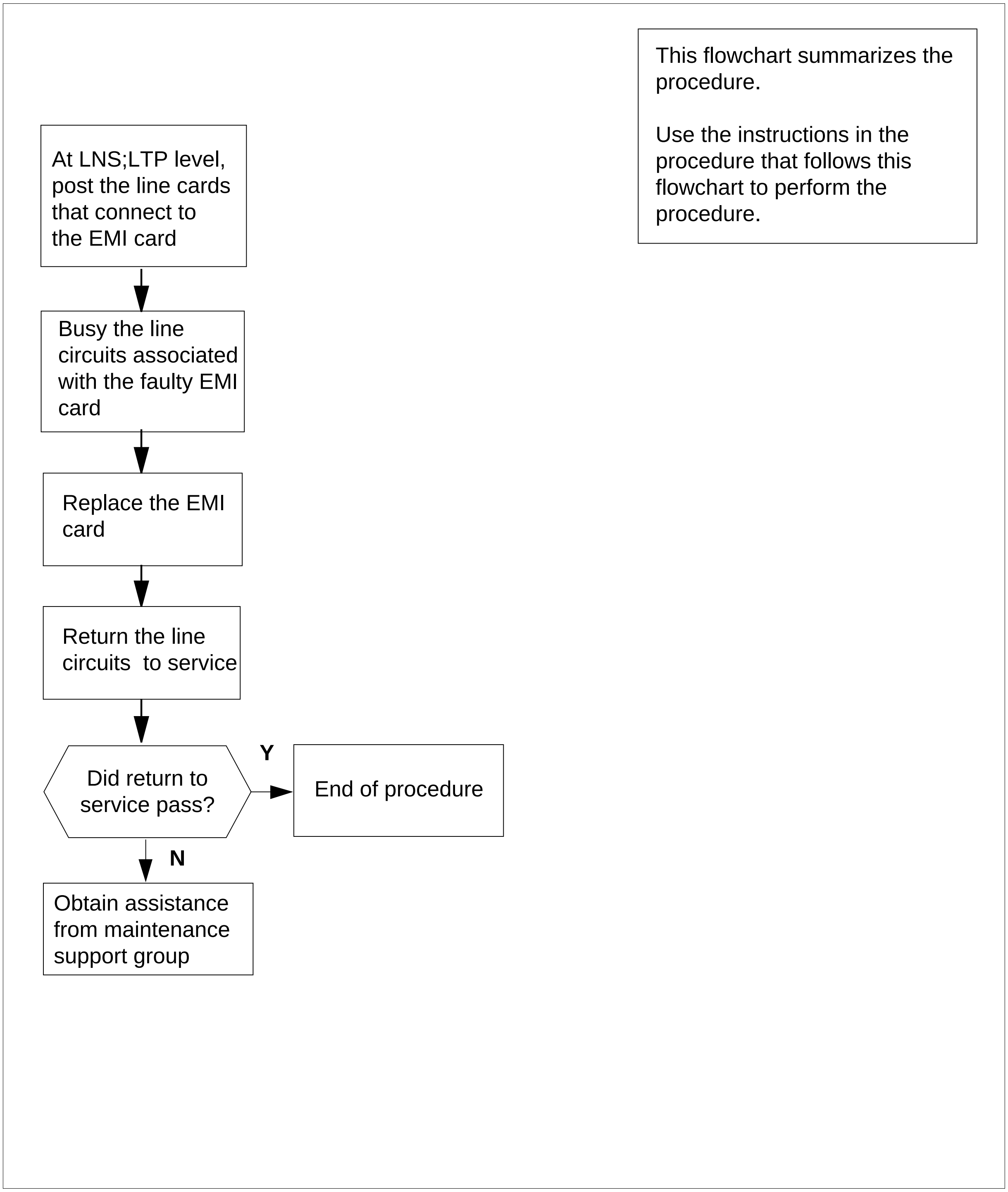
No common procedures are referenced in this procedure.

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.

NTTR66
in an RLD (continued)

Summary of replacing an NTTR66 in an RLD



NTTR66
in an RLD (continued)

Replacing an NTTR66 in an RLD

At your current location:

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to check or accept cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

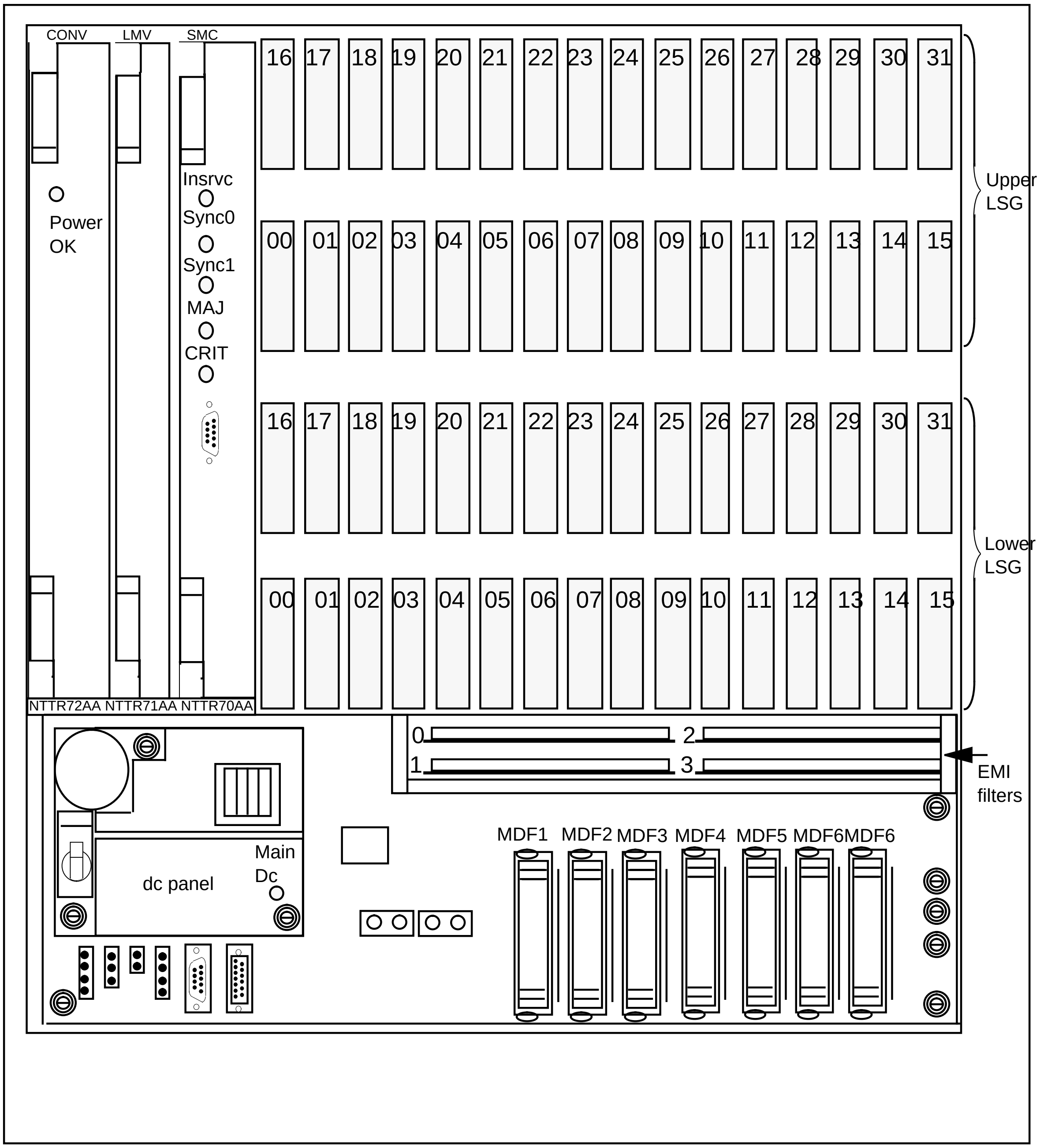
3

> **CAUTION**
> **Service disruption: calls may be dropped!**
> Perform this card replacment activity only during a period of low traffic. All calls being handled by the lines connected to the EMI filter card being replaced will be dropped.

Identify the EMI card to be replaced based on the Telephony subsystem (TSS) diagram. The relationship between the EMI card and the affected line cards is identified in the table following the figure. This information is also printed on a label on the back of the front cover of the SRME cabinet and on the inside of the TSS cover of the SRMO cabinet.

NTTR66
in an RLD (continued)

Telephony subsystem



NTTR66
in an RLD (continued)

EMI card number	Line cards affected
0	Lower line subgroup, cards 0-15
1	Lower line subgroup, cards 16-31
2	Upper line subgroup, cards 0-15
3	Upper line subgroup, cards 16-31

4 To access the line test position (LTP) level of the MAP terminal and post the lines associated with the EMI card, type

>MAPCI;MTC;LNS;LTP;POST L site frame unit lsg ckt_range

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the faulty card

unit
is 0 for the STAR

lsg
is the number of the line subgroup with the faulty card (0-35)

ckt_range
is the range of circuits associated with the faulty card, such as 0-15 or 16-31

Example of a MAP response:

```
LCC PTY RNG .....LEN.........  DN   STA F S LTA TE RESULT
RES      REM1 00 0 03 03     7213355 MB
```

5 To busy the lines, type

>BSY

and press the Enter key.

Note: The BSY command does not complete until there are no calls in the talking state within the range of the posted lines.

At the RLD site

6 Get a replacement card with the same product equipment code (PEC), including suffix, as the card you just removed.

7 Open the Star Module and access the TSS. Locate the EMI filter to be replaced using the TSS diagram.

NTTR66
in an RLD (end)

8

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point on the frame supervisory panel (FSP) while handling cards. This precaution protects the cards against damage caused by static electricity.

Carefully remove the EMI card. Place the card you removed in an electrostatic discharge (ESD) protective container.

9 Install the replacement card.

10 Close the TSS cover, if necessary and close the Star Module.

At the MAP terminal

11 To return the line cards to service, type

`>RTS lsg ckt_range`

and press the Enter key.

where

lsg
is the number of the line subgroup with the faulty card (0-1)

ckt_range
is the range of circuits associated with the faulty card, such as 0-15 or 16-31

If RTS	Do
passed	step 12
failed	step 14

12 Send any cards with faults for repair according to local procedure.

13 Record the following items in office records:

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

Go to step 15.

14 Get additional support in replacing this card by contacting the operating company personnel responsible for higher level of support.

15 You have correctly completed this procedure.

NTTR67
in an RLD

Application

Use this procedure to replace an NTTR67 in a remote line drawer (RLD) in a Star Remote Module Equipment (SRME) or Star Remote Module Outside (SRMO) as identified in the following table.

PEC	Suffixes	Name
NTTR67	AA	dc panel

Common procedures

This procedure does not refer to any common procedures.

Action

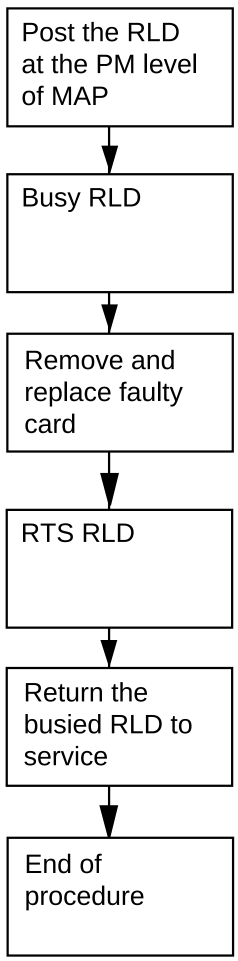
The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR67
in an RLD (continued)

Summary of replacing an NTTR67 in an RLD

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.



NTTR67
in an RLD (continued)

Replacing an NTTR67 in an RLD

At the current location:

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to check or accept cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

3 To post the Star Hub the RLD is connected to, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the name of the STAR site

frame
is the frame number of the STAR (0 to 511)

unit
is 0 for the STAR

Example of a MAP display:

```
              SysB     ManB     OffL     CBsy     ISTb     InSv
          PM    0        0        0        0        1       130
          STAR  0        0        0        0        1        10
STAR   Rem1  OO 0 ISTb   Links_OOS: CSide 0 PSide 0
Unit 0:  InSv  Mtce TakeOver    /RG:  0
Unit 1:  SysB  Mtce             /RG:  0               RG:
DRwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref  0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby  1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

4 To post the RLD, type

>RLD;POST rld_no

and press the Enter key.

where

rld_no
is the RLD number to be posted

Example of a MAP display:

NTTR67
in an RLD (continued)

```
        SysB     ManB     OffL     CBsy     ISTb        InSv
  PM      4        0       10        3        3           3
 STAR     0        0        0        0        1           1
STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb               /RG: 0
Unit 1:  ManB               /RG: 0                    RG
Drwr:         11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --

REM9 RLD DRWR  8 SYSB                      LogDrwr:  16  17
BANK_0:  Active                            Links_OOS: 2
BANK_1: Stby                               RLD BDch:  -
```

5 To busy the posted RLD, type

>BSY DRWR

and press the Enter key.

Example of a MAP display:

```
Warning:  Calls on RLD may be affected.
Do you wish to continue?
Please confirm ("YES", "Y", "NO", "N")
```

6 To respond affirmatively to the confirmation request, type

>Y

and press the Enter key.

At the SRME or SRMO site

7 The type of enclosure for the Star Module determines your next action.

Note: Because the dc panel has failed, there is no power available for the RLD to support subscribers.

If the RLD is in an	Do
SRME (inside) wall mount	step 8
SRMO (outdoors) cabinet	step 11

8

WARNING
Static electricity damage
Before removing the dc panel, put on a wrist strap and connect it to the wrist strap grounding point on the TSS. This protects the equipment against damage caused by static electricity.

NTTR67
in an RLD (continued)

Use a slot screwdriver and turn the three 1/4-turn screws at the bottom of the cover. Hold the cover by the left and right sides, lift up, and pull the cover towards you. Set the cover out of the way.

9 The dc panel is in the lower left hand corner of the telephony subsystem (TSS). Perform the following steps to remove and replace the rectifier:

- **a** Power down the RLD by performing the following steps:
  - **i** Set the circuit breaker on the dc panel to OFF.
  - **ii** Remove ac power from the RLD as follows.
    - if the enclosure is an indoor wall-mounted SRME, remove power at the local ac power panel
    - disconnect the battery connector
  - **iii** Note that the green Power On LED is not lit.
  - **iv** The RLD is now powered down.
- **b** Use a slot screwdriver to loosen the three screws that hold the dc panel to the TSS.
- **c** Remove the dc panel.
- **d** Remove the four fuses from the dc panel, recording the fuse size and color to ensure correct installation in the replacement dc panel
- **e** Install a replacement dc panel with one of the same PEC and suffix.
- **f** Install the four fuses that were removed in step 9d
- **g** Use a slot screwdriver to tighten the three screws that hold the dc panel to the TSS.
- **h** Power up the RLD by performing the following steps:
  - **i** Provide ac power to the RLD as follows.
    - if the enclosure is an indoor wall-mounted SRME, supply power at the local ac power panel
    - reconnect the battery connector
  - **ii** Set the circuit breaker on the dc panel to ON.
  - **iii** Reconnect the battery connector
  - **iv** Note that the green Power On LED is lit. Make sure no alarm condition is indicated by the LEDs on the SMC card.
  - **v** The RLD is now powered up

10 Replace the SRME cover. Use a slot screwdriver and turn the three 1/4-turn screws at the bottom of the cover. Go to step 13.

NTTR67
in an RLD (continued)

11

> **WARNING**
> **Static electricity damage**
> Before removing the dc panel, put on a wrist strap and connect it to the wrist strap grounding point in the top left corner of the TSS. This protects the equipment against damage caused by static electricity.

Unlock and open the cabinet door. The door alarm generates a Major alarm at the MAP terminal. Silence the alarm by pulling the interlock switch out. Loosen the two large screws at the left side of the inside TSS cover. Open the TSS cover to access the TSS.

a Power down the RLD by performing the following steps:

- **i** Set the circuit breaker on the dc panel to OFF
- **ii** Remove ac power from the RLD as follows:
  - if the enclosure is an outdoor pad or pole-mounted SRMO, set the Rectifier circuit breaker on the ac panel to the OFF position. Then set the Main circuit breaker on the ac panel to the OFF position.
  - disconnect the battery connector
- **iii** Note that the green Power On LED is not lit
- **iv** The RLD is now powered down

b Use a slot screwdriver to loosen the three screws that hold the dc panel to the TSS.

c Remove the dc panel.

d Remove the four fuses from the dc panel, recording the fuse size and color to ensure correct installation in the replacement dc panel.

e Install a replacement dc panel with one of the same PEC and suffix.

f Install the four fuses that were removed in step 11d

g Use a slot screwdriver to tighten the three screws that hold the dc panel to the TSS.

h Provide ac power to the RLD as follows:

- **i** if the enclosure is an outdoor pad or pole-mounted SRMO, set the Main circuit breaker on the dc panel to the ON position. Then set the Rectifier circuit breaker on the ac panel to the ON position.
- **ii** reconnect the battery connector

i Set the circuit breaker on the dc panel to ON

j Reconnect the battery connector

k Note that the green Power On LED is lit. Make sure no alarm condition is indicated by the LEDs on the SMC card

NTTR67
in an RLD (end)

l The RLD is now powered up.

12 Close and secure the TSS cover using the two screws on the left side of the TSS. Close and lock the cabinet door.

At the MAP terminal

13 To return the RLD to service, type

`>RTS DRWR`

and press the Enter key.

If the RTS	Do
passes	step 14
fails	step 16

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

15 Record the following items in office records:

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

Go to step 17.

16 Get additional support in replacing this card by contacting operating company personnel responsible for a higher level of support.

17 You have correctly completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTTR70 in an RLD

Application

Use this procedure to replace an NTTR70 in a remote line drawer (RLD) in a Star Remote Module Equipment (SRME) or Star Remote Module Outside (SRMO) as identified in the following table.

PEC	Suffixes	Name
NTTR70	AA AB	Star Module Controller (SMC) card

Common procedures

No common procedures are referenced in this procedure.

Action

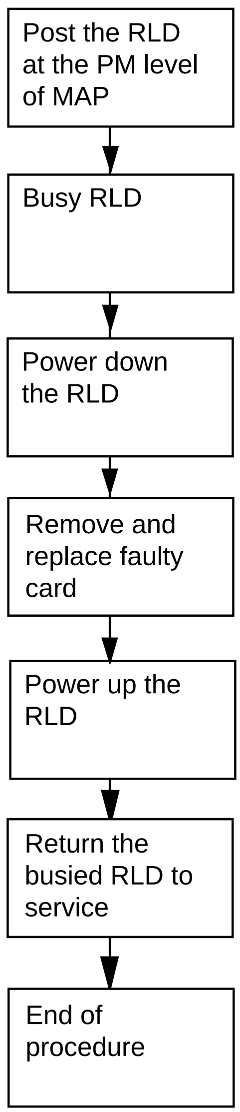
The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR70
in an RLD (continued)

Summary of replacing an NTTR70 RLD

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.



NTTR70
in an RLD (continued)

Replacing an NTTR70 in an RLD

At your current location:

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to check or accept cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

3 To access the PM level of the MAP and post the Star Hub where the RLD is connected. Type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the name of the STAR site

frame
is the frame number of the STAR (0 to 511)

unit
is 0 for the STAR

Example of a MAP display:

```
             SysB     ManB     OffL     CBsy     ISTb    InSv
         PM    0        0        0        0        1       130
         STAR  0        0        0        0        1        10
STAR   Rem1  OO 0 ISTb   Links_OOS: CSide 0 PSide 0
Unit 0:  InSv  Mtce TakeOver    /RG:  0
Unit 1:  SysB  Mtce             /RG:  0               RG:
DRwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
.. .. .. .. .. .. .. .. ss .. .. .. .. .. .. .. .. ..
```

4 To post the RLD, type

>RLD;POST rld_no

and press the Enter key.

where

rld_no
is the RLD number to be posted

Example of a MAP display:

NTTR70
in an RLD (continued)

```
                SysB      ManB      OffL      CBsy      ISTb       InSv

         PM       4         0        10         3         3          3
        STAR      0         0         0         0         1          1
STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb              /RG: 0
Unit 1:  ManB              /RG: 0                    RG
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
 MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --
REM9 RLD DRWR  8 SYSB                     LogDrwr:  16  17
BANK_0:  Active                           Links_OOS: 2
BANK_1: Stby                              RLD BDch:  -
```

5 To busy the posted RLD, type

>BSY DRWR

and press the Enter key.

Example of a MAP display:

```
Warning:  Calls on RLD may be affected.
Do you wish to continue?
Please confirm ("YES", "Y", "NO", "N")
```

6 To respond affirmatively to the confirmation request, type

>Y

and press the Enter key.

At the SRME or SRMO site

7 The type of enclosure the Star Module has determines your next action.

If the RLD is in an	Do
SRME (inside) wall mount	step 8
SRMO (outdoors) cabinet	step 9

8 Use a slot screwdriver and turn the 1/4-turn screws at the bottom of the cover. Hold the cover by the left and right sides, lift up, and pull the cover towards you. Set the cover out of the way. Pull the interlock switch out to silence the door alarm at the MAP terminal. Go to step 11.

9 Unlock and open the cabinet door. The door alarm generates a Major alarm at the MAP terminal. Silence the alarm by pulling the interlock switch out. Loosen the two large screws at the left side of the inside TSS cover. Open the TSS cover to access the TSS. Pull the interlock switch out to silence the door alarm at the MAP terminal.

10 Power down the RLD by performing the following steps:

a Set the circuit breaker on the dc panel to OFF.

NTTR70
in an RLD (continued)

b Remove ac power from the RLD as follows.

- if the enclosure is an indoor wall-mounted SRME, remove power at the local ac power panel
- if the enclosure is an outdoor pad or pole-mounted SRMO, set the Rectifier circuit breaker on the ac panel to the OFF position. Then set the Main circuit breaker on the ac panel to the OFF position.
- disconnect the battery connector.
- Note that the green Power On LED is not lit

c The RLD is now powered down.

11

> **WARNING**
> **Static electricity damage**
> Before removing the SMC card, put on a wrist strap and connect it to the wrist strap grounding point on the TSS. This protects the equipment against damage caused by static electricity.

The NTTR70 is in the right card slot in the upper left side of the TSS.

Note: Record the position of the DIP switches on the SMC card.

12 Set the DIP switches on the replacement card to the same settings as those on the card you have just removed.

Refer to the following tables for information about correct switch settings.

SMC DIP switches S1 and S2 settings

			DIP switch settings							
Function		**Switch number**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Grounding receive shield	Disable	1	On	On	On	Off	Off	Off	Off	Off
		2								
	Enable Direct	1	On	On	On	Off	Off	Off	Off	On
		2								
	Enable capacitor	1	On	On	On	Off	Off	Off	Off	Off
		2								On

NTTR70
in an RLD (continued)

SMC DIP switch S3 settings

	DIP switch settings				Distance to Star Hub	
Mode	**S3-1**	**S3-2**	**S3-3**	**D3-4**	**Feet**	**Meters**
DS-1 extended superframe (ESF) binary eight bit zero substitution (B8ZS) code suppression	Off	Off	Off	Off	0-133	0-41
	Off	Off	Off	On	133-266	41-81
	Off	Off	On	Off	266-399	81-122
	Off	Off	On	On	399-533	122-163
	Off	On	Off	Off	533-655	163-200

13 Replace the SMC card.

14 Power up the RLD by performing the following steps:

a Provide ac power to the RLD as follows.

- if the enclosure is an indoor wall-mounted SRME, supply power at the local ac power panel
- if the enclosure is an outdoor pad or pole-mounted SRMO, set the Main circuit breaker on the ac panel to the ON position. Then set the Rectifier circuit breaker on the ac panel to the ON position.
- reconnect the battery connector.

b Set the circuit breaker on the dc panel to ON.

c Note that the green Power On LED is lit. Make sure no alarm condition is indicated by the LEDs on the SMC card.

d The RLD is now powered up.

15 Wait at least 3 minutes for the Star Module to power up and become stable before continuing to the next step.

At the MAP terminal

16 Load the standby (Stby) flash memory bank on the NTTR70 card. To load the Stby bank, type

>LOADRLD CC

and press the Enter key.

If LOADRLD	Do
passes	step 17
fails	step 24

NTTR70 in an RLD (end)

17 Switch the activity of the memory banks to make the newly loaded bank active. To switch the activity, type

>SWBNK

and press the Enter key.

18 Load the Stby flash memory bank on the NTTR70 card from the active bank. To load the Stby bank, type

>LOADRLD MATE

and press the Enter key.

If LOADRLD	Do
passes	step 19
fails	step 24

19 To return the RLD to service, type

>RTS DRWR

and press the Enter key.

If RTS	Do
passes	step 22
fails	step 24

20 Look at the status and alarm LEDs on the SMC card. Make sure the Inservice LED is lit.

21 Close the TSS cover, if applicable. Replace the cover on the SRME wall mount. Close and lock the cabinet door on the SRMO cabinet.

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

23 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 25.

24 Get additional help replacing this card by contacting the operating company personnel responsible for a higher level of support.

25 You have correctly completed this procedure.

NTTR71
RLD

Application

Use this procedure to replace an NTTR71 in a remote line drawer (RLD) in a Star Remote Module Equipment (SRME) or Star Remote Module Outside (SRMO) as identified in the following table.

PEC	Suffixes	Name
NTTR71	AA	Line maintenance unit (LMU) card

Common procedures

No common procedures are referenced in this procedure.

Action

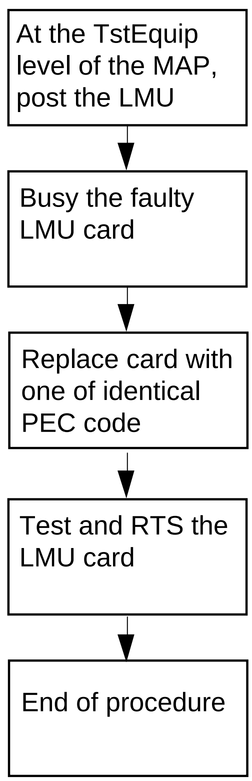
The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR71
RLD (continued)

Summary of replacing an NTTR71 in an RLD

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.



NTTR71
RLD (continued)

Replacing an NTTR71 in an RLD

At your current location:

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to check or accept cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

3 To access the test equipment (TSTEQUIP) level and post all LMUs, type

>MAPCI;MTC;MTCNA;TSTEQUIP;POST LMU ALL

and press the Enter key.

Example of a MAP response:

```
          SysB    ManB     OffL     CBsy     ISTb      InSv
TSTEQUIP    0       0        2        0        1        12
LMU         0       0        2        0        1         9

     PM       MTE        STATE
STAR  REM1 0 0   0         SYSB
```

4 Use the NEXT command to post the next LMU in the posted set until you access the LMU that is in the SysB state.

5 To busy the posted SysB LMU card, type

>BSY

and press the Enter key.

At the SRME or SRMO site

6 The type of enclosure the Star Module has determines your next action.

If the RLD is in an	Do
SRME (inside) Wall Mount	step 7
SRMO (outdoors) cabinet	step 8

7 Use a slot screwdriver and turn the 1/4-turn screws at the bottom of the cover. Hold the cover by the left and right sides, lift up, and pull the cover towards you. Set the cover out of the way. Pull the interlock switch out to silence the door alarm at the MAP terminal. Go to step 9.

8 Unlock and open the cabinet door. The door alarm generates a Major alarm at the MAP terminal. Silence the alarm by pulling the interlock switch out. Loosen the two large screws at the left side of the TSS cover. Open the TSS cover to access the TSS. Pull the interlock switch out to silence the door alarm at the MAP terminal.

NTTR71
RLD (continued)

9

> **DANGER**
> **Static electricity damage**
> Before removing the LMU card, put on a wrist strap and connect it to the wrist strap grounding point in the top left corner of the TSS. This protects the equipment against damage caused by static electricity.

The NTTR71 is in the center card slot in the upper left side of the telephony subsystem (TSS).

10 Replace the LMU card.

11 Look at the status and alarm LEDs on the SMC card. Make sure the Inservice LED is lit.

12 Close the TSS cover, if applicable. Replace the cover on the SRME Wall Mount. Close and lock the cabinet door on the SRMO cabinet.

At the MAP terminal

13 To test the new LMU card, type

>TST

and press the Enter key.

If TST	Do
fails	step 17
passes	step 14

14 To return the new LMU card to service, type

>RTS

and press the Enter key.

If RTS	Do
fails	step 17
passes	step 15

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

16 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 18.

NTTR71
RLD (end)

17 Get additional help replacing this card by contacting the operating company personnel responsible for a higher level of support.

18 You have correctly completed this procedure.

NTTR72 in an RLD

Application

Use this procedure to replace an NTTR72 in a remote line drawer (RLD) in a Star Remote Module Equipment (SRME) or Star Remote Module Outside (SRMO) as identified in the following table.

PEC	Suffixes	Name
NTTR72	AA	Power converter and ringing generator card

Common procedures

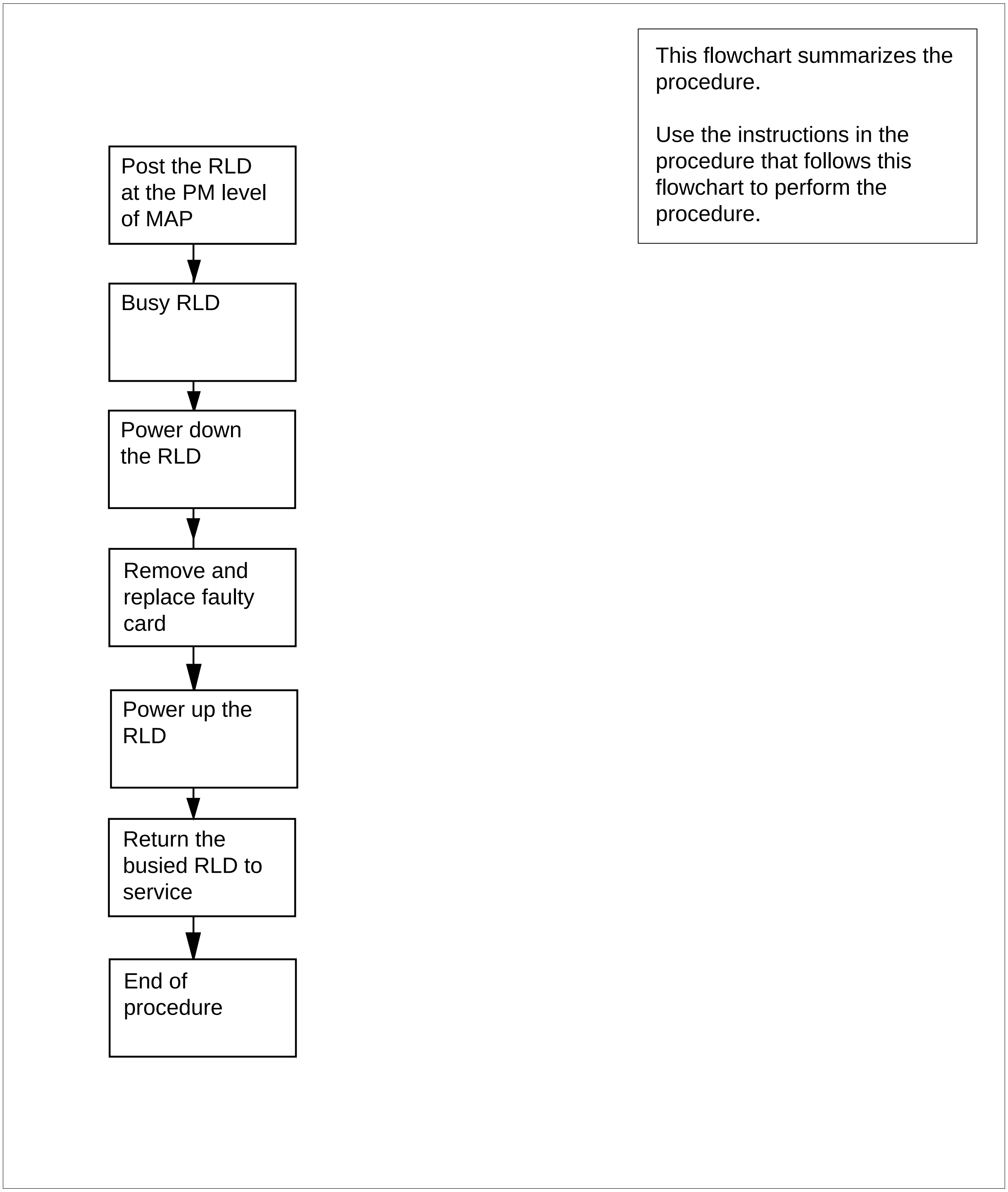
No common procedures are referenced in this procedure.

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.

NTTR72
in an RLD (continued)

Summary of replacing an NTTR72 RLD



NTTR72
in an RLD (continued)

Replacing an NTTR72 in an RLD

At your current location:

1 Proceed only if you were either directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure to check or accept cards, or were directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP display

3 To access the PM level of the MAP and post the Star Hub where the RLD is connected, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the name of the STAR site

frame
is the frame number of the STAR (0 to 511)

unit
is 0 for the STAR

Example of a MAP display:

```
             SysB     ManB     OffL     CBsy     ISTb    InSv
         PM    0        0        0        0        1       130
         STAR  0        0        0        0        1        10
STAR   Rem1  OO 0 ISTb   Links_OOS: CSide 0 PSide 0
Unit 0:  InSv  Mtce TakeOver    /RG:  0
Unit 1:  SysB  Mtce             /RG:  0               RG:
DRwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
.. .. .. .. .. .. .. .. SS .. .. .. .. .. .. .. .. ..
```

4 To post the RLD, type

>RLD;POST rld_no

and press the Enter key.

where

rld_no
is the STAR drawer (RLD) number to be posted

Example of a MAP display:

NTTR72
in an RLD (continued)

```
                 SysB     ManB     OffL     CBsy     ISTb      InSv
         PM       4        0       10        3        3          3
         STAR     0        0        0        0        1          1
STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:
Unit 0:  ISTb              /RG: 0
Unit 1:  ManB              /RG: 0                   RG
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --

REM9 RLD DRWR  8 SYSB                     LogDrwr:  16  17
BANK_0:  Active                           Links_OOS: 2
BANK_1: Stby                              RLD BDch:  -
```

5 To busy the posted RLD, type

>BSY DRWR

and press the Enter key.

Example of a MAP display:

```
Warning:  Calls on RLD may be affected.
Do you wish to continue?
Please confirm ("YES", "Y", "NO", "N")
```

6 To respond affirmatively to the confirmation request, type

>Y

and press the Enter key.

At the SRME or SRMO site

7 The type of enclosure the Star Module has determines your next action.

Note: Because the power and ringing card has failed, there is no power or ringing voltage available in the RLD to support subscribers.

If the RLD is in an	Do
SRME (inside) Wall Mount	step 8
SRMO (outdoors) cabinet	step 9

8 Use a slot screwdriver and turn the 1/4-turn screws at the bottom of the cover. Hold the cover by the left and right sides, lift up, and pull the cover towards you. Set the cover out of the way. Pull the interlock switch out to silence the door alarm at the MAP terminal. Go to step 11.

9 Unlock and open the cabinet door. The door alarm generates a Major alarm at the MAP terminal. Silence the alarm by pulling the interlock switch out. Loosen the two large screws at the left side of the TSS cover. Open the TSS cover to access the TSS. Pull the interlock switch out to silence the door alarm at the MAP terminal.

10 Power down the RLD by performing the following steps:

NTTR72
in an RLD (continued)

a Set the circuit breaker on the dc panel to OFF.

b Remove ac power from the RLD as follows:

- if the enclosure is an indoor wall-mounted SRME, remove power at the local ac power panel
- if the enclosure is an outdoor pad or pole-mounted SRMO, set the Rectifier circuit breaker on the ac panel to the OFF position. Then set the Main circuit breaker on the ac panel to the OFF position.
- disconnect the battery connector
- Note that the green Power On LED is not lit

c The RLD is now powered down.

11

> **WARNING**
> **Static electricity damage**
> Before removing the NTTR72 card, put on a wrist strap and connect it to the wrist strap grounding point on the TSS. This protects the equipment against damage caused by static electricity.

The NTTR72 is in the left card slot in the upper left area of the telephony subsystem (TSS).

12 Replace the NTTR72 card.

13 Power up the RLD by performing the following steps:

a Provide ac power to the RLD as follows.

- if the enclosure is an indoor wall-mounted SRME, supply power at the local ac power panel
- if the enclosure is an outdoor pad or pole-mounted SRMO, set the Main circuit breaker on the ac panel to the ON position. Then set the Rectifier circuit breaker on the ac panel to the ON position.

b Set the circuit breaker on the dc panel to ON.

c Re-connect the battery connector.

d Note that the green Power On LED is lit. Make sure no alarm condition is indicated by the LEDs on the SMC card.

e The RLD is now powered up.

14 Make sure the green Power OK LED is lit on the NTTR72. Wait a few minutes for the Star Module to power up and become stable before proceeding to the next step.

15 Close the TSS cover, if applicable. Replace the cover on the SRME Wall Mount. Close and lock the cabinet door on the SRMO cabinet.

NTTR72
in an RLD (end)

At the MAP terminal

16 To return the RLD to service, type

>RTS DRWR

and press the Enter key.

If RTS	Do
passes	step 17
fails	step 19

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

18 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 20.

19 Get additional help replacing this card by contacting the operating company personnel responsible for a higher level of support.

20 You have correctly completed this procedure.

NTTR73
in a STAR

Application

Use this procedure to replace the following card in a STAR HUB.

PEC	Suffixes	Name
NTTR73	AA	Universal maintenance pack (UMP)

Common procedures

The common replacing a card procedure is referenced in this procedure.

Action

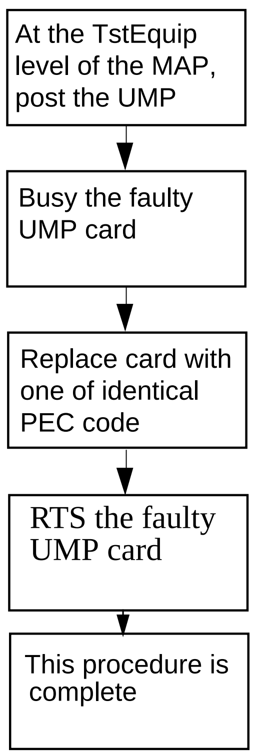
The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR73
in a STAR (continued)

Summary of card replacement procedure for an NTTR73 card in a STAR

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.



NTTR73
in a STAR (continued)

Replacing an NTTR73 card in a STAR

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

3 If you were directed to this procedure from another maintenance procedure, go to step 7. Otherwise, continue with step 4.

At the MAP terminal

4 To access the test equipment (TSTEQUIP) level and post all UMPs, type

>MAPCI;MTC;MTCNA;TSTEQUIP;POST UMP ALL

and press the Enter key.

Example of a MAP response:

```
         SysB    ManB     OffL     CBsy     ISTb      InSv
TSTEQUIP    0       0        2        0        1        12
UMP         0       0        2        0        1         9

PM        MTE         STATE
STAR  REM1 0 0   0         CBSY
```

5 Use the NEXT command to post the next UMP in the posted set until you access the UMP that is in the SysB state.

6 To busy the SysB UMP card posted in step 5, type

>BSY

and press the Enter key.

At the STAR control shelf

7 Replace the NTTR73 card using the common replacing a card procedure in this document. When the card is replaced, return to this point.

At the MAP terminal

8 To load the UMP card, type

>LOADTE

and press the Enter key.

9 If you were directed to this procedure from another maintenance procedure, return now to the alarm clearing procedure that directed you here. Otherwise, continue with step 10.

NTTR73
in a STAR (end)

At the MAP terminal

10 To test the new UMP card, type

>TST

and press the Enter key.

If TST	Do
fails	step 14
passes	step 11

11 To return the new UMP card to service, type

>RTS

and press the Enter key.

If RTS	Do
fails	step 14
passes	step 12

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

13 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Proceed to step 15.

14 Get additional help replacing this card by contacting the personnel responsible for a higher level of support.

15 You have correctly completed this procedure.

NTTR74 in a STAR

Application

Use this procedure to replace the following card in a STAR frame supervisory panel (FSP).

PEC	Suffixes	Name
NTTR74	AA	FSP alarm card

Common procedures

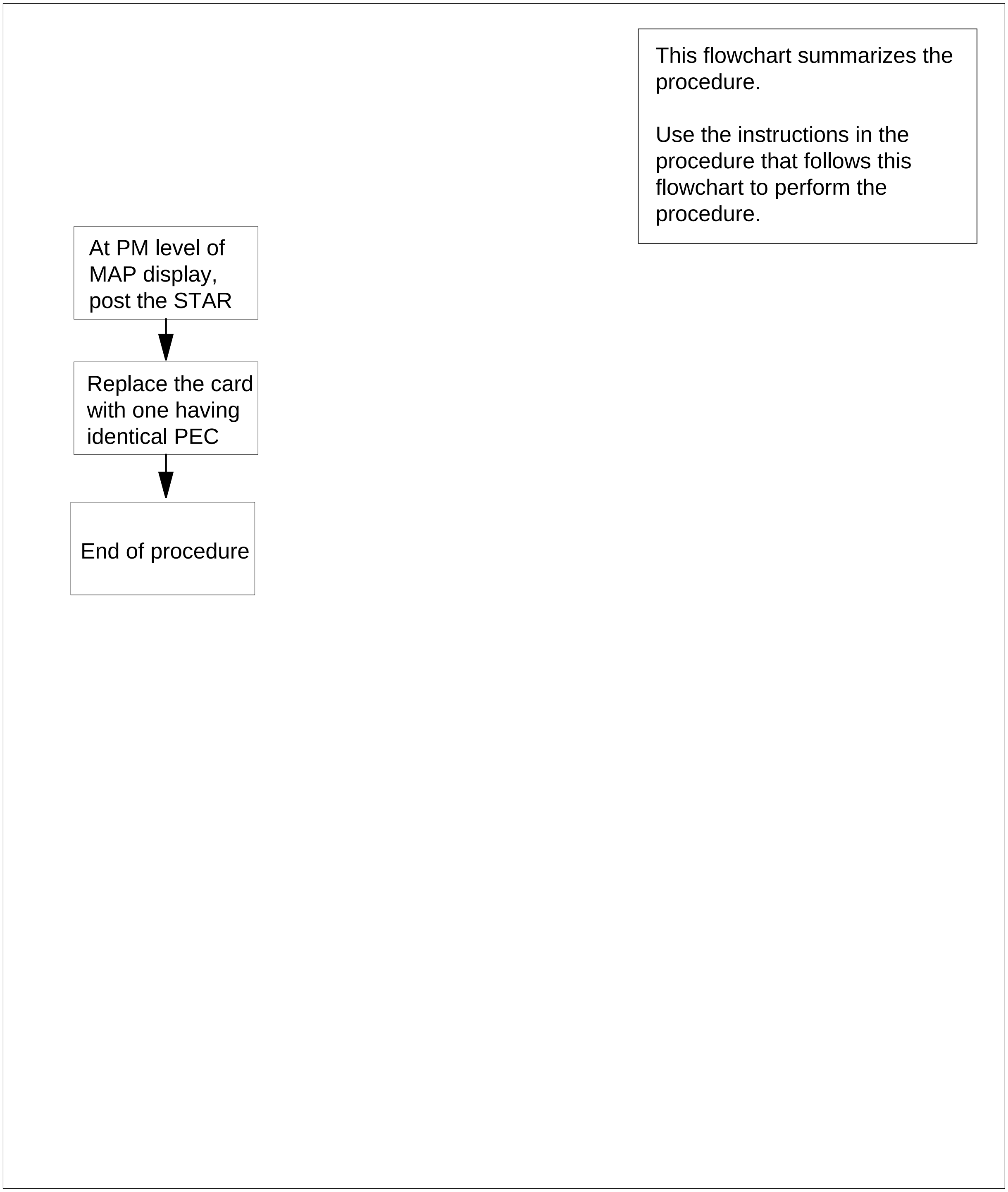
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR74
in a STAR (continued)

Summary of replacing an NTTR74 in a STAR



NTTR74
in a STAR (continued)

Replacing an NTTR74 in a STAR

> **CAUTION**
> **Loss of service**
> This procedure contains directions to offline the STAR. Since putting the STAR in an offline state seriously affects subscriber service, replace the FSP alarm card only during periods of low traffic.

> **DANGER**
> **Risk of electrocution**
> Some of the terminals inside the FSP have an electrical potential of -48 V dc. Remove all jewelry before replacing a card in the FSP. Do not touch any terminal inside the FSP.

At your current location:

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 To access the PM level and post the STAR, type

`>MAPCI;MTC;PM;POST STAR site frame unit`

and press the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

NTTR74
in a STAR (continued)

At the SRHE frame

4

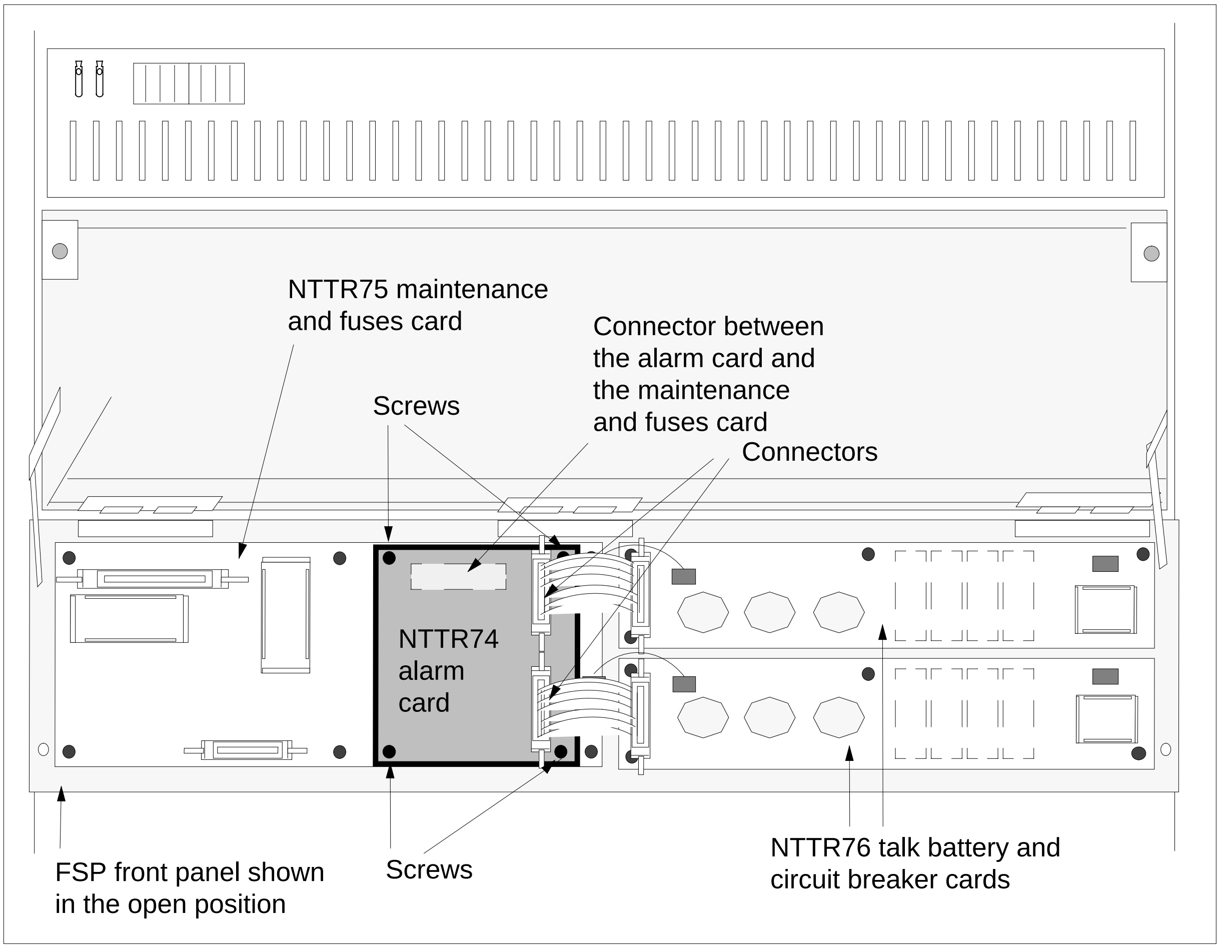
> **DANGER**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point on the frame supervisory panel (FSP) while handling cards. This precaution protects the cards against damage caused by static electricity.

Using a slot screwdriver, unscrew the two screws located in the upper left- and right-hand corners of the FSP front panel.

5 Swing the FSP front panel downward to expose the interior of the FSP and the cards located on the back of the FSP front panel.

6 With the FSP front panel open, locate the NTTR74 alarm card. Use the following diagram to assist you.

NTTR74
in a STAR (continued)



7 Remove the alarm card by performing the following steps:

a Disconnect the two cable connectors on the alarm card and note the connector numbers.

b Using a Phillips head screwdriver, unscrew the four Phillips head screws and remove the lock washers and flat washers that secure the NTTR74 alarms card to the NTTR75. Gently pull with a rocking motion until the pins on the underside of the alarm card are clear of the connector between the alarm card and the maintenance and fuses card.

c Place the card you have removed in an electrostatic discharge (ESD) protective container.

d Obtain a replacement card with the same product equipment code (PEC), including suffix, as the card you just removed.

8 Install the new alarm card by performing the following steps:

a Carefully install the new alarm card, positioning it to correctly align the pins to the connector on the maintenance and fuses card where the alarm card was removed from in step 7a

NTTR74
in a STAR (end)

b Gently press the card in place on the connector.

c Install the four Phillips head screws, lock washers, and flat washers in the NTTR74 alarms card to secure it to the NTTR75 Tighten the screws after all four screws are installed.

d Reconnect the two cable connectors that were disconnected in step 7a

9 Close the FSP front panel. Secure the FSP front panel by tightening the two screws that were loosened in step 4.

At the MAP terminal

10 Determine if either unit is ISTB.

If	Do
either unit is ISTb	step 11
the STAR is InSv	step 12

11 To perform an in-service test on the ISTb unit, type

>TST UNIT unit_no

and press the Enter key.

where

unit_no
is the STAR unit in the ISTb state

If TST	Do
passes	step 12
fails	step 14

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

13 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Proceed to step 16.

14 Get additional help by contacting the personnel responsible for a higher level of support.

15 If alarms are displayed, proceed to the appropriate alarm clearing procedure in this manual.

16 You have correctly completed this procedure.

NTTR75
in a STAR

Application

Use this procedure to replace the following card in the STAR frame supervisory panel (FSP).

PEC	Suffixes	Name
NTTR75	AA	Maintenance and fuses card

Common procedures

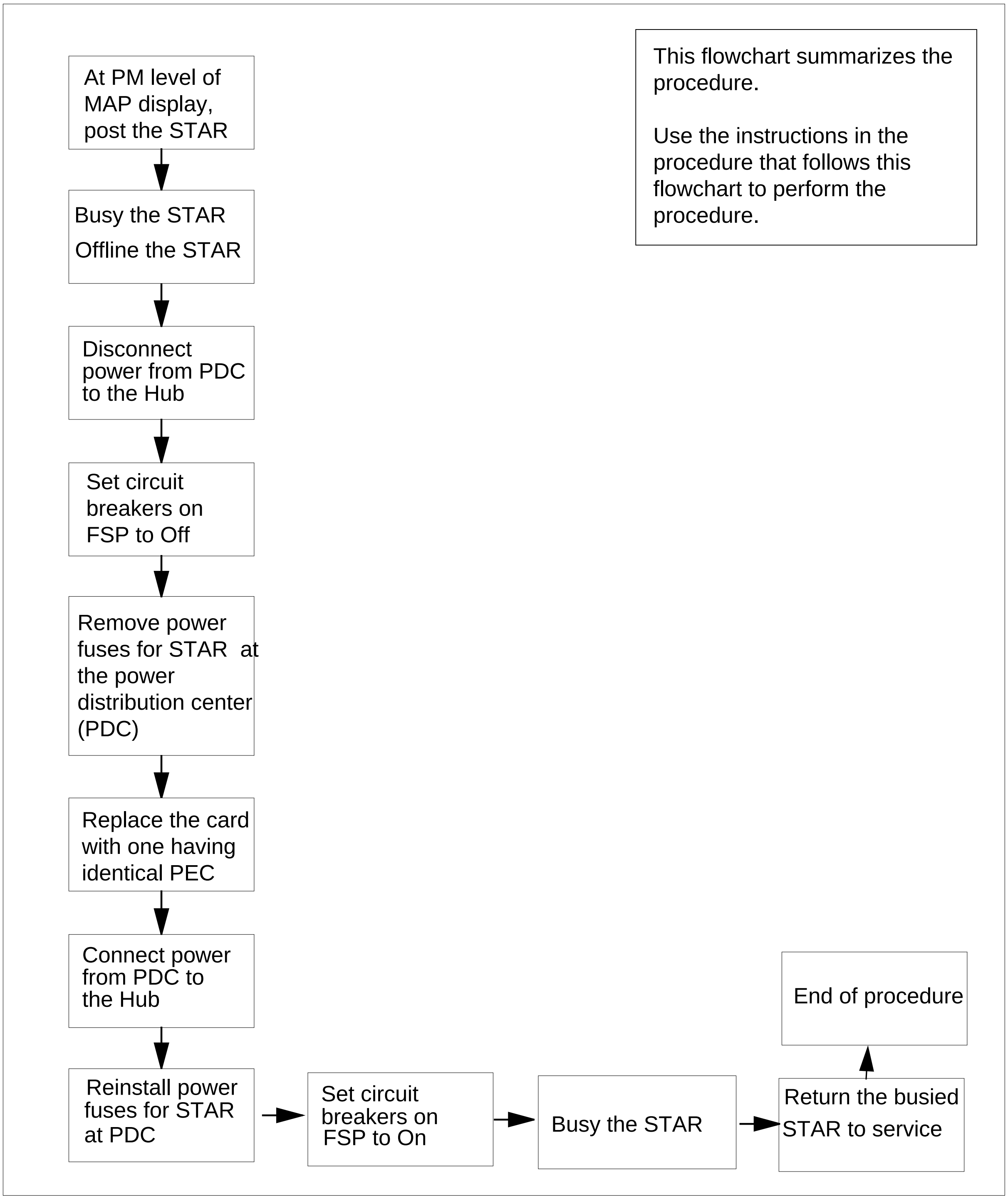
None.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR75
in a STAR (continued)

Summary of replacing a/an NTTR75 in a STAR



NTTR75
in a STAR (continued)

Replacing an NTTR75 in a STAR

CAUTION
Loss of service
This procedure contains directions to offline the STAR. Since putting the STAR in an offline state seriously affects subscriber service, replace the FSP alarm card only during periods of low traffic.

DANGER
Risk of electrocution
Some of the terminals inside the FSP have an electrical potential of -48 V dc. Remove all jewelry before replacing a card in the FSP. Do not touch any terminal inside the FSP.

At your current location:

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 To access the PM level and post the STAR, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

4 To busy the STAR containing the faulty card, type

>BSY PM

and press the Enter key.

NTTR75
in a STAR (continued)

5 To offline the STAR containing the faulty card, type

>OFFL PM

and press the Enter key.

At the SRHE frame

6 Disconnect the power from the PDC to the Star Hub.

7 On the FSP front panel, power down the ringing generators, power converters, line drawers and NTTR73 universal maintenance pack (UMP) in the control shelf by setting the circuit breakers listed in the following table to the Off position.

If Circuit breaker label	DoPurpose
PS00, Slot 3	NT6X53 power converter in unit 0, slot 3
PS01, Slot 5	NT6X53 power converter in unit 0, slot 5
PS10, Slot 20	NT6X53 power converter in unit 1, slot 20
PS11, Slot 18	NT6X53 power converter in unit 1, slot 18
Ring 0, Slot 1	NTTR60 ringing generator in unit 0, slot 1
Ring 1, Slot 22	NTTR60 ringing generator in unit 1, slot 22
Talk A	Talk battery A feed to the 9 line drawers 1 - 4, 9 - 13 and UMP cards in unit 0/1, slot 11/13
Talk B	Talk battery B feed to the 9 line drawers 5 - 8, 14 - 18 and UMP cards in unit 0/1, slot 11/13

8 Use a fuse puller to remove the following fuses on the FSP front panel

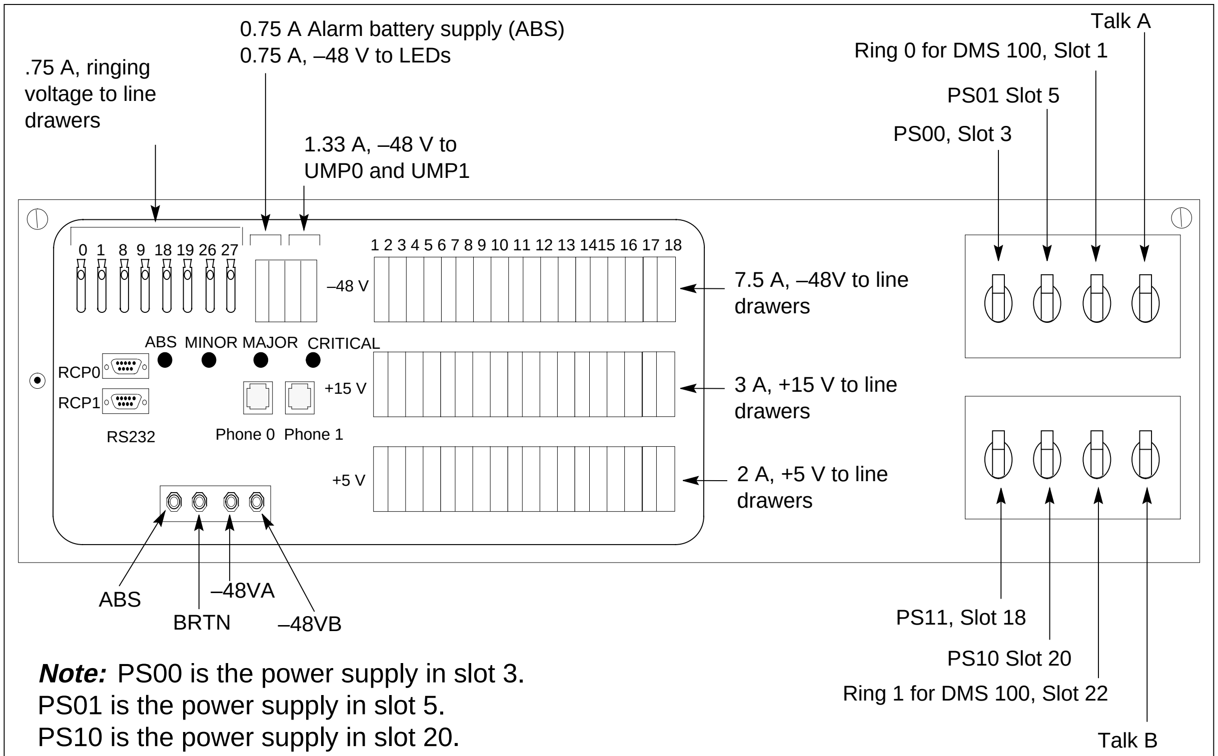
- one -48 V alarm and battery supply (ABS) fuse
- one -48 V LED
- two -48 V to universal maintenance packs (UMP)
- eight ringing voltage to line drawers
- 18 -48 V to line drawers
- 18 +15 V to line drawers
- 18 +5 V to line drawers

Note: Store and group the fuses by size to simplify reinstallation into the replacement card.

Use the following figure to locate the fuses and breakers and their labels.

NTTR75
in a STAR (continued)

FSP front panel



Note: PS00 is the power supply in slot 3.
PS01 is the power supply in slot 5.
PS10 is the power supply in slot 20.
PS11 is the power supply in slot 18.
TALKA is the breaker for talk battery A feed.
TALKB is the breaker for talk battery B feed.

9

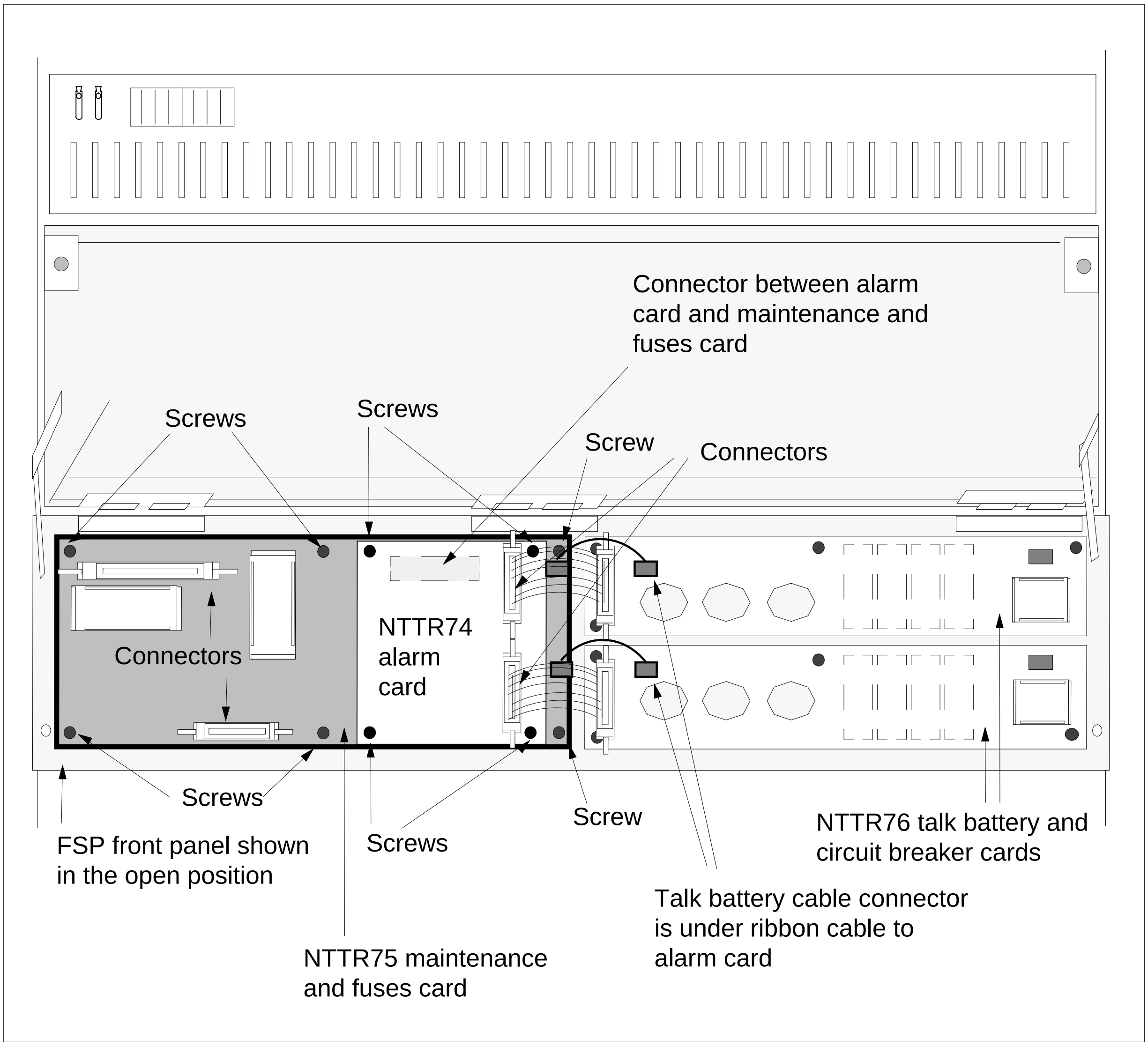
> **WARNING**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point on the FSP while handling cards. This precaution protects the cards against damage caused by static electricity.

Use a slot screwdriver to unscrew the two screws located in the upper left- and right-hand corners of the FSP front panel.

10 Swing the FSP front panel downward to expose the interior of the FSP and the cards located on the back of the FSP front panel.

11 With the FSP front panel open, locate the NTTR74 alarm card. Use the following diagram to assist you.

NTTR75
in a STAR (continued)



12 Remove the NTTR75 maintenance and fuses card by performing the following steps:

a Disconnect the two cable connectors on the NTTR74 alarm card and note the connector numbers.

b Using a Phillips head screwdriver, unscrew the four Phillips head screws and remove the lock washers and flat washers that secure the NTTR74 alarms card to the NTTR75. Gently pull with a rocking motion until the pins on the underside of the alarm card are clear of the connector between the alarm card and the maintenance and fuses card.

c Carefully remove the alarm card.

NTTR75
in a STAR (continued)

d Place the card you have removed in an electrostatic discharge (ESD) protective container.

e Disconnect the four cable connectors on the left half of the NTTR75 maintenance and fuses card and note the connector numbers. Then, disconnect the two talk battery cables on the right end of the card noting the connector labels.

f Using a Phillips head screwdriver, unscrew the six Phillips head screws and remove the lock washers and flat washers that secure the NTTR75 maintenance and fuses card to the back of the FSP front panel.

g Carefully remove the maintenance and fuses card.

h Place the card you have removed in an electrostatic discharge (ESD) protective container.

i Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card you just removed.

13 Install the new maintenance and fuses card by performing the following steps:

a Install the new maintenance and fuses card, positioning it to correctly connect the cable connectors that were disconnected in step 12e.

b Install the six Phillips head screws, lock washers, and flat washers in the NTTR75 maintenance and fuses card to secure it to the back of the FSP front panel. Tighten the screws after all six screws are installed.

c Connect the four cable connectors and the two talk battery cables on the NTTR75 maintenance and fuses card that were disconnected in step 12e.

d Carefully install the alarms card, positioning it to correctly align the pins to the connector on the maintenance and fuses card that was disconnected in step 12b

e Gently press the card in place on the connector.

f Install the four Phillips head screws, lock washers, and flat washers in the NTTR74 alarms card to secure it to the NTTR75. Tighten the screws after all four screws are installed.

g Reconnect the two cable connectors that were disconnected in step 12a.

14 Close the FSP front panel. Secure the FSP front panel by tightening the two screws that were loosened in step 9.

15 Connect the power from the PDC to the Hub.

16 Install the fuses in the FSP front panel that were removed in step 8. Use the figure titled “FSP front panel" to aid in correct fuse placement.

17 Restore power to the STARs ringing generators, power converters, line drawers, and UMP cards by setting the circuit breakers to the On position that were listed in the table and turned Off in step 7.

18 Observe the fuses on the FSP front panel. Determine if there are blown fuses.

If	Do
there are no blown fuses	step 19

NTTR75
in a STAR (end)

If	Do
there are blown fuses	step 23

At the MAP terminal

19 To busy the STAR that was offlined in step 5, type

>BSY PM

and press the Enter key.

20 To return to service the STAR, type

>RTS PM

and press the Enter key.

If RTS	Do
passes	step 21
fails and a card list appears (an alarm condition exists)	step 24

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

22 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Proceed to step 25.

23 Get additional help by contacting the personnel responsible for a higher level of support.

24 If alarms are displayed, go to the appropriate alarm clearing procedure in this manual.

25 You have correctly completed this procedure.

NTTR76 in a STAR

Application

Use this procedure to replace the following card in the STAR frame supervisory panel (FSP).

PEC	Suffixes	Name
NTTR76	AA	Talk battery and circuit breakers card

Common procedures

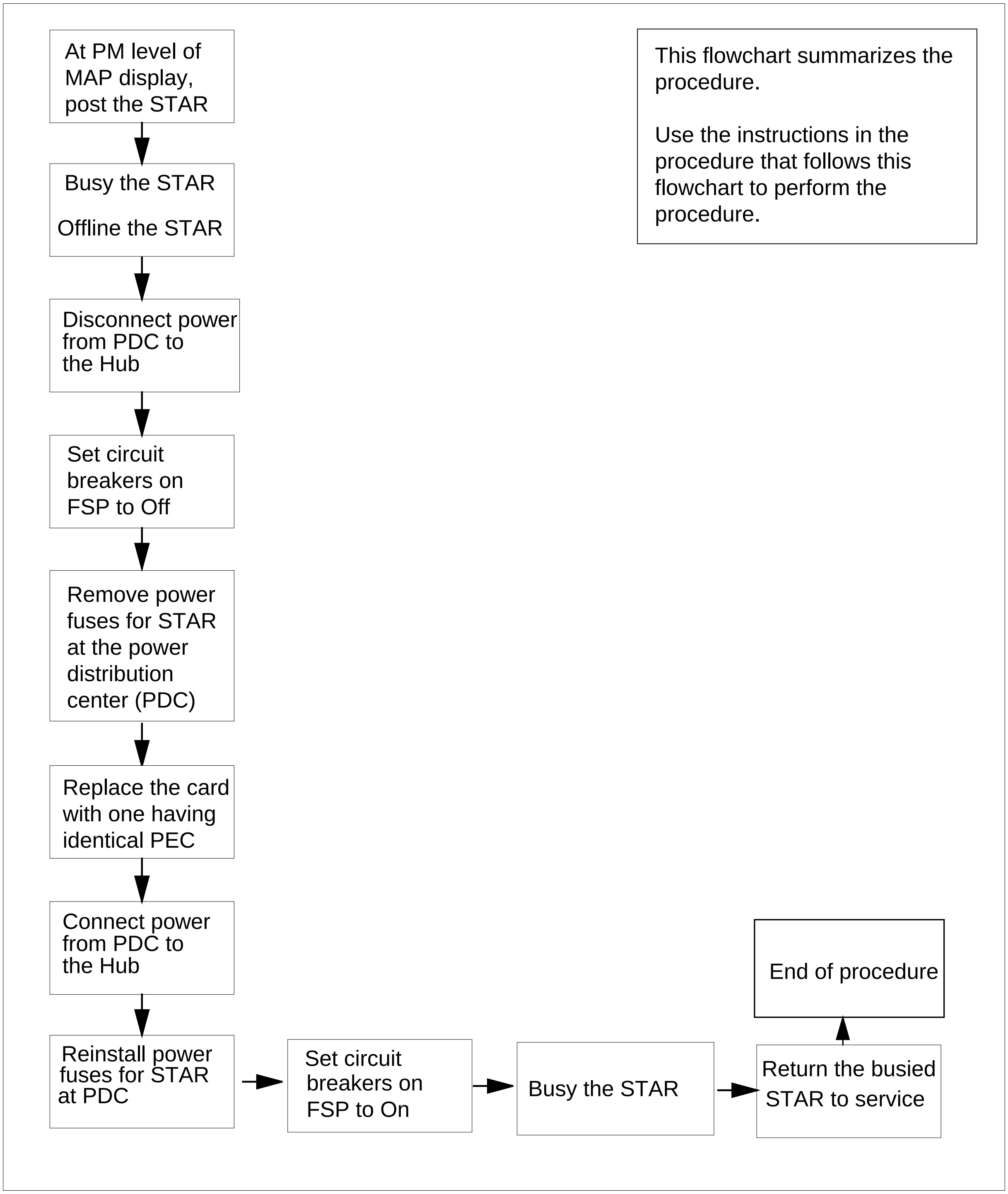
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR76
in a STAR (continued)

Summary of replacing an NTTR76 in a STAR



NTTR76
in a STAR (continued)

Replacing an NTTR76 in a STAR

> **CAUTION**
> **Loss of service**
> This procedure contains directions to offline the STAR. Since putting the STAR in an offline state seriously affects subscriber service, replace the FSP alarm card only during periods of low traffic.

> **DANGER**
> **Risk of electrocution**
> Some of the terminals inside the FSP have an electrical potential of -48 V dc. Remove all jewelry before replacing a card in the FSP. Do not touch any terminal inside the FSP.

At your current location:

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP terminal

3 To access the PM level and post the STAR, type

`>MAPCI;MTC;PM;POST STAR site frame unit`

and press the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

4 Check for REX tst by typing

`>tst rex query`

and press the Enter key.

NTTR76
in a STAR (continued)

If the MAP response is

`STAR SHUB 00 0 REX test is ON`

type the following

`>tst rex off`

the MAP response should be

`STAR SHUB 00 0 REX test is OFF`

5 To busy the STAR unit containing the faulty card, type

`>BSY UNIT unit_no`

and press the Enter key.

where

unit
is the STAR unit (0 or 1) associated with the faulty talk battery and circuit breakers card

6 To offline the STAR unit, type

`>OFFL UNIT unit_no`

and press the Enter key.

where

unit
is the STAR unit (0 or 1) associated with the faulty talk battery and circuit breakers card

At the SRHE frame

7 Disconnect the power from the PDC to the Star Hub by removing the fuses from the relevant NTTR76 units.

8 On the FSP front panel, power down the ringing generators, power converters, line drawers and NTTR73 universal maintenance pack (UMP) in the control shelf by setting the circuit breakers listed in the following table to the OFF position.

(Sheet 1 of 2)

Circuit breaker label	Unit number	Purpose
PS00, Slot 3	Unit 0	NT6X53 power converter, slot 3
PS01, Slot 5	Unit 0	NT6X53 power converter, slot 5
Ring 0, Slot 1	Unit 0	NTTR60 ringing generator, slot 1
Talk A	Unit 0	Talk battery A feed to the 9 line drawers 1 - 4, 9 -13 and UMP packs, in unit 0/1, slot 11/13
PS10, Slot 20	Unit 1	NT6X53 power converter, slot 20

NTTR76
in a STAR (continued)

(Sheet 2 of 2)

Circuit breaker label	Unit number	Purpose
PS11, Slot 18	Unit 1	NT6X53 power converter, slot 18
Ring 1, Slot 22	Unit 1	NTTR60 ringing generator, slot 22
Talk B	Unit 1	Talk battery B feed to the 9 line drawers 5 - 8, 14 - 18 and UMP packs, in unit 0/1, slot 11/13

If	Do
you are replacing both NTTR76 cards	step 9
else do not remove the fuses from the NTTR75 card and go to	step 10

At the FSP front panel

9 Use a fuse puller to remove the following fuses on the FSP front panel

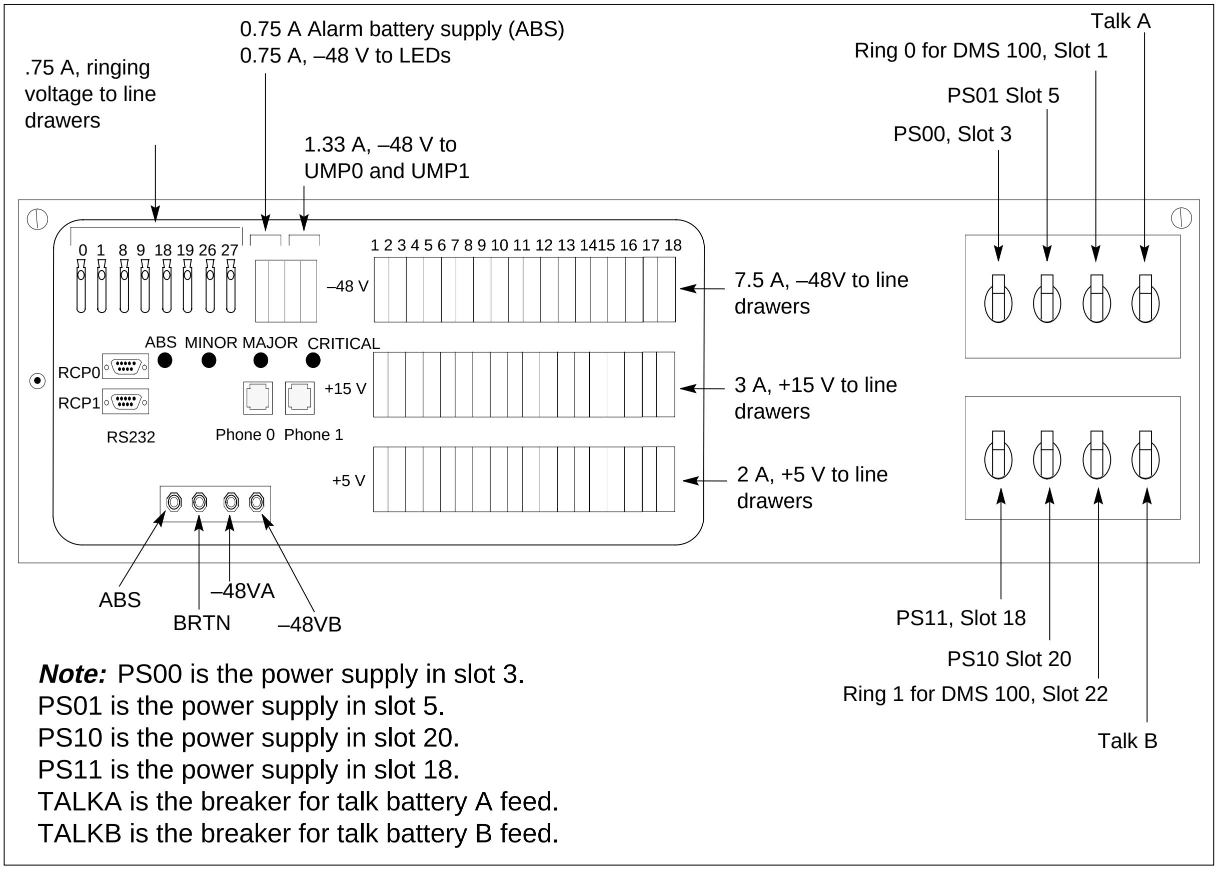
- one -48 V alarm and battery supply (ABS) fuse
- one -48 V LED
- two -48 V to universal maintenance packs (UMP)
- eight ringing voltage to line drawers
- 18 -48 V to line drawers
- 18 +15 V to line drawers
- 18 +5 V to line drawers

Note: Store and group the fuses by size to simplify reinstallation into the panel.

Use the following figure to locate the fuses and breakers and their labels.

NTTR76
in a STAR (continued)

FSP front panel



Note: PS00 is the power supply in slot 3.
PS01 is the power supply in slot 5.
PS10 is the power supply in slot 20.
PS11 is the power supply in slot 18.
TALKA is the breaker for talk battery A feed.
TALKB is the breaker for talk battery B feed.

At the SRHE frame

10

> **DANGER**
> **Static electricity damage**
> Wear a wrist strap connected to the wrist strap grounding point on the FSP while handling cards. This precaution protects the cards against damage caused by static electricity.

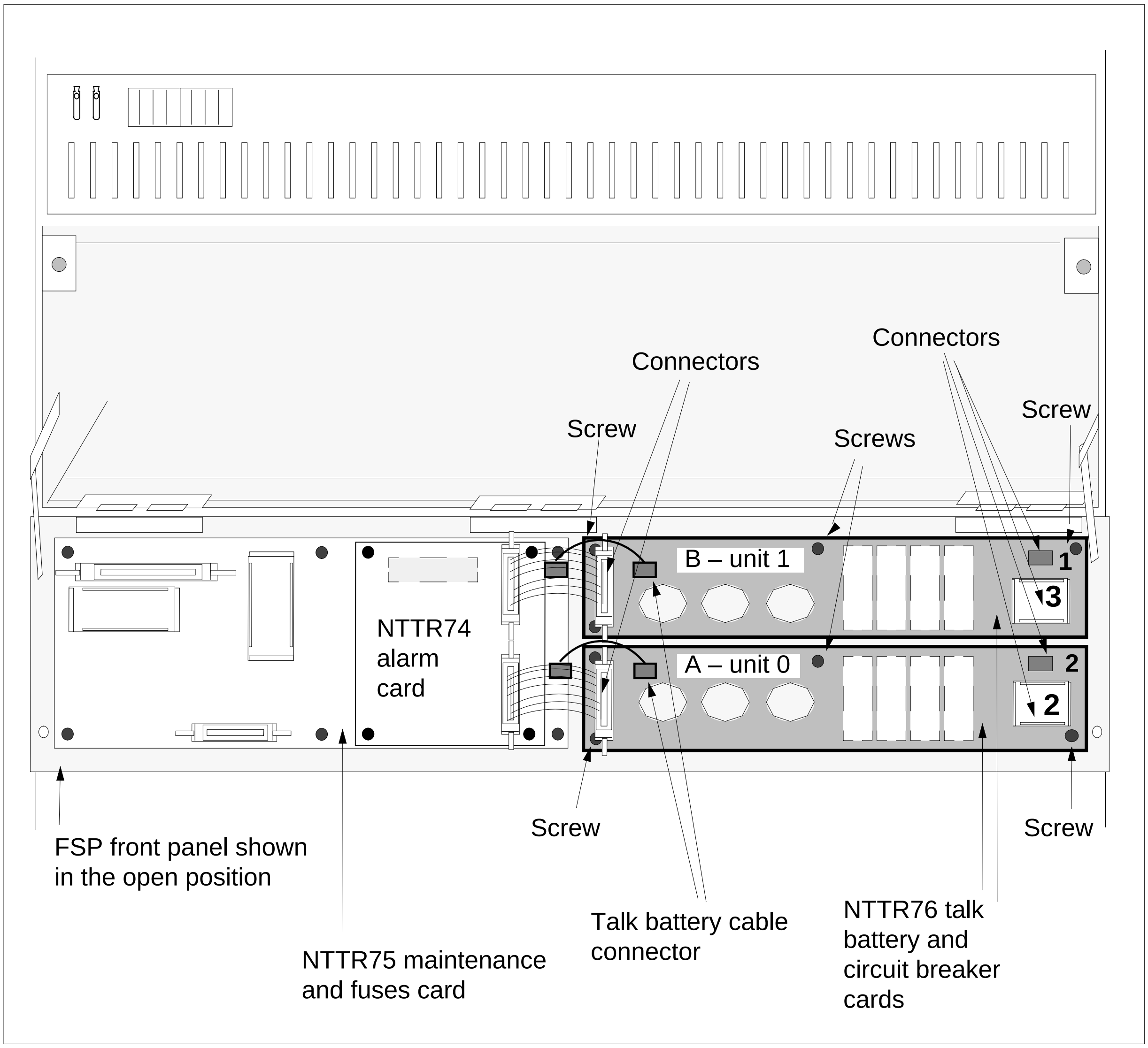
Remove the metal cover.

Using a slot screwdriver, unscrew the two screws located in the upper left and right hand corners of the FSP front panel.

11 Swing the FSP front panel downward to expose the interior of the FSP and the cards located on the back of the FSP front panel.

NTTR76
in a STAR (continued)

12 With the FSP front panel open, locate the NTTR76 talk battery and circuit breaker cards. Use the following diagram to assist you. Determine the correct card to remove, based on whether the problem is related to the A or the B feed or a defective circuit breaker. Note in the following diagram where the NTTR76 cards are labeled A and B and the unit number they support. The A relates to the A feed and the B relates to the B feed.



13 Remove the appropriate NTTR76 card by performing the following steps:

a Disconnect the four cable connectors on the NTTR76 card.

b Remove the cover.

NTTR76
in a STAR (continued)

c Using a Phillips head screwdriver, unscrew the five Phillips head screws and remove the screws, lock washers, and flat washers that secure the NTTR76 card to the back of the FSP front panel.

d Carefully remove the NTTR76 card.

e Place the card you have removed in an electrostatic discharge (ESD) protective container.

f Ensure the replacement card has the same product equipment code (PEC), including suffix, as the card you just removed.

14 Install the new NTTR76 talk battery and circuit breaker card by performing the following steps:

a Install the new NTTR76 card.

b Install the five Phillips head screws, lock washers, and flat washers in the NTTR76 card to secure the card to the back of the FSP front panel. Tighten the screws after all five screws are installed.

c Install the cover.

d Reconnect the four cable connectors on the NTTR76 card that were disconnected in step 13a

15 Close the FSP front panel. Secure the FSP front panel by tightening the two screws that were loosened in step 10.

16 Connect the power from the PDC to the Star Hub by restoring the fuses to the relevant NTTR76 units.

17 Install the fuses in the FSP front panel that were removed in Step 9. Use the figure titled “FSP front panel” to aid in correct fuse placement.

18 Restore power to the unit's ringing generators, power converters, line drawers, and UMP cards by setting the circuit breakers to the On position that were turned Off in step 8. Refer to the table in step 8.

19 Busy the STAR unit that was offlined in steps 5 and 6 by typing

>BSY UNIT unit_no

and press the Enter key

20 Observe the fuses on the FSP front panel. Determine if there are blown fuses.

If	Do
there are no blown fuses	step 21
there are blown fuses	step 25

At the MAP terminal

21 To return to service the STAR, type

>RTS UNIT unit_no

and press the Enter key.

where

NTTR76 in a STAR (end)

unit
is the STAR unit (0 or 1) that was busied in step 5

If RTS	Do
passes	step 23
fails and a card list appears (an alarm condition exists)	step 26

22 Turn REX tst back on by typing

>tst rex on

and press the enter key. The MAP response should be

`STAR SHUB 00 0 REX test is ON`

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

24 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Proceed to step 27.

25 Get additional help by contacting the personnel responsible for higher level of support.

26 If alarms are displayed, proceed to the appropriate alarm clearing procedure in this manual.

27 You have correctly completed this procedure.

NTTR77
in a STAR

Application

Use this procedure to replace the following card in a STAR.

PEC	Suffixes	Name
NTTR77	AA	Remote controller pack (RCP)

Common procedures

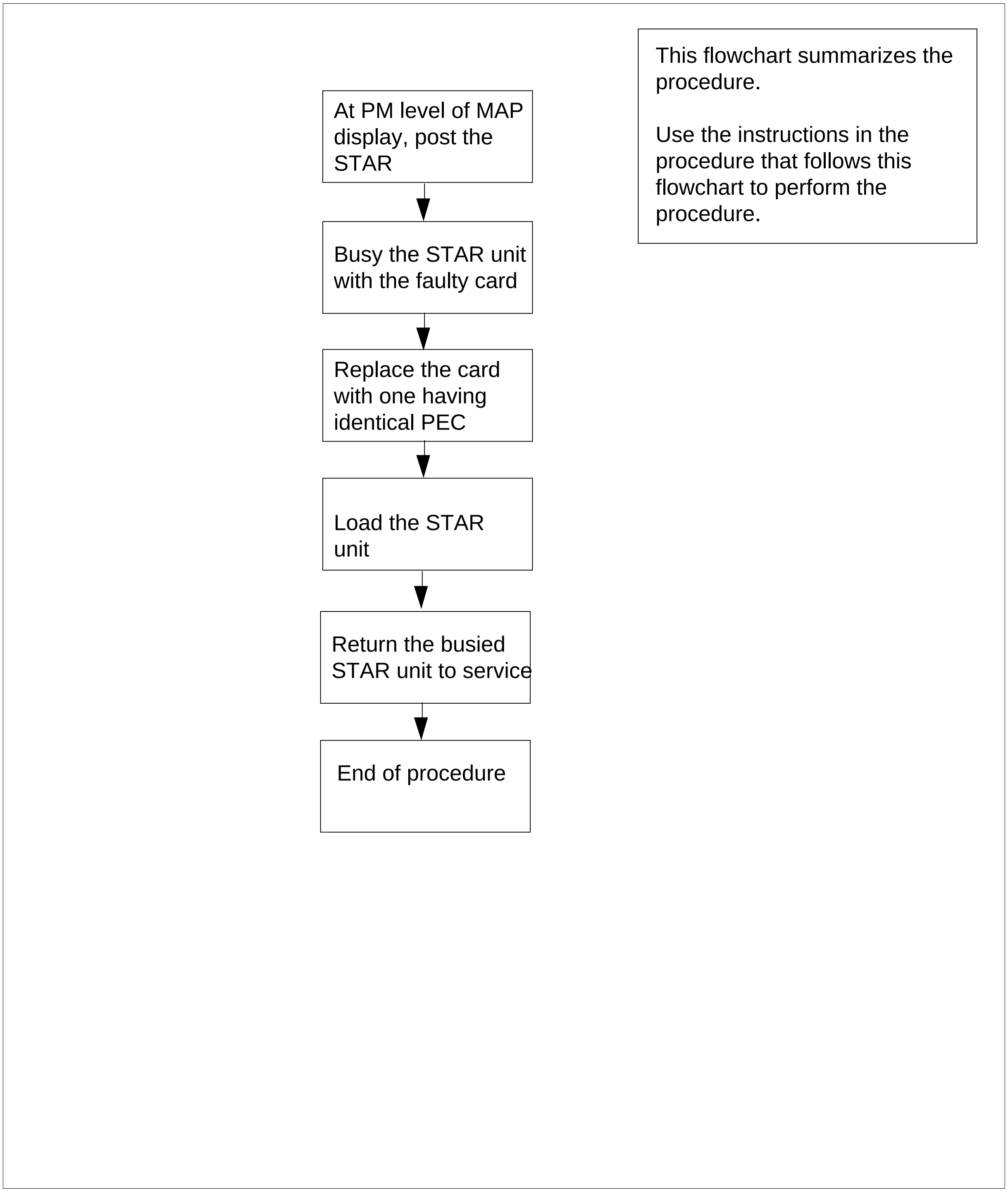
None

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.

NTTR77
in a STAR (continued)

Summary of card replacement procedure for an NTTR77 card in a STAR



Replacing an NTTR77 card in a STAR

ATTENTION

Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

At your current location

1

CAUTION
Loss of service
This procedure includes directions to manually busy one or more peripheral module (PM) units. Since manually busying a PM unit can cause service degradation, perform this procedure only if necessary to restore out-of-service components. Otherwise, carry out this procedure during periods of low traffic.

Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

2 If you were directed to this procedure from another maintenance procedure, go to step 6; otherwise, continue with step 3.

At the MAP display

3 To access the PM level and post the STAR, type

`>MAPCI;MTC;PM;POST STAR site frame unit`

and press the Enter key.

where

site
is the site name of the STAR (alphanumeric)

frame
is the frame number of the STAR (0-511)

unit
is 0 for the STAR

NTTR77
in a STAR (continued)

4 Determine the state of the PM unit associated with the card you are replacing.

If the state of the PM unit is	Do
`SysB` , `CBsy`, `ISTb`, `InSv`	step 5
`ManB`	step 6
`Offl`	step 30

5 To busy the STAR unit containing the faulty card, type

`>BSY UNIT unit_no`

and press the Enter key.

where

unit_no
is the STAR unit to be busied (0 or 1)

At the SRHE frame

6

DANGER
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 NTTR77 card using the procedure “Replacing a card." When the card has been replaced, return to this point.

7 If you were directed to this procedure from another maintenance procedure, return now to the procedure that directed you here and continue as directed. Otherwise, continue with step 9.

8 To load the STAR unit, type

`>LOADPM UNIT star_unit CC`

and press the Enter key.

where

star_unit
is the STAR unit to be loaded (0 or 1)

If	Do
message “loadfile not found in directory" displays at the MAP terminal	step 10

NTTR77
in a STAR (continued)

If	Do
load passes	step 9
load fails	step 29

9 To return the STAR unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the STAR busied in step 5 (0 or 1)

If RTS	Do
passes	step 27
fails	step 29

10 Determine the type of device where the PM load files are located.

If load files are located on	Do
IOC disk	step 17
SLM disk	step 22

11 Locate the tape that contains the PM load files.

At the IOE frame

12 Mount the tape on a magnetic tape drive.

At the MAP display

13 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

14 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 containing the PM load files

NTTR77
in a STAR (continued)

15 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

16 Go to step 26.

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

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

>DSKUT

and press the Enter key.

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, obtained in step 17

20 To leave the disk utility, type

>QUIT

and press the Enter key.

21 Go to step 26.

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

23 To access the disk utility level at the MAP display, type

>DISKUT

and press the Enter key.

24 To list the SLM file names into your user directory, type

>LV CM;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 22

25 To leave the disk utility, type

>QUIT

NTTR77
in a STAR (end)

and press the Enter key.

26 To load the STAR unit, type

>LOADPM UNIT star_unit CC

and press the Enter key.

where

star_unit
is the STAR unit to be loaded (0 or 1)

If	Do
load fails	step 29
load passes	step 9

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

28 Record the following items in office records:

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 31.

29 Get additional help replacing this card by contacting the personnel responsible for a higher level of support.

30 Consult office personnel to determine why the component is offline. Continue as directed by office personnel.

31 You have correctly completed this procedure.

NTTR87
in a STAR

Application

Use this procedure to replace an NTTR87 card in a STAR.

PEC	Suffixes	Name
NTTR87	AA	Quad frame carrier card

Common procedures

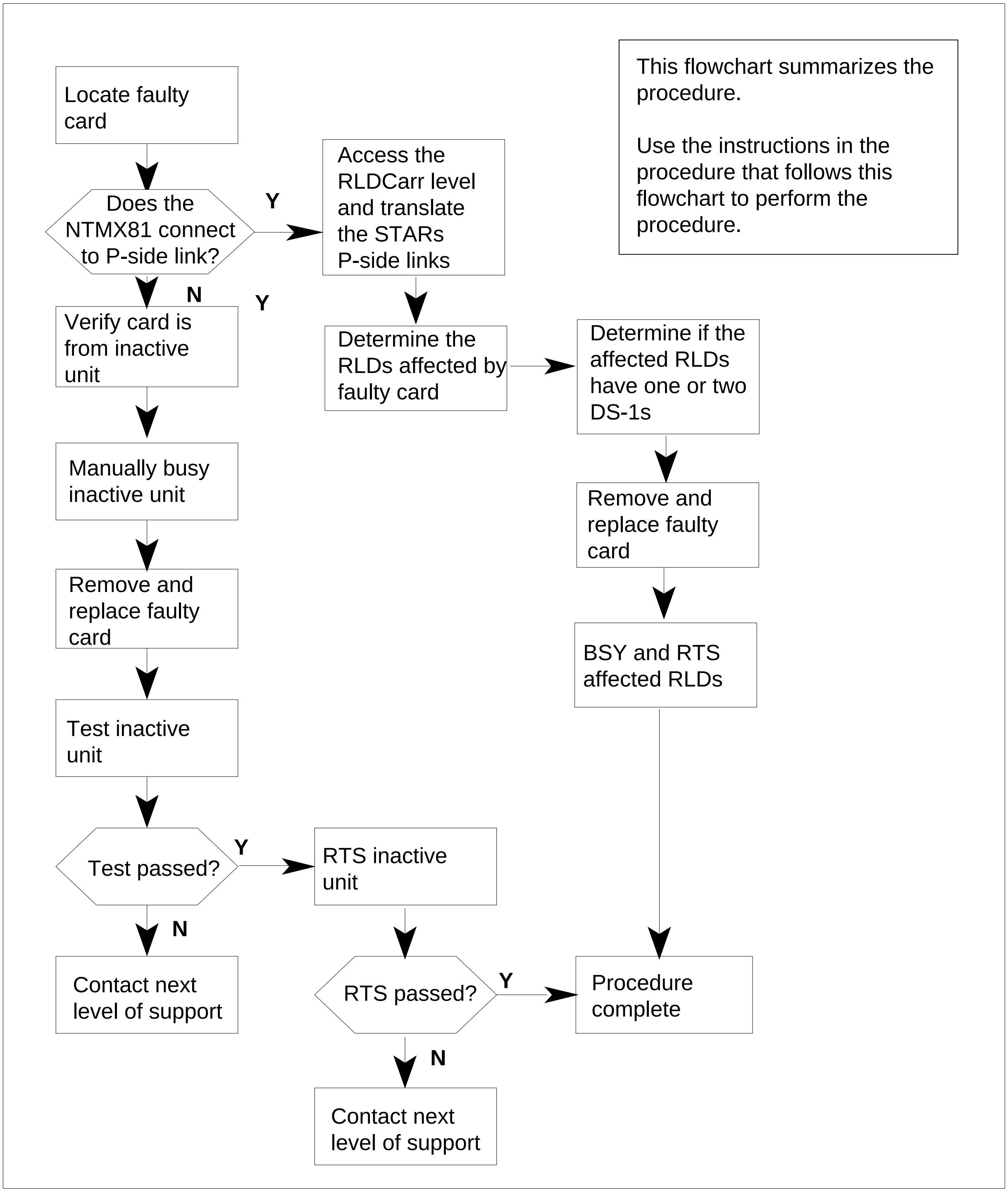
None

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTTR87
in a STAR (continued)

Summary of card replacement procedure for an NTTR87 card in a STAR



NTTR87
in a STAR (continued)

Replacing an NTTR87 card in a STAR

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for checking or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Get a replacement card. Make sure the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the MAP terminal

3 To make sure the PM level of the MAP display is currently displayed, type

>MAPCI;MTC;PM;POST STAR site frame unit

and press the Enter key.

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the card with faults (0 to 511)

unit
is 0 for the STAR

Example of a MAP response:

```
       SysB     ManB     OffL     CBsy     ISTb      InSv
 PM      0        0        2        0        1          12
STAR     0        0        2        0        1           9
STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb               /RG: 0
Unit 1:  InSv               /RG: 0                   RG:
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref 0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby 1 InSv
.. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
```

4 Determine the slot location of the NTTR87 with faults.

If the NTTR87 is in slot	Do
8 or 16 (C-side DS-1 links to host PM)	step 5
9, 10, 14, or 15 (P-side DS-1 links to Star Module)	step 12

5 Display and record the C-side link status of the posted STAR connected to the NTTR87 card with faults. To display the C-side links, type

>TRNSL C

and press the Enter key.

Example of a MAP response

```
LINK 0    LTC  0 0;CAP MS: STATUS SysB MSGCOND CLS RESTRICT
LINK 1    LTC  0 1;CAP  S: STATUS SysB
LINK 2    LTC  0 2;CAP MS: STATUS OK MSGCOND OPN UNRESTRICT
LINK 3    LTC  0 3;CAP  S: STATUS OK
LINK 4    LTC  0 4;CAP  S: STATUS SysB
LINK 5    LTC  0 5;CAP  S: STATUS SysB
```

6 To busy the inactive STAR unit, type

***>bsy unit* unit_no**

and press the Enter key.

where

unit_no
is the number of the inactive unit (unit 0 or 1)

7 From the display in step 5, determine the C-side host PM where the STAR is connected. To post the host PM, type

>POST pm_type pm_no

and press the Enter key.

where

pm_type
is the host PM type, such as LTC, LGC, RCC2

pm_no
is the number of the host PM

Example of a MAP display:

```
        SysB     ManB     OffL     CBsy     ISTb      In
PM        0        0        1        0        4        1
LTC       0        0        2        0        2
LTC   0 ISTb  Links_OOS:  CSide  0, PSide   4
Unit0:   Act InSv
Unit1:   Inact InSv
```

8 To display the P-side link information for the host PM, type

>TRNSL P

and press the Enter key.

Example of a MAP response

```
LINK 0: STAR REM1 00 0 0;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 1: STAR REM1 00 0 1;CAP  MS:STATUS SBsy MSGCOND: CLS
LINK 2: STAR REM1 00 0 0;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 3: STAR REM1 00 0 1;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 4: STAR REM1 00 0 0;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 5: STAR REM1 00 0 1;CAP  MS:STATUS OK   MSGCOND: OPN
LINK 6: STAR REM1 00 0 0;CAP  MS:STATUS SBsy MSGCOND: CLS
LINK 7: STAR REM1 00 0 1;CAP  MS:STATUS OK MSGCOND: OPN
```

NTTR87
in a STAR (continued)

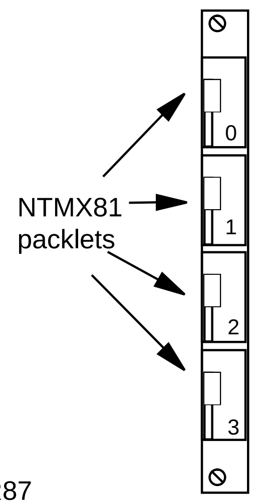
9 Record the numbers of the links with status not OK.

After identifying the link with faults, use the following chart to determine which NTTR87 card to remove by matching the provisioned link number with the slot number and the packlet number to the left of the table.

C-side link number

	Slot 8	Slot 16
0	0 2	1 3
1	4 6	5 7
2	8 10	9 11
3	12 14	13 15

NTMX81 packlet slot number in the NTTR87 card located in the specified card slots.



NTTR87 card

10 To manually busy the links connected to the NTTR87 card with faults, type

>BSY LINK link_no

and press the Enter key.

where

link_no
is the number of the link connected to the NTTR87 card with faults

Note: All provisioned links in the slot must be busied.

Go to step 17.

At the MAP terminal

11 To access the RLDCarr level and display the C-side links from all RLDs to the posted STAR, type

>RLDCARR;TRNSL

and press the Enter key.

Example of a MAP display:

NTTR87
in a STAR (continued)

```
Port  0: Unit 0 RLD 0 0;CAP   MS;STATUS: InSv
Port  1: Unit 1 RLD 0 1;CAP   MS;STATUS: InSv
Port  2: Unit 0 RLD 1 0;CAP   MS;STATUS: InSv
Port  3: Unit 1 RLD 1 1;CAP   MS;STATUS: InSv

Port 14: Unit 0 RLD 7 0;CAP   MS;STATUS: InSv
Port 15: Unit 1 RLD 7 1;CAP   MS;STATUS: InSV
Port 16: Unit 0 RLD 8 0;CAP   MS;STATUS: SysB
Port 17: Unit 1 RLD 8 1;CAP   MS;STATUS: InSv
Port 18: Unit 0 RLD 9 0;CAP   MS;STATUS: SysB
Port 19: Unit 1 RLD 9 1;CAP   MS;STATUS: InSv
```

Record the RLDs with link faults that connect to the STAR posted in step 3.

12 To access the RLD MAP level, type

>RLD

and press the Enter key.

13 Post the first RLD. To post the RLD, type

>POST rld_no

and press the Enter key.

where

rld_no
is the number of the RLD with the C-side link that has faults

Example of a MAP display:

```
                SysB     ManB     OffL     CBsy     ISTb       InSv
         PM       4        0       10        3        3          3
        STAR      0        0        0        0        1          1
STAR REM1 00 0  ISTb  Links_OOS: CSide 0 PSide 0 UMP OOS:0
Unit 0:  ISTb              /RG: 0
Unit 1:  ManB              /RG: 0                       RG
Drwr:          11 11 11 11 11 22 22 22 22 22 33 33 33  Pref  0 InSv
01 23 45 67 89 01 23 45 67 89 01 23 45 67 89 01 23 45  Stby  1 InSv
MM .M -- -- -- -- -- -o ss -- -- -- -- -- -- -- -- --

REM9 RLD DRWR  8 SYSB                     LogDrwr:  16  17
BANK_0:  Active                           Links_OOS: 1
BANK_1: Stby                              RLD BDch:  -
```

14 To display the C-side links for the posted RLD, type

>TRNSL

and press the Enter key.

Example of a MAP response

```
Port 16: HUB Owner Unit 0 RLD 8 Link 0; Cap MS; Status: SysB
Port 17: HUB Owner Unit 1 RLD 8 Link 1; Cap MS; Status: Istb
```

NTTR87
in a STAR (continued)

15 Use the following table and figure to determine which NTTR87 card to remove by matching the provisioned link number with the slot number.

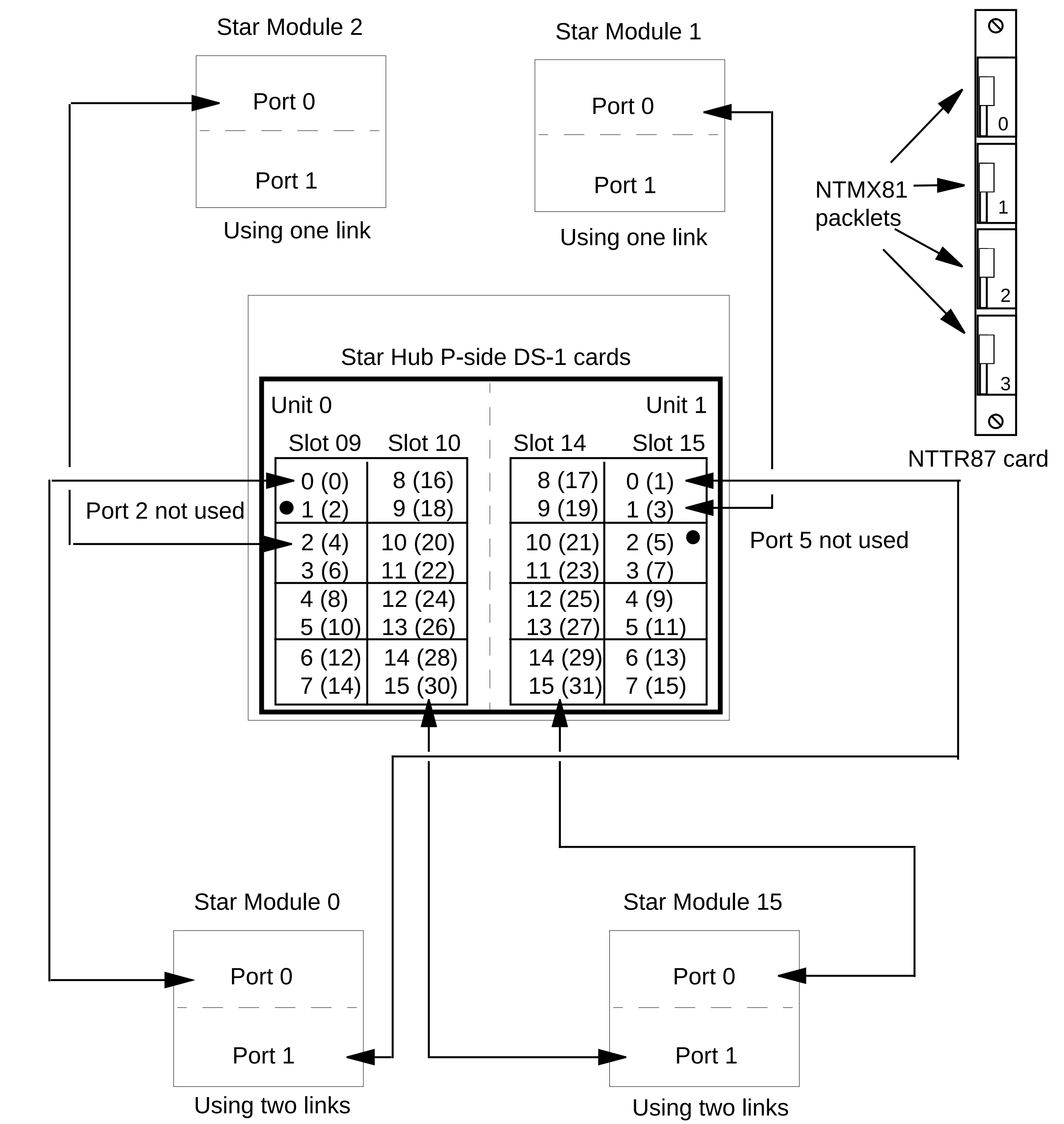
> ***Note:*** When replacing an NTTR87 card, determine if the RLDs affected by the card change have one or two DS-1 links. If the RLDs have one link, then each RLD must be posted, busied, and returned to service. If the RLD has two DS-1 links, the system automatically returns to service the DS-1 link.

Mapping Star Module ports to DS-1 slot and port numbers

Star Module and link numbers	Star Hub DS-1 slot and port numbers	Star Hub P-side port numbers	Star Module and link numbers	Star Hub DS-1 slot and port numbers	Star Hub P-side port numbers
Module 0 link 0	Slot 9, port 0	0	Module 8 link 0	Slot 10, port 8	16
Module 0 link 1	Slot 15, port 0	1	Module 8 link 1	Slot 14, port 8	17
Module 1 link 0	Slot 9, port 1	2	Module 9 link 0	Slot 10, port 9	18
Module 1 link 1	Slot 15, port 1	3	Module 9 link 1	Slot 14, port 9	19
Module 2 link 0	Slot 9, port 2	4	Module 10 link 0	Slot 10, port 10	20
Module 2 link 1	Slot 15, port 2	5	Module 10 link 1	Slot 14, port 10	21
Module 3 link 0	Slot 9, port 3	6	Module 11 link 0	Slot 10, port 11	22
Module 3 link 1	Slot 15, port 3	7	Module 11 link 1	Slot 14, port 11	23
Module 4 link 0	Slot 9, port 4	8	Module 12 link 0	Slot 10, port 12	24
Module 4 link 1	Slot 15, port 4	9	Module 12 link 1	Slot 14, port 12	25
Module 5 link 0	Slot 9, port 5	10	Module 13 link 0	Slot 10, port 13	26
Module 5 link 1	Slot 15, port 5	11	Module 13 link 1	Slot 14, port 13	27
Module 6 link 0	Slot 9, port 6	12	Module 14 link 0	Slot 10, port 14	28
Module 6 link 1	Slot 15, port 6	13	Module 14 link 1	Slot 14, port 14	29
Module 7 link 0	Slot 9, port 7	14	Module 15 link 0	Slot 10, port 15	30
Module 7 link 1	Slot 15, port 7	15	Module 15 link 1	Slot 14, port 15	31

NTTR87
in a STAR (continued)

Star Hub P-side links mapping



Note: The two numbers for each port in this figure [for example, 14 (29)] represent the following: the first number (14) is the DS-1 card port number by unit; the second number (29) is the Star Hub P-side port number.

NTTR87
in a STAR (continued)

16 Determine if additional RLDs connect to the NTTR87.

If additional RLDs are	Do
connected	step 13
not connected	step 17

At the SRHE frame

17

> **DANGER**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the frame supervisory panel (FSP) of the STAR. This protects the equipment against damage caused by static electricity.

> **DANGER**
> **Equipment damage**
> Take the following precautions when removing or inserting a card.
>
> 1. Do not apply direct pressure to the components.
> 2. Do not force the cards into the slots.

Put on a wrist strap.

Remove the NTMX81 packlets as described in the following steps:

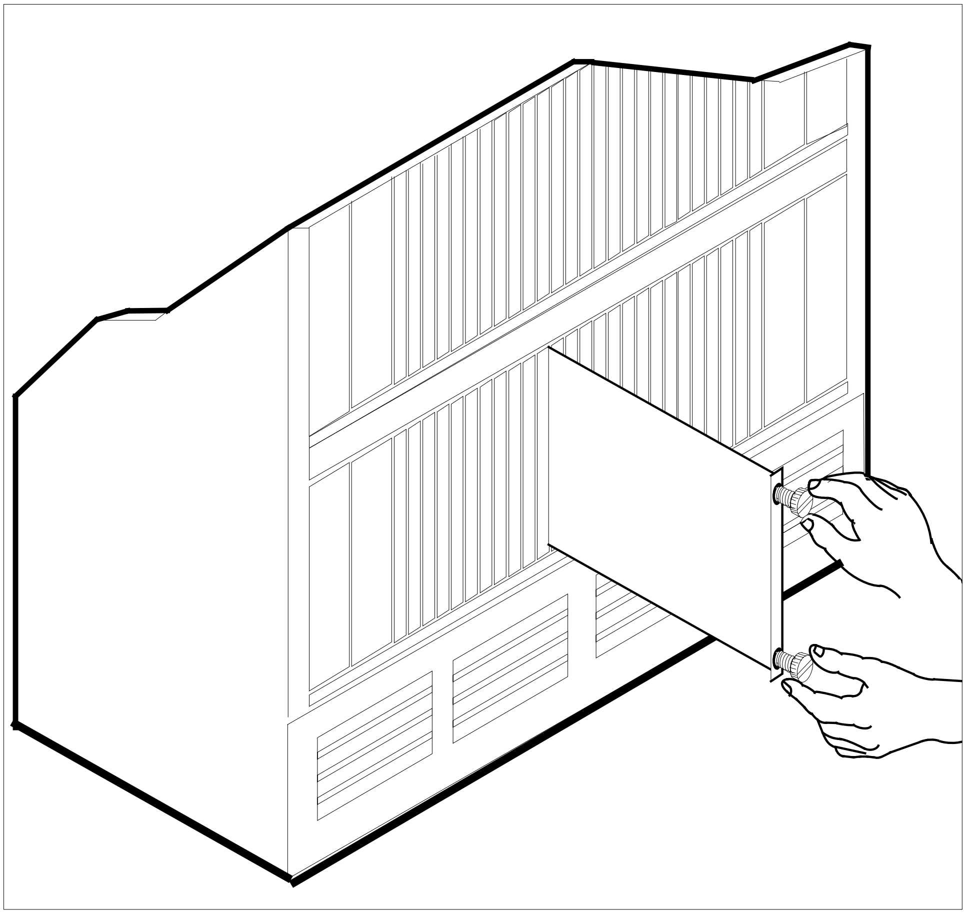
a Locate the NTMX81 packlets to be removed on the appropriate NTTR87 quad carrier card slot.

b Open the locking lever on the NTMX81 packlet. Carefully pull the packlet toward you until it clears the shelf. Repeat this step for all four packlets.

c Make sure the NTMX81 packlets are stored in an electrostatic discharge (ESD) container for protection of the circuit card until the packlets are installed again in the NTTR87 quad carrier card.

18 Using the T9908 wrist grounding strap and a T1324 screwdriver, remove the NTTR87 card. Insert the new card and tighten the screws.

NTTR87
in a STAR (continued)



19 Replace the NTMX81 packlets previously removed. Align the packlet with the slots in the shelf. Carefully slide the packlet into the circuit card slot in the NTTR87 circuit card.

20 Seat and lock the packlet.

a Using your fingers or thumbs, push on the upper and lower edges of the faceplate of the packlet to ensure the packlet is fully seated in the slot.

b Close the locking lever.

21 Use the following information to determine the next step in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 33
other	step 22

NTTR87
in a STAR (continued)

22 Use the following table to determine the next step in this procedure.

If you replaced an NTTR87 that housed DS-1 links for the	Do
Star Hub C-side	step 23
Star Hub P-side	step 27

At the MAP terminal

23 To test the busied network links from step 9, type

>TST LINK link_no

and press the Enter key.

where

link_no
is the number of the link that was manually busied in step 10.

Note 1: This step must be performed for each manually busied link.

Note 2: To test the other links connected to the STAR, perform this step for each link until all links are tested.

If TST	Do
passes	step 24
fails	step 34

24 To return to service the P-side links, type

>RTS LINK link_no

and press the Enter key.

where

link_no
is the number of the link manually busied in step 10.

Note 1: This step must be performed for each link that is manually busied.

Note 2: To RTS the other links connected to the STAR, perform the procedures in this step for each link until all links are returned to service.

If RTS	Do
passes	step 25
fails	step 34

25 To post the STAR where the NTTR87 card is located, type

>POST STAR site frame unit

and press the Enter key.

NTTR87
in a STAR (continued)

where

site
is the name of the site where the STAR is located

frame
is the frame number of the STAR with the card with faults (0 to 511)

unit
is 0 for the STAR

26 To return the inactive STAR unit to service, type

***>RTS UNIT* unit_no**

and press the Enter key.

where

unit_no
is the number of the STAR unit busied in step 6

If RTS	Do
passes	step 31
fails	step 34

27 Determine how many DS-1 links connect to the RLD affected by the NTMX81 card replacement.

If the RLD affected by the card replacement has	Do
one DS-1 link	step 28
two DS-1 links, the affected link returns to service automatically	step 31

Note: If there are two RLDs, each with one DS-1 link affected by this card change, both RLDs must be busied and returned to service.

28 To busy the posted RLD, type

>BSY DRWR

and press the Enter key.

Example of a MAP display:

```
Warning:  Calls on RLD may be affected.
Do you wish to continue?
Please confirm ("YES", "Y", "NO", "N")
```

29 To respond affirmatively to the confirmation request, type

>Y

and press the Enter key.

NTTR87
in a STAR (end)

30 To return the RLD to service, type

>RTS DRWR

and press the Enter key.

If RTS	Do
passes and there are no more RLDs to RTS	step 31
passes and there are more RLDs to return to service	step 28
fails	step 34

31 Send any cards with faults for repair according to local procedure.

32 Record the following items in office records

- date the card was replaced
- serial number of the card
- indications that prompted replacement of the card

Go to step 35.

33 Return to “Star Remote System alarm clearing procedures" in this manual or the other procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

34 Get additional help in replacing this card by contacting the personnel responsible for a higher level of support.

35 You have correctly completed this procedure. Remove the sign from the active unit and return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

Replacing a card
STAR or RLD

Application

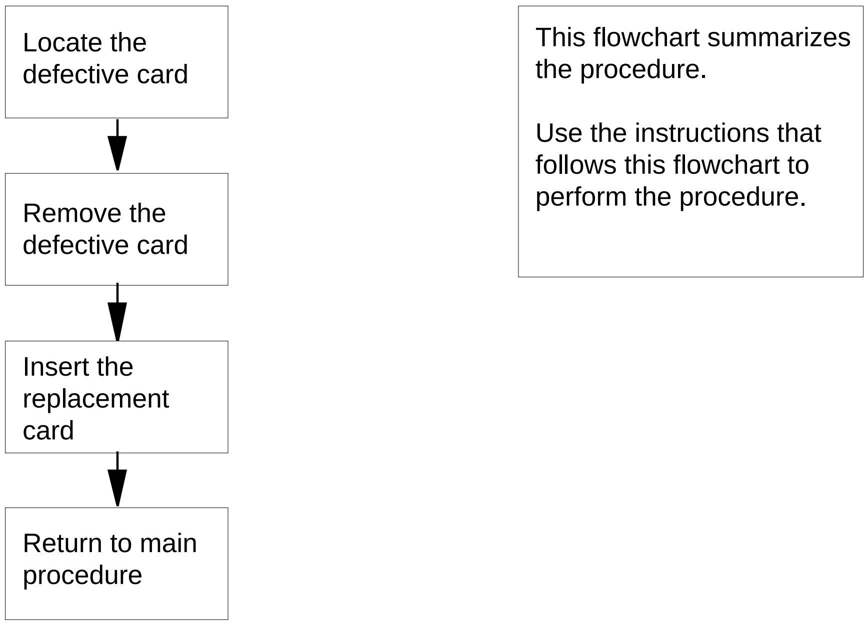
Use this procedure to unseat, remove, and reseat cards.

Action

The following flowchart is a summary of the procedure. To replace the card, use the instructions in the procedure that follows the flowchart.

Replacing a card
STAR or RLD (continued)

Summary of common procedures for Replacing a card in a STAR or RLD



Replacing a card
STAR or RLD (continued)

Replacing a card

At the STAR or RLD

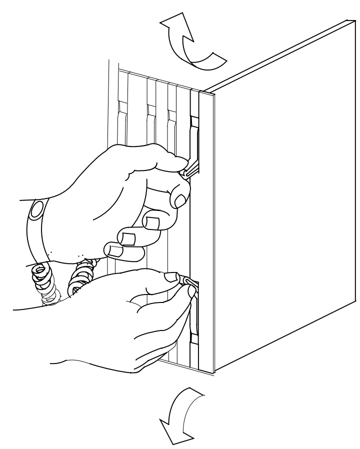
1 Proceed only if you have been directed to this procedure from a step in a maintenance procedure. Using this procedure independently may cause equipment damage or loss of service.

2

DANGER
Static electricity damage
Wear a wrist strap connected to the wrist strap grounding point on the frame supervisory panel (FSP) while handling cards. This precaution protects the cards against damage caused by static electricity.

Remove any cables from the faceplate of the card to be replaced and note the connector numbers.

3 Locate the card to be removed on the appropriate shelf if you have not already done so.

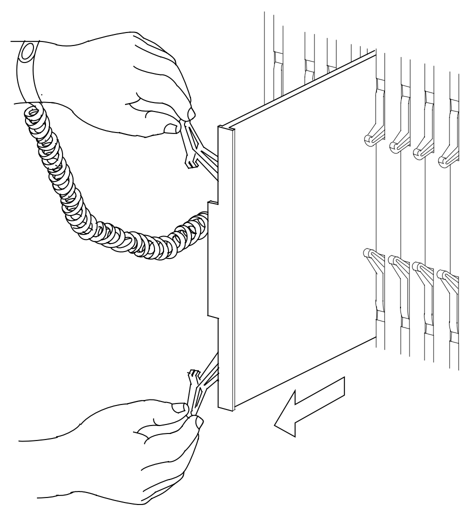


Replacing a card
STAR or RLD (continued)

4

DANGER
Do not hold card by levers only
Holding a card by the levers only may result in lever breakage. Once the card has been pulled half way out of the shelf, carefully grasp the card underneath for more secure support and continue to remove the card from the shelf. Avoid touching any wires or internal parts on the card.

Open the locking levers on the card to be replaced and gently pull the card toward you until it clears the shelf.



5 Examine the switch settings (if any) of the card just removed. Ensure the switch settings on the replacement card match those of the card being replaced.

6 Place the card you have removed in an electrostatic discharge (ESD) protective container.

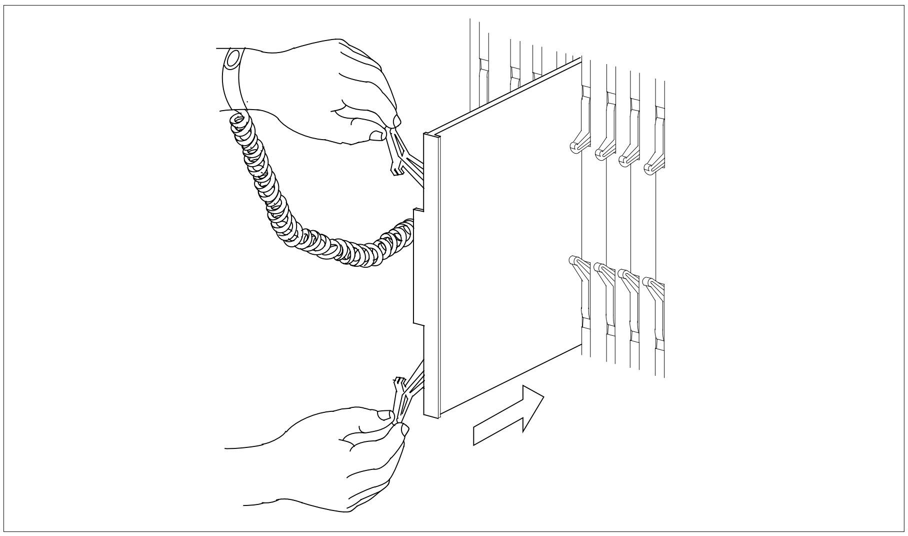
7 Ensure the replacement card has the same product equipment code (PEC), including suffix, as the card you just removed.

Replacing a card
STAR or RLD (continued)

8

DANGER
Improper insertion may damage circuit packs
Do not apply direct pressure to the components.Do not force the cards into the slots.

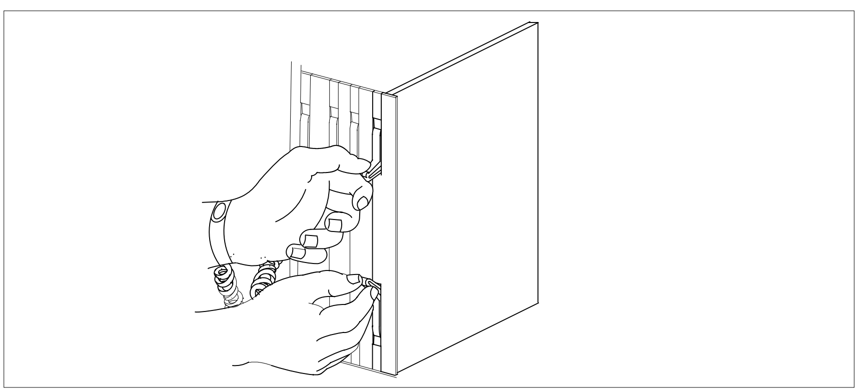
Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.



9 Seat and lock the card.

a Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure the card is fully seated in the shelf.

b Close the locking levers.



Replacing a card
STAR or RLD (end)

10 Reconnect any previously removed cables to the faceplate of the replacement card.

11 You have completed this procedure. Return to the main procedure that sent you to this procedure and continue as directed.

Replacing a line card
STAR or RLD

Application

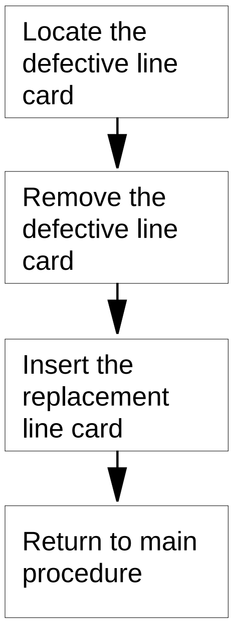
Use this procedure to unseat, remove, and reseat line cards in line drawers in the Star Hub or remote line drawer (RLD) if you have been directed from a maintenance procedure.

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
STAR or RLD (continued)

Summary of procedure for Replacing a line card in a STAR or RLD



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
STAR or RLD (continued)

Replacing a line card

At your current location:

1

> **DANGER**
> **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 Nortel Networks Corporate Standard 5028.)

> **DANGER**
> **Equipment damage**
> Take these precautions when removing or inserting a card.• Do not apply direct pressure to the components.• Do not force the cards into the slots.

> **DANGER**
> **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.

Proceed only if you have been directed to this procedure from a step in a maintenance procedure. Using this procedure independently may cause equipment damage or loss of service.

Note: Card shrouds are required for inserting or removing cards in line drawers. Two sizes are available for use with 3-inch and 6-inch cards, as

Replacing a line card
STAR or RLD (continued)

shown in the following table.

Line card insertion / withdrawal tool for	Apparatus code	Common product code
3-inch cards	QTH56A	A0298291
6-inch cards	QTH58A	A0313317

Note: A card removal tool is required for removing cards from line drawers. A description of this tool follows.

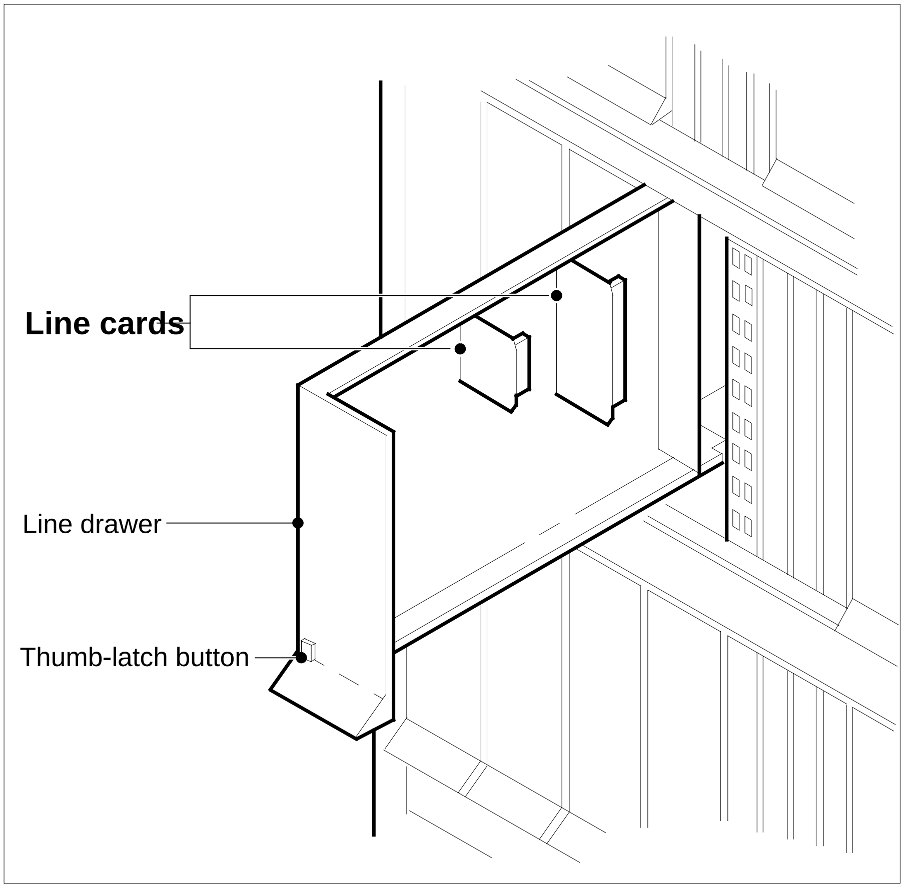
Card removal tool for	Apparatus code	Common product code
3-4 inch cards	QTH57A	A0298292
Note: For 4-inch or larger cards, use the large grip tool ITA9953.		

2 Locate the line drawer or RLD containing the line card to be removed.

3 Open the line drawer or RLD 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.

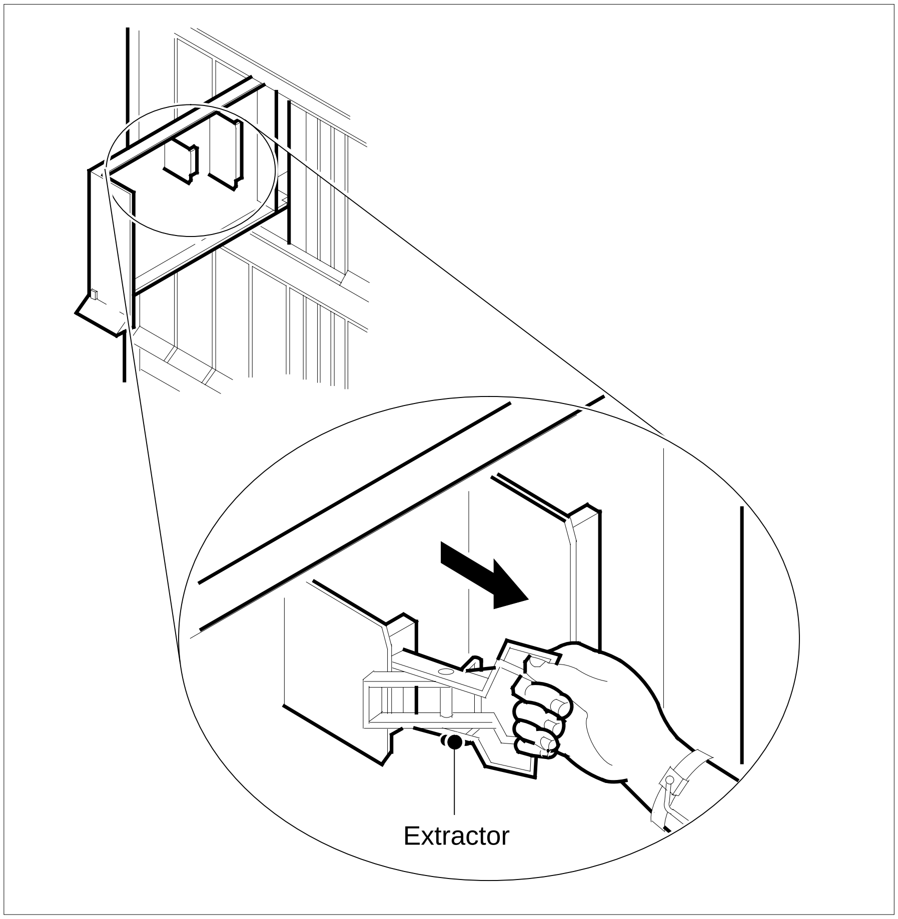
Replacing a line card
STAR or RLD (continued)



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.

Replacing a line card
STAR or RLD (continued)



- **d** Hold the front cover of the line drawer to steady it with your left hand.
- **e** Pull the extractor away from the drawer to unplug the card from its socket on the drawer backplane.
- **f** Continue pulling the card with the extractor until the card is clear of the shroud.
- **g** Insert the removed card into an ESD container and store according to local procedures.

5 Verify 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.

Replacing a line card
STAR or RLD (end)

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.

13 Star Remote System routine maintenance procedures

This chapter contains routine maintenance procedures for the Star Remote System. These procedures describe maintenance tasks that should be done on a regular basis by maintenance engineering and field maintenance personnel.

Battery inspection and cleaning
Star Module

Application

Use this procedure to inspect and clean the batteries in a Star Remote Module Equipment (SRME) or Star Remote Module Outside (SRMO cabinet.

Interval

Perform this procedure every 6 months.

Common procedures

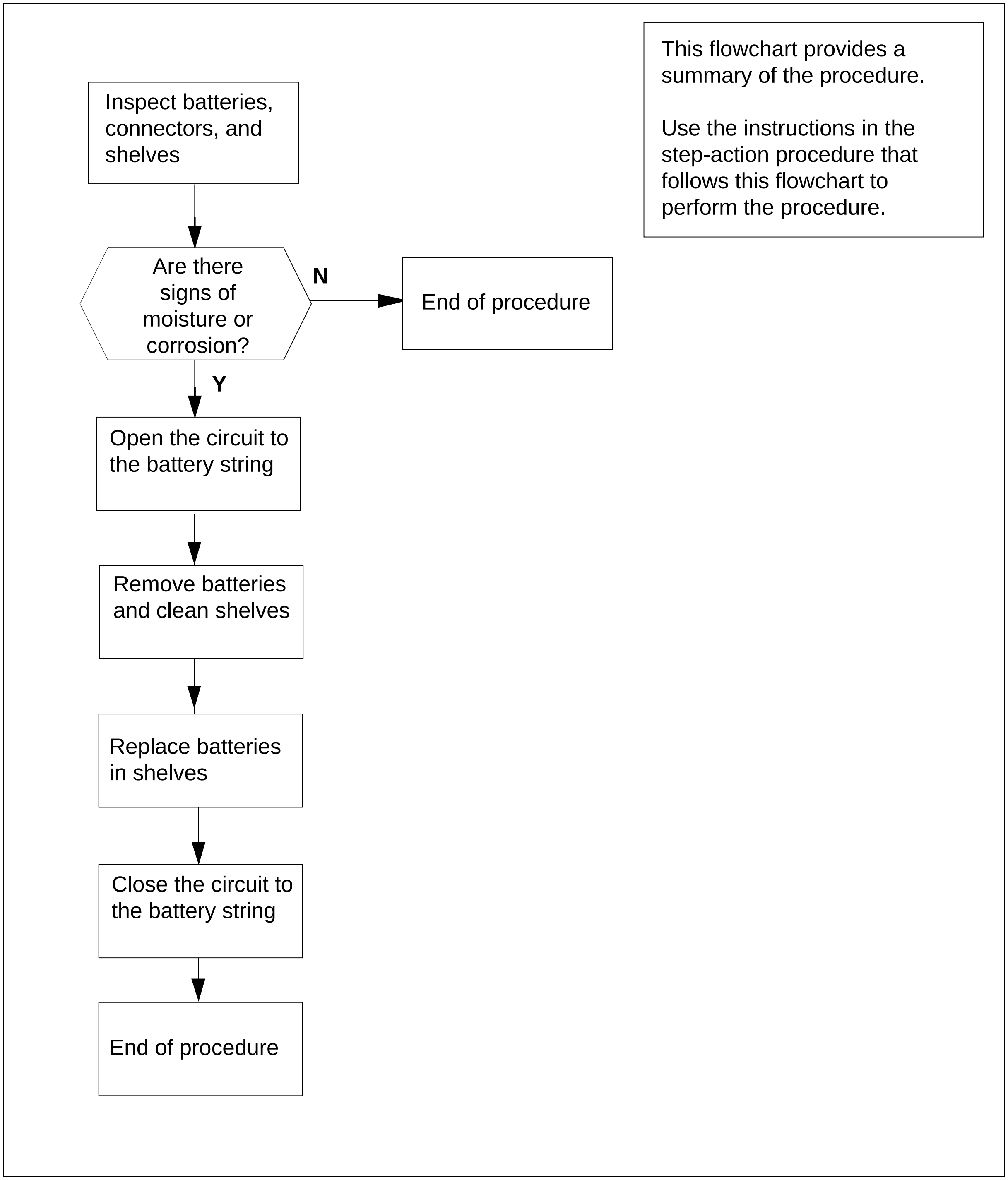
This procedure does not refer to any common procedures.

Action

The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

Battery inspection and cleaning
Star Module (continued)

Summary of Battery inspection and cleaning



Battery inspection and cleaning
Star Module (end)

Battery inspection and cleaning

At the SRME or SRMO cabinet

1

DANGER
Hazardous chemicals
Battery chemicals can be hazardous and potentially explosive. Use caution.

Inspect batteries, connectors, floor, and shelves for moisture or corrosion.

If moisture or corrosion is	Do
present	step 3
not present	step 8

2 Disconnect the battery connector from the TSS Backplane.

3 Disconnect the battery fuse connector and remove the battery from the shelf.

4 Clean the affected areas with baking soda and water. Continue until the cleaning solution no longer foams when it is applied.

5 Completely dry all cleaned areas and replace the batteries.

6 Connect the batteries to the system and connect the battery fuse connector.

7 Connect the batteries connector to the TSS Backplane.

8 You have correctly completed this inspection procedure.

Battery replacement
Star Module

Application

Use this procedure to batteries in a Star Remote Module Equipment (SRME) or Star Remote Module Outside (SRMO) cabinet.

Interval

Perform this procedure when doing the following:

- installing the SRME or SRMO
- replacing batteries for maintenance
- temporarily removing batteries for cleaning

Common procedures

This procedure does not refer to any common procedures.

Action

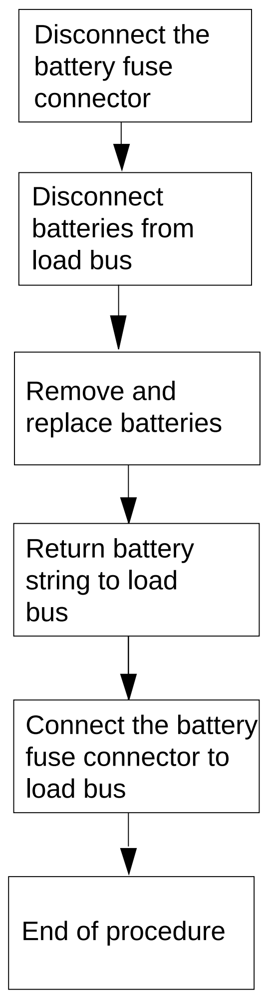
The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

Battery replacement
Star Module (continued)

Summary of Battery replacement

This flowchart provides a summary of the procedure.

Use the instructions in the step-action procedure that follows this flowchart to perform the procedure.



Battery replacement
Star Module (end)

Battery replacement

CAUTION
Possible loss of service during battery replacement
While batteries are being replaced, service may be lost if ac power is interrupted.

DANGER
Hazardous chemicals
Battery chemicals can be hazardous and are potentially explosive. Exercise caution.

At the SRME or SRMO cabinet

1 Disconnect the battery connector from the TSS Backplane.

2 Disconnect the battery fuse connector and remove batteries.

3 Install replacement batteries and connect to the load bus.

4 Connect the battery fuse connector.

5 Connect the batteries connector to the TSS Backplane.

6 You have correctly completed this procedure.

Fan cleaning and testing SRMO

Application

Use this procedure to clean and test the fan operation in a Star Remote Module Outside (SRMO) cabinet.

Interval

Perform this procedure when regulated by local policy.

Common procedures

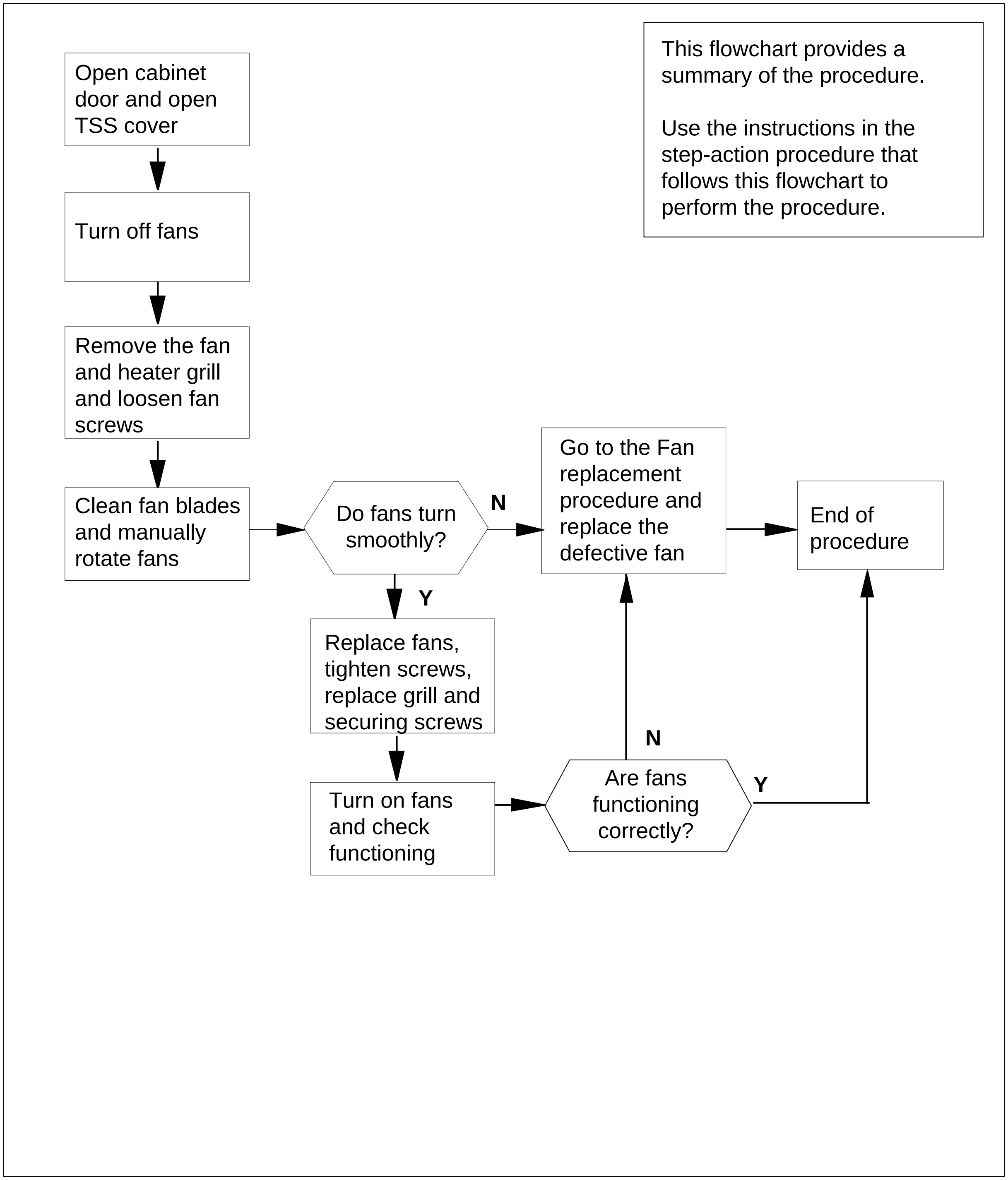
This procedure does not refer to any common procedures.

Action

The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

Fan cleaning and testing
SRMO (continued)

Summary of fan cleaning and testing



Fan cleaning and testing
SRMO (end)

Fan cleaning and testing

At the SRMO site

1 Loosen the two screws on the telephony subsystem (TSS) front cover and open the cover.

2 Power down the fans by removing the fan fuse on the dc panel.

3 Use a slot screwdriver to loosen the three 1/4-turn locking screws. Remove the protective cover from the fans and heater.

4 Use a Phillips screwdriver and remove the two screws that hold each fan. Slide the fans back to free them from the screws.

5 Clean the blades of the fans.

6 Manually rotate the fans to see if the fan blades turn easily.

If fan blades	Do
turn easily	step 7
do not turn easily	step 11

7 Install the fans and replace and tighten the two screws that hold the fans. Replace the fan and heater protective cover.

8 Replace the fan fuse in the dc panel to supply power to the fans.

9 If it is too cold for the fans to be running in normal operation, use a heat gun or blow dryer on the fan thermostat sensor at the top of the cabinet to turn on the fans.

10 Look at the fans to see if they are operating correctly. Listen for any roughness in fan operation.

IfFor each fan that is	Do
operating correctly	step 12
not running, running roughly, or else not operating correctly	step 11

11 Replace the fan with faults. Follow the “Fan replacement" procedure.

12 You have correctly completed this procedure.

Fan replacement
SRMO

Application

Use this procedure to replace fans with faults in the Star Remote Module Outside (SRMO) cabinet.

Interval

Perform this procedure as regulated by local policy.

Common procedures

This procedure does not refer to any common procedures.

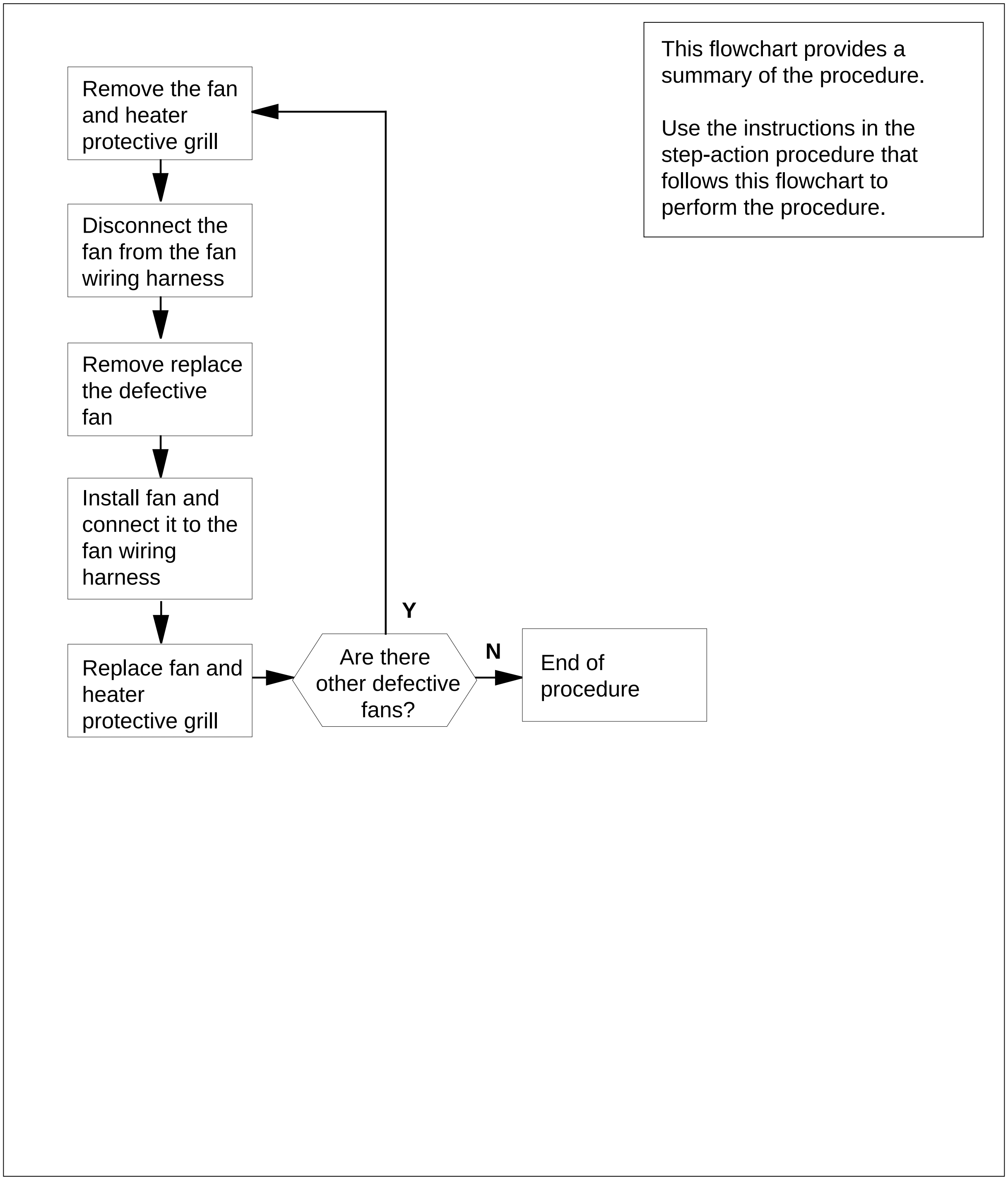
Action

The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

Fan replacement

SRMO (continued)

Summary of fan replacement



Fan replacement
SRMO (end)

Summary of fan replacement

At the SRMO site

1 Continue only if you were directed to this procedure from a step in a maintenance procedure. Using this procedure independently may cause equipment damage or service interruption.

2 Open the SRMO cabinet front door. Open the telephony subsystem (TSS) front cover by loosening the two screws on the left side of the cover.

3 Power down the fans by removing the fan fuse on the dc panel.

4 Use a slot screwdriver to loosen the three 1/4-turn locking screws. Remove the protective cover from the fans and heater.

5 Use a pair of small wire cutters to cut the cable ties that fasten the fan wiring in the cable harness.

6 Below the dc panel, disconnect the connector for the fan being replaced.

7 Use a Phillips screwdriver to remove the two screws that hold the fan with faults.

8 Install the new fan, taking note of the airflow and position indicators for correct position. Route the wires into the wiring harness.

9 Below the dc panel, connect the connector for the new fan.

10 Fasten the fan wiring to the cable harness with new cable ties.

11 Install the two screws and use a Phillips screwdriver to tighten the two screws that hold the fan.

12 Install the protective cover for the fans and heater. Use a slot screwdriver to lock the three 1/4-turn locking screws.

13 Replace the fan fuse that was removed in step 2 in the dc panel

14 You have correctly completed this procedure. Return to the main procedure that sent you to this procedure and continue as indicated.

GFCI check
SRMO

Application

Use this procedure to make sure the ground fault circuit interrupt (GFCI) for Star Remote Module Outside (SRMO) cabinet is working correctly.

Interval

Perform this procedure before using the outlet supplied with GFCI in the SRMO cabinet.

Common procedures

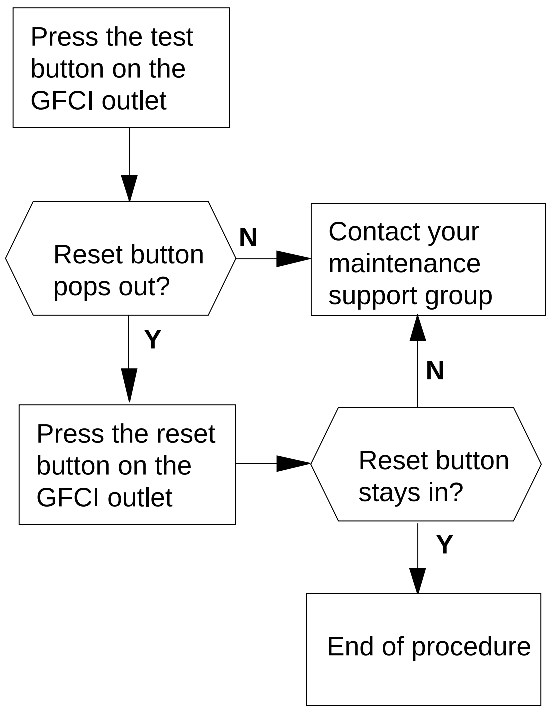
This procedure does not refer to any common procedures.

Action

The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

GFCI check
SRMO (continued)

Summary of GFCI check



This flowchart provides a summary of the procedure.

Use the instructions in the step-action procedure that follows this flowchart to perform the procedure.

GFCI check
SRMO (end)

GFCI check

At the SRMO site

1 Press the test button on the GFCI outlet.

2 Check the reset button to see if it pops out.

If the reset button	Do
pops out	step 3
does not pop out	step 4

3 Press the reset button.

Note: If the outlet experiences a strong power fluctuation while it is in use, the reset button will pop out. Press the reset button to reset the outlet.

If the reset button	Do
does not remain depressed	step 4
remains depressed	step 5

4 For additional support, contact the operating company personnel responsible for the next level of support. The GFCI outlet is part of the NTTR47 ac panel. If the outlet has faults, consider replacing the ac panel using the NTTR47AA card replacement procedure.

5 You have correctly completed this procedure.

Heater element replacement
SRMO

Application

Use this procedure to replace heater elements with faults in the Star Remote Module Outside (SRMO) cabinet.

Interval

Perform this procedure as regulated by local policy.

Common procedures

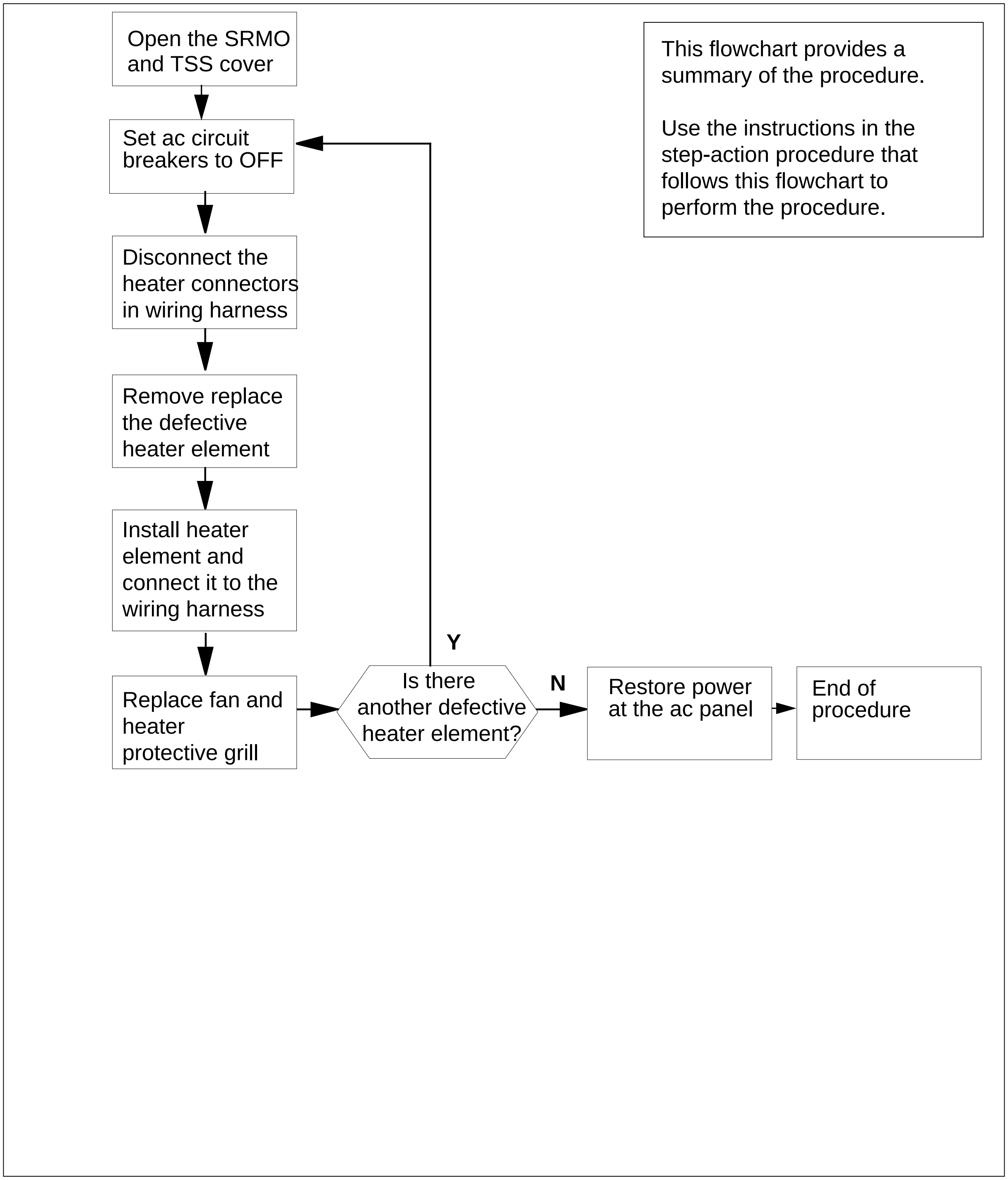
This procedure does not refer to any common procedures.

Action

The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

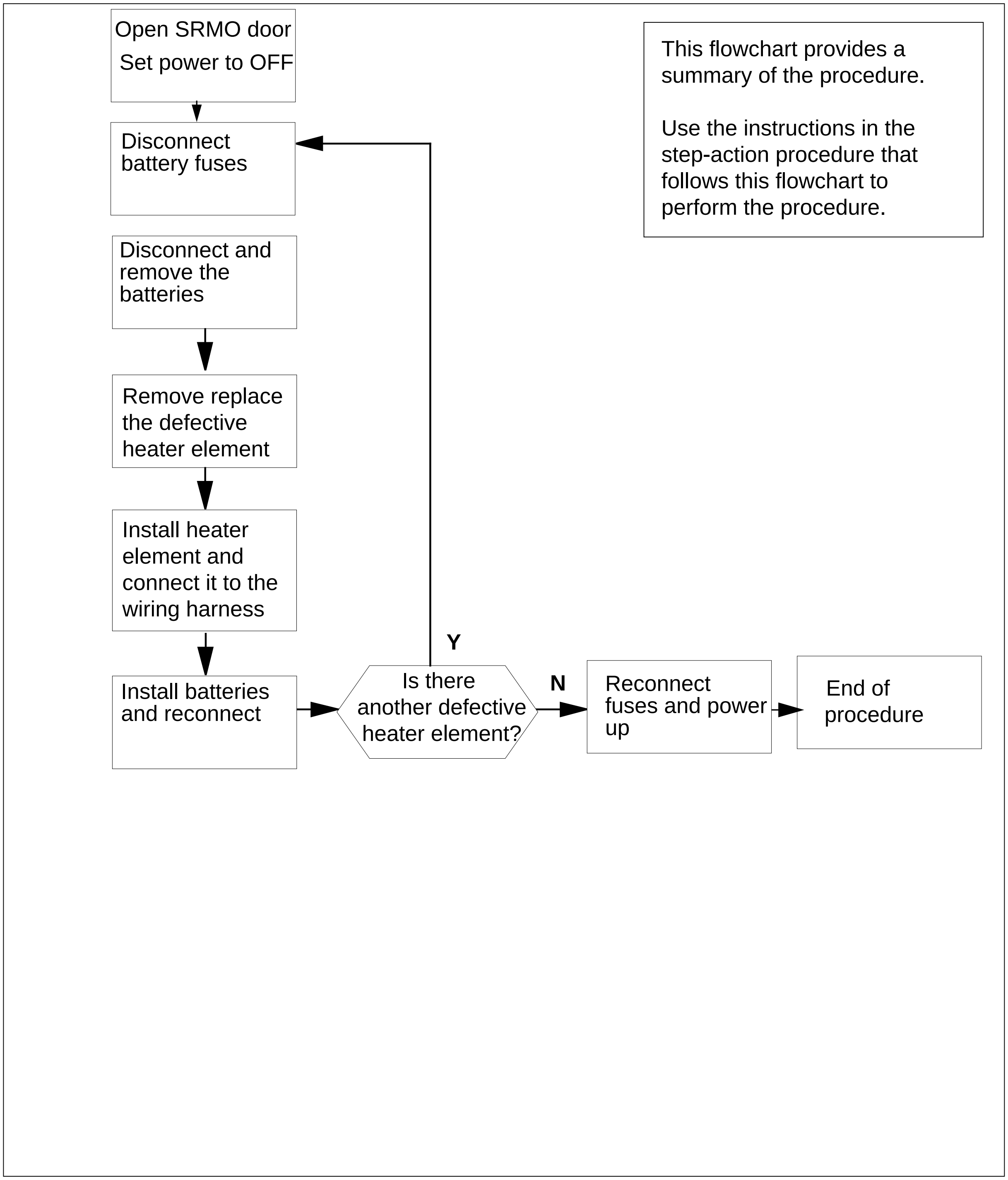
Heater element replacement
SRMO (continued)

Summary of Heater element replacement in the telephony subsystem (TSS)



Heater element replacement
SRMO (continued)

Summary of Heater element replacement in the battery compartment



Heater element replacement
SRMO (continued)

Summary of heater element replacement

At the SRMO site

1 Continue only if you were directed to this procedure from a step in a maintenance procedure. Using this procedure independently may cause equipment damage or service interruption.

2 The type of enclosure the Star Module has determines your next action.

If the heater element is in the	Do
telephony subsystem (TSS)	step 3
battery compartment	step 14

3 Open the SRMO cabinet door. Open the TSS front cover by loosening the two screws on the left side of the cover.

4 Set the main and rectifier circuit breakers on the ac panel to the OFF position.

5 Use a slot screwdriver to loosen the three 1/4-turn locking screws. Remove the protective cover from the fans and heater.

6 Remove power from the heater element with faults by disconnecting the two white in-line connectors in the wiring harness. The connectors are under the fan and heater assembly. One wire is red and the other white. Also, use a 7mm nut driver to remove the nut that secures the green and yellow ground wire for the heater element.

7 Use a pair of small wire cutters to cut the cable ties that fasten the heater element wires in the cable harness.

8 Lift up on the heater element to free it from the three holding devices.

9 Get a new heater element and press it into the three holding devices.

10 Connect the two white in-line connectors in the wiring harness under the fan and heater assembly. One wire is red and the other white. Also, use the 7mm nut driver to tighten the nut that secures the green and yellow ground wire for the heater element.

11 Install the protective cover for the fans and heater element. Use a slot screwdriver to turn the three 1/4-turn locking screws and lock the cover in position.

12 Set the main and rectifier circuit breakers on the ac panel to the ON position.

13 Close the TSS front cover and close the SRMO cabinet door.

Go to step 32.

14 Open the SRMO cabinet door.

15 Set the main and rectifier circuit breakers on the ac panel to the OFF position.

16 Disconnect the battery fuse holder from the negative (-) battery terminal.

Heater element replacement
SRMO (end)

17 Loosen and disconnect the strap that secures the batteries in the battery compartment.

18 Disconnect the wires that connect the batteries together. Remove the batteries.

19 Remove the battery tray. Lift up the left side of the battery tray and keep the right side down. At this diagonal position, remove the battery tray.

20 Remove power from the heater element with faults by disconnecting the two white in-line connectors in the wiring harness that exits the battery compartment at the bottom right. The connectors are to the right of the battery compartment. One wire is red and the other white. Also, use a 7mm nut driver to remove the nut that secures the green and yellow ground wire for the heater element.

21 Use a pair of small wire cutters to cut the two cable ties that fasten the heater element wires in the cable harness outside the battery compartment.

22 Lift up on the heater element to free it from the three holding devices.

23 Get a new heater element and press it into the three holding devices.

24 Connect the two white in-line connectors in the wiring harness for the heater element. One wire is red and the other white. Also, use the 7mm nut driver to tighten the nut that secures the green and yellow ground wire for the heater element.

25 Fasten the heater element wiring to the cable harness with new cable ties.

26 Install the battery tray.

27 Install the batteries. Connect the wiring between the batteries.

28 Tighten the strap that secures the batteries in the battery compartment.

29 Connect the battery fuse holder to the negative (-) battery terminal.

30 Set the main and rectifier circuit breakers on the ac panel to the ON position.

31 Close the SRMO cabinet door.

32 You have correctly completed this procedure. Return to the main procedure that sent you to this procedure and continue as indicated.

Heaters test
SRMO

Application

Use this procedure to test the heaters in the Star Remote Module Outside (SRMO) cabinet.

Interval

Perform this procedure every 12 months.

Common procedures

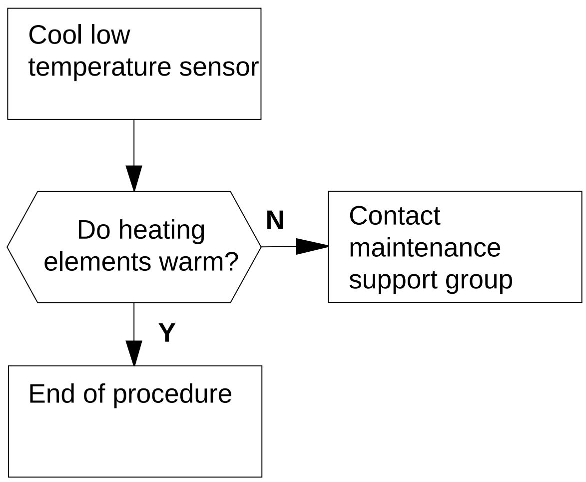
This procedure does not refer to any common procedures.

Action

The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

Heaters test
SRMO (continued)

Summary of Heaters test



This flowchart provides a summary of the procedure.

Use the instructions in the step-action procedure that follows this flowchart to perform the procedure.

Heaters test
SRMO (end)

Heaters test

At the SRMO site

1 Cool the low temperature sensors with a cooling spray. The battery temperature sensor is to the right of the battery compartment at the bottom of the SRMO cabinet. The cabinet low temperature sensor is in the dc panel.

2 Check that the battery heater element is ON. Check that the heater element located in the fan and heater cage is ON.

If the heater elements	Do
warm	step 4
do not warm	step 3

3 Contact your maintenance support group.

4 You have correctly completed this procedure.

High temperature alarm test
SRMO and SRME

Application

Use this procedure to test the high temperature alarm in the Star Remote Module Outside (SRMO) cabinet and Star Remote Module Inside (SRME) Wall Mount.

Interval

Perform this procedure when regulated by local policy.

Common procedures

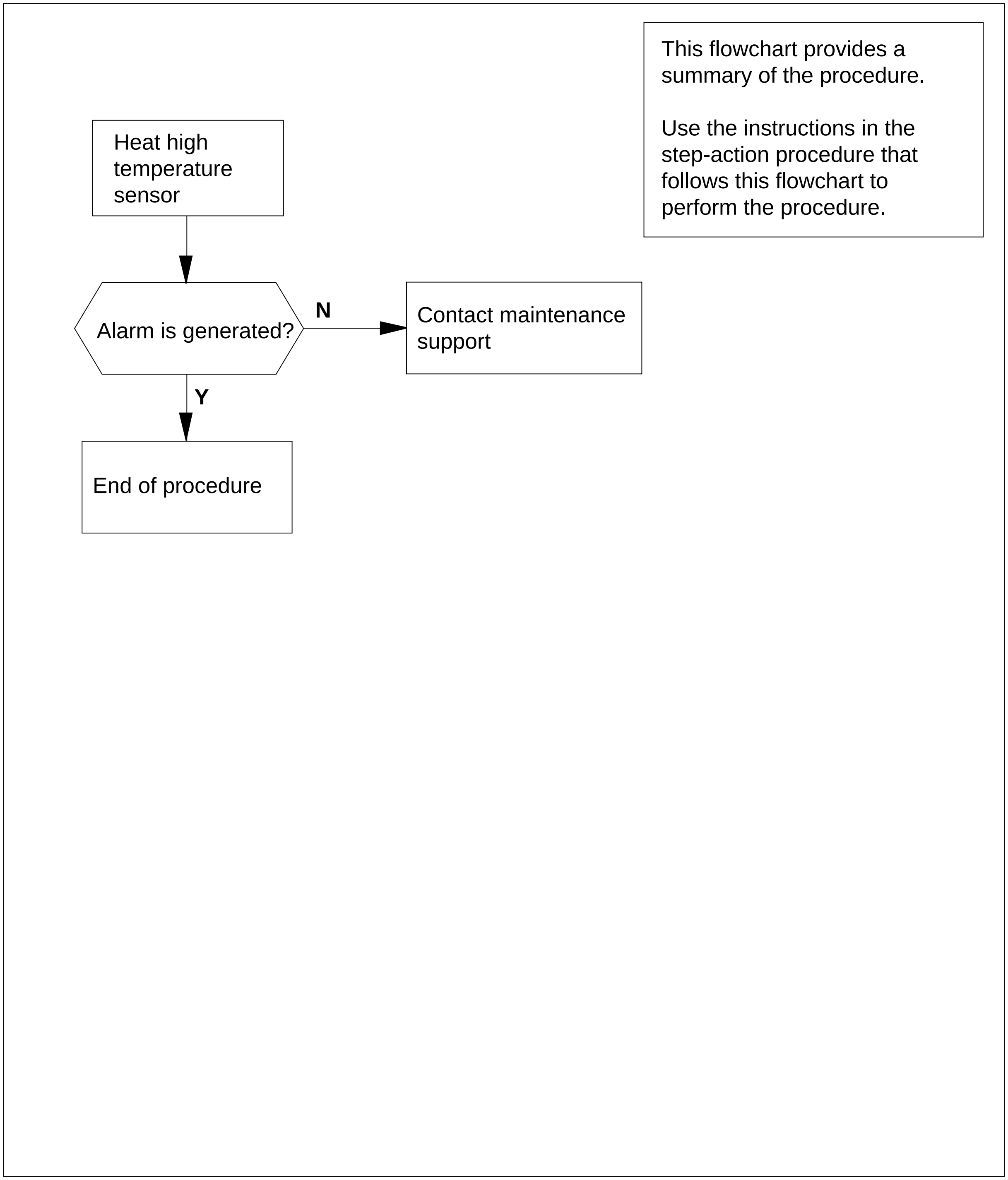
This procedure does not refer to any common procedures.

Action

The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

High temperature alarm test
SRMO and SRME (continued)

Summary of High temperature alarm test



High temperature alarm test SRMO and SRME (end)

High temperature alarm test

At the SRMO and SRME site

1 Activate the high-temperature alarm by blowing hot air, from a heat gun or a blow dryer, at the high-temperature sensors. The sensors are at the top of the LMU.

At the MAP terminal

2 Check that the alarm generates.

If the alarm	Do
generates	step 4
does not generate	step 3

3 Contact your maintenance support group.

4 You have correctly completed this procedure.

Inspecting spare fuse holders STAR

Application

Use this procedure to inspect spare fuse holders for the STAR, refilling them as needed.

Interval

Perform this procedure each week.

Common procedures

None

Action

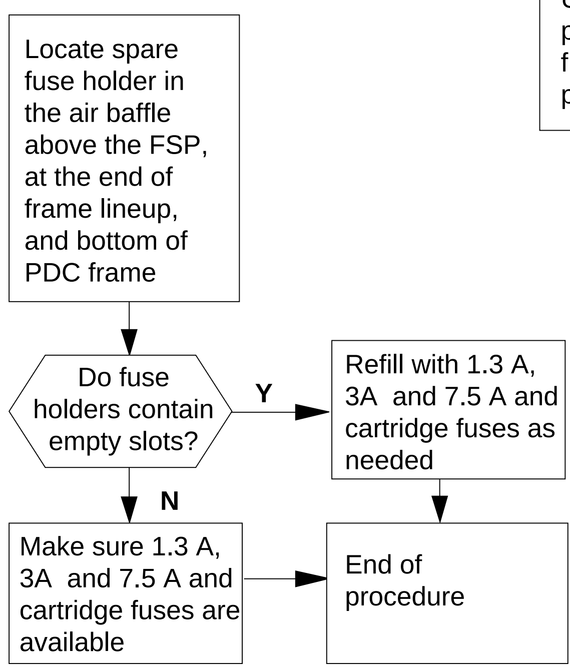
This procedure contains a summary flowchart as an overview of the procedure. Follow the specific steps to perform this procedure.

Inspecting spare fuse holders
STAR (continued)

Summary of inspecting spare fuse holders

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.



Inspecting spare fuse holders
STAR (end)

Inspecting spare fuse holders

At the STAR 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 are	Do
empty	step 3
not empty	step 4

3 Refill the spare fuse holder with the following fuses:

- .75 A fuses (Brown)
- 1.3 A fuses (White)
- 3 A fuses (Blue)
- 2 A fuses (Orange)
- 7.5 A fuses (Black)
- 30 A cartridge fuse (PDC only)

4 You have correctly completed this inspection procedure.

Low temperature alarm test
SRMO and SRME

Application

Use this procedure to test the low temperature alarm in the Star Remote Module Outside (SRMO) cabinet and Star Remote Module Inside (SRME) Wall Mount.

Interval

Perform this procedure every 12 months.

Common procedures

This procedure does not refer to any common procedures.

Action

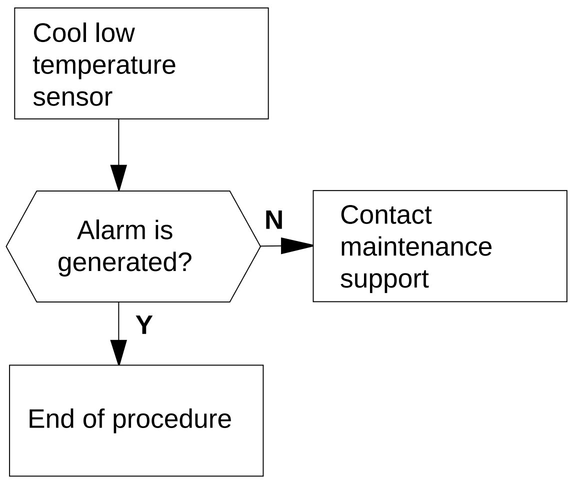
The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

Low temperature alarm test
SRMO and SRME (continued)

Summary of Low temperature alarm test

This flowchart provides a summary of the procedure.

Use the instructions in the step-action procedure that follows this flowchart to perform the procedure.



Low temperature alarm test SRMO and SRME (end)

Low temperature alarm test

At the SRMO and SRME +site

1 Select and activate the low-temperature alarm by blowing coolant on the low-temperature sensor. The low temperature sensor is in the dc panel.

2 Check that the alarm generates.

If the alarm	Do
generates	step 4
does not generate	step 3

3 Contact your maintenance support group.

4 You have correctly completed this procedure.

Testing ac/dc rectifier voltages RLD

Application

Use this procedure to test ac/dc rectifier voltages for the Star Module.

Interval

Perform this procedure once every 6 months.

Common procedures

Not applicable

Action

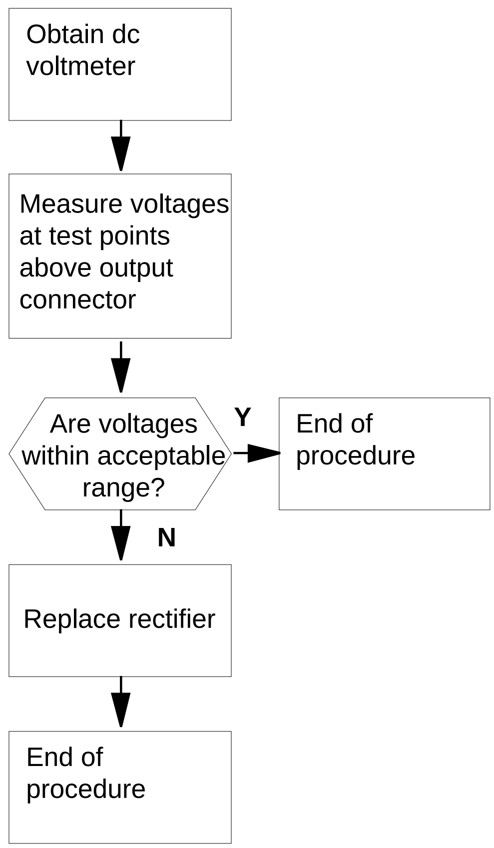
The flowchart that follows provides a summary of this procedure. Use the instructions in the step-action procedure that follows the flowchart to perform the routine maintenance procedure.

Testing ac/dc rectifier voltages
RLD (continued)

Summary of Testing ac/dc rectifier voltages

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.



Testing ac/dc rectifier voltages
RLD (end)

Testing ac/dc rectifier voltages

At the RLD site

1 Get a dc voltmeter.

2 Measure the voltage at the test points located above the rectifier output connector.

3 Compare the voltages measured with the acceptable voltage ranges given below.

Condition	Acceptable range
Normal	-52 V to -56 V
Battery test running	-45 V

If test point voltages are	Do
within acceptable range	step 5
not within acceptable range	step 4

4 Replace the NTTR46 rectifier as directed in the “Star Remote System card replacement procedures" in this manual.

On returning to this procedure, go to step 5.

5 You have correctly completed this procedure.

Testing power converter voltages
STAR

Application

Use this procedure to test power converter voltages for all power converters in the Star Hub.

Interval

Perform this procedure once every 6 months.

Common procedures

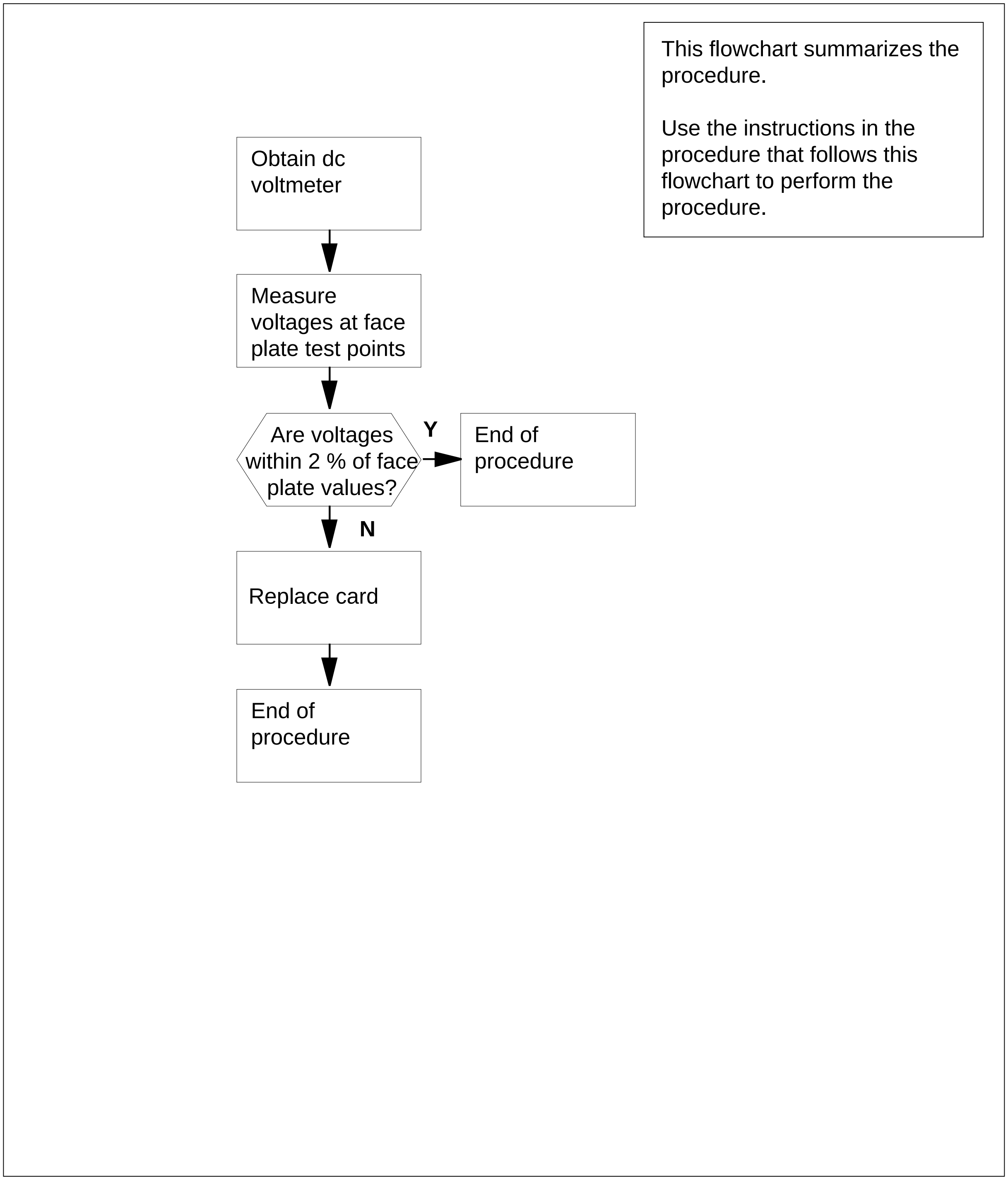
Not applicable

Action

This procedure contains a summary flowchart as an overview of the procedure. Follow the specific steps to perform this procedure.

Testing power converter voltages
STAR (continued)

Summary of Testing power converter voltages



Testing power converter voltages
STAR (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 NT6X53 power converters in the STAR control shelf.

3 The voltages must be within 2 percent of the nominal values printed on the NT6X53 faceplate.

Test point voltage	Acceptable range
+5.25 V	+5.00V to +5.50 V
+ 15 V	+14.25 V to +15.75 V

Compare the voltages measured with the acceptable voltage ranges given below.

If test point voltages are	Do
within acceptable range	step 5
not withinacceptable range	step 4

4 Replace the NT6X53 power converter as directed in the “Star Remote Hub card replacement procedures" in this manual.

On returning to this procedure, go to step 5.

5 You have correctly completed this procedure.

Testing wrist strap grounding cords STAR

Application

Use this procedure to verify the resistance of the wrist strap grounding cords is low enough to allow static electricity to discharge from the human body, but high enough to prevent electrocution if the equipment develops a short circuit while the wriststrap is being worn.

Interval

Perform this procedure every month.

Common procedures

None

Action

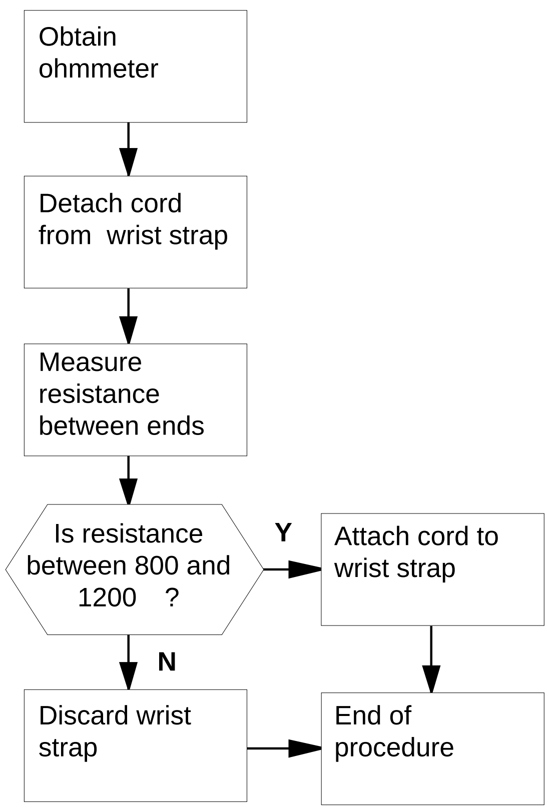
This procedure contains a summary flowchart as an overview of the procedure. Follow the specific steps to perform this procedure.

Testing wrist strap grounding cords
STAR (continued)

Summary of testing wrist strap grounding cords

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.



Testing wrist strap grounding cords
STAR (end)

Testing wrist strap grounding cords

At your current location

1 Obtain an ohmmeter.

2 Detach the grounding cord from the wrist strap.

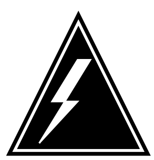
3 Measure the resistance between opposite ends of the grounding cord with the ohmmeter. If you are not familiar with the use of this test equipment, see manufacturer's intructions.

If resistance is	Do
between 800 Ω αvδ 1200 Ω	step 4
not between 800 Ω αvδ 1200 Ω	step 5

4 The grounding cord and wrist strap assembly is safe to use. Assemble the wrist strap to the grounding cord. Go to step 6.

5

DANGER
Risk of electrocution
The grounding cord is safe to use only if its resistance measures higher than 800 Ω. A lower resistance exposes the wearer to the risk of electrocution if equipment short circuits while the wrist strap is being worn.



WARNING
Damage to electronic equipment
A grounding cord that has a resistance higher than 1200 Ω cannot conduct static charges to ground adequately. It will not protect sensitive electronic equipment against build-ups of potentially damaging static charges.

Discard the entire assembly. *Do not attempt to use it.*

6 You have correctly completed this inspection procedure.

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DMS-100 Family

Star Remote System

Star Remote System Maintenance Manual

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