297-8223-550

DMS 100 Family

Remote Switching Center

Remote Switching Center Multi-Access Maintenance Manual

XPM11 and up   Standard   04.02   November 2000

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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 Servic*o*e Network Implementation Guide*, 297-8063-200
- *North American DMS-100 Log Report Manual*
- *North American DMS-100 Translations Guide*
- *Alarm Clearing Procedures*
- *Card Replacement Procedures*
- *XPM Operational Measurements Reference Manual*
- *PMDEBUG Users Guide,* TAM-1001-004

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 RSC-M maintenance introduction

The Remote Switch Center Multi-Access (RSC-M) is a remote common peripheral module (CPM) designed to support time division multiplexers (TDM). The support of European Telecommunications Standards Institute (ETSI) protocols by Digital Multiplex Systems (DMS) provides plain old telephone services (POTS) on international multi-vendor remotes.

The RSC-M is from the Remote Switching Center Overseas (RCO2) shelf, a component of the Remote Switching Center-SONET (RSC-S) cabinet. Within this document, references to the RCO2 shelf apply to the shelf configured in the RSC-M cabinet. For the purpose of explanation, the document will refer to the shelf as an RSC-M shelf.

An RSC-M connects to a DMS-100 host peripheral, the line group controller offshore (LGCOi+). The LGCOi+ uses 2 to 16 pulse code modulation (PCM30) links. Datafill tables and MAP displays indicate that the PLGC is the host peripheral. This document refers to the LGCOi+ i as a PCM30 line group controller (PLGC).

Note: One LGCOi+ supports a maximum of two RSC-M main and extension shelves.

The stand-alone version of the RSC-M referred to in this document will provide the following protocols. The protocols refer to the lines terminating on remote multi-vendor AMC nodes:

- LOOP
- EARTH
- DC5A
- DC5ADD

The RSC-M cabinet supports only channel associated signaling (CAS) lines. The CAS maintenance messaging for the RSC-M peripheral will indicate Global Peripheral Platform (GPP) or RCO2 as the PM type. The software

requires an upgrade. Then the software indicates the addition of the RSC-M PM type for messages and defaults to the GPP. This is a host from a base of a CAS peripheral, or the RCO2.

The RSC-M supports an access multiplexer capability (AMC) interface to public switched telephone networks (PSTN) that use CAS protocol with dedicated bearer (voice) channels. Each subscriber line on a CAS AMC is mapped to a specified voice channel on a PCM30 link. The RSC-M PCM30 links connected to CAS AMCs support 30 voice channels.

A RSC-M main shelf can support up to 22 PCM30 links. Each half extension (EXT) shelf can support an additional 24 PCM30 links. The RSC-M main shelf can support a total of 46 PCM30 links. A full RSC-M consists of one main and one EXT shelf. A RSC-M can support a maximum of 1380 lines for CAS AMC.

An RSC-M cabinet houses three RSC-M main shelves plus one full EXT shelf. This configuration provides a total maximum capacity of 114 PCM30 links in a cabinet. There must be at least one RSC-M main shelf configured in a cabinet. The following figures illustrate the RSC-M configuration.

Figure 1-1 RSC-M main and ext shelf configuration
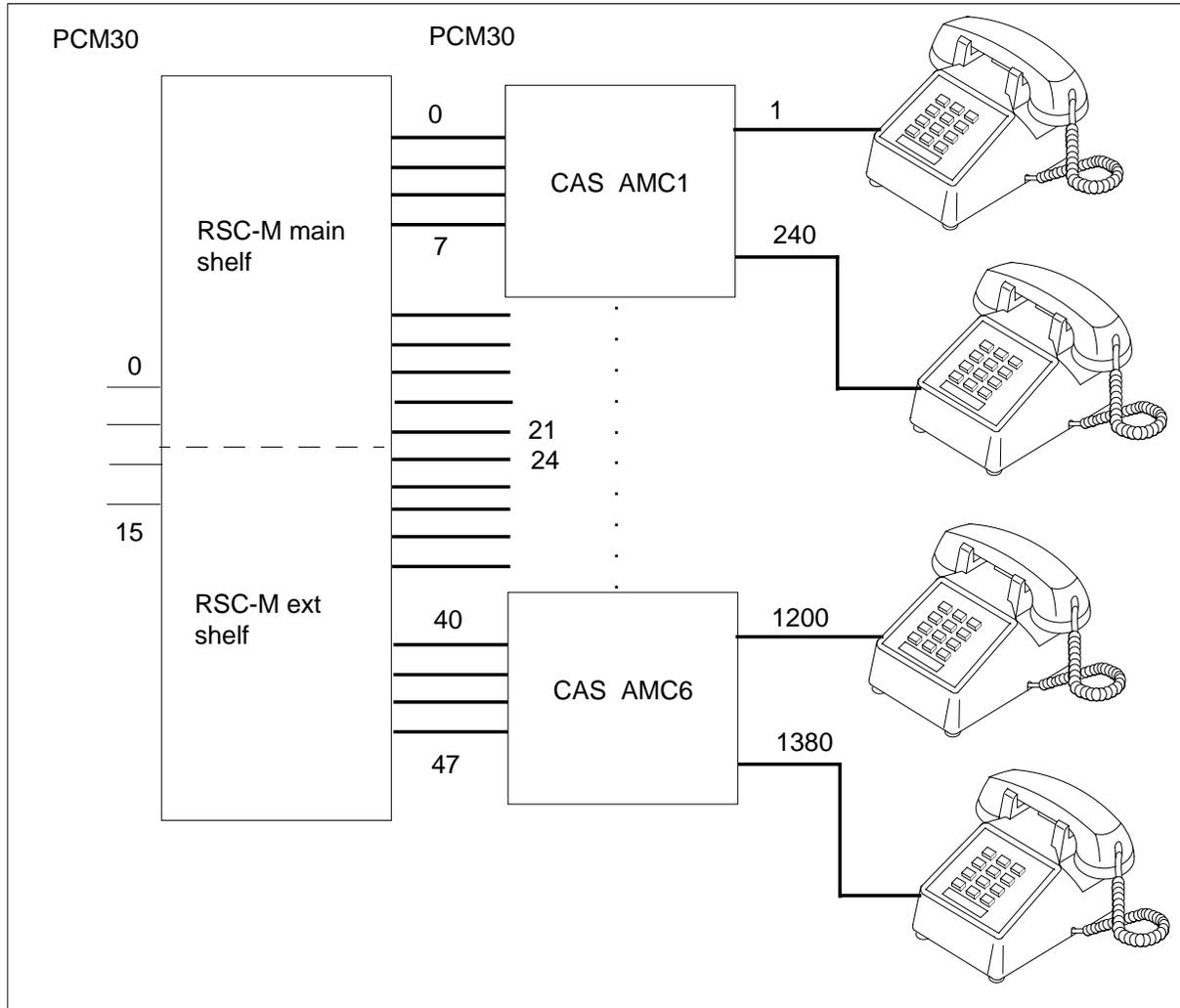
Figure 1-2 CPM cabinet for RSC-M applications
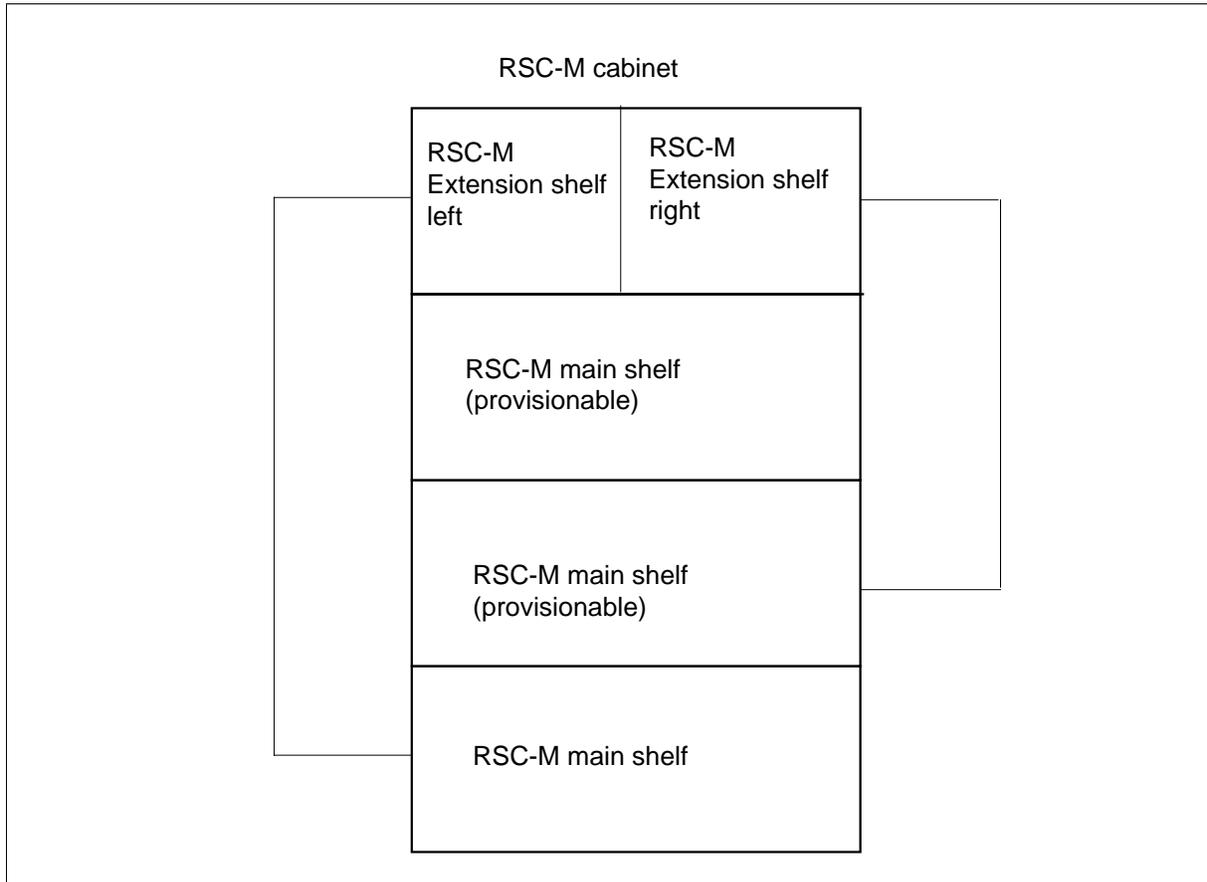
2 Maintenance overview

This section of the Remote Switching Center Multi-access (RSC-M) Maintenance Manual contains a summary of components. These components form the interface to multi-vendor access nodes. This section describes cabinetized modular supervisory panel (MSP) and power components of the RSC-M. This section provides descriptions of how software processes affect RSC-M components, and highlights voice and message flows. Northern Telecom (Nortel) digital multiplex switches use access multiplexer capability (AMC) nodes to communicate.

This chapter contains the following sections:

- hardware description
- operating description
- RSC-M maintenance
- fault conditions
- automatic maintenance
- increase to manual maintenance

The RSC-M supports channel associated signaling (CAS) AMCs. A CAS line is a 64 Kb/s channel in a 2 Mb/s pulse coded modulation (PCM30) carrier. The CAS lines use a call supervisory signaling protocol. This protocol requires ABCD control bits. These bits must be sent on timeslot (TS) 16 of each associated PCM30 link. The channels are entered as Meridian Digital Centrex (MDC) lines, as if the carrier channels were line cards.

When fault conditions occur, the RSC-M and the Digital Multiplex System (DMS) attempt to pinpoint the fault with system action like audits. If possible, the DMS-100 switch corrects the fault automatically and manual interruption is not required. If the fault requires manual interruption, the system indicates the correct trouble indicators. The section on automatic maintenance includes examples of appropriate trouble indicators.

Hardware description

This section describes the components of the cabinetized frame. The components include the MSP, RSC-M, and half extension (EXT) shelves. The AMCs are virtual entities to the DMS. The hardware description section does not include virtual entities to the DMS. This section also describes Human machine interface (HMI) commands that allow maintenance personnel access to node status.

The RSC-M is a standard DMS Streamline Model B C28 that contains four shelves. The system one shelf as an RSC-M main shelf. The system can provision additional RSC-M main shelves and EXT half-shelves. The following descriptions define the maximum channel. The maximum channel carries the capability of RSC-M shelves in common peripheral module (CPM) cabinets.

- A maximum of 16 PCM30 links connect each RSC-M main shelf to a PCM-30 line group controller (PLGC). This condition occurs on the control-side (C-side). A total of 16 C-side links are supported. Traffic studies indicate fewer than 10 C-side links are necessary to support 46 peripheral-side (P-side) links. The maximum C-side capacity of a cabinet with three RSC-M main shelves is 1380 DSO channels.

- On the P-side, each RSC-M main shelf can support a maximum of 22 PCM30 carrier links to the remote. An RSC-M half-shelf EXT module can support another 24 PCM30 carrier links, for a total of 46 PCM30 links. The system obtains the maximum RSC-M P-side capacity. The system obtains this capacity when the CPM cabinet is configured with three RSC-M main shelves and two half-shelf EXT modules. The total is 114 PCM30 links.

- An RSC-M main shelf and half-shelf hosting CAS can support a maximum of 1380 lines. These lines have 46 PCM30 links with 30 channels each. A maximum configured RSC-M can host 3420 CAS lines on remote nodes. A maximum configured RSC-M has three main shelves and two EXT half-shelves.

Common peripheral module

The RSC-M uses CPM architecture instead of XMS-based peripheral module (XPM) architecture.

When the RSC-M uses a CPM instead of an XPM, the following differences are implemented:

- enhancement of the matrix

- creation of the PCM circuit card to concentrate all signaling functions in one circuit card

- addition of receivable firmware to the Unified Processor (UP) (NTMX77) and PCM Signaling Processor (NTMX73)

The following section describes these components according to   operating areas. In each operating area, the functions of specific cards are highlighted and other RSC-M components are presented.

Modular supervisory panel in RSC-M

The following sections describe MSP components.

Alarm module

The alarm module (NTRX41AA) circuit card provides monitoring and alarm reporting for cabinets in a central office (CO) environment. This circuit card operates with an input battery voltage of -48V or -60V. The circuit card is provided with the MSP.

The NTRX41AA circuit card detects and monitors the following fault conditions:

- converter faults

- thermal breaker failures

- fan failure on one or two cooling units

- inverter failure in the cabinet

If these conditions occur, the NTRX41AA circuit card raises alarms and sends signals to the office alarm unit. The NTRX41AA circuit card provides maintenance facilities in the form of operating, data and alarm battery supply (ABS) jacks.

The NTRX41AA circuit card has the following functional blocks:

- alarm circuit

- maintenance

Alarm circuit   The alarm circuit consists of transistor logic that the following alarm inputs activate:

- battery-input voltage that triggers a FRAMEFAIL signal for an inverter alarm, talk battery module alarm, or fuse module alarm

- battery-return voltage that triggers a FRAMEFAIL signal for a converter fail alarm

- battery-input voltage that generates a FANFAIL signal and triggers an alarm for the cooling units

The alarm circuit provides two light-emitting diodes (LED) as visual indicators of the FRAMEFAIL and FANFAIL signals. The alarm circuit uses a connector interface to drive two additional external LEDs.

Maintenance   The NTRX41AA circuit card provides many maintenance features like jacks for operating, data and ABS. These features provide for interoffice communication and data transmission.

The following figure shows the relationship of NTRX41AA circuit card functional blocks.

Figure 2-1 NTRX41AA functional blocks
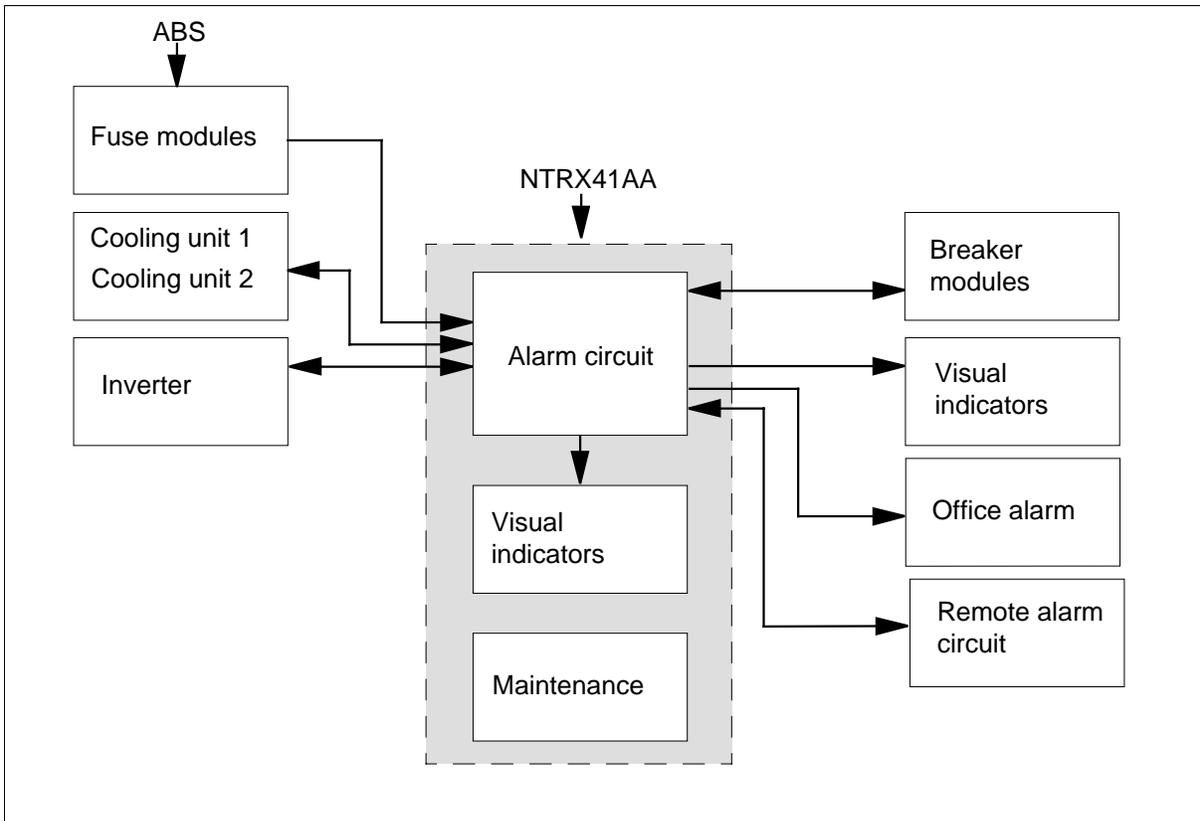
Pin-outs   The following table shows NTRX41AA circuit card pin-outs.

Table 2-1 NTRX41AA output connector J1 (Sheet 1 of 2)

Pin	D	C	B	A
1	RINGALM2	--	--	RINGALM1
2	--	--	--	--
3	--	--	--	--
4	BAT2	K2	BAT1	K1
5	BAT4	K4	BAT3	K3
6	BAT6	K6	BAT5	K5
7	BAT8	K8	BAT7	K7
8	BAT10	K10	BAT9	K9
9	BAT12	K12	BAT11	K11
10	BAT14	K14	BAT13	K13
11	BAT16	K16	BAT15	K15
12	BAT18	K18	BAT17	K17
13	BAT20	K20	BAT19	K19
14	--	FRAMEFAIL	--	FRMFLTST
15	INVALM	FUSEALM	FAN48	FAN48
16	D1B	D1A	TTB	TTA
17	-48V2	-48V2	-48V1	-48V1
18	-48V4	-48V4	-48V3	-48V3
19	FAIL4	FAIL3	FAIL2	FAIL1
20	FAIL8	FAIL7	FAIL6	FAIL5
21	FAIL12	FAIL11	FAIL10	FAIL9
22	FAIL16	FAIL15	FAIL14	FAIL13
23	FAIL20	FAIL19	FAIL18	FAIL17

Table 2-1 NTRX41AA output connector J1 (Sheet 2 of 2)

Pin	D	C	B	A
24	--	FANALM2	--	FANALM1
25	--	--	--	--
26	FANLMPTST	ACO	AISALM2	AISALM1
27	D2B	D2A	TRB	TRA
28	BR	BR	BR	BR
29	--	TEMPSW2	--	TEMPSW1
30	+15FG	+15FG	+5FG	+5FG

Power requirements   The nominal input voltage is -48V or -60V, but a range from -42V to -75V is acceptable. The maximum input current is 0.75A.

Fuse module
The fuse module (NTRX43AA) circuit card provides the following outputs for cabinets in a CO:

• a maximum of eight current-limited feed outputs

• one alarm output

The system provisions this circuit card with an MSP. This card operates with an input battery voltage of -48V or -60V.

Note: The QFF fuses are not supplied with this module. The system provisions the QFF fuses at the cabinet level.

The NTRX43AA circuit card:

• is a termination point for power distribution center (PDC) feeds

• supplies eight current-limited outputs for different circuits

• reports fuse and breaker failures to the NTRX41AA circuit card

Connector P1 provides the power feed for fuses F01 through F04. Connector P2 provides the power feed for fuses F05 through F08. These fuses are on the faceplate of the NTRX43AA circuit card. Connector J1 provides the fused outputs with currents that range from 0.18A through 5.0A. Connector P3 provides alarm outputs that report fuse failure to the NTRX41AA circuit card.

Pin-outs   The following three tables show NTRX43AA circuit card pin-outs.

The following table shows the pin-outs for the power input connectors P1 and P2.

Table 2-2 Power input connectors P1 and P2

Connector/pin	Signal
P1 1-9	-48V or -60V
P1 10-18	BAT RTN
P2 1-9	-48V or -60V
P2 10-18	BAT RTN

The following table shows the pin-outs for the NTRX43AA circuit card output connector J1.

Table 2-3 NTRX43AA output connector J1

Pin	Signal	Pin	Signal
1	-48VOUT 1	10	-48VOUT 5
2	-48VOUT 2	11	BAT RTN 5
3	-48VOUT 4	12	BAT RTN 6
4	-48VOUT 6	13	BAT RTN 3
5	-48VOUT 7	14	BAT RTN 4
6	-48VOUT 8	15	NC
7	BAT RTN 1	16	NC
8	BAT RTN 2	17	BAT RTN 7
9	-48VOUT 3	18	BAT RTN 8

The following table shows the pin-outs for the fail alarm connector P3.

Table 2-4 Fail alarm connector P3

Pin	Signal
1	FUSEALM
2	FUSEALM

Power requirements   The nominal input voltage is -48V or -60V, but a range from -42V through -75V is acceptable. The maximum input current is 30A.

Output   The following table shows NTRX43AA circuit card output specifications.

Table 2-5 NTRX43AA output specifications

Parameter	Value
Maximum voltage	-72V
Maximum current	5.0A
Minimum voltage	-42V
Minimum current	0.18A

Breaker module

 The system provisions the breaker module (NTRX42AA) circuit card with an MSP. This circuit card contains two circuit breakers -48V or -60V that provide two 10-A power feeds.

The NTRX42AA circuit card receives two input feeds from the PDC. The circuit card allows the two front-mounted breakers on the card to limit the input current. Breakers have automatic recovery from low battery (ARLB), and the standard DMS switch converter interface. These features allow the breakers to monitor converters.

The NTRX42AA circuit card

- monitors and detects converter failures
- trips breakers when over-current conditions exist
- trips breakers on converter failure
- provides termination points for PDC feeds
- provides battery feed samples for an alarm module
- responds to ARLB conditions

The NTRX42AA circuit card has the following functional blocks:

- ARLB
- trip circuits and enable
- breakers

The following figure shows the relationship of NTRX42AA circuit card functional blocks.

Figure 2-2 NTRX42AA functional blocks
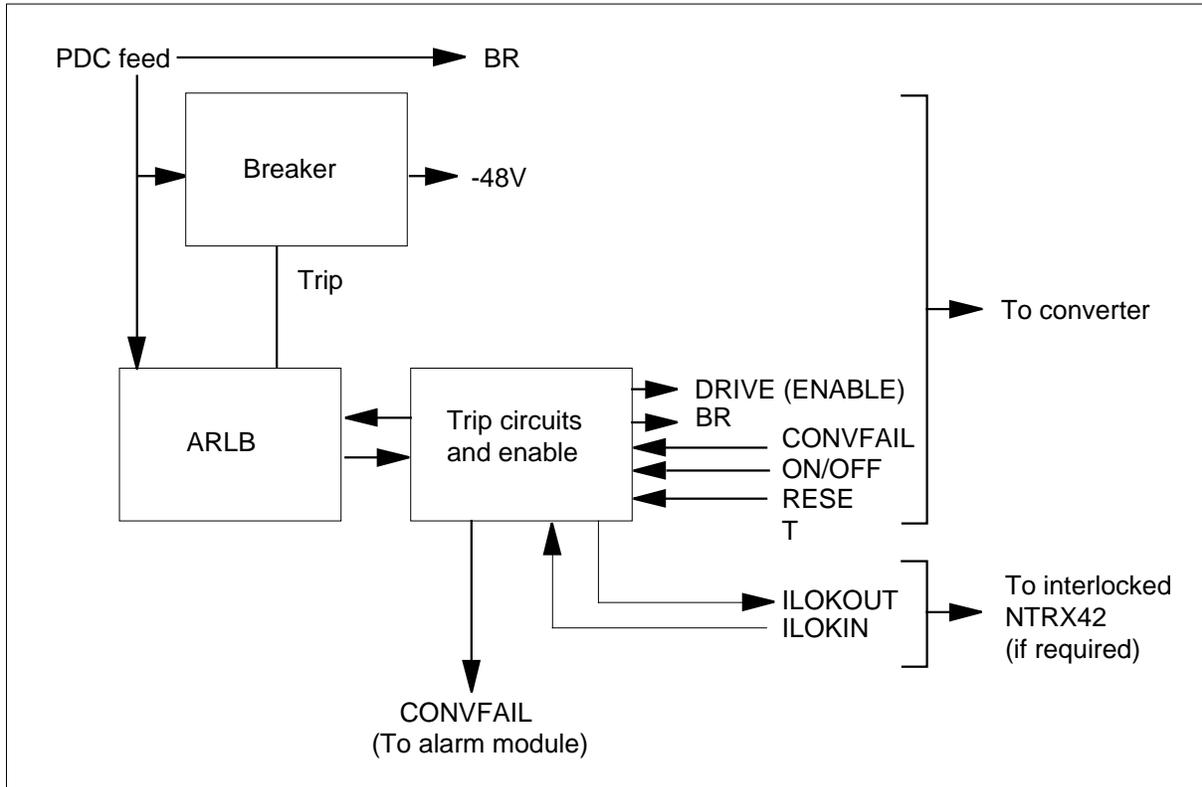
Automatic recovery from low battery   The NTRX42AA sends the NT6L62AA ARLB hybrid a sample of each two-input battery feeds. The ARLB provides two outputs to the NTRX42AA circuit card. An output can control the two relays on each breaker module. When the sampled voltage falls below -41.5V $\pm$ 0.5V, the relays power down to prevent breaker trip. The relays remove the DRIVE or ENABLE signal. This action causes the converters to shut down. The battery voltage must rise -44.5V $\pm$ 0.5V before the RESET relay starts again.

Trip and enable circuitry   A transistor circuit trips the associated circuit breaker. The trip occurs in response to alarm relay release in the associated power converter. This circuitry provides the DRIVE or ENABLE signal for the converters that require the signal.

Breakers   Two 10-A magnetic breakers are stacked in this breaker module. The breakers operate over the complete -48V to -60V range.

Pin-outs   The following table shows NTRX42AA circuit card pin-outs.

Table 2-6 NTRX42AA output connector J1

Pin	Signal	Pin	Signal
1	-48VSW1	13	CONVFAIL2
2	Not used	14	ILOKIN
3	ON/OFF1	15	DRIVE2
4	OEM-ALM1	16	Not used
5	OEM-ALM2	17	BAT RTN1
6	ON/OFF2	18	BR1
7	Not used	19	RESET1
8	-48VSW2	20	CONVFAIL1
9	Not used	21	CONVFAIL 2
10	DRIVE1	22	RESET2
11	ILOKOUT	23	BR2
12	CONVFAIL1	24	BAT RTN2

Power requirements   The nominal input voltage is -48V or -60V, but a range from -42V through -72V is acceptable. The maximum input current is 20A.

Output   The following table shows NTRX42AA circuit card output specifications.

Table 2-7 NTRX42AA output specifications (Sheet 1 of 2)

Parameter	Value
Voltage	-48V or -60V
High-voltage shutdown	-72V
Low-voltage shutdown	-42V

Table 2-7 NTRX42AA output specifications (Sheet 2 of 2)

Parameter	Value
Maximum current	2 x 10A
Minimum current	0A

Fan power control module

The fan power control (FPC) (NTRX54BA) receives A- and B-feed inputs from the PDC. The FPC provides a combined C-feed for the 48 Vdc fans and an alarm output. The circuit card can operate at -48 Vdc and -60 Vdc input in a central office (CO) environment.

The NTRX54BA circuit card includes two faceplate-mounted fuse holders that have 5-A fuses and an LED. A captive screw on the faceplate provides positive retention and conductive coupling to the shelf.

Location   The NTRX54BA circuit card occupies the last two-card positions in an MSP. The NTRX54BA circuit card is fully connectorized. The NTRX54BA circuit card provides A- and B-feed input through two 6.35 mm (0.25 in.) quick-connect plugs (A0381899). The circuit card also provides power/alarm output through an 18-pin Positronics power-lock connector (A0380977).

The main function of the NTRX54BA circuit card is to provide a small regulated 48V for fan operation. Features include:

- fuse failure alarm

- redundant feed operation

The following figure shows the relationship of NTRX54BA circuit card functional blocks.

Figure 2-3 NTRX54BA functional blocks
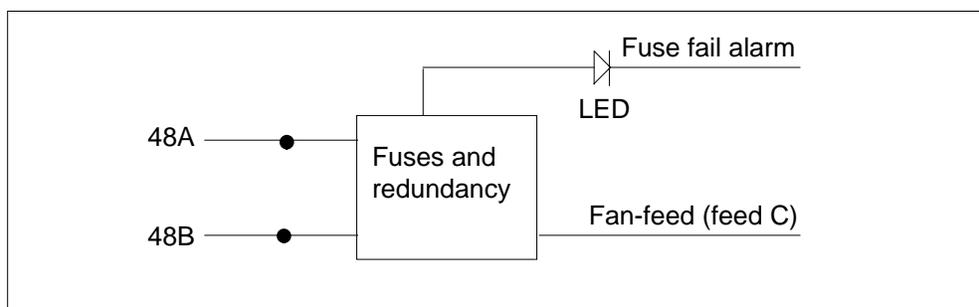
Feed combining   Feeds A and B provide redundancy if the feeds combine. If one of the feeds is not present, the other feed supplies power.

Fuse fail alarm   The system provides an alarm indication in case of a fuse failure.

Signaling   Three connectors are present on the rear of the NTRX54BA circuit card. The connectors are the P1 input, P2 input and J1 output connectors. The following three tables show the pin-outs.

The following table shows the pin-outs of the P1 input (battery A) connector.

Table 2-8 Power input (P1) connector

Connector number	Signal	Function	Description
P1/A, B	L - (A)	Input	-48 Vdc
P1/C, D	L + (A)	Input	BAT RTN

The following table shows the pin-outs of the P2 input (battery B) connector.

Table 2-9 Power input (P2) connector

Connector number	Signal	Function	Description
P2 /A, B	L - (B)	Input	-48 Vdc
P2 /C, D	L + (B)	Input	BAT RTN

The following table shows the pin-outs of the J1 output (18-pin) connector.

Table 2-10 18-pin output (J1) connector

Pin number	Signal	Function	Description
1-9	L - (FAN1)	Output	-48 Vdc
18	FAIL	Output	O/C - > BR through 3.Ok and LED on output failure causes Frame Fail to alarm module
10-17	L + (FAN)	Output	BAT RTN from fans

Power requirements   The next table lists input power requirement limits for the NTRX54BA circuit card.

Table 2-11 Power input requirement limits (A and B)

		Alarm	
Signal	**Standard**	**Minimum**	**Maximum**
Voltage	-48 Vdc	-39 Vdc	-56 Vdc
Current	1.5 A		2.5 A

The following table lists NTRX54BA circuit card power output requirement limits.

Table 2-12 Power output requirement limits (A and B)

		Alarm	
Signal	**Standard**	**Minimum**	**Maximum**
Voltage	-48 Vdc		-56 Vdc
Current	1.5 A	0.0 A	3.0 A

Environmental conditions   The NTRX54BA circuit card performs under limited environmental controls. The following table shows the limited environmental controls.

Table 2-13 Ambient conditions

Condition	Operating range	Short-term range
Temperature	0°C to 50°C (32°F to 122°F)	N/A
Humidity	5% to 95%	N/A

Equipment dimensions   The NTRX54BA circuit card dimensions are 101.6 mm (4 in) in height, 60.9 mm (2.4 in) in width and 254 mm (10 in) in depth. The approximate weight is 0.68 kg (1.5 lb).

Functional description

This section describes new features along with a description of RSCM shelves and circuits cards.

In-service firmware downloading

In-service firmware downloading permits XPM firmware loading in an XPM unit while the unit is in service (InSv). This feature reduces the amount of time

one unit of the XPM is out-of-service (OOS). In-service firmware downloading supports NTMX77 and NTAX74 processors.

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

This feature introduces the LOADFW command. The LOADFW command distinguishes the firmware load application from the firmware upgrade application. The command syntax for the LOADFW command is:

```
LOADFW: Load Firmware onto a PM or unit.
        All parameter will execute LOADFW on
        all PMs in the post set of the same
        PM type displayed on the MAP.
        LOADFW UPGRADE must be used to
        activate the new firmware.
 Parms: <DEVICE> {UNIT <UNIT_NO> {0 TO 1},
                  PM,
                  INACTIVE,
                  ACTIVE}
           [<FILENAME> STRING]
            [UPGRADE]
            [NOWAIT]
            [ALL]
```

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

>LOADFW PM

or

>LOADFW UNIT unit_no

or

>LOADFW INACTIVE

> *Note 1:* If the firmware_file is not specified with the LOADFW command, the command applies the firmware_file datafilled in the appropriate inventory table.

> *Note 2:* By using the LOADFW command without the UPGRADE option, the firmware downloads to the DMS system.

XPM Firmware Loader Robustness CM Component disables the firmware option of the LOADPM command. A message is output to the user if the

firmware option of the LOADPM command is used. This message states this option is not supported and to use the LOADFW command.

Loadfile verification

Integrity checks are performed on the firmware for loadfile accuracy. A loadfile record length check ensures the file is a firmware file before submission to the XPM. If the record length is not 54, a message is output to the user and the LOADFW command fails.

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

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

>QUERYPM CNTRS

Firmware upgrade

After loadfile verification, the XPM can be upgraded to the new firmware. To upgrade the firmware use one of the following command string sets:

>BSY PM

>LOADFW PM UPGRADE

>RTS PM

or

>BSY UNIT unit_no

>LOADFW UNIT unit_no UPGRADE

>RTS UNIT unit_no

or

>BSY INACTIVE

>LOADFW INACTIVE UPGRADE

>RTS INACTIVE

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

When this procedure is performed on a by-unit basis, perform a switch of activity (SwAct) followed by the RTS command. Execute the LOADFW command with the UPGRADE option on the now inactive unit.

The next table lists parameters used with the LOADFW command.

Table 2-14 LOADFW parameters

Parameter	Value	Definition
UNIT	n/a	Peripheral module unit
PM	n/a	Peripheral module
INACTIVE	n/a	State of peripheral module
ACTIVE	n/a	State of peripheral module
unit_no	0 or 1	PM unit number
filename	n/a	Name of firmware file. If the firmware file is not specified, the firmware load found in the appropriate inventory table is used.
UPGRADE	n/a	Upgrades the PM to the new firmware load. UPGRADE is an optional parameter.
ALL	n/a	Permits the use of the LOADFW command on a posted set of PMs. ALL is an optional parameter.
NOWAIT	n/a	Returns the prompt before the command is finished, on-screen status is not visible. NOWAIT is an optional parameter.
Note: In this table N/A is an abbreviation for not applicable.		

The figure "Functional block diagram of the RSC-M main shelf", relates to the functional description of the RSC-M main shelf. The figure "Functional block diagram of the RSC-M main shelf"appears in this section. A functional description of the RSC-M main shelf follows.

An RSC-M hosts channel associated signaling lines. These lines are directly mapped to dedicated time slots in the range of links provisioned to the node. A CAS node can have a maximum of eight PCM30 links. A PCM30 link has 32 DS0 channels for a total of 256 available channels. A CAS AMC node can support a maximum of 240 dedicated lines. A single RSC-M that has an EXT half-shelf that hosts a maximum of six CAS AMCs, supports 1380 lines.

RSC-M

The RSC-M main and EXT interface shelves are the primary operating devices on the DMS side of the RSC-M network. The operating areas of the RSC-M include the following:

- speech and message paths in the RSC-M
- cards
- RSC-M maintenance
- fault conditions
- automatic maintenance

The figures on the following pages represent the main and EXT shelf configurations.

Figure 2-4 RSC-M main shelf configuration in RSC-M cabinet

Note 1: The NTMX87 cards contain 4 dual NTMX82 I/F packlets. When NTMX82 cards are not required, the system must provision NTMX83 cards. If more than 22 P-side links are required, use the NTMX86 EXT shelf.

Note 2: The system provisions NT6X92 Global Tone Receiver (GTR) or Universal Tone Receiver (UTR) card in slots 6, 7, 21 and 22 if required.

Note 3: The system provisions NT6X78 CLASS modem resources (CMR) card in slots 5 and 23 if required.

Note 4: Slots 8 and 20 use an NTMX76 or 6X69.

Note 5: The MX74 DS30A packs are required in slots 13 and 15 for diagnostic purposes.

Figure 2-5 RSC-M EXT shelf configuration (NTMX86AA)

Figure: RSC-M extension shelf

| | Left EXT | | | | | | | | | | | | Right EXT | | | | | | | | |

NT 0X 50	NT MX 79	NT 0X 50	NT MX 87	NT 0X 50	NT MX 87	NT 0X 50	NT MX 87	NT0X50				NT MX 79	NT MX 79	NT0X50				NT MX 87	NT 0X 50	NT MX 87	NT 0X 50	NT MX 87	NT 0X 50	NT MX 79	NT 0X 50
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

Unit 0   Unit 1   Unit 0
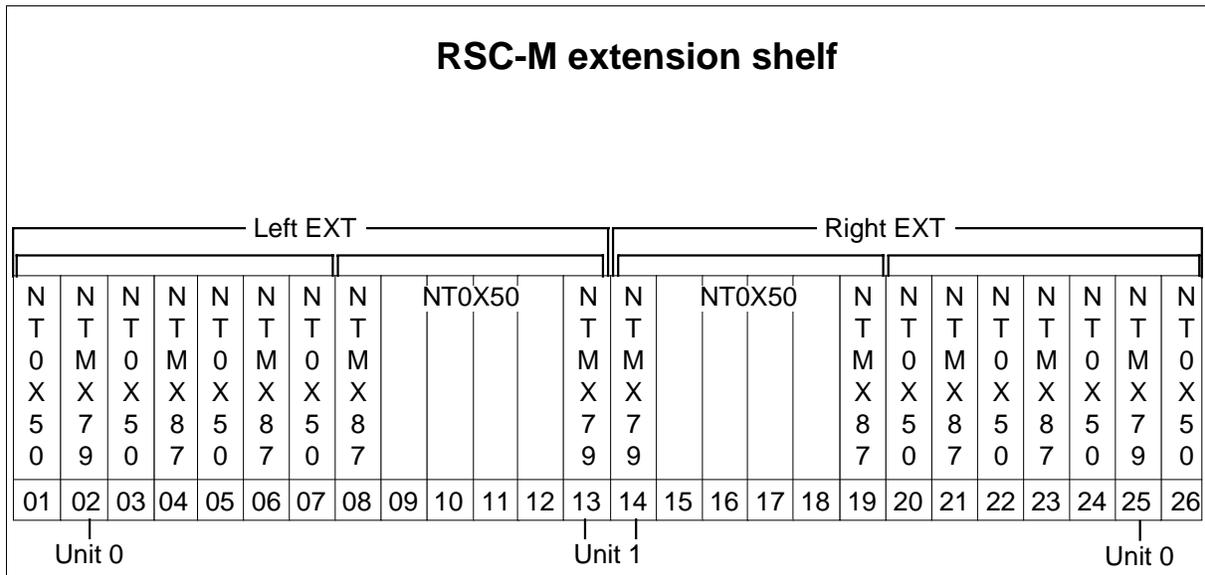
Speech and message paths in the RSC-M

The parallel speech bus consists of a transmit and receive bus. The voice and message paths pass between the two RSC-M units in a dual configuration. These paths also pass from the RSC-M to the host.

For the RSC-M to work, correct communication between the RSC-M units must be present. This condition allows the inactive unit to take over call processing. The RSC-M units communicate over the intermodule communication links (IMC).

Circuit cards

The following sections describe RSC-M circuit cards:

- host communication
- processor
- speech bus
- peripheral communication

Host communication cards   These cards translate between the 16 host PCM-30 ports and the parallel speech bus. The RSC-M host communication cards include the Quad Frame Carrier (NTMX87). These cards also include

two PCM30 packlets on the Quad Frame Carrier and the Enhanced Matrix (NTMX75).

> *Note:* When the system provisions NTMX87 and four NTMX82AA packlets are not required, the NTMX83 filler packlets are inserted. This action allows fan units to provide correct cooling to the unit.

On the C-side of the RSC-M, 16 PCM30 links connect each shelf to a LGCOi+. The maximum C-side channel capacity of a cabinet with three RSC-M main shelves is 1380.

The Enhanced Matrix circuit card (NTMX75) is non-blocking. This card performs all the switching functions that the RSC-M shelf and the EXT shelf require. The Enhanced Matrix circuit card is a single-stage time switch with 2528 input and output channels. A channel can switch to any free channel.

Input and output consist of two groups:

- C-side, 640 channels of which 128-channels are for service circuits
- P-side, 1888 channels

Processor   The Unified Processor (UP) (NTMX77) 68020 CPU circuit card controls RSC-M main and EXT shelf activities. Memory of the UP circuit card is consolidated on the circuit card. The memory provides electrically-erasable programmable read only memory (EEPROM). This circuit card has two FLASH EEPROMs. A FLASH EEPROMs is a 256kbyte programmable chip. This condition allows operating company personnel to load firmware on a manually-busied (ManB) RSC-M. Operating company personnel can only load firmware that is separate from the random access memory (RAM) load. Operating company personnel use the following command strings to load the firmware with the PM posted:

```
>LOADFW PM
```

or

```
>LOADFW UNIT unit_no
```

or

```
>LOADFW INACTIVE
```

Speech bus

Two speech buses are present. The speech buses are a transmit pulse coded modulation (XPCM) to the C-side and a receive (RPCM) to the P-side.

ATTENTION

To make sure that maximum performance occurs, do not install the UTR and GTR on the same RCC/RCC2. You will not know which receiver interprets tones. Some call processing tones can be degraded if designed for use with a GTR.

Circuit cards included are:

- global tone receiver (GTR) or universal tone receiver (UTR) (NT6X92)

- signaling processor (SIGP) (NTMX73)

- enhanced matrix (NTMX75), also used on C-side communications

- message and tone interface (NTMX76 or 6X69)

- CLASS modem resource (CMR) (NT6X78)

The GTR/UTR circuit card identifies and processes tones for channels on the parallel speech bus.

The SIGP circuit card supports all low-level signaling tasks and provides the system clock. The SIGP circuit card also contains software that maintains synchronization with the network. The SIGP circuit card provides the PCM30 maintenance and the maintenance interface for the two PCM30 carrier card (NTMX82). The SIGP circuit card controls messaging for CAS interfaces.

The NTMX76 message and tone card is the interface between the UP and a maximum of 32 data links.

The card allows HDLC protocol with the following:

- full duplex messaging

- windowing

- equal treatment

- performance features

The card also allows HDLC protocol with DMS-X half duplex messaging.

The message and tone card perform the following functions:

- send and receive DS30 control messages between nodes

- generate ROM and RAM tones and send the tones out on a speech bus

---

- setup, maintain and terminate calls
- checking parity and PCM path accuracy

The card has direct communication with the UP, parallel buses, the direct message link and with intermodule communication (IMC) links.

Pack diagnostics allow the UP to conduct several different levels of tests on the NTMX76 card. These tests are destructive and non-destructive.

The PMDEBUG performs the following destructive tests:

- Tone diagnostics
- Message tests
- Receive ASIC test
- Transmit ASIC test

Non-destructive tests are HDLC tests. The PMDEBUG performs the following non-destructive tests:

- Card life
- Memory tests
- HDLC messaging system test
- IMC test

The CMR circuit card supplies modem tones for Custom-Local Area Signaling Services (CLASS).

Extended Distance Capability

An RSC-M can be located at an extended distance from the host of an RSC-M. This condition is possible as a result of the development of HDLC protocol, the addition of the NTMX76 card and related software. The Extended distance capability (EDC) offers a 5-ms transmission delay and a 1.5 ms switching delay. These delays provide a maximum of a 6.5 ms one way delay from subscriber to host. The HDLC controller sends messages over 32 channels. The host and the remote use four channels for messaging, two for HDLC and two for DMS-X. The maximum number of channels available for voice and static trunk is 476 for PCM30 links.

The subscriber can use HDLC and DMS-X protocols in parallel and define the protocols on a separate remote. A subscriber defines the message card for extended distance capability. The subscriber selects DMS-X or HDLC protocol in table LTCINV at the host, or RCCINV at the remote. Refer to *Extended Peripheral Module International Translations Reference Manual* for entry examples.

Peripheral communication

The circuit cards in this section translate between the 46 P-side ports and the parallel speech bus. The following are the circuit cards:

- enhanced matrix circuit card (NTMX75). The system uses this card on C-side communications.

- quad PCM30 frame carrier circuit card (NTMX87)

- two PCM30 packlets (NTMX82)

- DS30A circuit card (NTMX74). This card is required but not used. The system uses this pack to run P-side loop and MX75 diagnostics.

For the NTMX75 circuit card, the description under the host communication section applies to the P-side.

The NTXM87 circuit card provides an interface between the RSC-M main and EXT shelf P-side links and AMCs. The NTMX87 circuit card has four dual, NTMX82, PCM30 packlets. The NTMX82 packlets transfer timing information.

When the system provisions a NTMX87 and four NTMX82AA packlets are not required, the NTMX83 filler packlets are inserted. This action allows fan units to provide correct cooling to the unit.

On the P-side, each RSC-M shelf can support a maximum of 22 PCM30 carrier links to remote AMC nodes. Slots 22 and 23 are not available for CAS.   A shelf with a half-shelf EXT can support an additional 24 PCM30 carrier links. The total is 46 PCM30 links for each full RSC-M module. A full RSC-M module consists of main and EXT shelves that support a maximum of 1380 lines.

The matrix card (NTMX75) and the power converter circuit card (NTMX79) provide DS60 data links between the shelves. The NTMX75 is on the RSC-M main shelf. The NTMX79 has DS60 extension links on the EXT shelf.

Figure 2-6 Functional block diagram of the RSC-M main shelf
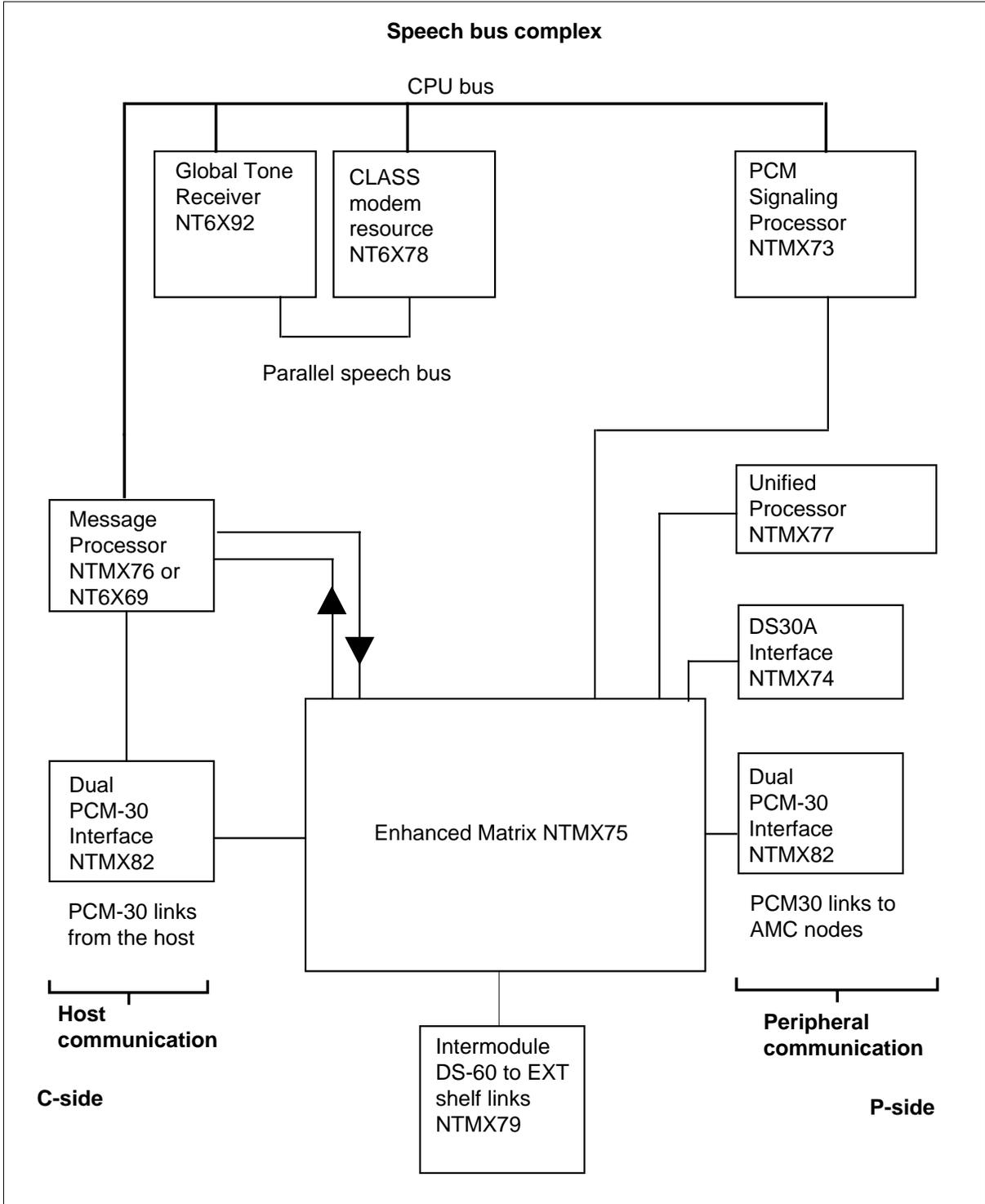
Emergency stand-alone operation

Emergency stand-alone (ESA) operation provides for maintenance operations and a minimum set of call processing activities on the RSC-M. To allow ESA operation capability, the ESA field in table RCCINV for the RSC-M must be set to Y.

The RSC-M communicates with the host over links 0 and 2. If both of these message links fail, the RSC-M cannot communicate with the host. The system enters ESA. If the system enters ESA, an RSC-M can enter ESA. The RSC-M can enter ESA because a loss of messaging to the host or the CC occurred. The CC can cause this condition if a warm restart occurs for the CC and the CC does not respond to the message audit. The RSC-M normally enters ESA because of the complete loss of links.

> *Note 1:* The PCM-30 links are not returned to service unless a minimum of one line is present on the links in table LNINV. This event occurs to avoid the possibility of generating SWERRs during ESA.

> *Note 2:* The DC5A and DC5ADD calls that terminate are not intraswitched in ESA. The DC5A and DC5ADD calls require outpulsing signals from the maintenance trunk module (MTM) in the DMS switch.

The ESA provides limited call processing to the RSC-M node when a loss of communication occurs with the host. When the systems enters ESA, the peripheral takes control of call processing from the CC. The ESA entry is warm. The system drops net-switched calls that require CC interruption. The system maintains intraswitched calls.

A warm ESA exit occurs when C-side communications are restored with the RSC-M. The RSC-M then attempts to return control to the CC. Calls that originate during the ESA exit are held until the CC resumes call processing activities. If an ESA exit attempt fails, the user executes a full RTS on the module. This action causes a loss of calls in progress.

Signaling

The following figure shows the signaling interface of a CAS AMC to RSC-M. Channels 0 and 16 of each PCM30 link perform messaging and control of the voice channels on the link. Maintenance messaging uses channel 0 of the associated link. The ABCD bits control CAS signaling on channel 16 of each link.

On CAS interfaces, a 64 Kb/s PCM30 virtual line channel is logically mapped to a singular PBX or subscriber line. A line card in the AMC supports this line. Virtual lines appear as a line of the appropriate type in table IBNLINES. These lines appear when the lines are entered at the DMS switch and AMC.

Figure 2-7 CAS interface
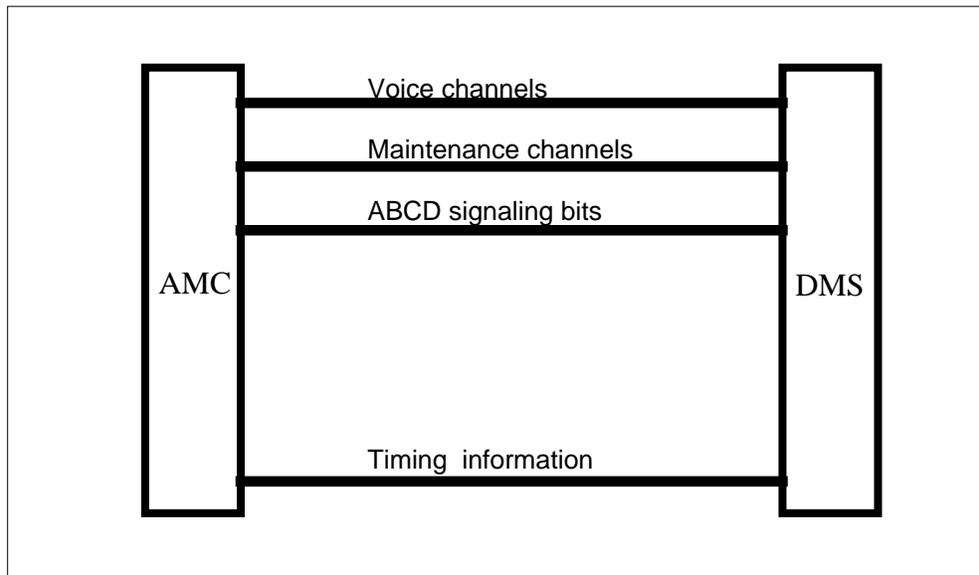
Signaling provisioning
In table carrier maintenance (CARRMTC), CAS interface links are entered as CAS type. In table remote carrier controller P-side inventory (RCCPSINV), P-side links are entered as D30 for DS30. In table RSC-M translations (GPPTRNSL), the selector (SEL) field is entered as MELCAS for CAS AMCs.

RSC-M maintenance

This section describes the following fault conditions and maintenance actions:

- types of problems that can occur in components like a circuit card or power supply

- the links that connect these components

- the software that controls the voice and message flow

RSC-M maintenance
The RSC-M configuration uses the following components:

- RSC-M node maintenance

- RSC-M carrier maintenance

- RSC-M lines maintenance

- RSC-M call process

- switch of activity (SWACT)

- routine exercise (REX) test

- static data update (non-ESA)
- RSC-M return-to-service

RSC-M node maintenance

The RSC-M node maintenance performs the following functions:

- processes RSC-M-related maintenance requests from the DMS
- directs activities that detect problems, initiates recovery procedures and sustains normal operation of the RSC-M system
- supports the RSC-M at the PM level of the MAP display
- generates logs and operational measurements (OMs) for RSC-M

The system views RSC-M maintenance as an extension of PCM line group controller (PLGC) maintenance. The PLGC maintenance is required to handle RSC-M functions.

The following events initiate maintenance activities:

- commands from the central control (CC)
- continuous, automated processes (like audits)
- problems encountered during RSC-M operation, like alarm detection or P-side link failure

Alarms and logs

The system generates an alarm when the system detects a fault on an RSC-M.

The user can obtain information about the fault from two sources:

- the use of the QUERYPM FLT command at the MAP terminal to view log reports
- PM logs that the system generated to indicate maintenance states

RSC-M peripheral level

The MAPCI;MTC;PM;RSC-M level provides the following commands:

- Quit—Quit this level of MAP display.
- Post—Select an RSC-M shelf by PM number, state or all.
- ListSet—List all PM types in a set.
- Trnsl—Show state of P-side, C-side or message links.
- Tst—Test the posted RSC-M, one unit, P-side link or CMR card.
- BSY—Manual busy the posted RSC-M, inactive unit P-side link or CMR circuit card.

- RTS—Return-to-service the posted RSC-M PM, unit, P-side link or CMR circuit card.
- Offl—Put off-line the posted RSC-M.
- LoadPM—Load the RSC-M PM or unit with firmware.
- Disp—Display all PMs in a specified state.
- Next—Move to the next RSC-M in the posted group.
- SWACT—Switch activity from the active RSC-M unit to the inactive unit.
- QUERYPM—Display information on the posted PM.
- Perform—Enter the performance monitoring level of the MAP display.
- IRLINK—Used only with dual configurations. The IRLINK is not available with RSC-M.

CI commands:

- QUERYRSC—Used to display CAS link information for RSC-M only.
- LNTOGPP—Translates the AMC description in table GPPTRNSL (site, frame and group). Translates the drawer number entered in table line inventory (LNINV) to the RSC-M and carrier numbers
- GPPTOLN—Translates the RSC-M (PM type, PM internal number) and carrier numbers to AMC description (site, frame, group) and drawer number.

RSC-M carrier maintenance

Maintenance for RSC-M carriers contains the following:

- addition of RSC-M carrier type (DS30) in table CARRMTC
- support at the CARRIER level of the MAP display
- audits for attached PCM30 lines
- generation of logs and OMs

AMC node carrier maintenance

The entry and maintenance interface for the RSC-M is the MAP terminal. The maintenance interface to the AMC node is a terminal that connects to the AMC node. The maintenance interface to the AMC node is a terminal like the MAP terminal.

The DMS switch returns-to-service (RTS) all the lines of an AMC node. When the RSC-M or PCM30 carrier is out-of-service (OOS), the lines are marked as line maintenance busy (LMB).

If a single line is busied, the system marks this line as maintenance busy (MB).

If the AMC node initiates a blocking of a line, the system marks the line as permanent lock out (PLO). An attempt to RTS an MB line while the line is blocked on the AMC side results in a PLO state for the line.

External bit error rate tests (XBERT)
The following XBERT tests are supported:

- XBERTPSL - Tests a channel looparound on the NTMX82 circuit card.

- XBERTHLP - Tests a given channel looparound on the NTMX82 (excluding channels 0 and 16). Loop the carrier to a digroup looparound or force the carrier on a digroup looparound. Use the Loop command to perform this action. The user must perform this action before the installation of the test.

Carrier maintenance log reports
Log reports are issued for given carrier-related occurrences. The system generates carrier RTS logs and carrier busy logs when the carrier changes states. Many logs relate to the maintenance limit (ML) and out-of-service (OOS) set in table CARRMTC.

Carrier alarms
On CAS interfaces with dedicated channel assignments, failure of a carrier causes a major alarm. The carrier alarm indicates that the lines on that carrier lost service. When a fault occurs on an RSC-M carrier, the system can detect and generate one of the following alarms:

- slips

- frame losses alarms (LLFA, LLMA, LLCMA, RFAI, RMAI)

- additional faults if the far end carrier supports the faults. Additional faults include AIS, BER, CARD, and CRC4.

The carrier MAP level displays the carrier number according to the class that reached or exceeded the ML or OOS. The MAP level displays trunk class if this carrier does not define RSC-M lines. The MAP level displays remote class if the PCM30 carrier defines RSC-M lines. The PCM30 carrier connects the RSC-M and the AMC nodes. When carriers exceed the ML or OOS limits, the system updates the MAP display for the carrier. For OOS limits, the carrier can be placed OOS. The DISP command allows you to display carriers that reach the ML or OOS limits.

The DMS switch monitors the signals that transmit between an RSC-M and lines for frame losses, slips, or other faults. When specifications are not met, the system increases OMs in the PCMCARR OM group, and ML and OOS limits. Steady frame loss, excessive frame losses, slips, and bit error rates (BER) normally cause the system to place a carrier OOS.

The LLFA, LLMA, RFAI, and RMAI are the PCM30 carrier alarms. The LLFA and LLMA are associated with signals from the lines to the RSC-M. The type of PCM30 alarms the system generates determine if these alarms are associated with these signals. The RFAI and RMAI associate with signals from the RSC-M to the lines. Steady-state frame loss for a specified duration in table CARRMTC generates LLFA and LLMA alarms. When the system regains the frame, the system clears these alarms for a specified duration. Table CARRMTC provides the value for this duration.

Isolated or intermittent faults like frame losses or slips accumulate. When the faults reach the ML, the system updates a field marked ML on the MAP display. This update serves as a warning to operating company personnel that faults can occur on the carrier.

The system flags a carrier temporarily system busy (SysB-T) or permanently system busy (SysB-P). This flagging depends on the number of times the system returns the carrier to service.

The system sets the carrier to SysB-T if a steady state alarm occurs for a carrier. A steady state alarm is an alarm that did not clear. The system sets the carrier to SysB-if the carrier exceeds the OOS for frame losses or slips.

The DMS switch places a carrier system busy (SysB) when the following alarms occur:

- LLFA
- LLMA
- RFAI
- RMAI
- AIS
- BER

The DMS switch can RTS the carrier when the system clears the alarm (frame regained).

The user can enter a limit on the number of times a carrier is RTS. This entry makes sure a carrier does not bounce indefinitely between SysB and INSV states. The default for the consecutive number of times the system can RTS the carrier is 255.

A carrier remains SysB-T until you RTS the carrier correctly. The RTS occurs when the tests of the RTS sequence pass. Successful test indicates that no faults remain on the carrier. The system sets the carrier to SysB-T when the carrier audit does not find alarms in the carrier.

You must RTS a carrier in the SysB-P state manually.

The DMS switch counts alarms, faults, and RTS for specified time or for audit intervals. At the end of an accumulative audit interval, the system clears the counters. An accumulative audit interval is normally midnight to midnight.

The RSC-M carrier states are:

- O (offline)

- C (CBSY)

- M (maintenance busied)

- . (in-service)

- S (system busy)

RSC-M lines maintenance

When a CAS carrier is installed, all channels send a blocking signal. When a line becomes INSV the associated channel sends an idle signal. When the system busies a line, the system sends a blocking signal on the associated channel.

RSC-M line states

RSC-M line states indicate the system can respond to maintenance actions or call processing. The system supports the following line states:

- CPB - call processing busy. The line is call processing (OFFhook).

- CPD - call processing deload. The BSY command (blocking) is issued to a CPB line. This line goes to MB when the subscriber goes on-hook.

- DEL - deloaded. The DEL is a state that changes between CPD and MB.

- IDL - idle. When an RSC-M carrier is INSV, all lines on this carrier become INSV idle (IDL). The system sends an IDL pattern (1101) by each associated line.

    Note: A return to service (RTS) of a carrier does not idle the lines. Return to service the lines. If the lines are idle before the carrier is busied, the lines must be idle immediately after an RTS of the carrier.

- MB - manually busy. Maintenance personnel remove the lines from service for maintenance actions.

- INB - installation busy. Data entry on the line is not complete; data entry on the line is in progress; data entry is complete, but a return to service of the line did not occur.

- NEQ - not equipped. The line is not entered.

- LMB - line module busy. The AMC carrier that contains the line is not INSV. This state occurs when the PCM30 carrier associated with the line is BSYed.

- PLO - permanent lock out. The user left a line offhook, or the AMC performed a blocking command on the line.

RSC-M lines maintenance facilities

Metallic line testing facilities that associate with analog line cards do not apply to CAS AMCs. The CAS AMCS do not have metallic test access.

The RSC-M supports the following facilities:

- manual maintenance

- FRLS, BUSY, and RTS commands at Line Maintenance (LNS) levels

- system maintenance

- line audit, to audit the accuracy of the line states

Line test level

Line tests on AMC nodes that subtend an RSC-M use DMS switch test facilities through network connections. These line tests do not use metallic access. The tests access functions through the line test position (LTP) level of the MAP display. These functions provide near and far end measurement and monitoring capabilities. These functions maintain subscriber lines from the DMS switch. When a line is posted, the system assigns a terminal type based on the call processing (CP)_SELECTOR of the line. The RSC-M lines have the same CP_SELECTOR as PCM30 line drawer (PLD) lines. The system assigns Type MISC_TERMINAL to RSC-M lines.

The following table describes the format of CAS addressing compared to current PLD and LEN addressing.

Table 2-15 Line equipment numbers (LEN) relationship

Standard line concentrating modules (LCM) LEN addressing format					
PM	**Site**	**Frame**	**Bay**	**Drawer**	**Card**
PLD	Site name	0 to 99	shelf number 0 or 1	0 to 19	0 to 31
RSC-M/CAS	Site name	0 to 99	NTMX87 card slot number 0 to 5	PCM30 link number 0 to 7	PCM30 channel number 0 to 31
Note: The RSC-M/CAS bay, drawer, and card sections of the LEN assign the PCM30 link, and the dedicated channel connected to the line.					

Two LEN number translation commands are available for CAS links on RSC-Ms.

- LNTOGPP—translates the AMC description in table GPPTRNSL. This command translates the site, frame, and group of the AMC to the RSC-M and carrier numbers. The LNTOGPP translates the drawer number entered in table line inventory (LNINV), to the RSC-M and carrier numbers.

- GPPTOLN—translates the RSC-M (PM type, PM internal number) and carrier numbers to the AMC description and drawer number. The AMC description includes the site, frame, and group of the AMC.

The following line maintenance commands are correct for posted CAS lines at the MAPCI;MTC;LNS;LTP;LEVEL <LTPMAN> or <LTPLTA>:

- NOISE—measures the C-message weighted circuit noise on a subscriber loop

- LOSS—measures the insertion loss of a test tone sent from the subscriber end of a loop to the switch

     Note: The LOSS E command is not supported

- TONEGEN—transmits a tone on a subscriber loop

     Note: Metallic TONEGEN option is not supported for CAS lines.

- JACK—connects a jack ended trunk to the digital side of a subscriber line

- MONLATA / TALKLATA—connects a headset circuit to a line in the MB or call processing busy (CPB) state. This connection is for listening or talking purposes. If the line is MB, a direct network connection occurs between the headset and line. If the line is CPB, a connection is set between the line under test, the connected circuit, and the headset. The line is set through a 3-port conference circuit.

     Note 1: Monitor/talk connections use direct network connections and 3-port conference circuits. Monitor/talk connections do not use metallic connections. Intrusion tones and an optional intrusion tone override parameter apply to RSC-M lines only.

     Note 2: MonLTA and TalkLTA commands for RSC-M lines have an optional parameter S or s. You can enter this parameter after a command. This condition causes an override of the default or entered intrusion tone. Silence is applied.

     Note 3: The battery option for the TalkLTA command is not supported for RSC-M lines.

- LTA—used only with the release (RLS) parameter to release monitor connections to CPB lines

    Note: If the monitored line is MB, you can use the LTA, RLS, or RTS commands to release connections. If the line is CPB, you must use the LTA RLS command.

- RLSCON—releases test equipment connected to a line

- RING—sends the correct signal to the AMC subscriber line that has a monitor connection. This signal causes ringing. Operating company personnel monitor a MB line. The signal allows operating company personnel to alert the tester in the field to go off-hook. This action allows you to monitor line quality.

    Note: The BSY, RTS, HOLD, and NEXT commands function as hidden commands from the subtending LTP levels. These commands operate by the same method as in the root LTP level. The ALMSTAT command does not provide specified information about a RSC-M line or on the posted link.

Figure 2-8 RSC-M line test configuration near end measurements
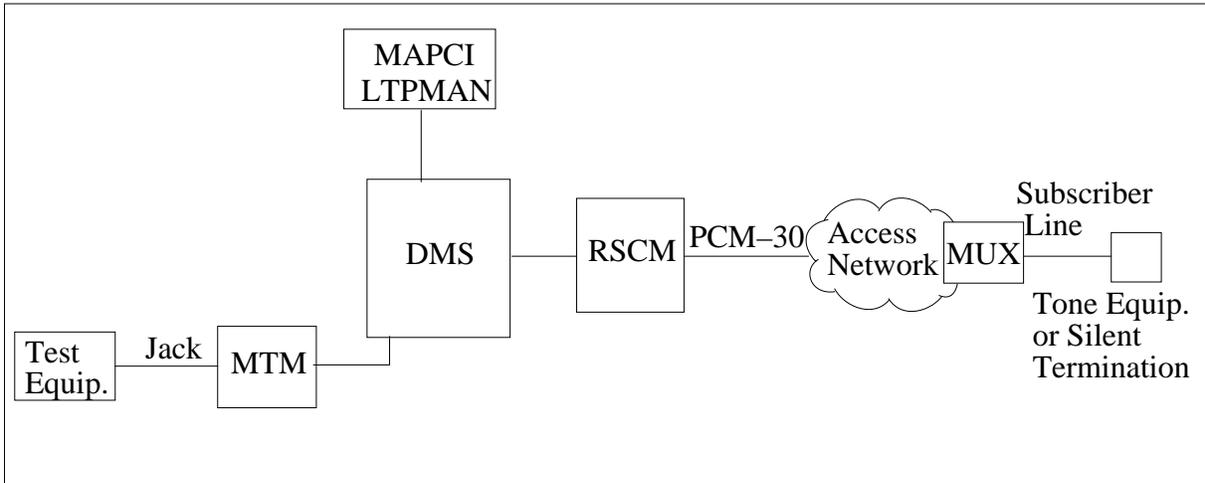
Figure 2-9 RSC-M monitor connections
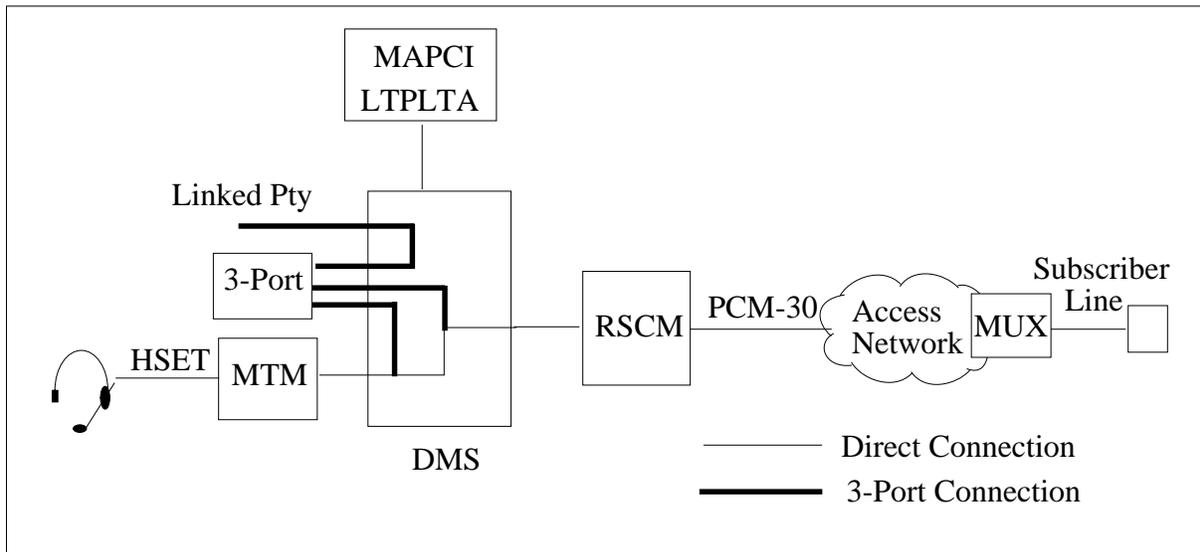
RSC-M call process

The user requires CC call process support for POTS and CLASS to enable call processing in the RSC-M. The RSC-M interface uses the basic host XPM call process to perform line call processing. The line card of the AMC performs line processing. Line processing includes on-hook detection and ring generation. This line card connects to each subscriber line.

Computing module data synchronization

The XPMs must adhere to several requirements to maintain system sanity. One of these requirements is that node and port tables in both units remain synchronized. Common tuples to both units must refer to the same internal indices and contain the same data. The presence of identical indices in both units allows processes to communicate between units. Active processes continue to function after a warm SWACT. Current functionalities make synchronization of the mate unit node and port tables difficult to preserve.

You must include the link states data and P-side node and port states data for basic loads. This action makes sure the RSC-M data is correctly initialized. The system coordinates management of node table synchronization in the XPM. The system forces the inactive unit to order the node table the same as the active unit. To order the node table, the system forces the active unit to send a map of the node table during a bulk download of configuration data. The inactive unit uses the map to enter data in the node table. This data entry occurs when the inactive unit receives data from the CM.

The inactive unit does not use the node map to write dynamic updates. The inactive unit expects to receive data in the same order as the active unit. When the inactive unit runs, the node and port tables always remain synchronized

with the active unit. Units can lose synchronization if one unit loses an earlier dynamic update. The active unit can contain a temporary interprocessor message link (IPML). This link performs broadcast loading in the node table when a dynamic update occurs. This link causes the tables to be out of synchronization. The IPML link is added only in the node table of the active unit.

To Update static data

Three types of updates provide the inactive unit of the RSC-M with the necessary data to control maintenance and call processing:

- static data

- bulk data

- dynamic data

Static data update

Static data holds RSC-M and AMC node configuration information. Configuration information includes the interaction between RSC-M P-side ports and node link numbers. The computing module (CM) sends this information to both units of the RSC-M when the CM is RTS. The CM sends this information to an InSv RSC-M when the following tables are modified:

- remote cluster controller inventory (RCCINV)

- remote cluster controller P-side inventory (RCCPSINV)

- line inventory (LNINV)

- special connection (SPECCONN)

When operating company personnel attempt to change configuration information, the update can fails. If the update fails, the system sets the RSC-M to an in-service trouble (ISTb) condition. The system notifies you that a static data mismatch is present. The system identifies the correct action to take.

Static data defines the RSC-M configuration and does not change when calls connect and disconnect. Data corruption can occur when static data in the host and the RSC-M does not match. Data mismatch causes the host to recognize a line that the RCM-does not recognize. This condition causes a loss of calls.

Feature Node Table Sync Design changes the method that the system clears the ISTb condition for XPMs. These XPMs have software loads that support configuration data table (CDT) management.

Each XPM unit contains tables that describe nodes that the XPM connects to and terminals that the XPM uses. Node table audits determine if the information contained in the XPM unit corresponds to data in the CM table

PMNODES. To prevent differences in the entries for the XPM units, the CM maintains all node information. To clear an ISTb condition on one unit, the XPM must be BSYed and RTSed. For a complete description of the entries for table PMNODES, refer to the *Translations Reference Manual*.

Node table sync improvements
Feature AF5678, XPM Node Table Sync Redesign, created table PMNODES. This table contains a list of all nodes in each XPM. This table transfers XPM node information to the new CM load during a software upgrade. This transfer makes sure the new CM software contains the correct node order for each XPM that becomes active. The CM controls the sequence and entries of node and port tables in both XPM units. The system maintains synchronization between the CM and the tables in active and inactive XPM units. The XPMs converted to this table do not use mapping information sent from the active to the inactive unit.

Table PMNODES is a read-only table. The system adds and deletes tuples when the associated inventory tables are entered. Associated inventory tables include tables RCCINV and LCMINV.

Node Table Sync Redesign introduces the following error handling changes:

- Table control applications that change inventory table reject tuples. These tuples are not supported when a peripheral does not have the available resources that that peripheral requires.

- The node table audit raises an ISTb condition on an XPM that has a node table mismatch with the CM. To clear the ISTb condition, BSY and RTS the whole XPM.

- A negative acknowledgment message from the XPM causes the system to abort the loading or RTS process. A negative acknowledgment message occurs when the system downloads the CDT node or port information during a bulk download.

- A negative acknowledgment message from the XPM raises an ISTb condition on the XPM. A negative acknowledgment message occurs when the system downloads the node CDT or port CDT data during a configuration update.

Figure 2-10 Enhanced XPM node table synchronization
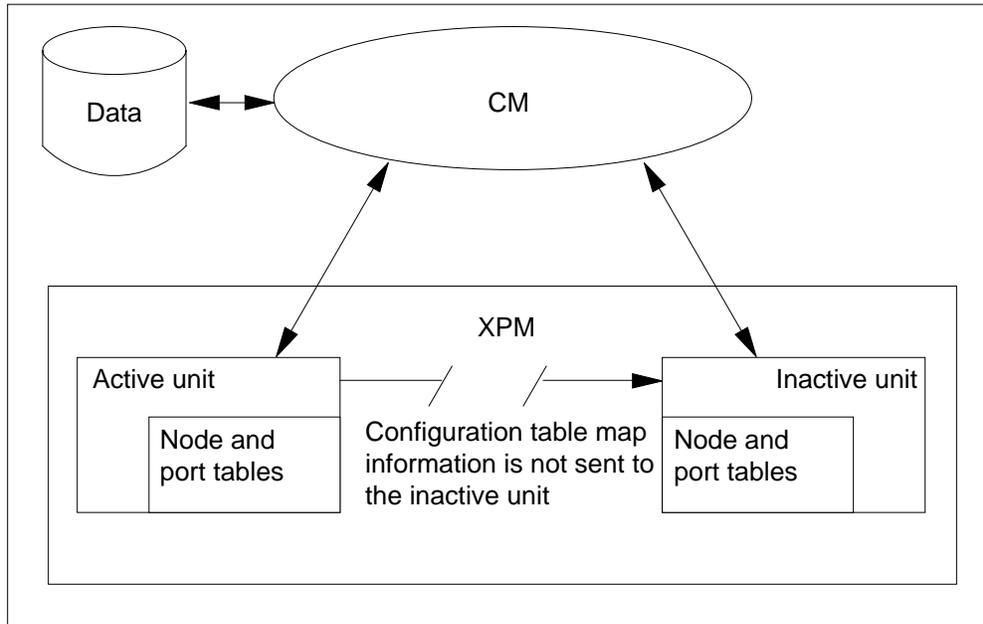
Bulk data update

With a Warm SWACT, the inactive unit requests a bulk transfer of critical dynamic data from the active unit. This event only occurs when both units of the RSC-M are INSV. The system requires this data to maintain established calls and to continue call processing if a SWACT occurs. This transfer is a bulk data update.

Bulk data includes AMC state, P-side and C-side port states (open/closed) and call processing data. The connection of a specified line circuit to a specified PCM30 channel is an example of call processing data.

A bulk data update transfers information from the active RSC-M unit to the inactive unit when the inactive unit is RTS. The information that a bulk data update transfers follows:

• AMC state (INSV or BSY)

• frequency selective ringing (FSR) codes

• subscriber states (idle or BSY)

A bulk data update brings the inactive unit of the RSC-M to date with the active unit.

Dynamic data update

A dynamic data update occurs continuously. Data that changes in the active unit is updated in the inactive unit. The following information is in dynamic data updates:

- AMC state (InSv or BSY)

- FSR codes

- subscriber states

- channel reassignment

- port states

- PCM30 link information

When the bulk transfer of critical data is complete, communication continues between the units. Information can continue to flow from the active unit to the inactive unit. This condition is an ongoing data update. As this data changes, the inactive unit is updated. The inactive unit maintains the capability to take over call processing from the mate if a SWACT occurs.

The following table lists critical dynamic data transferred to the inactive unit. The active unit sends this data to the mate of the active unit. The active units sends this data first in bulk. The active unit continues to send this data as data in the active unit change.

Table 2-16 Critical dynamic data

Dynamic data	Condition for change
Call data	The system establishes or disconnects
Terminal status	Terminal (line or trunk) is put into or taken OOS
Port status	A P- or C-side port change in state (open or close) is requested.
PCM30 maintenance	Maintenance or data synchronization reporting over PCM30 links is enabled or disabled.

For dynamic data, the inactive unit can take over call processing from the mate of the inactive unit. The inactive unit can take over call processing while the inactive unit retains many of the established calls.

The node and terminal table information is loaded to the RSC-M as static data.

Enhanced Dynamic Data Sync (EDDS)

The EDDS is a necessary component of warm switch of activity (SWACT). A Warm SWACT preserves processing of all calls. Warm SWACTs occur when the active unit of an XPM drops activity. An XPM trap, REX test, or other causes the active unit of an XPM to drop activity. An XPM drops activity to preserve call and unit states to allow calls to continue without interruption. For a successful warm SWACT, the inactive unit must be in service (INSV).

The inactive unit can be out of service (OOS), manually busy (ManB), system busy (SysB), or C-side busy (CBsy). If the inactive unit was in any of these states, the following events occur during a return to service (RTS):

- the system initializes the inactive unit

- The OOS tests run on the inactive unit

- if the inactive unit static data check sum is not correct, the CM sends new static data. The CM also marks the inactive unit in-service trouble (ISTb).

- the active unit sends dynamic data to the inactive unit (bulk sync).

- the CM marks the inactive unit INSV

Return the RSC-M to service

An RSC-M is RTS if manual maintenance occurs or a system audit detects a defective component.

When manual maintenance occurs, a fault can cause the RSC-M unit or the PM to become SysB. If this condition is present, the unit is normally busied and tested. When the defective component is located, repaired, or replaced an RTS occurs on the unit or PM.

If a system audit detects a defective component, an audit attempts to return the component to service.

Performing an RTS without running diagnostics

When the system uses the FORCE parameter with the RTS command, read only memory (ROM) diagnostics are not performed.

CAUTION
Use the FORCE parameter if directed to
Operating company personnel must not use the FORCE parameter unless directed to use this parameter.

Diagnostics that are normally part of the RTS command can find an additional fault.

For example, to return unit 0 of a PM to service, enter the command:

```
>RTS UNIT 0 FORCE
```

Switch of activity

A SWACT occurs when the two units of an XPM exchange activity state. The units exchange activity state to allow the unit that handles call processing to become the inactive unit. The inactive unit becomes the active unit and takes over call processing. The system maintains all processing of active calls during a warm SWACT.

The SWACTs can be controlled or uncontrolled. The system implements controlled SWACTs because any of the following occurred:

- manual action, like inputting the SWACT command
- planned system requests, like the REX test schedules
- the active unit is busied while the inactive unit is InSV

If both units are INSV, a controlled SWACT can occur. If the RSC-M is ISTb because of a previous REX test failure, a controlled SWACT can occur.

The system implements uncontrolled SWACTs when a hardware fault or a trap is in the active unit. The PM181 log messages inform operating company personnel of the reason the active unit dropped activity.

In a controlled SWACT, the following message interchange occurs:

- The CC messages the active unit of the RSC-M to start an audit of the inactive unit.
- The active unit messages the inactive unit to start a pre-SWACT audit.
- The inactive unit messages the pre-SWACT audit back to the active unit. The system initiates a warm SWACT based on the audit results.
- The original active unit remains INSV and clears data that is not normal.
- The new active unit sends five gain messages to the CC.
- The CC sends five gain-acknowledge messages to the RSC-M.
- The RSC-M sends three gain-acknowledge received messages to the CC.
- The CC informs the original active unit to drop activity.
- The original active unit sends the CC a drop message, and the CC prepares to receive this message.

If a controlled warm SWACT fails, the following message interchange occurs:

- The CC messages the active unit of the RSC-M to start an audit of the inactive unit.
- The system implements the pre-SWACT audit.
- A system initiates a warm SWACT based on the audit results.
- The original active unit remains INSV and clears data that is not normal.
- The new active unit does not send messages to the CC.
- The original wait time of the unit of 5 s expires and a SWACT-back occurs.
- The original active unit sends a SWACT-failed message to the CC.
- The CC SysB and RTS the inactive RSC-M unit.
- If the CC does not receive any messages, the CC forces a SWACT, SysB, and RTS for both units of the RSC-M.

In an uncontrolled SWACT, the RSC-M initiates the pre-SWACT audit. The sequence of messages are as follows:

- The active RSC-M unit messages the inactive RSC-M unit to start a pre-SWACT audit.
- The system implements the pre-SWACT audit.
- The system initiates a warm SWACT based on the audit results.
- The new active unit messages the CC that a gain that was not requested occurred.
- The original active unit remains INSV and clears data that is not normal.
- The new active unit sends five gain messages to the CC.
- The CC sends five gain-acknowledged messages to the RSC-M.
- The RSC-M sends three acknowledge-received messages to the CC.
- The CC informs the originally active unit to drop activity.
- If the CC does not receive messages, the CC forces a SWACT, SysB, and RTS for both RSC-M units.

The SWACT is complete when the CC receives a gain message from the newly active unit. The CC acknowledges the gain to the originally active unit. This condition applies to both the controlled and uncontrolled SWACTs. When a SWACT occurs, the CC and the RSC-M exchange a series of drop and gain

messages that clarify any activity. The following table explains common phrases found in these messages.

Table 2-17 Message phrases that describe CC to RSC-M SWACT communication

Message phrase	Explanation
Original active unit	Active unit before the SWACT (unit 0)
Original inactive unit	Inactive unit before the SWACT (unit 1)
Newly active unit	Active unit after the SWACT (unit 1)
Newly inactive unit	Inactive unit after the SWACT (unit 0)
Gain message	The message that the newly active unit (unit 1) sends to the CC. This message informs the CC that the unit gained activity.
Gain acknowledge message	The message the CC sends to the original active unit to confirm the newly active unit sends messages
Gain acknowledge received	The message the originally active unit sends to CC to confirm the newly active unit passed the post-SWACT audit
Drop message	The message the originally active unit (unit 0) sends to the CC. This message informs the CC that the unit dropped activity.

The figure on the next page shows the sequence for a controlled and uncontrolled SWACT and the SWACT-back operation of feature AN0538. The following section provides information about this feature.

Figure 2-11 SWACT sequence

```
┌─────────────────────────────────────────────────────────────────────────┐
│                                                                           │
│   ┌──────────────────────────┐        ┌──────────────────────────┐        │
│   │ 1.  Manual command or REX│        │ 1.  RSC-M starts SWACT   │        │
│   │     schedule CC starts   │        │     because of trap or   │        │
│   │     warm SWACT           │        │     error                │        │
│   └────────────┬─────────────┘        └────────────┬─────────────┘        │
│                │                                    │                      │
│                ▼                                    ▼                      │
│   ┌──────────────────────────────────────────────────────────┐           │
│   │ 2.  System implements pre-SWACT audit                     │           │
│   │          Pass                         Fail                 │           │
│   └──────────────────────────────────────────────────────────┘           │
│                │                                    │                      │
│                ▼                                    ▼                      │
│   ┌──────────────────────────┐        ┌──────────────────────────┐        │
│   │ 3.  SWACT informs inactive│◄───────│ 3.  If manual, respond to│       │
│   │     unit to gain activity │       │     message to continue  │        │
│   │                          │        │     >SWACT FORCE         │        │
│   └────────────┬─────────────┘        └────────────┬─────────────┘        │
│                │                                    │                      │
│                ▼                                    ▼                      │
│   ┌──────────────────────────┐        ┌──────────────────────────┐        │
│   │ 4.  Newly active unit    │        │ PM181                    │        │
│   │     sends gain messages  │        │ Pre-SWACT audit failure  │        │
│   │     to CC                │        │ REX failed Warm SWACT    │        │
│   │                          │        │ RSC-M is ISTb            │        │
│   └────────────┬─────────────┘        └──────────────────────────┘        │
│                │                                                           │
│                ▼                                                           │
│   ┌──────────────────────────┐                                            │
│   │ 5.  CC sends gain ACK    │                                            │
│   │     to RSC-M             │                                            │
│   └────────────┬─────────────┘                                            │
│                │          >15 s for retries                               │
│                │                                                          │
│                ▼                                    ▼                      │
│   ┌──────────────────────────┐        ┌──────────────────────────┐        │
│   │ 6.  RSC-M sends ACK      │        │ SWACT back to original   │        │
│   │     received to CC       │        │ unit SysB and RTS the    │        │
│   │                          │        │ inactive unit            │        │
│   └────────────┬─────────────┘        └────────────┬─────────────┘        │
│                │                                    │                      │
│                ▼                                    ▼                      │
│   ┌──────────────────────────┐        ┌──────────────────────────┐        │
│   │ 7.  Originally active    │        │ PM189                    │        │
│   │     unit is SysB and RTS │        │ Exhaust Retry            │        │
│   │                          │        │ PM181                    │        │
│   └────────────┬─────────────┘        │ Post-SWACT audit failed  │        │
│                │                       │ failed Warm SWACT        │        │
│                ▼                       └──────────────────────────┘        │
│   ┌──────────────────────────┐                                            │
│   │ 8.  SWACT is complete    │                                            │
│   │                          │                                            │
│   └──────────────────────────┘                                            │
│                                                                           │
└───────────────────────────────────────────────────────────────────────────┘
```

Pre- and post-SWACT audits

Feature AN0538, RSC-M Pre-SWACT/Post-SWACT Audit improves the
warm SWACT operation. This feature denies the SWACT if the inactive unit
cannot maintain activity or communication with the CC to improve the feature.
Under these conditions, feature AN0538 provides the capability to

SWACT-back to the originally active unit. The software that drives this feature is the SWACT controller in the CC. An autonomous capability added to the RSC-M software also drives this feature

SWACT controller
All manual requests and selected system requests for warm SWACTs are routed to the SWACT controller in the CC. The SWACT controller polls PM diagnostic history data. This data is in the CC and RSC-M state data. Diagnostic history data is not static data. The SWACT controller denies the request for a warm SWACT or allows a warm SWACT to proceed. This condition is based on the data polled. During the SWACT, the newly inactive unit remains in service. This unit initiates a process to clean data structures left in states that are not normal.

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

The SWACT controller can deny a manual request for a warm SWACT. If the controller denies the request, the system informs the user on the MAP terminal that the SWACT denied the request. The system provides a detailed reason for the denial. The system informs the user that the user can supersede the SWACT controller. To supersede the SWACT controller, enter the SWACT FORCE command. If the user overrides the SWACT controller, the system attempts a warm SWACT without consulting diagnostic history or state.

Post-SWACT audit
After a SWACT occurs, two-way communication can be available with the CC and the newly active unit can maintain activity. If these conditions occur, the inactive unit is system-busied and returned to service. The unit that was active earlier remains in service. This unit remains in service until the newly active unit can verify two-way communication with the CC. This unit also remains in service until the unit can maintain activity. The RSC-M can execute a SWACT-back to the originally active unit. The SWACT-back occurs if communication fails, or the newly active unit cannot maintain activity.

SWACT-back
If an RSC-M does not receive a gain-acknowledged message from the CC, the originally active RSC-M unit initiates a SWACT-back. During a SWACT-back, the originally active RSC-M unit attempts to regain activity. If successful, the inactive unit is set SysB and returned to service. The active unit remains in service. Normal calls from the originally active unit are preserved on the SWACT-back. The system drops all new calls made before and after

the SWACT-back. If a SWACT-back is not successful, both RSC-M units are set SysB and returned to service.

> *Note 1:* Operational measurements (OM) and peg counts are not reinitialized after a SWACT-back.

> *Note 2:* This feature is not supported during RSC-M or CC overload.

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

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

    where

    unit_no
    is the number of the active unit

- BSY ACTIVE

    > *Note:* The SWACT-back is provided for a REX test that the REX scheduler initiates. For additional information on how this feature interacts with REX testing, refer to "Routine exercise test".

Manual switch of activity
To perform manual SWACT, enter the SWACT command at the MAP terminal. The following message appears at the MAP display.

```
A warm SWACT is performed
after data sync of active terminals are attempted.
The inactive unit may not be capable of gaining activity
(please check logs).  Do you wish to continue regardless?
Please confirm (YES or NO)
```

The default cannot proceed because the newly inactive unit can take over call processing again.

Uncontrolled switch of activity

An uncontrolled SWACT can occur when the following events occur: Each of these states results in a different SWACT plan.

- both units are INSV

- the active unit is INSV and the inactive unit is ISTb

- the active unit is INSV and the inactive unit is SysB

The state of the units and the reason for the activity drop determine the sequence of events during an uncontrolled SWACT.

If a hardware fault occurs, the system produces a PM181 log. This log can contain messages that indicate the following:

- activity timeout

- CC links are not present

  Message links to the CC or host XPM are broken. Messaging cannot occur as a result.

- duplicate fault

  A critical hardware fault occurred.

- jammed

  The unit jams. This message means that the unit cannot change states (active/inactive).

- ready for ESA

  This message is for the RSC-M. In this event, a loss of all CC messaging occurs. If the original inactive unit does not send a drop message in a time period, the RSC-M enters ESA.

- static data faults

- The original active unit sends a drop message to the CC.

- The new active unit must send a gain message.

As with controlled SWACTs, the XPM continues to resend the gain message to a maximum of 15 s.

An uncontrolled SWACT can occur if the original active unit is INSV and the original inactive unit is ISTb. The critical factor in this example is the condition that causes the inactive unit to be ISTb. If data synchronization causes the ISTb, the example is the same for active and inactive units that are INSV. If data sync causes the ISTb, the original active unit drops sync and the XPM reinitializes. In this event, the system drops all calls.

If the original active unit is INSV less than 3 min, the unit returns to service without OOS diagnostics. The reason is that a previous SWACT occurred. If the SWACT occurred in less than 3 min, the active unit must have had OOS diagnostics run. If the original unit is active more than 3 min, the active unit returns to service with OOS diagnostics.

The active unit attempts to regain activity. This condition occurs for all types of RTSs. If the active unit cannot regain activity, both units are set SysB and all the XPM are set SysB.

```
ROM/RAM query
/Clear data
Initializing
/Static Data
Loading:Execs
Initializing
```

Fault conditions

The next section describes automatic maintenance that detects fault conditions. The section describes fault conditions for the RSC-M according to the configurations.

RSC-M

Fault conditions for the RSC-M include errors that are specified and errors that not specified to processor cards.

The following errors can occur in the RSC-M processor cards:

- parity faults
- traps
- software errors

Parity faults

A parity fault indicates a memory accuracy fault. If the executing code encounters a fault, the CPM is insane, and must drop activity immediately and go out-of-service. The parity error can initiate an interrupt instead of a bus error. When this event occurs, the parity audit identifies memory faults before code execution hits these faults. The CC handles parity faults when possible in order for an RTS to occur quickly.

The following are the three types of parity faults:

- Intermittent occurs when the RSC-M detects a fault, but does not find an error when the RSC-M reads the location again.
- Soft occurs when the RSC-M detects a parity error and finds an error when the RSC-M reads the location again. An error is not found when the

RSC-M writes to the location. The error can occur in the program store or memory store.

- Hard occurs when the RSC-M detects a fault and cannot reread or write to the memory location.

When a parity fault occurs, the CM determines the action to perform on the RSC-M unit. This action depends on the state of the unit that reports the fault. The state of the unit can be active or inactive. The CM handles the three types of faults.

When the CM detects a parity fault in the active unit of the RSC-M, the CM sets the unit ISTb. The reason that the CM sets the unit to ISTb is parity. The CM recovers the unit during a maintenance window. The maintenance window to recover a parity fault on the active unit is the XPM REX test window. The time for the XPM REX test window can be the same as the current time of the switch. If the time is the same, an audit determines if the active unit of the XPM has an ISTb of parity. If an ISTb is present, the CM SWACTs and reloads the RSC-M if dependencies are not present. This action clears the ISTb parity fault and the short term failure (STF) parity fault peg. This action resolves the parity fault in the RSC-M.

When the active unit reports the parity fault, the system generates a PM181 log. The system generates this log to notify operating company personnel of the problem. The CM performs the following recovery actions:

- a SWACT of the XPM

- loading the new inactive unit with the XPM software load that the inventory table that corresponds defines.

The CM considers the loading action an autoload. A manual, CM or mate reload of the XPM software to the affected unit clears the ISTb.

The CM does not permit an REX test to occur on the following:

- a P-side or C-side node of the XPM that the system recovers from a parity fault

- the XPM if the system recovers a P-side or C-side node from a parity fault

The CM does not allow two XPMs to perform a parity reload that are in the same configuration. This condition means a P-side node cannot perform a parity reload at the same time as the C-side node. A C-side parity reload cannot occur at the same time as the P-side node. This limit makes sure that only one XPM in a configuration is in simplex at a time.

The CM informs operating company personnel of a parity fault through PM181 log reports. This log is the primary trouble indicator. Operating

company personnel can check for associated logs, like the PM128, to understand what actions the CM takes. This section provides examples of the messages that associate with the PM181 and PM128 logs.

The RSC-M unit can be set ISTB with multiple reasons together. When a QUERYPM FLT occurs at the MAP level, all of the ISTb reasons appear. These reasons occurred on the unit and were not cleared.

Hard parity fault   When the active unit of the RSC-M reports a hard parity fault to the CM, the system generates a PM181 log. This log notifies operating company personnel:

- a parity fault occurred on the active unit and the unit was set ISTb

- the CM reloads the unit during the next XPM REX test window

To clear the ISTb and the parity fault, the user can perform a manual SWACT and reload.

An example of a PM181 log report follows:

```
PM181 JUL23 23:29:16 7700 INFO RSC-M 0 Unit 0
Node: Istb, Unit0 Inact: ISTb, Unit1 Act: ISTb
Parity audit has detected a hard parity fault.
The system will autoload the unit during the next
XPM REX test window.
Monitor the system for maintenance and recovery.
Site Flr  RPos  Bay_id  Shf Description Slot  EqPEC
RAL1 00   C05   RSCM 00  18  RSC-M : 000   3    MX77
```

When a unit changes state to ISTb of UP RAM parity fault, the system generates a PM128 log report. This log informs operating company personnel the unit changed state.

An example of a PM128 log follows:

```
*PM128 MAY09 09:49:56 9000 TBL ISTB SMA2 1
 Node: ISTb (Unit ISTb)
 Unit0 Inact: InSv
 Unit1   Act: ISTb (UP RAM Parity)
```

The system uses a command string QUERYPM FLT to display the faults on a posted RSC-M. The following example MAP response shows a hard parity fault is present in unit 1 of the posted XPM:

```
>querypm flt
Node is ISTb
    One or both Units inservice trouble
Unit 0
    no fault exists
Unit 1
    The following inservice troubles exists:
        Parity audit has detected a hard parity fault.
        A reload is required to clear this fault.
        The system will autoload this unit during the next
        XPM REX test window.
```

CM Action: The CM SWACTs and reloads the RSC-M during the next XPM REX test window. After the reload, the RSC-M is cleared of this ISTb fault.

User action: Operating company personnel do not need to take action. The user can initiate a manual SWACT and reload to clear the parity fault.

Parity fault handler improvements

The Parity Improvements feature provides the CPM the ability to collect and report additional information on parity trap faults. Faults that parity audits detect are improved to provide more information. This new information includes the specified address of the fault and if the fault is in code or not in code. This feature updates interfaces to the log (PM189), and trap (PM185) reporting to include this new information. The Parity Improvements feature depends on features AF5682 XPM Code Protection, and AF5680 XPM Exception Traceback Enhancements.

Feature AN0741 provides the following parity fault handling improvements:

- unify the parity audit and parity trap handlers
- improve the data captured and saved by the new handler to
    — use the information stored in the card state register (SR)
    — localize the parity fault to a specified byte address
    — perform hard/soft/intermittent fault categorization
    — query to determine if the fault is in code
- update interfaces to the PM189 and PM185 log reporting systems, to include the new information

Parity interrupt handler
The interrupt handler generates data on a memory fault. The interrupt handler stores the data in the appropriate area for reporting and action. The requirements for this function follow:

- Define a single entry point that can be bound as an interrupt handler.

- Be continuously available and correctly handle interrupts that start from the time that the interrupt handle is bound.

- Be able to distinguish between the two conditions when an interrupt can be raised. The interrupt can be raised if entered from parity audit or not entered from parity audit.

- Localize the fault to a specified byte address.

- Perform low-level categorization of the fault (hard/soft/intermittent) regardless of the interrupt source.

- Determine if the fault address is in code space or is not in code space.

- Leave the fault indication in place if the fault is not corrected.

- Save the fault data according to where the interrupt originated.

- Exit the handler according to where the interrupt originated.

XPM code protection
The parity audit process examines protected and non-protected memory areas. This feature allows writing to a write-protected memory area. This condition allows for pattern testing a parity fault byte in protected space. This condition also allows querying if a physical address lies in loaded code.

The parity exception handler determines if the parity fault occurred in execution space. The parity exception handler can initiate a quick recovery process because of this action.

The parity audit process examines protected and non-protected memory areas. The XPM code protection allows writing to a write-protected memory area. This condition allows for pattern testing a parity fault location byte. This condition also allows querying if a given physical address lies in loaded code. The parity exception handler determines if the parity fault occurred in execution space. The parity exception handler can initiate a quick recovery process because of this action.

Memory allocation
The memory allocation feature provides additional flexibility in memory use to address memory management issues. This flexibility protects codes and critical data from damage that errant software causes. The flexibility also reduces the risk of outages.

Protected memory is allocated for protectable patches when memory is not available. If protected memory allocation fails, non-protected memory can be used to store the patch. When possible, local patches must be stored in non-dynamic memory access (DMA). Additional non-DMA is allocated in the UP.

System component interactions

System components interact with the exception processing system to recover from error exceptions. The components also interact to report and display information about error exceptions. The system components that interact are as follows:

- CC
- PMDEBUG
- local maintenance (XPM maintenance)

If the system detects a fatal error, the user initiates local maintenance action. This action occurs to drop activity for the active unit only, and to set, or start the unit again. When the XPM unit is INSV, the unit reports exception errors to the CC. Exception errors are in the form of messages that are not requested. The XPM unit then generates a report for each exception in the trap buffer that the unit did not report. The CC receives the report and acknowledges the message. The CC logs in PMDEBUG separately to extract the exception information to generate a PM185 log report. The PMDEBUG provides the ability to view and delete exceptions data from the trap buffer at the task level.

Exception traceback improvements

An exception is a special condition at the ROM or TASK level that preempts normal processing. Both internal and external conditions can cause exceptions. The TASK-level exception-processing reports critical information on hardware and software states. The TASK-level reports critical information if a hardware or software fault prevents normal operation of the CPM unit. The process restores the task to a recognized point of execution and allows the task to perform recovery actions. If recovery is not possible, the TASK-level exception processing initiates local maintenance to start or set the CPM unit again.

Exception recovery action

Exception recovery consists of three different operations:

- severity (fatal or can recover)
- process fatal trap
- recover task (nonfatal trap)

When the recovery process is complete, the exception reporting system is notified that new trap data is available. Exception handling is complete. At

this stage, the recovery process sets up the trapped task for recovery. The recovery process allows the trapped task for recovery to resume. Or, the recovery process initiates a maintenance action to start or set the unit again.

If the trap is not fatal, the process restores convicted task to a point of execution. This point of execution allows the task to restore to a known state. The process of recovery does not consist of starting the task again. This process forces the task to perform a multi-level exit back to the task mainline. The task recovery model specifies a task to provide a mainline. The mainline is a do-forever loop that only calls the main body of the steady state code. An optional call to a recovery procedure follows the call to the main body of the steady state code. The task resumes after a recoverable trap. The process forces the task to return to the next instruction that follows the call to the main body of code. The next instruction must be a call to a recovery procedure that the task uses. The task uses this recovery procedure to realize the task takes a fault. The procedure allows the task to take special recovery action, or branch back to the start of the loop.

An improvement to exception recovery deals with the Direct Memory Access Memory Management Unit (NTMX77 DMA MMU). The system must take special action when the system attempts to recover from an NTMX77 DMA MMU error. Before this feature, when a DMA MMU error occurred, the exception processing system convicted the task that was interrupted. The software on the NTMX77 does not apply to the error but the system is able to convict the task. The convicted task determines if the error was fatal. An MMU error is not always fatal. The results of the fatal evaluation depend on the trapped task.

The processor that caused the fault does not know a problem occurred. If the access is for a read from the NTMX77 memory, the external processor receives invalid data. If the access is to write to NTMX77 memory, data is not written. The trap is considered fatal and maintenance action initiates to start or set the unit again.

Traps (XPM exception handling)
Feature AF5680, XPM Processing System Improvements, provides improvements in exception handling and in exception services. Exception handling includes the following activities:

- trap detection
- trap data capture
- recovery action

Exception services includes the following activities:

- trap administration

- trap reporting

- trap data access and display

Exceptions
An exception is a special condition at the ROM or TASK level that preempts normal processing. Both internal and external conditions can cause exceptions.

Internal conditions that cause an exception are:

- not permitted instructions

- address errors

- tracing

- breakpoints

- coprocessor protocol violations

The following are external conditions that cause an exception:

- interrupts from external devices

- bus errors

- coprocessor-detected errors

- resets

ROM-level exception processing
On initialization, the firmware maps all vectors to local exception handlers to provide:

- the least possible error recording and reporting

- establishment of a bootstrap environment

- debugging of utilities

- hardware abstraction

TASK-level exception processing
The TASK-level exception-processing reports critical information on hardware and software states. The TASK-level reports critical information if a hardware or software fault prevents normal operation of the XPM unit. The process restores the task to a known point of execution and allows the task to perform recovery actions. If recovery is not possible, the TASK-level exception processing initiates local maintenance to start or set the XPM unit again.

Exception data structure improvements
Modifications are made to the processing system data structure to support:

- a task to eliminate loss of trap data when multiple traps occur in a 10 s period

- accurate capture of trap-specific data

- guaranteed survival of trap data over restarts and reloads

- capture of both supervisor and user stacks at exception time

- circular buffer management at exception time

- enhanced trap administration functions

- expanded trap-specific error information to accommodate parity fault requirements

- exception-processing system that reports parity faults to the parity audit instead of the CC

- save the trap system version for each trap

XPM exception use
In the XPM, exceptions indicate error conditions for faults that require service. Exceptions also indicate normal non-error interrupts that indicate types of work that the CPU must perform.

Examples of exceptions that are normal events follow:

- 10 ms clock tick

- message frame pulse

- UART transmit and receive

- trap instructions (software interrupt)

- activity gain

- reset

Exceptions that are error conditions and that require service appear in the following table.

Table 2-18 XPM error type and description (Sheet 1 of 2)

Type	Fatal	Description
1	No	Value range error
2	No	Segment not present
3	No	Exit from uncalled procedure

Table 2-18 XPM error type and description (Sheet 2 of 2)

Type	Fatal	Description
4	No	Stack overflow
5	No	Floating point
6	No	Division by zero
7	No	Nil pointer reference
8	No	<Not Used>
9	No	<Not Used>
10	No	I/O Error - Result of system procedure IOCHECK
11	No	String
12	No	String indexing
13	No	Set error
14	No	Bad CSP (unimplemented standard procedure)
15	Yes	Bad P-code instruction
16	No	Task error
17	Yes	Request for reset - Trap 7
18	No	<Not Used>
19	Yes	Parity error
20	No	Addressing error
21	No	Illegal instruction
22	Yes	Spurious interrupt
23	No	Bus error
24	No	MMU-error
25	No	<Not Used>
26	No	Privilege violation
27	Yes	Sanity time-out

System component interactions

System components interact with the XPM exception processing system to recover from error exceptions. The components also interact to report and display information about error exceptions. The system components that interact are as follows:

*   CC

*   PMDEBUG

*   local maintenance (XPM maintenance)

If the system detects a fatal error, the user initiates local maintenance action. This action occurs to drop activity for the active unit only, and to set, or start the unit again. When the XPM unit is INSV, the unit reports exception errors to the CC. Exception errors are in the form of messages that are not requested. The XPM unit then generates a report for each exception in the trap buffer that the unit did not report. The CC receives the report and acknowledges the message. The CC logs in PMDEBUG separately to extract the exception information, and generates a PM185 log report. The PMDEBUG provides the ability to view and delete exceptions data from the trap buffer at the task level. Changes are made in the display routines to reflect data capture differences for required improvements accurately. An example of the PMDEBUG debug TRAPINFO level display appears in the next figure. At the ROM level, exception data can appear only as a hex dump.

Figure 2-12 Example exception display with required increases

```
Ram Load name = NLT02WY
MP rom name= XPMRKA03, SP rom name = XPMRKA03
trap in MP : Div by 0
Trap was Recoverable.  Unit was Active/Busy
Task:  BASEMON 0009 0009 Trap Sequence #: 1 Current load
PP Time : 00:00:22:04.70
Occurred at : 001951DF DEBUG   21 DOZERODI 115 Offset:  #21
Called from : 000D8A80 BASEMON 18 TDRIVBOD  30 Offset: #228
  000D8B8C BASEMON 18 TERMDRIV 11 Offset: #18
PC:000010AA SR=2100 US=0001FEB2 SS=001ABFF6 TCB=0001F00C
D0 =0000FFFF  D1 =00090000  D2 =FFFF0101  D3 =0000FF00
D4 =000100FF  D5 =FFFF0009  D6 =00000B0D  D7 =001A0000
A0 =0001F924  A1 =0001F92C  A2 =0001FEB2  A3 =001951DF
A4 =000A6F6E  A5 =0001FEC2  A6 =000F9BC2  A7 =001ABFF6
System Stack
0017ABFF6:  0004 0000 0006 0001 F00c 000A 000A 0998
0017AC006:  0004 0000 0006 0001 F00c 000A 000A 0998
User Stack:
0001FEB2:  0004 0000 0006 0001 F00c 000A 000A 0998
0001FEC2:  0004 0000 0006 0001 F00c 000A 000A 0998
0001FED2:  0004 0000 0006 0001 F00c 000A 000A 0998
```

Errors not specified to processor cards

The types of errors not specified to processor cards of the RSC-M are as follows:

- static data mismatch faults

- intermodule communication faults

Static data is data that defines the RSC-M configuration and does not change when calls are connected and disconnected. When the static data in the host and the RSC-M do not match, data corruption can occur. As a result of the mismatch, the host can think that a line is present. The line is not present for the RSC-M. This condition results in a loss of calls.

When two RSC-M units cannot communicate with each other because of intermodule communication (IMC) faults, a Warm SWACT is not possible. A Warm SWACT is not possible because one unit does not know what the other unit is processing.

Automatic maintenance

This section shows how audits and system actions identify the fault conditions. The system prepares to adjust the fault, or the system can produce a log that identifies the problem.

This section first describes the REX and SWACT process. This section then describes the audits and system actions that identify fault conditions in terms of RSC-M components.

Routine exercise test

A REX test includes a series of tests performed on an XPM unit. The system scheduler initiates these tests daily. Operating company personnel manually initiate these tests. The REX test combines the diagnostic and operating routines available on XPMs. Results of the REX test consist of four classes:

- not performed

- passed

- failed

- aborted by manual action

> *Note:* Maintenance action with the FORCE parameter or with the ABTK command, from another MAP terminal with the XPM posted causes an abort.

All four classes generate a log or display a message at the MAP terminal. Only REX tests that pass or fail are stored in the maintenance record. Failure reasons are available only for REX tests that fail.

The sequence of events that the REX test state machine or controller performs are as follows:

1. Test the inactive unit (includes INSV tests only).

2. SysB the inactive unit.

3. RTS the inactive unit. This action includes out-of-service (OOS) tests only.

4. Wait for superframe and data synchronization to occur.

5. Perform a pre-SWACT audit.

6. Perform a warm SWACT.

7. Maintain call processing capability on previously active unit.

8. Perform a post-SWACT audit.

9. SWACT back to the previous active unit if necessary.

10. SysB the new inactive unit.

11. RTS the inactive unit.

12. Wait for superframe and data synchronization to occur.

13. Run INSV diagnostics (TST) on the newly active unit.

14. Run INSV diagnostics (TST) on the inactive unit.

The following figure shows REX state machine (controller) actions.

Figure 2-13 REX state machine actions

Note 1: Pre-SWACT audit failed*.*
Note 2: SWACT failed.
Note 3: Post-SWACT audit failed.

‑ ► Indicates process failed
── ► Indicates process passed
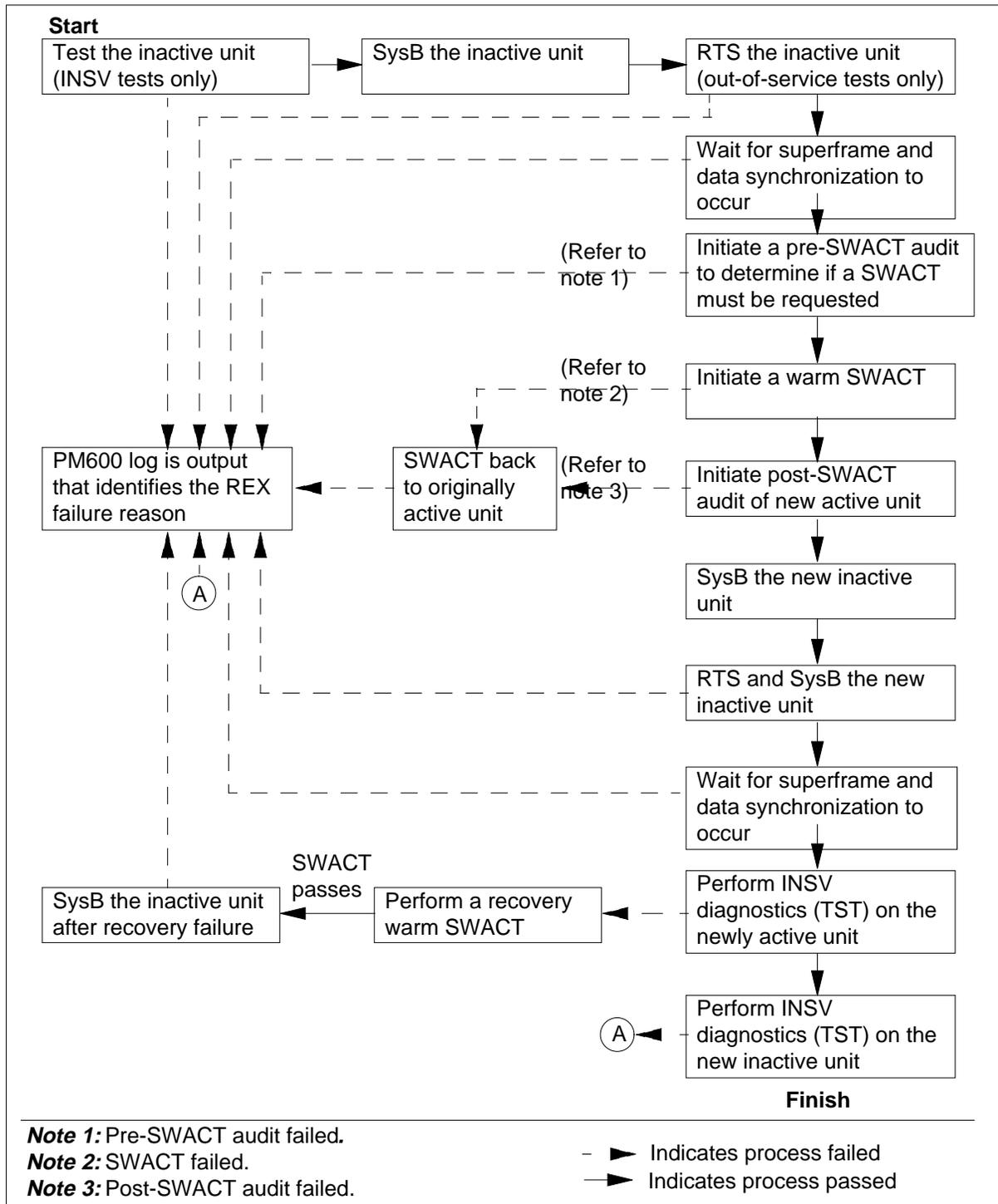
For the REX sequence to occur at any time, both units must be INSV. The REX test does not run when the following conditions occur:

- one unit is SysB and the PM is ISTb
- both units are SysB and the PM is SysB
- the PM is in overload
- the PM is ISTb

> *Note:* If the PM is ISTb because of a previous REX test, the REX test runs again.

When the system aborts the REX test because of a TST REX NOW command, the system returns a message. This message informs operating company personnel why the system terminated the REX test. If the system does not return a message, the system generates a PM181 log with the same type of message.

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

If an INSV or OOS diagnostic test fails, the REX failure reason includes the mnemonic. The mnemonic is an abbreviation of the diagnostic and the unit (O or 1) that failed.

The PM600 log details the following:

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

The REX steps included in the log after the failed step are recovery actions. The REX initiates the recovery actions as a result of the failure. The log includes the unit number if the REX action is unit-specific (BSY unit, RTS unit, TST unit, synchronized). The log does not include an action that affects the node (SWACT, BSY both units). The auxiliary log data consists of a card list and a mnemonic of the failed diagnostic.

The QUERYPM and QUERYPM FLT command strings contain information about the last REX. Both manually and system-initiated REXs store and display a new date/time and state (passed/failed) in the REX maintenance record. Passed means the REX completed without errors. Failed means the REX did not complete because of an error. This information is available through the QUERY PM and TST REX QUERY command strings. If the REX

fails, the user performs a manual RTS. The user also performs a manual REX, or an automated REX, to return the XPM to service from ISTb.

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

- REX scheduler, if the XPM is in the system

- date and time and result (passed/failed) of the last REX

- failure reason, diagnostics failures, and a list of defective cards, if the last REX failed

- date and time of previous failed REX

- date and time of first passed REX that follows previous failure

The following limits apply to REX tests:

- SuperNode supports concurrent REX tests for a maximum of ten XPMs with the same REX test class.

- For REX to run, the node must be either:

    — INSV, ISTb because of a REX failure

    — ISTb because P-side PCM30 links are OOS

- If a Warm SWACT is not possible, REX terminates.

- After successful completion of REX, the XPM has a new active unit because of the SWACT.

- If a restart occurs while REX is in progress, the system does not generate the PM600 log. The system does not generate the log because the restart deallocates the temporary data store used to build the PM600 log.

- The system provides No SWACT controller override for manual REX.

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

The REX test state machine or controller:

- calls the pre-SWACT audit, messages the other unit, and the warm SWACT occurs if the audit passes

- accounts for SWACT denial and failure reasons

- terminates a REX test if a SWACT denial occurs

- terminates a REX test if a SWACT back occurs. The active unit of the XPM does not change from the time the REX test began. A REX test

performs recovery and consists of a busy (BSY) and an RTS of the inactive unit.

- displays the failure reason for a SWACT denial or failure. The denial or failure occurs during a manual REX test at the MAP terminal as REX failed. Use the TST REX QUERY or TST REXCOV QUERY command for the posted XPM, to obtain s detailed reason for the failure. In addition, the system generates a PM600 log report that details the REX test failure reason.

System REX Controller for XPM Maintenance

The System REX Controller for XPM Maintenance feature provides the SuperNode switch with an S/DMS System REX test (SREX) controller. The SREX coordinates all the system REX tests under a common REX scheduler. This feature permits RSC-M REX tests to be scheduled while other REX tests are in progress. The SREX controller allows a REX to occur for the whole switch in less time. All peripherals, like the RSC-M, are also included. This condition permits REX test failures to be found and resolved quickly. This condition reduces outages in the field.

The SREX controller allows operating company personnel to perform the following actions:

- change the order that the system tests peripherals

- coordinate manually-initiated and system-initiated REX tests

- receive alarms for the RSC-M not being REXed in a time limit, using table REXSCHED

The SREX scheduler permits the user to enter the CI-level command REXTEST and the following parameters:

- SUSPEND, which suspends REX tests for one maintenance window. A maintenance window is the period between the REX START and STOP times. This period is entered in table office variable (OFCVAR) under the NODEREXCONTROL parameter.

- RESUME, which resumes REX tests after this command suspends REX tests

- QUERY, which returns the state of the REX test (active or suspended)

- HELP, which returns a short description of the REX test

    Note: The maximum number of concurrent XPM REX tests of each type that can run at the same time is ten.

The REX test order is as follows:

- critical nodes like CM and MS

- the number of days since the last system or manual REX test

- the order of internal PM number

Table REXSCHED must be entered to establish the REX schedule for the RSC-M. This table contains the information that the the REX coordinator requires to schedule the tests according to operating company specifications. In addition, the entry of table REXSCHED can disable the test. For additional information on table REXSCHED, refer to the data schema section of the *Translations Guide*.

The system generates the node evaluation graph log (NAG400) each hour, or in response to the NAG command. The system generates this log to list all nodes not INSV. The REX_INFO field of log NAG400 displays the results of the latest REX test.

Audits of the IM links   An audit runs sanity tests on IM links to make sure the data passed on the links is not lost or damaged. The audit runs on the inactive and active units. If the system detects a fault, the active INSV unit reports the fault to the CC.

When the system detects a fault on the IML link or links, the following occurs:

- the link is closed.

- the RSC-M status changes to ISTb.

- the RSC-M units do not communicate over the links. A Warm SWACT cannot occur.

- the system generates a PM128 log.

at the RSC-M level, the QUERYPM FLT command contains the following message:

```
NOT-CRITICAL HARDWARE FAULT
```

RSC-M testing
Operating company personnel normally issue the TST command to test the RSC-M. The types of test depend on two conditions, the state of the RSC-M and the parameters in the TST command.

The following determines fault conditions for the RSC-M:

- overload indicators (PM128, QUERYPM)

- REX

- audits of the IML links

- parity errors in the RSC-M

Overload resources

The traffic load on the RSC-M can be an amount of call processing greater than the processor cards can handle. As a result, the RSC-M accepts calls at a slower rate until the overload clears. Normally, in processing calls, the RSC-M queues the call requests and assigns the requests priorities in the data store. When the data store fills close to capacity, the RSC-M overload controls slow the rate of load acceptance. The controls halt the call process until store is available.

Overload control in the RSC-M occurs for C-side communication and line scanning.

In slowing or stopping the P-side communication, the RSC-M processor cards decrease the rate that the cards scan for messages on the P-side. By slowing the incoming workload, the demand for data store decreases. When the buffers are full, the system does not accept any work. The results are partial dials or ignored keys on business sets.

Display of overload state
When the RSC-M becomes overloaded, the state display changes to ISTb while both units show INSV.

Overload indicators (PM128, QUERYPM)   When the RSC-M enters overload, the system produces a PM128 log (RSC-M is ISTb). The log contains the following message:

```
PM Overloaded
```

At the PM level of the MAP display, posting the RSC-M and entering the QUERYPM FLT command provides the same message.

When this condition occurs, operating company personnel must immediately begin to collect all important OMs that track the amount and types of traffic. The reason the RSC-M enters overload can relate to a maintenance area, like network faults. In some occurrences, the reasons can relate to a capacity capability of the RSC-M configuration. The OM reports must be forwarded to both maintenance and engineering personnel for analysis.

Escalation to manual maintenance
With the RSC-M, automatic maintenance includes the output of the correct trouble indicators. The information that is normally in this section is in the "Automatic maintenance" section of this maintenance guide.

For additional specified examples of maintenance procedures, refer to the *Trouble locating and clearing* section in this document.

3 RSC-M hardware

Hardware components

The Remote Switching Center Multi-access (RSC-M) peripheral design is like the common peripheral module (CPM) design. A CPM consists of duplicated units on a single-shelf. This single shelf contains redundant units 0 and 1. The CPM units 0 and 1 run in an active and standby mode of operation.

The following table lists the common peripheral module type hardware component items delivered and needed to configure a CPM as an RSC-M cabinet.

Table 3-1 Major hardware components

Hardware	PEC
Modular supervisory panel (MSP) for cabinetized common peripheral modules	NTRX40
RCO2 main shelf	NTMX85
RCO2 extension shelf	NTMX86
Cooling unit	NTRX91

CPM packaging

The CPM hardware component packaging is provisioned in cabinets. These cabinets can house different hardware units. The configuration of cabinets and the cabinet components determine the services a CPM can offer.

Northern Telecom (Nortel) offers CPMs in single-cabinet and multiple cabinet configurations.

CPM cabinet

The CPM-based host peripheral provides some advantages over different systems. These systems include external multi-processor system (XPM) based

peripheral modules (XPM), line concentrating modules (LCM), and PCM30 line drawers (PLD) selections. The advantages provided are as follows:

- reduced footprint because a single cabinet supports up to 120 peripheral side (P-side) PCM30 links

- enhanced generic platform for future applications

- increased P-side port capacity

The CPM cabinet design includes an enhanced cabinet and MSP. The CPM cabinet design also includes improvements in the cooling unit (CU) and system cabling. These improvements improve integration of remote cabinets with current frame-based equipment.

This design addresses cabinet issues, cooling issues, MSP issues, and cabling issues. Most circuit pack-level rules in provisioning do not change. A top-mounted remote power filter unit vertically powers the cabinet.

Single-cabinetized RSC-M configuration

The single-cabinetized RSC-M configuration provides facilities to support a maximum of 114 PCM30 links with the following functional units:

- The MSP (NTRX40) provides alarm monitor and control functions for C28 cabinets. Each module provides specified functions. Each -48 Vdc distribution can contain a maximum of ten breaker modules. Each module contains two breakers. A maximum of eight fuse modules protects subcircuits. Each fuse module has eight breakers. There can be a total of 13 fuse and breaker modules.

- The enhanced CU (NTRX91) is a 10 in. deep forced air unit that uses 3 Rotron-type tube axial fans. The diameter of the tubes is 6 in. These fans provide a total of 200 cfm at 3 in. of back pressure. These fans dissipate 1600 W evenly.

     Note: The NTRX91 uses the current A0346832 air filter. This filter is an 80% dust arrestance synthetic fiber material filter.

- Can contain up to three RCO2 main shelves. Each shelf can control 22 PCM30 links to appropriate access nodes. Each shelf can have a maximum of 16 PCM30 links to the host peripheral. Links 22 and 23 are not available for CAS.

- one extension shelf divided into two half-shelves. Each half provides an additional 24 PCM30 links.

     Note: Each RCO2 main shelf can support one extension half-shelf.

Provisioning

Options in provisioning for the single or multiple-cabinet configurations include central side (C-side) PCM30 links for communication with the host. Options in provisioning also include P-side PCM30 links for connection to AMC nodes.

The following figures show the major components of the RSC-M.

Figure 3-1 Cabinetized RSC-M

RSC-M

MSP, shelf pos. 61

Provisionable RCO2
EXT shelf, pos. 47

Provisionable RCO2
main shelf, pos. 33

Provisionable RCO2
main shelf, pos. 19

RCO2 main
shelf, pos. 05

cooling
unit, shelf
pos. 00

NTMX90AB

Power Switch
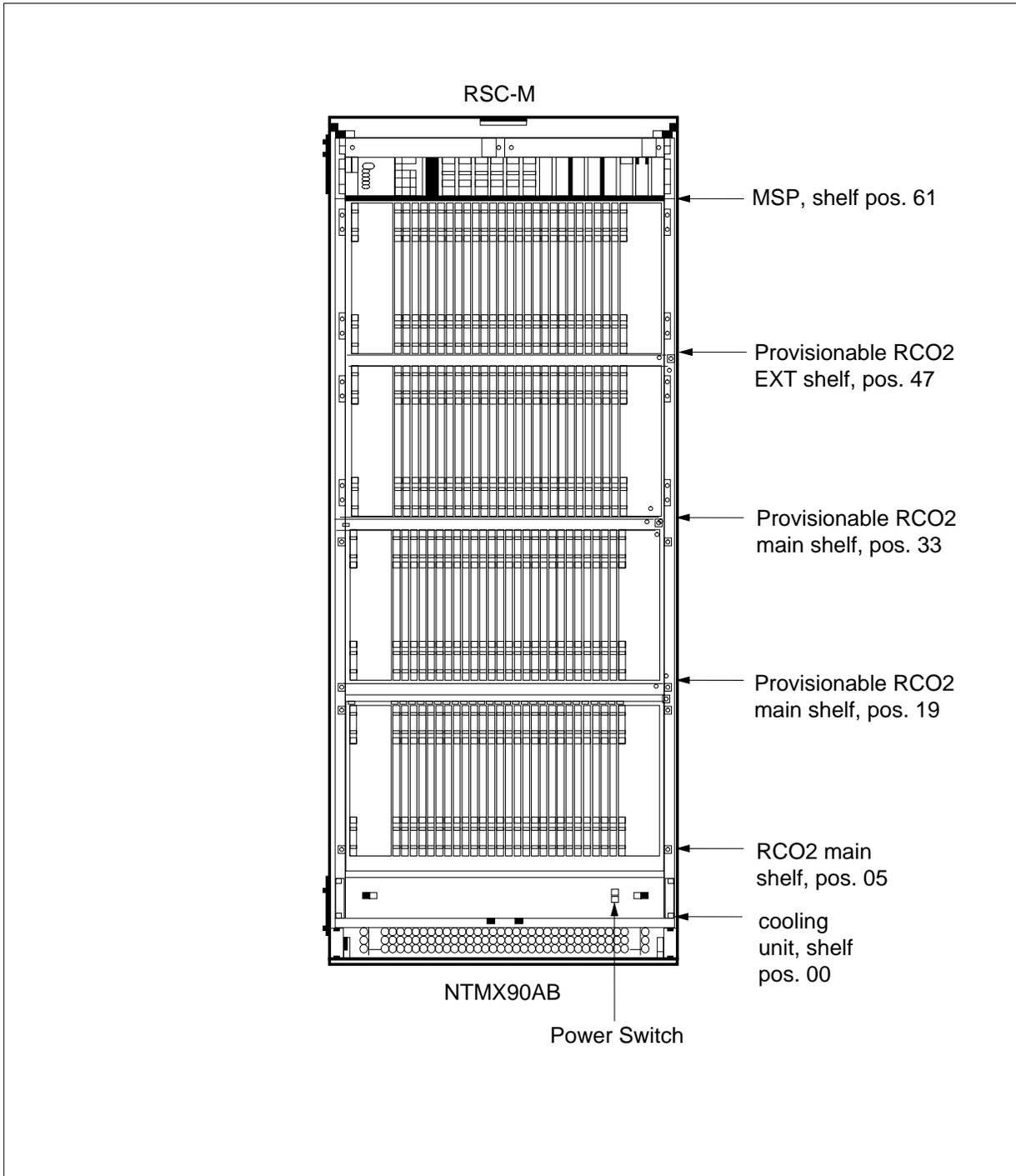
Figure 3-2 RCO2 main shelf configuration (NTMX85AA)

RCO2 main shelf

EMI Shield — C-side links — C-side links — EMI Shield

Unit 0 | Unit 1

Slot	0102	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	2627
Card	NTMX72	NTMX77	NT0X50	NT6X78	NT6X92	NT6X92	NTMX76	NTMX87	NTMX75	NTMX73	NTMX87	NTMX74	NTMX87	NTMX74	NTMX87	NTMX73	NTMX75	NTMX87	NTMX76	NT6X92	NT6X92	NT6X78	NT0X50	NTMX77	NTMX72

Unit 0   P-side links   Unit 1

Note 1: NTMX87 cards contain 4 dual NTMX82 I/F packlets. If more than 22 P-side links are required, use NTMX86 EXT shelf.

Note 2: Provision NTMX83 in all locations when the NTMX82 is not needed.

Note 3: If the NT6X92 Global tone receiver (GTR) or Universal tone receiver (UTR) card are required, provision these cards in slots 6, 7, 21 and 22.

Note 4: Provision the NT6X78 CLASS modem resources (CMR) card in slots 5 and 23.

Note 5: Slots 8 and 20 use an NTMX76 or 6X69.

Note 6: Provision the NTMX74 card in slots 13 and 15.

Figure 3-3 RSC-M EXT shelf configuration (NTMX86AA)

EXTENSION SHELF																									

Left EXT												Right EXT												
Unit 0							Unit 1					Unit 1					Unit 0								
NT0X50	NTMX79	NT0X50	NTMX87	NT0X50	NTMX87	NT0X50	NTMX87	NT0X50				NTMX79	NTMX79	NT0X50			NTMX87	NT0X50	NTMX87	NT0X50	NTMX87	NT0X50	NTMX79	NT0X50
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
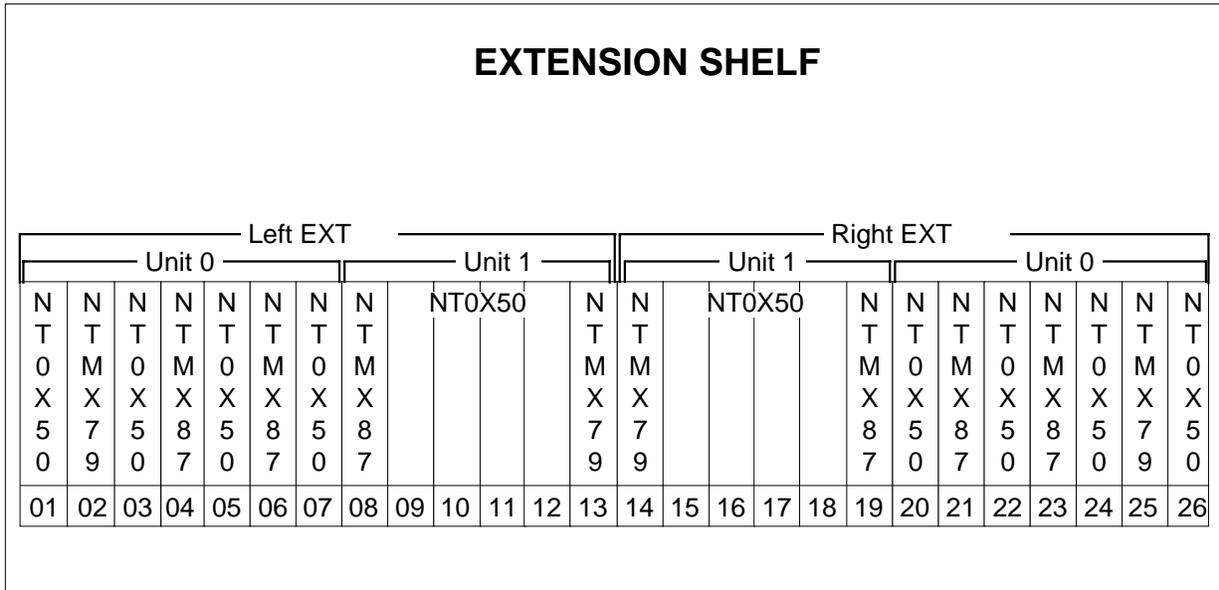
4 RSC-M Signaling and Communications

This section describes the protocols the Remote Switching Center Multi-access (RSC-M) uses for international service. The following paragraphs discuss signaling, features supported, and subscriber services.

Signaling and communications protocols

The RSC-M uses the following protocols, for communications and subscriber services:

- High-level data link control (HDLC)

  HDLC is a complete duplex message protocol based on the International Telegraph and Telephone Consultative Committee (CCITT) level 2 Signaling System 7 (Q.703). This protocol is supported between PLGC and RSC-M peripherals.

- Channel associated signaling (CAS) with the following protocols:
  — LOOP
  — EARTH
  — DC5A
  — DC5ADD

- Custom Local Access Signaling Services (CLASS) with dual tone multifrequency (DTMF) control.

CAS protocol

Virtual remote nodes with access multiplexer capabilities (AMC) that use CAS protocol, communicate with the digital multiplex switches (DMS) over pulse code modulation 30 (PCM30) links that terminate on the RSC-M. CAS protocol defines the action between AMC and DMS.

This section describes the interworking between the British Telecom User Part (BTUP) trunk carrier and DC5 protocol, and BTUP to CAS LOOP. DC5

signaling protocols include two types, DC5A and DC5ADD. The DC5A has delay dial.

Signaling and communications types

An RSC-M line is not a line circuit, but a 64 kbit/s channel in a 2 Mbit/s PCM30 carrier.

Channel associated signaling AMCs use call supervisory signaling that complies with the CAS protocol of ABCD bits. The ABCD bits are on time slot 16 (TS16) of each PCM30 link. Messaging channels are assigned to the same link as the associated voice channel. Dedicated channels, carrier channels are datafilled the same way as line cards.

> *Note:* The AMC generates the subscriber line signaling, like off- and on-hook, and ring generation.

The voice channels provide virtual line circuits that support voice calls over connections to dial pulse (DP) or DTMF analog subscriber stations. The virtual line circuits support voice calls over connections to a private branch exchange (PBX) connected to an AMC node. These channels provide CAS protocols to groups of the following analog line interfaces:

Figure 4-1 CAS interface
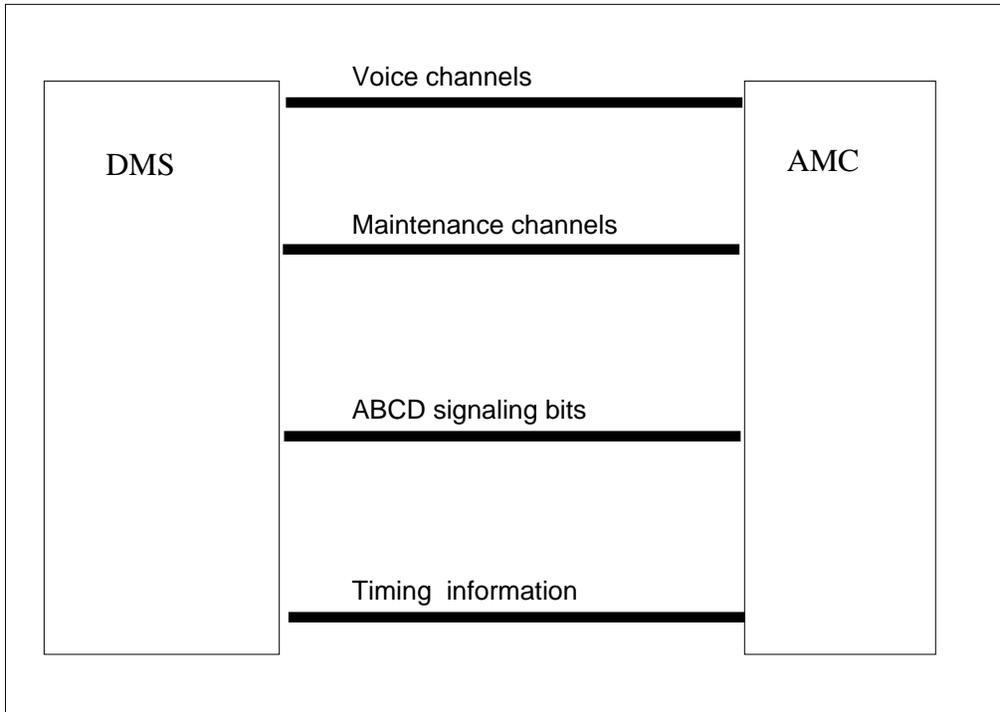
The following signaling is implemented on interfaces to CAS AMCs:

- The signaling processor (SIGP) circuit card provides messaging control of CAS links.

- The PCM30 link interface circuit cards provide the timing, link identification, and cyclic redundancy check-4 (CRC-4) error detection.

- User ports and voice channels are determined, one-to-one, on dedicated channels in CAS non-concentrating interfaces. There is no line concentration at the AMC node. Each PCM30 channel has a direct one-to-one relationship to an exact line.

RSC-M call setup protocol

The following examples describe the setup, release steps, and affiliated timers during normal call processing. This document does not describe connect and release sequences that are not normal, like answer again and established call again. Incoming and outgoing signals of all call types appear in the tables.

BTUP uses different types of messages to send signaling messages through the network. Common channel signaling (CCS) calls begin with the originating exchange sending an initial address message (IAM) to setup the call. The key fields of an IAM message are:

- routing label

- circuit identification

- message type

- called party number (CDN)

- calling party number (CGN).

The destination exchange responds with a message indicating address complete (ACM) and applies ringing to the called line. When the called line goes off-hook, the destination node sends an answer message (ANM) to the originating exchange. The originating and destination exchanges send messages to AMCs that require connection of voice channels to the calling and called lines.

The symbol T(n) designates timers for all AMCs and BTUP connection signal diagrams. The BTUP timer appears as T1', to differentiate between the BTUP T1' timer and the AMC T1 timer.

AMC timers:

- T1-setup supervision timer. Starts with line seizure and stops when the call is established. If T1 times out the call is dropped.

- T2-wait for first digit. Starts with line seizure and stops when the first digit is received.

- T3-restarts after each digit is received. Time-out indicates all digits are collected and starts T7.

- Timed-release disconnect (TRD)-long release disconnect timer. Starts when the terminating line suspends (SUS) the call. Stops if the terminating line restores (RES) connection before time-out. If TRD times out, the call is dropped.

BTUP timers:

- T1'-starts when release (REL) is sent. Stops when release clear (RLC) is received.

- T5-release supervision timer. Refer to T1'.

- T7-starts when T3 stops. Indicates digits collected and IAM message is sent. T7 stops when terminating exchange sends ACM message back.

- T9-starts when T7 stops. Call established setup speech conditions.

CAS to BTUP and BTUP to CAS signaling

This section illustrates the signaling sequences used during normal CAS to BTUP, and BTUP to CAS calls. The BTUP trunk indicated is not connected between the originating and terminating offices. Releases that are not normal, caused by the time-out of timers:

- T1 which is the total call setup time

- T7 which is the time between IAM and ACM

- TRD which is the time between terminator delay and requests to establish again

The following figures, refer to the CAS signals by name. Refer to table "CAS incoming signals" for the CAS incoming signal codes. Refer to table "CAS outgoing signals" for the CAS outgoing codes. Descriptions of the call processing events follow each figure.

Figure 4-2 BTUP to CAS line connection
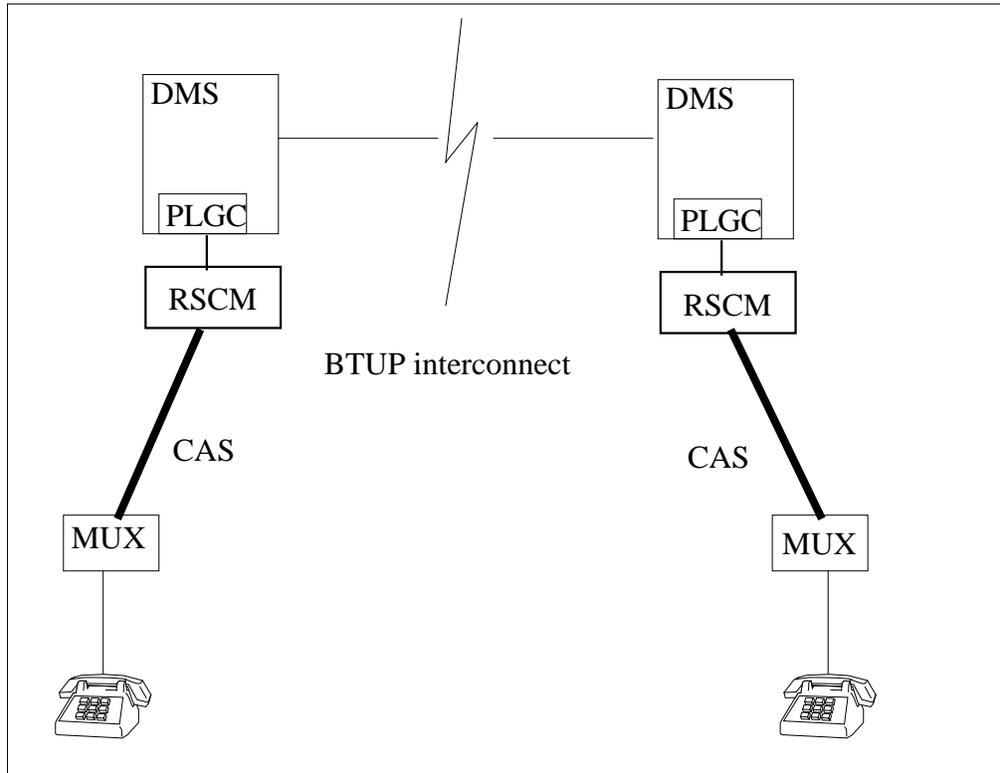
Note: During CAS setup digits can be DTMF or dial pulsed loop disconnect.

Figure 4-3 Call origination sequence CAS to CAS
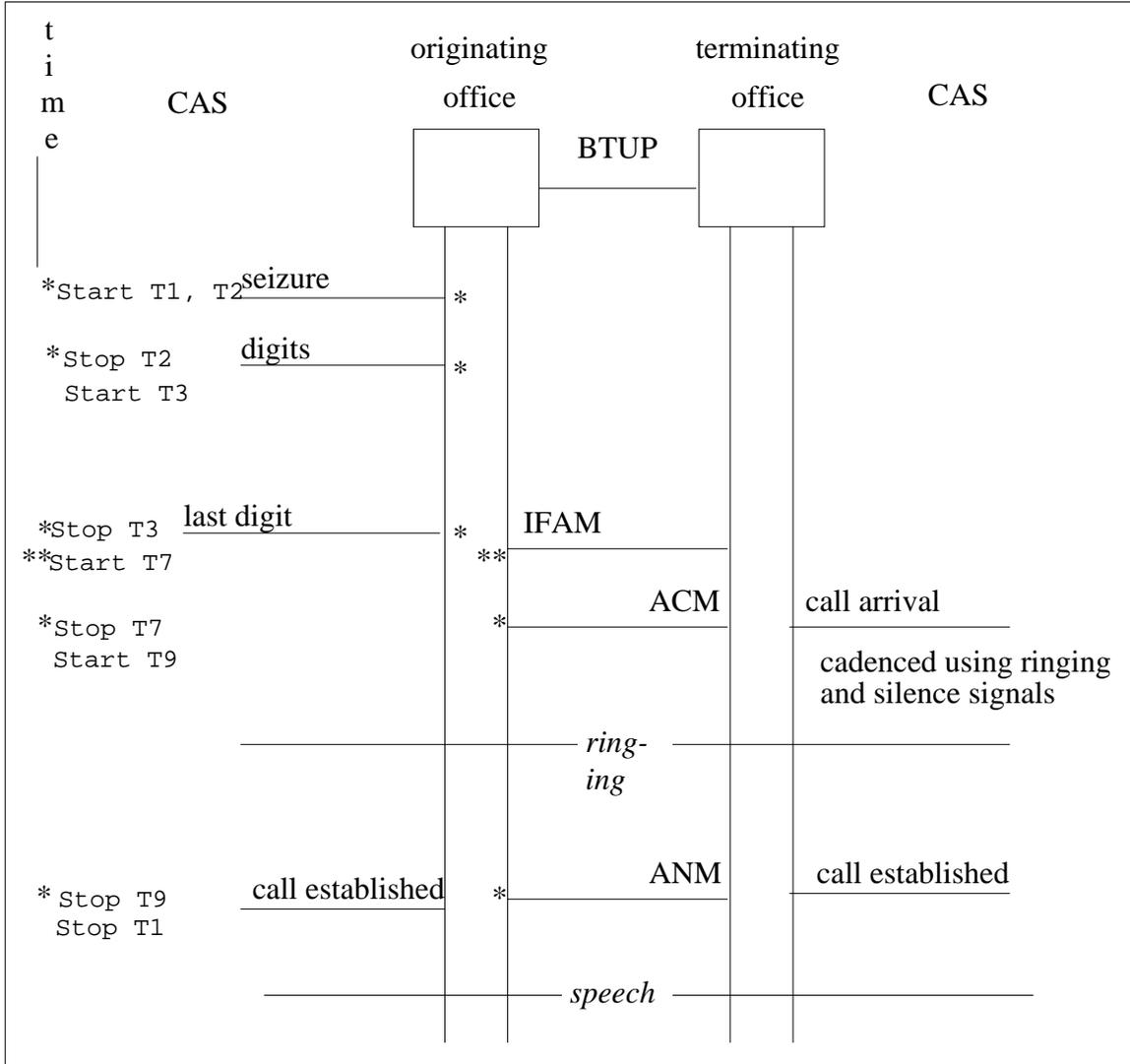
Call origination sequencing from a CAS line to a CAS line.

1. *AMC to originating exchange* After the originating exchange receives a seizure signal from the CAS AMC, the T1 and T2 timers start. When the originating exchange receives the first digit, the T2 timer stops and T3 starts. The T3 timer restarts after each digit is received.

2. *Originating exchange to terminating exchange* An outgoing route is selected and IFAM is sent to the terminating exchange after the originating exchanges receives all digits. Digits analysis can define the number length. When digits analysis defines the number length the T3 timer is stopped. When a number length that is not known occurs, the expiration of the T3 timer indicates the last digit. After an IFAM is sent, the T7 timer is started.

3. *Terminating exchange to AMC* When the terminating exchange receives the IFAM, the exchange sends a call arrival signal to the AMC node. The call arrival signal consists of ringing and silence signals. The system applies ringing to the line.

4. *Terminating exchange to originating exchange* The system sends the ACM message to the originating exchange and speech conditions are set up. When the originating exchange receives the ACM message, the exchange stops the T7 timer. After the T7 timer stops the originating exchange starts the T9 timer, and sets up speech conditions.

5. *Multiplexor to terminating exchange* When the subscriber answers the call, the AMC node sends a call established signal to the terminating exchange.

6. *Terminating exchange to originating exchange* When the terminating exchange receives a call established signal, the terminating exchange sends an ANM message to the originating exchange.

7. *Originating exchange to AMC* When the originating exchange receives an ANM message, the exchange stops the T9 and T1 timers. The originating exchange sends a call established signal to the AMC node. If the T1 timer lapses before a call is established, and the originator is off-hook, the sequence restarts the line seizure. If the originating subscriber is off-hook, the line transfers to a null state.

Figure 4-4 Call release sequence CAS to CAS (originator release)
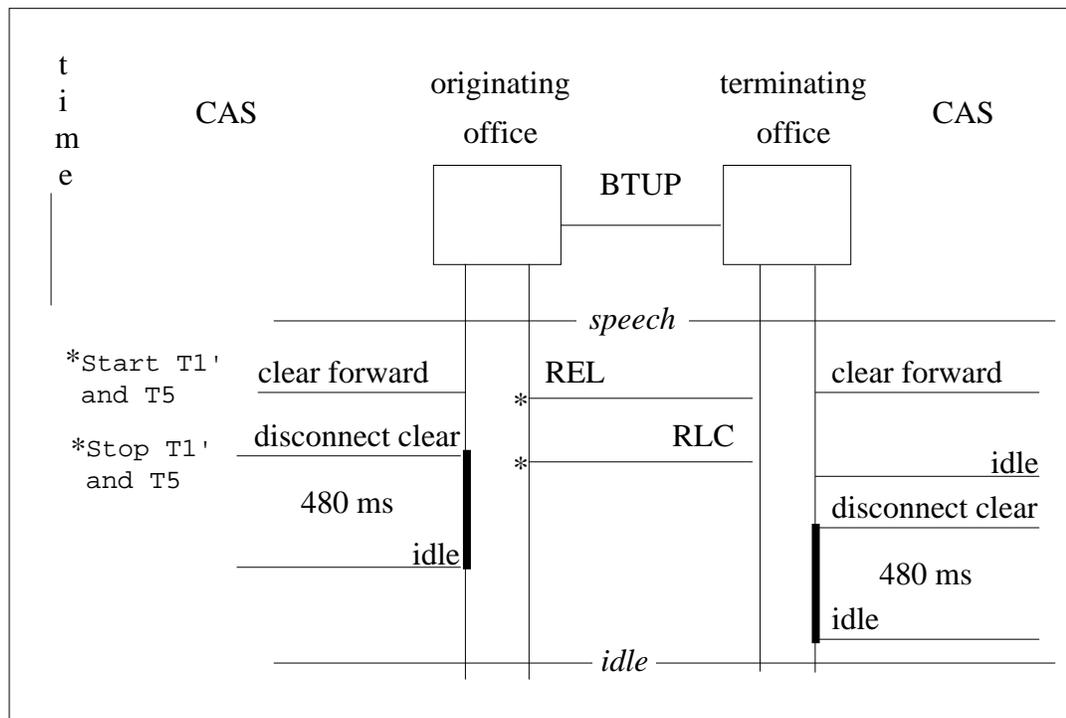
Call release sequencing from a CAS line to a CAS line (originator release).

1. *AMC to originating exchange* When a calling subscriber goes on-hook, the AMC node sends a clear forward signal to the originating exchange. The originating exchange sends a disconnect clear signal backwards for 480 ms followed by idle code.

2. *Originating exchange to terminating exchange* During the release sequence the originating exchange sends a REL message to the terminating exchange and starts the T1' and T5 timers.

3. *Terminating exchange to AMC* When the terminating exchange receives the REL message, the terminating exchange starts the release sequence. The release sequence starts when the exchange sends a clear forward message to the AMC node.

4. *Terminating exchange to originating exchange* The terminating exchange sends an RLC message to the originating exchange. The RLC message releases the outgoing trunk and stops the T1' and T5 timers.

5. *AMC to terminating exchange* When the terminator goes on-hook, the AMC node sends a disconnect clear to the terminating line for 480 ms followed by idle code.
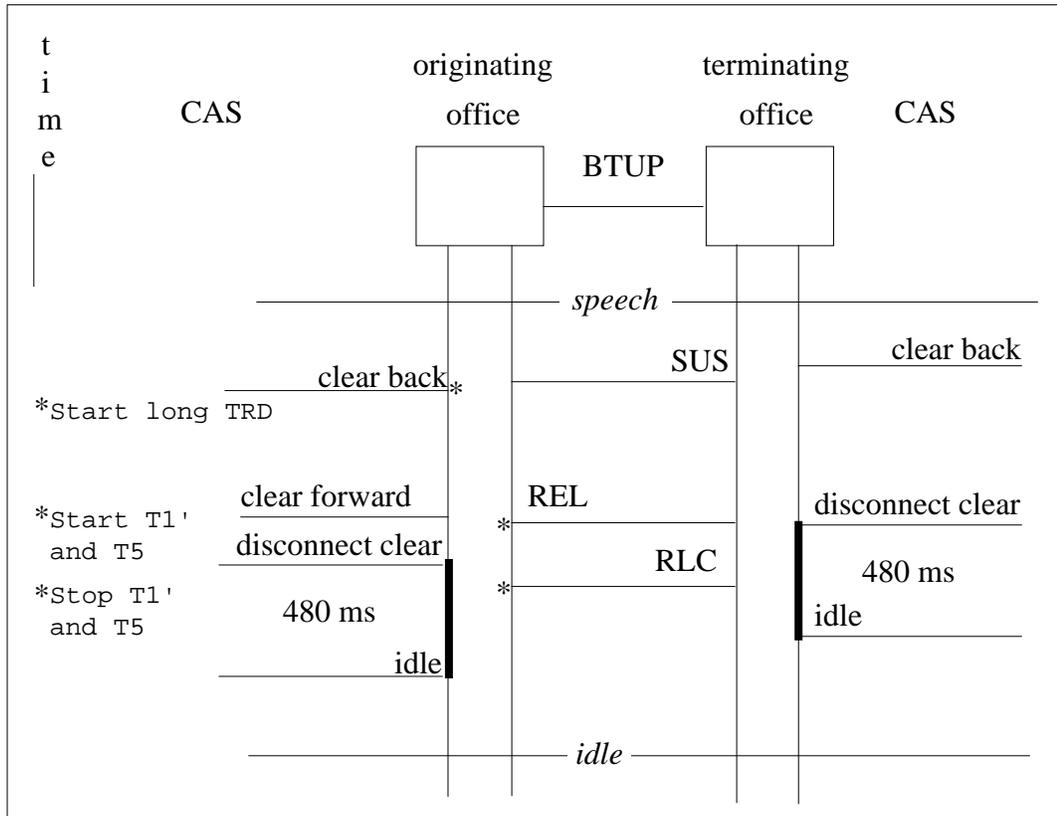
Figure 4-5 Call release sequence CAS to CAS (terminator release)

Call release sequencing from a CAS line to a CAS line terminator release.

1. *AMC to terminating exchange* When a called subscriber goes on-hook, the AMC node sends a clear back signal to the terminating exchange. The terminating exchange sends a SUS message to the originating exchange.

2. *Originating exchange to AMC* After the originating exchange receives a SUS message, the exchange starts the TRD timer. The originating exchange sends a clear back signal to the AMC node.

3. *AMC to originating exchange* When the calling subscriber goes on-hook, the AMC node sends a clear forward signal to the originating exchange. The originating exchange, during the release sequence, sends disconnect clear backwards for 480 ms. An idle code follows this message, and stops the TRD timer. The AMC sends a REL message to the terminating exchange and starts the T1' and T5 timers.

4. *Terminating exchange to AMC* The terminating exchange receives a REL message and sends an RLC message to the originating exchange. This message causes the T1' and T5 timers to stop. Disconnect clear is sent to the terminating line for 480 ms followed by idle code. The line idle is ready for call processing.

CAS AMC to DMS signals

The DMS switch and the CAS AMC node exchange signals during incoming and outgoing call processing. The following tables describe the sequencing signals that the DMS switch and a CAS AMC node exchange:

Table 4-1 CAS incoming signals (Sheet 1 of 2)

Status	Received by DMS from AMC	Transmitted by DMS to AMC
idle	1101	1101
seizure	0101	1101. Refer to note 1.
Dial pulse break	1101	1101. Refer to note 2.
Dial pulse make	0101	1101
call established	0101	0101

Note 1:   The calling subscriber line does not requires a signal before it is allowed to send digits.

Note 2:   Digit signals can be either DTMF or DP loop-disconnect.

Note 3:   The disconnect clear signal is nominally 480 ms followed by an idle code (1101) sent to the AMC node. The idle code is a response to the called subscriber time-out expiration, or in response to a clear forward. No outgoing call routes to the line until an idle code is received again.

Table 4-1 CAS incoming signals (Sheet 2 of 2)

Status	Received by DMS from AMC	Transmitted by DMS to AMC
clear back	0101	1101
re-answer	0101	0101
call re-established	0101	0101
clear forward	1101	
disconnect clear		0001. Refer to note 3.
blocking	1101	1111

Note 1: The calling subscriber line does not requires a signal before it is allowed to send digits.

Note 2: Digit signals can be either DTMF or DP loop-disconnect.

Note 3: The disconnect clear signal is nominally 480 ms followed by an idle code (1101) sent to the AMC node. The idle code is a response to the called subscriber time-out expiration, or in response to a clear forward. No outgoing call routes to the line until an idle code is received again.

Table 4-2 CAS outgoing signals (Sheet 1 of 2)

Status	Received by DMS from AMC	Transmitted by DMS to AMC
idle	1101	1101
call arrival		
ringing	1101	1011. Refer to note 1.
silence	1101	1001
call established	0101	0101
clear back	1101	0101
re-answer	0101	0101
call re-established	0101	0101

Note 1: Ringing cadence applies to the AMC. The ringing cadence is setup using the ringing and silence signals. Following the answer, to reach the talking phase apply 0101 to the AMC node.

Note 2: To clear a call, a disconnect clear signal is sent for 480 ms followed by a clear forward. The line is not reused until an idle code is received from the AMC.

Table 4-2 CAS outgoing signals (Sheet 2 of 2)

Status	Received by DMS from AMC	Transmitted by DMS to AMC
clear forward		1101
disconnect clear		0001. Refer to note 2.
blocking	1111	1101

Note 1:   Ringing cadence applies to the AMC. The ringing cadence is setup using the ringing and silence signals. Following the answer, to reach the talking phase apply 0101 to the AMC node.

Note 2:   To clear a call, a disconnect clear signal is sent for 480 ms followed by a clear forward. The line is not reused until an idle code is received from the AMC.

DC5 to BTUP and BTUP to DC5 signaling

This section illustrates the signaling procedures used during DC5 to BTUP, and BTUP to DC5 calls. The BTUP trunk indicated is not connected between the originating and terminating offices. The incoming and outgoing protocols, DC5A or DC5ADD, are not the same.

The following figures refer to the DC5 signals by name. Refer to the figure "DC5 and DC5ADD", incoming signals in this section for the DC5 incoming signal codes. Refer to the figure "DC5 and DC5ADD", outgoing signals in this section for the DC5 outgoing codes. Descriptions of the call processing events follow each figure.

Timers for all DC5 and BTUP connection signal diagrams are designated by the symbol T(n). To differentiate between the BTUP T1 timer and the DC5 T1 timer, the BTUP timer appears as T1'. Refer to the section on timers in this section for more information.

Figure 4-6 BTUP to DC5A line connection

Figure 4-7 DC5A to DC5A call setup
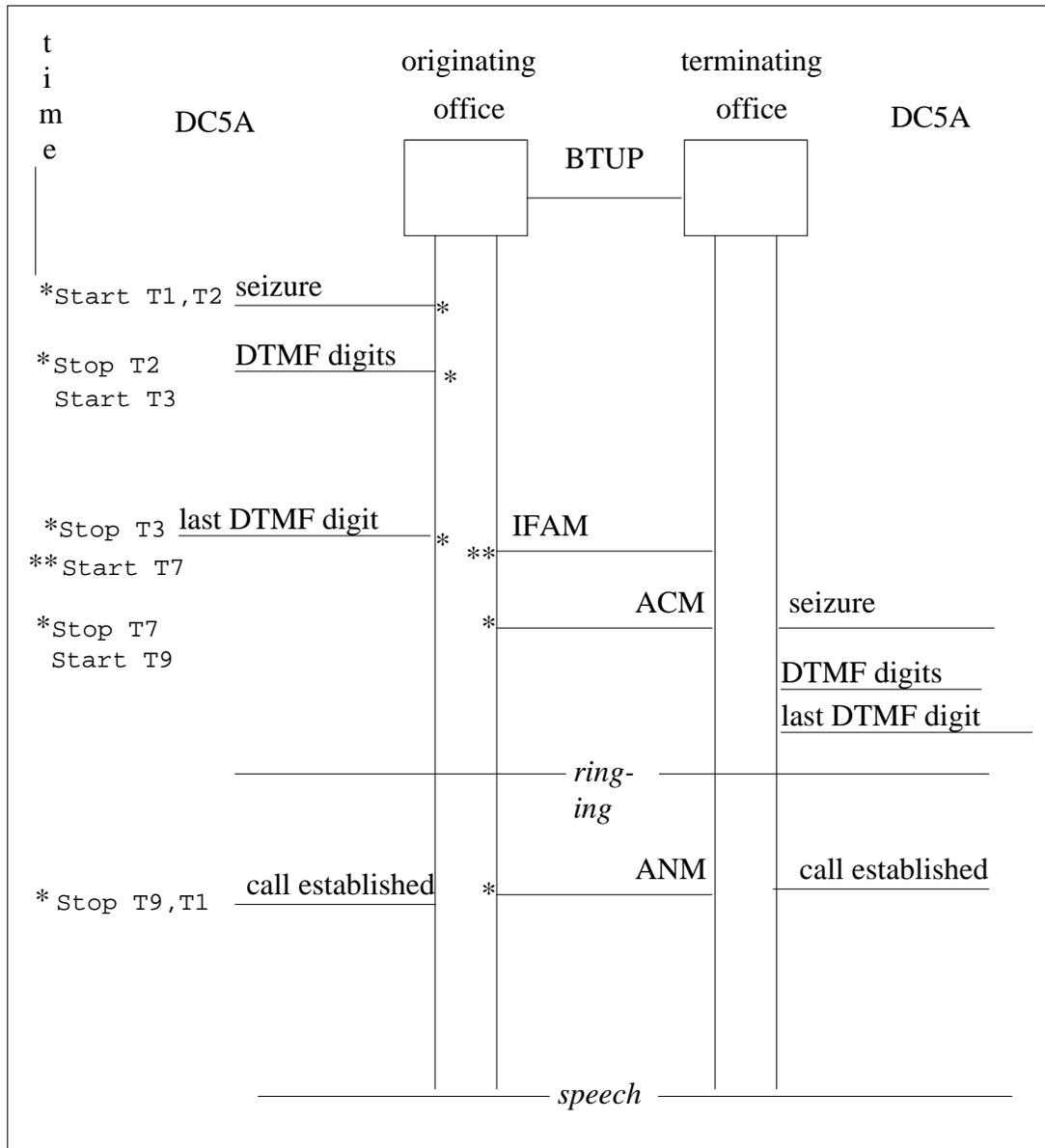
Call origination sequencing from a DC5A line to a DC5A line.

1. *AMC to originating exchange* After the originating exchange receives a seizure signal from the AMC, the T1 and T2 timers start. When the exchange receives the first DTMF digit, the T2 timer stops and T3 starts. The T3 timer restarts after the originating exchange receives each DTMF digit.

2. *Originating exchange to terminating exchange* After the originating exchange receives all DTMF digits the exchange selects an outgoing route. The originating exchange sends an IFAM message to the

terminating exchange. Digits analysis can define the number length, in which event the T3 timer is stops. In the event of a number length that is not known, the expiration of the T3 timer indicates the last digit. After the originating exchange sends an IFAM message, the T7 timer starts.

3. *Terminating exchange to AMC* After the terminating exchange receives the IFAM, the exchange sends a seizure signal to the AMC node. DTMF digits are outpulsed immediately because delay dial is not required.

4. *Terminating exchange to originating exchange* After the last DTMF digit is outpulsed, the terminating exchange an ACM message to the originating exchange. Speech conditions are setup. When the originating exchange receives an ACM message the T7 timer stops and the T9 timer starts. This action sets up speech conditions.

5. *AMC to terminating exchange* When the subscriber answers the call, the AMC node sends a call established signal to the terminating exchange.

6. *Terminating exchange to originating exchange* When the terminating exchange receives a call established signal, the exchange sends an ANM message to the originating exchange.

7. *Originating exchange to AMC* When the originating exchange receives an ANM message, the exchange stops the T9 and T1 timers. The originating exchange sends a call established signal to the AMC node.
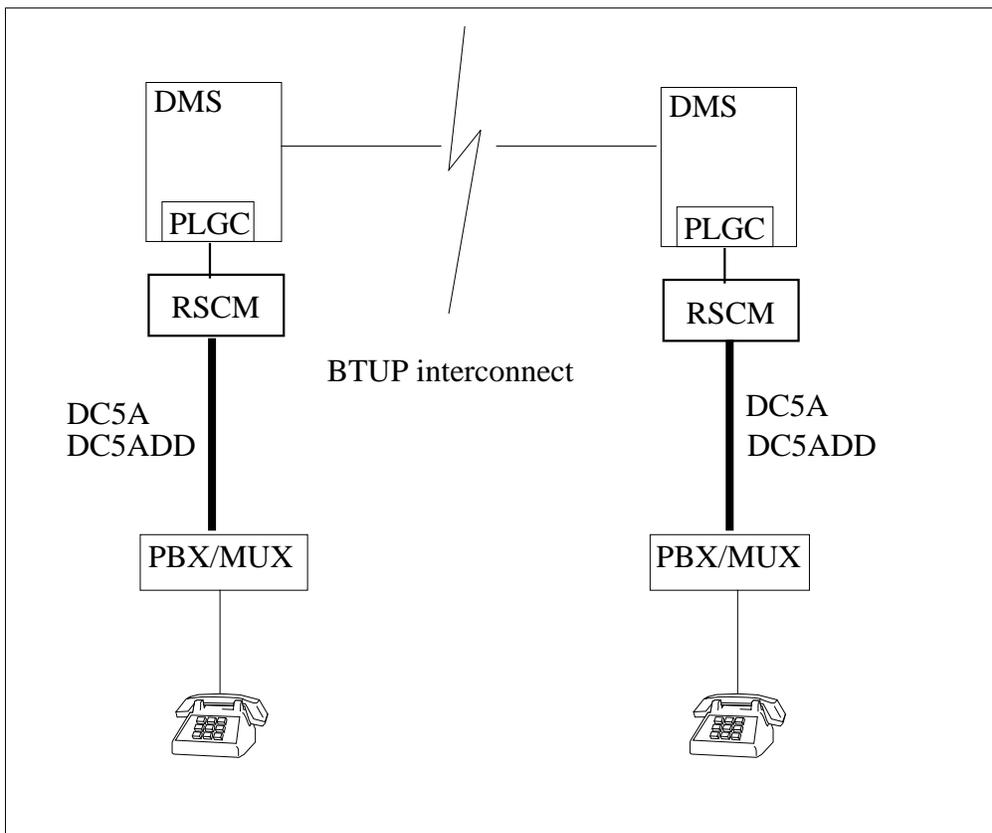
Figure 4-8 DC5ADD to DC5ADD call origination
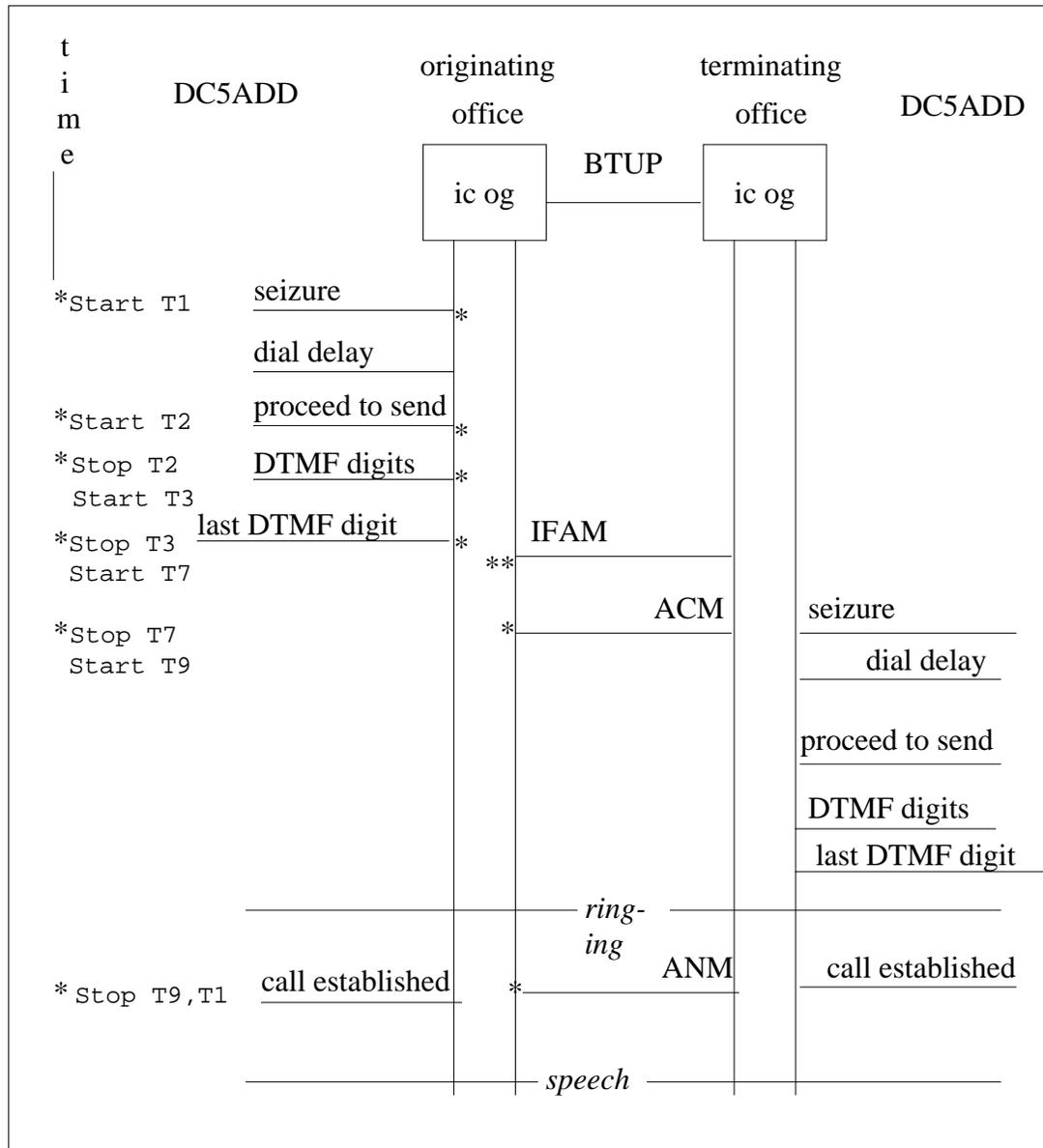
Call origination sequencing from a DC5ADD line to a DC5ADD line.

1. *AMC to originating exchange* After the originating exchange receives a seizure signal from the AMC, the T1 timer starts. The originating exchange sends a dial delay signal back to the AMC node within 30 ms. When the exchange is ready to receive digits, the system sends a proceed to send signal to the AMC. The T2 timer starts. The originating exchange attaches a universal tone receiver (UTR) to the call. When the originating

exchange receives the first DTMF digit the T2 timer stops and T3 starts. This action restarts each time the exchange receives a DTMF digit.

2. *Originating exchange to terminating exchange* After the originating exchange receives all DTMF digits and selects an outgoing route, the exchange sends an IAM the terminating exchange. Digits analysis can define the number length, in which event the T3 timer stops. In the event of a number length that is not known, the expiration of the T3 timer indicates the last digit. After the originating exchange sends an IAM the T7 timer starts.

3. *Terminating exchange to AMC* When the terminating exchange receives an IAM, the exchange sends a seizure signal to the AMC node. The system expects a dial delay signal within 2.5 s for a minimum duration of 30 ms. If the signal does not arrive during that period the system interprets the line as defective, and the call is routed to a treatment. After the dial delay signal is received, the proceed to send signal is expected within 2.5 s. When the proceed to send signal is received, DTMF digits are outpulsed to the AMC node.

4. *Terminating exchange to originating exchange* After the last DTMF digit is outpulsed, the terminating exchange sends an ACM message to the originating exchange. Speech conditions are setup. When the originating exchange receives the ACM message, the T7 timer stops and the T9 timer stops. This action sets up speech conditions.

5. *AMC to terminating exchange* When the subscriber answers the call, the AMC node sends a call established signal to the terminating exchange.

6. *Terminating exchange to originating exchange* When the terminating exchange receives a call established signal, the exchange sends an ANM message to the originating exchange.

7. *Originating exchange to AMC* When the originating exchange receives an ANM message, the exchange stops the T9 and T1 timers. The originating exchange sends a call established signal to the AMC node.
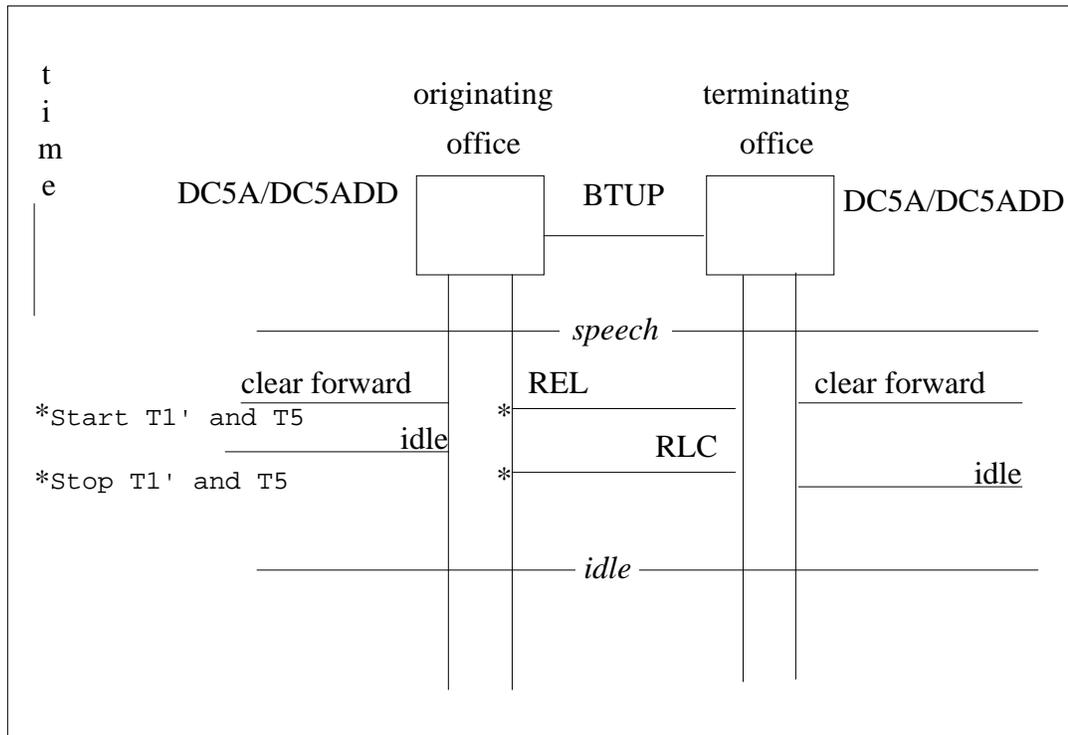
Figure 4-9 Call release sequence DC5A to DC5A (originator release)

Call release sequencing from a DC5A line to a DC5A line (originator release).

1. *AMC to originating exchange* When a calling subscriber goes on-hook, the AMC node sends a clear forward signal to the originating exchange. The originating exchange sends back an idle signal to the AMC node.

2. *Originating exchange to terminating exchange* During the release sequence the originating exchange sends a REL message to the terminating exchange and starts the T1' and T5 timers.

3. *Terminating exchange to AMC* When the terminating exchange receives the REL message the exchange starts the release sequence. To start the release sequence the terminating exchange sends a clear forward message to the AMC node.

4. *Terminating exchange to originating exchange* The terminating exchange sends a RLC message to the originating exchange. The RLC message releases the outgoing trunk in the previous exchange, and stops the T1' and T5 timers.

5. *AMC to terminating exchange* When the terminator goes on-hook, the AMC node sends an idle signal to the terminating exchange. The idle signal releases the outgoing trunk and establishes an idle condition.

Figure 4-10 Call release sequence DC5A to DC5A (terminator release)
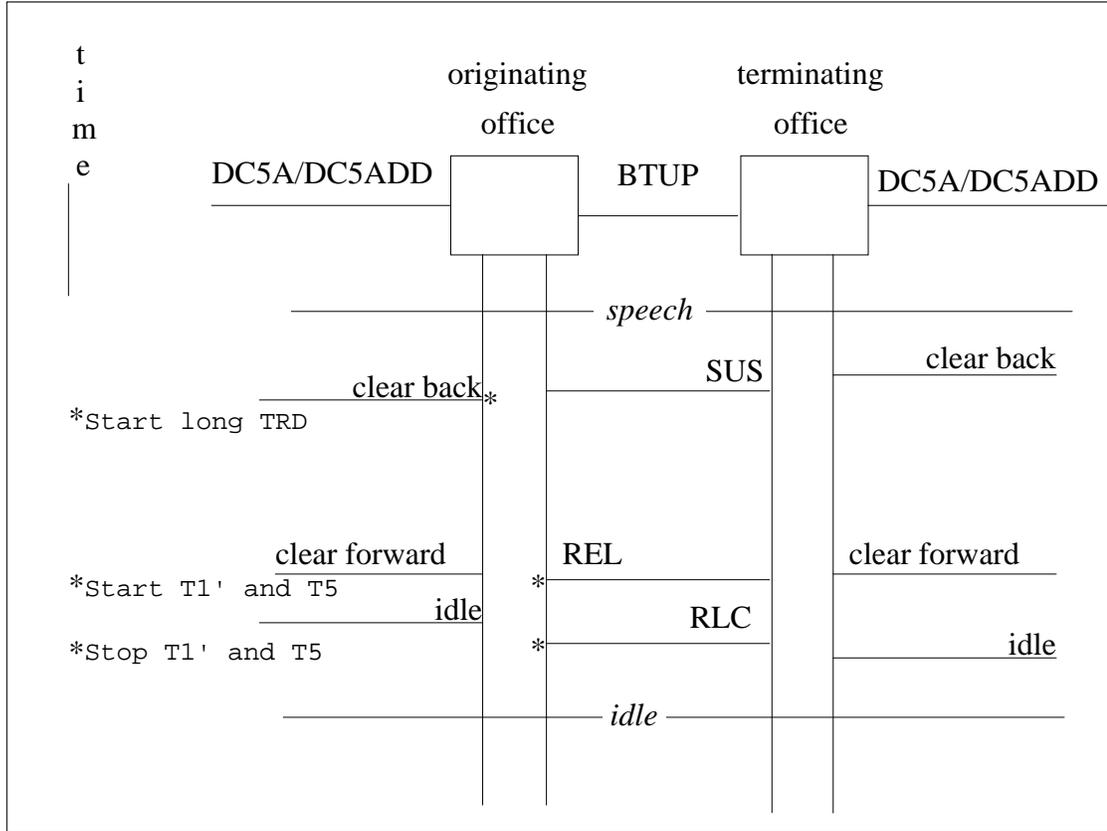
Call release sequencing from a DC5A line to a DC5A line (terminator release).

1. *AMC to terminating exchange* When a called subscriber goes on-hook, the AMC node sends a clear back signal to the exchange. The system sends a SUS message to the previous originating exchange.

2. *Originating exchange to AMC* After the previous originating exchange receives the SUS message, the TRD timer starts. The originating exchange sends a clear back signal to the AMC node.

3. *AMC to originating exchange* When a calling subscriber goes on-hook, the AMC sends a clear forward signal to the originating exchange. The exchange sends back an idle signal and stops the TRD timer. The originating exchange sends a REL message to the next terminating exchange, and the T1' and T5 timers start.

4. *Terminating exchange to AMC* When the terminating exchange receives the REL message, the exchange sends an RLC message to the originating exchange. This action stops the T1' and T5 timers at that exchange, and sends a clear forward message to the AMC node.

5. *AMC to terminating exchange* The AMC signals readiness when the AMC node sends an idle signal to the exchange.

DC5A and DC5ADD AMC to DMS signals

The following tables describe the sequencing signals exchanged between the DMS switch and an AMC node during incoming and outgoing call processing.

Table 4-3   DC5A and DC5ADD incoming signals

Status	Received by DMS from AMC	Transmitted by DMS to AMC
idle	1101	1101
seizure	0101	1101
delay dial		0101. Refer to note.
proceed to send		1101. Refer to note.
on-line signaling (DTMF)	0101	1101
call established	0101	0101
clear back	0101	1101
re-answer	0101	0101
call re-established	0101	0101
clear forward	1101	
blocking	1101	1111

Note: The AMC node requires no signal before the node can send digits if configured as DC5A. DC5ADD requires delay dial and proceeds to send signals that the DMS switch sends, before the AMC node sends digits. Delay dial must be sent for a minimum period of 30 ms and within 2.5 s. Proceed to send signal must be sent within 2.5 s of delay dial. The call established signal is not sent within 300 ms of the seize signal.

Table 4-4   DC5A and DC5ADD outgoing signals (Sheet 1 of 2)

Status	Received by DMS from AMC	Transmitted by DMS to AMC
idle	1101	1101
seizure	1101	0101

Note: The DMS switch requires no signal before the switch can send digits if configured as DC5A. DC5ADD requires delay dial and proceeds to send signals sent by the AMC node before the DMS switch sends digits. The system must send Delay dial for a minimum period of 30 ms and within 2.5 s. Proceed to send signal must be sent within 2.5 s of delay dial. The call established signal is not sent within 300 ms of the seize signal.

Table 4-4   DC5A and DC5ADD outgoing signals (Sheet 2 of 2)

Status	Received by DMS from AMC	Transmitted by DMS to AMC
delay dial	0101	0101. Refer to note.
proceed to send	1101	1101. Refer to note.
call established	0101	0101
clear back	1101	0101
re-answer	0101	0101
call re-established	0101	0101
clear forward	NA	1101
blocking	1111	1101

Note: The DMS switch requires no signal before the switch can send digits if configured as DC5A. DC5ADD requires delay dial and proceeds to send signals sent by the AMC node before the DMS switch sends digits. The system must send Delay dial for a minimum period of 30 ms and within 2.5 s. Proceed to send signal must be sent within 2.5 s of delay dial. The call established signal is not sent within 300 ms of the seize signal.

5 RSC-M alarm clearing procedures

This section contains alarm clearing procedures for the Remote Switching Center Multi-access (RSC-M). These procedures describe alarm clearing procedures that maintenance engineering and field maintenance personnel can use.

Ext RSC-M/RCO2
RSC-M cabinet with MSP shelf major

Alarm display
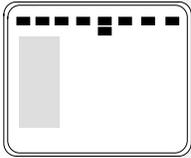
	CM	MS	IOD	Net	PM	CCS	Lns	Trks	**Ext**	APPL
	.	.	.	.	.	.	.	.	**1FSP** **M**	.

Indication

The alarm code FSP under the Ext header of the alarm banner indicates an Ext modular supervisory panel (MSP) alarm. The alarm banner appears at the MTC level of the MAP display.

The number preceding the alarm code indicates how many cabinets are affected by the alarm. The letter M below the alarm code indicates that the alarm class is major.

Note: Current software does not reflect the change from FSP to MSP in the MAP display.

Meaning

An RSC-M alarm occurs when one or more cabinets in the office experiences a power or cooling unit problem.

The number that appears below the alarm banner EXT header indicates the number of affected cabinets.

Result

The type of fault and the type of cabinet that contains the fault determines the effect on subscriber service.

Common procedures

There are no common procedures.

Action

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

Ext RSC-M/RCO2
RSC-M cabinet with MSP shelf major (continued)

Summary of clearing an Ext FSP major alarm for a RSC-M cabinet with an MSP shelf

```
FAN FAIL          Y      Repair cooling          This flowchart summarizes the
lam lit?  ─────────────> unit                    procedure.

     │ N                                          Use the instructions that follow
     │                           │                this flowchart to perform the
     │                           ▼                procedure.
     │
     │        Y  /  FRAME FAIL  \  N
     │   <──────    LED lit?    ──────>
     │            \            /
     │                 │
     ▼                 ▼

/ CONVERTER \   Y    Replace power
\ FAIL LED lit? /──> converter
     │ N                  │
     │                    ▼
     │           / CONVERTER \  N
     │           \ FAIL LED lit? /──┐
     │                │ Y           │
     │                ▼             │
     │          Replace alarm       │
     │          module              │
     │                │             │
     │                ▼ <───────────┘
     │
     │      Y  /  FRAME FAIL  \  N
     │  <───────   LED lit?   ───────>
     │         \             /
     ▼                               ▼

/ Fuse  \  Y    Replace fuse    / FRAME FAIL \  N    / Ext FSP      \  N
\ blown? /───>              ───>\ LED lit?    /────>\ Alarm clears? / ──> ⊳ 1
     │ N                         \           /        \             /
     │                                │ Y                   │ Y
     └──────────────────────────>     ▼                     ▼

Clear other Ext  ◁ 1         Contact next           End
FSP alarms                   level of support
```

Ext RSC-M/RCO2
RSC-M cabinet with MSP shelf major (continued)

Clearing an Ext FSP major alarm for an RSC-M cabinet with an MSP shelf

At the front of the RSC-M cabinet

1 Determine if the FAN FAIL lamp on the MSP is lit.

If the FAN FAIL lamp	Do
is lit	step 35
is not lit	step 2

2 Determine if the CONVERTER FAIL LED on any power converter in the RSC-M cabinet is lit.

If CONVERTER FAIL LED	Do
is not lit	step 3
is lit	step 7

3 Determine if any fuses on the MSP are blown.

If a fuse	Do
is blown	step 4
is not blown	step 40

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

5 Remove the blown fuse.

6

DANGER
Risk of fire
To protect against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and vendor.

Insert the replacement fuse.

If the fuse	Do
does not blow again	step 34

Ext RSC-M/RCO2
RSC-M cabinet with MSP shelf major (continued)

If the fuse	Do
blows again	step 40

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

If the POWER switch	Do
is OFF	step 8
is ON	step 9

8   Set the POWER switch on the power converter to ON.

If the CONVERTER FAIL LED	Do
is lit	step 9
is not lit	step 34

9   Record the shelf and unit (0 or 1) numbers that contain the lit CONVERTER FAIL LED.

10   Identify the circuit breaker for the shelf and unit that contains the lit CONVERTER FAIL LED. The circuit breaker is located on the MSP.

Note 1: Two circuit breakers are available for each shelf.

Note 2: Circuit breakers have the following labels for identification:

- A breaker designation number,
- equipment shelf number and
- power converter card position number

For example, CB02-47-01 is circuit breaker 02 for shelf 47, card position number 01.

11   Determine if the circuit breaker is ON or OFF.

If the circuit breaker	Do
is ON	step 12
is OFF	step 13

12   Set the circuit breaker to OFF.

13   Push the power switch on the converter up. Hold the power switch in the RESET position as you set the circuit breaker to ON.

Ext RSC-M/RCO2
RSC-M cabinet with MSP shelf major (continued)

14   Release the power switch on the converter to the ON position.

If the circuit breaker	Do
turns OFF, and the CONVERTER FAIL LED remains lit	step 15
remains ON, and the CONVERTER FAIL LED is lit	step 26
remains ON, and the CONVERTER FAIL LED is not lit	step 34

15   Record the numbers of the cabinet and shelf with the lit CONVERTER FAIL LED.

16   Determine if power to the RSC-M cabinet connects through a power distribution center (PDC) or through a cabinetized PDC (CPDC). This information is available from office records or from office company personnel.

If power connects through	Do
PDC	step 17
CPDC	step 21

At the PDC

17   Locate the fuse for the affected RSC-M shelf and unit (0 or 1).

18   Remove the fuse. Pull the fuse cartridge out.

If the fuse	Do
is blown	step 19
is not blown	step 24

19

> **DANGER**
> **Risk of fire**
> To protect against risk of fire, replace the blown fuse with a fuse of the same type, rating (color code), and vendor.

Remove the blown fuse from the fuse cartridge and insert a replacement fuse.

20   Insert the fuse cartridge again. Proceed to step 24.

Ext RSC-M/RCO2
RSC-M cabinet with MSP shelf major (continued)

At the CPDC

21   Locate the circuit breaker that powers the RSC-M shelf and unit (0 or 1).

22   Determine if the circuit breaker is ON or OFF.

If the circuit breaker	Do
is OFF	step 23
is ON	step 24

23   Set the circuit breaker to ON.

At the front of the RSC-M cabinet

24   Push the power switch on the converter up. Hold the power switch in the RESET position as you set the circuit breaker to ON.

25   Release the power switch on the converter to the ON position.

If the circuit breaker	Do
remains ON and the CONVERTER FAIL LED is lit	step 26
turns OFF again and the CONVERTER FAIL LED remains lit	step 29
remains ON and the CONVERTER FAIL LED is not lit	step 34

At the front of the RSC-M cabinet

26   Set the circuit breaker to OFF.

27   Replace the power converter card. Perform the correct procedure in the *Card Replacement Procedures*. Complete the procedure and return to this point.

28   Determine the state of the power converter you replaced. Determine the state of the associated circuit breaker.

If the circuit breaker	Do
is OFF, and the CONVERTER FAIL LED is lit	step 29
remains ON, and the CONVERTER FAIL LED is lit	step 30
remains ON and the CONVERTER FAIL LED is not lit	step 34

Ext RSC-M/RCO2
RSC-M cabinet with MSP shelf major (continued)

29	Determine if the pins in the backplane of the shelf are bent or short-circuited.	

> ***Note:*** The backplane is at the rear of the RSC-M cabinet.

If the pins	Do
are not bent or short-circuited	step 30
are bent or short-circuited	step 40

30	Set the circuit breaker to OFF.
31	Replace the alarm module (NTRX41AA). Perform the correct procedure in the *Card Replacement Procedures*. Complete this procedure and return to this point.
32	Push up the power switch on the converter. Hold the power switch in the RESET position while setting the circuit breaker to ON.
33	Release the power switch on the converter to the ON position.

If the CONVERTER FAIL LED	Do
is not lit	step 34
is lit	step 40

34	Determine if the FRAME FAIL lamp on the MSP is lit.

If the FRAME FAIL lamp	Do
is lit, and blown fuses are present on the MSP	step 4
is lit, and blown fuses are not present on the MSP	step 40
is not lit	step 37

35	Repair the cooling unit that has defects. Perform the correct procedure in the *Routine Maintenance Procedures*. Complete this procedure and return to this point.
36	Determine if the FRAME FAIL lamp on the MSP is lit.

If the FRAME FAIL lamp	Do
is lit	step 2
is not lit	step 37

Ext RSC-M/RCO2
RSC-M cabinet with MSP shelf major (end)

At the MAP terminal

37   To access the EXT level of the MAP display, type

>MAPCI;MTC;EXT

and press the Enter key.

38   Determine if an FSP alarm is present.

If an FSP alarm	Do
is present, and you did not perform the appropriate alarm clearing procedure in all the cabinets or frames with an FSP alarm	step 39
is present, and you did perform the appropriate alarm clearing procedure in all the cabinets or frames with an FSP alarm	step 40
is not present	step 42

39   Perform the correct alarm clearing procedure for the other types of frames or cabinets with an FSP alarm. Complete these procedures and return to step 38.

At the back of the RSC-M cabinet

40

> **DANGER**
> **Risk of electrocution**
> Terminals in the MSP can have an electrical potential of -48 V dc to -60 V dc. Do not touch any terminals in the MSP.

Determine if the alarm battery supply wiring of the MSP is short-circuited.

> ***Note:*** Personnel at the next level of support can request this information.

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

42   The procedure is complete.

PM RSC-M/RCO2
critical

Alarm display
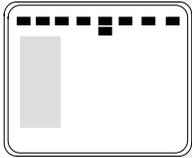
	CM	MS	IOD	Net	**PM**	Lns	Trks	Ext	APPL
	.	.	.	.	**nRCO2**	.	.	.	.
					C				

Indication

An nRCO2 *C* under the PM subsystem header at the MTC level of the MAP display indicates an RSC-M critical alarm.

Note: This section refers to RSC-M/RCO2 as RCO2. When software generates messages to the MAP terminal, the software does not differentiate between the two types of RCO2.

Meaning

Both RCO2 units are system-busy (SysB) or C-side busy (CBsy).

Result

Call processing ceases. The RCO2 can be in emergency stand-alone (ESA).

Common procedures

There are no common procedures.

Action

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

PM RSC-M/RCO2
critical (continued)

Summary of a PM RSC-M/RCO2 critical alarm

```
┌──────────────┐        ┌────────────┐
│ Access PM    │    ③──│ ManB links │
│ level at MAP │        └────────────┘
│ to silence   │              │
│ alarm        │              ▼
└──────────────┘        ┌────────────┐
      │                 │ TST links  │
      ▼                 └────────────┘
┌──────────────┐              │
│ ManB the     │              ▼
│ PM           │        ┌────────────┐
└──────────────┘        │ Return links│
      │                 │ to service │
      ▼                 └────────────┘
┌──────────────┐              │
│ Return       │        ②──┐  │
│ RCO2 to      │           │  │
│ service      │           │  │
└──────────────┘           ▼  ▼
```

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.
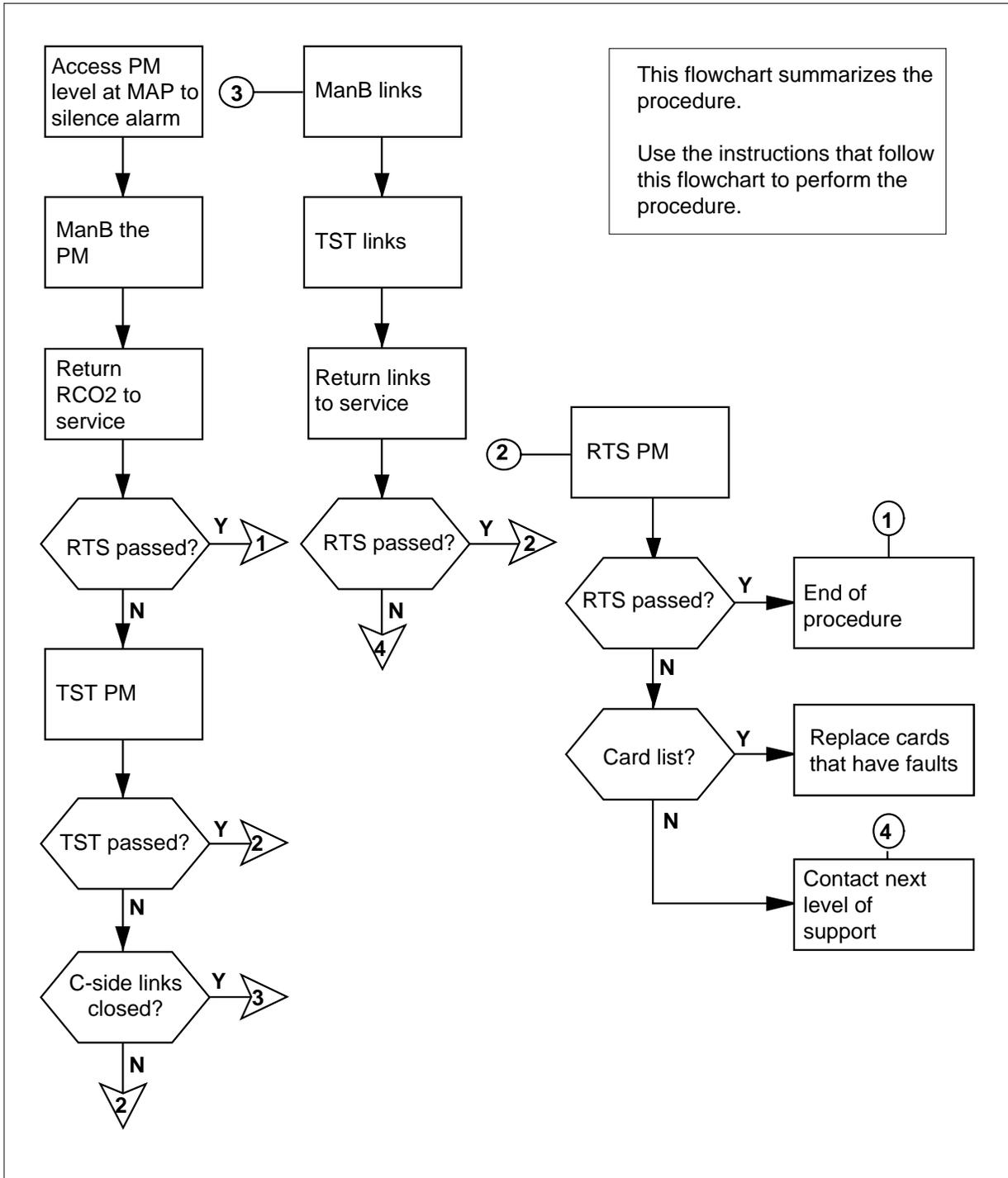
PM RSC-M/RCO2
critical (continued)

Clearing a PM RSC-M/RCO2 critical alarm

At the MAP display

1

ATTENTION

Enter this procedure from the PM system-level alarm clearing procedure step that identified an RCO2-associated fault.

To silence the alarm, type:

>MAPCI;MTC;SIL

and press the Enter key.

2   To identify the RCO2 that has faults, type

>Pm;disp STATE cbsy RCO2

and press the Enter key.

Example of a MAP response:

```
CBsy   RCO2: 2
     or
None
```

If *None* appears on the MAP screen, display the SysB RCO2. To display the SysB RCO2, type

>disp STATE SYSB RCO2

and press the Enter key.

Example of a MAP response:

```
SysB   RCO2: 2
```

3   To post the CBsy or SysB RCO2, type

>POST RCO2 rco2_no

and press the Enter key.

where

> **rco2_no**
> is the number of the RCO2 displayed in step 2

Example of a MAP response:

RCO2		SysB	ManB	Offl	CBsy	ISTb	InSv
	PM	3	0	1	1	4	12
	RCO2	0	0	2	1	2	9

PM RSC-M/RCO2
critical (continued)

4 To check for fault indicators, type

>**querypm flT**

and press the Enter key.

Example of a MAP display:

```
   CM    MS    IOD    Net    PM    CCS    Lns    Trks    Ext    APPL
   .     .     .      .     1RCO2   .     .      .       .      .
                             *C*

RCO2                SysB    ManB    OffL    CBsy    ISTb    InSv
 0 Quit    PM        1       0       1       2       4       12
 2 Post_   RCO2      1       0       2       2       2        9
 3 ListSet
 4         RCO2    0 CBsy  Links_OOS:  CSide  1, PSide   0
 5 TRNSL_  Unit0:   Act    CBsy
 6 Tst_    Unit1:   Inact CBsy
 7 Bsy_    QUERYPM FLT
 8 RTS_        Unit0  Static data not updated
 9 OffL        Unit1  Reset
10 LoadPM_
11 Disp_
12 Next
13 SWACT
14 QueryPM
15
16
17 Perform
18
```

5

DANGER
The RCO2 can be in ESA
A CBsy indicator can change to a SysB indicator if the RCO2
is in emergency stand-alone (ESA) mode. The system
generates PM180 and PM181 logs to indicate ESA. The
system only supports local calls.

Use the following information to determine the next step.

If the RCO2	Do
is SysB	step 6
is CBsy	step 15

6 Check for PM180 and PM181 logs. These logs indicate that the RCO2 is in
emergency stand-alone (ESA). Perform this check according to local

PM RSC-M/RCO2
critical (continued)

operating company policy and according to the type of device that generates the log reports.

If log reports	Do
are available	step 10
are not available	step 7

7   To activate the LOGUTIL database, type

>QUIT ALL;LOGUTIL PM

and press the Enter key.

8   To display PM180 and PM181 log reports, type

>WHILE (BACK)(SLEEP 2)

and press the Enter key.

9   The MAP display scrolls PM181 and PM180 log reports and other types of log reports. Check these reports for possible reasons for the critical alarm in the RCO2. When the MAP display finishes scrolling and you have the necessary information, return to the CI command level. To return to the CI command level, type

>QUIT

and press the Enter key.

10   To post the RCO2 again, type

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

> **rco2_no**
> is the number of the RCO2 displayed in step 2

If the PM logs	Do
indicate ESA	step 35
do not indicate ESA	step 11

11   To manually busy the RCO2, type

>bsy pm

and press the Enter key.

12   To restore PM service, type

>rts pm force

and press the Enter key.

> ***Note:*** The following MAP response indicates the system entered ESA. Do not continue. Return to step 8 and continue to monitor log reports until the system recovers from ESA.

PM RSC-M/RCO2
critical (continued)

Example of a MAP response:

```
UNIT unit_no in ESA MODE.
THIS ACTION WILL CAUSE ESA EXIT AND ABORT n CALLS
PLEASE CONFIRM ("YES" OR "NO")
```

where

> **unit_no**
> is the number of the RCO2 identified in step 2

> **n**
> is the number of calls now in progress

13   To confirm the command in step 12, type

>yes

and press the Enter key.

If RTS PM FORCE	Do
passes for both units	step 37
fails for both units	step 14
fails for one unit	Refer to the alarm clearing procedures for an RCO2 ISTb major alarm.

14   To perform an in-service test on the ManB RCO2, type

>tst pm

and press the Enter key.

Example of a MAP response:

```
Test Passed
     or
Test Failed
```

If TST	Do
passes	step 12
fails because C-side links are closed	step 15
fails and a the system generates a card list	step 31

15   To identify C-side links to the host PM that are CBsy, type

>trnsl c

PM RSC-M/RCO2
critical (continued)

and press the Enter key.

> *Note:* A host PM is a PCM-30 line group controller (PLGC).

Example of a MAP response:

```
LINK 0: PLGC    1 0;CAP MS;STATUS:  OK,;MSGCOND: OPN,Restricted
LINK 1: PLGC    1 1;CAP  S;STATUS:  OK
LINK 2: PLGC    1 2;CAP MS;STATUS: OK,;MSGCOND:OPN,Unrestricted
LINK 4: PLGC    1 4;CAP  S;STATUS:  CBsy
LINK 5: PLGC    1 4;CAP  S;STATUS:  OK
LINK 6: PLGC    1 4;CAP  S;STATUS:  OK
LINK 7 :PLGC    1 4;CAP  S;STATUS:  OK
```

16   To post the host PM identified in step 15, type

>**>*post* host_pm host_pm_no**

and press the Enter key.

where

> **host_pm**
> is the PLGC

> **host_pm_no**
> is the number of the PLGC

Example of a MAP display:

```
   CM    MS    IOD    Net    PM    CCS    Lns    Trks    Ext    APPL
   .     .     .      .    1RCO2   .      .       .      .       .
                            *C*
PLGC            SysB    ManB      OffL     CBsy    ISTb     InSv
 0 Quit   PM     3       0         1        1       4        12

 2 Post_  PLGC    0       0         2        1       2         9
 3 ListSet
 4        PLGC   1 ISTb  Links_OOS:  CSide  0, PSide   1
 5 Trnsl_ Unit0:   Act InSv
 6 Tst_   Unit1:   Inact InSv
 7 Bsy_
 8 RTS_
 9 OffL
10 LoadPM_
11 Disp_
12 Next
13 SwAct
14 QueryPM
15
16
17 Perform
18
```

17   To identify the P-side links that have faults and choose a link that has faults, type

>**>*TRNSL P***

and press the Enter key.

Example of a MAP response:

```
LINK 0: RCO2    1 0;CAP MS;STATUS:  OK,;MSGCOND: OPN,Restricted
LINK 1: RCO2    1 1;CAP  S;STATUS:  OK
LINK 2: RCO2    1 2;CAP MS;STATUS:  OK,;MSGCOND:OPN,Unrestricted
LINK 4: RCO2    1 4;CAP  S;STATUS:  ISTb
LINK 5: RCO2    1 4;CAP  S;STATUS:  OK
LINK 6: RCO2    1 4;CAP  S;STATUS:  OK
LINK 7 :RCO2    1 4;CAP  S;STATUS:  OK
```

18   To busy the link that has faults, type

>**bsy link** **link_no**

and press the Enter key.

where

> **link_no**
> is the number of the P-side link indicated in step 17

19   To test the link that has faults, type

>**TST link** **link_no**

and press the Enter key.

where

> **link_no**
> is the number of the link made manually busy in step 18

If TST	**Do**
passes and the alarm clears	step 25
fails	step 20

20   To display any trunks that have faults, type

>**TRKS;carrier;post remote**

and press the Enter key.

Example of a MAP response:

```
CLASS ML OS ALARM  SYSB   MANB UNEQ OFFL CBSY PBSY     INSV
TRUNKS 0 0  0       0      0    0    0    0    0        0
REMOTE 0 0  0       5      1    0    0    1    0        10

NO CLASS  SITE PLGC CKT D ALARM  SLIP FRAME BER SES STATE
0   TRUNKS BRSC 0     2 C       0     0   <-.7   0   INSV
1   REMOTE BRSC 0    12 C       0     0   <-.7   0   INSV
2   REMOTE BRSC 0    13 C       0     0   <-.7   0   MANB

                                             MORE...
```

PM RSC-M/RCO2
critical (continued)

       Note: The `MORE ...` at the bottom of the display indicates you can observe more links. To observe these links, type

       >NEXT

       and press the Enter key.

21   Perform the procedure to repair or correct the defective trunk indicated by the MAP display in step 20.

       Note: If the MAP display indicates message links that have faults, ManB these links before you return to service (RTS) the links.

22   To test the ManB link, type

       >*tst* link_no

       and press the Enter key.

       where

          link_no
           is the number of the ManB link. The NO column lists this link number as shown in the MAP display in step 20. The number for the ManB link in the example is 2.

If TST	Do
passes and the alarm clears	step 23
fails	step 36
fails and the system generates a card list	step 31

23   To post the host PM, type

       >*pm;post* host_pm host_pm_no

       and press the Enter key.

       where

          host_pm
           is the host PM PLGC posted in step 16

          host_pm_no
           is the number of the host PM PLGC

24   To verify the status of the P-side links, type

       >*TRNSL P*

       and press the Enter key.

       Example of a MAP response:

```
LINK 0: RCO2     1 0;CAP MS;STATUS:  OK,;MSGCOND: OPN,Restricted
LINK 1: RCO2     1 1;CAP  S;STATUS:  OK
LINK 2: RCO2     1 2;CAP MS;STATUS:  OK,;MSGCOND:OPN,Unrestricted
LINK 4: RCO2     1 4;CAP  S;STATUS:  OK
LINK 5: RCO2     1 4;CAP  S;STATUS:  OK
LINK 6: RCO2     1 4;CAP  S;STATUS:  OK
LINK 7 :RCO2     1 4;CAP  S;STATUS:  OK
```

PM RSC-M/RCO2
critical (continued)

25   To return the link to service, type

>**RTS link** **link_no**

and press the Enter key.

where

   link_no
      is the number of the link identified in step 17

   Note: Perform this step for each link that was made busy.

26   To post the *inactive* RCO2, type

>**post RCO2 rco2_no**

and press the Enter key.

where

   rco2_no
      is the number of the RCO2 identified in step 2

   Note: This RCO2 must be SysB.

27   To return the *inactive* PM unit to service, type

>**RTS PM**

and press the Enter key.

If RTS for both RCO2 units	Do
passes	step 37
fails	step 28

28   To manually busy the *inactive* RCO2 unit, type

>**bsy unit unit_no**

and press the Enter key.

where

   unit_no
      is the number of the *inactive* RCO2 unit from step 26

29   To perform an out of service (OOS) test on the *inactive* RCO2 unit, type

>**tst unit unit_no**

and press the Enter key.

where

   unit_no
      is the number of the RCO2 unit made manually busy in step 28

If TST	Do
passes	step 30

PM RSC-M/RCO2
critical (continued)

If TST	Do
fails	step 31

30   To return the *inactive* RCO2 unit to service, type

>rts unit unit_no

and press the Enter key.

where

> **unit_no**
> is the number of the RCO2 tested in step 29

If RTS	Do
passes	step 37
fails	step 36

31   Observe the card listing shown on the MAP display.

Example of a MAP response:

```
SITE        FLR        RPOS BAY_ID     SHF        DESCRIPTION  SLOT    EQPEC
RSCS0       01         A00 RSCM   00   32         RCO2 :  000    :03     MX77
RSCS0       01         A00 RSCM   00   32         RCO2 :  000    :08     MX76
RSCS0       01         A00 RSCM   00   32         RCO2 :  000    :11     MX73
RSCS0       01         A00 RSCM   00   32         RCO2 :  000    :15     MX74
RSCS0       01         A00 RSCM   00   32         RCO2 :  000    :17     MX73
```

If you	Do
replaced all the cards on the list	step 32
did not replace all the cards on the list	step 34

32   Determine if the NTMX82 circuit card was replaced.

If you	Do
replaced the NTMX82 circuit card	step 36
did not replace the NTMX82 circuit card	step 33

33   Go to the card replacement procedure for the NTMX82 circuit card in the *Card Replacement Procedures* section of this document. When you finish the card replacement procedures, go to step 23 of this procedure.

34   Go to the card replacement procedure in *Card Replacement Procedures* for the next card on the card list. When you finish the card replacement procedures, go to step 29 of this procedure.

PM RSC-M/RCO2
critical (end)

35   *Go to Recovery Procedures for instructions on recovering the RCO2.* When
you complete the recovery procedure, return to step 4 and complete the
alarm clearing procedure.

36   Contact the next level of support to obtain more help in clearing this alarm.

37   This procedure is complete. If other alarms appear, reference the correct
alarm clearing procedures for the indicated alarms.

PM RSC-M/RCO2
major

Alarm display
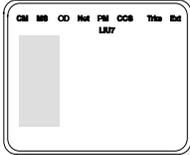
CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	EIO
.	.	.	.	**1RCO2**	.	.	.	.	.

Indication

The alarm code 1RCO2 M under the PM subsystem header at the MTC level of the MAP display indicates an RSC-M major alarm.

Note: This section refers to RSC-M/RCO2 as RCO2. When software sends messages to the MAP terminal, the software does not know the difference between the two types of RCO2.

Meaning

The indicated number of RCO2 units are in the system-busy (SysB) or C-side busy (CBsy) state.

Result

This alarm does not affect subscriber service. When both RCO2 units fail, subscriber service ends.
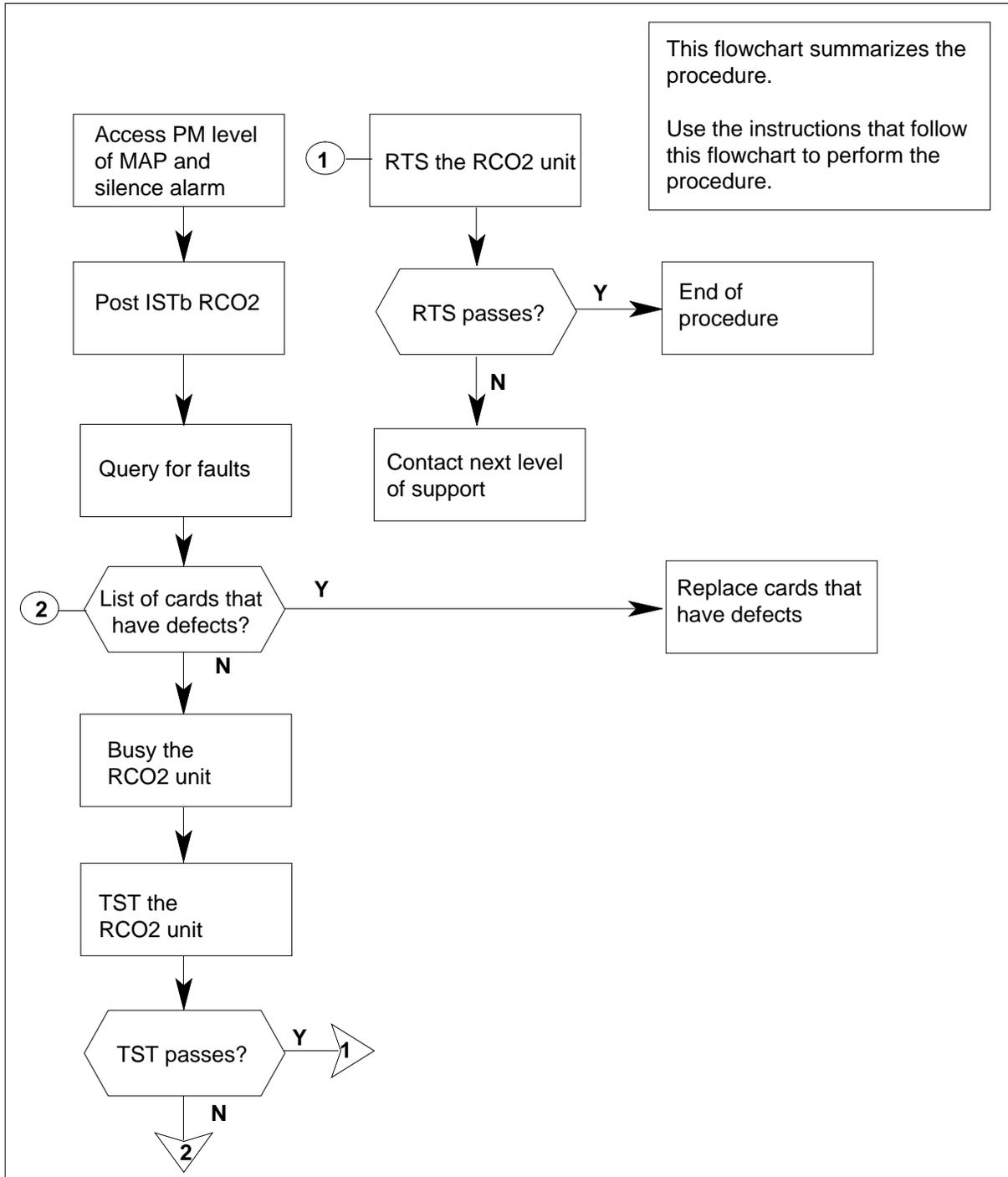
Common procedures

There are no common procedures.

Action

This section provides a summary flowchart of the procedure to clear an alarm. A detailed step-action procedure follows the flowchart.

PM RSC-M/RCO2
Major (continued)

Summary of clearing a PM RSC-M/RCO2 major alarm

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

```
                    ┌─────────────────┐        ┌─────────────────┐
                    │ Access PM level │     ┌1┐│ RTS the RCO2 unit│
                    │ of MAP and      │     └─┘└─────────────────┘
                    │ silence alarm   │
                    └─────────────────┘              │
                            │                        ▼
                            ▼                   ╱RTS passes?╲ ──Y──▶ End of
                    ┌─────────────────┐         ╲           ╱       procedure
                    │ Post ISTb RCO2  │              │
                    └─────────────────┘              N
                            │                        ▼
                            ▼                  ┌─────────────────┐
                    ┌─────────────────┐        │ Contact next    │
                    │ Query for faults│        │ level of support│
                    └─────────────────┘        └─────────────────┘
                            │
    ┌2┐                     ▼
    └─┘             ╱List of cards that╲ ──Y──▶ Replace cards that
                    ╲have defects?     ╱        have defects
                            │
                            N
                            ▼
                    ┌─────────────────┐
                    │ Busy the        │
                    │ RCO2 unit       │
                    └─────────────────┘
                            │
                            ▼
                    ┌─────────────────┐
                    │ TST the         │
                    │ RCO2 unit       │
                    └─────────────────┘
                            │
                            ▼
                    ╱TST passes?╲ ──Y──▶ 1
                    ╲           ╱
                            │
                            N
                            ▼
                            2
```

DMS-100 Family Remote Switching Center Multi-Access Maintenance Manual XPM11 and up

PM RSC-M/RCO2
Major (continued)

Clearing a PM RSC-M/RCO2 major alarm

At the MAP display

1

> ### ATTENTION
> Enter this procedure from a PM system-level clearing an alarm procedure step. This PM system-level clearing alarm procedure step identifies an RCO2-associated fault.

To silence the alarm, if required, type

>MAPCI;MTC;PM;SIL

and press the Enter key.

2   To identify the RCO2 that has faults, type

>DISP STATE ISTB RCO2

and press the Enter key.

Sample response on the MAP display:
Istb RCO2 : 2

3   To post the SysB RCO2, type

>POST RCO2 rco2_no

and press the Enter key.

where

   rco2_no
      is the number of the RCO2 displayed in step 2

Sample response on the MAP display:

RCO2		SysB	ManB	Offl	CBsy	ISTb	InSv
	PM	0	0	1	0	4	12
	RCO2	0	0	2	0	2	9

4   To check for fault indicators, type

>QUERYPM FLT

and press the Enter key.

Sample response on the MAP display:

```
 CM       MS       IOD      Net      PM       CCS      Lns      Trks     Ext
 .        .        .        .      1RCO2      .        .        .        .

RCO2                SysB     ManB     OffL     CBsy     ISTb     InSv
 0 Quit    PM         0        0        1        0        1       12
 2 Post_   RCO2       0        0        2        0        1        9
 3 ListSet
 4         RCO2  2 ISTb  Links_OOS:  CSide  1, PSide   0
 5 TRNSL_  Unit0:   Act InSv
 6 Tst_    Unit1:   Inact ISTb
 7 Bsy_    QUERYPM FLT
 8 RTS_        Unit0  InSv
 9 OffL        Unit1  C-side links out of service
10 LoadPM_
11 Disp_
12 Next
13 SWACT
14 QueryPM
15
16
17 Perform
18
```

If the system indicates	Do
a card that has faults	step 25
no cards have faults	step 5

5   To manually busy the SysB RCO2 unit, type

>BSY UNIT unit_no

and press the Enter key.

where

>   **unit_no**
>   is the number of the SysB RCO2 indicated in step 4

6   To test the ManB RCO2, type

>TST UNIT unit_no

and press the Enter key.

where

>   **unit_no**
>   is the number of the RCO2 unit manually busied in step 5

Sample response on the MAP display:

PM RSC-M/RCO2
Major (continued)

```
Test Passed
     or
Test Failed
```

If TST	Do
passes	step 24
fails, and the system produces a card list	step 25
fails, and the system produces a card list	step 7

7   To identify C-side links to the host PM that are in a SysB condition, type

>TRNSL C

and press the Enter key.

> **Note:** A host PM is a PCM-30 line group controller (PLGC).

Sample response on the MAP display:

```
LINK 0:   PLGC     1   0;CAP MS;STATUS:   OK,;MSGCOND: OPN,Restricted
LINK 1:   PLGC     1   1;CAP  S;STATUS:   OK
LINK 2:   PLGC     1   2;CAP MS;STATUS:   OK,;MSGCOND:OPN,Unrestricted
LINK 4:   PLGC     1   4;CAP  S;STATUS:   SysB
LINK 5:   PLGC     1   4;CAP  S;STATUS:   OK
LINK 6:   PLGC     1   4;CAP  S;STATUS:   OK
LINK 7:   PLGC     1   4;CAP  S;STATUS:   OK
```

If link	Do
is not busy	step 29
is a message link or a speech link	step 8

8   To post the host PM, type

>POST host_pm   host_pm_no

and press the Enter key.

where

> **host_pm**
>   is a PLGC

> **host_pm_no**
>   is the number of the PLGC

Sample response on the MAP display:

PM RSC-M/RCO2
Major (continued)

```
CM      MS     IOD     Net      PM    CCS     Lns     Trks     Ext
 .       .      .       .     1RCO2    .       .       .        .

PLGC                  SysB     ManB    OffL    CBsy    ISTb     InSv
 0 Quit    PM          0        0       1       0       4       12
 2 Post_   PLGC        0        0       2       0       2        9
 3 ListSet
 4         PLGC  1 ISTb  Links_OOS:  CSide   0, PSide   1
 5 Trnsl_  Unit0:   Act InSv
 6 Tst_    Unit1:   Inact InSv
 7 Bsy_
 8 RTS_
 9 OffL
10 LoadPM_
11 Disp_
12 Next
13 SwAct
14 QueryPM
15
16
17 Perform
18
```

9   To identify the P-side links that have faults, type

>TRNSL P

and press the Enter key.

Sample response on the MAP display:

```
LINK 0:   RCO2     2    0;CAP MS;STATUS:    OK,;MSGCOND: OPN,Restricted
LINK 1:   RCO2     2    1;CAP  S;STATUS:    OK
LINK 2:   RCO2     2    2;CAP MS;STATUS:    OK,;MSGCOND:OPN,Unrestricted
LINK 4:   RCO2     2    4;CAP  S;STATUS:    ISTb
LINK 5:   RCO2     2    4;CAP  S;STATUS:    OK
LINK 6:   RCO2     2    4;CAP  S;STATUS:    OK
LINK 7:   RCO2     2    4;CAP  S;STATUS:    OK
```

10   To busy the link that has faults, type

>BSY LINK link_no

and press the Enter key.

where

link_no
is the number of th P-side link that has faults chosen in step 9

11   To return the link to service, type

>RTS LINK link_no

and press the Enter key.

where

PM RSC-M/RCO2
Major (continued)

> **link_no**
>> is the number of the link manually busied in step 10

If RTS	Do
passes and alarm persists	step 29
passes and alarm clears	step 16
fails	step 12

12   To display any links that have faults, type

>TRKS;CARRIER;POST host_pm host_pm_no

and press the Enter key.

Sample response on the MAP display:

```
CLASS ML  OS    ALARM    SYSB  MANB    UNEQ  OFFL    CBSY  PBSY  INSV
TRUNKS 0  0     0        0     0       0     0       0     0     0
REMOTE 0  0     0        5     0       0     0       0     0     10

NO  CLASS  SITE    RCC  CKT  D  ALARM  SLIP FRAME    BER   SES   STATE
0   TRUNKS BRSCS   0    0    C         0    0        <-.7  0     INSV
1   REMOTE BRSCS   0    1    C         0    0        <-.7  0     INSV
2   REMOTE BRSCS   0    2    C         0    0        <-.7  0     MANB
                                                 MORE  .  .  .
```

> **Note:** The MORE . . . at the bottom of the display indicates the user can read more links. To read these links, type

>NEXT

and press the Enter key.

13   Perform the corrective procedure on the link that the MAP display in step 12 indicates.

> **Note:** The system can indicate message links that have faults. These links must be in the ManB state before the links can return to service (RTS).

14   To test the ManB link, type

>TST link_no

and press the Enter key.

where

> **link_no**
>> is the number of the ManB link. This link number is listed under the NO column as shown in the MAP display in step 12. The number for the ManB link in the example is1.

If TST	Do
passes and alarms clears	step 15

PM RSC-M/RCO2
Major (continued)

If TST	Do
fails	step 29

15   To post the host PM, type

>PM;POST host_pm host_pm_no

and press the Enter key.

where

> **host_pm**
>   is the PLGC posted in step 8

> **host_pm_no**
>   is the number of the PLGC

16   To return the link to service, type

>RTS LINK link_no

and press the Enter key.

where

> **link_no**
>   is the number of the link identified in step 9

If RTS	Do
passes	step 19
fails	step 29

17   To post the RCO2, type

>POST RCO2 rco2_no

and press the Enter key.

where

> **rco2_no**
>   is the number of the RCO2 identified in step 2

Note: This RCO2 must be ISTB.

18   To return the *inactive* unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

> **unit_no**
>   is the number of the RCO2 posted in step 19

If RTS	Do
passes	step 19

PM RSC-M/RCO2
Major (continued)

If RTS	Do
fails	step 29

19 To switch activity (SwAct) of the RCO2 units, to make sure the unit being tested is inactive, type

>**SWACT**

and press the Enter key.

Sample response on the MAP display:

```
SITE      FLR       RPOS BAY_ID       SHF  DESCRIPTION    SLOT EQPEC
RSCS0     01        A00 RSCM   00     32   RCO2 :   000   : 09  MX82
RSCS0     01        A00 RSCM   00     32   RCO2 :   000   : 08  6X69
RSCS0     01        A00 RSCM   00     32   RCO2 :   000   : 11  MX73
RSCS0     01        A00 RSCM   00     32   RCO2 :   000   : 15  MX74
RSCS0     01        A00 RSCM   00     32   RCO2 :   000   : 17  MX73
```

If the prompt indicates	Do
a warm SwAct will occur	step 21
a cold SwAct will occur	step 20

20

⚠️ **CAUTION**
Loss of service
All calls that this PM handles are lost, which include data calls. Perform this step during a period of low traffic only.

Perform the next step during a period of low traffic.

21 To confirm the SwAct initiated in step 19, type

>**YES**

and press the Enter key.

After both units are in-service, use the following information to determine where to go next in this procedure.

If SWACT	Do
passes	step 22
fails	step 29

---

22   To busy the *inactive* RCO2 unit, type

   >BSY UNIT unit_no

   and press the Enter key.

   where

   > **unit_no**
   > is the number of the *inactive* RCO2 unit

23   To perform an out-of-service (OOS) test on the *inactive* RCO2 unit, type

   >TST UNIT unit_no

   and press the Enter key.

   where

   > **unit_no**
   > is the number of the RCO2 unit busied in step 22

If TST	Do
passes	step 24
fails	step 25

24   To return the *inactive* RCO2 unit to service, type

   >RTS UNIT unit_no

   and press the Enter key.

   where

   > **unit_no**
   > is the number of the RCO2 unit tested in step 23

If RTS	Do
passes	step 30
fails	step 29

25   Check the card listing that appears in the following MAP display.

   Sample response on the MAP display:

```
SITE    FLR    RPOS    BAY_ID        SHF   DESCRIPTION     SLOT       EQPEC
RSCS0   01     A00     RSCM    00    32    RCO2 :   000    : 03       MX77
RSCS0   01     A00     RSCM    00    32    RCO2 :   000    : 08       MX76
RSCS0   01     A00     RSCM    00    32    RCO2 :   000    : 11       MX73
RSCS0   01     A00     RSCM    00    32    RCO2 :   000    : 15       MX74
RSCS0   01     A00     RSCM    00    32    RCO2 :   000    : 17       MX73
```

If all cards on the list	Do
are replaced	step 26

PM RSC-M/RCO2
Major (end)

If all cards on the list	Do
are not replaced	step 28

26   Determine if the user replaced the NTMX82 circuit card.

If the NTMX82 card	Do
is replaced	step 29
is not replaced	step 27

27   Refer to the card replacement procedure for the NTMX82 circuit card in *Card Replacement Procedures*. When you complete the card replacement procedures, go to step 11 of this procedure.

28   Refer to the card replacement procedure in *Card Replacement Procedures* for the next card on the card list. When you complete the card replacement procedures, go to step 23 of this procedure.

29   For further assistance on clearing this alarm, contact the next level of support.

30   This procedure is complete. If other alarms appear, refer to the correct clearing alarm procedure for the indicated alarms.

PM RSC-M/RCO2
minor

Alarm display
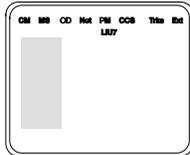
	CM	MS	IOD	Net	**PM**	CCS	Lns	Trks	Ext	EIO
	.	.	.	.	**1RCO2**	.	.	.	.	.

Indication

At the MTC level of the MAP display, a 1RCO2 under the peripheral module (PM) subsystem header indicates an remote switching center multi-access (RSC-M) minor alarm.

Note: In this section RSC-M/RCO2 is known as RCO2. When software outputs messages to the MAP terminal, the software does not recognize the difference between the two types of RCO2.

Meaning

The indicated number of RCO2 units are in the in-service trouble (ISTb) state.

Impact

This condition does not affect subscriber service.

Common procedures

There are no common procedures.

Action

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

PM RSC-M/RCO2
minor (continued)

Summary of clearing a PM RSC-M/RCO2 minor alarm

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Access PM level of MAP and silence alarm

Post ISTb RCO2

Query for faults

List of cards that have defects?

Busy the RCO2 unit

TST the RCO2 unit

TST passes?

1 RTS the RCO2 unit

RTS passes?

Y → End of procedure

N → Contact next level of support

Y → Replace cards that have defects
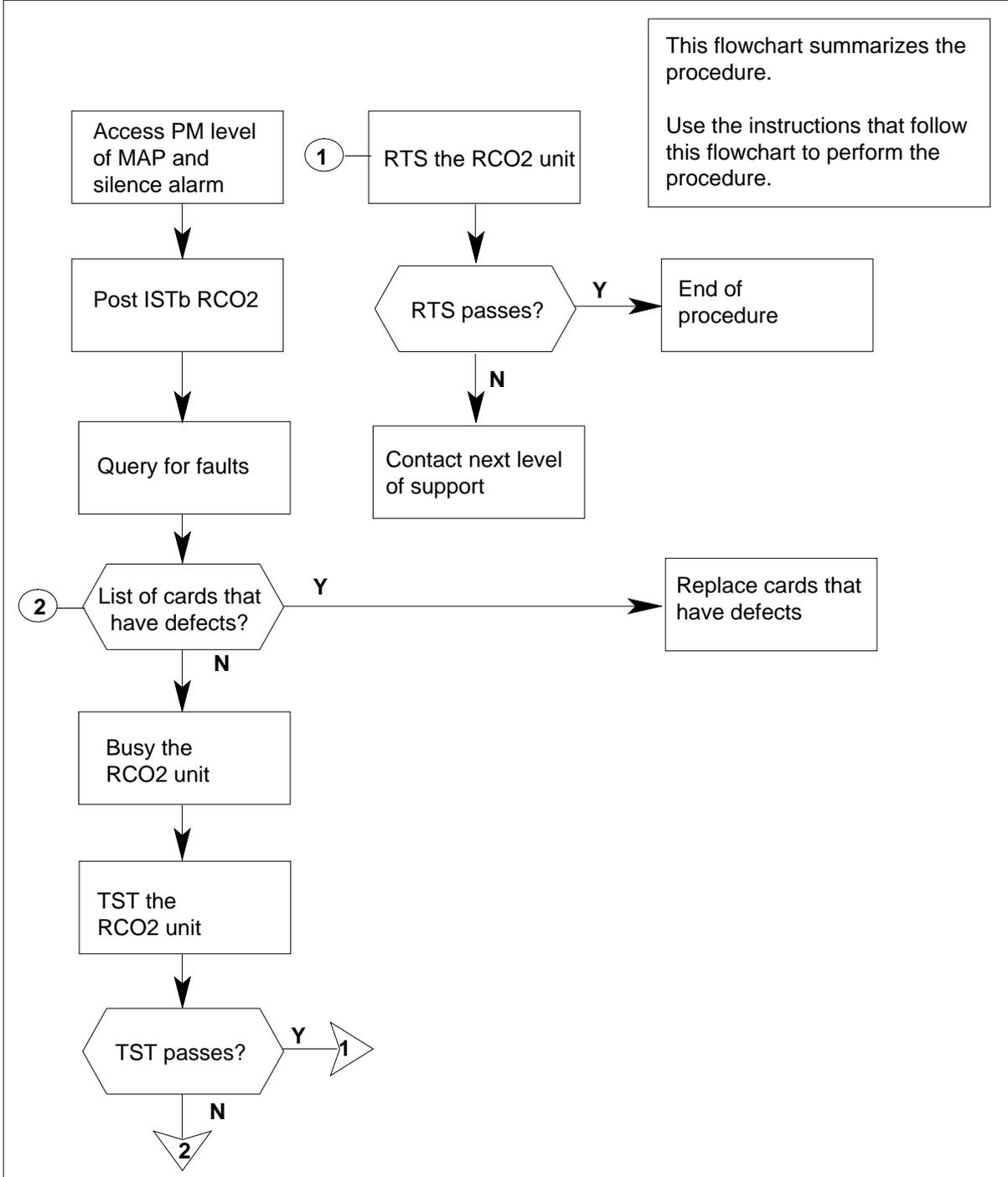
Clearing a PM RSC-M/RCO2 minor alarm

At the MAP display

1

<div style="border:1px solid black; padding:10px;">

ATTENTION

Enter this procedure from a peripheral module (PM) system-level alarm
clearing procedure step that identified an RCO2-associated fault.

</div>

To silence the alarm, if required, type

>MAPCI;MTC;PM;SIL

and press the Enter key.

2   To identify the defective RCO2, type

>DISP STATE ISTB RCO2

and press the Enter key.

Typical response on the MAP display:
ISTb RCO2 : 2

3   To post the ISTb RCO2, type

>POST RCO2 rco2_no

and press the Enter key.

where

rco2_no
is the number of the RCO2 in step 2

Typical response on the MAP display:

RCO2		SysB	ManB	Offl	CBsy	ISTb	InSv
	PM	0	0	1	0	4	12
	RCO2	0	0	2	0	2	9

4   To check for fault indicators, type

>QUERYPM FLT

and press the Enter key.

Typical response on the MAP display:

PM RSC-M/RCO2
minor (continued)

```
 CM      MS      IOD      Net      PM      CCS      Lns      Trks      Ext
 .       .       .        .      1RCO2     .        .        .         .

RCO2                 SysB      ManB      OffL      CBsy      ISTb      InSv
 0 Quit    PM         0         0         1         0         1        12
 2 Post_   RCO2       0         0         2         0         1         9
 3 ListSet
 4         RCO2   2 ISTb  Links_OOS:  CSide  1, PSide   0
 5 TRNSL_  Unit0:   Act InSv
 6 Tst_    Unit1:   Inact ISTb
 7 Bsy_    QUERYPM FLT
 8 RTS_        Unit0  InSv
 9 OffL        Unit1  C-side links out of service
10 LoadPM_
11 Disp_
12 Next
13 SWACT
14 QueryPM
15
16
17 Perform
18
```

If the system	Do
indicates a defective card	step 20
does not indicate a defective card	step 5

5   To manually busy the ISTb RCO2 unit, type

>**BSY UNIT unit_no**

and press the Enter key.

where

    unit_no
        is the number of the ISTb RCO2 in step 4

6   To test the ManB RCO2, type

>**TST UNIT unit_no**

and press the Enter key.

where

    unit_no
        is the number of the RCO2 unit manually busied in step 5

Typical response on the MAP display:

```
Test Passed
     or
Test Failed
```

If TST	Do
passes	step 19
fails and the system produces a card list	step 20
fails and the system does not produce a card list	step 7

7   To identify central-side (C-side) links to the host PM that are busied by the system (SysB), type

>TRNSL C

and press the Enter key.

> **Note:** The host PM is a PCM-30 line group controller (PLGC).

Typical response on the MAP display:

```
LINK 0:   PLGC    1   0;CAP MS;STATUS:    OK,;MSGCOND: OPN,Restricted
LINK 1:   PLGC    1   1;CAP  S;STATUS:    OK
LINK 2:   PLGC    1   2;CAP MS;STATUS:    OK,;MSGCOND:OPN,Unrestricted
LINK 4:   PLGC    1   4;CAP  S;STATUS:    SysB
LINK 5:   PLGC    1   4;CAP  S;STATUS:    OK
LINK 6:   PLGC    1   4;CAP  S;STATUS:    OK
LINK 7:   PLGC    1   4;CAP  S;STATUS:    OK
```

8   To post the host PM, type

>POST host_pm host_pm_no

and press the Enter key.

where

> **host_pm**
>   is the PLGC

> **host_pm_no**
>   is the number of the PLGC

Typical response on the MAP display:

PM RSC-M/RCO2
minor (continued)

```
CM     MS     IOD     Net     PM      CCS     Lns     Trks    Ext
.      .      .       .     1RCO2     .       .       .       .

PLGC                  SysB    ManB    OffL    CBsy    ISTb    InSv
 0 Quit    PM          0       0       1       0       4       12
 2 Post_   PLGC        0       0       2       0       2        9
 3 ListSet
 4         PLGC   1 ISTb  Links_OOS:  CSide  0, PSide   1
 5 Trnsl_  Unit0:   Act InSv
 6 Tst_    Unit1:   Inact InSv
 7 Bsy_
 8 RTS_
 9 OffL
10 LoadPM_
11 Disp_
12 Next
13 SwAct
14 QueryPM
15
16
17 Perform
18
```

9   To identify the peripheral-side (P-side) links that have defects, type

>TRNSL P

and press the Enter key.

Typical response on the MAP display:

```
LINK 0:    RCO2     2    0;CAP MS;STATUS:    OK,;MSGCOND: OPN,Restricted
LINK 1:    RCO2     2    1;CAP  S;STATUS:    OK
LINK 2:    RCO2     2    2;CAP MS;STATUS:    OK,;MSGCOND:OPN,Unrestricted
LINK 4:    RCO2     2    4;CAP  S;STATUS:    ISTb
LINK 5:    RCO2     2    4;CAP  S;STATUS:    OK
LINK 6:    RCO2     2    4;CAP  S;STATUS:    OK
LINK 7:    RCO2     2    4;CAP  S;STATUS:    OK
```

10   To busy the link that has defects, type

>BSY LINK link_no

and press the Enter key.

where

> **link_no**
> is the number of the P-side link in step 9

11   To test the defective link, type

>TST LINK link_no

and press the Enter key.

where

PM RSC-M/RCO2
minor (continued)

> **link_no**
> is the number of the link manually busied in step 10

If TST	Do
passes and alarm persists	step 24
passes and alarm clears	step 17
fails	step 12

12   To display any links that can have defects, type

>TRKS;CARRIER;POST host host_no

and press the Enter key.

Typical response on the MAP display:

```
CLASS ML  OS    ALARM      SYSB  MANB    UNEQ  OFFL      CBSY  PBSY  INSV
TRUNKS 0  0     0          0     0       0     0         0     0     0
REMOTE 0  0     0          5     0       0     0         0     0     10

NO  CLASS  SITE    RCC  CKT  D  ALARM  SLIP FRAME     BER  SES   STATE
0   TRUNKS BRSCS   0    0    C         0    0         <-.7 0     INSV
1   REMOTE BRSCS   0    1    C         0    0         <-.7 0     INSV
2   REMOTE BRSCS   0    2    C         0    0         <-.7 0     MANB
                                                 MORE . . .
```

> **Note:** The MORE . . . at the bottom of the display indicates that you can observe more links. To observe more links, type

>NEXT

and press the Enter key.

13   Carry out the repair/corrective procedure the MAP display indicates in step 12.

> **Note:** If the system indicates message links that can have defects, these links must be in a ManB state before the links can be returned to service (RTS).

14   To test the ManB link, type

>TST link_no

and press the Enter key.

where

> **link_no**
> is the number of the ManB link. This link number appears under the

> NO column as indicated in the MAP display in step 12. The number

PM RSC-M/RCO2
minor (continued)

for the ManB link in the example is 2.

If TST	Do
passes and alarm clears	step 15
fails	step 24

15   To post the host PM, type

>PM;POST host_pm host_pm_no

and press the Enter key.

where

    host_pm
        is the PLGC in step 8

    host_pm_no
        is the number of the PLGC

16   Use the information in step 7 to determine which RCO2 unit associates with the SysB link. The unit must be *inactive* to continue.

If RCO2 unit	Do
is inactive	step 21
is active	step 17

17   To RTS the link, type

>RTS LINK link_no

and press the Enter key.

where

    link_no
        is the number of the link in step 9

    Note: Each link in step 9 must be RTS.

18   To post the RCO2, type

>POST RCO2 rco2_no

and press the Enter key.

where

    rco2_no
        is the number of the RCO2 in step 2

    Note: This RCO2 must be SysB.

19   To RTS the *inactive* unit, type

>RTS UNIT unit_no

and press the Enter key.

where

    unit_no
      is the number of the RCO2 in step 18

If RTS	Do
passed	step 25
failed	step 20

20   Observe the card listing in the following MAP display.

Typical response on the MAP display:

```
SITE      FLR        RPOS BAY_ID        SHF   DESCRIPTION    SLOT EQPEC
RSCS0     01         A00  RSCM    00    32    RCO2 :  000    : 09  MX82
RSCS0     01         A00  RSCM    00    32    RCO2 :  000    : 08  6X69
RSCS0     01         A00  RSCM    00    32    RCO2 :  000    : 11  MX73
RSCS0     01         A00  RSCM    00    32    RCO2 :  000    : 15  MX74
RSCS0     01         A00  RSCM    00    32    RCO2 :  000    : 17  MX73
```

If all cards on the list	Do
are replaced	step 21
are not replaced	step 23

21   Determine if the NTMX82 circuit card was replaced.

If the NTMX82 card	Do
is replaced	step 24
is not replaced	step 22

22   Perform the card replacement procedure for the NTMX82 circuit card in *Card Replacement Procedures*. Finish the card replacement procedures and go to step 19.

23   Perform the card replacement procedure in *Card Replacement Procedures* for the next card on the card list. Finish with the card replacement procedures and go to step 19.

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

25   This procedure is complete. If the system displays other alarms, perform the appropriate alarm clearing procedures.

6 RSC-M card replacement procedures

This section contains card replacement procedures for the Remote Switching Center Multi-access. These procedures describe the removal and replacement of defective cards. Maintenance engineering and field maintenance personnel use these procedures.

This section references the following common procedures:

- "Removing and replacing a card"
- "Returning a card for repair or replacement"

NT6X69
in an RSC-M

Application

This procedure replaces an NT6X69 circuit card in a Remote Switching Center Multi-access (RSC-M) main shelf.

Note: In the examples of this section, RSC-M refers to RCO2. When software outputs messages to the MAP terminal, the software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NT6X69	LB	Message and tone card

Common procedures

Does not apply

Action

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

NT6X69
in an RSC-M (continued)

Summary of card replacement procedure for an NT6X69 card in an RSC-M RCO2

```
┌──────────────┐
│ Locate       │
│ defective card│
└──────┬───────┘
       │
       ▼
┌──────────────┐
│ Verify card is│
│ from inactive │
│ unit          │
└──────┬───────┘
       │
       ▼
┌──────────────┐
│ Manually busy │
│ inactive unit │
└──────┬───────┘
       │
       ▼
┌──────────────┐
│ Remove and    │
│ replace defective│
│ card          │
└──────┬───────┘
       │
       ▼
┌──────────────┐
│ RTS inactive  │
│ unit          │
└──────┬───────┘
       │
       ▼
   ╱─────────╲      Y    ┌──────────────┐
  ╱ RTS passed? ╲───────▶│ Return to original│
  ╲             ╱        │ procedure     │
   ╲─────────╱           └──────────────┘
       │ N
       ▼
┌──────────────┐
│ Contact next  │
│ level of support│
└──────────────┘
```

This flowchart is a summary of the procedure.

Use the flowchart to review the procedure. Follow the steps to perform the procedure.
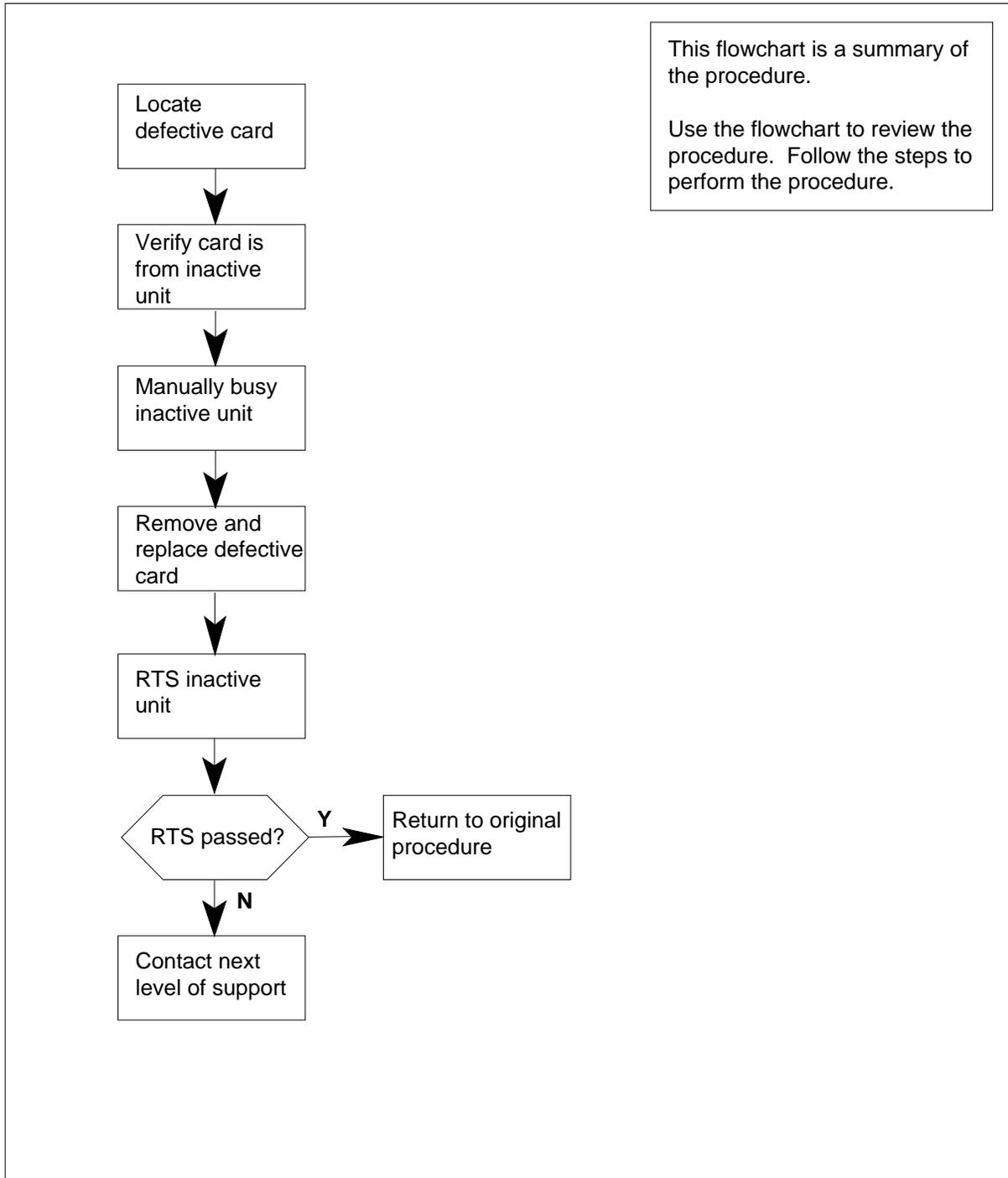
NT6X69
in an RSC-M (continued)

To Replace a/an NT6X69 in an RSC-M

At your Current Location:

1   Continue with this procedure if:

- a step in a maintenance procedure directs you to this card
- you use this procedure to verify or accept cards
- your maintenance support group directs you to this procedure.

2

> **WARNING**
> **Loss of service**
> When you replace a card in the RSC-M, make sure that the unit in which you replace the card is *inactive* and the mate unit is *active*.

Obtain a replacement card. Make sure the replacement card has the same PEC and PEC suffix, as the card to be removed.

At the MAP terminal

3   Make sure the peripheral module (PM) level of the MAP display appears, type:

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

    rco2_no
        is the number of the rco2 with the defective card

Example of a MAP display:

```
CM      MS     IOD     Net     PM      CCS     LNS     Trks    Ext    Appl
 .      .      .       .       .       .       .       .       .      .

RCO2                  SysB     ManB    OffL    CBsy    ISTb           InSv
 0 Quit    PM         0        0       0       0       0             25
 2 Post_   RCO2       0        0       0       0       0             0
 3 ListSet
 4         RCO2    0 InSv  Links_OOS:
 5 TRNSL   Unit0:    Inact InSv
 6 TST     Unit1:    Act InSv
 7 BSY
 8 RTS
 9 OffL
10 LoadPM_
11 Disp_
12 Next_
13
14 QueryPM
15
16
17
18
```

4   Check the MAP display to make sure that the card to be removed is on the inactive unit.

If defective card is on	Do
active unit	step 4
inactive unit	step 6

5   To switch the processing activity (SWACT) to the inactive unit,type:

>SWACT

and press the Enter key.

Example of a MAP response:

```
RSCM 0      A Warm SwAct will be performed after
             data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If	Do
you must confirm the command	step 6
the system rejects the SWACT	step 23

NT6X69
in an RSC-M (continued)

6   To confirm the system prompt, type:

>YES

and press the Enter key.

When both units are in-service, proceed to the next step.

At the RSC-M

7   Place a sign with the words Active unit-Do not touch on the unit. Do not attach the sign with magnets or tape.

At the MAP terminal

8   To busy the inactive PM unit, type:

>bsy unit rco2_unit_no

and press the Enter key.

where

> **rco2_unit_no**
> is the number of the inactive RCO2 unit zero or one

9   To set the PM to the ROM level and stop messaging, type:

>PMRESET UNIT rco2_unit_no NORUN

and press the Enter key.

where

> **rco2_unit_no**
> is the number of the inactive RCO2 unit zero or one

NT6X69
in an RSC-M (continued)

At the RSC-M

10

> **WARNING**
> **Static electricity damage**
> Before you remove cards, put on a wrist strap that connects to the wrist strap grounding point on the left side of the modular supervisory panel (MSP) of the RSC-M. The wrist strap protects the equipment against static electricity damage.

> **DANGER**
> **Equipment damage**
> Take these precautions when you remove or insert a card:
>
> 1. Do not apply direct pressure to the components.
>
> 2. Do not force the card in the slots.

Put on a wrist strap.

11 The following figures show how to remove the NT6X69 card:

   a Locate the card to be removed on the appropriate shelf.
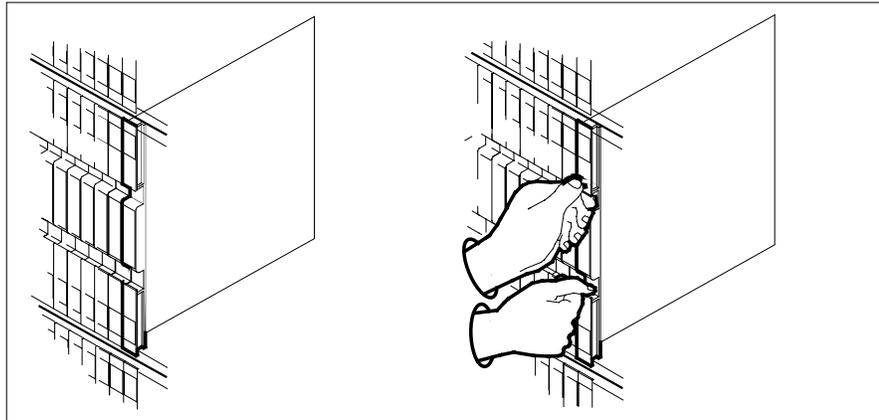
   b Open the locking levers on the card to be replaced. Carefully pull the card toward you until the card clears the shelf.

NT6X69
in an RSC-M (continued)
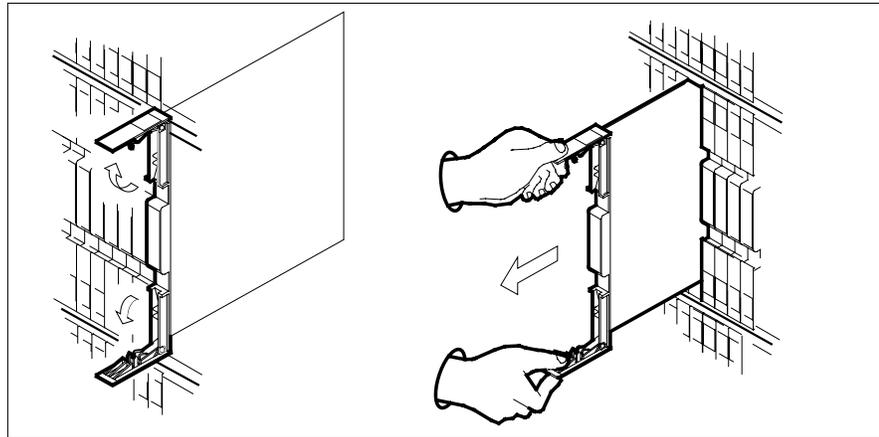
    c   Make sure the replacement card has the same PEC and PEC suffix, as the card you removed.

12   Open the locking levers on the replacement card.

    a   Align the card with the slots in the shelf.

    b   Carefully slide the card in the shelf.
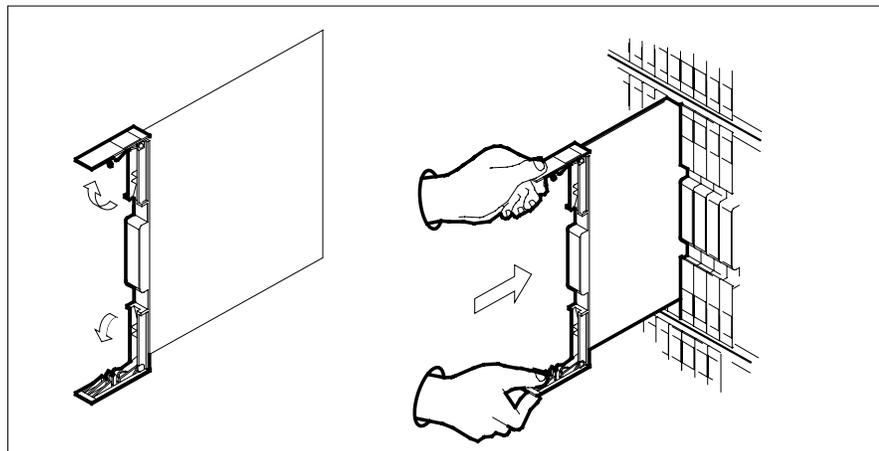
13

> ⚠️ **CAUTION**
> **Loss of subscriber service**
> Subscriber service can occur in the active unit when you
> reseat the NT6X69 card.
>
>
> Peform this procedure during low traffic periods.

Seat and lock the card.

a   Use your fingers or thumbs to push on the upper and lower edges of the
faceplate. Make sure that the card sits completely in the shelf.

b   Close the locking levers.
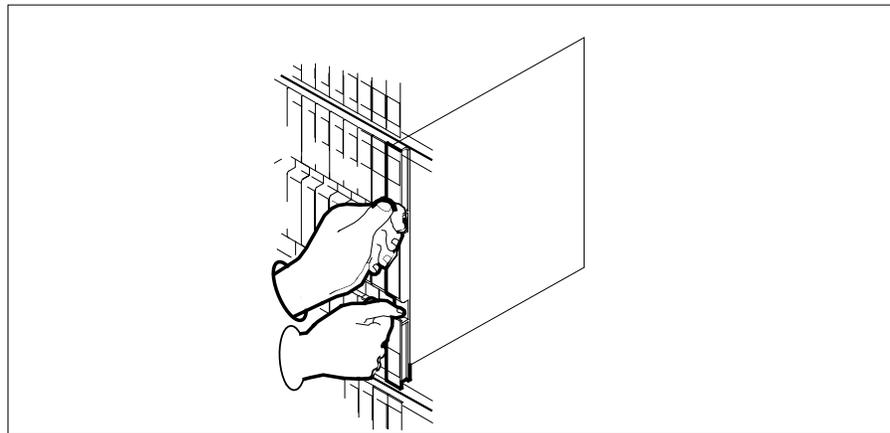
At the MAP terminal

14   To perform a full reset of the inactive unit, type:

>**PMRESET UNIT rco2_unit_no**

and press the Enter key.

where

rco2_unit_no
is the number of the inactive RCO2 unit zero or one

If PMRESET	Do
passes	step 17
fails, try loading this unit again	step 15

NT6X69
in an RSC-M (continued)

If PMRESET	Do
fails with a card list	step 20

15   To load the inactive unit, type:

>LOADPM UNIT rco2_unit_no CC

and press the Enter key.

where

> **rco2_unit_no**
> is the number of the inactive RCO2 unit zero or one

If LOADPM	Do
passes	step 16
fails	step 21
fails with a card list	step 20

16   Use the following information to determine the next step in this procedure:

If you entered this procedure from	Do
How to clear an procedure	step 20
other	step 17

17   To return the inactive RCO2 unit to service, type:

>RTS UNIT rco2_unit_no

and press the Enter key.

where

> **rco2_unit_no**
> is the number of the inactive RCO2 unit zero or one

If RTS	Do
passes	step 18
fails	step 21

18   Send the defective cards for repair according to local procedure.

19   Record the date the card is replaced, the serial number of the card, and the problems that prompted replacement of the card. Go to step 22.

20   Return to the procedure that directed you to this procedure. At the point where the system produced a defective card list, identify the next damaged

NT6X69
in an RSC-M (end)

card on the list. Go to the appropriate card replacement procedure for that card in this manual.

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

22   This procedure is complete. Remove the sign from the active unit. Return to the maintenance procedure that directed you to this card replacement procedure. Continue as directed.

23   For additional help, keep 2, contact the next level of support.

> ***Note:*** The system can recommend you use the SWACT command with the FORCE option. When this condition occurs, contact the office personnel to determine if use of the FORCE option is correct.

NT6X78
in an RSC-M

Application

> *Note:* In the examples of this section RSC-M refers to RCO2. When software outputs messages to the MAP terminal the software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NT6X78	AB	CLASS Modem Resource

Common procedures

This section refers to the following procedures:

- replacing a card
- returning a card

Action

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

NT6X78
in an RSC-M (continued)

Summary of replacing an NT6X78 in an RSC-M

```
┌─────────────────┐
│ Post RSC-M      │
│ and make unit   │
│ inactive        │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Manually busy   │
│ CMR card in     │
│ inactive unit   │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Replace the     │
│ card            │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Return CMR      │
│ card to service │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│                 │
│      End        │
│                 │
└─────────────────┘
```

This flowchart is a summary of the procedure.

Use the flowchart to review the procedure. Follow the steps to perform the procedure.
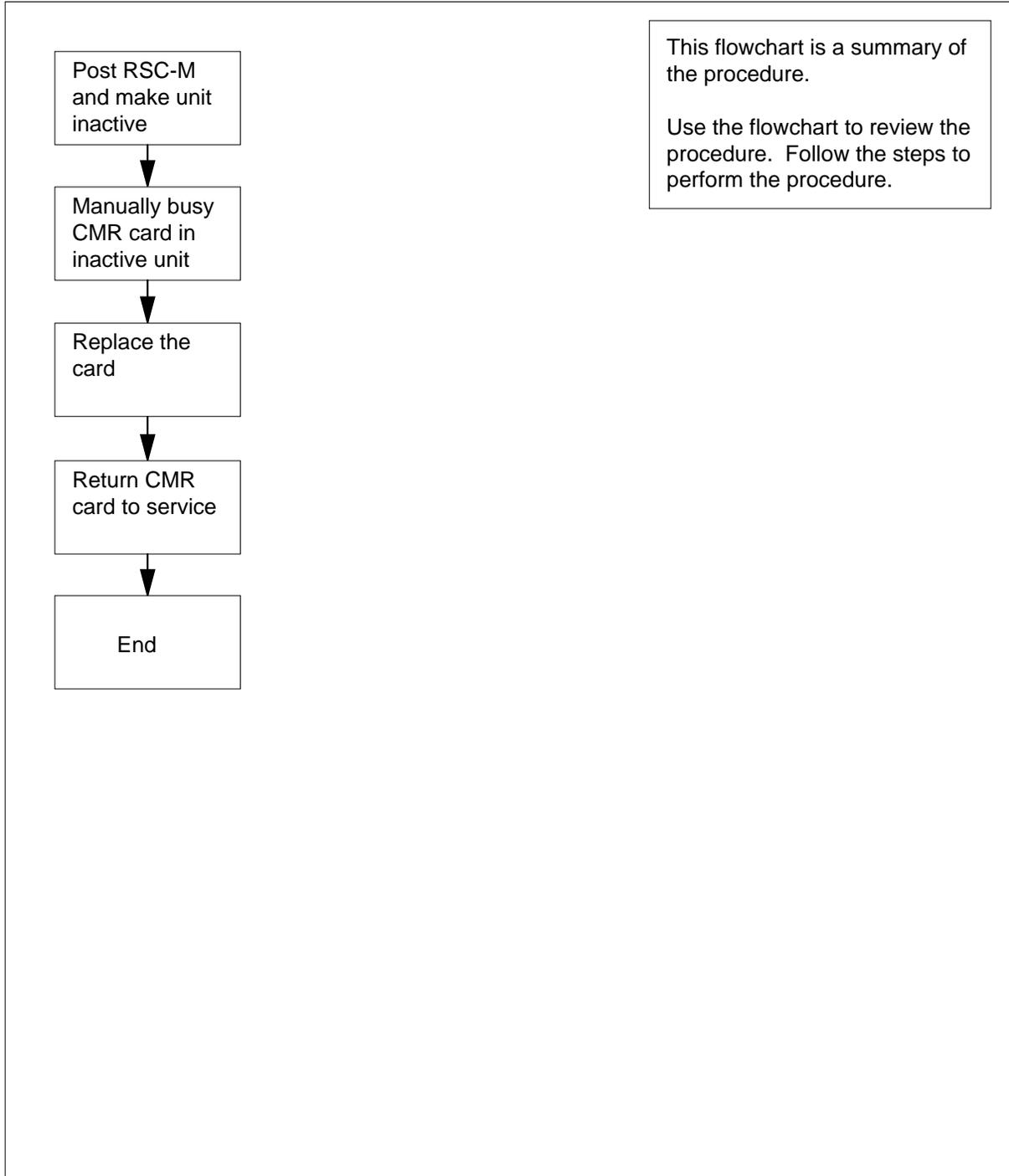
NT6X78
in an RSC-M (continued)

Summary of replacing an NT6X78 in an RSC-M

At the MAP display:

1 Proceed if one the following conditions apply:

- a step in a maintenance procedure directs you to this card
- you use this procedure to verify or accept cards
- your maintenance support group directs you to this procedure.

2

> **WARNING**
> **Loss of service**
> When you replace a card in the RSC-M, make sure the unit in
> which you replace the card is *inactive* and the mate unit is
> *active*.

Obtain an NT6X78 replacement circuit card. Make sure the replacement
circuit has the same product engineering code (PEC) and PEC suffix, as the
circuit card to be removed.

At the MAP terminal

3 To access the peripheral module (PM) level of the MAP display and to post
the RSC-M/RCO2 with the defective card, type:

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

> **rco2_no**
> is the PM number zero to 255

Example of a MAP response:

```
              SysB     ManB     OffL     CBsy     ISTb     InSv
   PM                   0        0        5        0        1
   RCO2                 0        0        0        0        0

RCO2     0 InSv  Links_OOS: CSide  1 , PSide  0
Unit0:   Inact InSv
Unit1:   Act   ISTb
```

4 To determine the location of the RCO2 that contains the NT6X78 circuit card
you are to replace, type:

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname: UK00ADU6 EEPRom Load:
BNK0N205
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
RSC-M 00  C02  RSC-M 00  05  RCO2: 000        MX85AA
RSC-M 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   Check the MAP display to make sure the circuit card you are to remove is on the inactive unit.

If defective card is on the	Do
active unit	step 6
inactive unit	step 8

6   To switch activity of the units, type:

>SWACT

and press the Enter key.

Example of a MAP response:

```
RCO2 0     A Warm SwAct will be performed after
           data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If	Do
the system prompts you to confirm a warm Switch of Activity (SWACT)	step 7
the system rejects the SWACT	step 20

7   To confirm the command, type:

>YES

and press the Enter key.

Example of a MAP response:

NT6X78
in an RSC-M (continued)

```
Unit0:    Inact SysB  Mtce
Unit1:    Act   ISTb

RCO2 0     SwAct Passed
```

Note: A maintenance flag (Mtce) can appear. This Mtce indicates system-initiated maintenance tasks are in progress. Wait until the flag disappears from the status lines for both PM units before you proceed to the next step.

If the MAP response is	Do
is SWACT passed	step 8
is other than listed here	step 19

8 To busy the inactive unit, type:

>BSY UNIT unit_no CMR

and press the Enter key.

where

> **unit_no**
> is the number of the inactive RCO2 unit zero or one

At the cabinet

9 Place a sign with the words *Active unit-Do not touch* on the active unit. Do not attach the sign with magnets or tape.

At the shelf

10

⚡ **WARNING**
Static electricity damage
Wear with a strap that connects the wrist-strap grounding modular supervisory panel (MSP) to handle circuit cards. The wrist strap protects the cards against static electricity damage.

Locate the circuit card to be replaced.

> **Note:** The NT6X78 circuit cards, are in slot five of unit zero, and slot 23 of unit one.

11 To replace the card, use the common replacing a card procedure in this document. Complete the procedure and return to this point.

> **Note:** If the circuit card you replace has switches, make sure the switches on the replacement circuit card have the same settings.

12   Use the following information to determine the next step:

If you	Do
are directed to this procedure from a maintenance procedure	step 13
are not directed to this procedure from a maintenance procedure	step 14

13   Remove the sign from the active unit. Return to the maintenance procedure that sent you to this procedure and continue as directed.

14   To load the CLASS modem resource (CMR) in the inactive RCO2 unit, type:

>LOADPM UNIT unit_no CC CMR

and press the Enter key.

where

> **unit_no**
> is the number of the inactive RCO2 unit

If LOAD	Do
passes	step 15
fails	step 19

15   To return to service (RTS) the CMR in the inactive RCO2 unit, type:

>RTS UNIT unit_no CMR

and press the Enter key.

where

> **unit_no**
> is the number of the RCO2 unit loaded in step 15

If RTS	Do
passes	step 16
fails	step 19

At the cabinet

16   Remove the sign from the active RCO2 unit.

17   Go to the common returning a card procedure in this document.

18   This procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

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

NT6X78
in an RSC-M (end)

20   For additional help with the SWACT, contact the the next level of support.

> ***Note:*** The system can recommend the use of the SWACT command with the FORCE option. If this condition occurs, contact office personnel to determine if use of the FORCE option is correct.

NT6X92
in an RSC-M

Application

Use this procedure to replace an NT6X92 circuit card in a Remote Switching Center Multi-access (RSC-M) main shelf.

Note: In the examples of this section, RSC-M refers to RCO2. When software outputs messages to the MAP terminal, the software does not differentiate between the two types of RCO2.

ATTENTION
For maximum performance, do not install the UTR and GTR on the same RSC-M RC02. Currently there is no way to determine which receiver is used to interpret tones. Some call processing tones can be degraded if the tones are designed for use with a GTR.

PEC	Suffixes	Name
NT6X92	CA	Universal tone receiver card (UTR)
NT6X92	EA	Global tone receiver card (GTR)

Common procedures

This section refers to the following procedures:

- replacing a card
- returning a card

Action

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

NT6X92
in an RSC-M (continued)

Summary of Replacing an NT6X92 in an RSC-M

Post RSC-M
and make unit
inactive

↓

Manually busy
RSC-M unit
and reset

↓

Replace the
card

↓

Return RSC-M
unit to service

↓

End

This flowchart is a summary of
the procedure.

Use the flowchart to review the
procedure. Follow the steps to
perform the procedure.
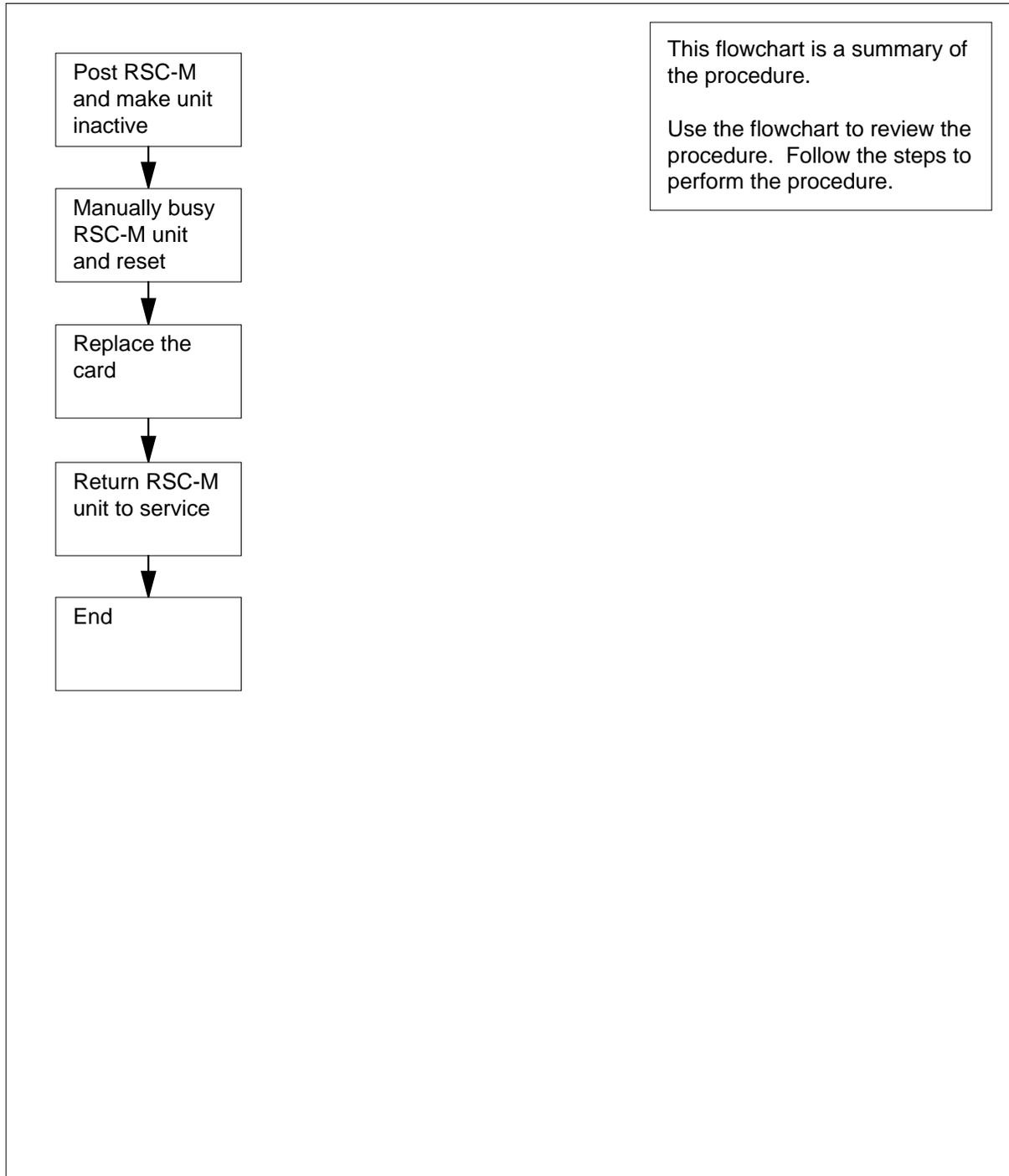
NT6X92
in an RSC-M (continued)

To replace an NT6X92 in an RSC-M

At the MAP display

1   Proceed if one of the following conditions apply:

- a step in a maintenance procedure directed you to this card replacement procedure
- you use this procedure to verify or accept cards
- the maintenance support group directed you to this procedure

2

> **WARNING**
> **Loss of service**
> When you replace a card in the RSC-M, make sure the unit in which you replace the card is *inactive* and the mate unit is *active*.

Obtain an NT6X92 replacement circuit card. Make sure the replacement circuit card has the same product engineering code (PEC) and PEC suffix, as the circuit card to be removed.

At the MAP terminal

3   To access the peripheral module (PM) level of the MAP display and to post the RSC-M/RCO2 with the defective card, type:

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

    rco2_no
      is the PM number zero to 255

Example of a MAP response:

NT6X92
in an RSC-M (continued)

```
RCO2              SysB    ManB    OffL    CBsy    ISTb    InSv
  0 Quit    PM      0       0       2       0       2       25
  2 Post_   RCO2    0       0       0       0       1       1
  3 ListSet
  4         RCO2  0 ISTb  Links_OOS:  CSide  1, PSide   1
  5 TRNSL   Unit0:   Inact ISTb
  6 TST     Unit1:   Act InSv
  7 BSY
  8 RTS
  9 OffL
 10 LoadPM_
 11 Disp_
 12 Next_
```

4   To determine the location of the RCO2 that contains the NT6X92 circuit card you are to replace, type:

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname: UK00ADU6 EEPRom Load:
BNK0N205
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
HOST 00  C02  RSC-M 00  05  RCO2: 000        MX85AA
HOST 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   Determine the state of the RCO2 unit for the circuit card you are to replace.

If the state of the RCO2 unit	Do
is active	step 6
is inactive	step 8

6   To switch activity (SWACT) of the units, type:

>SWACT

and press the Enter key.

Example of a MAP response:

```
RCO2 0     A Warm SwAct will be performed after
           data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If the system	Do
prompts you to confirm a warm SWACT	step 7
rejects the SWACT	step 20

7   To confirm the command, type:

>YES

and press the Enter key.

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act    ISTb

RCO2 0     SwAct Passed
```

If the MAP response	Do
is SWACT passed	step 8
is other than listed here	step 19

8   A maintenance flag (Mtce) can appear. A maintenance flag indicates system-initiated maintenance tasks are in progress. Wait until the flag disappears from the status lines for both RCO2 units before you proceed to the next step.

At the cabinet

9   Place a sign with the words *Active unit-Do not touch* on the active unit. Do not attach this sign with magnets or tape.

10   To manually busy (ManB) the inactive unit, type:

>BSY INACTIVE

and press the Enter key.

Example of a MAP response:

NT6X92
in an RSC-M (continued)

```
RCO2    0 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:   Inact ManB
Unit1:   Act   ISTb
Bsy INACTIVE
RCO2 0 Unit 0   Bsy Passed
```

If the BSY command	Do
passes	step 11
fails	step 19

At the shelf

11

```
  ⚠  WARNING
     Static electricity damage
     Wear a wrist strap that connects to the wrist-strap grounding
     point of the modular supervisory panel (MSP) to handle
     circuit cards.  The wrist strap protects the cards against static
     electricity damage.
```

Locate the circuit card to replace.

> *Note:* The NT6X92 circuit cards, are in slots 6 and 7 of unit 0, and slots
> 21 and 22 of unit 1.

12 To replace the card, use the common replacing a card procedure in this
document. Complete the procedure and return to this point.

> *Note:* If the card you replace has switches, make sure the switches on the
> replacement circuit card have the same settings.

13 The next action depends on the reason you performed this procedure.

If a maintenance procedure	Do
directs you to this procedure	step 14
does not direct you to this proce-dure	step 15

14 Remove the sign from the active unit. Return to the maintenance procedure
that sent you to this procedure. Continue as directed.

At the MAP terminal

15   To return the inactive unit to service, type:

   >RTS   INACTIVE

   and press the Enter key.

If the RTS command	Do
passes	step 16
fails	step 19

16   Remove the sign from the active unit.

17   Go to the common returning a card procedure in this document.

18   This procedure is complete.

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

20   For additional help with a SWACT, contact the next level of support.

   Note: The system can recommend the use of the SWACT command with the FORCE option. If this condition occurs, contact office personnel to determine if the use of the FORCE option is acceptable.

NTMX72
in an RSC-M

Application

Use this procedure to replace an NTMX72 circuit card in a Remote Switching Center Multi-Access (RSC-M) main shelf.

Note: In the examples in this section RSC-M refers to RCO2. When software outputs messages to the MAP terminal, the software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTMX72	AA, AB	Power converter

Common procedures

This section refers to the following common procedures:

- replacing a card
- returning a card

Action

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

NTMX72
in an RSC-M (continued)

Summary of replacing an NTMX72 in an RSC-M

```
┌─────────────────┐
│ Post RSC-M      │
│ and make unit   │
│ inactive        │
└────────┬────────┘
         │
         ▼
┌─────────────────┐
│ Manually busy   │
│ and reset       │
│ RSC-M unit      │
└────────┬────────┘
         │
         ▼
┌─────────────────┐
│ Replace the     │
│ card            │
└────────┬────────┘
         │
         ▼
┌─────────────────┐
│ Load RSC-M      │
│ unit and return │
│ to service      │
└────────┬────────┘
         │
         ▼
┌─────────────────┐
│ End             │
└─────────────────┘
```

This flowchart is a summary of the procedure.

Use the flowchart to review the procdure. Follow the steps to perform the procedure.
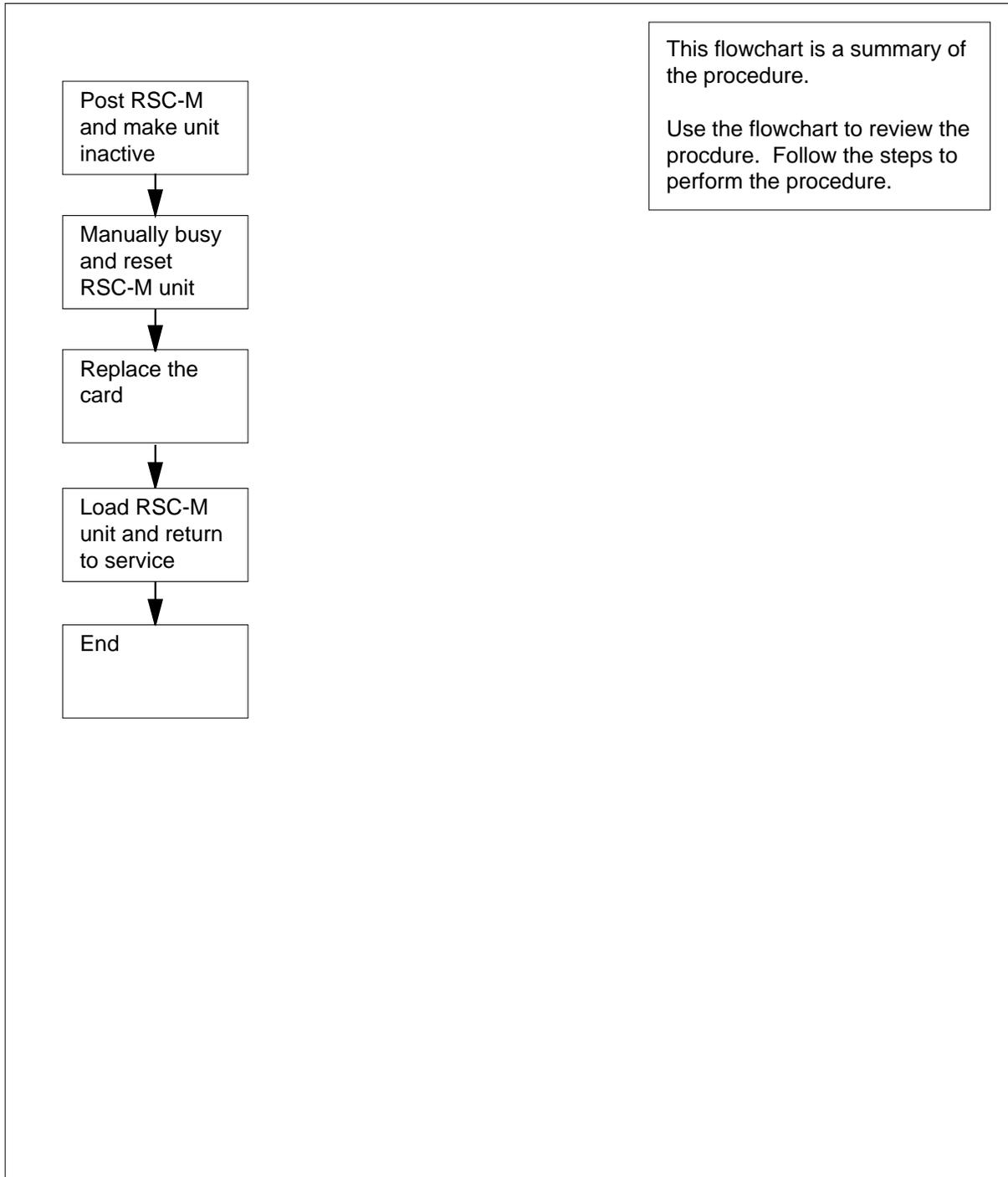
NTMX72
in an RSC-M (continued)

To replace an NTMX72 in an RSC-M

At the MAP display

1   Proceed if one of the following conditions apply:

- a step in a maintenance procedure directed you to this card replacement procedure

- you use this procedure to verify or accept cards

- the maintenance support group directed you to this procedure.

2

> **WARNING**
> **Loss of service**
> When you replace a card in the RSC-M, make sure the unit in which you replace the card is *inactive* and the mate unit is *active*.

Obtain an NTMX72 replacement circuit card. Make sure the replacement circuit card has the same product engineering code (PEC) and PEC suffix, as the circuit card to be removed.

At the MAP terminal

3   To access the peripheral module (PM) level of the MAP display and to post the RSC-M/RCO2 with the defective card, type:

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

> **rco2_no**
>   is the PM number zero to 255

Example of a MAP response:

NTMX72
in an RSC-M (continued)

```
RSC-M               SysB      ManB      OffL      CBsy      ISTb      InSv
 0 Quit    PM        0         0         2         0         2         25
 2 Post_   RCO2      0         0         0         0         1         1
 3 ListSet
 4         RCO2    0 ISTb  Links_OOS:  CSide  1, PSide   1
 5 TRNSL   Unit0:    Inact CBsy
 6 TST     Unit1:    Act InSv
 7 BSY
 8 RTS
 9 OffL
10 LoadPM_
11 Disp_
12 Next_
```

4   To determine the location of the RCO2 that contains the NTMX72 circuit card
you are to replace, type:

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname:KRI07BI1 EEPRom Load:MX77NG03
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
RSC-M 00  C02  RSC-M 00  05  RCO2: 000         MX85AA
RSC-M 00  C02  RSC-M 00  47  EXT:LEFT   01:13 MX86AA
```

5   Determine the state of the RCO2 unit for the circuit card you are to replace.

If the state of the RCO2 unit	Do
is active	step 6
is inactive	step 8

6   To switch activity (SWACT) of the units, type:

>SWACT

and press the Enter key.

Example of a MAP response:

NTMX72
in an RSC-M (continued)

```
RCO2 0     A Warm SwAct will be performed after
           data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If the system	Do
prompts you to confirm a warm SWACT	step 7
rejects the SWACT	step 24

7 To confirm the command, type:

>YES

and press the Enter key.

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act   ISTb

RCO2 0    SwAct Passed
```

If the MAP response	Do
is SWACT passed	step 8
other than listed here	step 23

8 A maintenance flag (Mtce) can appear. A maintenance flag indicates system-initiated maintenance tasks are in progress. Wait until the flag disappears from the status lines for both RCO2 units before you proceed to the next step.

At the cabinet

9 Place a sign with the words *Active unit-Do not touch* on the active unit. Do not attach this sign with magnets or tape.

10 To manually busy (ManB) the inactive unit, type:

>BSY INACTIVE

and press the Enter key.

Example of a MAP response:

```
RCO2     0 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:   Inact ManB
Unit1:   Act   ISTb
Bsy INACTIVE
RCO2 0 Unit 0    Bsy Passed
```

If the BSY command	Do
passes	step 11
fails	step 23

11   To reset the inactive RCO2 unit, type:

>PMRESET UNIT unit_no NORUN

and press the Enter key.

where

   unit_no
      is the RCO2 unit number zero or one

Example of a MAP response:

```
RCO2 1 Unit 0    PMReset Passed
```

12   Use the following information to determine the next step:

If the card you are to replace has a suffix of	Do
AA	step 13
AB	step 15

NTMX72
in an RSC-M (continued)

At the shelf

13

> ⚠ **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist-strap grounding point of the modular supervisory panel (MSP) to handle circuit cards. This protects the cards against static electricity damage.

To power down the inactive unit, set the power switch on the NTMX72 faceplate to the OFF position.

> *Note:* The NTMX72 circuit cards, are in slots 1 and 2 of unit 0, and in slots 26 and 27 of unit 1.

14   To replace the card, use thecommon replacing a card procedure in this document. Complete this procedure and go to step 17.

> *Note:* If the circuit card you are to replace has switches, make sure the switches on the replacement circuit card have the same settings.

15

> ⚠ **WARNING**
> **Briefly state reasons for the ESDS caution**
> Enter the reasons for the electro-static discharge caution: an ESDS caution informs the reader to observe precautions for handling an electrostatically sensitive device.

To power down the NTMX72AB power converter, set the circuit breaker on the MSP for the inactive unit to the OFF position.

16   To replace the card, use the procedure removing and replacing a card in this section. Complete this procedure and go to step 17.

17   Power up the NTMX72 circuit card as follows:

a   Insert the NTMX72 circuit card completely. An audible alarm can sound. To silence this alarm, restore power to the NTMX72 circuit card.

b   If you replaced an NTMX72AA power converter, set the POWER switch to the ON position. Set the POWER switch to RESET when you set the circuit breaker on the MSP to the ON position.

c   If you replaced an NTMX72AB power converter, set the circuit breaker on the MSP to the ON position. Set the circuit breaker on the MSP to ON, for the NTMX72AB that you powered down in step 15.

18   To load the inactive unit, type:

```
>LOADPM  INACTIVE
```

and press the Enter key.

If the LOADPM command	Do
passes	step 19
fails	step 23

19   To return the inactive unit to service, type:

>RTS   INACTIVE

and press the Enter key.

If the RTS command	Do
passed	step 20
failed	step 23

20   Remove the sign from the active unit.

21   Go to the common returning a card procedure in this document.

22   This procedure is complete.

23   For additional help contact the next level of support.

24   For additional help with the SWACT, contact the next level of support.

> *Note:* The system can recommend the of use the SWACT command with the FORCE option. When this condition occurs, contact office personnel to determine if the use of the FORCE option is acceptable.

NTMX73
in an RSC-M

Application

Use this procedure to replace an NTMX73 circuit card in a Remote Switching Center Multi-access (RSC-M) main shelf.

Note: In this section, RSC-M is referred to as RCO2 in the examples. When software outputs messages to the MAP terminal, the software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTMX73	AB	pulse code modulation (PCM) signaling card

Common procedures

Two common procedures are referenced in this section:

- replacing a card
- returning a card

Action

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

NTMX73
in an RSC-M (continued)

Summary of replacing an NTMX73 in an RSC-M

Post RSC-M
and make the
unit inactive

↓

Manually busy
RSC-M unit
and reset

↓

Replace the
card

↓

Load the
RSC-M unit

↓

Return RSC-M
unit to service

↓

End

This procedure contains a
summary flowchart and a list of
steps. Use the flowchart to
review the procedure. Follow
the steps to perform the
procedure.
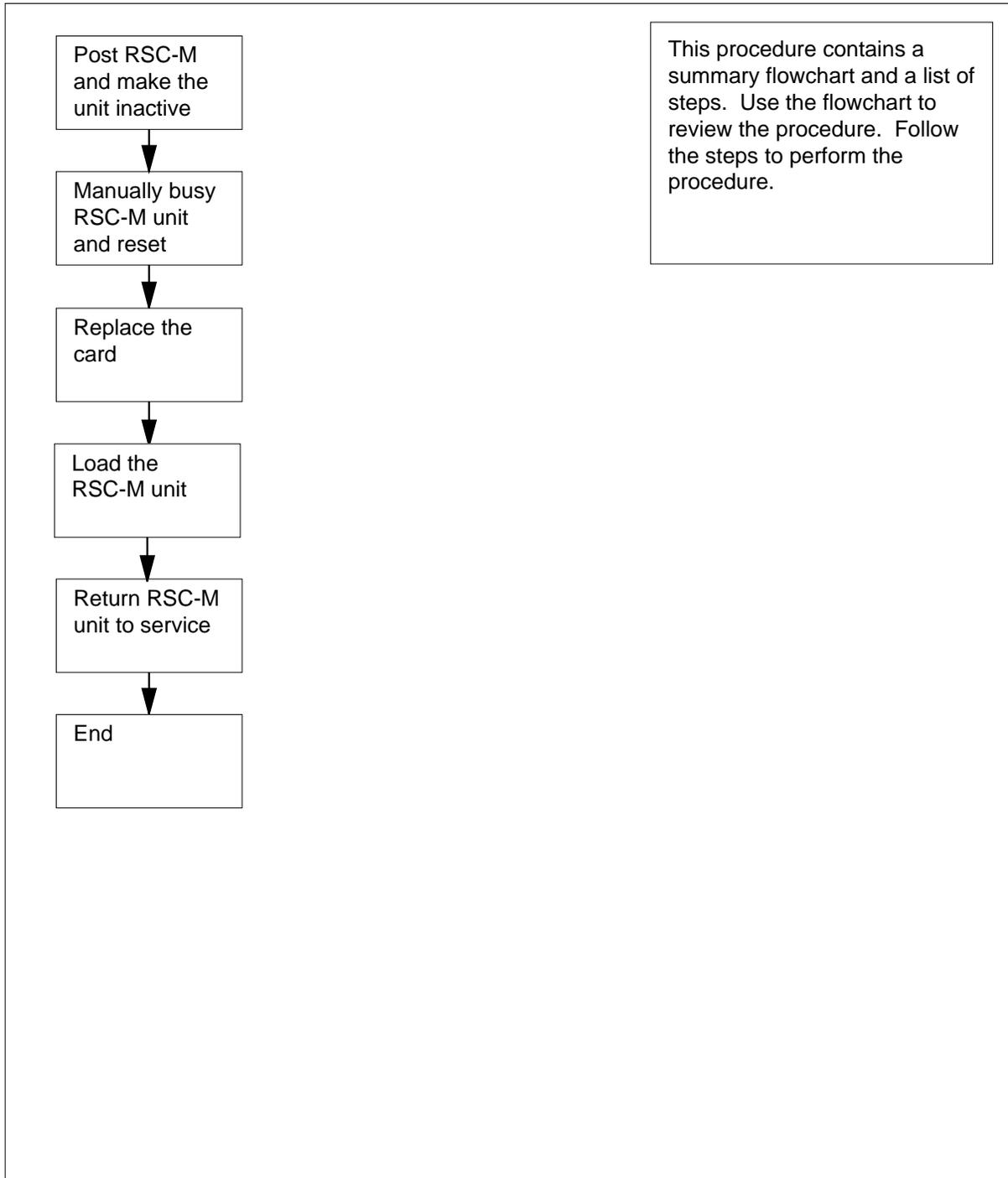
NTMX73
in an RSC-M (continued)

Replacing an NTMX73 in an RSC-M

At the MAP display

1 Proceed if:

- a step in a maintenance procedure directs you to this card replacement procedure

- you use the procedure to verify or accept cards

- your maintenance support group directs you to this procedure.

2

> **WARNING**
> **Loss of service**
> When you replace a card in the RSC-M, make sure the unit in which you replace the card is *inactive*. Make sure that the mate unit is *active*.

Obtain an NTMX73 replacement circuit card. Make sure the replacement circuit card has the same product engineering code (PEC), and PEC suffix, as the circuit card you remove.

At the MAP terminal

3 Make sure the peripheral module (PM) level appears on the MAP display. To post the RSC-M/RCO2, type:

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

   rco2_no
       is the number of the RCO2 with the defective card

Example of a MAP response:

```
RCO2                SysB     ManB     OffL     CBsy     ISTb     InSv
   0 Quit    PM      0        0        2        0        2        25
   2 Post_   RCO2    0        0        0        0        1        1
   3 ListSet
   4         RCO2  0 ISTb  Links_OOS:  CSide  1, PSide   1
   5 TRNSL   Unit0:   Inact ISTb
   6 TST     Unit1:   Act InSv
   7 BSY
   8 RTS
   9 OffL
  10 LoadPM_
  11 Disp_
  12 Next_
```

4   To determine the location of the RCO2 that contains the circuit card you must replace, type:

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM Type: RSC-M PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname:KRI07BI1 EEPRom Load:MX77NG03
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
HOST 00  C02  RSC-M 00  05  RCO2: 000        MX85AA
HOST 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   Determine the state of the RCO2 unit that associates with the circuit card to replace.

If the state of the RCO2 unit is	Do
active	step 6
inactive	step 8

6   To perform a Switch of Activity (SWACT) of the units, type:

>SWACT

and press the Enter key.

Example of a MAP response:

NTMX73
in an RSC-M (continued)

```
RCO2 0     A Warm SwAct will be performed after
            data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If	Do
the system prompts you to confirm a warm SWACT	step 7
the system rejects the SWACT	step 22

7   To confirm the command, type:

>YES

and press the Enter key.

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act   ISTb

RCO2 0     SwAct Passed
```

If the MAP response is	Do
SWACT passed	step 8
other	step 21

8   A maintenance flag (Mtce) can appear that indicates that system-initiated maintenance tasks are in progress. When the flag disappears from the status lines for both RCO2 units, you can proceed to the next step.

At the cabinet

9   Place a sign on the active unit that bears the words *Active unit-Do not touch*. Do not use magnets or tape to attach the sign.

10   To manually busy (ManB) the inactive unit, type:

>BSY INACTIVE

and press the Enter key.

Example of a MAP response:

```
RSC-M      0 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:    Inact ManB
Unit1:    Act   ISTb
bsy INACTIVE
RCO2 0 Unit 0    Bsy Passed
```

If the BSY command	Do
passes	step 11
fails	step 21

11   To reset the inactive RCO2 unit, type:

>PMRESET UNIT unit_no NORUN

and press the Enter key.

where

> **unit_no**
> is the RCO2 unit number zero or one

At the shelf

12

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist-strap grounding
> point of the modular supervisory panel (MSP) to handle
> circuit cards. The wrist strap protects the cards against static
> electricity damage.

Locate the circuit card you must replace.

> **Note:** The NTMX73 circuit cards, are in slot 11 of unit zero, and slot 17 of unit one.

13   To replace the card, use the common replacing a card procedure in this document. When the procedure is complete, return to this point.

> **Note:** If the circuit card you must replace has switches, make sure the switches on the replacement circuit card have the same settings.

14   The next action depends on the reason you perform this procedure.

If	Do
a maintenance procedure directs you to this proce- dure	step 15

NTMX73
in an RSC-M (end)

If	Do
a maintenance procedure does not direct you to this procedure	step 16

15   Remove the sign from the active unit. Return to the maintenance procedure that sent you to this procedure and continue as directed. At the point where the system produces a defective card list, identify the next defective card on the list. Go to the correct card replacement procedure for that card in this manual.

At the MAP terminal

16   To load the inactive unit, type:

    >LOADPM INACTIVE

and press the Enter key.

If the LOADPM command	Do
fails	step 21
passes	step 17

17   To return the inactive unit to service, type:

    >RTS INACTIVE

and press the Enter key.

If the RTS command	Do
passes	step 18
fails	step 21

18   Remove the sign from the active unit.

19   Go to the common returning a card procedure in this document.

20   The procedure is complete.

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

22   For additional help with a SWACT, contact the next level of maintenance.

> ***Note:*** The system can recommend that you use the SWACT command with the FORCE option. Consult office personnel to determine if you must use the FORCE option.

NTMX74
in an RSC-M

Application

Use this procedure to replace an NTMX74 card in the Remote Switching Center Multi-Access (RSC-M) shelf.

> *Note:* In this section RSC-M is referred to as RCO2 in the examples. When software outputs messages to the MAP terminal the system does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTMX74	AB	DS30A Interface

Common procedures

None

Action

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

NTMX74
in an RSC-M (continued)

Summary of Replacing an NTMX74 in an RSC-M

```
Locate
defective
card
   ↓
Verify card
from inactive
unit
   ↓
ManB inactive
unit
   ↓
PMRESET the
ManB unit to the
ROM level
   ↓
Remove and
replace defective
card
   ↓
PMRESET
the ManB unit
   ↓
PMRESET
passes?  ──Y──▷ 2
   │
   N
   ↓
   1
```

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

```
1
   ↓
Reload the
inactive unit
   ↓
Loadpm
passes?  ──Y──▷
   │
   N
   ↓
```

```
2
   ↓
RTS inactive
unit
   ↓
RTS passes?  ──Y──▷ End of
                     procedure
   │
   N
   ↓
Contact next
level of
maintenance
```
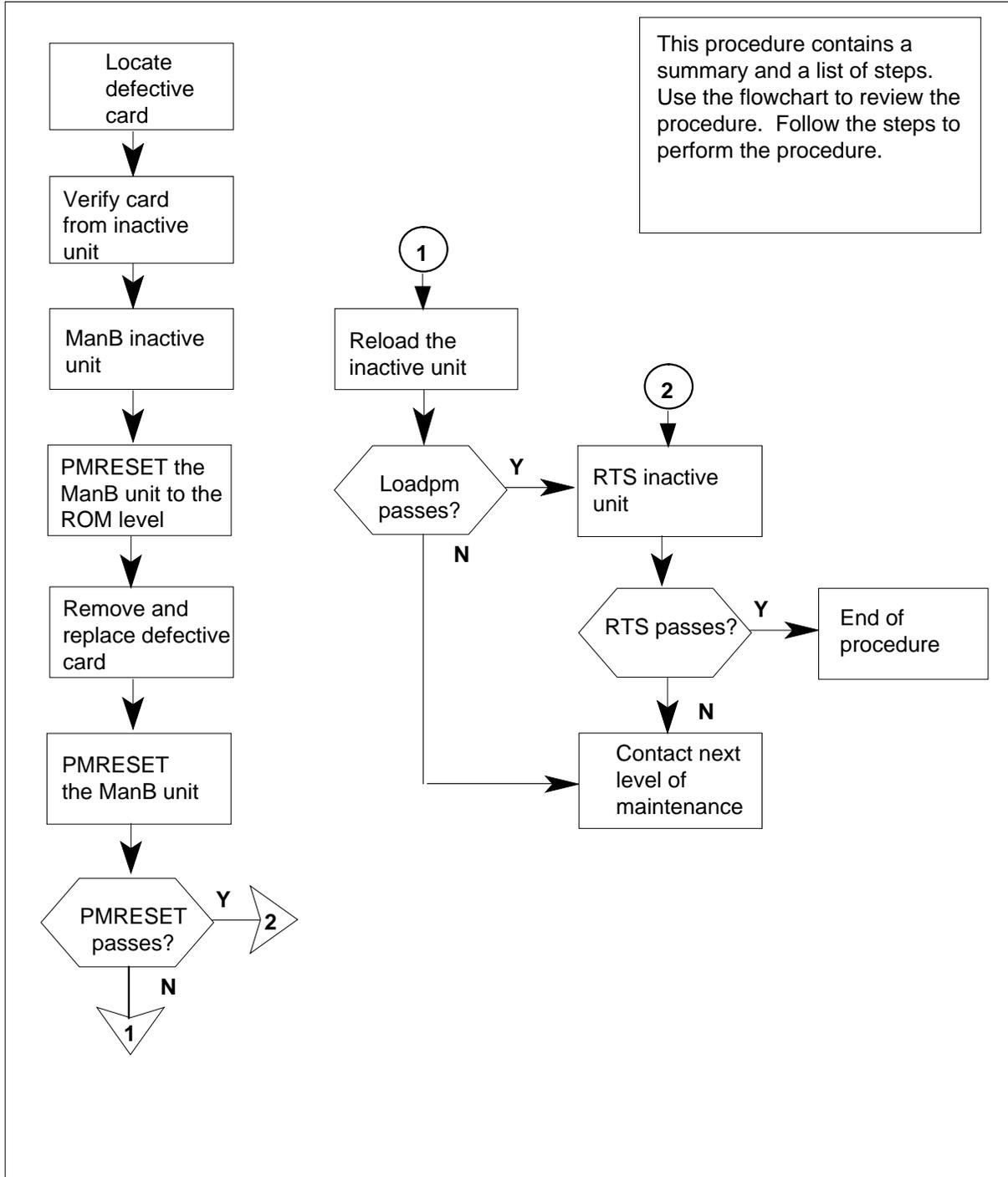
NTMX74
in an RSC-M (continued)

Replacing an NTMX74 in an RSC-M

> ⚠ **WARNING**
> **Loss of service**
> When you replace a card in the RSC-M, make sure that the unit in which you replace the card is *inactive*. Make sure that the mate unit is *active*.

At your current location

1   Proceed if you have been directed to this card replacement procedure:

- from a step in a maintenance procedure

- to use the procedure to verify or accept cards

- by your maintenance support group.

Obtain an NTMX74 replacement card. Verify that the replacement card has the same product engineering code (PEC), and PEC suffix, as the card to remove.

At the MAP terminal

2   Set the MAP display to the peripheral module (PM) level. To post the RSC-M/RCO2, type:

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

  rco2_no
    is the number of the RCO2 with the defective card

Example of a MAP display:

NTMX74
in an RSC-M (continued)

```
  CM      MS      IOD      Net      PM     CCS     LNS    Trks     Ext     Appl
   .       .       .        .      1RCO2    .       .       .       .       .

RCO2                SysB      ManB      OffL      CBsy      ISTb      InSv
  0 Quit    PM       0         0         2         0         2        25
  2 Post_   RCO2     0         0         0         0         1         1
  3 ListSet
  4         RCO2  0 ISTb  Links_OOS:  CSide  1, PSide   1
  5 TRNSL   Unit0:   Inact InSv
  6 TST     Unit1:   Act InSv
  7 BSY
  8 RTS
  9 OffL
 10 LoadPM_
 11 Disp_
 12 Next_
 13 SWACT
 14 QueryPM
 15
 16
 17 Perform
 18
```

3   Observe the MAP display. Make sure that the card you remove is on the inactive unit.

If defective card is on	Do
active unit	step 4
inactive unit	step 6

4   To perform a Switch of Activity (SWACT) of the processing activity, to the inactive unit, type:

>SWACT

and press the Enter key.

5   To confirm the system prompt, type:

>YES

and press the Enter key.

After the two units are in-service, proceed to the next step.

At the RSC-M cabinet

6   Place a sign on the *active* unit that bears the words *Active unit-Do not touch*. Do not use magnets or tape to attach this sign.

NTMX74
in an RSC-M (continued)

At the MAP terminal

7   To busy the inactive PM unit, type:

>**bsy INACTIVE**

and press the Enter key.

8   To set the Manual Busy (ManB) RCO2 unit to the ROM level to prevent
trapping, type:

>**PMRESET UNIT unit_no NORUN**

and press the Enter key.

where

unit_no
is the number of the inactive RCO2 unit busied in step 7

At the RSC-M cabinet

9

> **WARNING**
> **Static electricity damage**
> Wear a wrist-strap that connects to the wrist strap grounding
> point on the left side of the modular supervisory panel (MSP)
> of the RCO2. The wrist strap protects the cards against static
> electricity damage.

Put on a wrist strap.

10

> **DANGER**
> **Equipment damage**
> Take the following precautions when you remove or insert a
> card:
>
> 1. Do not apply direct pressure to the components.
>
> 2. Do not force the cards into the slots.

Remove the NTMX74 card as the following figures describe:

a   Locate the card you must remove on the correct shelf.

NTMX74
in an RSC-M (continued)
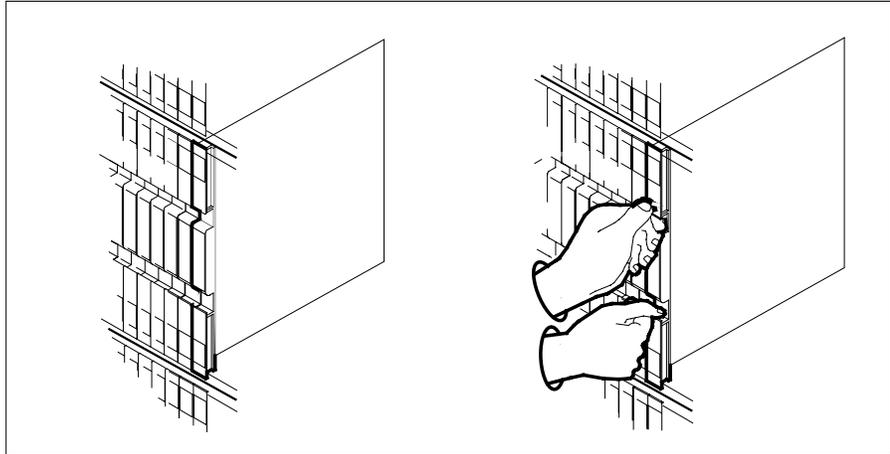
b   Open the locking levers on the card you must replace. Carefully pull the card toward you until the card clears the shelf.
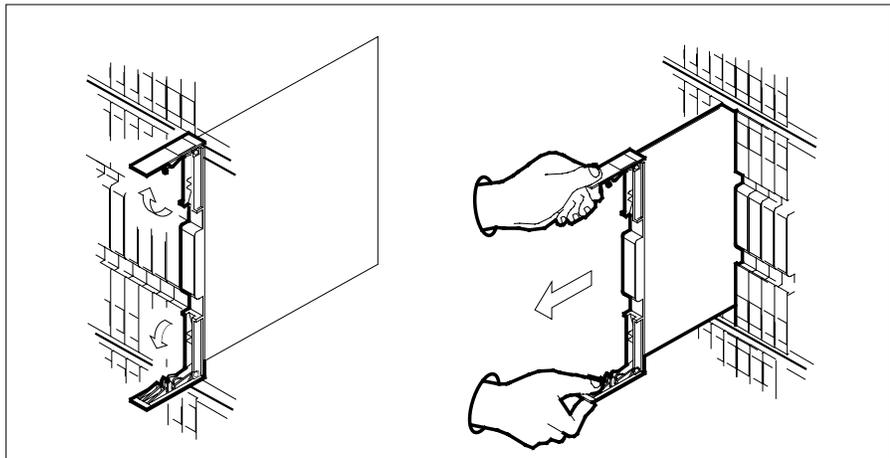
c   Make sure the replacement card has the same PEC, and PEC suffix, as the card you remove.

11   Open the locking levers on the replacement card.

a   Align the card with the slots in the shelf.

b   Carefully slide the card into the shelf.
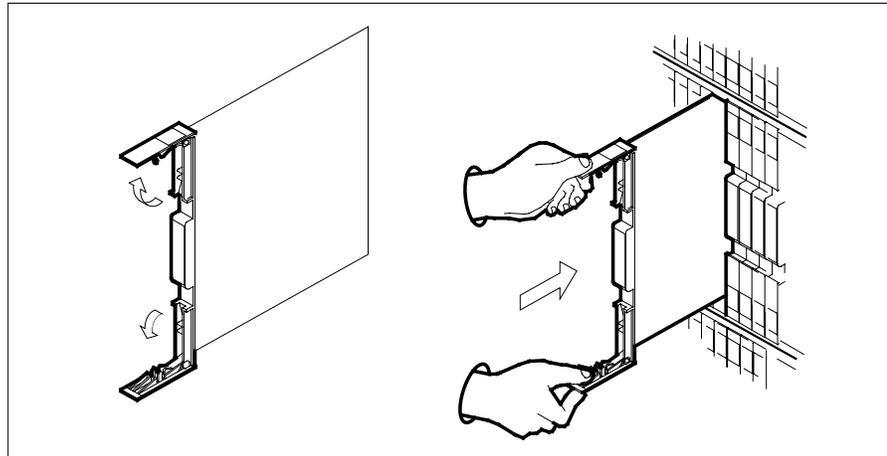
12 Seat and lock the card.

  a Use your fingers or thumbs to push on the upper and lower edges of the faceplate. Peform this action to make sure the card is fully seated in the shelf.

  b Close the locking levers.
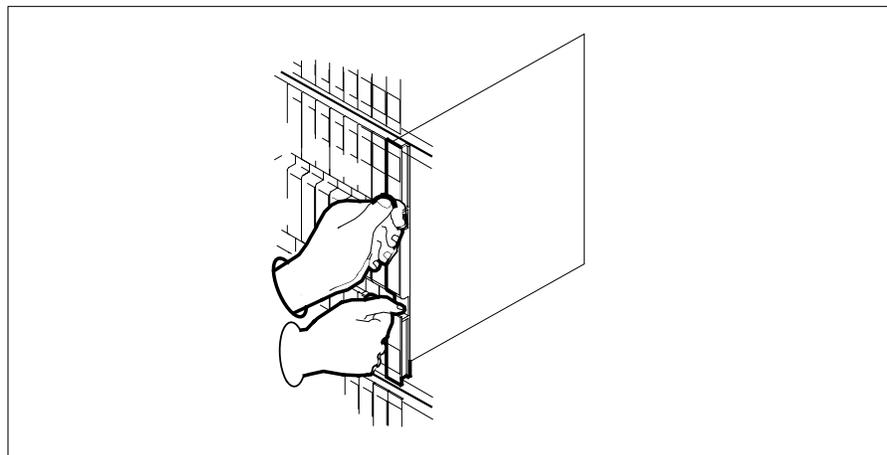
13 Refer to the following table to determine the next step:

If you enter this procedure from	Do
alarm clearing procedure	step 19
other	step 14

14 To reset the inactive RCO2 unit, type:

  `>PMRESET UNIT unit_no`

NTMX74
in an RSC-M (continued)

and press the Enter key.

where

    unit_no
        is the number of the inactive RCO2 unit zero or one

If the PMRESET command	Do
passes	step 16
fails	step 15

15   To reload the inactive RCO2 unit, type:

    >LOADPM UNIT unit_no

    and press the Enter key.

    where

        unit_no
            is the number of the inactive RCO2 unit zero or one

If the LOADPM command	Do
passes	step 16
fails	step 20

16   To return the inactive RCO2 unit to service, type:

    >RTS UNIT unit_no

    and press the Enter key.

    where

        unit_no
            is the number of the RCO2 unit busied in step 7

If RTS	Do
passes	step 17
fails	step 20

17   Send defective cards for repair according to local procedure.

18   Record the date the card is replaced. Record the serial number of the card, and the problems that prompt replacement of the card. Go to step 21.

19   Return to the procedure that directed you to this procedure. At the point where a defective card list was produced, identify the next defective card on the list. Go to the correct card replacement procedure for that card in this manual.

20   For additional help to replace this card, contact the next level of maintenance.

NTMX74
in an RSC-M (end)

21   The procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure. Continue as directed.

NTMX75
in an RSC-M

Application

Use this procedure to replace an NTMX75 circuit card in a Remote Switching
Center Multi-access (RSC-M) main shelf.

Note: In this section RSC-M is referred to as RCO2 in the examples. When
software outputs messages to the MAP terminal, the software does not
differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTMX75	AA	Time switch matrix card

Common procedures

Two common procedures are referenced in this section:

- replacing a card

- returning a card

Action

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

NTMX75
in an RSC-M (continued)

Summary of replacing an NTMX75 in an RSC-M

```
┌─────────────────┐
│ Post RSC-M      │
│ and make unit   │
│ inactive        │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Manually busy   │
│ RSC-M unit      │
│ and reset       │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Replace the     │
│ card            │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Return RSC-M    │
│ unit to service │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ End             │
│                 │
└─────────────────┘
```

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.
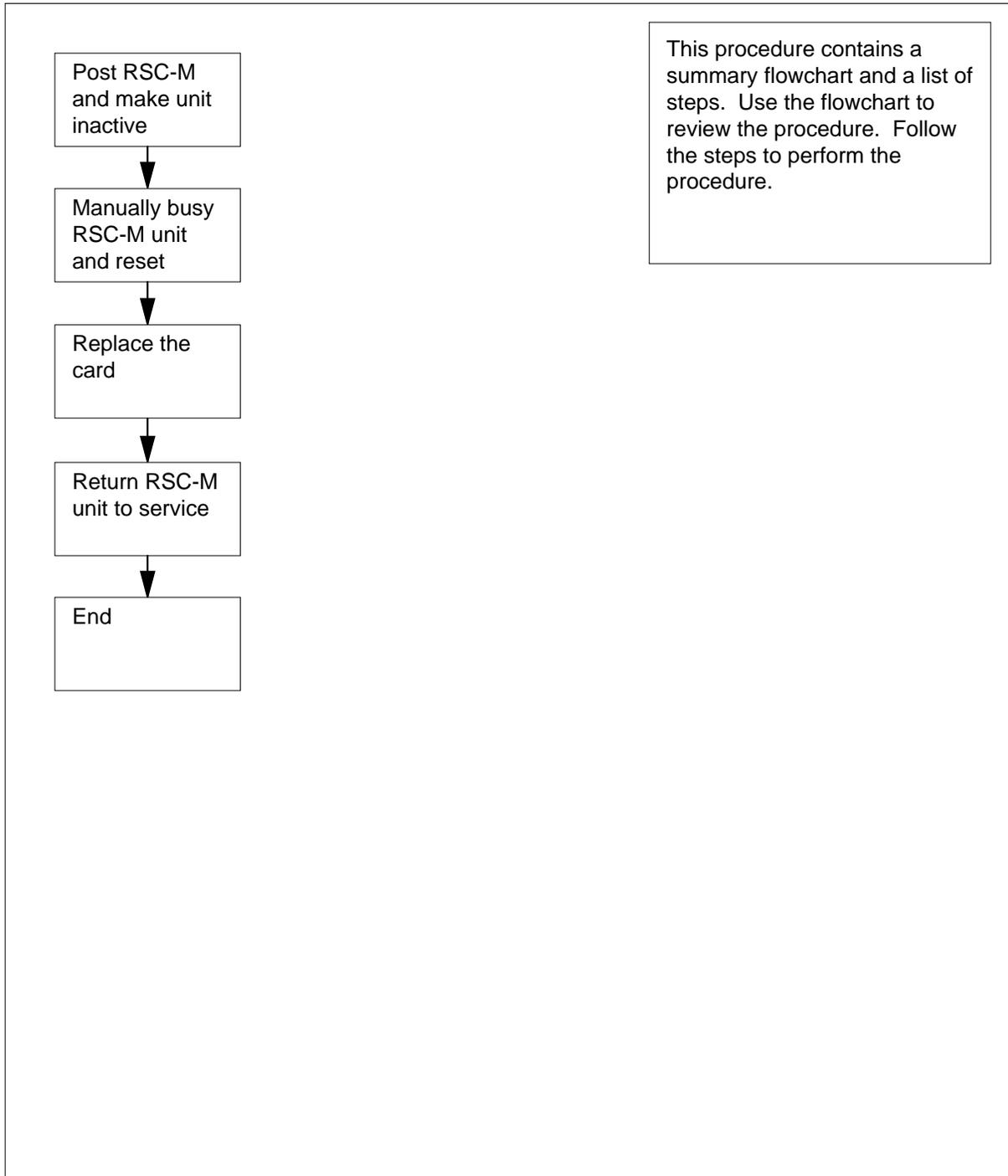
NTMX75
in an RSC-M (continued)

Replacing an NTMX75 in an RSC-M

At the MAP display

1   Proceed if:

- a step in a maintenance procedure directs you to this card replacement procedure

- you use the procedure to verify or accept cards

- your maintenance support group directed you to this procedure.

2

> **WARNING**
> **Loss of service**
> When you replace a card in the RSC-M, make sure the unit in which you replace the card is *inactive*. Make sure the mate unit is *active*.

Obtain an NTMX75 replacement circuit card. Make sure the replacement circuit card has the same product engineering code (PEC), and PEC suffix, as the circuit card you remove.

At the MAP terminal

3   Make sure the peripheral module (PM) appears on the MAP display. To post the RSC-M/RCO2, type:

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

   rco2_no
       is the number of the RCO2 with the defective card

Example of a MAP response:

```
RCO2                    SysB    ManB    OffL    CBsy    ISTb    InSv
 0 Quit    PM       0       0       2       0       2      25
 2 Post_   RCO2     0       0       0       0       1       1
 3 ListSet
 4         RCO2  0 ISTb  Links_OOS:  CSide  1, PSide   1
 5 TRNSL   Unit0:   Inact ISTb
 6 TST     Unit1:   Act InSv
 7 BSY
 8 RTS
 9 OffL
10 LoadPM_
11 Disp_
12 Next_
```

4   To determine the location of the RCO2 that contains the circuit card you want
to replace, type:

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname:KRIO7BI1 EEPRom Load:MX77NG03
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
RSC-M 00  C02  RSC-M 00  05  RCO2: 000         MX85AA
RSC-M 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   Determine the state of the RCO2 unit that associates with the circuit card to
replace.

If the state of the RCO2 unit is	Do
active	step 6
inactive	step 8

6   To perform a Switch of Activity (SWACT) of the units, type:

>SWACT

and press the Enter key.

Example of a MAP response:

NTMX75
in an RSC-M (continued)

```
RCO2 0     A Warm SwAct will be performed after
           data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If	Do
the system prompts you to confirm a warm SWACT	step 7
the system rejects the SWACT	step 21

7 To confirm the command, type:

>YES

and press the Enter key.

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act   ISTb

RCO2 0     SwAct Passed
```

If the MAP response is	Do
SWACT passed	step 8
other	step 20

8 A maintenance flag (Mtce) can appear, that indicates system-initiated maintenance tasks are in progress. When the flag disappears from the status lines for both RCO2 units you can proceed to the next step.

At the cabinet

9 Place a sign on the active unit that bears the words *Active unit-Do not touch.* Do not use magnets or tape to attach this sign.

10 To manually busy (ManB) the inactive unit, type:

>BSY INACTIVE

and press the Enter key.

Example of a MAP response:

NTMX75
in an RSC-M (continued)

```
RCO2     0 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:   Inact ManB
Unit1:   Act   ISTb
Bsy INACTIVE
RCO2 0 Unit 0    Bsy Passed
```

If the BSY command	Do
passes	step 11
fails	step 20

11   To reset the inactive RCO2 unit, type:

>PMRESET UNIT unit_no NORUN

and press the Enter key.

where

    unit_no
      is the RCO2 unit number zero or one

12

> ⚠ **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist-strap grounding
> point of the modular supervisory panel (MSP) to handle
> circuit cards. This protects the cards against static electricity
> damage.

Locate the circuit card you must replace.

    Note: The NTMX75 circuit cards, are in slot 10 of unit zero, and slot 18 of
    unit one.

13   To replace the card, use the common replacing a card procedure in this
document. When the procedure is complete, return to this point.

    Note: If the circuit card you replace has switches, make sure the switches
    on the replacement circuit card have the same settings.

14   The next action depends on the reason you perform this procedure.

If	Do
a maintenance procedure directs you to this procedure	step 15

NTMX75
in an RSC-M (end)

If	Do
a maintenance procedure does not direct you to this procedure	step 16

15   Remove the sign from the active unit. Return to the maintenance procedure that sends you to this procedure. Continue as directed.

At the MAP terminal

16   To return the inactive unit to service, type:

>   **>RTS   INACTIVE**

and press the Enter key.

If the RTS command	Do
passes	step 17
fails	step 20

17   Remove the sign from the active unit.

18   Go to the common returning a card procedure in this document.

19   The procedure is complete.

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

21   For additional help with SWACT, contact the next level of maintenance.

> *Note:* The system can recommend that you use the SWACT command with the FORCE option. Consult office personnel to determine if you must use the FORCE option.

NTMX76
in an RSC-M

Application

Use this procedure to replace an NTMX76 circuit card in a Remote Switching Center Multi-access (RSC-M) main shelf.

Note: In this section, RSC-M is referred to as RCO2 in the examples. When software outputs messages to the MAP terminal, the software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTMX76	AA, AB	Message and tones card

Common procedures

Two common procedures are referenced in this section:

- replacing a card
- returning a card

Action

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

NTMX76
in an RSC-M (continued)

Summary of Replacing an NTMX76 in an RSC-M

Post RSC-M
and make unit
inactive

↓

Manually busy
RSC-M unit
and reset

↓

Replace the
card

↓

Return RSC-M
unit to service

↓

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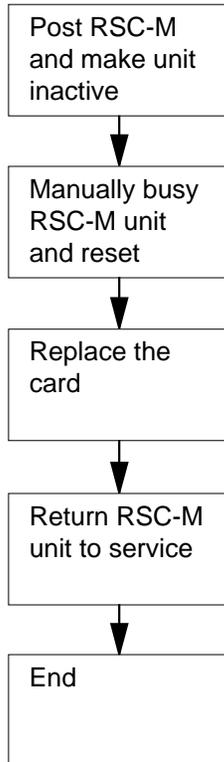
This procedure contains a
flowchart and a list of steps.
Use the flowchart to review the
procedure. Follow the steps to
perform the procedure.

NTMX76
in an RSC-M (continued)

Replacing an NTMX76 in an RSC-M

At the MAP display

1   Proceed if:

- a step in a maintenance procedure directs you to this card replacement procedure

- you use the procedure to verify or accept cards

- your maintenance support group directs you to this procedure.

2

> **WARNING**
> **Loss of service**
> When you replace a card in the RSC-M, make sure the unit in which you replace the card is *inactive*. Make sure that the mate unit is *active*.

Obtain an NTMX76 replacement circuit card. Make sure the replacement circuit card has the same product engineering code (PEC), and PEC suffix, as the circuit card you remove.

At the MAP terminal

3   Make sure the peripheral module (PM) level appears on the MAP display. To post the RSC-M/RCO2, type:

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

> **rco2_no**
>   is the number of the RCO2 with the defective card(s)

Example of a MAP response:

NTMX76
in an RSC-M (continued)

```
RCO2              SysB    ManB    OffL    CBsy    ISTb    InSv
 0 Quit    PM        0       0       2       0       2      25
 2 Post_   RCO2      0       0       0       0       1       1
 3 ListSet
 4         RCO2   0 ISTb  Links_OOS:  CSide  1, PSide   1
 5 TRNSL   Unit0:    Inact ISTb
 6 TST     Unit1:    Act InSv
 7 BSY
 8 RTS
 9 OffL
10 LoadPM_
11 Disp_
12 Next_
```

4   To determine the location of the RCO2, that contains the circuit card to
          replace, type:

          >QUERYPM

          and press the Enter key.

          Example of a MAP response:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname: UK00ADU6 EEPRom Load:
BNK0N205
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
RSC-M 00  C02  RSC-M 00  05  RCO2: 000        MX85AA
RSC-M 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   Determine the state of the RCO2 unit that associates with the circuit card to
          replace:

If the state of the RCO2 unit is	Do
active	step 6
inactive	step 8

6   To perform a Switch of Activity (SWACT) of the units, type:

          >SWACT

          and press the Enter key.

          Example of a MAP response:

```
RCO2 0    A Warm SwAct will be performed after
          data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If	Do
the system prompts you to confirm a warm SWACT	step 7
the system rejects the SWACT	step 21

7   To confirm the command, type:

>YES

and press the Enter key.

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act   ISTb

RCO2 0    SwAct Passed
```

If the MAP response is	Do
SWACT passed	step 8
other	step 20

8   A maintenance flag (Mtce) can appear, that indicates system-initiated maintenance tasks are in progress. Wait until the flag disappears from the status lines for both RCO2 units before you proceed to the next step.

At the cabinet

9   Place a sign on the active unit that bears the words *Active unit-Do not touch.* Do not use magnets or tape to attach this sign.

10   To manually busy (ManB) the inactive unit, type:

>BSY INACTIVE

and press the Enter key.

Example of a MAP response:

NTMX76
in an RSC-M (continued)

```
RCO2     0 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:   Inact ManB
Unit1:   Act   ISTb
Bsy INACTIVE
RCO2 0 Unit 0    Bsy Passed
```

If the BSY command	Do
passes	step 11
fails	step 20

11   To reset the inactive RCO2 unit, type:

>**PMRESET UNIT unit_no NORUN**

and press the Enter key.

where

    unit_no
        is the inactive RCO2 unit number zero or one.

At the shelf

12

⚠ **WARNING**
Static electricity damage
Wear a wrist strap that connects to the wrist-strap grounding point of the modular supervisory panel (MSP) to handle circuit cards. The wrist strap protects the cards against static electricity damage

---

Locate the circuit card you want to replace.

    Note: The NTMX76 circuit cards are in slot 8 of unit zero, and slot 20 of unit one.

13   To replace the card use the common replacing a card procedure in this document. When the procedure is complete, return to this point.

    Note: If the circuit card you replace has switches, make sure the switches on the replacement circuit card have the same settings.

At the MAP terminal

14   To reset the inactive unit, type:

>**PMRESET UNIT unit_no**

and press the Enter key.

where

unit_no
is the number of the RCO2 unit busied in step 10

If PMRESET	Do
passes	step 15
fails	step 20

15   Use the following information to determine the next step in this procedure.

If you enter this procedure from	Do
alarm clearing procedures	step 19
other	step 16

16   To return the inactive unit to service, type:

>RTS   INACTIVE

and press the Enter key.

If the RTS command	Do
passes	step 17
fails	step 20

17   Remove the sign from the active unit.

18   Go to the common returning a card procedure in this document.

Go to step 22.

19   Return to *Alarm Clearing Procedures* or other procedure that direct you to this procedure. Continue as directed.

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

21   For additional help with SWACT, contact the next level of maintenance.

Note: The system can recommend that you use the SWACT command with the FORCE option. Consult office personnel to determine if you must use the FORCE option.

22   The procedure is complete.

NTMX77
in an RSC-M

Application

Use this procedure to replace an NTMX77 circuit card in a Remote Switching Center Multi-access (RSC-M) main shelf.

Note: In this section, RSC-M is known as RCO2 in the examples. When software outputs messages to the MAP terminal, software does not differ between the two RCO2 types.

PEC	Suffixes	Name
NTMX77	AA	Unified Processor card

Common procedures

Two common procedures are referenced in this section:

* "Replacing a card"
* "Returning a card"

Action

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

NTMX77
in an RSC-M (continued)

Summary of replacing an NTMX77 in an RSC-M

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

```
Locate faulty
NTMX77 card
      │
      ▼
Verify card is
from inactive unit
      │
      ▼
Place sign on
active unit
      │
      ▼
ManB inactive
unit and
PMRESET
NORUN                          LOADPM
      │                        INACTIVE
      ▼                            │
Unseat                             ▼
NTMX73 and                      LOADPM          Y
NTMX74 cards                    INACTIVE ──────────► RTS RCO2
      │                         pass?                    │
      ▼                            │ N                    ▼
Remove and                         ▼              N
replace faulty                 Contact next ◄────────── RTS pass?
card in inactive               level of
unit                           support                   │ Y
      │                                                   ▼
      ▼                                            End of
Reseat                                             procedure
NTMX73 and
NTMX74 cards
```

NTMX77
in an RSC-M (continued)

To replace an NTMX77 in an RSC-M

At the MAP display

1   Proceed only if one of the following conditions apply. The maintenance support group or a step in a maintenance procedure directs you to this card replacement procedure. Use the procedure to verify or accept cards.

2

⚠ **WARNING**
Loss of service
To replace a card in the RSC-M, make sure the unit in which you replace the card is *inactive* and the mate unit is *active*.

Obtain an NTMX77 replacement circuit card. Make sure the replacement circuit card contains the same product engineering code (PEC) and suffix as the circuit card that you remove.

At the MAP terminal

3   Make sure the current MAP display is at the peripheral module (PM) level. To post the RSC-M/RCO2, type

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

rco2_no
is the number of the RCO2 that you post.

Example of a MAP response:

```
RCO2                SysB      ManB      OffL      CBsy      ISTb      InSv
  0 Quit    PM       0         0         2         0         2         25
  2 Post_   RCO2     0         0         0         0         1         1
  3 ListSet
  4         RCO2   0 ISTb  Links_OOS:  CSide  1, PSide   1
  5 TRNSL   Unit0:    Inact ISTb
  6 TST     Unit1:    Act InSv
  7 BSY
  8 RTS
  9 OffL
 10 LoadPM_
 11 Disp_
 12 Next_
 13 SwAct
 14 QueryPM
 15
 16 IRLINK
 17 Perform
 18
```

---

4   To determine the location of the RCO2 that contains the circuit card that you replace, type

>**QUERYPM**

and press the Enter key.

Example of a MAP response:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped:53 Loadname: KRI07BI1 EEPRom Load:MX77NG03
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
RSC-M 00  C02  RSC-M 00  05  RCO2: 000        MX85AA
RSC-M 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   Determine the state of the RCO2 unit associated with the circuit card to replace.

If the state of the RCO2 unit	Do
is active	step 6
is inactive	step 8

6   To switch activity of the units, type

>**SWACT**

and press the Enter key.

Example of a MAP response:

```
RCO2 0     A Warm SwAct will be performed after
         data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If the system	Do
prompts you to confirm a warm SWACT	step 7
rejects the SWACT	step 24

7   To confirm the command, type

>**YES**

and press the Enter key.

NTMX77
in an RSC-M (continued)

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act   ISTb

RCO2 0     SwAct Passed
```

If the MAP response	Do
is SWACT passed	step 8
is other than listed here	step 23

8   A maintenance flag (Mtce) can appear. This flag indicates that maintenance tasks that the system initiates are in progress. Wait until the flag disappears from the status lines for both RCO2 units before you proceed to the next step.

At the cabinet

9   Place a sign on the active unit with the words *Active unit-Do not touch.* Do not attach this sign with magnets or tape.

10   To manually busy (ManB) the inactive unit, type

>BSY INACTIVE

and press the Enter key.

Example of a MAP response:

```
RCO2      0 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:   Inact ManB
Unit1:   Act   ISTb
bsy INACTIVE
RCO2 0 Unit 0    Bsy Passed
```

If the BSY command	Do
passed	step 11
failed	step 23

11   To reset the inactive RCO2 unit, type

>PMRESET UNIT unit_no NORUN

and press the Enter key.

where

    unit_no
      is the rco2 unit number (0 or 1)

NTMX77
in an RSC-M (continued)

At the shelf

12

> ⚠️ **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist-strap grounding point of the modular supervisory panel (MSP) to handle circuit cards. The wrist-strap protects the cards against static electricity damage.

Locate the circuit card to replace.

> *Note:* NTMX77 circuit cards reside in slot 3 of unit 0, and slot 25 of unit 1.

13   Unseat the NTMX73 and NTMX74 circuit cards.

14   To replace the card, use the common "Replacing a card" procedure in this document. Complete the procedure and return to this point. Make sure the replacement card has the same PEC, including suffix, as the card you just removed.

> *Note:* If the NTMX77 card has a DIP switch, set DIP switch S1 to CPM.

15   Reseat the NTMX73 and NTMX74 circuit cards.

16   The next action depends on the reason you perform this procedure.

If a maintenance procedure	Do
directed you to this procedure	step 17
did not direct you to this procedure	step 18

17   Remove the sign from the active unit. Return to the maintenance procedure that sent you to this procedure. Continue as directed.

At the MAP terminal

18   To load the inactive unit, type

>LOADPM INACTIVE

and press the Enter key.

If the LOADPM command	Do
failed	step 23
passed	step 19

19   To return the inactive unit to service, type

>RTS INACTIVE

NTMX77
in an RSC-M (end)

and press the Enter key.

If the RTS command	Do
passed	step 20
failed	step 23

20 Remove the sign from the active unit.

21 Go to the common "Returning a card" procedure in this document.

22 This procedure is complete.

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

24 For additional help with switch of activity, contact the next level of support.

> ***Note:*** If the system recommends the use of the SWACT command with the FORCE option, consult office personnel. Office personnel can advise you to not use the FORCE option.

NTMX79
in an RSC-M

Application

Use this procedure to replace an NTMX79 circuit card in a Remote Switching Center Multi-access (RSC-M) extension (EXT) shelf.

Note: In this section, RSC-M is known as RCO2 in the examples. When software outputs messages to the MAP terminal, software does not differ between the two RC0o2 types.

PEC	Suffixes	Name
NTMX79	AA	DS60 Extender

Common procedures

Two common procedures are referenced in this section:

- replacing a card
- returning a card

Action

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

NTMX79
in an RSC-M (continued)

Summary of replacing an NTMX79 in an RSC-M

Locate
faulty card

↓

Verify card is
linked to the
inactive unit

↓

Manually
busy
inactive unit

↓

Power down
NTMX79
card

↓

Replace the
card

↓

Return
RSC-M unit
to service

↓

End

This flowchart summarizes the
procedure.

Use the instructions that follow this
flowchart to perform the procedure.
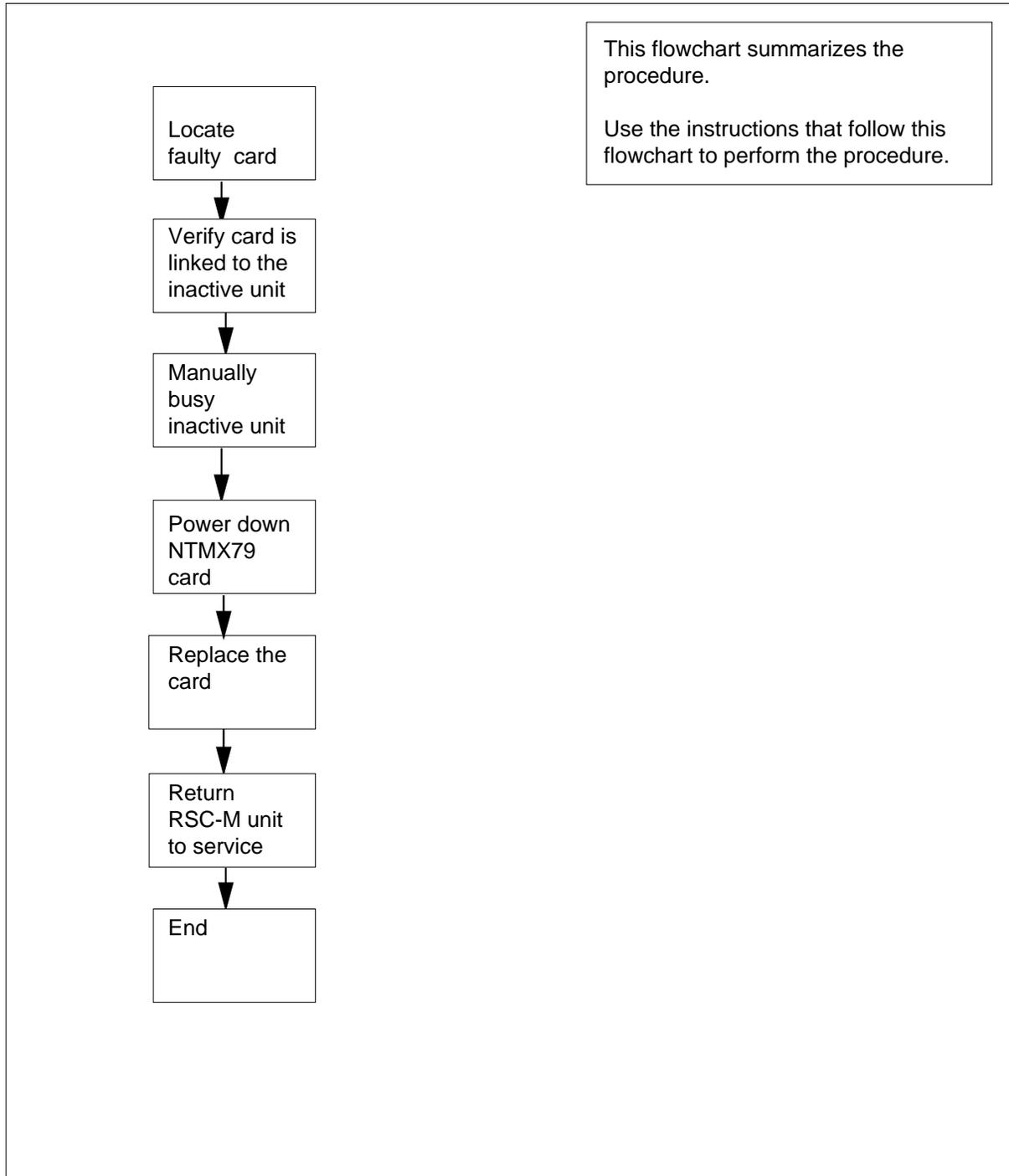
NTMX79
in an RSC-M (continued)

To replace an NTMX79 in an RSC-M

At the MAP display

1   Proceed only if one of the following conditions applies. The maintenance
support group or a step in a maintenance procedure directs you to this card
replacement procedure. Use the procedure to verify or accept cards.

2

> ⚠ **WARNING**
> **Loss of service**
> To replace a card in the RSC-M, make sure the unit in which
> you replace the card is *inactive* and the mate unit is *active*.

Obtain an NTMX79 replacement circuit card. Verify the replacement circuit
card has the same product engineering code (PEC) and suffix as the old
circuit card.

At the MAP terminal

3   Make sure the system displays the peripheral module (PM) level of the MAP
display. To post the RSC-M/RCO2, type

>**MAPCI;MTC;PM;POST RCO2 rco2_no**

and press the Enter key.

where

>**rco2_no**
>>is the number of the RCO2 with the defective card

Example of a MAP response:

```
RCO2              SysB     ManB      OffL     CBsy      ISTb      InSv
  0 Quit    PM      0        0         2        0         2        25
  2 Post_   RCO2    0        0         0        0         1         1
  3 ListSet
  4         RCO2  0 ISTb  Links_OOS:  CSide  1, PSide   1
  5 TRNSL   Unit0:   Inact ISTb
  6 TST     Unit1:   Act InSv
  7 BSY
  8 RTS
  9 OffL
 10 LoadPM_
 11 Disp_
 12 Next_
```

NTMX79
in an RSC-M (continued)

4   To determine the location of the RCO2 extension half shelf (left or right) that contains the circuit card to replace, type

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname: KRI07BI1 EEPRom Load:MX77NG03
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
RSC-M 00  C02  RSC-M 00  05  RCO2: 000        MX85AA
RSC-M 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   Observe the LED on the defective NTMX79 circuit card. The system removes the LED when the unit to which the LED connects is inactive.

If the defective card	Do
connects to the active unit	step 6
connects to the inactive unit	step 8

6   To switch the processing activity (SWACT) to the inactive unit, type

>SWACT

and press the Enter key.

Example of a MAP response:

```
RCO2 0     A Warm SwAct will be performed after
         data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If the system	Do
prompts you to confirm a warm SWACT	step 7
rejects the SWACT	step 25

7   To confirm the command, type

>YES

and press the Enter key.

NTMX79
in an RSC-M (continued)

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act   ISTb

RCO2 0     SwAct Passed
```

If the MAP response	Do
is SWACT passed	step 8
is other than listed here	step 24

8   A maintenance flag (Mtce) can appear. This flag indicates that maintenance tasks that the system initiates are in progress. Wait until the flag disappears from the status lines for both PM units before you proceed to the next step.

At the cabinet

9   Place a sign on the active unit that bears the words *Active unit-Do not touch.* Do not attach this sign with magnets or tape.

At the MAP terminal

10   To busy the inactive PM unit, type

   >bsy INACTIVE

   and press the Enter key.

11   Locate the circuit card to replace.

   Note: The location of NTMX79 circuit cards are in slots 2 and 13 of the extension (EXT) shelf connected to unit 0. The location of these cards are also in slots 14 and 25 of the EXT shelf connected to unit 1.

12

WARNING
Static electricity damage
Wear a wrist strap that connects to the wrist-strap grounding point on the left side of the modular supervisory panel (MSP) to remove cards. The wrist strap protects the equipment against static electricity damage.

Power down the NTMX79 circuit card on the extension shelf.

13   To replace the card, use the common replacing a card procedure in this document. When the procedure is complete, return to this point.

   Note: If the circuit card to replace has switches, make sure the switches on the replacement circuit card have the same settings.

14   Power up the NTMX79 circuit card as follows:

NTMX79
in an RSC-M (end)

     a   Make sure that insertion of the NTMX79 circuit card is correct..

     b   Set the POWER switch to the ON position.

15   To determine the circuit breaker that controls the NTMX79 circuit card that you replace, observe the MSP. Note the circuit breaker that trips.

16   Press and hold the circuit breaker on the MSP to the ON position. When the circuit breaker is ON, place the power switch on the NTMX79 circuit card to the RESET position. The CONVERTER FAIL LED on the NTMX79 circuit card, and the FRAME FAIL lamp on the MSP are ON.

17   To determine where to proceed next in this procedure, use the following information.

If you	Do
entered this procedure from alarm clearing procedures	step 18
entered this procedure from other	step 19

18   Remove the sign from the active unit. Return to the procedure that directed you to this procedure. At the point where the system produced a defective card list, identify the next defective card on the list. Go to the correct card replacement procedure for that card in this manual.

19   To return the inactive RCO2 unit to service, type

    >RTS UNIT unit_no

    and press the Enter key.

    where

        unit_no
          is the number of the inactive unit

20   Use the following information to determine where to proceed.

If RTS	Do
passed	step 21
failed	step 24

21   Remove the sign from the active unit.

22   Go to the common returning a card procedure in this document.

23   This procedure is complete.

24   For additional help to replace this card, contact operating company maintenance personnel.

25   For additional help with switch of activity, contact the next level of support.

       Note: If the system recommends the use of the SWACT command with the FORCE option, consult office personnel. Office personnel can advise you to not use the FORCE option.

<div align="right">

**NTMX82
in an RSC-M**

</div>

Application

Use this procedure to replace an NTMX82 circuit card in a Remote Switching Center Multi-access (RSC-M) main or extension (EXT) shelf.

Note: In this section, the examples refer to RSC-M as RCO2. When software outputs messages to the MAP terminal, the software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTMX82	AA	Dual PCM30 interface

Common procedures

The common returning a card procedure is referenced in this procedure.

Action

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

NTMX82
in an RSC-M (continued)

Summary of replacing an NTMX82 in an RSC-M

Determine card location and defective C-side or P-links

↓

Manually busy the links to the card

↓

Remove and replace defective card

↓

Test links on replaced card

↓

Test passes? — **Y** → RTS links on replaced card

N ↓

Contact next level of maintenance

RTS links on replaced card ↓

RTS passes? — **Y** → End of procedure

N ↓

Contact next level of maintenance

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.
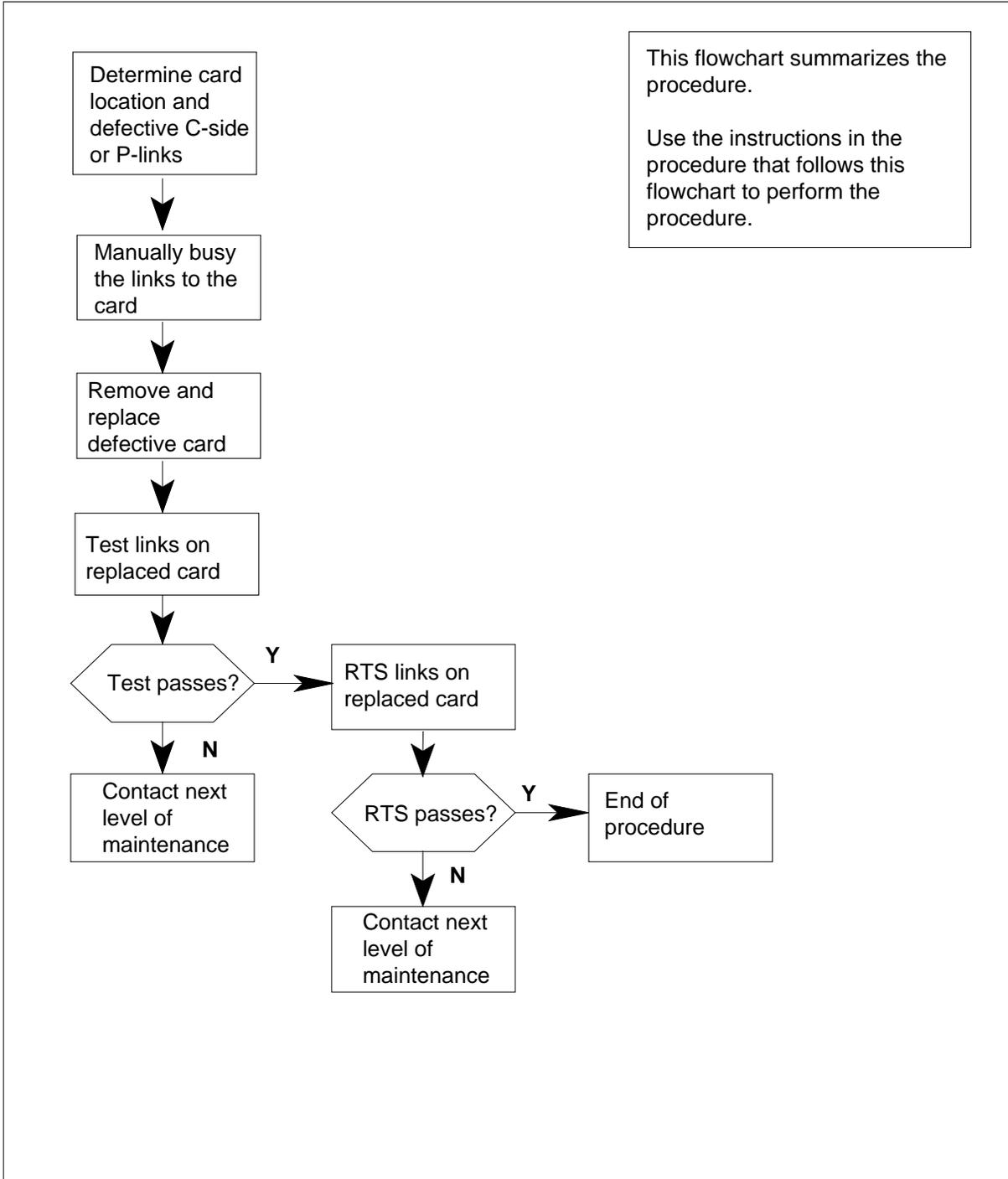
NTMX82
in an RSC-M (continued)

Replacing an NTMX82 in an RSC-M

At the MAP display

1   Proceed to step 2 if one of the following conditions applies:

    •   another maintenance procedure directed you to this card replacement procedure

    •   you use the procedure to verify or accept cards

    •   your maintenance support group directed you to this procedure

2

> **WARNING**
> **Loss of service**
> When you replace an NTMX82 circuit card in RSC-M, both links that the circuit card serves must be BSY. Active calls on the affected links are lost. Execute this procedure in periods of low traffic.

Obtain an NTMX82 replacement circuit card. Make sure the replacement circuit card has the same product equipment code (PEC) and PEC suffix as the circuit card to remove.

At the MAP terminal

3   To post the RSC-M/RCO2 with the defective card(s), type

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

    rco2_no
        is the number of the RCO2 with the defective card(s)

Example of a MAP response:

NTMX82
in an RSC-M (continued)

```
RCO2              SysB      ManB      OffL      CBsy      ISTb      InSv
 0 Quit    PM       0         0         2         0         2        25
 2 Post_   RCO2     0         0         0         0         1         1
 3 ListSet
 4         RCO2  0 ISTb  Links_OOS:  CSide  1, PSide   1
 5 TRNSL   Unit0:   Inact ISTb
 6 TST     Unit1:   Act InSv
 7 BSY
 8 RTS
 9 OffL
10 LoadPM_
11 Disp_
12 Next_
```

4   To determine the location of the RCO2 main or extension half shelf (left or right) with the circuit card to replace, type

>**QUERYPM**

and press the Enter key.

Example of a MAP display:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname:KRI07BI1 EEPRom Load:MX77MNG03
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
RSC-M 00  C02  RSC-M 00  05  RCO2: 000        MX85AA
RSC-M 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   To display defective C-side links, type

>**TRNSL C**

and press the Enter key.

Example of a MAP response:

```
LINK  0   PLGC 0         0;CAP    MS:STATUS OK          MSGCOND   OPN
LINK  1   PLGC 0         1;CAP     S:STATUS SBsy
LINK  2   PLGC 0         2;CAP    MS:STATUS OK          MSGCOND   OPN
LINK  3   PLGC 0         3;CAP     S:STATUS OK
LINK  4   PLGC 0         4;CAP     S:STATUS OK
LINK  5   PLGC 0         5;CAP     S:STATUS SBsy
```

If C-side links	Do
are defective	step 7

NTMX82
in an RSC-M (continued)

If C-side links	Do
are not defective	step 6

6   To display the peripheral-side (P-side) links that associate with the NTMX82 circuit card, type

>TRNSL P

and press the Enter key.

Example of a MAP response

```
Link  0:   REM1 11 0  0;Cap MS;Status:OK    ;MsgCond:OPN
Link  1: Carrier of Class – Trunk ;Status:OK
Link  2: Carrier of Class – Trunk ;Status:SBsy
Link  3: Carrier of Class – Trunk ;Status:SBsy
Link  4: Carrier of Class – Trunk ;Status:SBsy
Link  5: Carrier of Class – Trunk ;Status:OK
Link  6: Carrier of Class – Trunk ;Status:OK
Link  7: Carrier of Class – Trunk ;Status:OK
Link  8:    REM1 11 1 0;Cap MS;Status:OK;   MsgCond:OPN
```

The following table displays the P-side link configuration for an RSC-M cabinet. The cabinet has three RCO2 main shelves and two extension half shelves.

Note 1: Other configurations, like two RCO2 main shelves and four extension half shelves, can be provisioned in an RCO2 cabinet. For P-side link configurations other than the link that the following table describes, consult office administration, or review office records.

Note 2: The RCO2 can have an associated extension half shelf. Consult office administration, or review office records for the P-side link configuration for the extension half shelf.

Note 3: The NTMX82 packlets bear the numbers 0 through 3 from the top of each NTMX87 circuit card.

RCO2 P-side link connections (Sheet 1 of 2)

Card Location	MX87 Slot No.	Links for MX82 Card 0	Links for MX82 Card 1	Links for MX82 Card 2	Links for MX82 Card 3
RCO2 main, shelf, pos. 05	12	0, 1	2, 3	4, 5	6, 7
	16	8, 9	10, 11	12, 13	14, 15
	14	16, 17	18, 19	20, 21	22, 23
Left extension half shelf	4	24, 25	26, 27	28, 29	30, 31

NTMX82
in an RSC-M (continued)

RCO2 P-side link connections (Sheet 2 of 2)

Card Location	MX87 Slot No.	Links for MX82 Card 0	Links for MX82 Card 1	Links for MX82 Card 2	Links for MX82 Card 3
	6	32, 33	34, 35	36, 37	38, 39
	8	40, 41	42, 43	44, 45	46, 47
RCO2 main shelf, position 19 (optional)	12	0, 1	2, 3	4, 5	6, 7
	16	8, 9	10, 11	12, 13	14, 15
	14	16, 17	18, 19	20, 21	22, 23
Right extension half shelf	19	40, 41	42, 43	44, 45	46, 47
	21	32, 33	34, 35	36, 37	38, 39
	23	24, 25	26, 27	28, 29	30, 31
Provisioned RCO2 shelf, position 33	12	0, 1	2, 3	4, 5	6, 7
	16	8, 9	10, 11	12, 13	14, 15
	14	16, 17	18, 19	20, 21	22, 23

Note: Proceed to step 10.

7 To post the host PM, type

>POST host_pm host_pm_no

and press the Enter key.

where

> **host_pm**
> is a PCM-30 line group controller (PLGC)

> **host_pm_no**
> is the number of the PLGC that connects to the defective card

Example of a MAP display:

NTMX82
in an RSC-M (continued)

```
CM       MS      IOD      Net       PM      CCS      Lns      Trks     Ext  Appl
 .        .       .         .      1RCO2     .        .        .        .    .

PLGC                 SysB      ManB      OffL      CBsy      ISTb       InSv
 0 Quit    PM         0         0         1         0         4         12
 2 Post_   PLGC       0         0         2         0         2          9
 3 ListSet
 4         PLGC   1 ISTb  Links_OOS:  CSide   0, PSide    1
 5 Trnsl_  Unit0:   Act InSv
 6 Tst_    Unit1:   Inact InSv
 7 Bsy_
 8 RTS_
 9 OffL
10 LoadPM_
11 Disp_
12 Next
13 SwAct
14 QueryPM
15
16
17 Perform
18
```

8   To display the P-side links that associate with the NTMX82 card, type

   >TRNSL P

   and press the Enter key.

   Example of a MAP response:

```
LINK 0    RCO2 0 RMIO 1 0;CAP      MS:STATUS OK   MSGCOND OPN
LINK 1    RCO2 1 RMIO 0 0;CAP      MS:STATUS SBsy MSGCOND CLS
LINK 2    RCO2 0 RMIO 1 1;CAP      MS:STATUS OK
LINK 3    RCO2 1 RMIO 0 1;CAP      MS:STATUS OK
LINK 4    RCO2 0 RMIO 2 0;CAP      MS:STATUS OK   MSGCOND OPN
LINK 5    RCO2 1 RMIO 2 1;CAP      MS:STATUS SBsy MSGCOND CLS
```

9   After you identify the defective C-side link, use the following chart to
   determine which NTMX82 card you remove. Match the link number with the
   slot number and the packlet number to the left of each table.

NTMX82
in an RSC-M (continued)
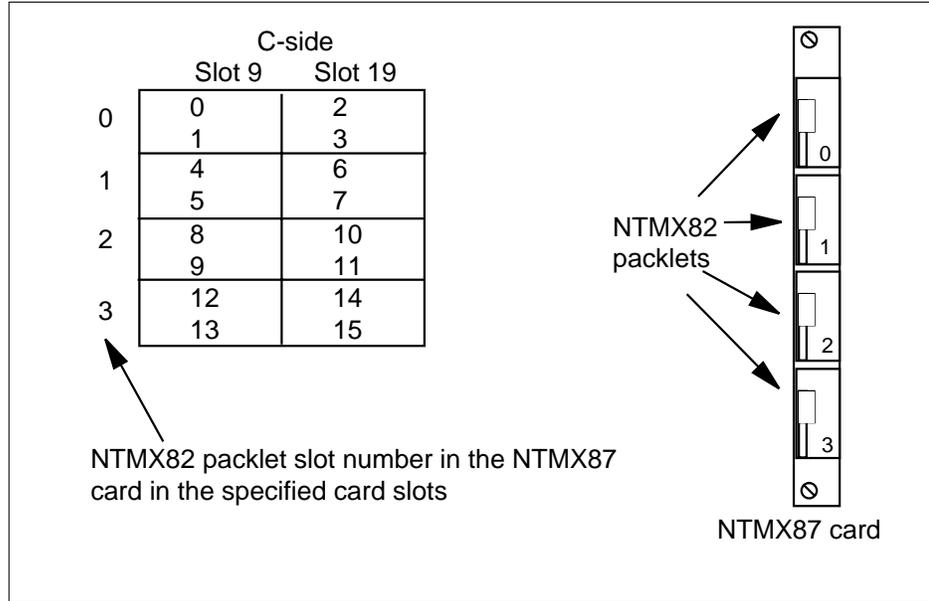
RCO2 C-side link connections

C-side

	Slot 9	Slot 19
0	0 1	2 3
1	4 5	6 7
2	8 9	10 11
3	12 13	14 15

NTMX82 packlets

NTMX82 packlet slot number in the NTMX87 card in the specified card slots

NTMX87 card

10 Record the RCO2 number, shelf location, slot number, and numbers of the associated links for the circuit card you want to replace.

11 To manually busy (ManB) the links that connect to the defective circuit card, type

>**BSY LINK link_no**

and press the Enter key.

where

> **link_no**
> is the number of the link that associate with the defective NTMX82 circuit card

Note 1: Each NTMX82 circuit card has two associated links. Each link must be ManB. Possible link number pairs are as follows: 0 & 1; 2 & 3; 4 & 5; or 6 & 7.

Note 2: To busy the other links that associate with the RCO2, execute this step for each link until all links are busy.

NTMX82
in an RSC-M (continued)

At the cabinet

12

> **WARNING**
> **Static electricity damage**
> Wear a wrist strap that connects to the wrist strap grounding
> point on the left side of the modular supervisory panel (MSP)
> of the RCO2. The wrist strap protects the equipment against
> static electricity damage.

> **DANGER**
> **Equipment damage**
> Take the following precautions when you remove or insert a
> card:
>
> 1. Do not apply direct pressure to the components.
>
> 2. Do not force the cards into the slots.

Put on a wrist strap.

Remove the NTMX82 packlet(s) as described in the following steps:

a   Locate the packlet to remove on the appropriate NTMX87 circuit card slot.

b   Open the locking lever on the packlet you replace. Carefully pull the circuit card toward you until the card clears the shelf.

c   Make sure the replacement circuit card has the same PEC and PEC suffix as the circuit card you remove.

13   Before you insert the replacement circuit card, make sure the switch settings match the settings on the circuit card that you remove. The next table describes the PCM30 DIP switch settings on the NTMX82 circuit card.

NTMX82 switch settings (Sheet 1 of 2)

Port	Impedance	Output
Even port	75 OHM	Switch S3 pos 1, 2, 3, and 4 ON , pos 5 and 6 OFF
Even port	120 OHM	Switch S3 pos 1 and 5 ON, pos 2, 3, 4, and 6 OFF
Note: Set switch S2 positions 1 & 2 to ON to enable messaging.		

NTMX82
in an RSC-M (continued)

NTMX82 switch settings (Sheet 2 of 2)

Port	Impedance	Output
Odd port	75 OHM	Switch S1 pos 1, 2, 3, and 4 ON , pos 5 and 6 OFF
Odd port	120 OHM	Switch S1 pos 1 and 5 ON, pos 2, 3, 4, and 6 OFF
Note: Set switch S2 positions 1 & 2 to ON to enable messaging.		

14   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 circuit card slot in the NTMX87 circuit card.

15   Seat and lock the packlet.

    a   Use your fingers to push on the upper and lower edges of the faceplate of the packlet. Perform this action to make sure the packlet is seated in the slot.

    b   Close the locking lever.

16   Use the following information to determine your next action in this procedure.

If the procedure you followed previous to this procedure	Do
is alarm clearing procedures	step 17
is other than listed here	step 18

17   Return to the procedure that directed you to this procedure. At the point where the system produces a defective card list, identify the next defective card on the list. Proceed to the corresponding card replacement procedure for the card in this manual.

At the MAP terminal

18   To test the busied links from step 11, type

    >TST LINK link_no

    and press the Enter key.

    where

NTMX82
in an RSC-M (end)

> **link_no**
>> is the number of the link ManB in step 11

Note 1: Perform this step for each link ManB.

Note 2: To test the other links that associate with the RCO2, execute the procedures in this step. Execute the procedures for each link until all links are tested.

If the test of the link(s)	Do
passes	step 19
fails	step 22

19 To return to service (RTS) the links, type

>RTS LINK link_no

and press the Enter key.

where

> **link_no**
>> is the number of the link tested in step 18

Note: To RTS the other links that associate with the RCO2, execute the procedures in this step. Execute the procedures for each link until all links are RTS.

If RTS	Do
passes on all links	step 20
fails	step 22

20 Proceed to the common returning a card procedure in this document.

21 The procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure. Continue as directed.

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

NTMX87
in an RSC-M

Application

Use this procedure to replace an NTMX87 circuit card in a Remote Switching Center Multi-access (RSC-M) main or extension (EXT) shelf.

Note: In this section this manual refers to RSC-M as RCO2 in the examples. When software outputs messages to the MAP terminal, software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTMX87	AA	Quad Frame Carrier

Common procedures

The common returning a card procedure is referenced in this procedure.

Action

The following flowchart is a summary of the procedure. Use the instructions in the step-action procedure that follows the flowchart to replace the card.

NTMX87
in an RSC-M (continued)

Summary of replacing an NTMX87 in an RSC-M

```
                                          ┌─────────────────────────┐
  ┌──────────────────┐                    │ This flowchart summarizes│
  │ Determine card   │                    │ the procedure.           │
  │ location and     │                    │                          │
  │ faulty C-side or │                    │ Use the instructions in  │
  │ P-links          │                    │ the procedure that       │
  └────────┬─────────┘                    │ follows this flowchart   │
           │                              │ to perform the procedure.│
           ▼                              └──────────────────────────┘
  ┌──────────────────┐
  │ Manually busy    │
  │ the links to the │
  │ card             │
  └────────┬─────────┘
           │
           ▼
  ┌──────────────────┐
  │ Remove and       │
  │ replace faulty   │
  │ card             │
  └────────┬─────────┘
           │
           ▼
  ┌──────────────────┐
  │ Test links on    │
  │ the card you     │
  │ replace          │
  └────────┬─────────┘
           │
           ▼
    ╱───────────╲      Y      ┌──────────────┐
   ╱ Test passed? ╲─────────▶ │ RTS links on │
   ╲             ╱            │ replaced card│
    ╲───────────╱             └──────┬───────┘
           │ N                       │
           ▼                         ▼
  ┌──────────────────┐         ╱───────────╲    Y    ┌──────────────┐
  │ Contact next     │        ╱ RTS passed? ╲──────▶ │ End of       │
  │ level of support │        ╲             ╱        │ procedure    │
  └──────────────────┘         ╲───────────╱         └──────────────┘
                                     │ N
                                     ▼
                              ┌──────────────┐
                              │ Contact next │
                              │ level of     │
                              │ support      │
                              └──────────────┘
```
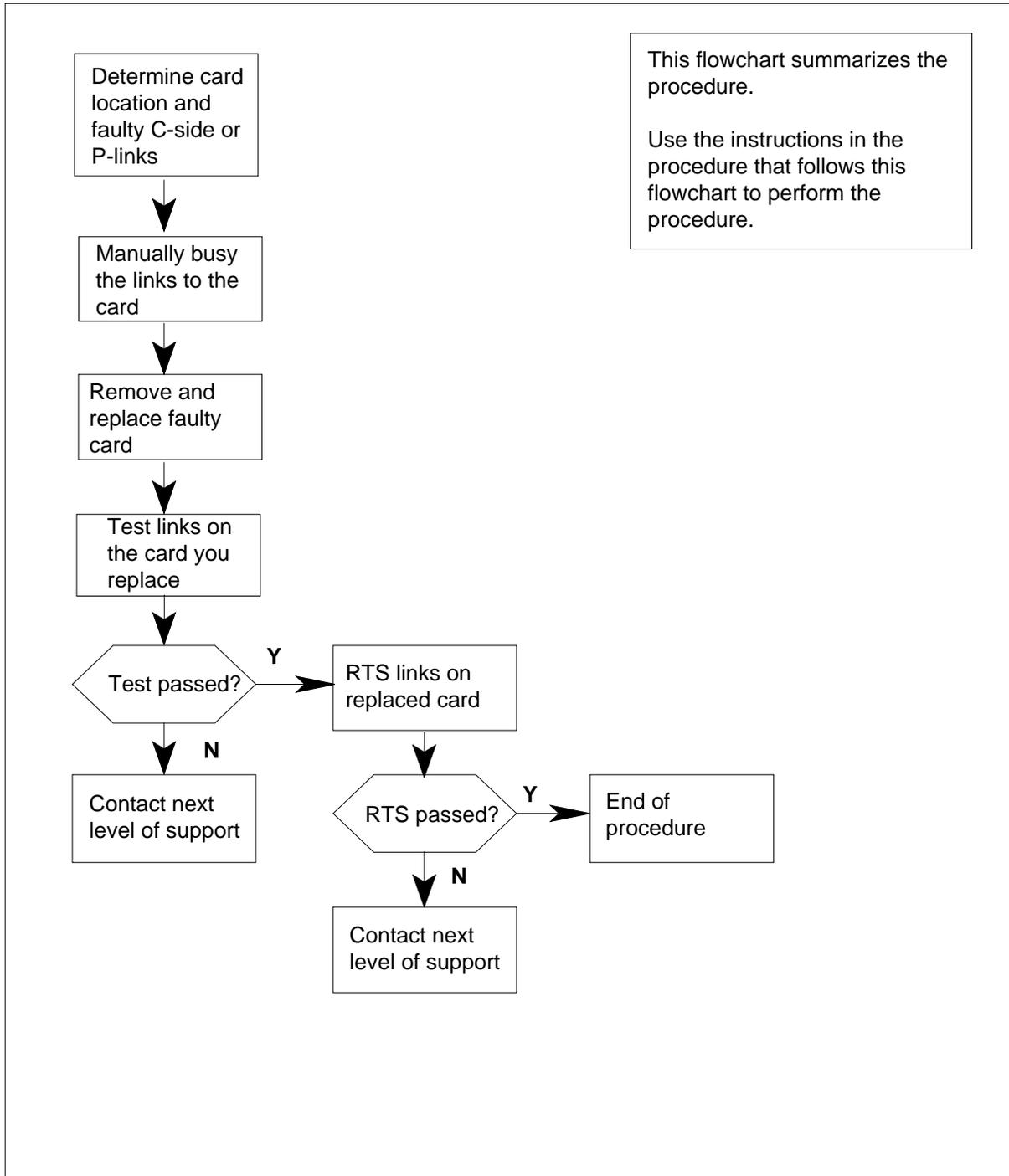
NTMX87
in an RSC-M (continued)

Replacing an NTMX87 in an RSC-M

At the MAP display

1   Proceed only under the following conditions:

- a step in a maintenance procedure directed you to this card replacement procedure

- you are using the procedure to verify or to accept cards

- your maintenance support group directed you to this procedure

2

WARNING
Loss of service
When you replace an NTMX87 circuit card in the RSC-M all links served by that card must be BSYed. All active calls on the affected links are lost. Make sure to perform this procedure only during periods of low traffic.

Obtain an NTMX87 replacement circuit card. The replacement circuit card must have the same product equipment code (PEC), including suffix, as the circuit card you must remove.

At the MAP terminal

3   To post the RSC-M/RCO2 with the defective card(s), type

>MAPCI;MTC;PM;POST RCO2 rco2_no

and press the Enter key.

where

rco2_no
is the number of the RCO2 with the defective card(s)

Example of a MAP response:

NTMX87
in an RSC-M (continued)

```
RCO2               SysB     ManB     OffL     CBsy     ISTb     InSv
 0 Quit    PM       0        0        2        0        2        25
 2 Post_   RCO2     0        0        0        0        1        1
 3 ListSet
 4         RCO2   0 ISTb  Links_OOS:  CSide  1, PSide   1
 5 TRNSL   Unit0:   Inact ISTb
 6 TST     Unit1:   Act InSv
 7 BSY
 8 RTS
 9 OffL
10 LoadPM_
11 Disp_
12 Next_
```

4   To determine the location of the RCO2 main or extension half shelf (left or right) that contains the circuit card you must replace, type

>QUERYPM

and press the Enter key.

Example of a MAP display:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname:KRI07BI1 EEPRom Load:MX77NG03
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
RSC-M 00  C02  RSC-M 00  05  RCO2: 000        MX85AA
RSC-M 00  C02  RSC-M 00  47  EXT:LEFT  01:13 MX86AA
```

5   To display any defective central side (C-side) links, type

>TRNSL C

and press the Enter key.

Example of a MAP response:

```
LINK  0   PLGC 0           0;CAP    MS:STATUS OK      MSGCOND   OPN
LINK  1   PLGC 0           1;CAP     S:STATUS SBsy
LINK  2   PLGC 0           2;CAP    MS:STATUS OK      MSGCOND   OPN
LINK  3   PLGC 0           3;CAP     S:STATUS OK
LINK  4   PLGC 0           4;CAP     S:STATUS OK
LINK  5   PLGC 0           5;CAP     S:STATUS SBsy
```

If C-side links are	Do
defective	step 7

NTMX87
in an RSC-M (continued)

If C-side links are	Do
not defective	step 6

6   To display the peripheral-side (P-side) links associated with the NTMX87 circuit card, type

>TRNSL P

and press the Enter key.

Example of a MAP response

```
Link  0:   REM1 11 0  0;Cap MS;Status:OK    ;MsgCond:OPN
Link  1: Carrier of Class – Trunk ;Status:OK
Link  2: Carrier of Class – Trunk ;Status:SBsy
Link  3: Carrier of Class – Trunk ;Status:SBsy
Link  4: Carrier of Class – Trunk ;Status:SBsy
Link  5: Carrier of Class – Trunk ;Status:OK
Link  6: Carrier of Class – Trunk ;Status:OK
Link  7: Carrier of Class – Trunk ;Status:OK
Link  8:    REM1 11 1 0;Cap MS;Status:OK;   MsgCond:OPN
```

The following table shows the P-side link configuration for an RSC-M cabinet. The cabinet has three RCO2 main shelves and two extension half shelves.

Note 1: A RCO2 cabinet can include other configurations like two RCO2 main shelves and four extension half shelves. Consult office administration or review office records for P-side link configurations other than the configurations mentioned in the following table.

Note 2: If the RCO2 has an associated extension half shelf, consult office administration or review office records for the P-side link configuration.

Note 3: NTMX82 packlets number from 0 to 3 starting at the top of each NTMX87 circuit card.

RCO2 P-side link connections (Sheet 1 of 2)

Card Location	MX87 Slot No.	Links for MX82 Card 0	Links for MX82 Card 1	Links for MX82 Card 2	Links for MX82 Card 3
RCO2 main, shelf, pos. 05	12	0, 1	2, 3	4, 5	6, 7
	16	8, 9	10, 11	12, 13	14, 15
	14	16, 17	18, 19	20, 21	22, 23
Left ext. half shelf	4	24, 25	26, 27	28, 29	30, 31
	6	32, 33	34, 35	36, 37	38, 39

NTMX87
in an RSC-M (continued)

RCO2 P-side link connections (Sheet 2 of 2)

Card Location	MX87 Slot No.	Links for MX82 Card 0	Links for MX82 Card 1	Links for MX82 Card 2	Links for MX82 Card 3
	8	40, 41	42, 43	44, 45	46, 47
RCO2 main shelf, pos. 19 (optional)	12	0, 1	2, 3	4, 5	6, 7
	16	8, 9	10, 11	12, 13	14, 15
	14	16, 17	18, 19	20, 21	22, 23
Right ext. half shelf	19	40, 41	42, 43	44, 45	46, 47
	21	32, 33	34, 35	36, 37	38, 39
	23	24, 25	26, 27	28, 29	30, 31
Prov. RCO2 shelf, pos. 33	12	0, 1	2, 3	4, 5	6, 7
	16	8, 9	10, 11	12, 13	14, 15
	14	16, 17	18, 19	20, 21	22, 23

Note: Go to step 10.

7   To post the host peripheral module (PM), type

>POST host_pm host_pm_no

and press the Enter key.

where

host_pm
is a PCM-30 line group controller (PLGC)

host_pm_no
is the number of the PLGC connected to the defective card

Example of a MAP display:

NTMX87
in an RSC-M (continued)

```
CM      MS      IOD     Net     PM      CCS     Lns     Trks    Ext  Appl
 .       .       .       .    1RCO2     .       .       .       .    .

PLGC               SysB    ManB    OffL    CBsy    ISTb    InSv
 0 Quit    PM       0       0       1       0       4       12
 2 Post_   PLGC     0       0       2       0       2        9
 3 ListSet
 4         PLGC  1 ISTb  Links_OOS:  CSide  0, PSide   1
 5 Trnsl_  Unit0:   Act InSv
 6 Tst_    Unit1:   Inact InSv
 7 Bsy_
 8 RTS_
 9 OffL
10 LoadPM_
11 Disp_
12 Next
13 SwAct
14 QueryPM
15
16
17 Perform
18
```

8   To display the P-side links associated with the NTMX87 card, type

>TRNSL P

and press the Enter key.

Example of a MAP response

```
LINK 0    RCO2 0 5  27;CAP    MS:STATUS OK   MSGCOND OPN
LINK 1    RCO2 1 5  27;CAP    MS:STATUS SBsy MSGCOND CLS
LINK 2    RCO2 0 7  47;CAP    MS:STATUS OK
LINK 3    RCO2 1 7  47;CAP    MS:STATUS OK
LINK 4    RCO2 0 5  50;CAP    MS:STATUS OK   MSGCOND OPN
LINK 5    RCO2 1 5  50;CAP    MS:STATUS SBsy MSGCOND CLS
```

9   After you identify the defective C-side link, determine which NTMX87 to
remove by using the following chart. Match the link number with the slot
number and the packlet number to the left of each correct table.

NTMX87
in an RSC-M (continued)
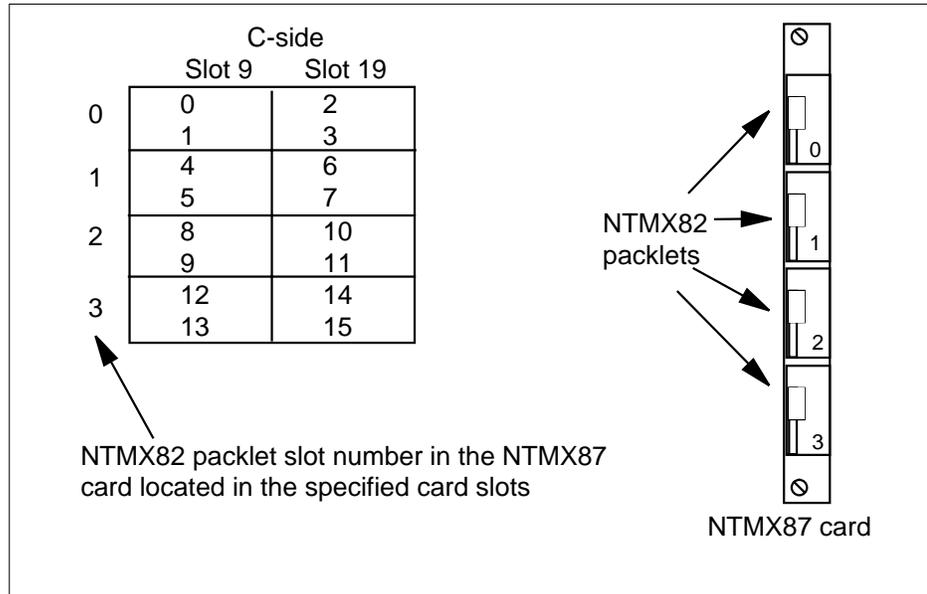
RCO2 C-side link connections

	C-side	
	Slot 9	Slot 19
0	0 1	2 3
1	4 5	6 7
2	8 9	10 11
3	12 13	14 15

NTMX82 packlet slot number in the NTMX87
card located in the specified card slots

NTMX82 packlets

NTMX87 card

10   Record the RCO2 number, shelf location, slot number, and numbers of the
associated links for the circuit card you replace.

11   To manually busy (ManB) the links that connect to the defective NTMX87
circuit card, type

   >BSY LINK link_no

   and press the Enter key.

   where

   link_no
      is the number of the link associated with the defective NTMX87 circuit
      card

   Note 1: Each NTMX87 circuit card has eight links associated with it. Each
   link must be ManB. Possible link number pairs are as follows: 0 to 7; 8 to
   15; 16 to 23.

   Note 2: To busy the other links for the RCO2, perform this step for each
   link until all links are busy.

NTMX87
in an RSC-M (continued)

At the cabinet

12

⚠️ **WARNING**
Static electricity damage
When you handle circuit cards, make sure wear a wrist strap that connects to the wrist strap grounding point. The grounding point is on the left side of the modular supervisory panel (MSP) of the RCO2. The wrist strap protects the equipment against damage caused by static electricity.

🛑 **DANGER**
Equipment damage
Take the following precautions when you remove or insert a card:

1. Make sure you do not apply direct pressure to the components.

2. Make sure you do not force the cards into the slots.

Put on a wrist strap.

13 Remove the NTMX82 packlet(s) as described in the following steps:

a Locate the packlet you must remove on the correct NTMX87 circuit card slot.

b Open the locking lever on the packlet you must replace. Carefully pull the circuit card toward you until the circuit card clears the shelf.

c Make sure the replacement circuit card has the same PEC, including suffix, as the circuit card just removed.

14 Use the T9908 wrist grounding strap and a T1324 screwdriver to remove the NTMX87 quad frame carrier circuit card.

NTMX87
in an RSC-M (continued)
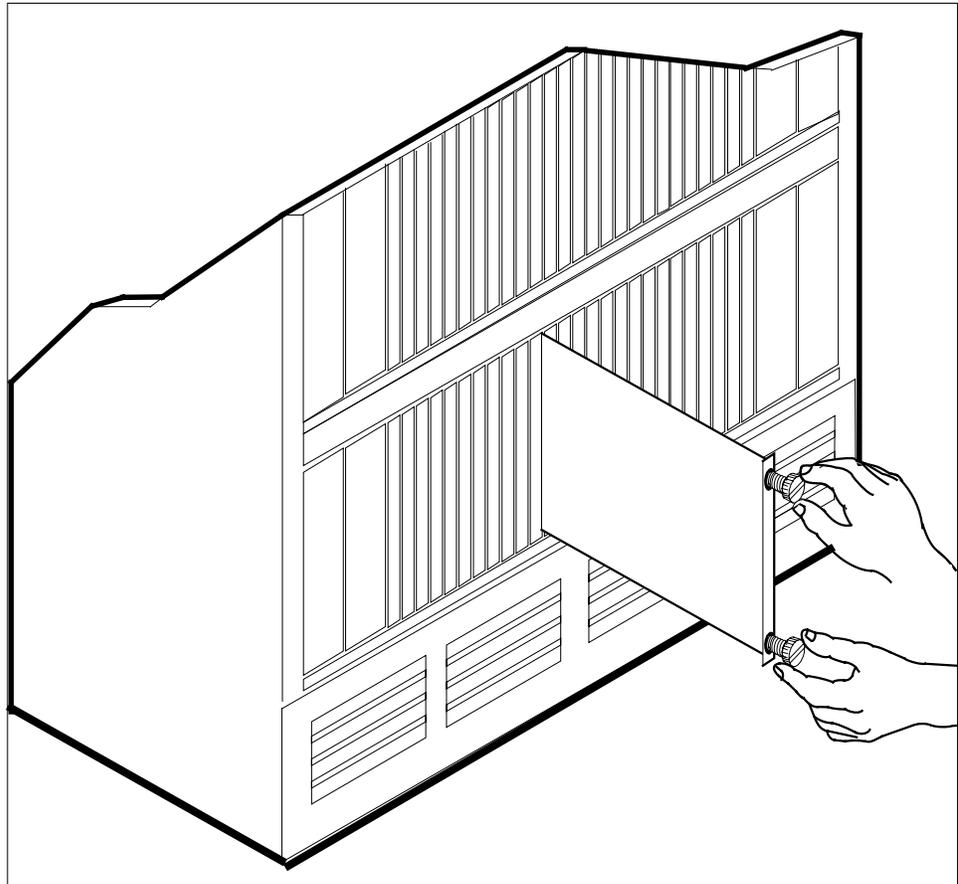
15   Before you insert the replacement NTMX82 circuit card, make sure the switch settings are identical to the switch settings on the circuit card you removed. The next table describes the PCM30 DIP switch settings on the NTMX82 circuit card.

NTMX82 switch settings (Sheet 1 of 2)

Port	Impedance	Output
Even port	75 OHM	Switch S3 pos 1, 2, 3, and 4 ON , pos 5 and 6 OFF
Even port	120 OHM	Switch S3 pos 1 and 5 ON, pos 2, 3, 4, and 6 OFF
Note: Set switch S2 positions 1 & 2 ON to allow messaging.		

NTMX87
in an RSC-M (continued)

NTMX82 switch settings (Sheet 2 of 2)

Port	Impedance	Output
Odd port	75 OHM	Switch S1 pos 1, 2, 3, and 4 ON , pos 5 and 6 OFF
Odd port	120 OHM	Switch S1 pos 1 and 5 ON, pos 2, 3, 4, and 6 OFF
Note: Set switch S2 positions 1 & 2 ON to allow messaging.		

16   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 circuit card slot in the NTMX87 circuit card.

17   Seat and lock the packlet.

     a   Use your fingers to push on the upper and lower edges of the faceplate of the packlet. Make sure the packlet is fully seated in the slot.

     b   Close the locking lever.

18   Insert and secure the new NTMX87 quad frame carrier card. Remove wrist strap.

19   Use the following information to determine the next step in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 20
other	step 21

20   Return to the procedure that directed you to this procedure. At the point where the system produced a defective card list, identify the next defective card on the list. Go to the correct card replacement procedure for that card in this manual.

At the MAP terminal

21   To test the busied links from step, type

     >TST LINK link_no

     and press the Enter key.

     where

NTMX87
in an RSC-M (end)

    link_no
        is the number of the link ManB in step 11

Note 1: Perform this step for each link ManB.

Note 2: To test the other links associated with the RCO2, execute the procedures in this step for each link. Continue until all links are tested.

If the test of the link(s)	Do
passed	step 22
failed	step 25

22   To return to service (RTS) the links, type

    >RTS link_number

and press the Enter key.

where

    link_number
        is the number of the link tested in step 21

Note: To RTS the other links associated with the RCO2, execute the procedures in this step for each link. Continue until all links are RTS.

If RTS	Do
passed on all links	step 23
failed	step 25

23   Go to the common returning a card procedure in this document.

24   You have completed this procedure. Remove the sign from the active unit. Return to the maintenance procedure that directed you to this card replacement procedure. Continue as directed.

25   Contact the personnel responsible for higher level support for additional help to replace this card.

NTRX41
in an RSC-M/MSP

Application

Use this procedure to replace an NTRX41 card in a modular supervisory panel (MSP) that supports a Remote Switching Center Multi-Access (RSC-M) cabinet.

Note: In this section, examples refer to RSC-M as RCO2 . When software outputs messages to the MAP terminal, software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTRX41	AA, BA, CA	Alarm module

Common procedures

The common returning a card procedure is referenced in this procedure.

Action

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

NTRX41
in an RSC-M/MSP (continued)

Summary of Replacing an NTRX41 in an RSC-M/MSP

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Locate
defective card

↓

Remove and
replace
defective card

↓

Card
successfully
changed? **Y** → Return to
original
procedure

↓ **N**

Contact next
level of support
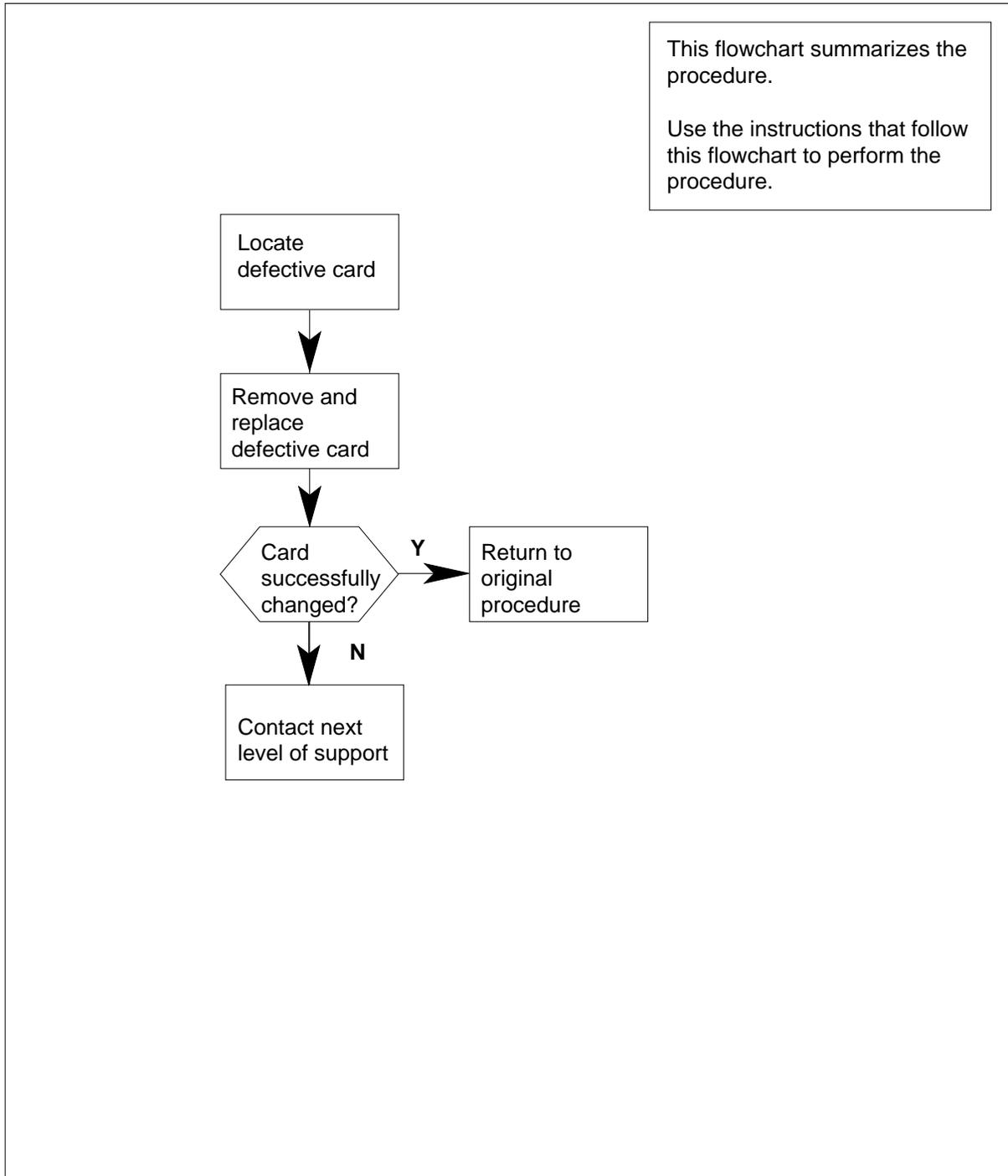
NTRX41
in an RSC-M/MSP (continued)

Replacing an NTRX41 in an RSC-M/MSP

At the MAP display:

1   Proceed if the next level of support or a step in a maintenance procedure directed you to this card replacement procedure. Use this procedure to verify or accept cards.

2   Obtain an NTRX41 replacement circuit card. Make sure the replacement circuit card has the same PEC and suffix as the circuit card to remove.

At the front panel of the cabinet

3   Open the front cover of the MSP. Release the two cover latches and swing the cover down to the open position.
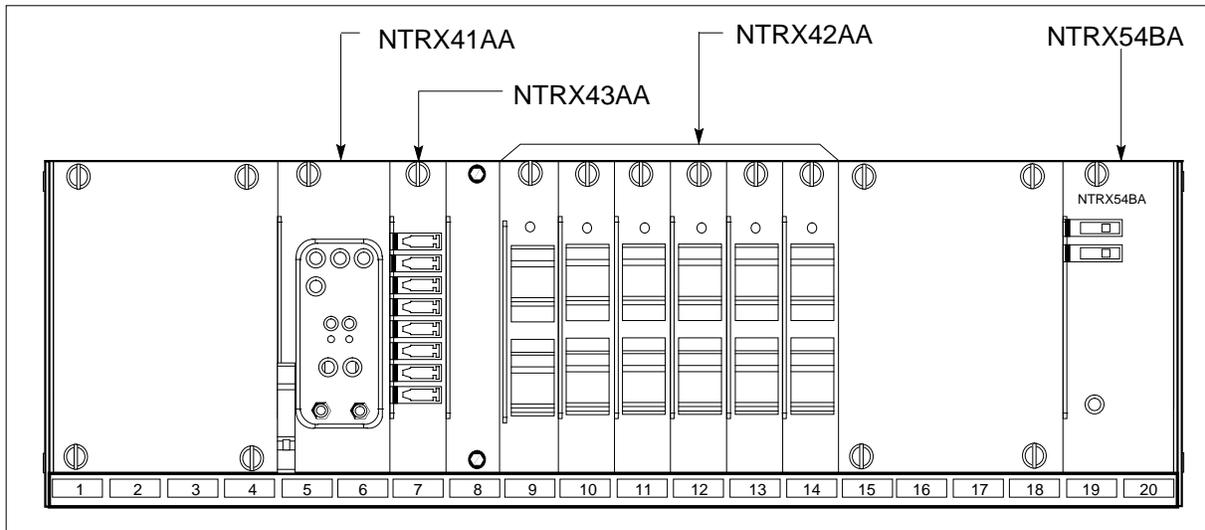
MSP

4

WARNING
Risk of injury from high energy levels, static electricity damage
Wear a wrist strap that connects to the wrist-strap grounding point on the left side of the modular supervisory panel (MSP) to remove cards. The wrist strap protects the equipment against static electricity damage.

NTRX41
in an RSC-M/MSP (continued)

> **DANGER**
> **Risk of injury from high energy levels, equipment damage**
> Take these precautions when you remove or insert a card:
>
> 1. Do not apply direct pressure to the components.
>
> 2. Do not force the cards in the slots.

Wear a wrist strap.

5   Locate and remove the NTRX41 circuit card that appears in the following figure.

 The circuit card is in slots 05 and 06.

a   At the front of the MSP, disengage the knurled thumbscrew at the top of the circuit card.

b   Pull out the lever on the upper left side of the alarm module.

c   Carefully pull the circuit card toward you until the circuit card clears the shelf.

6   Make sure the replacement circuit card has the same PEC and suffix as the last circuit card removed.
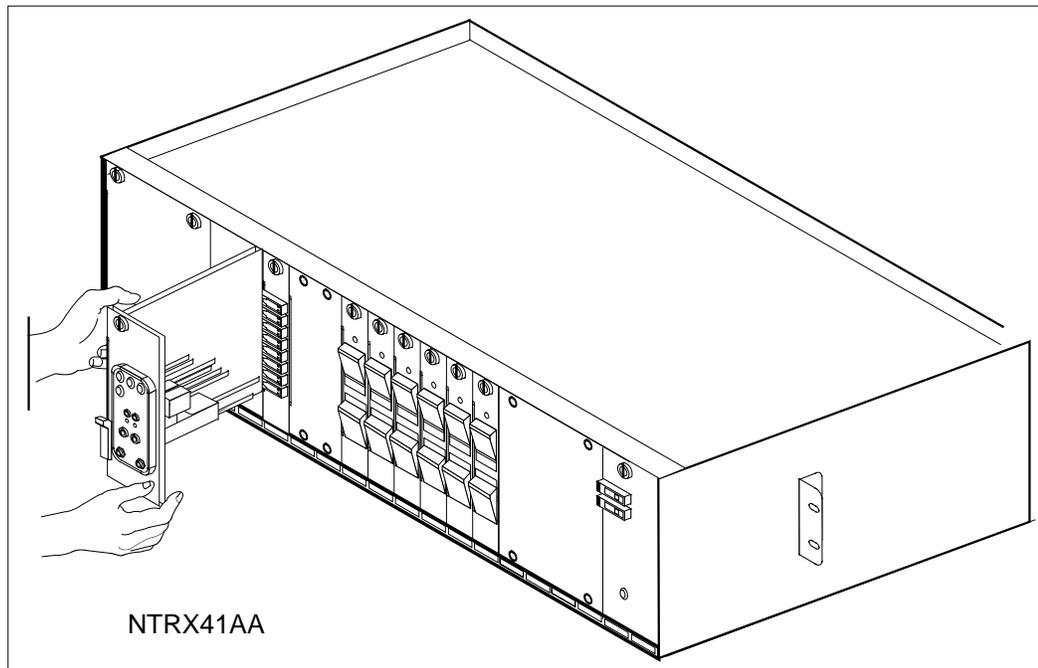
NTRX41AA

a   Align the circuit card with the slots in the shelf. Carefully slide the circuit card in the shelf.

b   Seat the circuit card carefully and tight.

NTRX41
in an RSC-M/MSP (end)

    c   Push in lever on the upper left side of alarm module.

    d   Tighten the knurled thumbscrew at the top of the circuit card.

If the alarm light	Do
remains off (or light for a short time)	step 7
turns on	step 9

7   Go to the common returning a card procedure in this document.

8   This procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure. Continue as directed.

9   For additional help with this card replacement, contact the next level of support.

NTRX42
in an RSC-M/MSP

Application

Use this procedure to replace an NTRX42 card in a modular supervisory panel (MSP) that supports a Remote Switching Center Multi-access (RSC-M) cabinet.

Note: In this section, RCO2 in the examples refers to RSC-M. When software outputs messages to the MAP terminal, software does not differentiate between the two types of RCO2.

PEC	Suffixes	Name
NTRX42	AA	Circuit breaker module

Common procedures

None

Action

A connector removal tool is available to facilitate removal of the AMP Faston receptacles. This tool facilitates removal of these receptacles from the power input and output connectors of the MSP modules. This tool comes in two lengths: P0746192 152 mm (6 in) and P0747552 254 mm (10 in). You can use the shorter tool when access to the rear of the MSP is limited. For example, limited access can be MSP modules located behind the cabinet bulkhead.

This tool is approximately 2 mm (0.090 in) thick and 17 mm (0.65 in) wide, with a jaw-like cutout at each end. The cutout profile conforms to the shape of the Faston receptacle. You can use the shorter tip of each profile to position the receptacle in the tool.

The first connection point of the tool serves as the pivot point. To engage the longer profile tip with the action-arm of the power connector, rotate the tool around the pivot point. The longer tip of the profile is the tip that has a hook on the end. As the tool presses the action-arm of the connector, the receptacle disengages from the connector tab. To remove the receptacle, pull the tool away from the connector with the receptacle trapped in the jaw of the tool. To disengage the tool from the receptacle, rotate the hook of the tool off the action-arm of the receptacle.

The cutout shape is the same on each tool end, but the orientation of the profile is off by 15 degrees. This difference enables the use of the tool at different

NTRX42
in an RSC-M/MSP (continued)

angles. You can require the use of these angles because of limited access to the connectors.

Connector removal tool
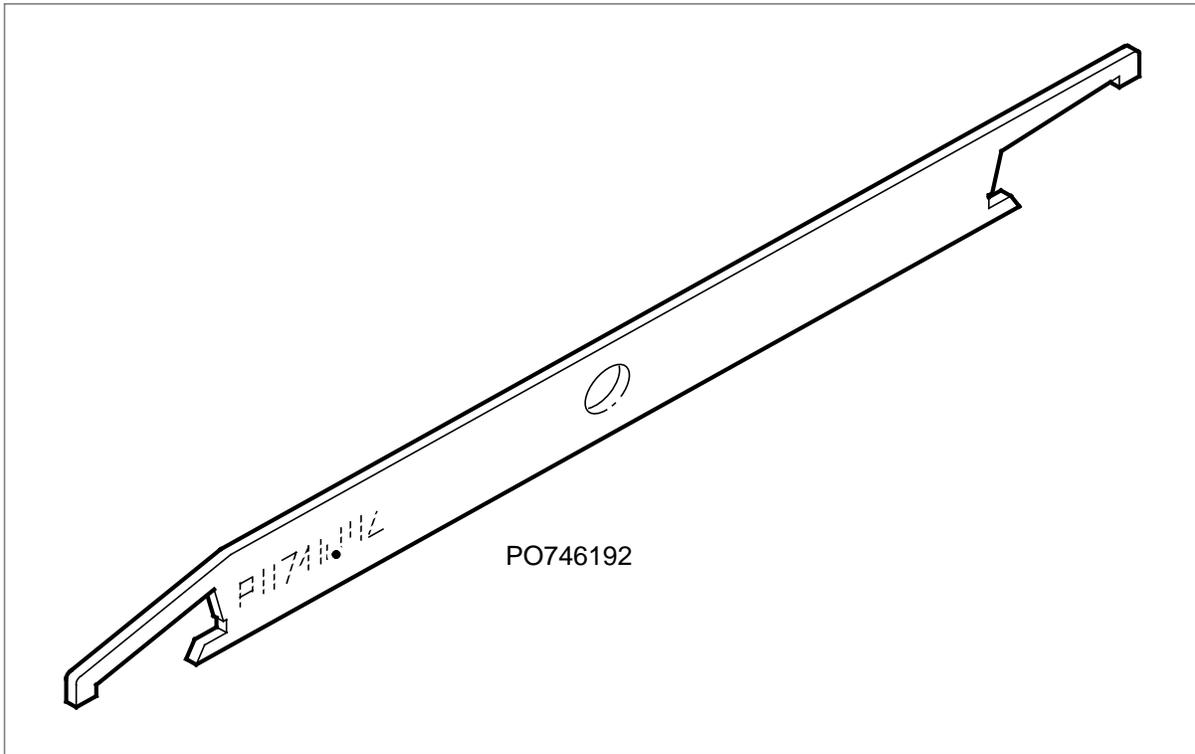
PO746192

This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure. The detailed procedure depends on which circuit cards the breaker module circuit card (NTRX42) serves. Instructions will direct you to the correct steps that depend on your configuration.

NTRX42
in an RSC-M/MSP (continued)

Summary of replacing an NTRX42 in an RSC-M/MSP

Identify shelves that this CB serves

↓

Post the served units

↓

Manually busy served units

↓

Remove and replace defective card

↓

RTS inactive units

↓

RTS passed? —**Y**→ Return to original procedure

↓ **N**

Return to card list and replace next card

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.
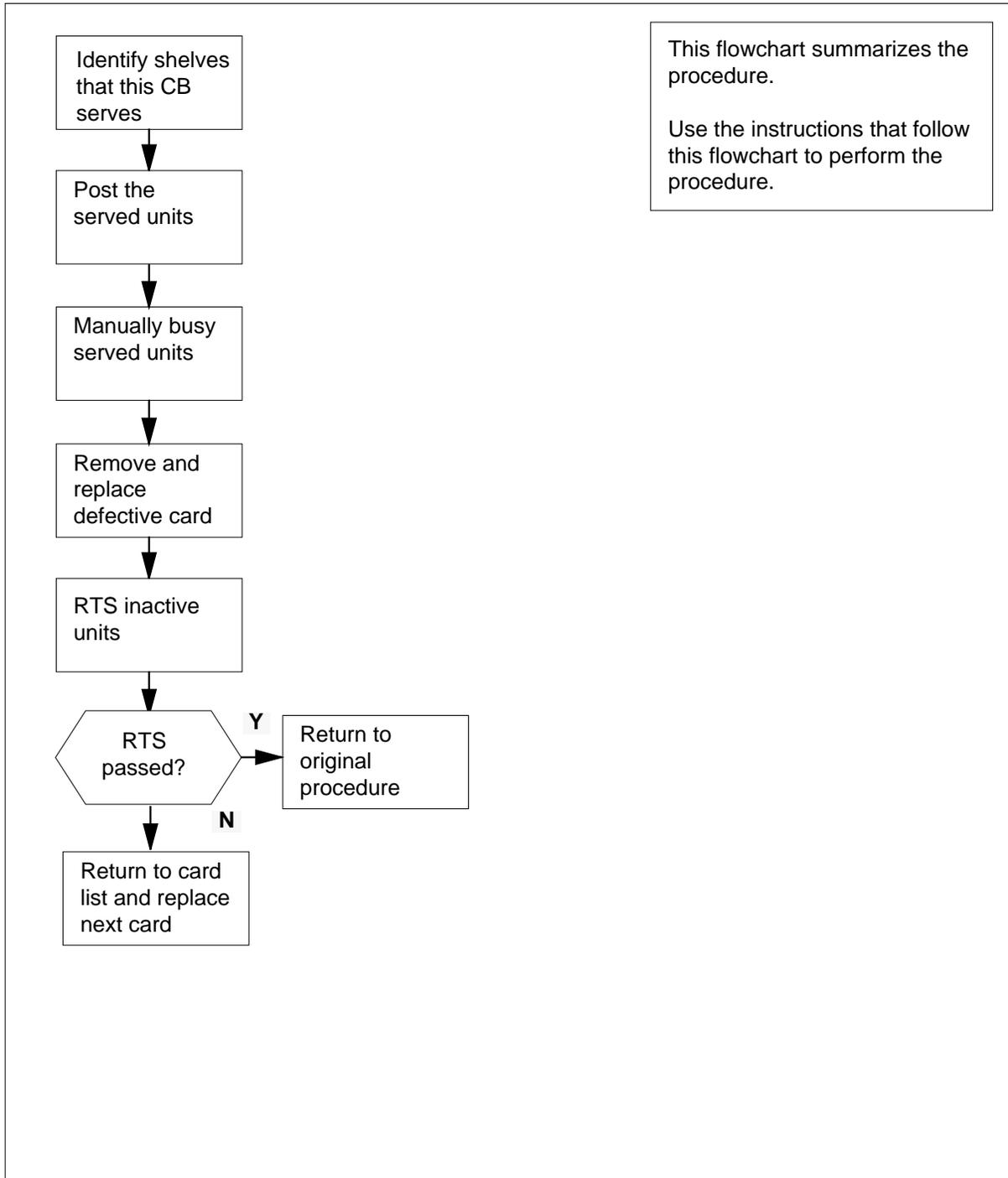
NTRX42
in an RSC-M/MSP (continued)

Replacing an NTRX42 in an RSC-M/MSP

At the MAP terminal

1 Proceed only if one of the following conditions applies. Your maintenance support group or a step in a maintenance procedure directed you to this card replacement procedure. You use the procedure to verify or accept cards.

2

> ⚠️ **WARNING**
> **Loss of service**
> When you replace an NTRX42 card in the RSC-M, make sure the units associated with the NTRX42 card are *inactive* . Make sure the mate units are *active*

Obtain an NTRX42 replacement circuit card. Make sure the replacement circuit card has the same product equipment code (PEC) and PEC suffix as the circuit card to remove.

At the front panel of the cabinet

3 Open the front cover of the MSP. Release the two cover latches. Swing the cover down to the open position.

MSP
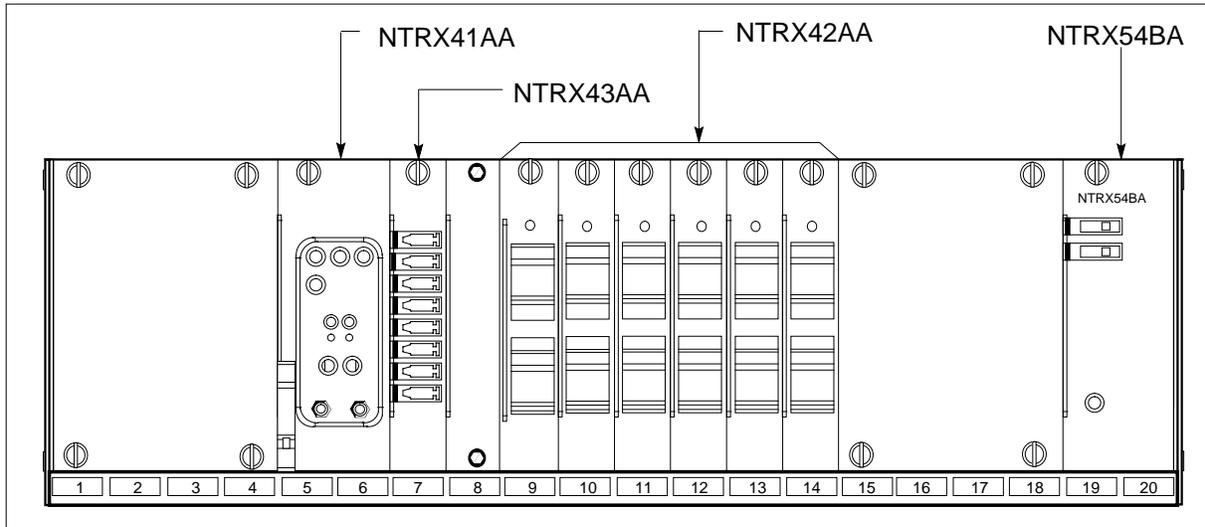
4 Use the breaker designation label to identify the circuit cards each circuit breaker (CB) services. Many modules of NTRX42 service two separate

---

NTRX42
in an RSC-M/MSP (continued)

devices (or units). You must power down both units before removal of the associated NTRX42 circuit card.

At the MAP terminal

5   Set the MAP display to the peripheral module (PM) level. To post the RSC-M/RCO2 that the NTRX42 circuit breaker card powers, type

>*MAPCI;MTC;PM;POST RCO2* `rco2_no`

and press the Enter key.

where

rco2_no
is the number of the RCO2 that the NTRX42 card powers

Example of a MAP response:

```
RCO2                SysB     ManB     OffL     CBsy     ISTb     InSv
  0 Quit    PM       0        0        2        0        2        25
  2 Post_   RCO2     0        0        0        0        1        1
  3 ListSet
  4         RCO2  0 ISTb  Links_OOS:  CSide  1, PSide   1
  5 TRNSL   Unit0:   Inact ISTb
  6 TST     Unit1:   Act InSv
  7 BSY
  8 RTS
  9 OffL
 10 LoadPM_
 11 Disp_
 12 Next_
```

6   To determine the location of the RSC-M units or extension (EXT) half shelves that the circuit card you replace powers, type

>**QUERYPM**

and press the Enter key.

Example of a MAP response:

```
PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
PMs Equipped: 53 Loadname:KRI07BI1 EEPRom Load:MX77NG03
WARM SWACT is supported and available
RCO2 0 is included in the REX schedule.
REX on RCO2 0 has not been performed.
Node Status: {OK, FALSE}
Unit 0 Act,   Status: {OK, FALSE}
Unit 1 Inact, Status: {OK, FALSE}
Site Flr RPos Bay_id Shf Description Slot EqPEC
HOST 00  C02  LTEI 00  05  RCO2 000         MX85AA
HOST 00  C02  CEXT 00  47  EXT:LEFT  01:13 MX86AA
```

NTRX42
in an RSC-M/MSP (continued)

7 Use the following table to determine the RSCM PM units or EXT half shelves associated with the NTRX42 card that you replace.

Note: You must busy all RCO2 units or EXT half shelves associated with the circuit breakers on the defective NTRX42 card before replacement. For example, replacement of the NTRX42 card with CB3 and CB4 affects unit 1 of the RSCM located in shelf 5. This replacement also affects unit 1 of the RSCM located in shelf 19.

RSC-M shelves powered by NTRX42 circuit breakers

CB1 and CB2	CB3 and CB4	CB5 and CB6	CB7 and CB8	CB9 and CB10	CB11 and CB12
CB1 shelf 5 unit 0	CB3 shelf 5 unit 1	CB5 shelf 33 unit 0	CB7 shelf 33 unit 1	CB9 shelf 47 EXT left to unit 0 of RSCM in shelf 5	CB11 shelf 47 EXT left to unit 1 of RSCM in shelf 5
CB2 shelf 19 unit 0	CB4 shelf 19 unit 1	Reserved	Reserved	CB10 shelf 47 EXT right to unit 1 of RSCM in shelf 19	CB12 shelf 47 EXT right to unit 0 of RSCM in shelf 19

Note 1: Before you remove the NTRX42 card with CB9 and CB10, you must busy specified units. BSY unit 0 of the RSCM in shelf 5 and BSY unit 1 of the RSCM in shelf 19.

Note 2: Before you remove the NTRX42 card with CB11 and CB12, you must busy specified units. BSY unit 1 of the RSCM in shelf 5 and BSY unit 0 of the RSCM located in shelf 19.

8 Repeat steps 5 and 7 to determine the RSC-M unit(s) that will associate.

9 Determine the state of the RSC-M unit(s) associated with the NTRX42 card you want to replace.

If the state of the RCO2 unit	Do
is active	step 10
is inactive	step 13

10 To switch activity of the units, type

>SWACT

and press the Enter key.

Example of a MAP response:

```
RCO2 0      A Warm SwAct will be performed after
            data sync of active terminals.
Please confirm ("YES", "Y", "NO", or "N"):
```

If the system	Do
prompts you to confirm a warm SWACT	step 11
rejects the SWACT	step 32

11   To confirm the command, type

>YES

and press the Enter key.

Example of a MAP response:

```
Unit0:   Inact SysB  Mtce
Unit1:   Act   ISTb

RCO2 0     SwAct Passed
```

If the MAP response	Do
is SWACT passed	step 12
is other than listed here	step 31

At the MAP terminal

12   To manually busy (ManB) the inactive unit, type

>BSY UNIT INACTIVE

and press the Enter key.

Example of a MAP response:

```
RCO2     0 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:   Inact ManB
Unit1:   Act   ISTb
Bsy INACTIVE
RCO2 0 Unit 0    Bsy Passed
```

If the BSY command	Do
passed	step 13
failed	step 31

NTRX42
in an RSC-M/MSP (continued)

13 Repeat steps 9 to 12 until all units powered by the NTRX42 card are in the inactive state. Place a sign on the active units that bears the words *Active unit-Do not touch*. Do not attach this sign with magnets or tape.

At the RCO2 shelf

14 Power down the unit(s) and EXT shelves associated with the NTRX42 cards. To power down these units and shelves, set the ON/OFF switch on the power converter faceplate to the OFF position. Both the converter FAIL LED and FRAME FAIL lamp on the MSP will be ON. An audible alarm can sound. To silence an alarm, type

>**SIL**

and press the Enter key.

At the front panel of the cabinet

15 Determine the defective circuit breaker on the MSP. Switch both breakers on that circuit card to the OFF position. Safety tag the front of the circuit breaker.

16 An alarm can sound. To silence the alarm, type

>*SIL*

and press the Enter key.

At the rear panel of the cabinet

17

WARNING
Risk of injury from high energy levels, static electricity damage
Wear a wrist strap that connects to the wrist-strap grounding point on the left side of the modular supervisory panel (MSP) to remove cards. The wrist strap protects the equipment from static electricity damage.

DANGER
Risk of physical damage to cards
Take these precautions when you remove or insert a card:

1. Do not apply direct pressure to the components.

2. Do not force the cards into the slots.

3. Do not insert metallic objects into the black conntectors. Voltage is present and equipment damage can result.

Wear a wrist strap.

18 Open the rear door and locate the NTRX42 circuit card. To verify the card location, check the slot number stamped in the chassis.

NTRX42
in an RSC-M/MSP (continued)

a   Note the wire color and the location to facilitate connection again.
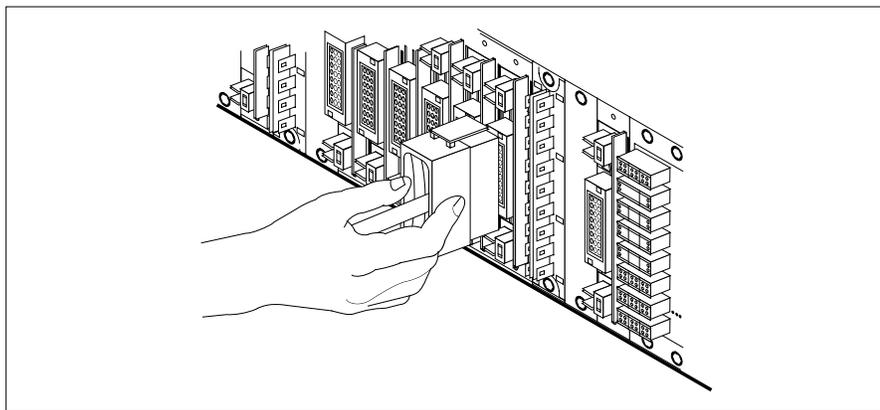
b   Safety tag the front of the circuit breaker to indicate maintenance activity.

c   Use the connector removal tool to disconnect the power connectors to the circuit card manually. Work from the bottom of the MSP shelf to the top of the MSP shelf. Manually disconnect and tag the smaller black power connectors located below the larger blue power connector. Manually disconnect and tag the large blue power connector. Disconnect and tag the smaller black power connectors located above the large blue power connector. Make sure you disconnect the black connectors *before* you remove the circuit card.

d   The connectors have voltage present, but the connectors are insulated. Secure the connectors to the power-connector bundle with a line-tie until you connect the connectors again.

19   Jumper connectors and cables can be present. Disconnect and tag these jumper connectors and cables. Separate the jumper connectors and cables for use on the replacement unit.

At the front panel of the cabinet

20   Remove the NTRX42 circuit card.

a   Disengage the captive screw that has a spring and is at the top of the circuit card.

b   Grasp the top and bottom of unit. Carefully pull the circuit card toward you until the circuit card clears the shelf.

c   Replace the circuit card. Make sure the replacement circuit card has the same PEC and PEC suffix as the circuit card that you replace.

d   Tighten the spring-loaded captive screw at the top of the circuit card.

NTRX42
in an RSC-M/MSP (continued)
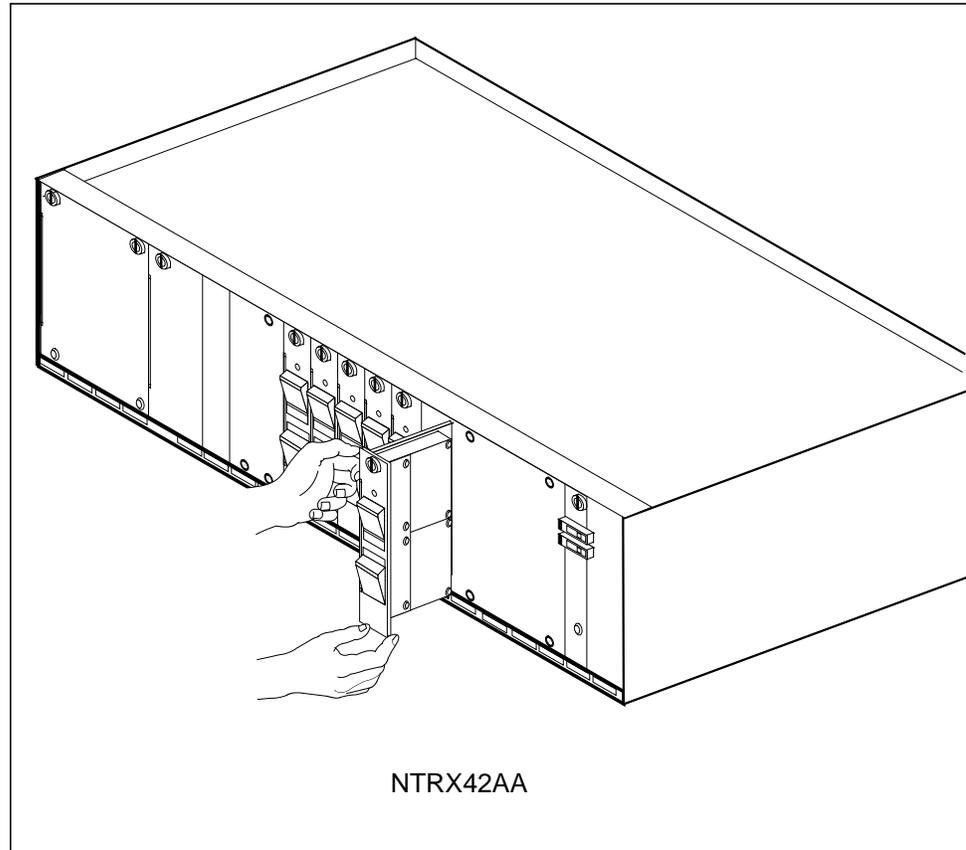
NTRX42AA

21 Replace any jumper connectors and cables removed in step 19. Insert the power connectors again at the rear of the circuit card.
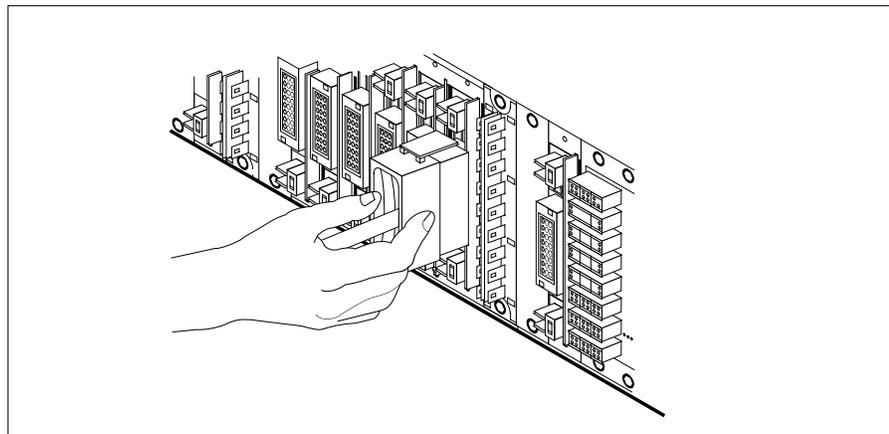
22 Apply the correct label from the spare parts on the replacement NTRX42 circuit breaker card.

NTRX42
in an RSC-M/MSP (continued)

23   Switch on the associated power converter(s).

24   Reset the circuit breakers to ON (up). Cards that this breaker controls can include a reset switch. If this condition applies, hold the RESET button up while you set the circuit breaker to the ON position.

25   Observe the circuit breakers on the NTRX42 card.

If the circuit breaker(s)	Do
does not trip and power returns to the associated power converters	step 26
trips or power does not return to the associated power converters	step 31

26   To load the inactive units, type

>LOADPM UNIT INACTIVE

and press the Enter key.

    Note: Repeat this step for each unit that you busied in step 12.

If the LOADPM command	Do
passed	step 27
failed	step 31

27   To return the inactive unit(s) to service, type

>RTS INACTIVE

and press the Enter key.

If the RTS command	Do
passed	step 28
failed	step 31

28   Remove the safety tag from the front of the circuit breaker and the signs from the active units.

29   Close the front cover of the MSP. Swing the cover up to the closed position and lock the two cover latches.

30   This procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure. Continue as directed.

31   For additional help with this card replacement, contact the next level of support.

NTRX42
in an RSC-M/MSP (end)

32   For additional help with switch of activity, contact the next level of support.

> *Note:* If the system recommends that you use the SWACT command with the FORCE option, consult office personnel. Office personnel can advise you to not use the FORCE option.

NTRX43
in an RSC-M/MSP

Application

Use this procedure to replace an NTRX43 card in a modular supervisory panel (MSP) that supports a Remote Switching Center Multi-access (RSC-M) cabinet.

PEC	Suffixes	Name
NTRX43	AA	Fuse module

Common procedures

The common returning a card procedure is referenced in this procedure.

Action

A connector removal tool is available to allow removal of the AMP Faston receptacles. This tool allows removal of these receptacles from the power input and output connectors of the MSP modules. This tool comes in two lengths: P0746192 152 mm (6 in.) and P0747552 254 mm (10 in.). Use the shorter tool when conditions cause limited access to the rear of the MSP. Limited access can occur when MSP modules are behind the cabinet bulkhead.

This tool is approximately 2 mm (0.090 in.) thick and 17 mm (0.65 in.) wide, with a jaw-like cut-out at each end. The cut-out profile conforms to the shape of the Faston receptacle. Use the shorter tip of each profile to position the receptacle in the tool.

The first meeting point of the tool serves as the pivot point. When you rotate the tool around this pivot point, you engage one tip with the action-arm of the power connector. This tip is the longer tip of the profile that has a hook on the end of the tip. As you press the action-arm of the connector, you disengage the receptacle from the connector tab. To remove the receptacle, pull the tool with the receptacle trapped in the jaw of the tool away from the connector. To disengage the tool from the receptacle, rotate the hook of the tool off the action-arm of the receptacle.

The shape of the cut-out is the same on each end of the tool. The position of the profile is off by 15 degrees. This difference allows for the use of the tool at different angles. You can require the use of the tool at different angles because of limited access to the connectors.

NTRX43
in an RSC-M/MSP (continued)
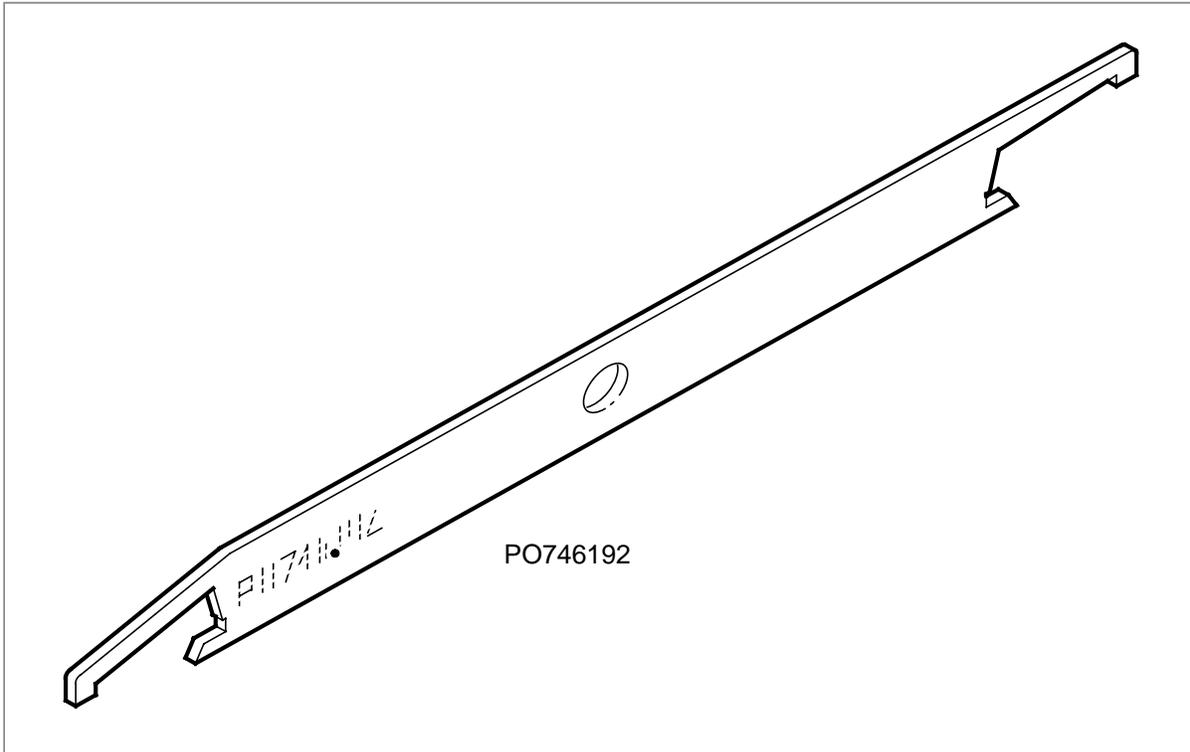
Connector removal tool

PO746192

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

NTRX43
in an RSC-M/MSP (continued)

Summary of Replacing an NTRX43 in an RSC-M/MSP

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Locate defective card

Remove and replace defective card

Card successfully changed?

Y → Return to original procedure

N → Contact next level of support
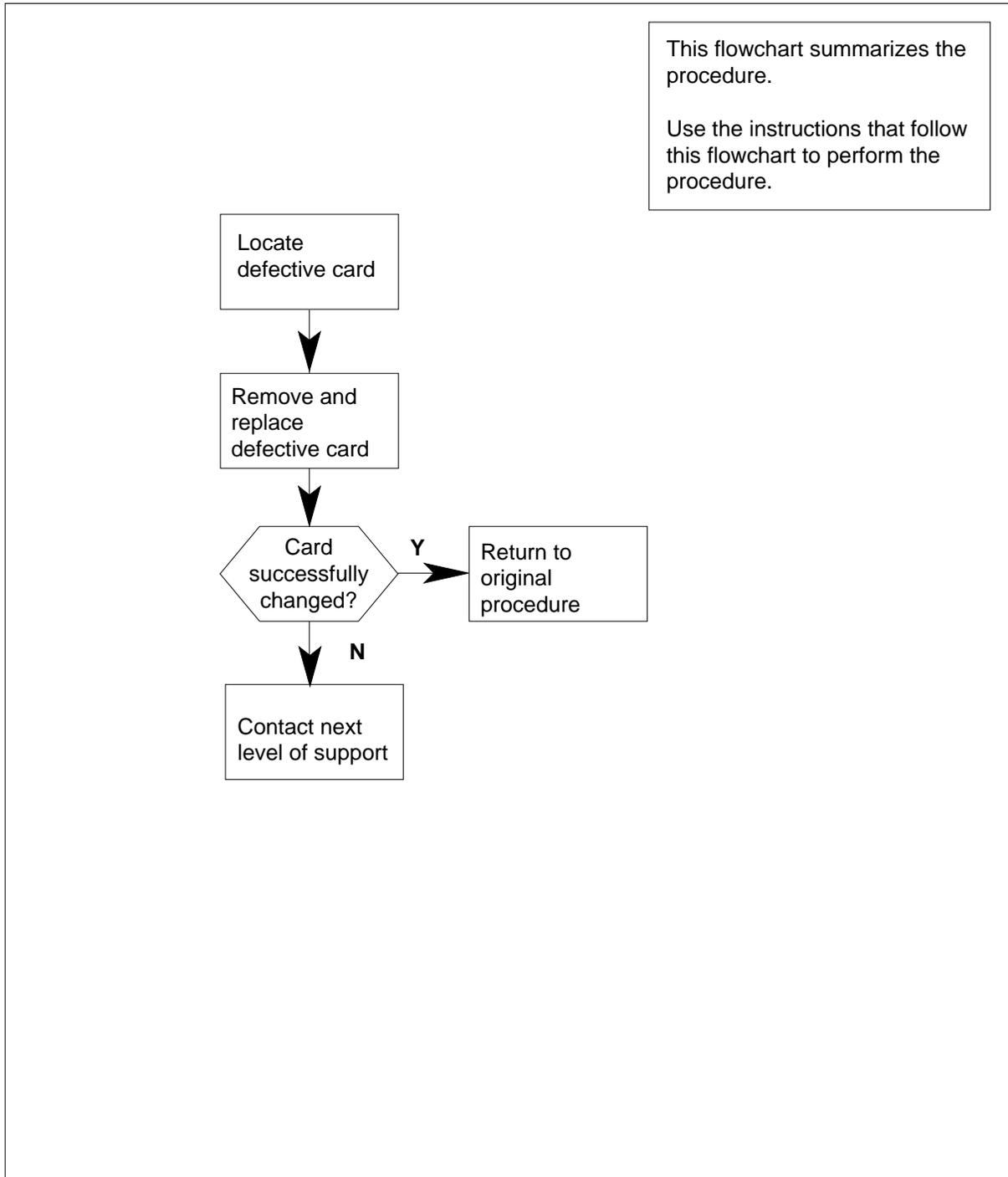
NTRX43
in an RSC-M/MSP (continued)

Replacing an NTRX43 in an RSC-M/MSP

At the MAP terminal

1   Proceed if the maintenance support group or a step in a maintenance procedure directed you to this card replacement procedure. Use this procedure to verify or accept cards.

2   Obtain a replacement circuit card. Make sure the replacement circuit card has the same product equipment code (PEC) and suffix as the circuit card you want to remove.

At the front panel of the cabinet

3   Open the front cover of the MSP. Release the two cover latches. Swing the cover down to the open position.

MSP
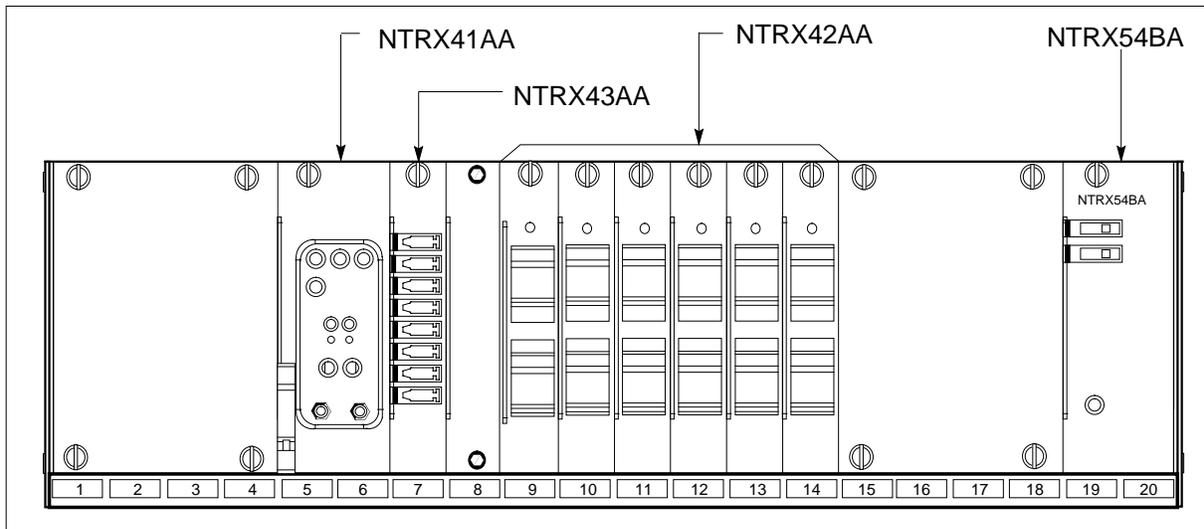
4   Power down the circuit breaker that supplies the fuse module. Safety tag the front of the circuit breaker. When you service the fuse module, fans can shut down, alarms can sound or a loss of alarms can occur.

NTRX43
in an RSC-M/MSP (continued)

5

> **WARNING**
> **Risk of injury from high energy levels, static electricity damage**
> Wear a wrist strap connected to the wrist-strap grounding
> point on the left side of the modular supervisory panel (MSP)
> to remove cards. The wrist strap protects the equipment
> static electricity damage.

> **DANGER**
> **Risk of injury from high energy levels, equipment damage**
> Take these precautions when you remove or insert a card:
>
> 1. Do not apply direct pressure to the components.
>
> 2. Do not force the cards in the slots.

Wear a wrist strap.

6   Remove the fuses from the fuse module.

Note: Observe fuse colors, values and positions before you remove fuses from the fuse module.At the front panel of the cabinet

Open the front cover of the MSP. Release the two cover latches. Swing the cover down to the open position.

MSP

Power down the circuit breaker that supplies the fuse module. Safety tag the front of the circuit breaker. When you service the fuse module, fans can shut down, alarms can sound or a loss of alarms can occur.

Wear a wrist strap.

Remove the fuses from the fuse module.

Observe fuse colors, values and positions before you remove fuses from the fuse module.

NTRX43
in an RSC-M/MSP (continued)

At the rear panel of the cabinet

7

> ### DANGER
> **Risk of injury from high energy levels, voltage present**
> Do not insert metallic objects into the black connectors.
> Voltage is present and equipment damage can result.

Remove the NTRX43 circuit card as appears in the following figures.

a Open the rear doors of the cabinet. Locate the back of the card to replace.

b Note the wire color and the location to facilitate connection.
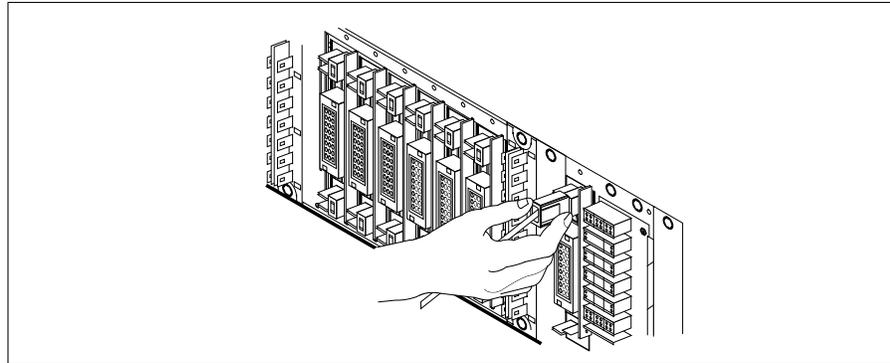
c Use the connector removal tool to disconnect the power connectors to the circuit card manually. Work from the bottom of the MSP shelf to the top of the MSP shelf. Manually disconnect the smaller black power connectors located below the larger blue power connector. Manually disconnect the large blue power connector. Disconnect the smaller black power connectors located above the large blue power connector. Make sure that you disconnect the black connectors *before* you remove the circuit card.

d The connectors have voltage present. The connectors are insulated. Secure the connectors to the power-connector bundle with a line-tie until the time comes to connect the connectors again.

e Jumper connectors and cables can be present. Remove and tag these jumper connectors and cables on the back of the circuit card. Save the jumper connectors and cables for use on the replacement circuit card.

<div align="right">

NTRX43
in an RSC-M/MSP (continued)

</div>

At the front panel of the cabinet

8   Remove the NTRX43 circuit card.

    a   Disengage the knurled thumbscrew at the top of the circuit card.

    b   Carefully pull the circuit card toward you until the circuit card clears the shelf.

NTRX43AA
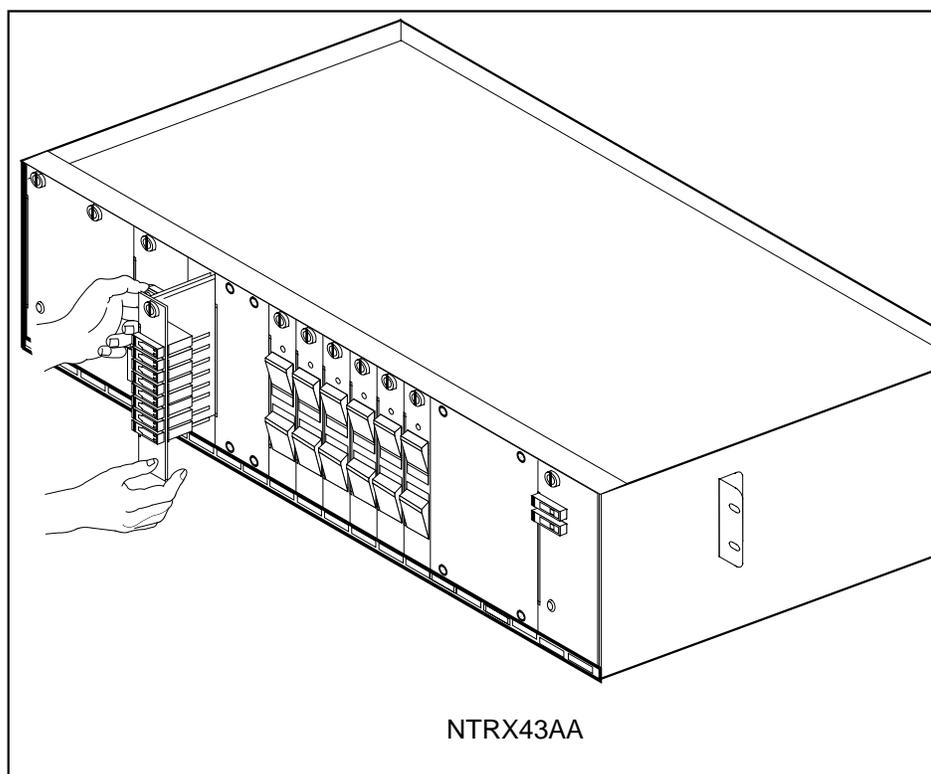
9   Make sure the replacement circuit card has the same PEC and suffix as the circuit card you removed.

    a   Align the circuit card with the slots in the shelf. Carefully slide the circuit card in the shelf.

    b   Carefully seat the circuit card tight.

    c   Tighten the knurled thumbscrew at the top of the circuit card.

At the rear panel of the cabinet

10   Locate the replaced circuit card. Attach the power connectors again.

NTRX43
in an RSC-M/MSP (end)
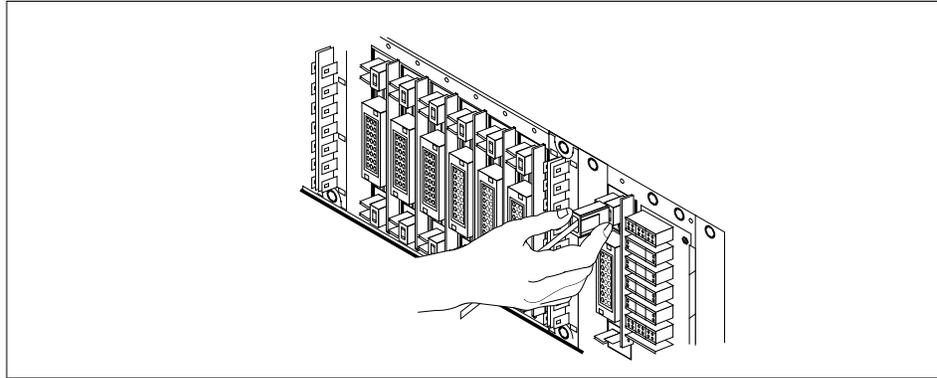
11   Install the jumper connectors and cables removed in step 7 on the replacement circuit card.

At the front of the cabinet

12   Replace the fuses removed in step 6.

13   Power up the circuit breaker that supplies the fuse module. Remove the safety tag.

If fuses	Do
do not blow	step 14
blow (protrude)	step 16

14   Go to the common returning a card procedure in this document.

15   This procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure.

16   For additional help with this card replacement, contact the next level of support.

NTRX54
in an RSC-M/MSP

Application

Use this procedure to replace an NTRX54 card in a modular supervisory panel (MSP) that supports the RCO2 shelf in the Remote Switching Center Multi-access (RSC-M) cabinet.

PEC	Suffixes	Name
NTRX54	BA	Fan power control module

Common procedures

The common returning a card procedure is referenced in this procedure.

Action

A connector removal tool is available to allow removal of the AMP Faston receptacles. This tool allows removal of these receptacles from the power input and output connectors of the MSP modules. This tool comes in two lengths: P0746192 152 mm (6 in.) and P0747552 254 mm (10 in.). You can use the shorter tool when conditions cause limited access to the rear of the MSP. An example of limited access is MSP modules located behind the cabinet bulkhead.

This tool is approximately 2 mm (.090 in.) thick and 17 mm (.65 in.) wide, with a jaw-like cut-out at each end. The cut-out profile conforms to the shape of the Faston receptacle. The shorter tip of each profile positions the receptacle in the tool.

The first meeting point of the tool serves as the pivot point. When you rotate the tool around this pivot point, you engage a profile tip with the action-arm of the power connector. This profile tip is the longer tip of the profile that has a hook on the end of the tip. As you press the action-arm of the connector, you disengage the receptacle from the connector tab. To remove the receptacle, pull the tool with the receptacle trapped in the jaw of the tool away from the connector. To disengage the tool from the receptacle, rotate the hook of the tool off the action-arm of the receptacle.

The shape of the cut-out is the same on each end of the tool. The position of the profile is off by 15 degrees. This difference allows for the use of the tool at different angles. You can require the use of the tool at different angles because of limited access to the connectors.

NTRX54
in an RSC-M/MSP (continued)
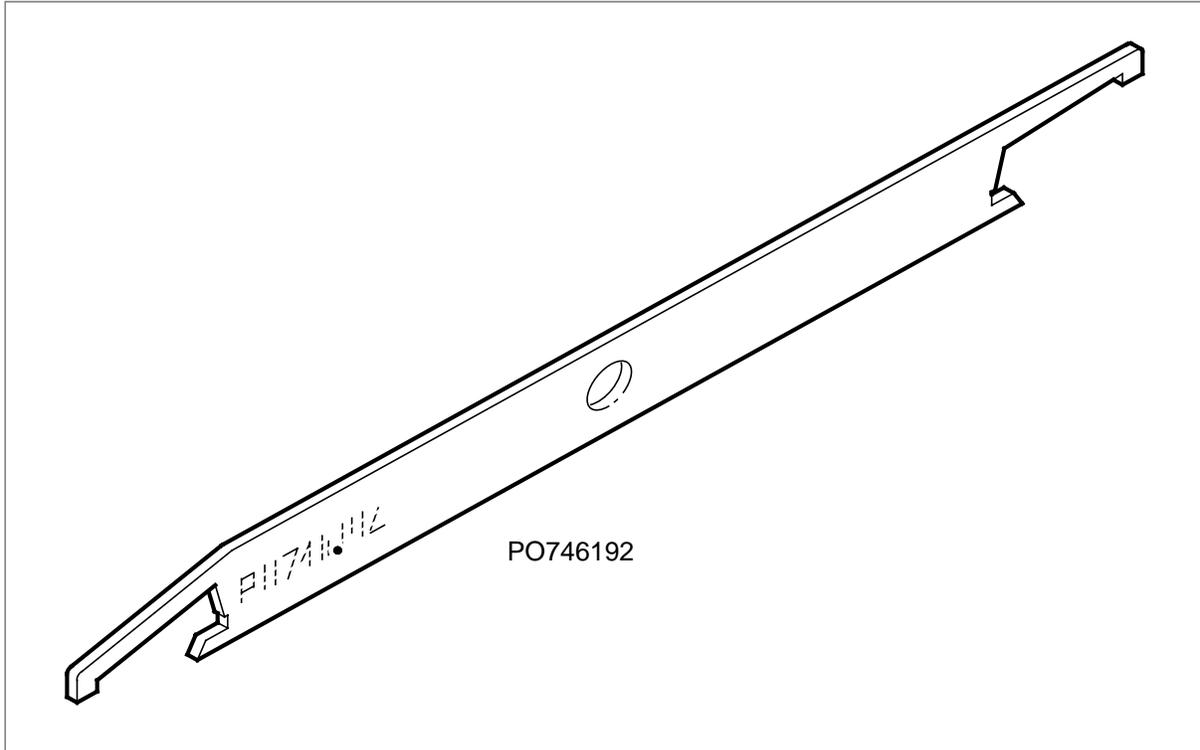
Connector removal tool

PO746192

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

NTRX54
in an RSC-M/MSP (continued)

Summary of Replacing an NTRX54 in an RSC-M/MSP

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Locate
defective card

↓

Remove and
replace
defective card

↓

Card
successfully
changed?

Y → Return to
original
procedure

N

↓

Contact next
level of support
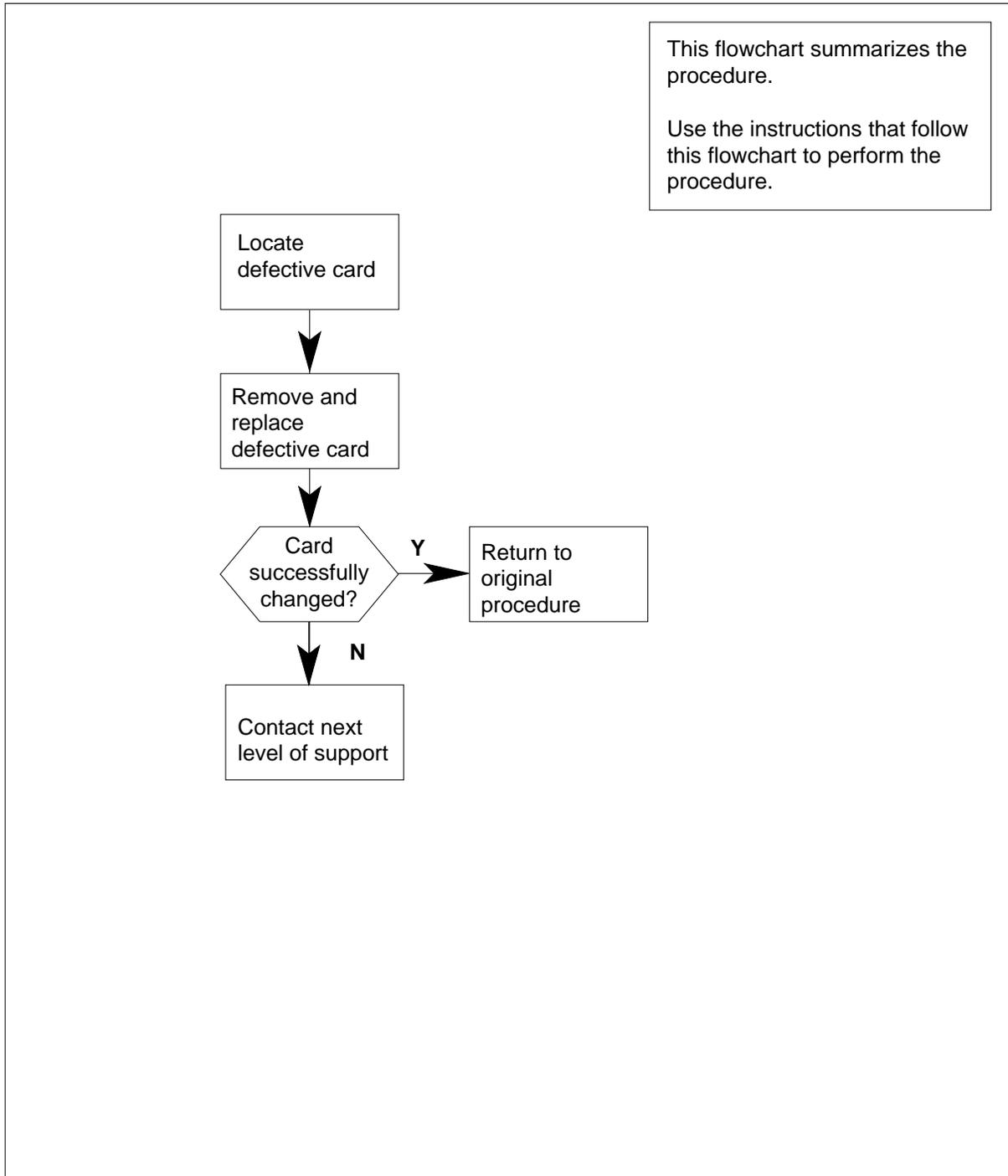
NTRX54
in an RSC-M/MSP (continued)

Replacing a/an NTRX54 card in an RSC-M/MSP

At the MAP terminal

1   Proceed if your maintenance support group or a step in a maintenance procedure directed you to this card replacement procedure. Use the procedure to verify or accept cards.

2   Obtain a replacement circuit card. Make sure the replacement circuit card has the same product equipment code (PEC) and suffix as the circuit card you want to remove.

At the front panel of the cabinet

3   Open the front cover of the MSP. Release the two cover latches. Swing the cover down to the open position.

MSP

4

WARNING
Risk of injury from high energy levels, static electricity damage
Wear a wrist strap that connects to the wrist-strap grounding point on the left side of the modular supervisory panel (MSP) to remove cards. The wrist strap protects the equipment against static electricity damage.

NTRX54
in an RSC-M/MSP (continued)

> **DANGER**
> **Risk of injury from high energy levels, equipment damage**
> Take these precautions when you remove or insert a card:
>
> 1. Do not apply direct pressure to the components.
>
> 2. Do not force the cards in the slots.

> **DANGER**
> **Heat damage**
> Do not leave this card out of service for more than 30 min. A
> large amount of damage the whole cabinet can occur if
> cooling does not occur for more than 30 min.

Put on a wrist strap.

5   Remove the two fuses in the fan power control module.

At the rear panel of the cabinet

6   Remove the NTRX54 circuit card as shown in the following figures.

   a   Open the rear doors of the cabinet. Locate the circuit card. The circuit card is in slots 19 and 20.

   b   Loosen the four screws. Slide the access plate sideways to remove the access plate.
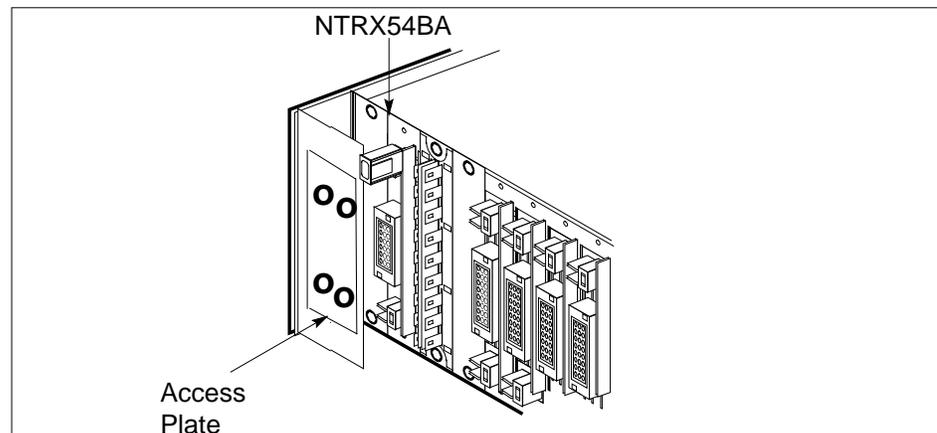
7   Note the wire color and location of the connector cables to facilitate connection.

8   Use the connector removal tool to disconnect the power connectors to the circuit card manually. Work from the bottom of the MSP shelf to the top of the MSP shelf. Manually disconnect the smaller black power connectors located below the larger blue power connector. Manually disconnect the large blue

NTRX54
in an RSC-M/MSP (continued)

power connector. Disconnect the smaller black power connectors located above the large blue power connector. Make sure you disconnect the black connectors before you remove the circuit card.

9 The connectors have voltage present. The connectors are insulated. Secure the connectors to the power-connector bundle with a line-tie until the time arrives to connect the connectors again.

At the front panel of the cabinet

10 Remove the NTRX54 circuit card.

  a Disengage the knurled thumbscrew at the top of the circuit card.

  b Carefully pull the circuit card toward you until the circuit card clears the shelf.

NTRX54BA
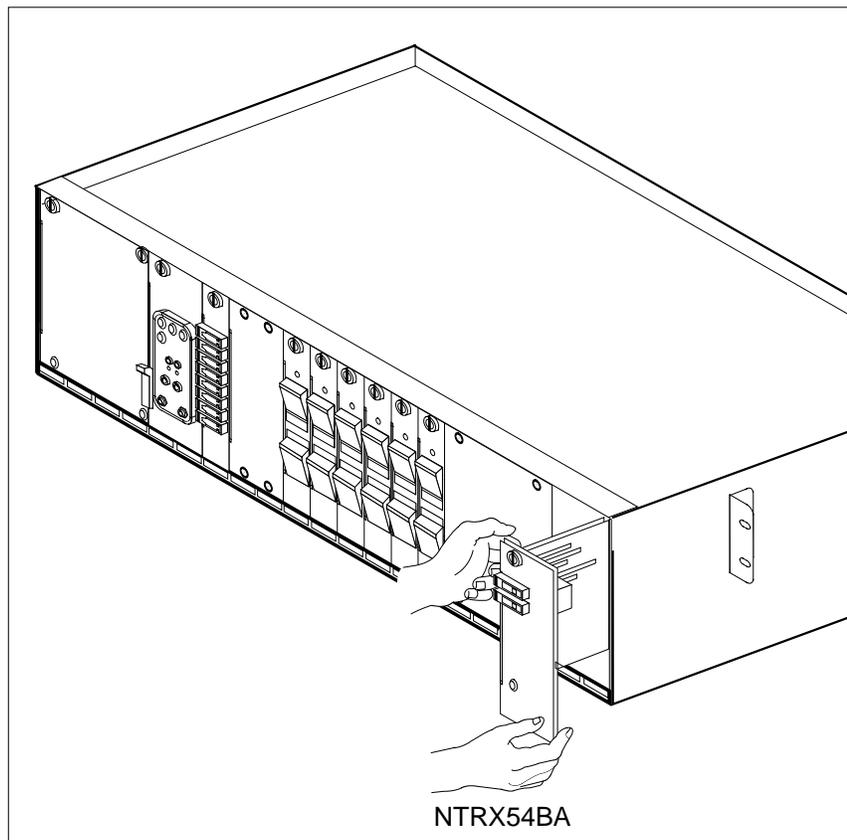
11 Make sure the replacement circuit card has the same PEC and suffix as the circuit card you removed.

  a Align the circuit card with the slots in the shelf. Carefully slide the circuit card in the shelf.

  b Carefully seat the circuit card tight.

  c Tighten the knurled thumbscrew at the top of the circuit card.

NTRX54
in an RSC-M/MSP (end)

At the rear panel of the cabinet

12   Locate the replaced circuit card. Attach the power connectors. Step 6 describes how to attach the power connectors.
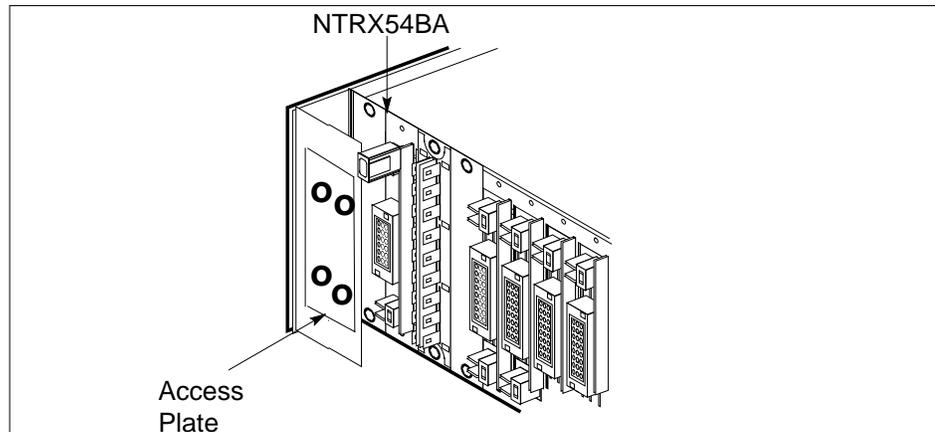
13   Replace the two fuses removed in step 5.

14   Send defective cards for repair according to local procedure.

If fuses	Do
do not blow	step 15
blow (protrude)	step 16

15   Go to the common returning a card procedure in this document.

Go to step 17.

16   For additional help with this card replacement, contact the next level of support.

17   This procedure is complete. Return to the maintenance procedure that directed you to this card replacement procedure.

Returning a card for repair or replacement in an RSC-M/RCO2

Application

Use this procedure to return a circuit card, like a power converter, for repair or replacement. Your location determines the documents you must fill out and the address where you return the circuit card. The documents and address for Canada are different than the documents and address for the United States.

Interval

Perform this procedure as required.

Common procedures

There are no common procedures.

Action

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

Returning a card for repair or replacement
in an RSC-M/RCO2 (continued)

Summary of Returning a card for repair or replacement in an RSC-M/RCO2

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Place card in ESD protective bag

↓

Fill out the return label

↓

Pack card in an approved shipping carton

↓

Address carton to correct service center.

↓

End of procedure
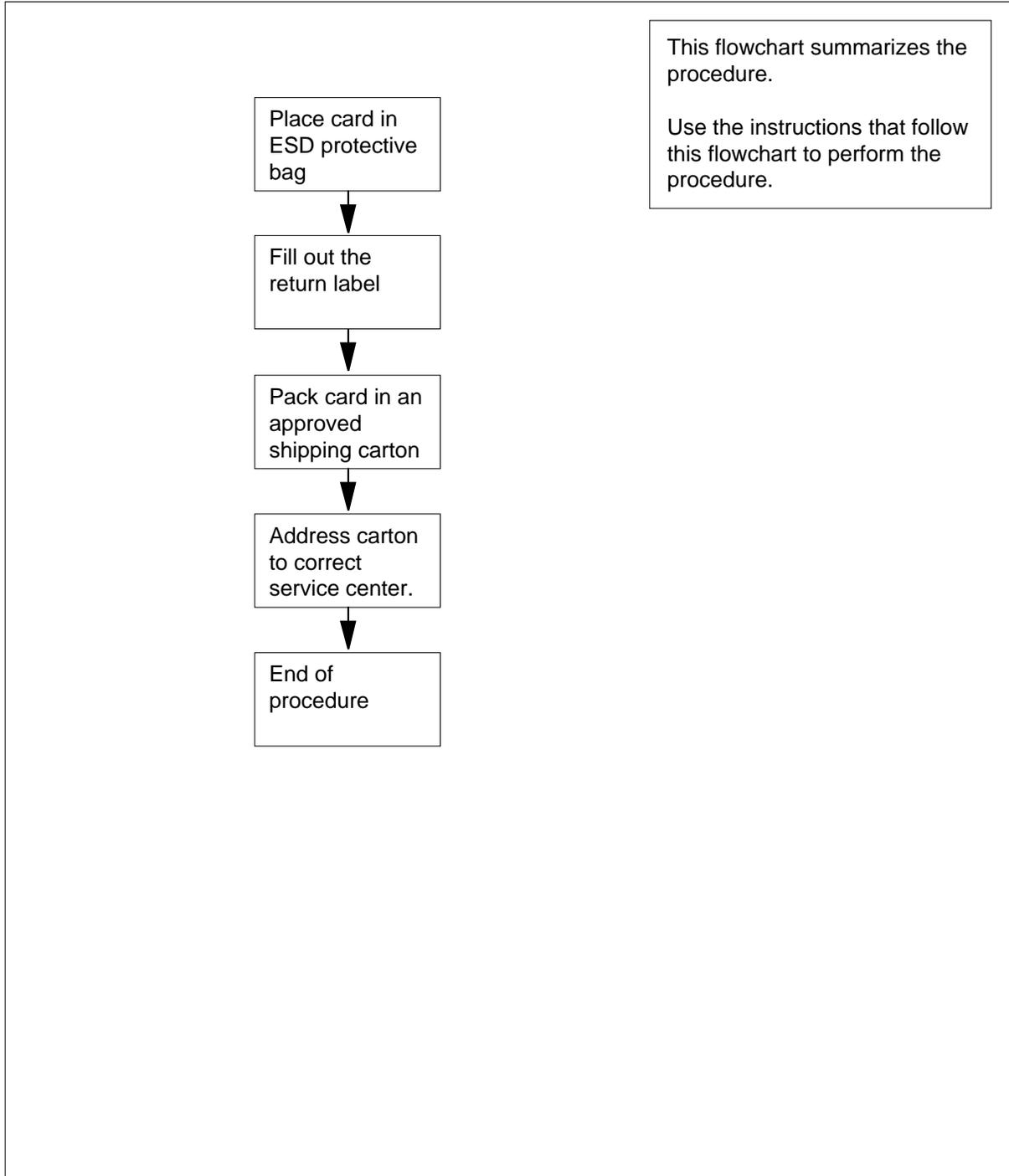
Returning a card for repair or replacement
in an RSC-M/RCO2 (end)

Returning a card for repair or replacement in an RSC-M/RCO2

At the cabinet

1   Place the circuit card in an electrostatic-discharge protective bag.

2   Fill in the return label for each circuit card you return.

3   Fill in one return tag (form 24-115) for each circuit card or assembly you return.

Make sure that you include the following information:

- return authorization number from customer service
- NT product engineering code (PEC)
- serial number
- release number
- PCL release software in use at the time of replacement
- peripheral module load name
- description of the failure and action taken to repair
- best fault code that describes the fault (see the bottom of the tag)
- name of your company
- office identifier code
- your name
- site name

If you require help to fill out the tag, call 905-454-2808. In an emergency, call 905-457-9555.

4   Attach one copy of the circuit card tag to a circuit card latch.

5   Keep the other copies of the tag for your records.

6   Pack the circuit card or assembly in a Northern Telecom (Nortel) shipping carton and seal the card or assembly.

If a Nortel shipping carton is not available, use another carton. Make sure that you:

- enclose each card or assembly in packing paper
- surround each card or assembly in bubble pack or foam
- secure each card or assembly tight in the carton so that the card or assembly cannot shift around

7   Address the carton to: Nortel Customer Operations, c/o Wesbell Transport, 1630 Trinity Road, Unit #3 Door #4, Mississauga, Ontario, L5T 1L6

8   This procedure is complete.

7 Locating and clearing RSC-M trouble

This section to locate and clear problems contains the following information:

- Locating and correcting problems

- Problem solving chart

- Advanced procedures to solve problems

This section is for maintenance engineering and field maintenance personnel. Maintenance engineering and field maintenance personnel already have a basic knowledge of the DMS-100 Series of switches and of the Remote Switching Center Multiple-access (RSC-M). This section is not for operating personnel that need exact procedures to perform maintenance tasks.

8 RSC-M trouble isolation and correction

Troubleshooting the RSC-M

This section includes descriptions of faults, test configurations, and test tools. These descriptions are for Remote Switching Center Multi-access (RSC-M) trouble isolation and correction. In this document MAP displays can indicate an RSC-M is an RCO2. Software does not differentiate between the two types of RCO2.

Trouble condition indicators

Many indications of trouble conditions can be present. These indications include:

- operational measurements
- log reports
- alarms

Operational measurements

Operational measurements (OM) are the best means to detect both accurate and potential system troubles. These measurements monitor and count events in the system. Use the OM thresholding feature to monitor and report key RSC-M activity. These reports must be routine and constitute an additional method of trouble detection. Log reports and alarms are the primary method of trouble detection.

Log reports

Logs provide detailed information on call errors, diagnostic results, and system status. Operating company personnel use logs for analysis. Logs are good indicators of trouble conditions. Logs are good indicators of any of the following conditions:

- sudden increase in volume of logs
- reports generated for messages not printed
- large number of like logs

Alarms

Audible and visual alarms indicate that corrective action is required. The level of the alarm indicates alarm severity and emergency of corrective action. Alarm severity and emergency appears as minor, major, or critical. A description of the alarm conditions appears in the following table.

Table 8-1 Assessing PM alarms from the MAP display (Sheet 1 of 2)

MTC level	PM level	Possible scenarios
PM RCO2	ISTb 1	One unit or both units experience minor problems. These problems normally do not involve the peripheral processor (PP).
		A static data mismatch occurs between an RSC-M unit and the central control (CC).
		A nonmessaging central side (C-side) link is out-of-service (OOS).
		A peripheral side (P-side) link is OOS.
PM RCO2 M	ISTb 1	One of the units is system busy (SysB). A PP card failure normally causes this condition. If the unit is the active unit, the peripheral module (PM) software performs a switch of activity (SWACT) on the units. Check for PM128 logs.
PM RCO2 M	ISTb 1	One of the RSC-M units is OOS. The RSC-M can process both voice and data calls.

Table 8-1 Assessing PM alarms from the MAP display (Sheet 2 of 2)

MTC level	PM level	Possible scenarios
PM RCO2 *C*	SysB 1	Both units are SysB. If the cause of this state is communication with the host, the RSC-M enters emergency stand-alone (ESA). The following sequence of logs generates when the RSC-M enters ESA:
		• PM109—The carrier is busy.
		• PM128—The RSC-M is in-service trouble (ISTb).
		• PM107—The RSC-M is central-side (C-side) busy (CBsy).
		• PM107—The line concentrating modules (LCM) are CBsy.
		• PM102—The RSC-M is SysB.
		• PM181—The RSC-M attempts to restart the message links.
		Both PPs are defective, so both units are SysB.
PM RCO2 *C*	SysB 1	Both RSC-M units are OOS. Both voice and data services are lost.

Use the following guidelines when you respond to alarms:

- More than one alarm of the same severity can appear on the MAP display. When this event occurs, clear the alarms from the left of the screen to the right.

- If a more severe alarm occurs when you fix an alarm, respond to the new alarm.

- Standard pulse coded modulation (PCM30) link alarms and cyclic redundancy checking (CRC-4) failures indicate failed and out-of-service (OOS) link equipment.

For instructions on how to clear an alarm, refer to the *Alarm Clearing Procedures* in this document.

Locating and clearing faults

This section contains standard fault detection steps to locate and clear faults:

1. Silence audible alarms that the system generates when the system detects alarm conditions.

2. To isolate the fault, read status displays and trace fault codes to the menu level required to clear the fault.

3. Busy the hardware to remove system access to the component with faults. This action allows you to perform maintenance activity without interference from the system.

4. Test the component with faults, and identify the card you must replace. Replace the damaged card, and test the component again.

5. Return the hardware to service.

Fault isolation program

The fault isolation program improves the XMS-based peripheral module (XPM) capability to isolate faults and provides the following diagnostics:

- Improved read-only memory (ROM) diagnostics allow the RSC-M to detect a wider range of possible faults. These faults can develop in the processor. The ROM diagnostics also perform good fault isolation, reduced testing time, and safe tests.

- Mate diagnostics provide the central control (CC) with a method to diagnose a defective RSC-M unit through the mate unit of the CC. To activate mate diagnostics, set Office parameter, XPM_MATE_DIAGNOSTICS_AVAILABLE, in table OFCOPT toY.

- Intermodule communication (IMC) diagnostics provide diagnostic support for both IMC links of an XPM. An IMC audit drives these diagnostics to verify the accuracy of both IMC links at normal intervals. An audit failure initiates automatic maintenance activity.

- XPM memory parity audit

- XPM static data audit

Office recovery program

The office recovery program improves the reliability and performance of all system restarts. The method for this program is to return to service (RTS) as many good nodes, as fast as possible. With dual-unit nodes like the RSC-M, the emphasis is on the return of an active unit to service. Return this unit to service during the recovery process. Leave recovery of the inactive unit for a later time when all active units are RTS.

The office recovery program provides the following system improvements:

- RECOVER command for manual dead-office recovery

- hardware and software initialization arrangement that provides good system restarts

User interface for the RSC-M at the PM level of the MAP display

The RSC-M integrates in to the peripheral module (PM) level MAP display. A list of the PM states that apply to to an RSC-M appears in the next table.

Table 8-2 Overview of RSC-M states

RSC-M state	Code	Description
Central side busy	CBsy	The RSC-M cannot communicate with the CC. The network interface links that carry messages between the RSC-M and the Digital Multiplex System (DMS) are not available. The PLGC is not in-service (InSv).
In service	InSv	The RSC-M is InSv and can support any process, like call processing.
In-service trouble	ISTb	The RSC-M is InSv and has a minor fault.
Manual busy	ManB	The RSC-M is busy. Enter the BSY command at the MAP position.
Offline	Offl	Remove the RSC-M from service to enable commissioning testing or hold the RSC-M out-of-service (OOS) for a short time.
System busy	SysB	System maintenance removes the RSC-M from service.

The following figure describes a normal response at the MAP display when posting an RSC-M.

Figure 8-1 Posting a RSC-M at the PM level of the MAP display

```
   CM      MS     IOD     Net     PM     CCS     Lns      Trks      Ext     Appl
    .       .       .       .       .       .       .       .        .        .

RCO2                       SysB     ManB    Offl    CBsy    ISTb     InSv
0  Quit             PM        0        0       0       0       0       64
2  Post_            RCO2      0        0       0       0       0        2
3  ListSet
4                   RCO2 0    InSv    Links_OOS:  CSide  0  PSide   0
5  Trnsl_
6  Tst_            Unit 0:   Act    InSv
7  Bsy_            Unit 1:   InAct  InSv
8  RTS_
9  Offl
10 LoadPM_
11 Disp_
12 Next
13 SWACT
14 QueryPM
15
16
17 Perform
18
     userid
TIME   hh : mm>
```

Commands supported for the RSC-M at the PM MAP level appear in
alphabetical order in the following table. Enter the following command string
at the MAP terminal to obtain a description of command syntax:

>HELP command

where

> **command**
> is the entry that the following table lists

Table 8-3 Overview of RSC-M/RC02 commands at the PM level (Sheet 1 of 2)

Command	Function	Description
BSY	Busy	Busies a unit of a posted RSC-M, a peripheral-side (P-side) link, a CLASS modem resource (CMR) (NT6X78) circuit card, or a RSC-M shelf.
DISP	Display	Displays a group of RSC-Ms in a specified state when in use with the STATE option. Displays diagnostic history of the RSC-M when in use with the DIAGHIST option.
LISTSET	List	List the contents of the posted set.

Table 8-3 Overview of RSC-M/RC02 commands at the PM level (Sheet 2 of 2)

Command	Function	Description
LOADPM	Load PM	Loads software and data in one unit or both units of a posted RSC-M or the CMR circuit card.
NEXT	Next	Posts the RSC-M that follows in a displayed set.
OFFL	Offline	Sets a posted RSC-M offline.
PMRESET	Peripheral reset	Resets posted RSC-M or RSC-M unit.
POST	Post	Posts an exact RSC-M, all RSC-Ms in a specified state, or RSC-M peripherals as a group.
PERFORM	Perform sublevel	Allows operating company personnel to view details of the performance and activity of the posted RSC-M.
QUERYPM	Query PM	Displays information on a posted RSC-M. This information includes location, node number, associated peripheral load name, and any associated faults. Displays information on faults when in use with the FLT option. Displays information about the diagnostic history when in use with the DIAGHIST option.
QUIT	Quit	Exits the current PM level of the MAP display, or cancels an RSC-M selection.
RTS	Return to service	Returns to service a P-side link, one unit or both units of a posted RSC-M, or a CMR circuit card.
SWACT	Switch activity	Switches RSC-M activity from the active to the inactive unit for a posted RSC-M. The faults or previous performance of the inactive unit determine if the SWACT controller denies the SWACT request.
TRNSL	Translate	Displays information about the interface links between the RSC-M and PLGC, or about the PCM30 links between the RSC-M and CAS nodes.
TST	Test	Tests one or both units of a posted RSC-M, CMR circuit card, or a PCM30 link to an CAS node.

Examples of specific RSC-M commands
This section provides examples of specified RSC-M level commands.

Example of SWACT command   When the user enters the command SWACT without parameters for a posted RSC-M, the following response appears at the MAP terminal:

```
A Warm SWACT will be performed after data
sync of active terminals.
Please confirm ("YES","Y", or "NO", "N"):
```

Examples of the DISP command   The DISP command contains two options, STATE and DIAGHIST. Use the STATE option with a specified state of the RSC-M to request the system lists all RSC-Ms in the specified state. An example of a specified state of the RSC-M is Syb B.

The following is an example of the DISP command that uses the STATE option with a selected PM type. The system lists all XPMs of the state and PM type requests.

>MAPCI;MTC;PM;DISP STATE state RCO2

where

state
    is a PM state such as; SysB, ManB, OffL, CBsy, ISTb, or InSv

Example of a MAP response:

```
SysB RCO2 : 0, 2
```

The following is an example of the DISP command that uses the diagnostic history (DIAGHIST) option with a selected PM type. The system lists the long and short term diagnostic history of the selected PMs. For additional information on maintenance uses of the DISP DIAGHIST command refer to page Section , "The Extended Peripheral Modules Diagnostics History feature provides a resident database to record selected diagnostic results of XPMs. This feature captures diagnostic results that indicate XPM sanity. The data in this database can influence DMS maintenance activities. This database provides operating company personnel with MAP command access to data on the accumulated results of diagnostics. Data in the history database remains over warm, cold, and reload restarts. This feature is part of software package, New Peripheral Maintenance. This feature is not an optional feature." on page 8-20 in this section.

>MAPCI;MTC;PM;DISP DIAGHIST RCO2

and press the Enter key.

Example of a MAP response:

```
      Diagnostic History for ECAP05.
      Report generated 95/09/07 THU at 08:43:55
  RCO2 0 Long-term Failure (LTF) last reset: 95/09/05 19:05:01
     UNIT 0 Short-Term Failure (STF) last reset 95/09/06 10:29
            No failures recorded
     UNIT 1 Short-Term Failure (STF) last reset 95/09/06 10:29
            No failures recorded

  RCO2 1 Long-term Failure (LTF) last reset: 95/09/05 19:05:01
     UNIT 0 Short-Term Failure (STF) last reset 95/09/06 10:29
            No failures recorded
     UNIT 1 Short-Term Failure (STF) last reset 95/09/06 10:29
            No failures recorded
```

Finding link and channel information

The translate (TRNSL) command provides link information on a posted PM.
The TRNSL options available are all P-side links, all control side (C-side)
links, or only P-side or C-side links that carry messages (MSG).

The C-side and P-side of the RSC-M use PCM-30 links. The links on the
C-side of the RSC-M send both voice and messages to the host. Channel 1 on
ports 1 and 2 only carry messages. If the system activates extended distance
capability (EDC), channel 6 of ports 1 and 2 carries messages.

The links on the P-side of the RSC-M connect remote multi-access nodes.

When you enter the TRNSL P command, the following information appears:

*   the RSC-M P-side link number, the RSC-M name, external number, and
    the RSC-M P-side port and the channel on that port associated with the
    control channel

*   The AN name and C-side link number of this AN if messaging (C-channel)
    link

*   capabilities (Cap) of the link if C-channel messaging (MS)

*   the state of speech links that appear as trunk class carriers. Carriers can be
    one of the following:

    — OK

    — ManB

— SysB

— Offl

• condition of the message link, which can be one of the following:

— OPN

— CLS

— MTC

An example of a MAP display for the TRNSL P command appears in the following figure.

Figure 8-2 Example TRNSL P display for the RSC-M

```
     CM      MS     IOD     Net     PM     CCS     Lns     Trks     Ext    Appl
      .       .      .       .       .      .       .       .        .      .

 RCO2                        SysB     ManB      Offl     CBsy     ISTb    InSv
 0   Quit          PM         0        0         0        0        0       60
 2   Post_         RCO2       0        0         0        0        1        2
 3   Listset
 4                 RCO2     ISTb    LINKS_OOS:  CSide 0     PSide 1
 5   Trnsl_        Unit0:    Act    InSv
 6   Tst_          Unit1:    Inact InSv
 7   Bsy_          Trnsl  P
 8   RTS_          Link  0: MUXS 00 0 0;Cap MS;Status:Offl  ;MsGCond:CLS
 9   Offl_         Link  1: MUXS 00 0 1;Cap MS:Status:Offl  ;MsgCond:CLS
 10  LoadPM_       Link  2: MUXS 00 0 2;Cap MS;Status:Ok    ;MsgCond:OPN
 11  Disp_         Link  3: MUXS 00 0 3;Cap MS;Status:Offl  ;MsgCond:CLS
 12  Next_         Link  4: MUXS 00 0 4;Cap MS;Status:Offl  ;MsgCond:CLS
 13  SWACT         Link  5: MUXS 00 0 5;Cap MS;Status:Offl  ;MsgCond:CLS
 14  QueryPM       Link  6: MUXS 00 0 6;Cap MS;Status:Offl  ;MsgCond:CLS
 15                Link  7: MUXS 00 0 7;Cap MS;Status:Offl  :MsgCond:CLS
 16                MORE...
 17  Perform
 18
      userid
 TIME   hh : mm>
```

An example of a MAP display for the TRNSL C command appears in the following figure.

Figure 8-3 Example TRNSL C display for the RSC-M

```
    CM     MS     IOD    Net     PM    CCS     Lns    Trks    Ext    Appl
    .      .      .      .       .      .       .      .       .      .

RCO2                    SysB    ManB      Offl    CBsy    ISTb   InSv
0  Quit         PM        0       0        0       0       1      12
2  Post_        RCO2      0       0        0       0       1      17
3  Listset
4               RCO2     ISTb   LINKS_OOS:  CSide 0    PSide 1
5  Trnsl_       Unit0:    ACT   InSv
6  Tst_         Unit1:   InAct  ISTb
7  Bsy_         Trnsl  C
8  RTS_
9  Offl_         LINK 0:   PLGC     1 0;CAP MS;STATUS:  OK,;MSGCOND:OPN,Restricted
10 LoadPM_       LINK 1:   PLGC     1 1;CAP  S;STATUS:  OK
11 Disp_         LINK 2:   PLGC     1 2;CAP MS;STATUS:  SysB,;MSGCOND:CLS,Unrestricted
12 Next          LINK 4:   PLGC     1 4;CAP  S;STATUS:  ISTb
13 SWACT         LINK 5:   PLGC     1 4;CAP  S;STATUS:  OK
14 QueryPM       LINK 6:   PLGC     1 4;CAP  S;STATUS:  OK
15             LINK 7:   PLGC     1 4;CAP  S;STATUS:  OK
16
17 Perform
18
     userid
 TIME  hh : mm>
```

Querying the RSC-M

When you enter the QUERYPM command on a posted RSC-M, the following information appears:

- PM type and number

- internal number—used for advanced tools

- node number—used for advanced tools

- RSC-M name and number

- node state—both RSC-M units state

- location of RSC-M

An example of a MAP display for the QUERYPM command appears in the following figure.

Figure 8-4 Example QUERYPM display for the RSC-M

```
    CM      MS      IOD     Net     PM      CCS     Lns     Trks    Ext     Appl
    .       .       .       .       .       .       .       .       .       .

RCO2                    SysB        ManB        Offl     CBsy     ISTb    InSv
0   Quit        PM       0           0           0        0        0       60
2   Post_       RCO2     0           0           0        0        0       2
3   Listset
4               RCO2     ISTb    LINKS_OOS:  CSide 0    PSide 1
5   Trnsl_      Unit0:   ACT     InSv
6   Tst_        Unit1:   InAct InSv
7   Bsy_
8   RTS_         PM Type: RCO2 PM No.: 0 PM Int. No.: 9 Node_No: 24
9   Offl_        PMs Equipped: 53 Loadname: UK00ADU6 EEPRom Load:
10  LoadPM_      ESA equipped: YES Intraswitching is ON
11  Disp_        Warm SWACT is supported and available
12  Next         RCO2 0 is included in the REX schedule.
13  SWACT        REX on GPP 0 has not been performed.
14  QueryPM      Node Status: {OK, FALSE}
15               Unit 0 Act,   Status: {OK, FALSE}
16               Unit 1 Inact, Status: {OK, FALSE}
17  Perform      Site Flr RPos Bay_id Shf Description Slot EqPEC
18               REM0 00  C02  RSCM 00  05  RCO2: 000       MX85AA
     userid      REM0 00  C02  RSCM 00  47  EXT:LEFT  01:13 MX86AA
  TIME  hh : mm>
```

User interface for external alarms

The EXT MAP level monitors active EXT alarms. To list active alarms, enter the EXT MAP level and type the LIST CRIT, LIST MAJ, LIST MIN, or LIST NOALM commands.

User interface for carrier maintenance

The CARRIER level of the MAP display posts the carriers for the PCM30 links on both the C-side and P-side of the RSC-M. This CARRIER level is part of the TRKS subsystem. Once at the carrier level, the system posts the RSC-M by the same way the system posts other PM types. A sample of a carrier display appears in the following figure.

Figure 8-5 Example carrier 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_     PROTLN  0   0      0    0    0    0    0    0    0    3
6  Tst_
7  Bsy_
8  RTS_
9  Offl_     N CLASS  SITE RCO2 CKT D ALRM SLIP FRME BER ES SES STATE
10 DispOpt   0 REMOTE RMO2   0   0 C        1    0 1.0  2   0  INSV
11 Disp_     1 REMOTE RMO2   0   1 C        1    0 1.0  2   0  INSV
12 Next      2 REMOTE RMO2   0   2 C        0    0 1.0  1   0  INSV
13           3 REMOTE RMO2   0   3 C        1    0 1.0  1   0  INSV
14 Detail_   4 REMOTE RMO2   0   4 C        1    0 1.0  1   0  INSV
15
16           SIZE OF POSTED SET  :    5
17
18
    userid
 TIME  hh : mm>
```

BERP level carrier maintenance

The bit error rate performance (BERP) level performance tool is available at the MAP terminal. This tool allows operating company personnel to measure and monitor the bit error rate performance of the DMS-100 switch. This tool also helps to identify defective components in the DMS switch. The tool cannot test each path and change through a switch. Use the BERP tool to make a random number of test calls, or bit error rate tests (BERT), to obtain the BERP for a DMS switch. A test call is the transmission of a bit stream over a path in the DMS switch for a specified duration of time. A test at the BERP level consists of a number of test calls, or BERTs. To obtain a measure of the performance of the DMS switch, extrapolate the results of the test calls. This measure is based on the performance of the test calls.

To access BERP level carrier maintenance from the MAP terminal, type

>MAPCI;MTC;BERP

and press the Enter key.

The first step in a BERT is to set up a path. This path loops from an integrated bit error rate tester (IBERT), back to this IBERT through a specified loopback point in the path. When you set up a path, the IBERT transmits a known bit

pattern for a specified period of time. The known bit pattern transmits back to the IBERT. The IBERT command compares this pattern to the bit pattern sent.

There are two forms of RSC-M BERP testing: RSC-M C-side link testing and RSC-M P-side link testing.

Note: The loopback point for BERT testing of RSC-M P-side links is a hard wired connection at the AN.

The following table shows BERP commands related to the RSC-M and the use of these commands.

Table 8-4 BERP level commands

Command	Supported?	Configuration dependent?
QUIT	Yes	No
REVIEW	Yes	No
SUMMARY	Yes	Yes
SELECT	Yes	Yes
DEFINE	Yes	No
CALLSET	Yes	No
DEFTIME	Yes	Yes
CHECK	Yes	Yes
START	Yes	Yes
STOP	Yes	Yes
OUTPUT	Yes	No
RESET	Yes	No
PARMSET	Yes	Yes
SORTKEY	Yes	No
PROCESS	Yes	No
LOOPBK	Yes	Yes
WBERT	No	Not applicable

Fault isolation tests

When the system detects a fault condition in the RSC-M, you must perform maintenance action. The fault can occur in any RSC-M component. Operating company personnel use fault isolation procedures to determine which component caused the fault. Operating company personnel use these procedures to remove the fault condition or report this condition to the correct maintenance support group.

Handling a SysB RSC-M unit

When the system busies an RSC-M unit, this unit is not InSv any longer. When this event occurs, the unit cannot process calls. If the unit is the active unit, the system attempts a Warm SWACT.

The following reasons are provided for a SysB RSC-M unit when the command QUERYPM FLT is entered:

- activity dropped
- CC audit
- diagnostic failed
- PM audit
- self-test failed
- trap
- unsol (unsolicited messages) exceeded
- reset
- C-side links
- P-side AN link failure

Standard troubleshooting methods require the testing of a specified unit of a SysB RSC-M. If the unit passes all tests and can RTS, the SysB fault clears. A list of suspect RSC-M can accompany test failures. An example of these cards follows:

```
RCO2 60 Unit 0 Tst Failed
Failed to open link
Site Flr RPos  Bay_id Shf  Description      Slot    EqPEC
RM02 00  C05   RSCM 00 18    RCO2 : 000      :09     6X40
RM02 00  C05   RSCM 00 18    RCO2 : 000      :10     MX75
RM02 00  C05   RSCM 00 18    RCO2 : 000      :08     MX76
```

Replace one card at a time, in the order listed. Retest the unit until the identified fault clears.

The test can fail. A message, like `No Reply From PM`, can accompany the failure. Use the PMRESET command to reset the RSC-M. This action can clear the fault. If the reset fails, a list of suspected damaged circuit cards can accompany the failure. The list that appears for test failures is an example of this list. Replace the circuit cards one card at a time. The replacement of one damaged circuit card can clear the SysB problem.

Clearing faults in a SysB RSC-M can require reloading the RSC-M with software.

You can reset, reload, or replace suspected circuit cards. These actions do not always clear the SysB fault. If this event occurs, a software problem can be present in the RSC-M. Contact the next level of support.

Handling an ISTb RSC-M unit

When an RSC-M is ISTb, one unit or both units has a fault. The unit can continue to process calls. The following responses occur when the QUERYPM FLT command is at the RSC-M MAP level:

- `Data out of date` The PM requires reloading.

- `Static data mismatch with CC` The RSC-M requires a download of static data. You must make the inactive unit busy. Perform an RTS and a warm SWACT.

- `P-side links out of service` PCM30 link maintenance is required.

- `Load mismatch with CC` The load information entered in table RCCINV must change to match the load the RSC-M uses. To display the RSC-M load, enter the QUERYPM CNTRS command.

A unit of the RSC-M can require testing. Like a SysB RSC-M, to clear a fault in an ISTb RSC-M replace defective circuit cards, reset the RSC-M, or reload the RSC-M.

Handling data mismatch

When the RSC-M has data mismatch trouble, the system places RSC-M in the ISTb state. An example of data mismatch trouble is a static data mismatch with CC. To handle data mismatch, busy the inactive unit of the RSC-M, RTS the unit and execute a switch of activity (SWACT). After a successful SWACT, BSY and RTS the newly inactive unit. This action clears the ISTb alarm.

Handling an IMC link fault

The intermodule communications (IMC) link audit can detect data loss or corruption of messages over IMC links. When this event occurs, the status of the RSC-M becomes ISTb and the system generates a PM128 log. If operating

company personnel enter the QUERYPM FLT command, the response includes the following statement:

```
NON-CRITICAL HARDWARE FAULT
```

Operating company personnel must perform the following steps:

1. Test both units to confirm the audit result.

2. Bsy the inactive unit, set the unit to Offl, and replace the defective circuit cards listed.

3. Return the inactive unit to service.

The node can remain ISTb for more than 5 min and the response to the QUERYPM FLT command does not change. If this condition occurs, the fault can be in the active unit. If the RTS of the inactive unit is successful, perform the following steps:

1. Switch the activity of the units.

2. Busy the newly inactive unit.

3. Test the inactive unit.

4. Set the unit with the damaged circuit cards to Offl. Replace the defective circuit cards with good circuit cards.

5. Return the inactive unit to service.

Handling a parity error fault

If the system detects a parity fault, you can correct the fault without a loss of service. This section provides information on the types of parity faults. This section provides an overview of the actions the CM takes to handle parity faults. This section includes the actions operating company personnel must take.

The three types of parity faults are

*   An intermittent fault, which occurs when the system detects a fault. The system does not detect an error during the reread of the location.

*   A soft fault occurs when the system system detects a parity error, and an error when the XPM attempts to reread the location. The system cannot detect an error when the XPM attempts to write to the location. The error can occur in the program store or the memory store.

*   A hard fault occurs when an XPM detects an error. The XPM cannot reread and cannot write to the memory location.

When a parity fault occurs, the CM determines the action to perform on the XPM unit. The action the CM determines depends on the status of the unit that

reports the fault. The state of the unit can be active or inactive. The same CM handles all three types of faults.

When the CM detects a parity fault in the active unit of the XPM, the CM sets the unit ISTb with a reason of parity. The CM recovers the unit during a maintenance window. The maintenance window to recover a parity fault on the active unit is the XPM REX test window. The time for the XPM REX test window can match the current time of the switch. If this event occurs, an audit checks if the active unit of the RSC-M has an ISTb of parity. If an ISTb occurs, the CM SWACTs and reload the XPM. The CM performs these tasks if requirements are not present. This action clears the ISTb parity fault and the short term failure (STF) parity fault peg. This action resolves the parity fault in the XPM.

When the active unit reports a parity fault, the system generates a PM181 log. This action notifies operating company personnel of the problem. The CM performs recovery actions. The CM performs a SWACT of the RSC-M and loads the newly inactive unit with the XPM software load. The associated inventory table defines this software load. The CM considers this loading action an autoload. A manual CM or mate reload of the XPM software clears the ISTb to the affected unit.

The CM does not permit a REX test to occur

- on a P-side or C-side node of the XPM that is recovered from a parity fault
- on the XPM if a P-side or C-side node is recovered from a parity fault

The CM does not allow two XPMs to perform a parity reload when the XPMs are in the same configuration. This restriction means a P-side node cannot perform a parity reload at the same time as the associated C-side node. A C-side parity reload cannot occur at the same time as its P-side node. This restriction makes sure that only one XPM in a configuration is in simplex at a time.

The CM generates PM logs to inform operating company personnel of a parity fault. This log is the primary trouble indicator. Operating company personnel can check for associated logs to understand the actions the CM takes. An example of an associated log is the PM128. This section provides examples of the messages associated with the PM181 and PM128 logs.

The RSC-M unit can be set ISTB with multiple reasons at the same time. When you perform a QUERYPM FLT at the MAP level, all ISTb reasons that occurred on the unit appear. These reasons are not cleared.

Hard parity fault   When the active unit of the XPM reports a hard parity fault to the CM, the CM generates a PM181 information log. This log notifies operating company personnel of the following events:

- a parity fault occurred on the active unit, and the unit is ISTb

- the CM reloads the unit during the next XPM REX test window

You can perform a manual SWACT and reload to clear the ISTb and the parity fault.

An example of a PM181 log report follows:

```
PM181 JUL23 23:29:16 7700 INFO RCO2 0 Unit 0
Node: Istb, Unit0 Inact: ISTb, Unit1 Act: ISTb
Parity audit has detected a hard parity fault.
The system will autoload the unit during the next
XPM REX test window.
Monitor the system for maintenance and recovery.
Site Flr  RPos  Bay_id  Shf Description Slot  EqPEC
RAL1 00   C05   CMVI 00  18  RCO2 : 000   3    MX74
```

When a unit changes state to ISTb of UP RAM parity fault, the system generates a PM128 log report. This log informs operating company personnel that the unit changed state.

An example of a PM128 log follows:

```
*PM128 MAY09 09:49:56 9000 TBL ISTB RCO2 1
 Node: ISTb (Unit ISTb)
 Unit0 Inact: InSv
 Unit1   Act: ISTb (UP RAM Parity)
```

The command string QUERYPM FLT displays the faults on a posted XPM. The following example MAP response indicates that a hard parity fault is present in unit 1 of the posted XPM:

```
>querypm flt
Node is ISTb
    One or both Units inservice trouble
Unit 0
    no fault exists
Unit 1
    The following inservice troubles exists:
        Parity audit has detected a hard parity fault.
        A reload is required to clear this fault.
        The system will autoload this unit during the next
        XPM REX test window.
```

CM action: The CM must SWACT and reload the XPM during the next XPM REX test window. The reload clears the XPM of this ISTb fault.

User action: No action is required by operating company personnel. You can start a manual SWACT and reload to clear the parity fault.

Diagnostic tests

Diagnostic tests pinpoint hardware faults to a card level that you can replace. The system or the user can initiate these tests. The system generates system initiated diagnostics when internal counters exceed fixed levels. The user must initiate diagnostics when log reports indicate a common equipment problem. The user must initiate diagnostics when system detected alarms occur. The user must initiate diagnostics when OMs show high error counts.

XPM diagnostic history

The Extended Peripheral Modules Diagnostics History feature provides a resident database to record selected diagnostic results of XPMs. This feature captures diagnostic results that indicate XPM sanity. The data in this database can influence DMS maintenance activities. This database provides operating company personnel with MAP command access to data on the accumulated results of diagnostics. Data in the history database remains over warm, cold, and reload restarts. This feature is part of software package, New Peripheral Maintenance. This feature is not an optional feature.

This feature is one of a group of three associated features. The two features that remain are XPM PreSWACT/Post SWACT Audit, and XPM REX Control and Trouble Notification Improvements. The XPM PreSWACT/Post SWACT Audit feature uses a subset of diagnostic results. This feature uses past REX tests and SWACT results to determine if a SWACT must occur. This text refers to the functionality the PreSWACT/Post SWACT Audit introduces as the SWACT controller. The XPM REX Control and Trouble Notification feature modifies the XPM REX test to use the SWACT controller and to provide log improvements.

An XPM can perform diagnostics to test the functionality of XPM hardware. Diagnostics can run as a result of CC or XPM requests. Diagnostics the XPM performs are a normal part of XPM audits. The SWACT controller and operating company personnel use the diagnostic results for system analysis.

The DIAGHIST is an option of the DISP command. The default for this option is to display all supported XPMs. Use this option with a specific PM to display all XPMs of the requested type.

If the requested PM is not supported, the following message appears:

```
 Diagnostic history is not supported
 for this PM type.
```

If peripherals are not present on the requested PM, the following message appears:

```
None.
```

The following is an example of the DISP command that uses the DIAGHIST option with a selected PM. The system displays the diagnostic history for all XPMs of the PM requested.

>MAPCI;MTC;PM;DISP DIAGHIST RCO2

```
 Diagnostic History for RTPK04AY
 Report generated 95/03/29 WED at 13:36:20

 RCO2 0  Long-Term Failure (LTF) last reset: 95/03/24 08:44:53
   UNIT 0   Short-Term Failure (STF) last reset: 95/03/29
  12:28:23
        Last diagnostic failure: 95/03/24 12:28:23
              DIAGLIST         STF          LTF
              CPM AUDIT          1            4
              FAC AUD            0            3
              EXTDIAG            0            3
              CARDLIST         STF          LTF
                NTMX73           1           10

 Note: Cards reported by the mate unit are indicated by a ″*″

   UNIT 1   Short-Term Failure (STF) last reset: 95/03/28
  16:12:15
        Last diagnostic failure: 95/03/28 15:41:45
              DIAGLIST         STF          LTF
              EXTDIAG            0            4
              FAC AUD            0            1
              CPM AUDIT          0            1
              CARDLIST         STF          LTF
                NTMX79           0            6
                NTMX76           1            1
                NTMX77           0            1
```

Using the DIAGHIST option with the QUERYPM command

An option called DIAGHIST is added to the QUERYPM command. This option displays the history of diagnostic failures for the posted peripheral. Each unit displays the short- and long-term failure counts. The last reset date and time for short term failure counters appears for each unit. The last reset date and time for long-term failure counters appears for the entire node. Reset

of long term failure counters is allowed from this level. The last diagnostic failure time is the time of the last diagnostic failure that occurred on the unit. The command string QUERYPM DIAGHIST provides a summary of diagnostic failures and cards reported as hardware faults. This summary is the same as the format that the command string DISP DIAGHIST displays. The MAP responses in this text are for example purposes only.

If the requested PM is not supported, the following message appears:

```
Diagnostic history is not supported
for this PM type.
```

If a unit of the peripheral does not have diagnostic failures or card faults, the system displays the following:

```
No failures recorded.
```

Three optional parameters are added to this option:

- reset
  - allows long term failure counters to be reset to zero. The system generates a PM601 log that record a summary of the long-term failure counters before the counters are reset.

- diag
  - displays the short- and long-term failure counts of the diagnostics that each unit of an XPM fails. This parameter does not contain card information.

- card
  - displays the short and long term failure counts of the cards on each unit of the XPM that the log reports as hardware failures. This parameter does not contain diagnostic information.

    Note 1: The reset parameter is not specified for routine use. Reset changes long term failure counters to zero.

    Note 2: The card parameter provides an asterisk (*) beside any card that a diagnostic on the mate unit in the XPM reports.

The following are examples of the command string QUERYPM DIAGHIST used with and without optional parameters:

>MAPCI;MTC;PM;POST RCO2 0; QUERYPM DIAGHIST

```
 RCO2 0  Long-Term Failure (LTF) last reset: 95/03/24 08:44:53
   UNIT 0 Short-Term Failure (STF) last reset: 95/03/29
12:28:23
        Last diagnostic failure: 95/03/29 12:47:55
        DIAGLIST  CARDLIST         STF        LTF
        CPM AUD: Total failures      1          4
                :NTMX79              1          4
                :NTMX77              1          3
         FAC AUD: Total failures     0          3
                :NTMX79              0          3
         EXTDIAG: Total failures     0          3
                :NTMX79              0          3
   UNIT 1 Short-Term Failure (STF) last reset: 95/03/28
16:12:15
        Last diagnostic failure: 95/03/28 15:41:45
        DIAGLIST  CARDLIST         STF        LTF
        DCHIALB: Total failures      0          6
                :NTMX77              0          1
                :NTMX79              0          5
        EXTDIAG: Total failures      0          4
                 :NTMX79             0          4
        FAC AUD: Total failures      0          1
                :NTMX76              0          1
                :NTMX77              0          1
        CPM AUD: Total failures      0          1
                :NTMX79              0          1
```

This response is the default information for the DIAGHIST option. The default response identifies the failed diagnostics and associated cards. This display indicates that on unit 0, the CPMAUD failed one time since the last time unit 0 gained activity. The 1 in the STF column indicates this failure. The last time the unit gained activity was at 12:28 a.m. on 3/29. The numbers below the 1 indicate the cards involved. The CPMAUD failed a total of four times since the LTF reset time. The last reset time was at 8:44 a.m. on 3/24.

A single test can cause one or more diagnostic failures. The test can cause at least zero associated cards. The sum of card counts from this display cannot be the accurate number of times a diagnosis fails. Also, the cards can be on either unit. Only specified diagnostics report failures on the mate unit. This display shows cards on the same unit the diagnostic runs on.>**QUERYPM DIAGHIST DIAG**

```
RCO2 0  Long-Term Failure (LTF) last reset:  95/03/24
08:44:53
   UNIT 0  Short-Term Failure (STF) last reset: 95/03/29
              12:28:23
      Last diagnostic failure: 95/03/29 12:47:55
            DIAGLIST       STF         LTF
             CPM AUDI        1           4
             FAC AUD         0           3
             EXTDIAG         0           3
   UNIT 1  Short-Term Failure (STF) last reset: 95/03/28
              16:12:15
      Last diagnostic failure: 95/03/28 15:41:45
            DIAGLIST       STF         LTF
             DCHIALB         0           6
             EXTDIAG         0           4
             FAC AUD         0           1
             CPM AUDIT       0           1
```

>QUERYPM DIAGHIST CARD

```
RCO2 0 Long-Term Failure (LTF) last reset: 95/03/24
08:44:53
   UNIT 0  Short-Term Failure (STF) last reset: 95/03/29
              12:24:23
      Last diagnostic failure: 95/03/29 12:49:55
            CARDLIST       STF         LTF
             NTMX79          1          10
             NTMX77          1           3


   UNIT 1  Short-Term Failure (STF) last reset: 95/03/28
              16:12:15
      Last diagnostic failure: 95/03/28 15:12:15
             NTMX79          0           6
             NTMX76          0           1
             NTMX77          0           1
```

>QUERYPM DIAGHIST RESET

```
WARNING: The Long Term Failure (LTF) counters will be
         ZEROed.


Please confirm ("YES" "Y" "NO" or "N"):
```

>YES

```
LTF counters reset to zero.
```

SWACT controller

This feature provides short term diagnostic performance data to the SWACT controller. A set of query procedures appear for applications that require this information. The SWACT controller determines if a SWACT is required. Short term data for a specified unit means diagnostic and audit failure counts measured from the last time a unit correctly gained activity.

Operating company personnel analysis

The XPM Diagnostic History feature provides data on the failure history of diagnostics. This data indicates the type of the number of failures that occur and which cards are defective. MAP commands display data for a specified XPM or for all XPMs this feature supports. MAP commands display two sets of data. MAP commands display short term failure counts, and long term failure counts.

Short term failure counts   accumulate from the last time a unit correctly gained activity. This data can help operating company personnel plan maintenance activities for outage analysis. If an outage occurs, include the XPM Diagnostic History data for that peripheral with other associated data.

Long term failure counts   accumulate from the last time long term. Manual action or Product Computing-Module Load (PCL) application resets the long term failure counts. Long term failure counts must last last for the life of the PCL. This data channels back to the design groups to provide data for additional diagnostic system improvements.

Description of diagnostics

Because different PMs contain different hardware, different diagnostics run on each type of PM. Approximately 75 diagnostics are available for use on XPMs. Only a subset of the 75 diagnostics runs on a specified PM. This feature captures failures for the following types of diagnostics:

- in-service
- out of service
- single diagnostic
- facility audit
- other audits

Each diagnostic indicates zero or more cards. The XPM determines the number of cards. The CC can generate card lists for display at the MAP terminal or in logs. Any card indicated by a XPM diagnostic or audit, and reported to CC, appears in a list of card failures.

Note: The XPM Diagnostic History feature records only those cards that an XPM indicates. This feature does not record cards that CC generates.

Diagnostics can be grouped together and run as a set of diagnostics or run as a single test. Common sets are:

- in-service tests
- out-of-service tests
- facility audit tests
- ROM diagnostics

In-service and out-of-service tests

In-service and out-of-service tests are solicited tests. These tests run only as a result of CC requests. The system can use a manual TST command, manual or system RTS, SWACT, BSY or REX commands to request a test on an XPM unit. When the CC makes this request, the XPM runs a set of diagnostics. The diagnostics included in the set depend on the PM type of the XPM, the state of the XPM unit, and the activity of the XPM unit. If the unit is InSv, the XPM runs a set of in-service diagnostics. If the unit is OOS, the XPM runs a set of out-of-service diagnostics.

The results of separate diagnostics return to CC along with a final result for the entire set. If any cards are defective, the system generates a card list and transfers the list to CC at the end of the set of tests.

Facility audit

The facility audit is a set of diagnostics the XPM runs to test the XPM. If the audit detects problems, the audit sends a message to CC. This message indicates the problem and a list of defective cards.

ROM diagnostics

If the XPM is at ROM level, a set of ROM diagnostics can run.

This feature does not capture failures. This feature does not capture the cards mate and ROM diagnostics use. The system generates a card list or log at the MAP terminal for each diagnostic. The system does not record a card list or diagnostic failure is recorded in the diagnostic history.

The following table lists and describes the diagnostics associated with the RSC-M that this feature supports. The table classifies the diagnostics as solicited, audit, or both. The table identifies the diagnostics that the SWACT controller requires.

The following table lists the RSC-M cards that the XPM Diagnostic History feature supports.

Table 8-5 Supported cards

Card name	Description
NT6X78	CLASS Modem Resource (CMR)
NT6X92	Universal Tone Receiver (UTR)
NTMX75	Matrix card
NTMX77	68020 Processor (UP)

How the feature stores diagnostics

This feature stores diagnostic results in the form of counters. Each unit of each peripheral that this feature supports has a set of counters. The feature keeps counters for diagnostic failures and for defective cards. The feature keeps three types of counters:

- diag - the number of times a diagnostic fails

- card - the number of times the diagnostic reports a card as defective

- diag and card combination - the number of times a diagnostic and card combination occurs

The feature keeps two subcounters for each of the three counters: a short term failure counter, and a long term failure counter. The short term failure counters are used by The XPM Diagnostic History feature uses the short term failure counters to determine if a SWACT is correct. The system resets short term failure counters are reset often during the PCL.

Long term failure counters record the diagnostic history of a peripheral or office over a long period of time. The command string QUERYPM DIAGHIST RESET or a BCS application resets long term failure counters.

A single test failure can report at least one diagnostic failures and at least zero defective cards. A diagnostic that runs in one unit can report cards in that unit and cards in the mate unit. When a diagnostic fails, each diagnostic routine sends the failure information to the history database.

Resets and time stamps

The history database stores five time stamps for each peripheral:

- for the node
  - — the time when long term failure counters are last reset
- for unit 0
  - — the time when short term failure counters for unit 0 are last reset
  - — the time when the last diagnostic failure occurred on unit 0
- for unit 1
  - — the time when short term failure counters for unit 1 are last reset
  - — the time when the last diagnostic failure occurred on unit 1

Each unit has short term counters reset to zero internally when the unit successfully gains activity. This gain of activity can occur as a result of an RTS or SWACT command. Long term counters are reset for each node from an XPM posted at the MAP terminal. When long term counters are reset, the system generates a log. The log contains a summary of the data collected for that node before the reset.

A new software application resets all diagnostic history data. The diagnostic resets short and long term failure counts. In this condition, the system does not generate a log with long term failure counts.

ROM diagnostic

The read-only memory (ROM) diagnostic detects problems in the processor and memory cards. The ROM diagnostic activates when the XPM is in the who-am-I (WAI) state.

> *Note:* The unit must be reloaded after this diagnostic runs.

The diagnostic tests the following memory card circuits:

- memory circuitry
- parity circuitry
- holding registers

The diagnostic test the following processor card circuits:

- memory mapper unit
- universal synchronous/asynchronous receive/transmit (USART) integrated circuits
- programmable timers

Matrix card diagnostic

The matrix circuit card diagnostic tests the occurrence and functionality of components on the NTMX75 circuit card. This card diagnostic includes the following diagnostics:

- matrix card occurrence test - makes sure the basic hardware is available.

- connection memory test - detects stuck logic levels and the ability to address correctly the connection memory.

- control memories 0 and 1 tests - tests the control memories by the same method as the connection memory test.

- message card occurrence test - makes sure the message card is present.

- digital pad circuit test - makes sure the two digital pad erasable and programmable read-only memory (EPROM) units and the control circuit function correctly.

- C-side link integrity test - checks the validity of all C-side links between the NTMX75 circuit card and the C-side interface circuit card.

- P-side link integrity test - verifies the integrity of the P-side link on each port. These ports are between the PCM30 interface circuit card and the NTMX75 circuit card.

- time switch functioning test - checks the time switching function of the NTMX75 circuit card. This test checks the input and output section serial to parallel and parallel to serial. The NTMX75 circuit card supports 80 C-side and P-side links. The test checks all types of connections between the links. The NTMX75 allows all types of connections between them (P-side to P-side, C-side to C-side, and P-side to C-side).

- plane select test - checks the plane select function. This function selects between the C-side of the unit and the C-side of the mate unit for each channel.

- programmable read-only memory (PROM) identification (IDPROM) test - checks the validity of the information burned in the IDPROM. This information includes the design information checksum, and the product engineering code (PEC) code of the circuit card and version.

The diagnostic is active during four diagnostic modes. The modes are divided according to PM states, InSv or OOS, and to the PM unit activity, active or inactive.

Sync diagnostics for the NTMX73 circuit card

The sync diagnostic checks associated hardware components, to verify that the phase-locked loop (PLL) oscillator functions correctly. The sync diagnostic detects problems in the signaling processor sync components, and generates an error report on the defective component.

The following is a list of PLL components tested:

- phase comparator

- gate

- frame pulse indicator

- frame pulse generator

The following is a list of the problems detected:

- Phase comparator value cannot be reset or read correctly.

- Gate cannot be closed or opened during normal mode or test mode.

- Real-time clock interrupts are not received.

- Phase comparator counter results are not correct.

- Frame pulse indicator does not match gate state.

- Frame pulse generator does not generate internal frame pulses.

Message diagnostic

The message diagnostic tests the hardware on the NTMX76 circuit card. This diagnostic checks if the on-board processor time slice processes, the speech bus interface, the IMC link, and the cyclic redundancy check (CRC) ROM functions correctly. The test checks the integrity of the message buffer memory and C-side and P-side messaging.

The diagnostic involves the following XPM hardware component:

- NTMX76 circuit card

- NTMX75 circuit card

- NTMX82 PCM30 interface packlets

- speech bus

Tones diagnostic

The tones diagnostic runs PCM checksums on the tones of ports 16 and 17. These ports are phantom ports. The diagnostic makes sure the checksums agree with the checksums in the tone ROM. The tone ROM is on the NTMX76 circuit card. This diagnostic checks the speech bus connection memory for all channels except 0 and 16 of ports 16 and 17. The diagnostic tests this speech bus memory to make sure the tones are enabled on the speech bus.

This diagnostic involves the NTMX76 circuit card and speech bus. This circuit card and speech bus are hardware components.

Speech path diagnostic

The speech path diagnostic runs a complete check on all the XPM speech channels for data integrity. This diagnostic checks all C-side and P-side loop-arounds and all time slots of the speech bus. The diagnostic tests highway mux and the PCM enable-disable gates.

The following XPM hardware components are involved in this diagnostic:

- NTMX76 circuit card
- NTMX75 circuit card
- NTMX82 PCM30 interface packlet
- speech bus

P-side loop diagnostic

The P-side loop diagnostic tests the P-side loops on the P-side interface circuit cards. This diagnostic acts as a occurrence test on these circuit cards for the rest of the diagnostics. This diagnostic contains the following tests:

- hardware occurrence
- P-side interface occurrence

CMR diagnostic

The NT6X78 circuit card in the RSC-M can self-diagnose. The NT6X78 circuit card contains on-board firmware. This firmware provides the correct card level diagnostic. The diagnostic detects problems that affect service as soon as possible.

The CMR diagnostic provides the RSC-M with both in-service and out-of-service diagnostics. The diagnostic provides along a CMR audit that performs the in-service diagnostic at regular intervals. This feature provides a diagnostic interface to report CMR failures.

The in-service diagnostic provides an interface and controls on-board firmware diagnostics. These diagnostics provide continuous testing of various critical components of the NT6X78 circuit card. This diagnostic runs one time each minute. An in-service audit request determines the number of times the diagnostic runs. Operating company personnel can request the in-service diagnostic at the MAP terminal. These diagnostic triggering techniques result in complete in-service coverage of the NT6X78 circuit card.

The out-of-service diagnostic is a more complete test of the functionality of important CMR hardware. This diagnostic uses some of the same on-board firmware diagnostics as the in-service tests. This diagnostic allows a more complete testing of all resources where normal in-service traffic and time restrictions do not permit.

The CMR audit runs this audit at regular intervals. The facility audit that the diagnostic normally uses for this purpose has a repetition time of 7.5 min. This time is too low to provide adequate detection time for the NT6X78 circuit card. A new audit was added for this feature.

Results of the CMR diagnostic test are logged as a PM181 audit exception report. The PM181 audit exception report lists the failed card list and indicates that CMR diagnostics detected the problem.

9 RSC problem solving chart

The following problem solving chart provides operating company personnel with easy access to troubleshooting procedures for Remote switching Center Multiple-access (RSC-M) alarms.

Table 9-1 RSC-M alarm clearing (Sheet 1 of 3)

Alarm condition	Possible cause	Action
RCO2 Critical	Power problems caused both units to be out of service (OOS).	Proceed as follows: 1. Verify the RSC-M powers up. Check for EXT alarm and end aisle alarm lights. 2. Identify RSC-M in critical state. 3. Post, then busy (Bsy) the defective RSC-M. 4. Return to service (RTS) the defective RSC-M. 5. Replace cards that appear in card list. Use correct card replacement procedures. 6. If no reply from the peripheral module (PM), attempt to set the defective RSC-M again. 7. If reset fails, attempt to load the defective RSC-M again. 8. Return the RSC-M to service.

Table 9-1 RSC-M alarm clearing (Sheet 2 of 3)

Alarm condition	Possible cause	Action
RCO2 Major	Defective card caused one unit to be OOS.	Proceed as follows: 1. Identify the system busy (SysB) RSC-M unit. 2. Display peripheral-side (P-side) links at the MAP terminal. 3. Busy and test (SysB) links. 4. If test fails, replace cards in card list, and test again. 5. If test passes, return links to service. If alarm clears, the problem is complete. If Major alarm continues, go to step 6. 6. Post, then Bsy, the defective RSC-M unit. 7. Perform OOS test. 8. Replace cards that appear in card list. Use correct card replacement procedures. 9. Load again, if necessary, and RTS RSC-M unit. *Note:* The problem can be present at the remote access node (AN).
RCO2 Minor	Defective card caused some degradation of service.	Proceed as follows: 1. Identify the in-service trouble (ISTb) RSC-M unit. 2. Post, then Bsy, the defective RSC-M unit. 3. Perform OOS test. 4. Replace cards that appear in card list. Use correct card replacement procedures. 5. RTS RSC-M unit.

Table 9-1 RSC-M alarm clearing (Sheet 3 of 3)

Alarm condition	Possible cause	Action
	The P-side links OOS caused some degradation of service.	Proceed as follows: 1. Display P-side links at the MAP terminal. 2. Bsy and test SysB links. 3. If test fails, replace cards in card list, and test again. 4. If test passes, return links to service.
	Control-side (C-side) links OOS caused some degradation of service.	Proceed as follows: 1. Display C-side links at the MAP terminal. 2. Bsy and test SysB links. 3. If test fails, replace cards in card list and test again. 4. If test passes, return links to service.
RCO2 Minor (continued)	The PM load mismatch with inventory table	Proceed as follows: 1. Determine the load the RSC-M must use. 2. Enter correct load name in table line trunk controller inventory (RCCINV). 3. Bsy, load, and return the RSC-M unit to service.
	Data is out of date or static data mismatch with central control (CC)	Proceed as follows: 1. Bsy the defective unit. 2. Load the unit with CC data 3. Return the unit to service.
Ext MSP Major	Cabinet power or fan failure	Proceed as follows: 1. Check Fan Fail lamp 2. Repair cooling unit if defective 3. Check Frame Fail LED 4. Repair converter or replace fuse(s)

10 RSC-M advanced troubleshooting procedures

Perform the following steps to power-up the Remote Switching Center Multi-access (RSC-M).

Powering up the RSC-M

The RSC-M is part of the host office. Use the general host office powering-up procedure to power-up the RSC-M.

At the RSC-M:

1 Set the switch on the power converter for unit 0 to the ON position.

2 Press the reset button on the NTMX72AA/AB power converter for RSC-M unit 0. At the same time, trip the associated circuit breaker (CB) up and release the CB. The CB must stay up. If the CB does not stay up, a problem is present with the power circuits.

3 Repeat steps 1 and 2 for RSC-M unit 1.

4 To post the RSC-M you want to power up, type:

`>MAPCI;MTC;PM;POST RCO2 rco2_number`

5 To busy both RCO2 units, type:

`>BSY PM`

6 To determine the name of the PM load data file, type:

`>TABLE RCCINV;POS site_name RCO2 rco2_number`

> ***Note:*** Field LOAD gives the name of the RAM loadfile. Field OPTCARD list the CMR loadfile. Field PEC6X45 gives the firmware loadfile name. Access table PMLOADS to see the device name where the system stores these loadfiles.

7 To access the disk utility program and list the files the disk volume contains, type:

`>DSKUT;LISTVOL volume_name ALL`

> *or*

`>DISKUT;LF volume_name`

8 To leave the disk utility program, type:

`>QUIT`

9 To load the RSC-M, type:

  >LOADPM PM

  If the LOADPM PM fails because of Loadfile not found, return to step Section 7, "To access the disk utility program and list the files the disk volume contains, type:" on page 10-1.

10 To load the firmware of the RSC-M, type:

  >LOADFW PM

11 To update the firmware of the RSC-M, type:

  >LOADFW PM UPGRADE

12 To return the RSC-M, type:

  >RTS PM

13 To load the CMR card, type:

  >LOADPM PM CC CMR

14 This procedure is complete.

Powering down the RSC-M

Perform the following steps to power down the RSC-M.

At the RSC-M:

1 Communicate all actions to all correct personnel. Communicate with personnel at the host office and at offices that connect to the RSC-M over the P-side links.

2 To post the RSC-M you want to power down, type:

  >MAPCI;MTC;PM;POST RCO2 rco2_number

3 Busy (BSY) and offline (OFFL) all P-side PCM-30 links to the P-side accessnode

4 To busy the RSC-M, type:

  >BSY PM

5 To set to OFFL the RSC-M made busy in step Section 2, "To post the RSC-M you want to power down, type:" on page 10-2, type:

  >OFFL

6 To remove the power from the RSC-M, set the switch on the power converters in both units to the OFF position.

7 The procedure is complete.

11 RSC-M recovery procedures

This section describes recovery procedures for the Remote Switching Centre Multi-access (RSC-M). These procedures describe how to recover an RSCM/RCO2 manually. Maintenance engineering and field maintenance personnel use these procedures.

Recovering an out-of-service RSC-M/RCO2

Application

Use this procedure to return to service (RTS) an RSC-M/RCO2 busied by the system (SysB).

Action

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

Note: In this section RSC-M/RCO2 refers to RCO2. When software transmits messages to the MAP terminal, the software does not differentiate between the two types of RCO2.

Recovering an out-of-service RSC-M/RCO2 (continued)

Summary of Recovering an out-of-service RSC-M/RCO2

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Access PM level and silence alarm

More than one RCO2 to recover? — Y → Post set of SysB RCO2s → Use RECOVER command with ALL option

Posted RCO2s loaded? — N → 1

RCO2s returned to service? — N → 1

Y → End

N → Post the SysB RCO2

Use RECOVER command

Posted RCO2 loaded? — N → Busy PM or unit

Y

RCO2 returned to service? — N → Busy PM or unit → Return the PM or unit to service → Return to service passes? — N → 1

Y → End

Y → End

Recovering an out-of-service RSC-M/RCO2 (continued)

Summary of Recovering an out-of-service RSC-M/RCO2

```
(1)──► Query for system busy reasons
           │
           ▼
        Busy the SysB PM or unit
           │
           ▼
        Is system busy reason C-side links? ──Y──► Display C-side links ──► Is status of links OK? ──Y──► (2)
           │N                                                                      │N
           ▼                                                              Contact network level or carrier maintenance
        Is system busy reason reset? ──Y──► (3)
           │N
           ▼
(2)──► Test a busied unit ──► Test passes? ──Y──► (4)
                                  │N
                                  ▼
                              Does card list display? ──Y──► Replace defective cards ──► (2)
                                  │N
                                  ▼
                              NO REPLY FROM PM displayed? ──Y──► (3)
                                  │N
                                  ▼
                              Contact next level of support
```

Recovering an out-of-service RSC-M/RCO2 (continued)

Summary of Recovering an out-of-service RSC-M/RCO2

```
   ③
   │
┌──────────┐      ╱ Did unit ╲  Y   ╱2╲
│ Reset    │─────▶  initialize?  ────▶
│ the unit │      ╲          ╱
└──────────┘           │ N
                       ▼
              ┌──────────┐    ╱  Load  ╲  Y   ╱2╲
              │ Load the │───▶   passes?  ────▶
              │ unit     │    ╲         ╱
              └──────────┘         │ N
                                   ▼
                          ╱ Does card list ╲  Y  ┌──────────┐   ╱2╲
                            display?           ──▶│ Replace  │──▶
                          ╲               ╱       │ defective│
                                │ N               │ cards    │
                                ▼                 └──────────┘
                          ╱ Is GET ON ╲  Y  ┌──────────┐
                            FILE FAILED  ──▶│ Contact next│
                            displayed?      │ level of   │
                          ╲           ╱     │ support    │
                                │ N         └──────────┘
                                ▼
                          ┌──────────┐
                          │ Contact  │
                          │ next     │
                          │ level of │
                          │ support  │
                          └──────────┘
```

Recovering an out-of-service RSC-M/RCO2 (continued)

Summary of Recovering an out-of-service RSC-M/RCO2

```
(4) → [Return unit to service] → ◇ Return to service passes? --Y--> [End]
                                        |
                                        N
                                        ↓
        [Return unit to service] ←Y── ◇ Load passes? ←── [Load PM]
                                        |
                                        N
                                        ↓
                                 [Contact next level of support]
```

Recovering an out-of-service RSC-M/RCO2 (continued)

To recover an out of service RSC-M/RCO2

At the MAP display

1 When the system detects a fault, the system can trigger an audible alarm. To access the peripheral module (PM) level of the MAP display and silence the alarm, type

>**MAPCI;MTC;PM;SIL**

and press the Enter key.

2 To display the SysB RCO2, type

>**DISP STATE SYSB RCO2**

and press the Enter key.

Example of a MAP response:

```
SysB RCO2: 0
```

If	Do
one RCO2 is SysB	step 5
more than one RCO2 is SysB	step 3

3 To access the set of SysB RCO2s, type

>**POST RCO2 SYSB**

and press the Enter key.

Example of a MAP response:

```
RCO2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM       3     0     1     3     2    13
    RCO2     2     0     0     3     0     7

RCO2 1 SysB  Links_OOS:  CSide 0, PSide 0
Unit0:  Act    SysB
Unit1:  Inact  SysB
```

4 To recover the SysB RCO2s with the PM recovery tool, type

>**RECOVER ALL**

and press the Enter key.

Example of a MAP response:

```
This operation will be executed on n RCO2s.
Please Confirm ("YES" or "NO"):
```

> **Note:** In the MAP response, *n* is the number of all RCO2s in the posted set.

Recovering an out-of-service RSC-M/RCO2 (continued)

Go to step 7.

5   To access the SysB RCO2, type

>POST RCO2 rco2_no

and press the Enter key.

where

rco2_no
is the number of the RCO2 displayed in step 2

Example of a MAP response:

```
RCO2     SysB  ManB  Offl  CBsy  ISTb  InSv
   PM       3     0     1     3     2    13
   RCO2     1     0     0     3     0     7

RCO2 1 SysB  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   SysB
Unit1:  Inact SysB
```

6   To recover the SysB RCO2 with the PM recovery tool, type

>RECOVER

and press the Enter key.

Example of a MAP response:

```
RCO2 1 recover request submitted
```

Go to step 8.

7   To confirm the request for the recovery operation, type

>YES

and press the Enter key.

The recovery tool submits a recovery request for each posted RCO2. This action appears in the following example of a MAP response.

Example of a MAP response:

```
RCO2 0 Recover request submitted
RCO2 1 Recover request submitted


RCO2 n Recover request submitted
```

The tool determines which posted RCO2 requires recovery. For each RCO2 that requires recovery, the tool attempts to load PM units 0 and 1. For each RCO2 loaded, and for all other RCO2s that require the procedure, the tool attempts to RTS the active unit.

In the following example:

- the tool loads and RTS the RCO2 0
- the RCO2 1 was RTS

Recovering an out-of-service RSC-M/RCO2 (continued)

- RCO2 2 did not load unit 0
- the RCO2 2 does load unit 1, and RTS unit 1
- the RCO2 3 did not load

Example of a MAP response:

```
RCO2 1 Recover passed
RCO2 0 Unit 0  LoadPM passed
RCO2 0 Unit 1  LoadPM passed
RCO2 2 Unit 0  LoadPM failed
               Failed to initialize
RCO2 2 Unit 1  LoadPM passed
RCO2 3 Unit 0  LoadPM failed
               Failed to initialize
RCO2 3 Unit 1  LoadPM failed
               Failed to initialize
RCO2 2 Unit 0  Reloading required.
               RTS attempted on mate
RCO2 0 Recover passed
RCO2 2 Recover passed
 .
 .
 .
RCO2 n Recover passed
```

A summary of the operation appears in the following example:

Example of a MAP terminal response:

```
Summary:
3 passed
1 failed
```

8   Determine if all the RCO2s recovered.

If	Do
all RCO2s recover	step 36
one or more RCO2s did not re-cover	step 9

9   Record the RCO2s that cannot recover.

10   Work on the RCO2s that have both units out-of-service (OOS). Use the *Alarm Clearing Procedures* section in this document to clear any RCO2s with one unit OOS.

If one	Do
or more RCO2 cannot be loaded and both units are OOS	step 11

Recovering an out-of-service RSC-M/RCO2 (continued)

If one	Do
or more RCO2 cannot be loaded or RTS	step 34

11   To post the SysB RCO2, type

    >POST RCO2 rco2_no

    and press the Enter key.

    where

        rco2_no
            is the number of a RCO2 recorded in step 9

12   To busy the SysB RCO2, type

    >BSY PM

    and press the Enter key.

13   To RTS the SysB RCO2, type

    >RTS PM

    and press the Enter key.

> **Note:** If the system responds with instructions to RTS one unit after an RTS PM fails, ignore this message. Follow the instructions in the following table.

If the RTS	Do
passes on both units	step 33
fails on one or both units	step 14

14   To check for fault indicators, type

    >QUERYPM FLT

    and press the Enter key.

15   Determine if one or both units require recovery.

If recovery	Do
is required on both units	step 16
is required on one unit	step 34

16   Identify the error message reported in step 14.

If the error reason	Do
is activity dropped	step 17
is CC audit	step 17

Recovering an out-of-service RSC-M/RCO2 (continued)

If the error reason	Do
is diagnostics failed	step 17
is PM audit	step 17
is self test failed	step 17
is trap	step 17
is unsol exceeded	step 17
is reset	step 22
is C-Side links	step 30
is load failed	step 19
is other than listed here	step 35

17   To test the RCO2 units that did not recover, type

>TST UNIT unit_no

and press the Enter key.

where

> **unit_no**
> is the number of one of the units 0 or 1, busied in step 12

If the test	Do
passes	step 18
fails	step 20

18   To return the unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

> **unit_no**
> is the number of the unit tested in step 17

If the RTS	Do
passes	step 36
fails one time	step 19
fails more than one time	step 35

Recovering an out-of-service RSC-M/RCO2 (continued)

19 To load unit again, type

>LOADPM UNIT unit_no CC FORCE

and press the Enter key.

where

    unit_no
      is the number of the unit that did not RTS in step 18

If the LOADPM	Do
passes	step 18
fails	step 35

20 Identify the test failure message.

If the display message	Do
is NO REPLY FROM PM	step 21
is FAIL MESSAGE RE-CEIVED FROM PM	step 35
is a card list	step 25
indicates a load failure	step 27

21 Determine if the NO REPLY FROM PM message occurred.

If the message	Do
occurred before	step 35
did not occur before	step 22

22 To reset the unit, type

>PMRESET UNIT unit_no

and press the Enter key.

where

    unit_no
      is the number of the unit tested in step 17

Note: During reset, the MAP terminal must indicate the reset events in sequence. These events appear as displayed in the following MAP response.

Example of a MAP response:

Recovering an out-of-service RSC-M/RCO2 (continued)

```
RESET
 STATUS
 RUN
 INITIALIZE
 LOADING DATA
```

If the unit	Do
did not initialize	step 23
initialized	step 27

23 Determine if the NO REPLY FROM PM message appears.

If the message	Do
appears	step 35
does not appear	step 24

24 Determine if the NO WAI AFTER RESET message appears.

If the message	Do
appears	step 25
does not appear	step 18

25 Check the card list at the MAP terminal.

Example of a MAP response:

```
SITE FLR RPOS  BAY_ID SHF DESCRIPTION SLOT EQPEC
RSCM  00  M07  LTEI 00  05  RCO2 : 001  03  MX77
RSCM  00  M07  LTEI 00  05  RCO2 : 001  25  MX77
```

If all of the cards	Do
are replaced	step 35
are not replaced	step 26

26 Go to the *Card Replacement Procedures* section in this document for the next card on the list. Complete the card replacement procedures and go to step 17.

27 To load the unit, type

>LOADPM UNIT unit_no CC

and press the Enter key.

where

Recovering an out-of-service RSC-M/RCO2 (continued)

unit_no
is the number of the unit to be loaded

If the LOADPM	Do
passes	step 18
fails	step 28

28   Identify the failed load in step 27.

If message displayed	Do
is NO WAI AFTER RESET	step 25
is FAIL ROM DIAG	step 25
is GET ON FILE FAILED	step 29
a message does not appear	step 35

29   The message GET ON FILE FAILED indicates a problem with the storage device. Go to step 35.

30   To display the status of C-side links, type

   >TRNSL C

   and press the Enter key.

   Example of a MAP response:

```
LINK0 ENET 0 0 30 00  0;Cap:MS;Status:OK  ;MsgCond:OPN,Restricted
LINK1 ENET 1 0 30 00  0;Cap:MS;Status:SBsy;MsgCond:CLS,Restricted
LINK2 ENET 0 0 30 00  1;Cap:MS;Status:OK
LINK3 ENET 1 0 30 00  1;Cap:MS;Status:OK
```

31   Note the numbers and conditions of the links.

If the status of the MS links	Do
is CLS	step 32
is not OK	step 32
is OK	step 17

32   Probable cause is a problem with the network interface card or the ENET port interface card. Contact the next level of support.

33   Recover the next RCO2 unit or next RCO2 PM recorded in step 9.

If	Do
another RCO2 PM requires recovery	step 11

Recovering an out-of-service RSC-M/RCO2 (end)

If	Do
all RCO2 PMs are recovered	step 36

34 Go to the appropriate alarm clearing procedure in the *Alarm Clearing Procedures* section to determine how to continue. The PM recovery tool recovers one unit of a PM. This action can cause the system to raise a major alarm.

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

36 This procedure is complete. The PM recovery tool recovers one unit of a PM. If the system displays other alarms, refer to the appropriate alarm clearing procedures.

12 RSC-M routine maintenance procedures

This chapter contains the routine maintenance procedures for the remote switching center multi-access (RSC-M) for international applications. These procedures describe preventive maintenance tasks. These procedures are for maintenance engineering and field maintenance personnel. Maintenance engineering and field maintenance personnel perform these maintenance tasks at scheduled intervals.

Checking torque on grounding bolts

Application

Use this procedure to check the torque of grounding bolts.

Interval

Perform this procedure every month.

Common procedures

There are no common procedures.

Action

This procedure contains a summary flowchart as an overview of the procedure. Follow the steps to perform this procedure.

Checking torque on grounding bolts (continued)

Summary of checking torque on grounding bolts

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Locate correct torquing tool.

↓

Reference the correct torque value.

↓

Set the tool to the correct torque value.

↓

Set bolts to the inspection torque settings.

↓

End of procedure.
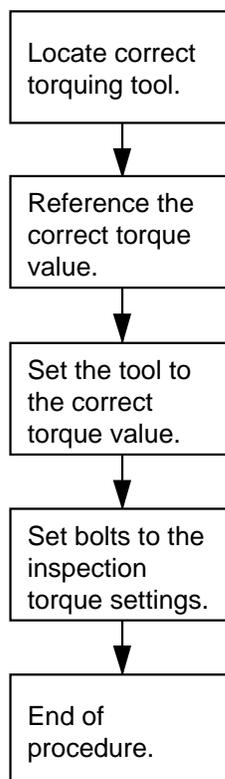
Checking torque on grounding bolts (end)

Checking torque on grounding bolts

At your current location

1   Locate the T9958 click-type preset torque wrench.

2   Align the small fractions on the edge of the handle with the center of the main torque scale.

3   To set the correct inspection torque value, turn clockwise to increase value or turn counter-clockwise to decrease value.

If grounding bolts are type	Do
1/4-20 backplane, -48 V ground first nut	step 4
1/4-20 backplane, -48 V ground second nut	step 5

4   Set inspection torque to 5 ft/lb. Proceed to step 6.

5   Set inspection torque to 25 in/lb.

6   Position the wrench on the grounding bolts and tighten to inspection torque specification.

7   Return the T9958 torque wrench to the appropriate location.

8   The procedure is complete.

Cooling unit replacement

Application

Use this procedure to replace a defective cooling unit (NTRX91AA).

Interval

Perform this procedure when a cooling unit cannot operate. An illuminated fan fail indicator on the front of the modular supervisory panel (MSP) indicates a defective cooling unit.
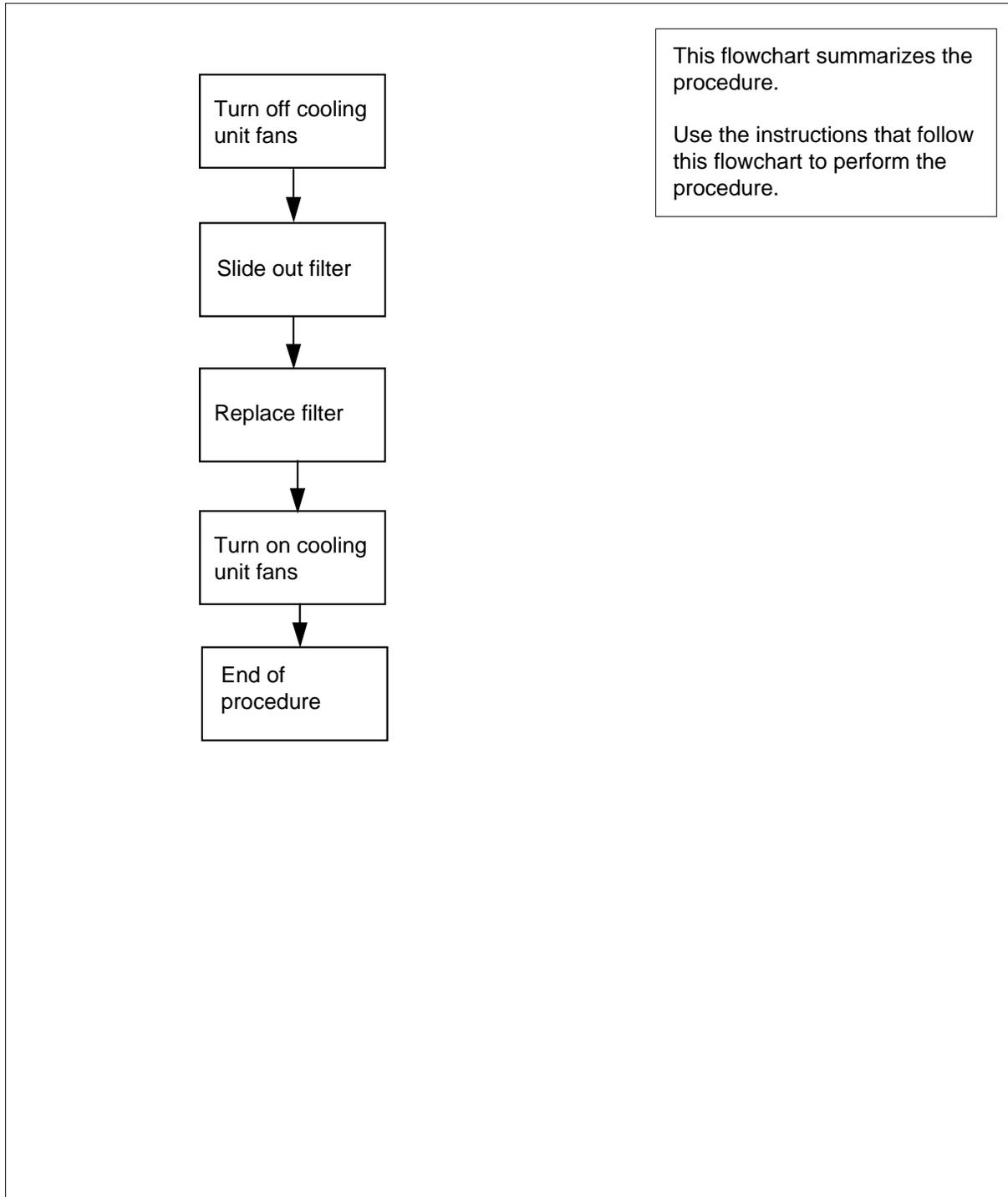
Common procedures

There are no common procedures.

Action

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

Cooling unit replacement (continued)

Summary of cooling unit replacement

```
┌─────────────────┐          ┌──────────────────────────────┐
│ Turn off        │          │ This flowchart summarizes the│
│ cooling unit    │          │ procedure.                   │
└────────┬────────┘          │                              │
         │                   │ Use the instructions that    │
         ▼                   │ follow this flowchart to     │
┌─────────────────┐          │ perform the procedure.       │
│ Remove          │          └──────────────────────────────┘
│ cooling unit    │
└────────┬────────┘
         │
         ▼
┌─────────────────┐
│ Install new     │
│ cooling unit    │
└────────┬────────┘
         │
         ▼
┌─────────────────┐
│ Turn on         │
│ cooling unit    │
└────────┬────────┘
         │
         ▼
┌─────────────────┐
│ End of procedure│
└─────────────────┘
```
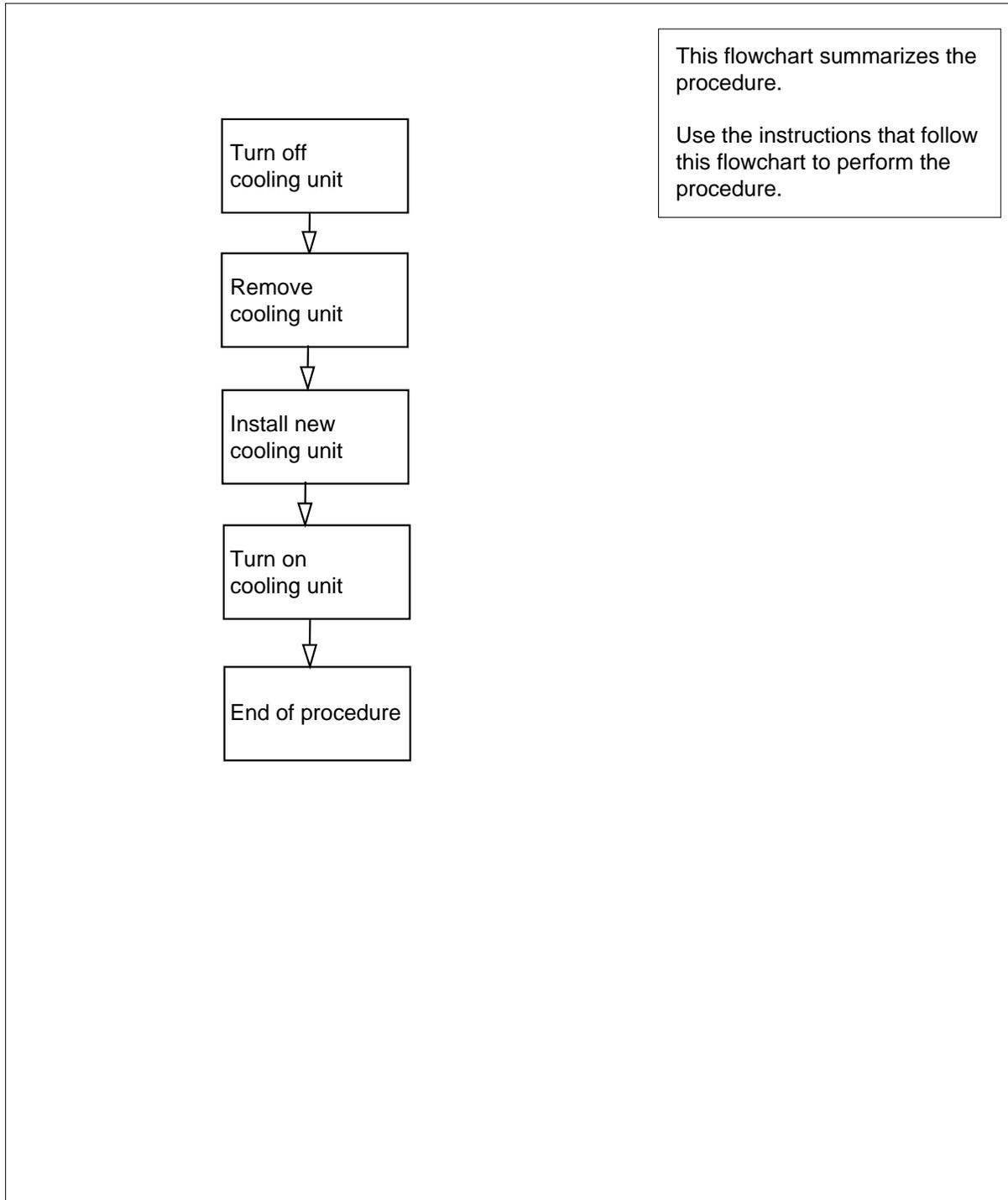
Cooling unit replacement (end)

Cooling unit replacement

At your current location

1

> **DANGER**
> **To prevent overheating**
> Do not leave the cooling unit fans off for longer than 30 min.

To make sure the cooling unit fans are off, place the power switch on the cooling unit in the off position.

2 Turn the two knobs on the front panel of the cooling unit counterclockwise and slide the cooling unit to remove the cooling unit.
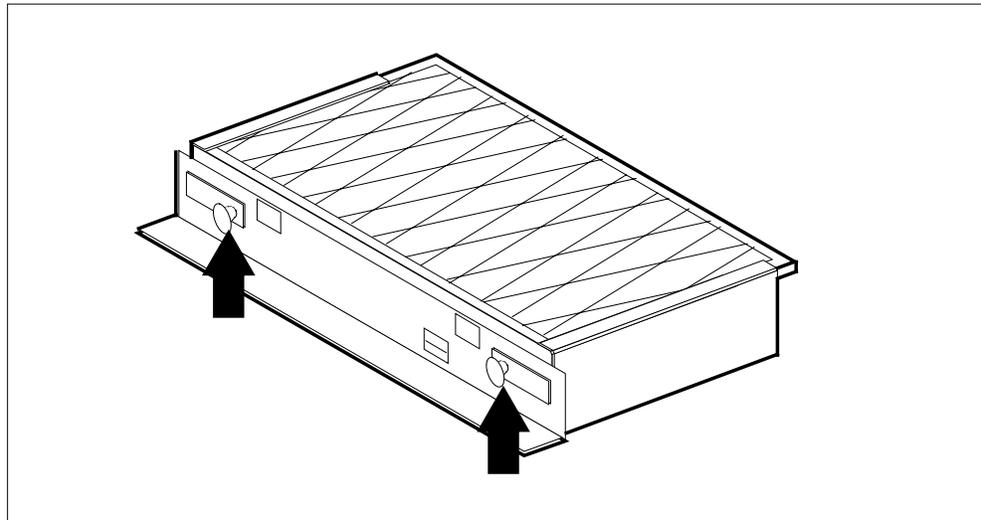
3 Replace the cooling unit with the same part number as that of the old unit. Slide the new cooling unit to replace the cooling until both sides lock in place.

4 To power up the cooling unit, place the power switch on the cooling unit in the on position.

5 This procedure is complete.

Inspecting and changing bulbs

Application

Use this procedure to inspect and replace defective fan fail, aisle end, and frame fail bulbs.

Interval

Perform this procedure one time each month.

Common procedures

There are no common procedures.

Action

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

Inspecting and changing bulbs (continued)

Summary of Inspecting and changing bulbs

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Locate correct bulb location

↓

Power down the cooling unit

↓

Remove defective bulb

↓

Replace bulb

↓

Power up the cooling unit
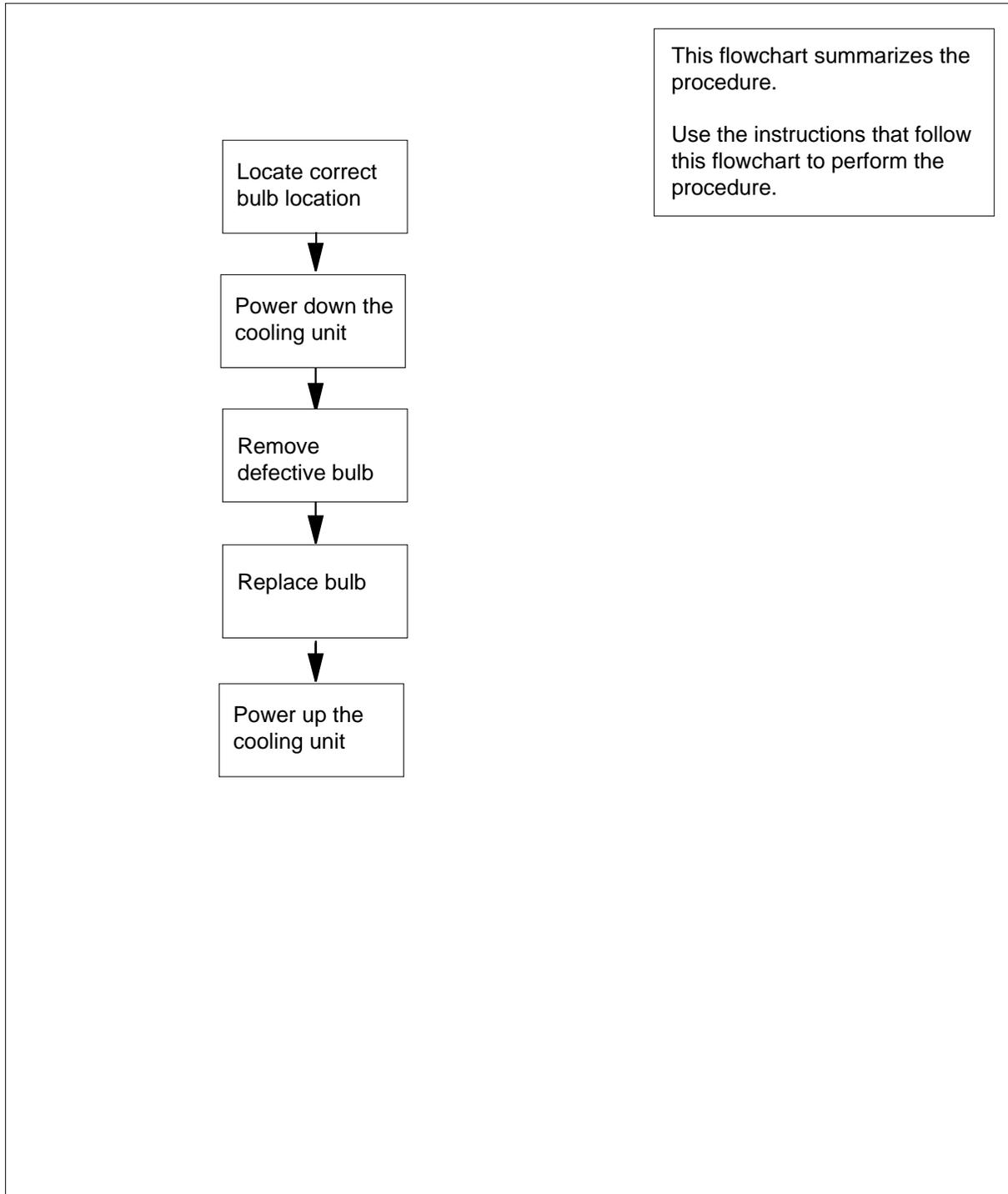
Inspecting and changing bulbs (continued)

Inspecting and changing bulbs

At your current location

1   Use the following procedures to inspect the fan fail, aisle end, and frame fail
        bulbs.

If bulbs are	Do
fan fail bulbs	step 2
frame fail bulbs	step 2
aisle end bulbs	step 3

2

DANGER
To prevent overheating
Do not leave the cooling unit fans off for more than 30 min.

To inspect the fan fail and frame fail bulbs, turn the power switch for the
cooling unit to the off position.
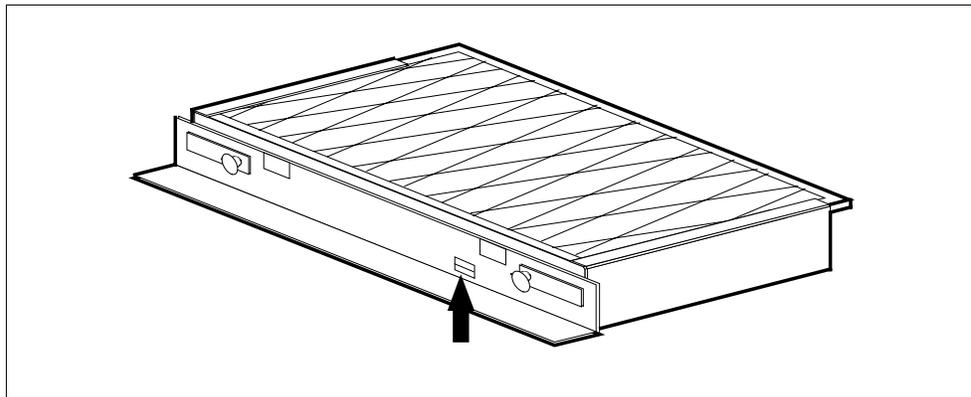
If fan fail and frame fail bulbs	Do
light	step 8
do not light	step 7

Inspecting and changing bulbs (end)

3

DANGER
To prevent overheating
Do not leave the cooling unit fans off for more than 30 min.

To inspect the aisle end bulb, turn the power switch for the cooling unit to the off position.
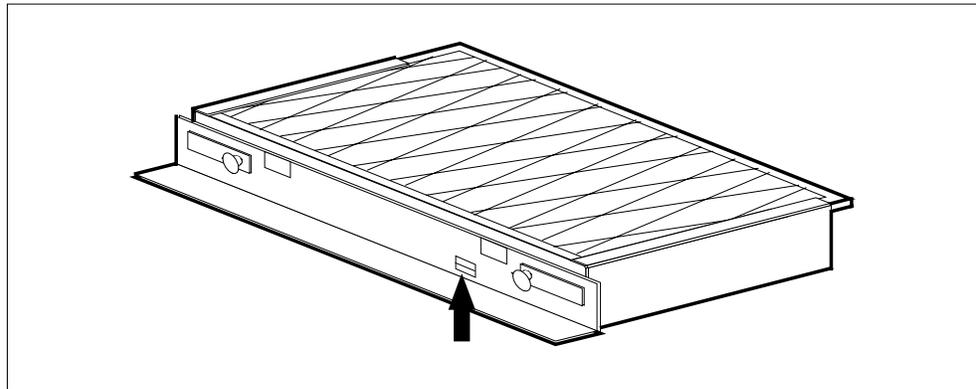
If aisle end bulb	Do
lights	step 8
does not light	step 4

4 Remove the bulb cover or bulb frame casing. Use the case as a hook to pull the clear plastic bulb ejector. Go to step 5.

5 Replace with new bulb.

6 Attach bulb cover or bulb frame casing. Go to step 8.

7 Use the *Card Replacement Procedures* section in this document to replace the Alarm Module (NTRX41) circuit card. Return the NTRX41 circuit card to Northern Telecom (Nortel) for bulb replacement. Go to step 8.

8 To power up the cooling unit, place the cooling unit power switch in the ON position.

9 The procedure is complete.

Inspecting cooling unit filters

Application

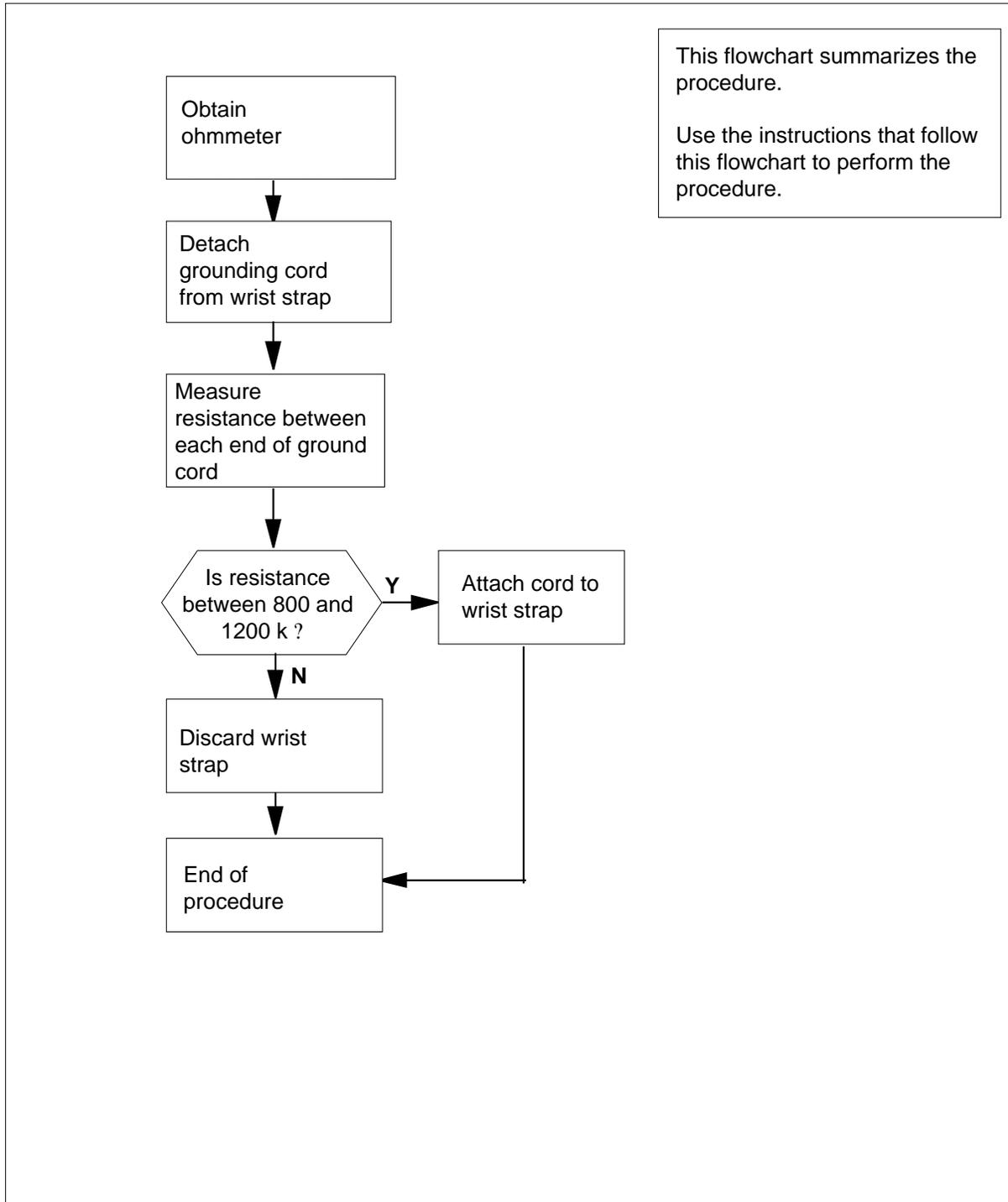Use this procedure to inspect cooling unit filters.

Interval

Perform this procedure in two week intervals.

Common procedures

There are no common procedures.

Action

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

Inspecting cooling unit filters (continued)

Inspecting cooling unit filters

```
┌─────────────────┐
│ Turn off cooling │
│ unit fans        │
└────────┬─────────┘
         │
         ▼
┌─────────────────┐
│ Slide out filter │
└────────┬─────────┘
         │
         ▼
┌─────────────────┐
│ Inspect filter   │
└────────┬─────────┘
         │
         ▼
┌─────────────────┐
│ Replace or       │
│ install filter   │
│ again            │
└────────┬─────────┘
         │
         ▼
┌─────────────────┐
│ Turn on cooling  │
│ unit fans        │
└─────────────────┘
```

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Inspecting cooling unit filters (continued)

Inspecting cooling unit filters

At your current location

1
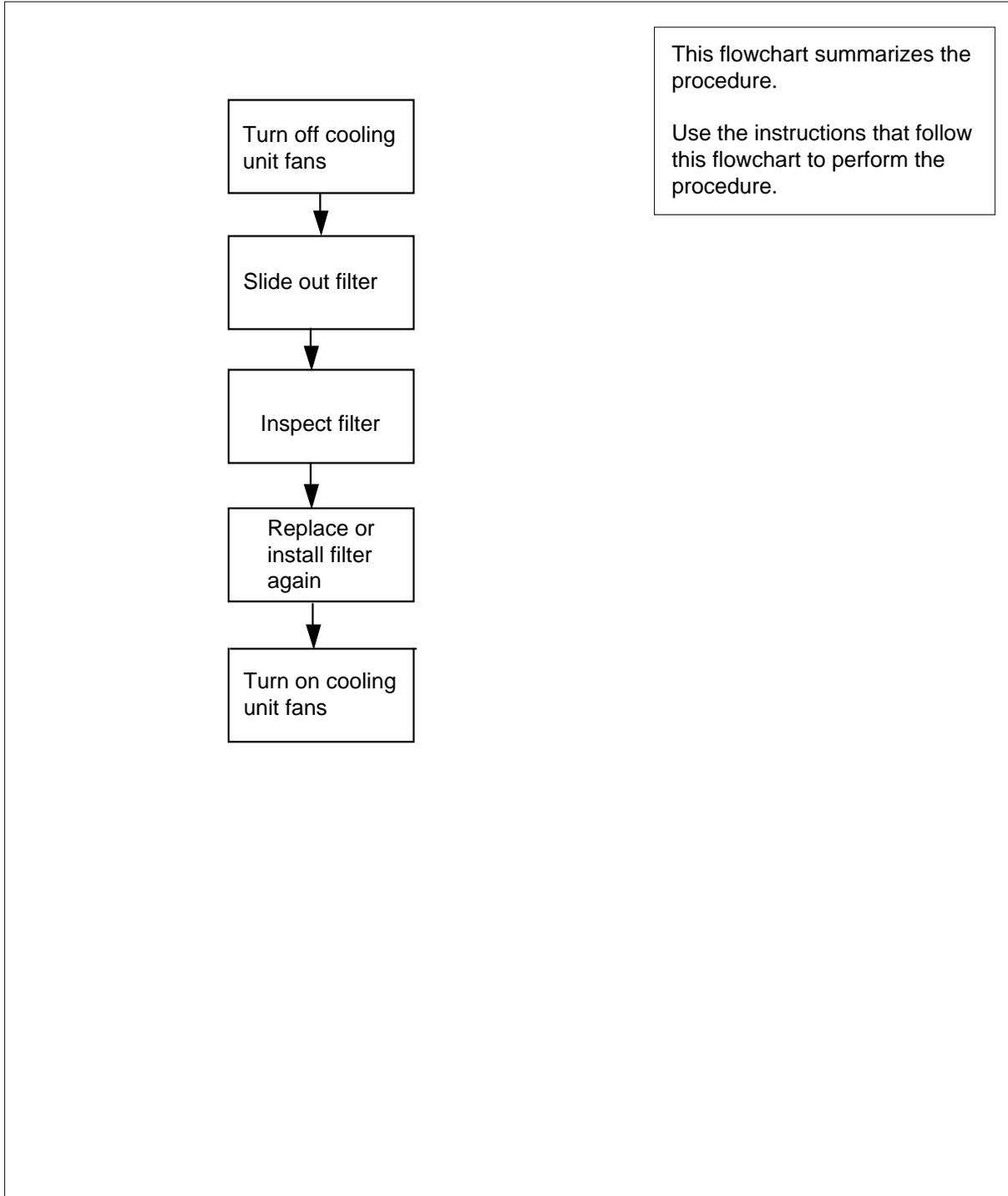
	DANGER **To prevent overheating** Do not leave the cooling unit fans off for more than 30 min.

	DANGER **To prevent overheating** Do not leave the cooling unit fans off for more than 30 min.

To make sure the cooling unit fans are off, place the power switch on the cooling unit in the off position.

2 Use the two filter access tabs to grip the filter.
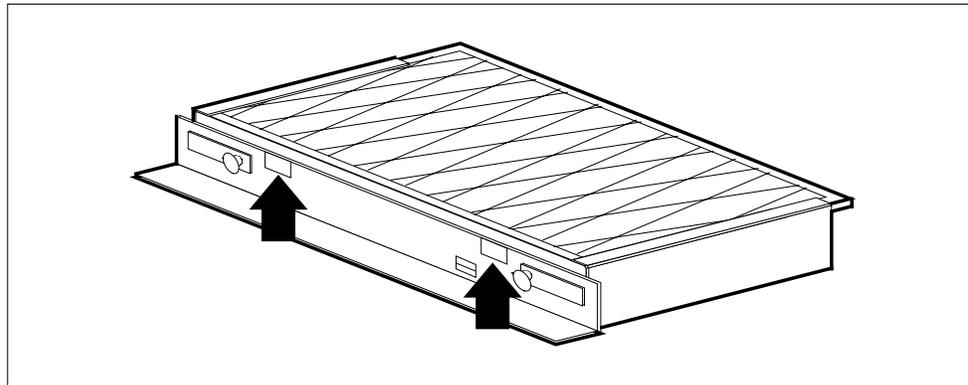
3 Slide the filter out of the cabinet.

Inspecting cooling unit filters (end)
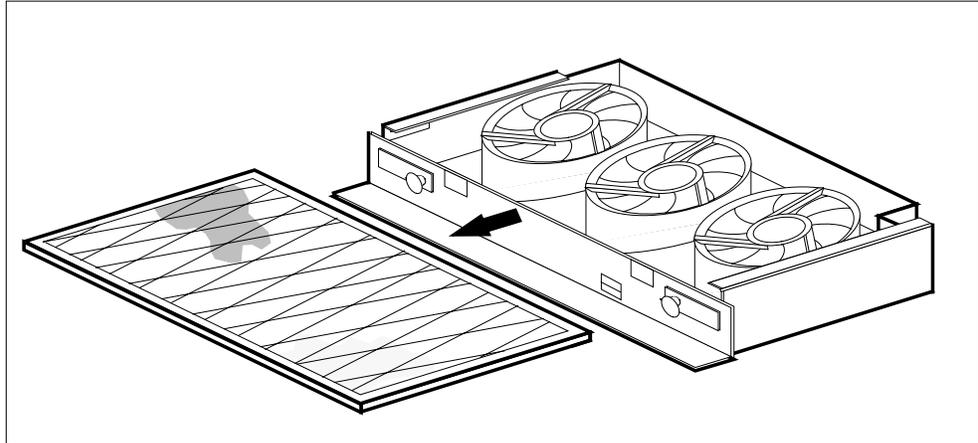
If filter surfaces appear	Do
dirty	step 4
clean	step 5

4   Replace the filter with the same part number as the old unit. Go to step 6.

5   Install the filter in the cabinet again.

6   To power up the cooling unit, place the power switch on the cooling unit in the on position.

7   The procedure is complete.

Replacing cooling unit filters

Application

Use this procedure to replace cooling unit filters.

Interval

Perform this procedure at intervals of three months.

Common procedures

There are no common procedures.

Action

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

Replacing cooling unit filters (continued)

Summary of Replacing cooling unit filters

```
┌─────────────────┐
│ Turn off cooling │
│ unit fans        │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Slide out filter │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Replace filter   │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ Turn on cooling  │
│ unit fans        │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ End of           │
│ procedure        │
└─────────────────┘
```

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

Replacing cooling unit filters (continued)

Replacing cooling unit filters

At your current location

1

> **DANGER**
> **To prevent overheating**
> Do not leave the cooling fans off for longer than 30 min.

> **DANGER**
> **To prevent overheating**
> Do not leave the cooling fans off for longer than 30 min.

Make sure the cooling unit fans are off. To perform this requirement, place the power switch on the cooling unit in the off position.

2   Use the two filter access tabs to grip the filter.
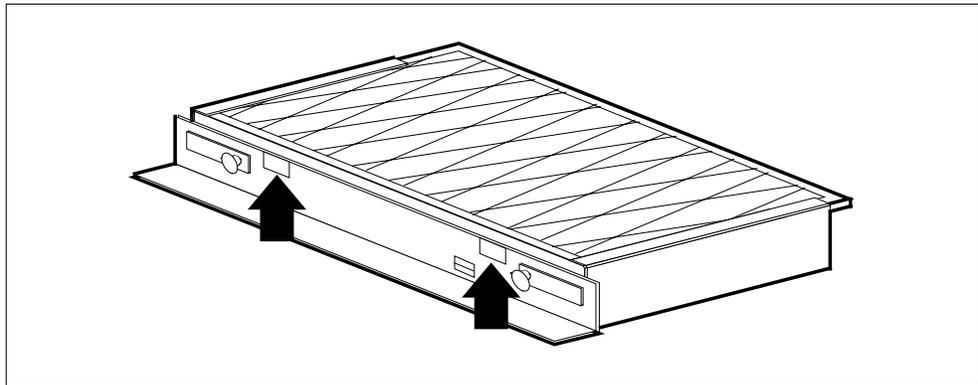
3   Slide the filter out of the cabinet.

Replacing cooling unit filters (end)
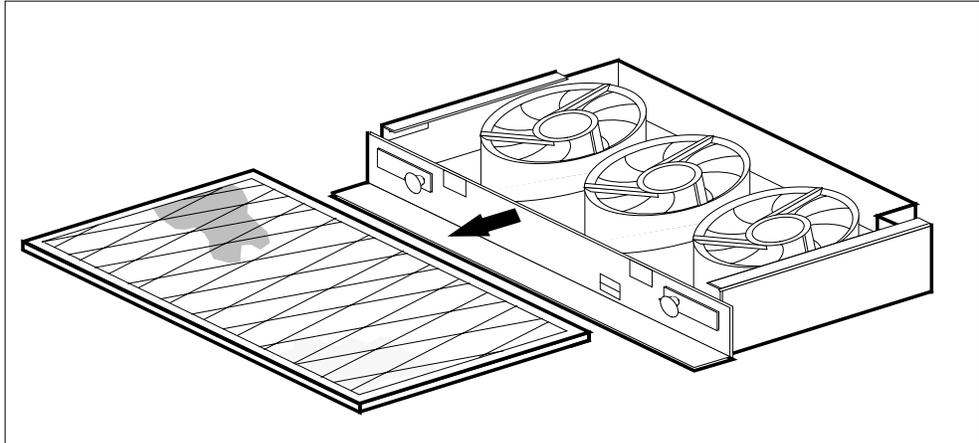
4	Replace the filter with the same part number as the part number of the old unit.
5	To power up the cooling unit, place the power switch on the cooling unit in the on position.
6	This procedure is complete.

Testing power converter voltages

Application

Use this procedure to test power converter voltages.

Interval

Perform this procedure in six month intervals.

Common procedures

Does not apply

Action

This procedure contains a summary flowchart as an overview of the procedure. Follow the exact steps to perform this procedure.

Testing power converter voltages (continued)

Summary of Testing power converter voltages

This flowchart is a summary of the procedure.

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

Obtain dc voltmeter

↓

Measure voltages at face plate test points

↓

Are voltages within 2% of face plate values? — **Y**

N

↓

Replace card

↓

End of procedure
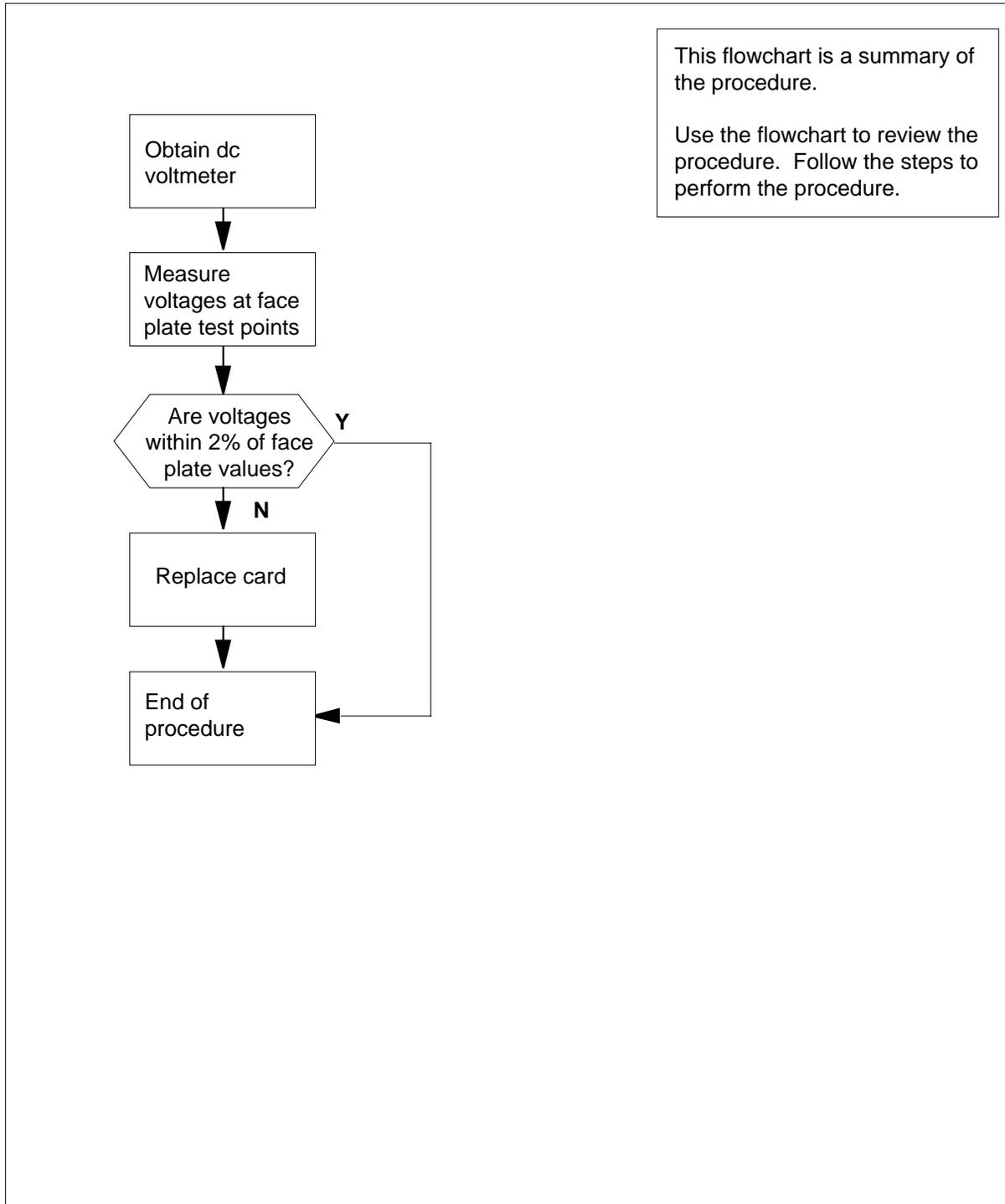
Testing power converter voltages (continued)

Testing power converter voltages

At your current location

1   Obtain a dc voltmeter.

2   Measure the voltage at the test points on the face plates of all power converters in the equipment cabinet.

> **Note:** This procedure applies to the NTMX72AA power converter. The NTMX72AB does not have test points on the faceplate to support testing power converter voltages.

Circuit cards with status indicators
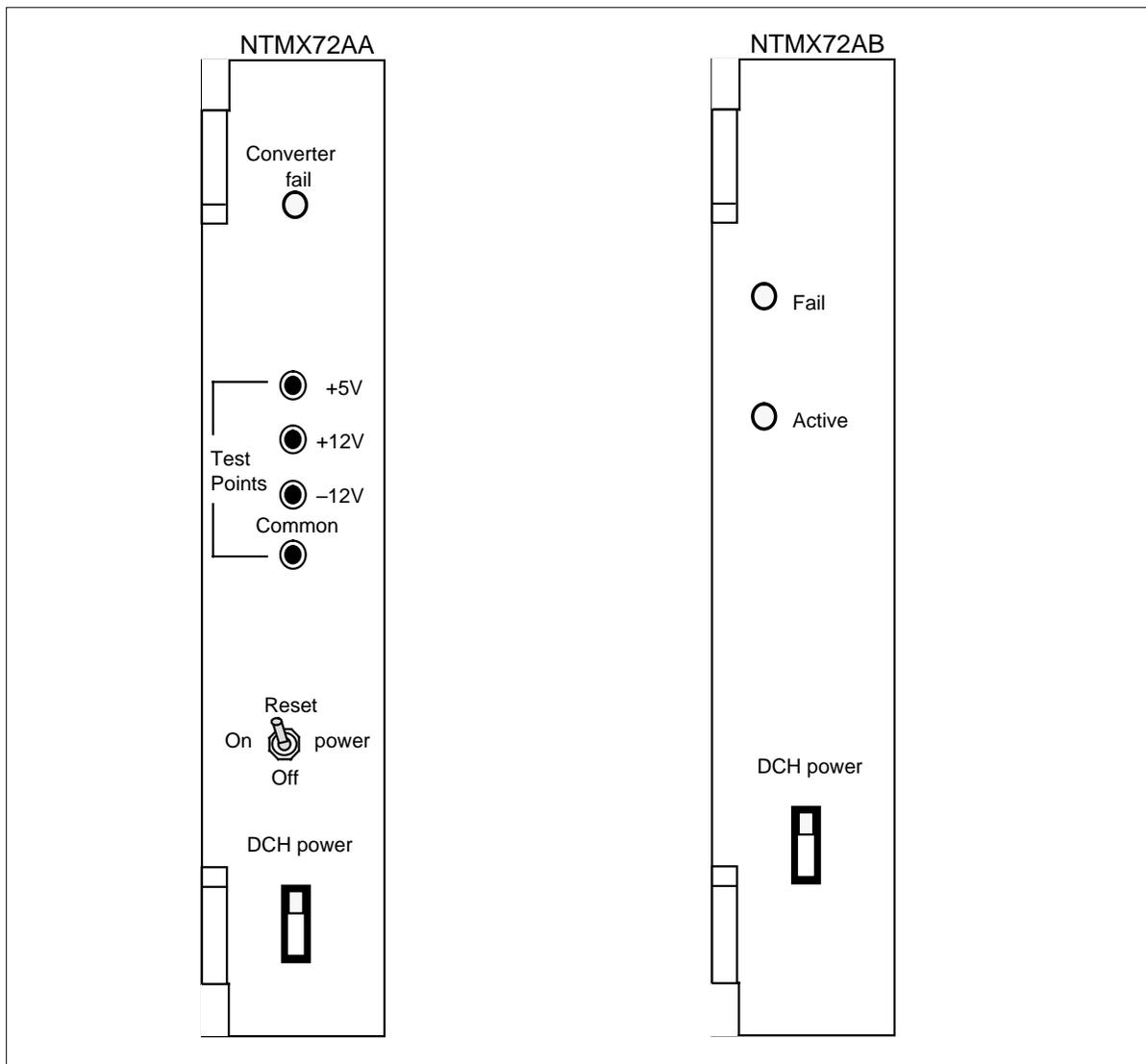
Testing power converter voltages (end)

3   The voltages must be within 2% of the nominal values printed on the faceplate. Compare the voltages measured in step 2 with the following acceptable voltage ranges:

Test point voltage	Acceptable range
+12 V	+11.76 V to + 12.24 V
-12 V	-12.24 V to -11.76 V
+ 5 V	+4.9 V to +5.1 V
-5 V	-5.1 V through -4.9 V

If test point voltages are	Do
within acceptable range	step 5
not within acceptable range	step 4

4   Replace the power converter as *Card Replacement Procedures* directs.

5   This procedure is complete.

Testing wrist strap grounding cords

Application

Use this procedure to verify that the level of resistance of wrist strap grounding cords is correct. The level must be low enough to allow static electricity to discharge from the body of the user. The level must be high enough to prevent electrocution. Electrocution occurs if the equipment develops a short-circuit while the user wears the wrist strap.

Interval

Perform this procedure in one month intervals.

Common procedures

There are no common procedures.

Action

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

Testing wrist strap grounding cords (continued)

Summary of Testing wrist strap grounding cords

This flowchart summarizes the procedure.

Use the instructions that follow this flowchart to perform the procedure.

```
        ┌──────────────┐
        │ Obtain       │
        │ ohmmeter     │
        └──────┬───────┘
               │
               ▼
        ┌──────────────┐
        │ Detach       │
        │ grounding cord│
        │ from wrist strap│
        └──────┬───────┘
               │
               ▼
        ┌──────────────┐
        │ Measure      │
        │ resistance between│
        │ each end of ground│
        │ cord         │
        └──────┬───────┘
               │
               ▼
        ╱──────────────╲          ┌──────────────┐
       ╱ Is resistance  ╲   Y     │ Attach cord to│
       ╲ between 800 and ╱────────▶│ wrist strap   │
        ╲ 1200 k ?      ╱          └──────┬───────┘
         ╲─────┬────────╱                 │
               │ N                        │
               ▼                          │
        ┌──────────────┐                  │
        │ Discard wrist│                  │
        │ strap        │                  │
        └──────┬───────┘                  │
               │                          │
               ▼                          │
        ┌──────────────┐                  │
        │ End of       │◀─────────────────┘
        │ procedure    │
        └──────────────┘
```

Testing wrist strap grounding cords (end)

Testing wrist strap grounding cords

At your current location

1 Obtain an ohmmeter.

2 Take the grounding cord off the wrist strap.

3 Measure the resistance between opposite ends of the grounding cord with the ohmmeter.

If resistance is	Do
between 800 kΩ $\alpha\nu\delta$ 1200 $\kappa\Omega$	step 4
not between 800 kΩ $\alpha\nu\delta$ 1200 $\kappa\Omega$	step 5

4 You can use the grounding cord and wrist strap assembly. Assemble the wrist strap to the grounding cord.

Go to step 6.

5

DANGER
Risk of electrocution
The grounding cord is only safe to use if the resistance of the grounding cord measures higher than 800 kΩ. Lower resistance exposes the wearer to the risk of electrocution. Electrocution can occur if equipment short-circuits while the user wears the wrist strap.

WARNING
Damage to electronic equipment
A grounding cord that has a resistance higher than 1200 kΩ cannot conduct enough static charges to ground correctly. The grounding cord will not protect sensitive electronic equipment against build-ups of static charges that can cause damage.

Discard the complete assembly. *Do not attempt to use it.*

6 The procedure is complete.

Index

DMS 100 Family
Remote Switching Center
Remote Switching Center Multi-Access

Maintenance Manual

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