297-8263-550

DMS-100 Family

Expanded Subscriber Carrier Module-100 Access

Maintenance Manual

XPM13 and up   Standard   11.01   August 2000

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DMS-100 Family

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Maintenance Manual

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Contents

Maintenance Manual

About this document

When to use this document

This Expanded Subscriber Carrier Module-100 Access (ESMA) maintenance reference manual provides: overview, hardware, and functionality information; automatic maintenance; user interface; manual maintenance information; recovery procedures; alarm clearing procedures; card replacement procedures; and routine maintenance procedures. The information in this maintenance manual is intended for operating company personnel engaged in ESMA maintenance.

How to check the version and issue of this document

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

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

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

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

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

References in this document

The following documents are referred to in this document:

- *DMS-100 Business Set Feature Description and Operation*, 297-2011-100
- *S/DMS AccessNode Configuration and Equipment Description*, 323-3001-100
- *S/DMS AccessNode User Interface Description*, 323-3001-301
- *S/DMS AccessNode Alarm and Trouble Clearing Procedures,* 323-3001-543
- *Extended Peripheral Module Translations Reference Manual*
- *Product Document Directory*, 297-8991-001
- *Digital Channel Bank-Requirements and Objectives,* PUB 43801

As of NA011 (LEX and LET) and EUR010 (EUR) releases, any references to the data schema section of the Translations Guide will be mapped to the Customer Data Schema Reference Manual.

The Advanced Business Services suite does not include an Advanced Maintenance Guide. Consult one or more of the following documents.

- *Bellcore Format Automatic Message Accounting Maintenance Guide,* 297-1001-590
- *Input/Output Devices Maintenance Guide*, 297-1001-594
- *Lines Maintenance Guide*, 297-1001-591
- *Networks Maintenance Guide,* 297-1001-591
- *Peripheral Modules Maintenance Guide,* 297-1001-592
- *Trunks Maintenance Guide,* 297-1001-595

What precautionary messages mean

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

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

Examples of the precautionary messages follow.

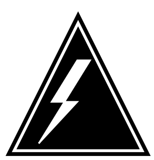
ATTENTION - Information needed to perform a task

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

DANGER - Possibility of personal injury

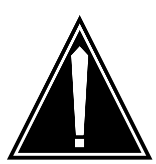
DANGER
Risk of electrocution
Do not open the front panel of the inverter unless fuses F1, F2, and F3 have been removed. The inverter contains high-voltage lines. Until the fuses are removed, the high-voltage lines are active, and you risk being electrocuted.

WARNING - Possibility of equipment damage



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

CAUTION - Possibility of service interruption or degradation



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

How commands, parameters, and responses are represented

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

Input prompt (>)

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

>BSY

Commands and fixed parameters

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

>BSY CTRL

Variables

Variables are shown in lowercase letters:

>BSY CTRL ctrl_no

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

Responses

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

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

FP 3 Busy CTRL 0: Command passed.
```

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

Procedure 1

1 Manually busy the CTRL on the inactive plane by typing

>BSY CTRL ctrl_no

and pressing the Enter key.

where

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

Example of a MAP response:

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

1 SMA2 overview

Introduction

To update current access networks, operating companies replace copper with fiber at an accelerated pace. The use of fiber reduces ownership costs, simplifies networks, increases network flexibility, and increases bandwidth for advanced services. Examples of advanced services are the integrated services digital networks (ISDN), residential video and multimedia. To meet these purposes, operating companies require the powerful and flexible Bellcore Standard TR-TSY-000303 (TR-303) compliant interface products. The Bellcore Standard TR303 products support advanced services and enhanced operations, administration, maintenance and provisioning (OAM&P).

TR-303 is a technical requirements standard. This standard establishes guidelines for multiple vendors to have access to the digital switching services and operations of a central office.

The Expanded Subscriber Carrier Module-100 Access (ESMA) is the Nortel Networks multi-vendor interface (MVI) solution. The ESMA meets TR-303 standards. Another name for ESMA is the Subscriber Carrier Module-100 Access 2 (SMA2). The SMA2 connects remote digital terminals (RDT) and channel banks to the Digital Multiplex System (DMS) SuperNode switch. The RDTs access digital services from the DMS SuperNode switch through the SMA2.

The SMA2 provides the following:

- multi-vendor interface to a DMS SuperNode switch
- a maximum of 28 DS-1 links for each RDT
- support for a maximum of eight RDTs, or seven RDTs when equipped with ISDN
- support for integrated channel banks (ICB)
- the ability to connect to junctored network (JNET) or enhanced network (ENET)

The SMA2 is a host peripheral module (PM) based on the common peripheral module (CPM). The SMA2 provides the interface between the DMS SuperNode switch and an RDT. This document uses the name SMA2 to refer to the hardware and software that provide the interface.

This document uses the name “SMA system" to describe the SMA2 and additional elements like the following:

- the DMS SuperNode switch software that supports the SMA2 to RDT interface, and maintenance and provisioning functions
- the test and service circuits for signal processing
- the RDT line testing capabilities

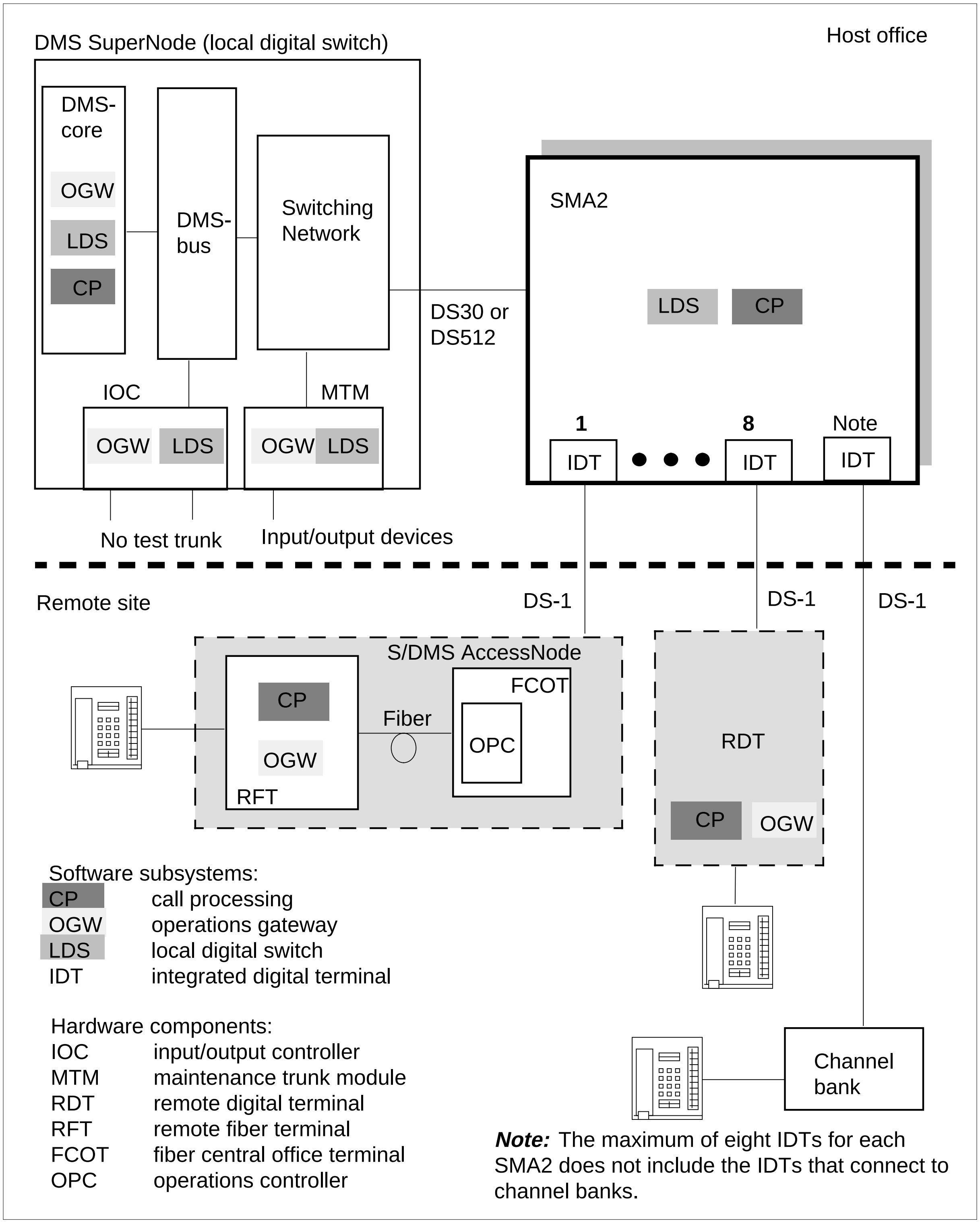
This document focuses on the maintenance of the SMA2. The MAP terminal includes many maintenance functions. This document includes maintenance information for the SMA system.

SMA system summary

This section provides a summary of the SMA system. This section describes the hardware components and software subsystems.

The basic SMA system configuration appears in the following diagram.

Figure 1-1 SMA system configuration



The SMA system hardware components

The SMA system consists of the following:

- DMS SuperNode switch hardware components:
  - — DMS-bus
  - — DMS-core
  - — input/output controller (IOC)
  - — network
    - – ENET
    - – JNET
  - — peripheral modules
    - – maintenance trunk module (MTM)
    - – SMA2
- RDT
- S/DMS AccessNode components:
  - — fiber central office terminal (FCOT)
  - — operations controller (OPC)
  - — remote fiber terminal (RFT)
- DS-1 links

S/DMS SuperNode switch

The DMS SuperNode switch as the local digital switch (LDS) interface appears in figure “SMA system configuration". The local digital switch (LDS) interface is the interface to the RDT.

DMS-bus The DMS-bus is the messaging control component of the DMS SuperNode processor. The DMS-bus components are a pair of message switches (MS). The DMS-bus does not change for the SMA2.

DMS-core The DMS-core is the call management and system control part of the DMS SuperNode. The DMS-core consists of the computing module (CM) and system load module (SLM).

The DMS-core does not change for the SMA2.

Input/output controller (IOC) The IOC provides the user interfaces for the SMA2. These interfaces include logs, operational measurements (OM) and MAP terminal interfaces.

Network The network accepts incoming calls and uses connection instructions from the CM to connect calls. Two network types support the SMA system:

- enhanced network (ENET) - a channel-matrixed time switch that provides pulse code modulated (PCM) voice and data connections between PM. The ENET also provides message paths to the DMS-bus components.
- junctored network (JNET) - a time-division multiplexing (TDM) system. This system allows the switching of 1920 channels for each network pair (completely duplicated).

Peripheral modules The PMs that provide operations monitoring and digital services to customers appear in the diagram “SMA system configuration."

- **Maintenance trunk module (MTM)** The MTM contains many types of test and service circuits for signal processing. These circuits include signal distribution (SD) cards, scan (SC) cards, and multiline test units (MTU) and metallic test access (MTA) cards.
- **SMA2** The SMA2 is the key hardware component of the SMA system. The SMA2 connects the RDT and S/DMS AccessNode to the DMS switching network. The peripheral side (P-side) of the SMA2 uses a maximum of 48DS-1 links to connect to a maximum of eight RDTs. On the central side (C-side), the SMA2 connects to the switching network. The SMA2 uses DS512 (fiber-optic) links to an ENE or DS30 (copper) links to a JNET for the C-side connection.

Remote digital terminal (RDT)

The RDT is a remote access vehicle that connects terminal devices to the SMA2. These terminal devices can transmit voice or data, or voice and data. An RDT that connects to the DMS SuperNode switch through an SMA2 forms an integrated digital loop carrier (IDLC). The RDT connects a maximum of 2048 subscriber lines from different types of terminal devices. The RDT normally resides at a remote site.

In the TR-303 specification the name RDT refers to the remote digital terminal equipment of a vendor that complies with the TR-303 specification. References to RDT in this document apply to multi-vendor interface access remotes and S/DMS AccessNode remotes. The S/DMS AccessNode remotes are remote fiber terminals (RFT). The name S/DMS AccessNode or RFT applies to the Nortel Networks remote access vehicle. The names refer to the next generation digital loop carrier (NGDLC), the S/DMS AccessNode.

S/DMS AccessNode

The S/DMS AccessNode is the Nortel Networks remote access vehicle that connects terminal devices to the SMA2. These terminal devices can transmit voice or data. Like the RDT, an S/DMS AccessNode that connects to the DMS SuperNode switch through an SMA2 forms an IDLC.

The S/DMS AccessNode can connect to additional service nodes, like other digital switches, analog switches, and digital cross-connect systems. Refer to *S/DMS AccessNode Configuration and Equipment Description* for additional information about the S/DMS AccessNode in these configurations.

Integrated channel bank

A channel bank is a communications device that multiplexes voice signals. A channel bank that connects to an SMA2 has a logical representation at the SuperNode switch. This logical representation is the integrated channel bank (ICB). The ICB is another IDT. The ICB is a virtual component that represents resources of the SuperNode switch. These resources support one to four channel banks and include one to four of DS-1 links.

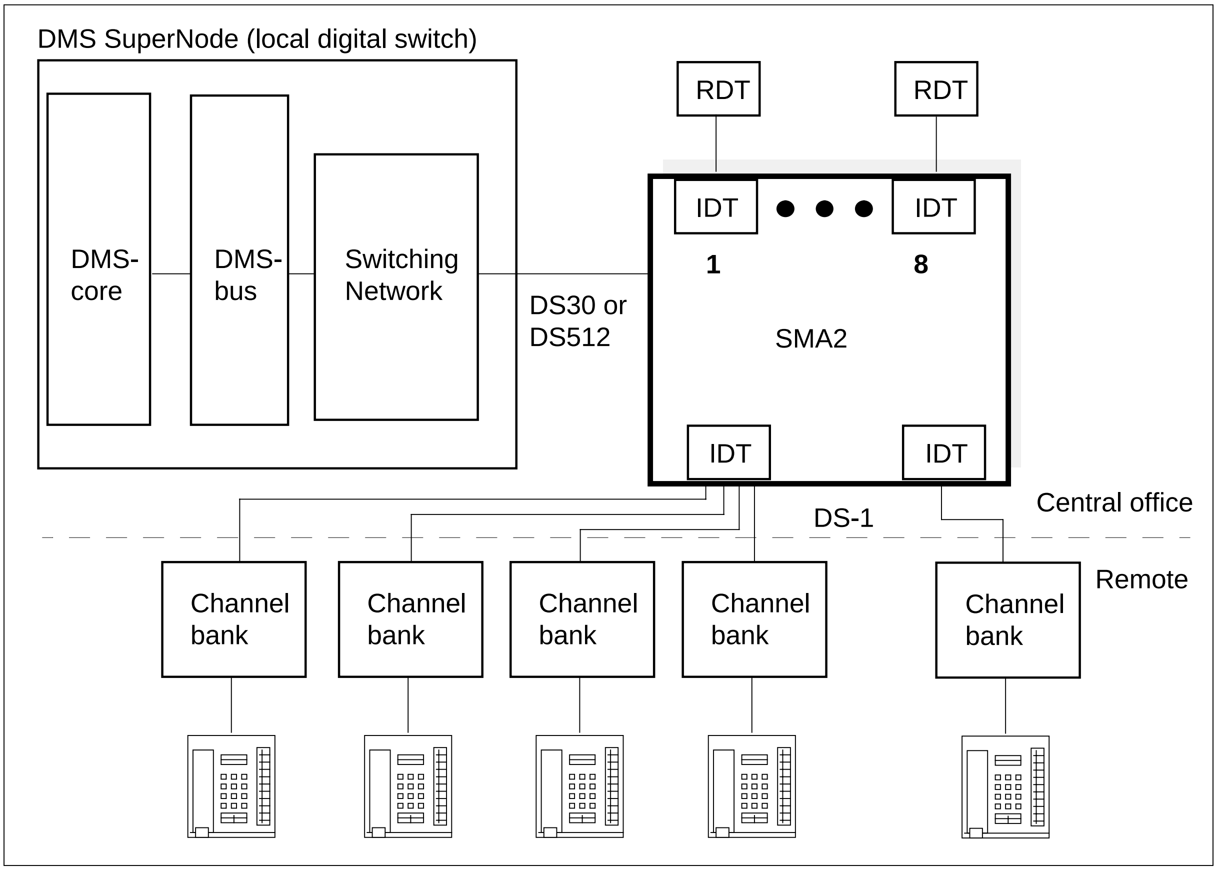
The ICB configuration reduces operating company equipment costs. The ICBs eliminate the need for a channel bank and terminating line card in the central office. The ICBs allow operating companies to use new DS-1 bandwidth on current SMA2s. This additional bandwidth increases customer access.

Channel banks in the ICB configurations have the following characteristics:

- support foreign exchange service (FXS) signaling for plain-old telephone service (POTS) loop and ground start lines
- the DS-1 link or links that serve the ICB do not provide protection switching
- a maximum of 96 lines that do not concentrate on the P-side of the SMA2
- conform to the AT&T D4 channel bank specification

Two ICB configurations appear in the following diagram. One configuration uses four DS-1 links. The other configuration uses one DS-1 link.

Figure 1-2 Integrated channel bank



Fiber central office terminal (FCOT) The FCOT provides bandwidth management and conversion from optical to electrical. This conversion allows traffic from the synchronous optical network (SONET) transmission facility to and from the DMS SuperNode switch. The traffic transmits over DS-1 facilities that terminate at the SMA2. The FCOT also provides protection switching for the SONET facility.

> ***Note:*** The generic term for the FCOT is the digital central office terminal (DCOT). The name DCOT in TR-303 refers to digital central office terminal (COT) equipment of a vendor that complies with the TR-303 specification. In this document, FCOT refers to a DCOT in conjunction with the S/DMS AccessNode.

Operations controller (OPC) The OPC is a processing complex that contains software that performs the following important functions:

- memory, hard drive and tape storage
- nonvolatile storage, downloads and administration of the software that FCOTs and RFTs use

- software applications that relate to operations to facilitate provisioning and maintenance of S/DMS AccessNodes.
- interfaces to allow S/DMS AccessNodes to communicate with the external operations systems.

The OPC function can reside in a separate shelf, a stand-alone workstation, or a DMS SuperNode applications processor. Refer to *S/DMS AccessNode User Interface Description* for additional information about the OPC.

Remote fiber terminal (RFT) The RFT can be configured with a minimum of 96 to a maximum of 2048 subscriber lines from different types of terminal devices. The lines connect to one fiber optic transmission facility from the fiber central office terminal (FCOT). The RFT connects and mulitplexes traffic from subscriber lines to and from the optical fiber transmission facility. The RFT normally resides at a remote site. There is now a hardware limit of 1344 lines on the RFT. The RFT can be resized to increase or decrease line capacity.

> ***Note:*** The more generic name for the RFT is the remote digital terminal (RDT). The RDT is the name in the TR-303 specification that refers to the remote digital terminal equipment of a vendor that follows the TR-303 specification.

The DS-1 links

A maximum of 28 DS-1 links can carry subscriber traffic and message channels to an RDT.

The SMA system software subsystems

This section describes the distribution of software subsystems across the hardware components. Refer to the figure “SMA system configuration". The SMA system and the locations of the software subsystems appear in this figure.

The SMA system configuration contains the following software entities:

- IDT
- LDS
- CP
- OGW

The following sections provide additional information about these entities.

Integrated digital terminal (IDT)

The ESMA uses three interfaces. These interfaces are TR-303, AccessNode, and the ICB.

TR-303 BellCore standard TR-TSY-000303 defines a signaling interface that allows any vendor's RDT to connect to any vendor's local digital switch. The interface then accesses digital switching services from the local digital switch.

AccessNode The AccessNode is an RDT made by Nortel Networks. The AccessNode supports both the generic TR-303 interface and the proprietary AccessNode interface. The proprietary interface is based on TR-303. However, the AccessNode contains extensions that allow it to support services not defined in TR-TY-000303. The ESMA uses this interface for nodes provisioned in table RDTINV with a signaling type of RFT.

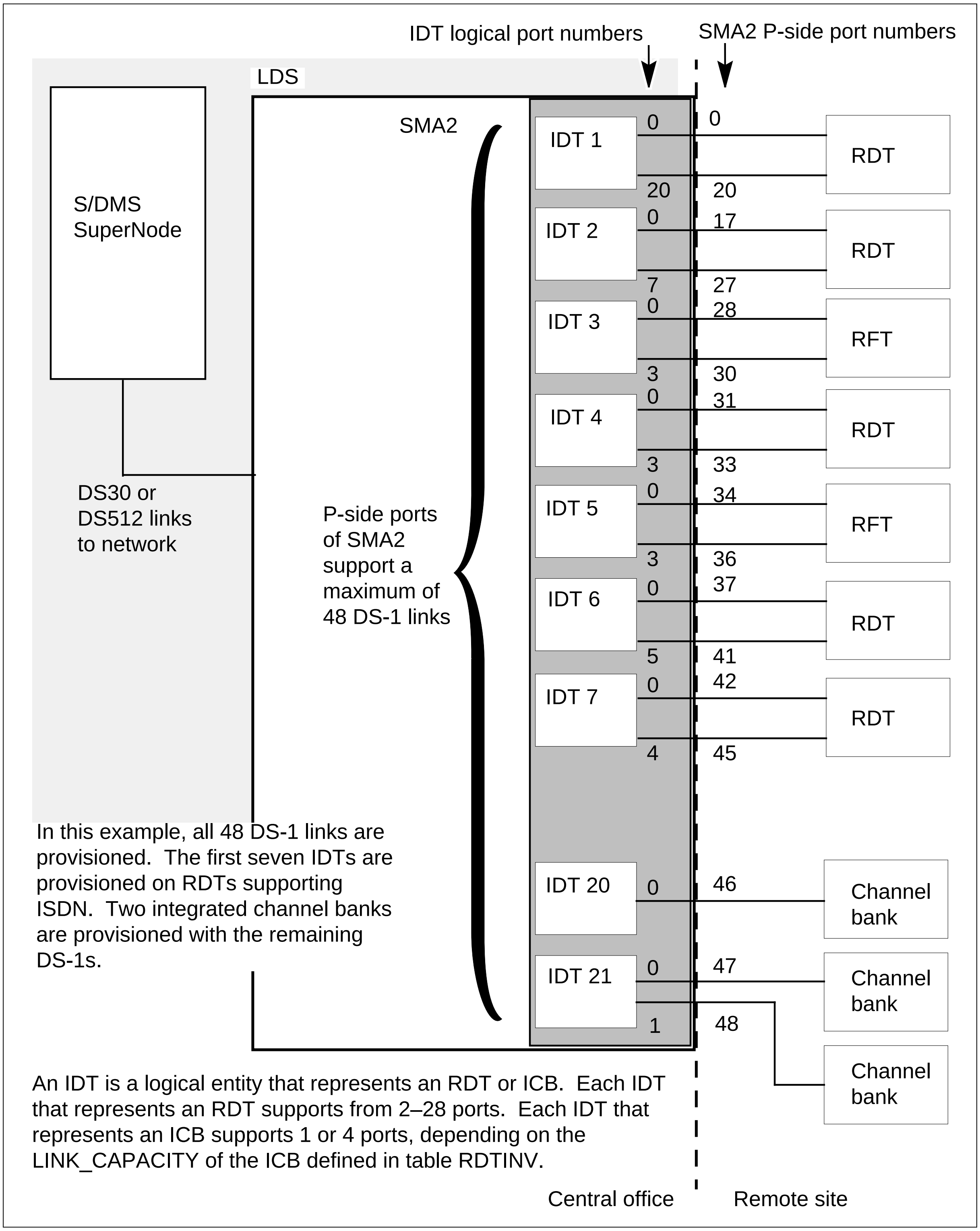
ICB PUB 43801 is an AT&T publication that defines the signaling for D4 channel banks. The ESMA uses this interface for nodes provisioned in table RDTINV with signaling type of ICB.

Each of the interfaces described above allows an external line concentrating device (LCD) to connect to a DMS-100. When an LCD connects to the DMS-100 through the ESMA, the DMS-100 considers the LCD as an IDT. The IDT enables the DMS-100 to track the state of the external node and perform maintenance on the external node.

The P-side DS-1 links of an SMA2 connect to the C-side ports of an RDT or ICB. The SMA2 supports a maximum of 48 DS-1 links on the P-side. An RDT can support a maximum of 28 DS-1 links on the C-side. An ICB supports a maximum of four DS-1s on the C-side. The DS-1 links map to the IDT logical ports in the SMA2. The association of the DS-1 links to IDT logical ports appears in the following example.

For example, one IDT is configured to connect to an RDT through 28 logical ports. These 28 logical ports are mapped to 28 DS-1 links on the SMA2. The SMA2 supports 48 DS-1 links. Only 20 DS-1 links remain to assign from the SMA2 P-side to the other IDT logical ports.

Figure 1-3 Example DS-1 links mapped to IDT ports



Local digital switch (LDS)

An LDS is any class-5 digital central office switch. For SMA2 software, the LDS applications are responsible for the maintenance and provisioning of switch resources that connect to an RDT. An LDS includes the following:

- the DMS SuperNode switch resources associated to IDTs and DS-1 carriers to RDTs
- locally switched services for customer equipment that connects to an RDT. These services include cross-connects at the RDT for services that are not switched locally and services that are not switched.
- the LDS and IDT maintenance functions. These functions include system maintenance, recovery, and fault isolation
- the RDT alarm reports and log reports
- link access procedure on the D-channel (LAPD) administration, provisioning, and maintenance.

Call processing (CP)

The CP function performs low-layer call processing tasks. The CP function translates between the internal DMS SuperNode switch protocol and the protocols for communication with the RDT. This software allows DMS call processing logic to communicate with the TR-303 messages and procedures.

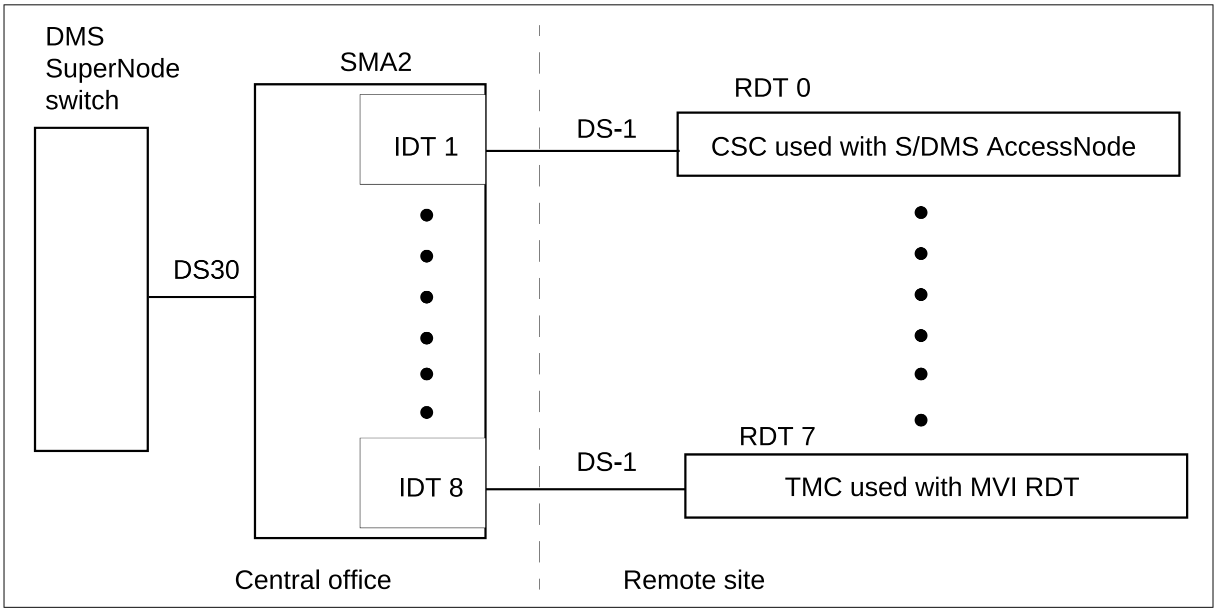
The Bellcore TR-303 requirements for IDLC systems specify two signaling options. The options are hybrid signaling and out-of-band signaling as follows:

- Hybrid signaling uses ABCD robbed-bit signaling (RBS) for call supervision and the time-slot management channel (TMC) for time slot assignment. The SMA2 supports the hybrid option for generic TR-303 RDT integration.
- Out-of-band signaling uses the common signaling channel (CSC) for call supervision and time slot assignment. The SMA2 supports the out-of-band option for S/DMS AccessNode integration.

The SMA2 offers service providers the flexibility for the support of S/DMS AccessNodes (CSC) and generic RDTs (TMC) on one PM. The support of both the signaling options allows the SMA2 to offer advantages. The SMA2 offers the operating advantage of the out-of-band method (CSC) and the interoperability advantages of the hybrid approach (TMC).

The CP software design allows the SMA2 to support different signaling types and different types of access vehicles. These signaling types and types of access vehicles appear in the following diagram.

Figure 1-4 How the SMA2 supports different signaling types



The SMA2 can support different types of RDTs, but each RDT must have only one type of signaling.

The CP software can process calls from the following service groups:

- plain old telephone service (POTS)
- coin
- Meridian Digital Centrex (MDC)
- Datapath
- non-switched
- non-locally switched
- loop reverse battery
- ISDN

Operations gateway (OGW)

The OGW function spreads across the DMS-core, IOC, and MTM. The OGW provides the protocol translation and routing capabilities. These capabilities connect a number of RDTs to a different set of operations interfaces. These interfaces include the local MAP terminal, logs, scan and SD points, and the no test trunk (NTT) test.

This OGW software performs the following functions.

- External alarm interface—The operating company can enter DMS tables to set an external alarm for each RDT. External alarms are minor, major or critical. When an alarm activates, the OGW operates an SD point and displays an alarm. The alarm appears at the EXT level of the MAP terminal.
- No test trunk—The no test trunk (NTT) test includes the subscriber lines off the RDT in external line testing systems.
- Scan and signal distribution points—The operating company can enter DMS tables to set up an external alarm interface. This interface allows alarms for each S/DMS AccessNode to be reported to an alarm system.

Advantages of TR-303 applications

The application of TR-303 standards provide the following advantages:

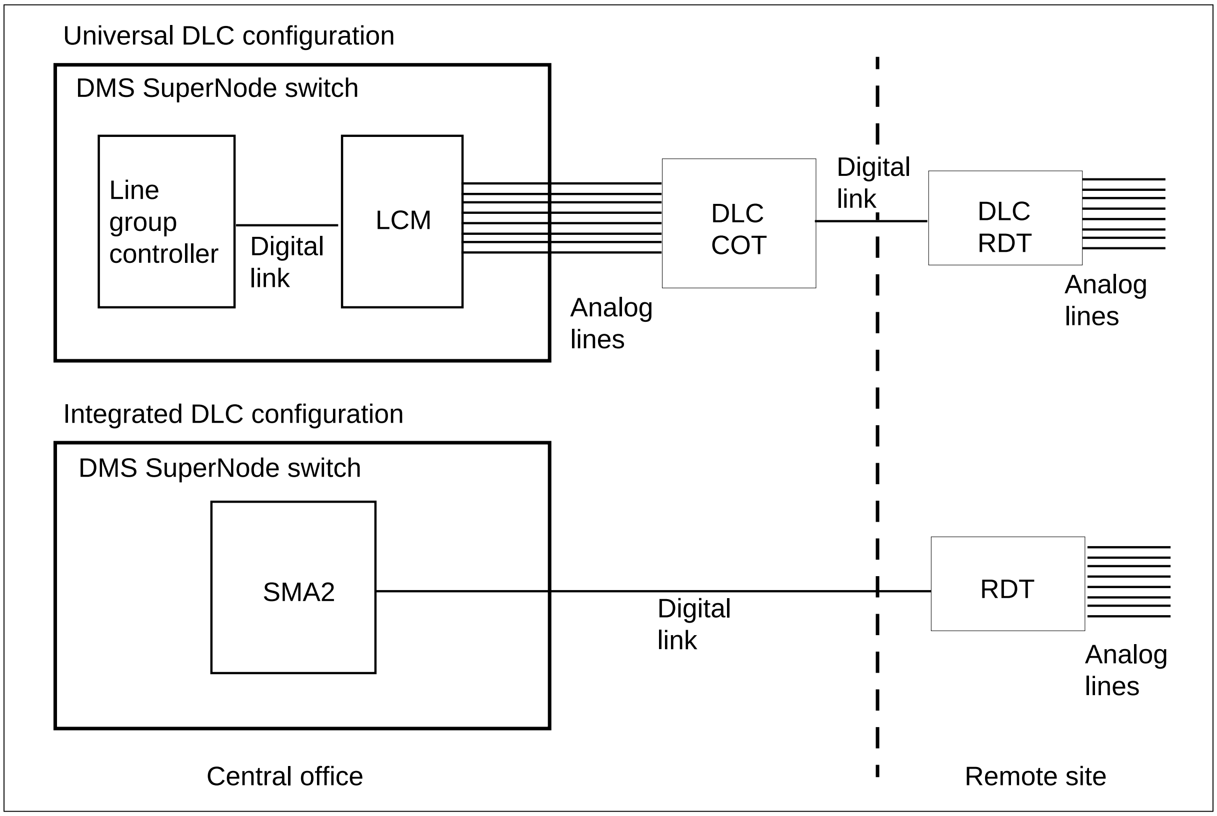
- efficiency improvement through the use of digital integration
- service expansion and increased revenue
- simplification of network planning
- increased efficiency of DS-1 facilities
- enhances control
- remote provisioning
- integrated line testing
- integrated ISDN

Each of these advantages are discussed in the paragraphs that follow.

Digital integration

Digital integration eliminates the need for both the line concentrating module (LCM) and the digital loop carrier (DLC) COT. This process reduces hardware costs. This integration appears in the following figure. Analog-to-digital conversions occur only at the RDT and not at the DLC COT and the LCM. The performance of these conversions at the RDT enhances transmission quality.

Figure 1-5 Digital integration



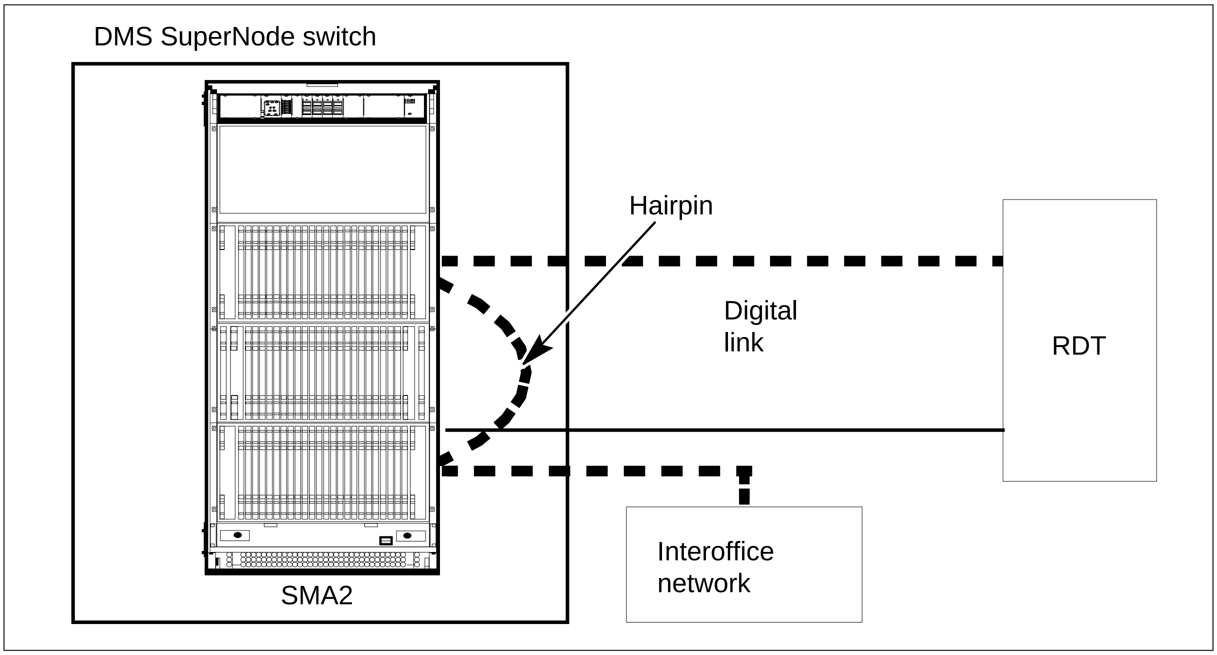
Expanded services

The TR-303 opens the access network and provides the following digital services:

- remote ISDN applications
- business and residential services
- the DS-1 and DS-3 wideband and broadband services
- hairpin for special services for services from RDTs that meet TR-303 standards that are not switched locally or not switched.

The hairpin service appears in the following figure.

Figure 1-6 Hairpin for special services

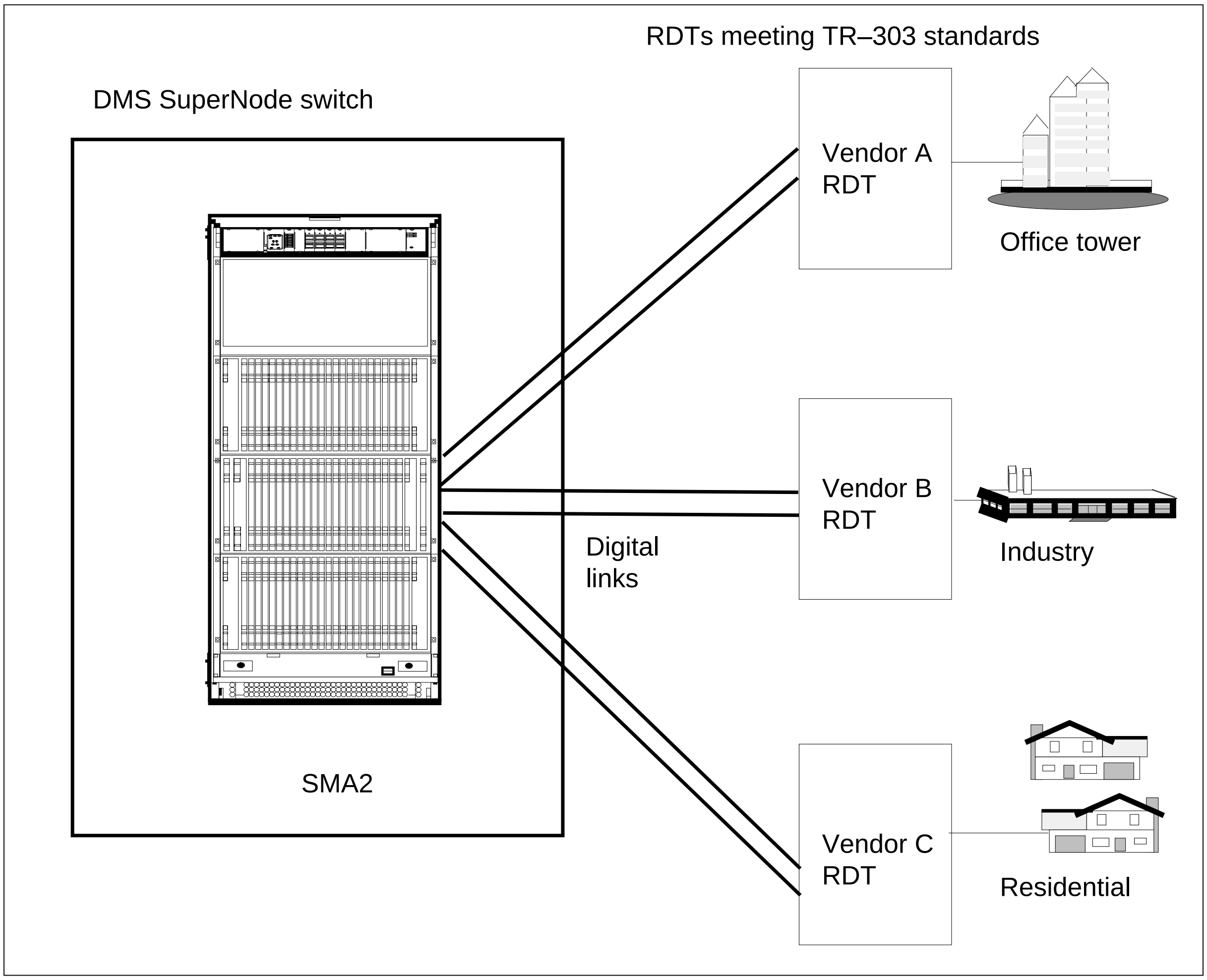


Simplified network planning

The TR-303 standards simplify network planning through the following:

- a multi-vendor interface, which supports a wide range of remote digital terminal equipment.
- network providers, which can make purchase decisions for access equipment and for switching equipment that is separate from other switching equipment.

Figure 1-7 Simplified network planning



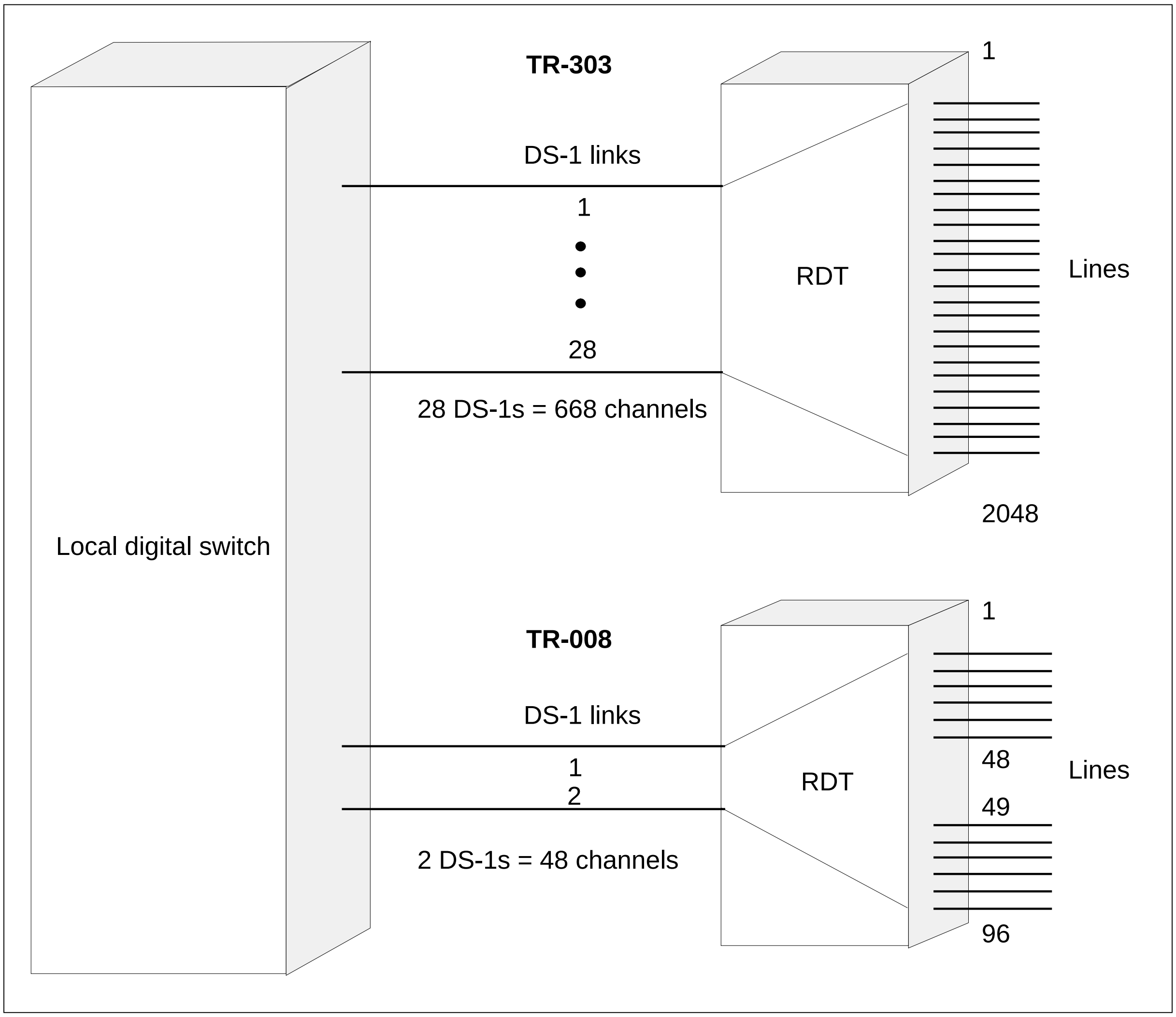
Increased efficiency of DS-1 facility

The TR-303 increases efficiency of DS-1 facilities and switch ports. The TR-303 uses concentration to increase efficiency. The TR-303 maintains the same grade of service. This improvement is possible because the SMA2 can support large RDTs. The TR-303 compares to TR-008 as follows:

- the TR-303
  - — allows any line to access any channel
  - — supports a 7 to 1 concentration for an office engineered to 3 ccs (hundred call seconds)
  - — includes load balancing
- the TR-008
  - — restricts each 48-line digroup to a fixed pool of 24 channels.
  - — supports a maximum 2 to 1 concentration.
  - — requires rehoming subscribers when load balancing

The following figure compares DS-1 utilization between TR-008 and TR-303.

Figure 1-8 Efficient DS-1 utilization



Enhanced surveillance

The TR-303 standards improve event reporting messages to identify RDT troubles correctly.

The following tools help monitor RDT alarm conditions and reports:

- scan and signal distribution points
- MAP display
- logs

Scan and signal distribution points

The SMA2 analyzes alarm reports from RDTs and uses information from the reports to drive the following signal distribution (SD) points:

- eight SD points to display a code that identifies the RDT with the highest alarm level of danger.
- four SD points to display alarm levels: critical, major, minor or warning alarm condition.
- connect to E2A telemetry to status and command (SAC) remote.
- the RDT alarm cutoff scan (SC) point function.
- the RDT alarm cutoff indication SD point.

The entry of ALMSD table and RDTINV table in the DMS SuperNode switch activates the SD points.

The MAP display

The MAP terminal displays the alarm condition levels that relate to RDTs. The alarm condition levels are:

- external alarm (EXT) level
- peripheral module (PM) level—alarm condition appears as an IDT in an in-service trouble (ISTB) state

Logs

The DMS SuperNode system converts event reports, which the system receives from an S/DMS AccessNode or TR-303 RDT, to DMS log reports. The system can route these reports to different devices for display or storage. Set conditions determine if the reports require display or storage. Each report contains information about the event and the result of the event on service. A list of the RDT alarms that log reports can contain follows.

Equipment alarms:

- equipment failure
- receiver problem
- equipment mismatch
- timing problem
- equipment missing
- power problem

Transmission alarms

- call setup failure
- loss of frame/framing error

- degraded signal
- loss of signal
- error rates that exceed standards

Environmental alarms

- battery alarms
- fan alarms
- external alarms

Software alarms

- corrupt data
- storage capacity
- memory mismatch

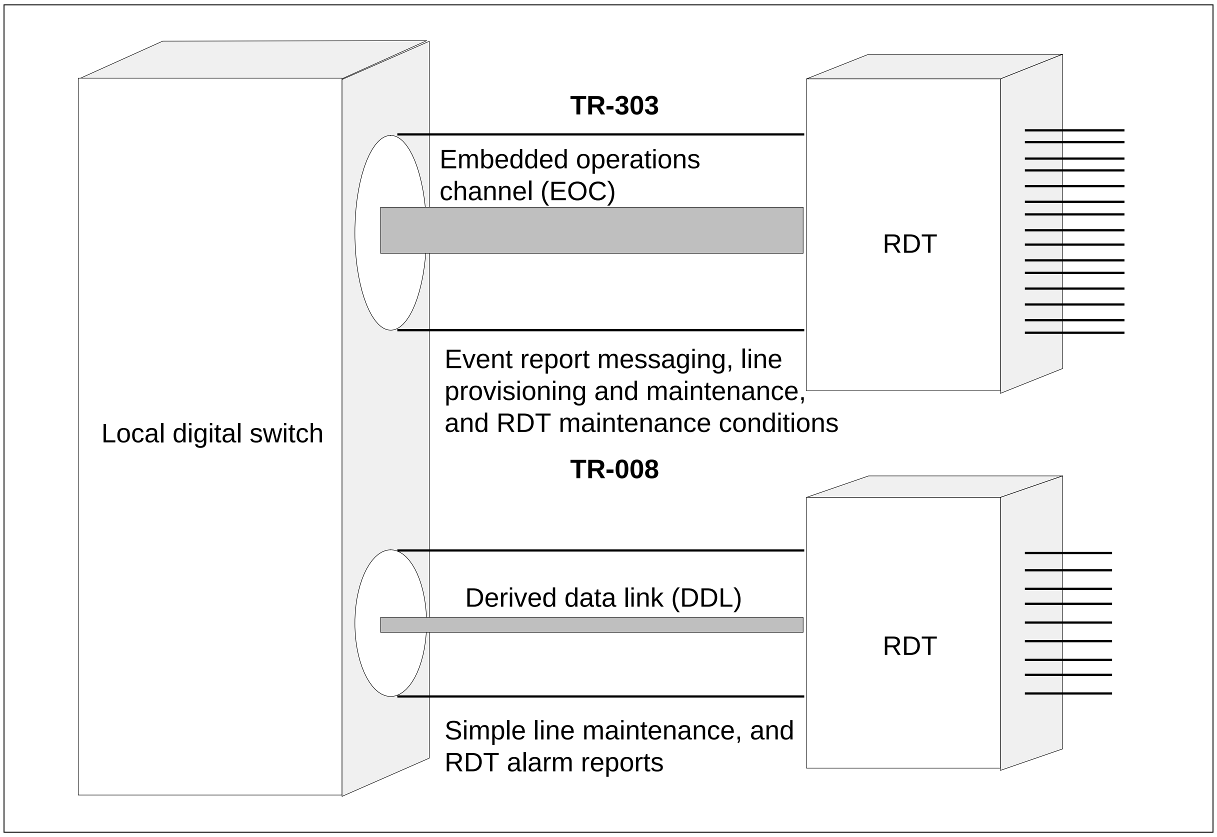
Comparison of TR-303 and TR-008

A comparison of TR-303 and TR-008 OAM&P abilities follows.

- The message protocol of TR-303 supports the following:
  - loop and channel tests
  - facility maintenance
  - detailed alarm reports
  - remote provisioning
  - ISDN performance monitoring
  - ISDN loopback tests
  - data link protection switching
  - line service state updates
- The bit-oriented protocol for the TR-008 supports the following:
  - loop and channel tests
  - facility maintenance
  - summary alarm reports

A comparison of OAM&P capabilities in TR-008 and TR-303 appears in the following diagram.

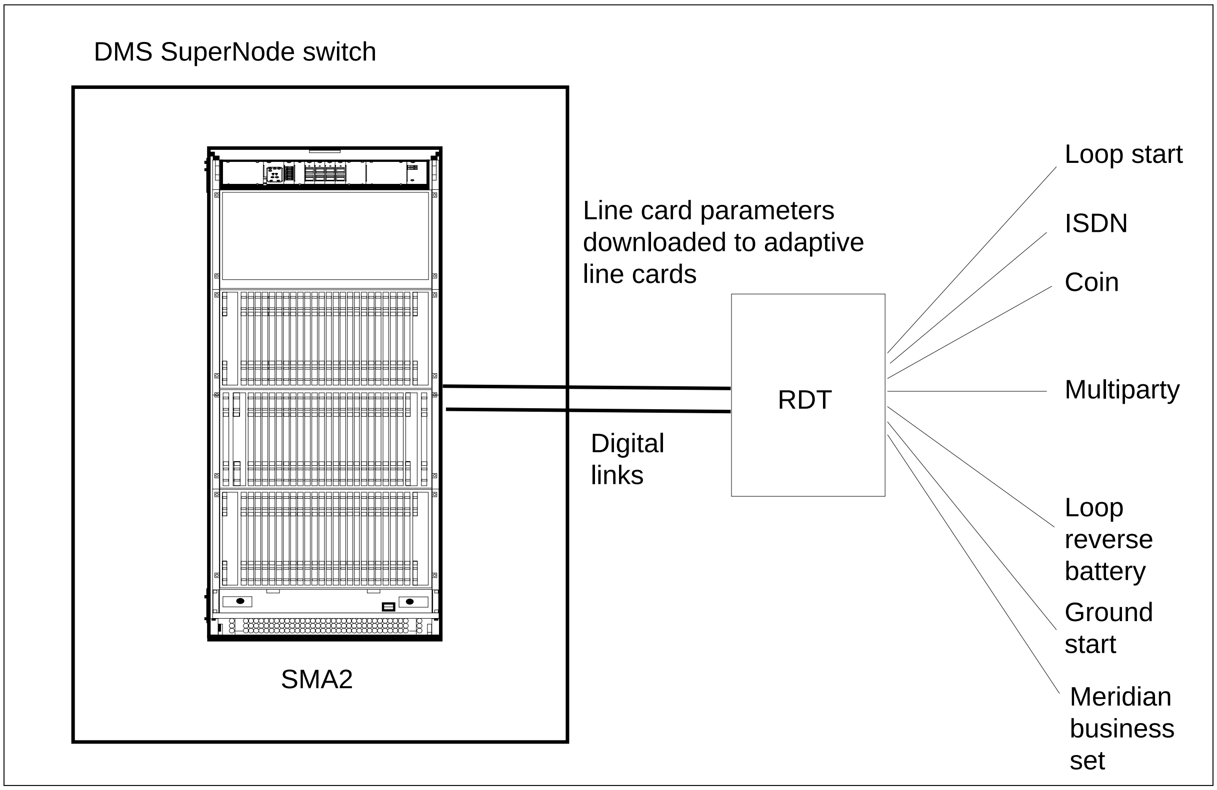
Figure 1-9 Advanced OAM&P



Remote provisioning

The SMA2 supports automatic download of line card parameters for switched services. This feature eliminates the need for operating company personnel to travel to the remote site to change line cards or option settings. Refer to the following diagram for an example of downloaded services.

Figure 1-10 Remote provisioning



Integrated line testing

The SMA2 works with an S/DMS AccessNode equipped with an integrated remote test unit (IRTU). This function supports a complete integrated line test application.

Integrated ISDN

The TR-303 improves ISDN capabilities beyond the ISDN capabilities of TR-008. A description of these improvements follows.

The TR-303 4 to 1 time division multiplex (TDM) basic rate interface (BRI) configuration supports the following:

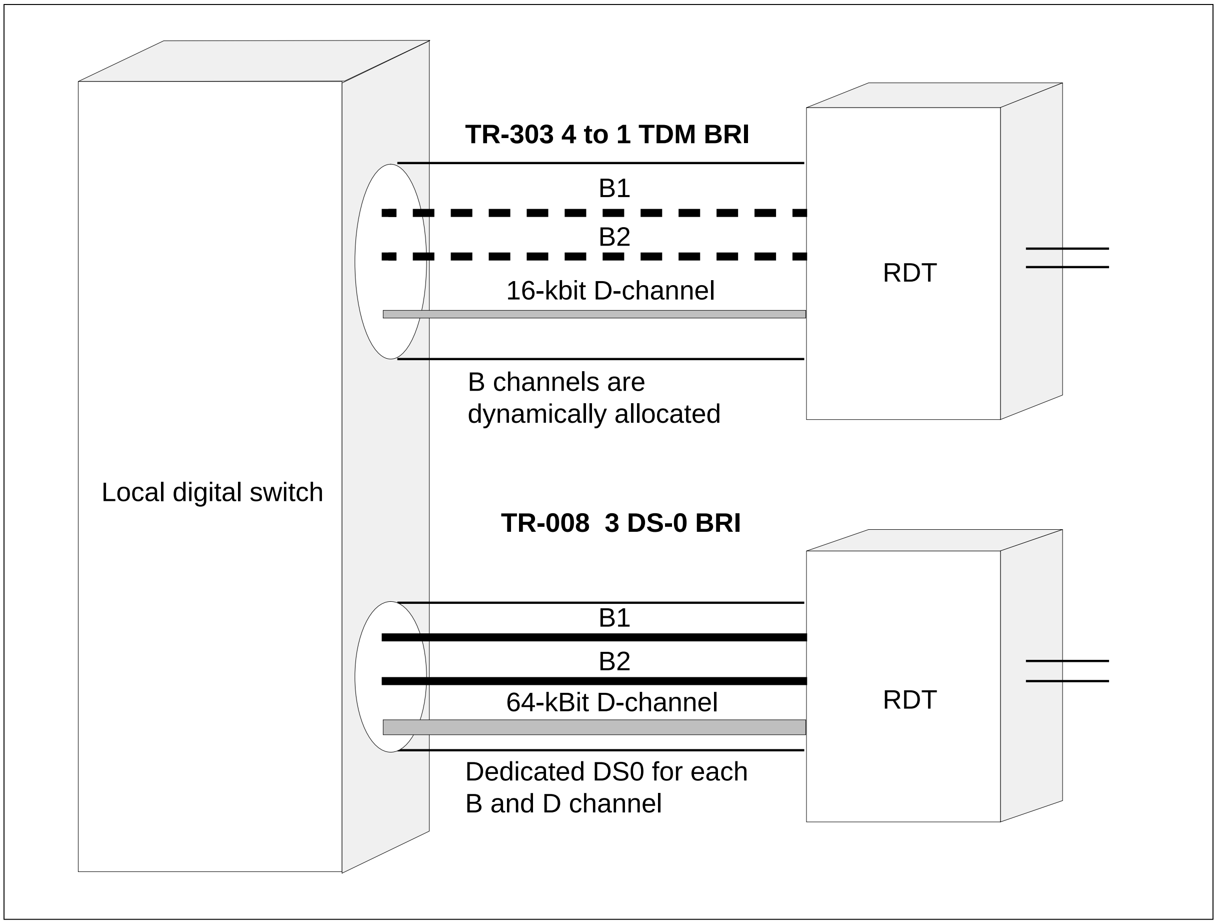
- four D-channels for each digital signal 0 (DS0), which is one channel of a DS-1, which consists of 24 channels
- dynamic allocation of B-channels
- the RDT channel cost is one DS0 for each four ISDN lines
- performance monitoring
- ISDN loopbacks

The TR-008 3 to 1 DS0 BRI configuration requires the following:

- a dedicated DS0 for each D-channel
- a dedicated DS0 for each B-channel
- three DS0 channels in for each RDT ISDN line

The configuration does not support performance monitoring or ISDN loopbacks.

Figure 1-11 Integrated ISDN



2 SMA2 hardware

Introduction

This section describes the hardware components of the Expanded Subscriber Carrier Module-100 Access (ESMA). The ESMA also has the name SMA2.

Note: References to remote digital terminal (RDT) in this section apply to multi-vendor interface (MVI) access remotes and S/DMS AccessNode remotes. These remotes also have the name remote fiber terminal (RFT). Where specific references to a remote access vehicle are required, the name S/DMS AccessNode or RFT refers to the next generation digital loop carriers (NGDLC) of Nortel Networks, the S/DMS AccessNode.

The SMA2 consists of the following hardware components:

- multi-vendor interface (MVI) equipment cabinet (CMVI - cabinetized MVI frame) or standard DMS SuperNode seven-foot frame (MVIE - multi-vendor interface equipment or MVDD - multi-vendor double density)
- two-unit common peripheral module (CPM) main shelf
- extension half-shelf (CMVI and MVIE)
- blank filler shelf (CMVI and MVIE)
- circuit cards
- modular supervisory panel (MSP)
- cooling unit

The following sections describe the physical characteristics and capabilities of each of these components.

MVI equipment cabinet and frame

An MVI cabinet or frame holds the SMA2.

- CMVI — cabinetized MVI (NTMX90BA), with two main shelves and one extension shelf in a C28 Model B cabinet. The cabinetized MVI provides restricted equipment access and electromagnetic interference (EMI) compliancy

- MVIE— MVI equipment frame (NTQX90AA), with two main shelves and one extension shelf in a standard DMS-100 7 ft frame
- MVDD— multi vendor double density frame (NTQX90BA) with four NTMX9050 shelves initially equiped with two CPM modules but capable of up to four CPM modules on demand. Due to the lack of an extension shelf Nortel Networks does not recommend the MVDD frame for customers interested in ISDN BRI support. The MVDD is optimized for applications that concentrate at the RDT.

The cabinet or frame consists of:

- two NTMX9050 SMA2 shelves (CMVI and MVIE)
- four NTMX9050 SMA2 shelves in a MVDD
- one NTMX9051 extension shelf (CMVI or MVIE)
- one NTRX40AA MSP
- one NTRX91AA cooling unit (CU)
- one blank filler shelf (CMVI and MVIE)

Each SMA2 module supports a maximum of:

- 28 DS-1 ports for one remote digital terminal (RDT)
- 48 DS-1 links for each SMA2

Each cabinet or frame contains two SMA2 modules in a CMVI and MVIE or up to four SMA2 modules in a MVDD. These modules support a maximum of 96 peripheral side (P-side) DS-1 links. Each SMA2 module in a CMVI or MVIE contains one CPM shelf and one-half of one extension shelf. The SMA2 modules are numbered consecutively and start in the lower shelf of the first frame.

The following table compares configuration options between the CMVI cabinet / MVIE frame and the MVDD frame.

Table 2-1 ESMA frame configuration options (Sheet 1 of 2)

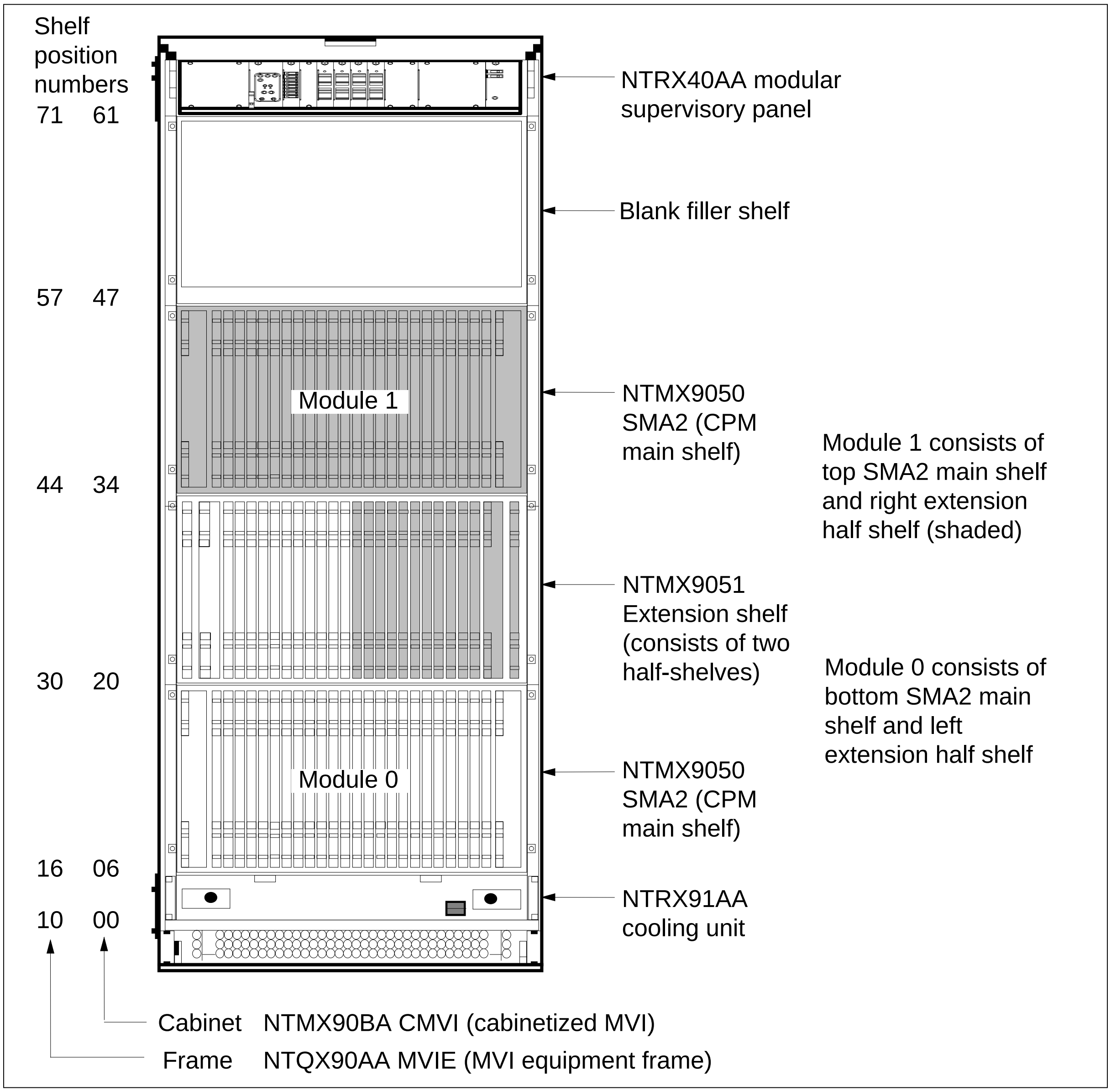
CMVI / MVIE configuration	Double Density configuration
(for use where concentration is required)	**(for use where concentration is not preferred)**
48 DS-1’s per ESMA @ 2.4 to 1 concentration	24 DS-1’s per ESMA @ 1.2 to 1 concentration
48 ICB’s per ESMA	24 ICB’s per ESMA

Table 2-1 ESMA frame configuration options (Sheet 2 of 2)

CMVI / MVIE configuration	Double Density configuration
(for use where concentration is required)	**(for use where concentration is not preferred)**
756 ISDN lines per ESMA	Optimized for Non-ISDN applications
2 ESMA modules per frame	4 ESMA modules per frame
960 C-Side channels/frame (480 per ESMA)	1920 C-Side channels/frame (480 per ESMA)
96 DS-1’s per frame	96 DS-1’s per frame
40 DS-1’s per frame (no concentration)	80 DS-1’s per frame (no concentration)

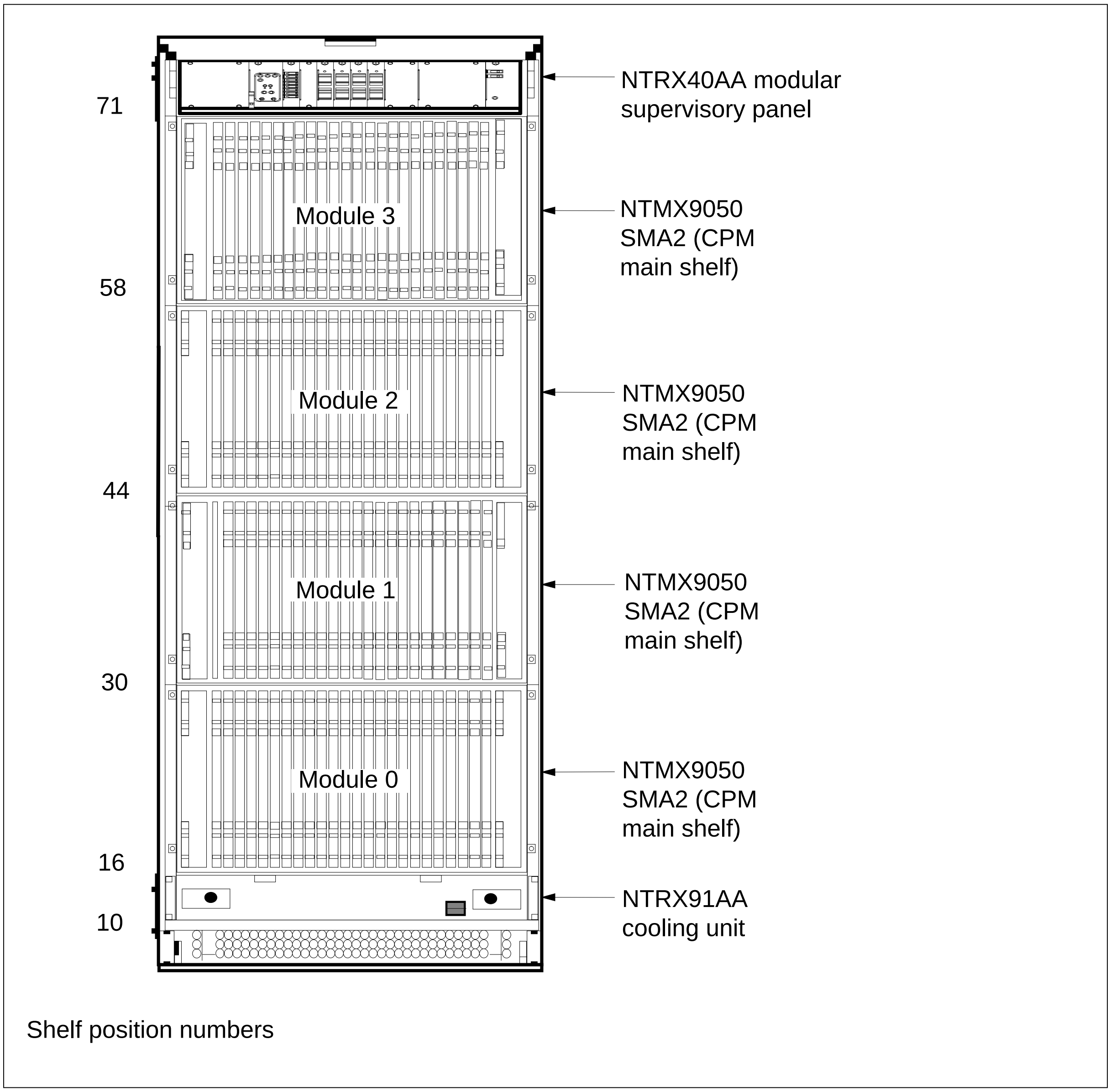
The following figure illustrates the MVI cabinet and frame layout for the CMVI and MVIE configuration.

Figure 2-1 MVI cabinet and frame layout for the CMVI and MVIE (Cabinet is shown. Frame is like cabinet)



The following figure illustrates the MVI frame layout for the MVDD (multi-vendor double density) configuration equiped with four SMA2 modules.

Figure 2-2 Multi-vendor double density MVDD frame



SMA2 main shelf hardware configuration

The SMA2 provides speech and control interfaces between the DMS SuperNode network and the lines assigned to an RDT. The SMA2 contains the equipment required for call processing functions associated with the RDT. At the DMS SuperNode host office, each SMA2 exists in a dual-unit main shelf configuration. This arrangement allows the control complex in each unit to control all call processing in the SMA2. One unit is active and provides the needed processing and control functions. The inactive unit is in a hot-standby mode. This unit can take over call processing if a fault occurs on the active unit.

Circuit cards

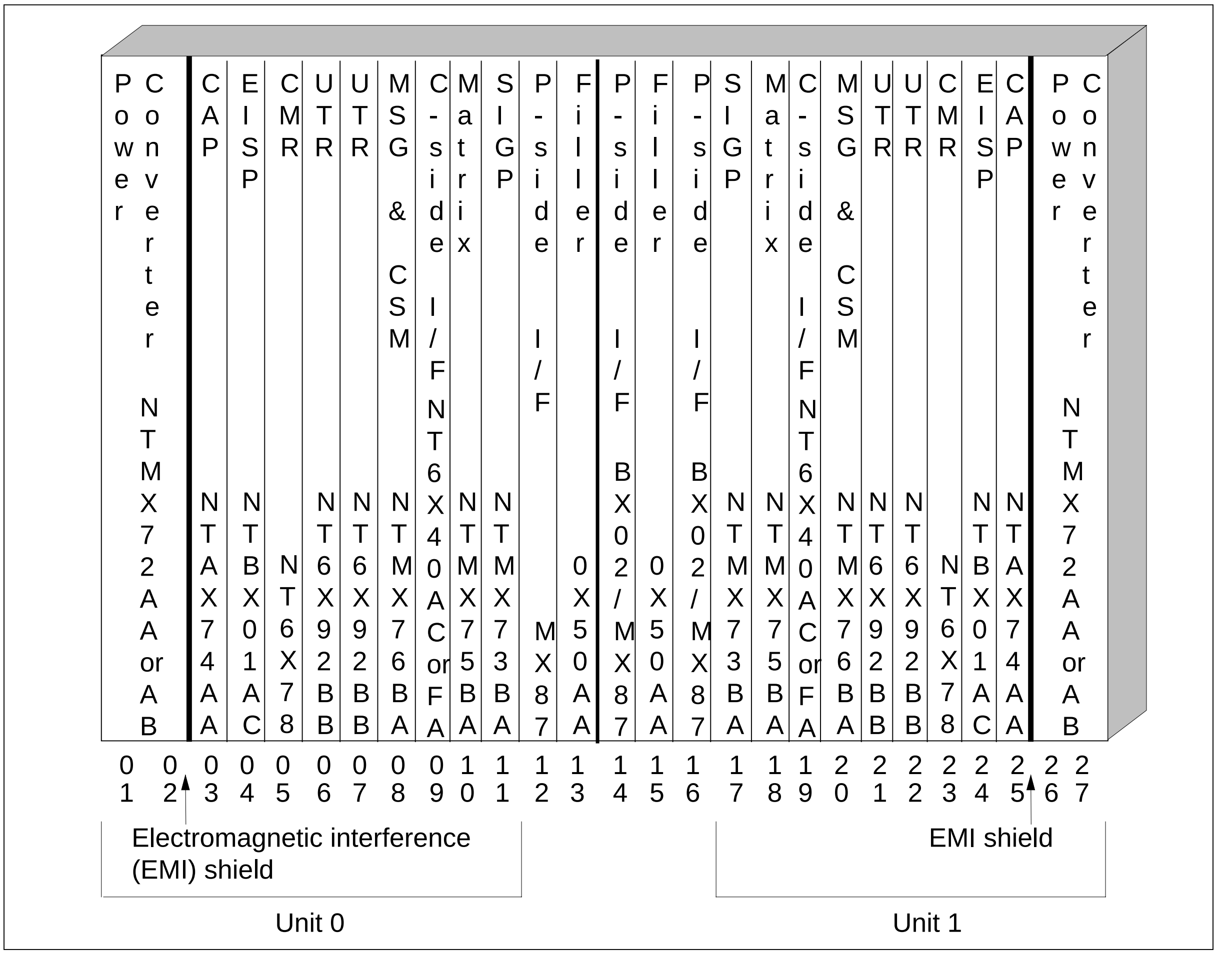
The following table lists the names and abbreviations, if applicable, of all the circuit cards in an SMA2 main shelf.

Table 2-2 SMA2 main shelf cards

Category	PEC	Name	Location
C-side communication	NT6X40AC or AD	DS30 network interface	Slots 09 and 19
	NT6X40FA or FB	DS512 network interface	Slots 09 and 19
	NT6X40GA	DS512 network interface paddle board	Slots 09 and 19 of backplane
Processor	NTAX74AA	Cellular access processor (CAP) with 16Mbyte memory	Slots 03 and 25
	NTMX73BA	Signaling processor (SIGP)	Slots 11 and 17
Speech bus	NT6X78AB	CLASS modem resource (CMR)	Slots 05 and 23
	NT6X92BB or NT6X92EA	Universal tone receiver (UTR) Global tone receiver (GTR)	Slots 06 and 22, required; slots 07 and 21, optional
	NTBX01AC	Enhanced ISDN signaling preprocessor (EISP)	Slots 04 and 24
	NTMX75BA	Enhanced matrix	Slots 10 and 18
	NTMX76BA or CA	Message (MSG) and channel supervision messaging (CSM) (CA version required to support ADSI and SCWID/DSCWID)	Slots 08 and 20
Peripheral communication	NTMX87AA	Quad frame carrier DS-1 interface (DS-1) and NTMX81AA-dual DS-1 packlets	Slots 12, 14, and 16
	NTBX02BA	Enhanced D-channel handler (EDCH)	Slots 14 and 16
Power	NTMX72AA or AB	Power converter	Slots 01 and 26

The following figure illustrates the SMA2 shelf configuration.

Figure 2-3 SMA2 shelf configuration



C-side communication cards

These cards communicate between the duplicated 16 C-side DS30 links or the duplicated DS512 link and the parallel speech bus.

NT6X40 (DS30 or DS512 interface) The NT6X40 cards are in slots 9 and 19 of the SMA2 shelf. The SMA2 uses one of the following central side (C-side) interface card configurations:

- the NT6X40AC or AD DS30 interface to a JNET (junctored network)
- the NT6X40FA or FB DS512 interface to an ENET (enhanced network)—The SMA2 uses this card with a NT6X40GA paddle board fiber interface card.

Plane 0 of the network connects to unit 0 of the SMA2 and plane 1 connects to unit 1. Each network plane uses a maximum of 16 DS30 links or one DS512 to connect to an SMA2 unit. These links connect to DS30 interface cards

(NT6X40AC) or to DS512 interface cards (NT6X40FA). One of these cards is in unit 0 and one is in unit 1.

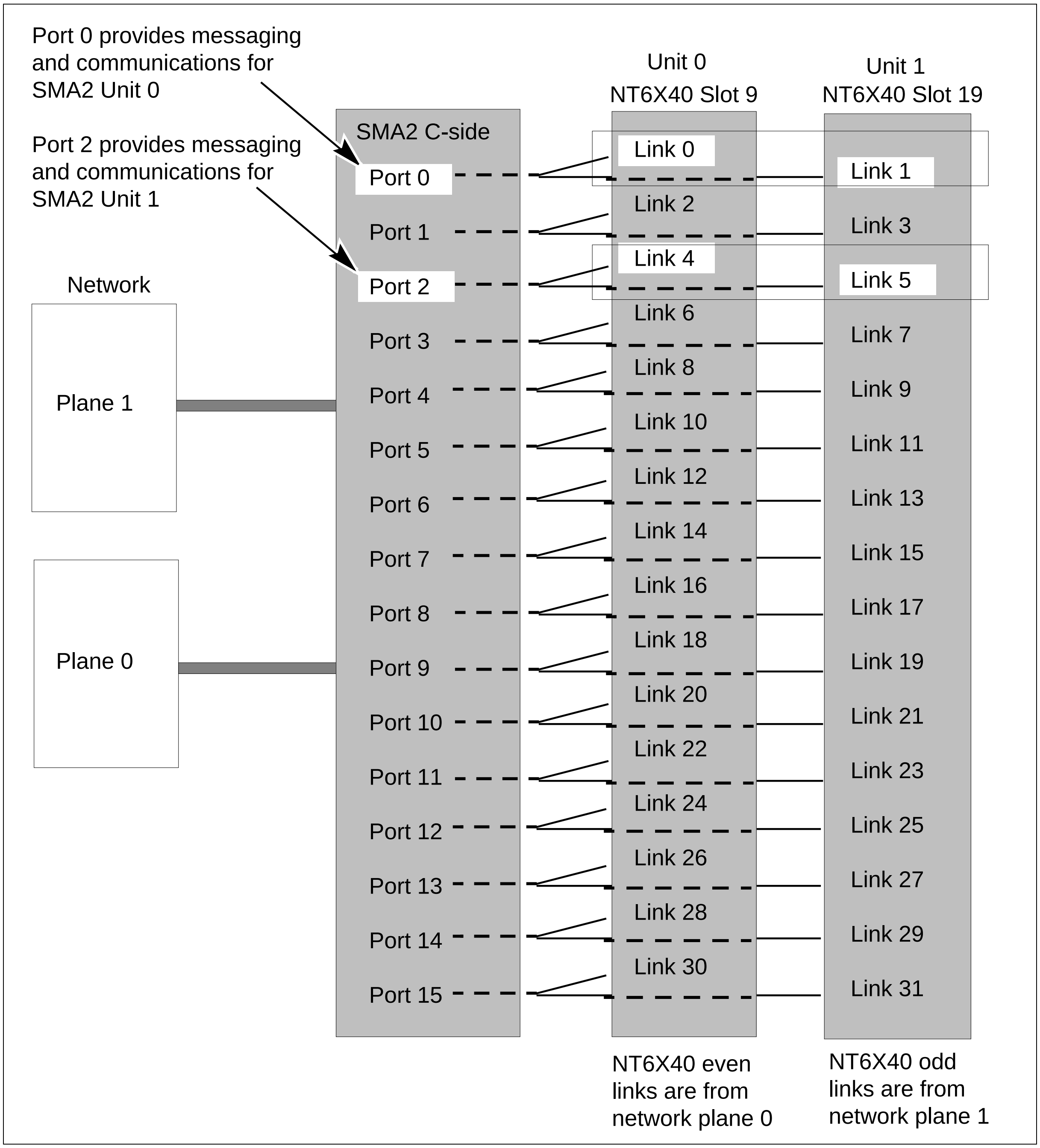
Physically, a maximum of 16 DS30 links from a network plane can connect to 16 ports in a NT6X40 card in one unit. Two NT6X40 cards, one in each unit, provide a maximum of 32 (0 through 31) ports on a fully equipped SMA2. Sixteen ports are dedicated to network plane 0 and 16 ports are dedicated to plane 1. The even-numbered links connect unit 0 to plane 0. The odd-numbered links connect unit 1 to plane 1.

Logically, the SMA2 shelf has 16 C-side ports. Functionally, two links from an NT6X40 in unit 0 and unit 1 constitute one logical C-side port. The logical C-side port appears in the diagram that follows. For example, physical C-side link number 8 on the NT6X40 in unit 0 and physical C-side link 9 on the NT6X40 in unit 1 compose logical C-side port number 4. Interface with the network module requires at least three ports for each SMA2 (three pairs of duplicated links).

Feature AN1121 allows loop around diagnostics for SMA2s with NT6X40 cards of version AD or FB. The enhanced diagnostic checks for missing or failed 6X40AD or FB cards. This diagnostic also improves testing of the interface section on the NTMX75BA matrix card. Failure of one NT6X40 card does not cause loss of service. Links that connect the NT6X40 cards to the matrix cards are fully redundant through the active unit. Loss of service does not occur.

The enhanced diagnostics of the NT6X40AD and FB cards are enabled when field PEC6X40 in table LTCINV is entered NT6X40AD or FB. A PM777 log that contains a card list indicates faults.

Figure 2-4 SMA2 C-side interface to the network



Each DS30 or DS512 card synchronizes the incoming signal with the SMA2. Each of these cards provides 512 channels for each plane to the formatter cards in units 0 and 1. This condition provides a duplicated path through the active control complex.

To determine the maximum distance between the ESMA and the RDT, take the following into consideration: transmission delay, media limitations, and echo management techniques. Maintain the round trip signaling delay at or below 5 milliseconds. If conditions are ideal, it is possible to reach distances of 500 miles or more.

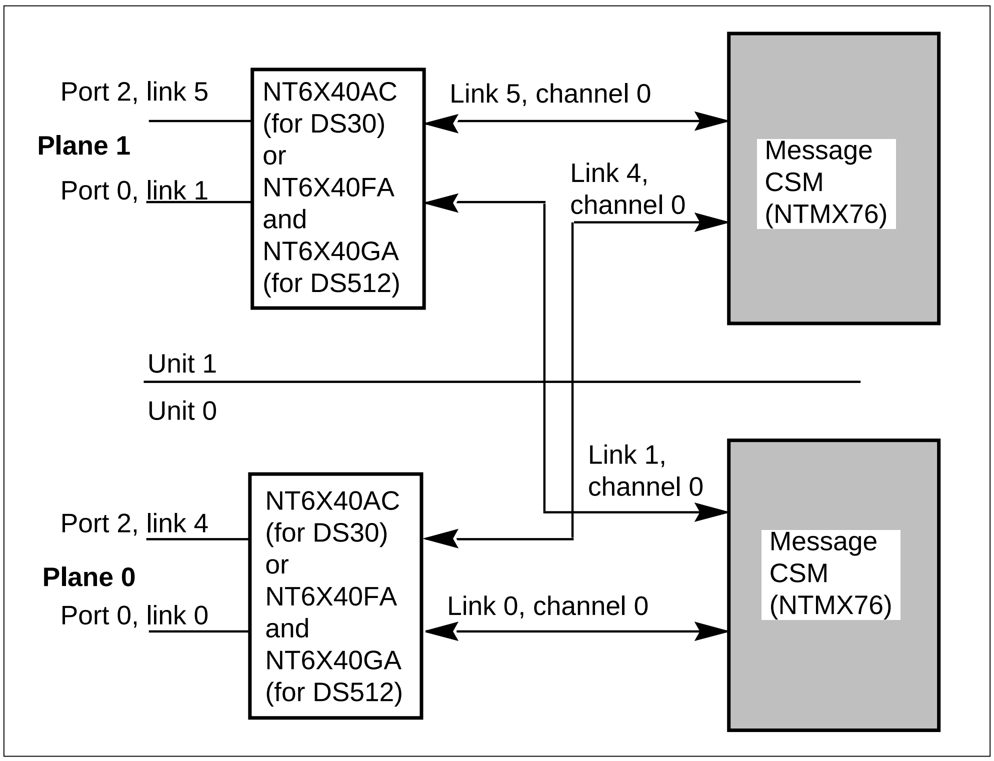
C-side messaging

Messaging between the network and the SMA2 uses logical ports 0 and 2 of the SMA2. The following configurations maintain message reliability:

- two ports are for messaging
  - — communication with SMA2 unit 0 uses logical port 0
  - — communication with SMA2 unit 1 uses logical port 2
- an even link (link 0) from plane 0, and an odd link (link 1) from plane 1 compose logical port 0
- an even link (link 4) from network plane 0, and odd link (link 5) from plane 1 compose logical port 2

The C-side message links appear in the following figure.

Figure 2-5 SMA2 C-side message links



Processor cards

These cards control the SMA2.

NTAX74AA (cellular access processor card) The cellular access processor (CAP) card, also known as the 16 Mbyte processor card, is in slots 3 and 25 of the SMA2 shelf. The CAP consists of the NTAX74 motherboard and an NTNX4814 microcontroller subsystem (MCS) daughterboard. The MCS daughterboard has a 68040 processor and 16 Mbytes of memory to support downloadable firmware capability. The CAP has direct read/write access to the matrix card, SIGP, EISP, CMR, UTR, and MSG and CSM card. The NTAX74 provides call processing functions, like:

- digit collection (pulse)
- channel assignment
- message processing

Real-time call processing functions:

- send and receive messages
- control the enhanced time switch
- supervise channels
- perform switch activity and reset control

The CAP provides dynamic random access memory (DRAM) and a direct memory access (DMA) from the EISP card.

NTMX73BA (signaling processor card) The signaling processor (SIGP) card is in slots 11 and 17 of the SMA2 main shelf. The signaling processor uses a 68360 microprocessor with 1 Mbyte of dynamic RAM. The signaling processor supports all low-level signaling tasks and provides the system clock for the SMA2.

The NTMX73BA communicates with the NTAX74AA through shared RAM that resides on the pack. The NTMX73BA communicates with NTMX75 through internal DS60 service links. A software controlled phase locked loop (PLL) implements synchronization with the external reference source. The PLL compares the internal frame pulse with the external reference source. The PLL aligns the internal frame pulse with the external frame pulse.

The NTMX73BA card has one phase comparator that receives frame pulses from one of eight mux-selected external sources. The phase comparator is a hardware-driven component. The comparator counts the time difference between the arrival of an internal frame pulse and an external frame pulse.

The NTMX73BA supports:

- synchronization of the local shelf clock to an external clock
- handling cyclic redundancy check (CRC) bytes the NTMX75 matrix circuit card extracts from DS-1 links
- removal of ABCD signaling bits from and insertion of ABCD bits to DS-1 links
- removal of derived data link (DDL) bits and facility data link (FDL) bits from and inserting DDL and FDL bits to DS-1 links. The use of DDL and FDL bit-oriented messaging lays the preparation for future TR-303 functionalities.

Speech bus cards

The speech bus contains these cards. The speech bus consists of two speech buses, one bus each for send and receive.

NT6X78AB (custom local area signaling service modem resource card)
The optional custom local area signaling service (CLASS) modem resource (CMR) card found in slots 5 and 23 supports CLASS features. An example of a CLASS feature is calling number delivery (CND) that delivers:

- directory number of the calling party
- date and time of the call to the customer premises equipment of the called party.

For more information on CLASS and the CMR card, see the *Translations Reference Manual*.

NT6X92BB (universal tone receiver card) or NT6X92EA (global tone receiver) The NT6X92BB card is the universal tone receiver (UTR) card. Each SMA2 requires two UTRs. One UTR is in slot 6 and one UTR is in slot 22. The UTR card receives and explains multi-frequency (MF) and dual-tone multi-frequency (DTMF) signals. This card also identifies and processes pulse code modulation (PCM) tones for the 30 channels on the parallel speech bus.

Each UTR has 32 channels numbered 0 to 31. Channels 0 and 16 are for messaging. Channels 1 to 15 and 17 to 31 are used to identify and process PCM tones.

The UTR card allows the SMA2 to perform all digit collection functions at the location of the originating terminal. These functions include the following:

- allocation of a free receiver
- establishment of a path to the receiver

- collection and processing of digits
- deallocation of the receiver

The NTAX74 processor controls the UTR. The allocation or deallocation tasks for receivers resides in the SMA2 and not in the computing module (CM). These receivers make and free connections.

> ***Note 1:*** The UTR is a critical card. A failure of the UTR causes the unit where the UTR resides to go system busy (SysB).
>
> ***Note 2:*** Two additional UTR cards can be provisioned for each SMA2 shelf based on standard methods that calculate traffic requirements. The two additional UTRs are in slots 7 and 21.

ATTENTION

To maintain peak performance, do not install the UTR and GTR on the same SMA. There is no method that indicates the receiver that decodes tones. Some call processing tones can be degraded if designed for use with a GTR.

The NT6X92EA global tone receiver (GTR) identifies and processes the following tones:

- dual-tone multifrequency (DTMF)
- MF
- MF-socotel
- CMF-forward and backward tones

This GTR identifies and processes the tones in 64 channels on the parallel speech bus. These 64 channels consist of 32 channels on the P-side and 32 channels on the C-side.

The GTR is LSSGR (LATA switching systems general requirements) and CCITT (International Telegraph and Telephone Consultative Committee) flexible. The GTR is available as a replacement for all national and international versions of the UTR.

NTBX01AC (enhanced ISDN signaling preprocessor card) The enhanced ISDN signaling preprocessor (EISP) card is in slots 04 and 24 of the SMA2 shelf. The EISP uses the DMA to communicate with the CAP card. This arrangement allows the EISP access to the memory on the CAP card. The EISP:

- converts the Q.931 message (time-slot management channel [TMC] or common signaling channel [CSC]) for circuit switched voice/data calls.

This condition allows the CAP to communicate with the RDT or S/DMS AccessNode

- communicates between the EDCH and the CAP
- contains 4 Mbytes of on-board memory

NTMX76BA or CA (message and CSM card) The message and CSM card processes signaling and control messages between the SMA2 and the CM. Slots 8 and 20 of the SMA2 contain the NTMX76BA/CA circuit card. The NTMX76 card performs:

- channel supervision messaging (CSM) for call processing and diagnostics. The system conveys CSM messages between two peripherals together with the pulse code modulation (PCM). The system uses these messages to setup, maintain, and terminate calls and to check the parity and PCM path accuracy.
- generation of ROM and RAM tones
- receives and sends DS30 control messages to the CM

The NTMX76CA version of the message and CSM card contains upgraded firmware required to support Analog Display Services Interface (ADSI) and spontaneous call-waiting identification (SCWID) or deluxe SCWID (DSCWID). The following describes ADSI and SCWID/DSCWID:

- ADSI permits application software to download softkey information to customer premise equipment (CPE)
- SCWID is a CLASS feature. This feature allows a subscriber to receive caller identification (CID) information. The subscriber receives this information from a call that waits for connection when the subscriber is off-hook. The DSCWID allows the subscriber to control the disposition of incoming calls when an off-hook stable call exists.

NTMX75BA (matrix card) The matrix card in slots 10 and 18 is a duplicated expanded time switch and a high-capacity switch matrix. The matrix circuit card is:

- non-blocking
- a single state time switch with 2528 channels
  - — 640 C-side channels consist of 128 service channels and 512 channels speech and message channels
  - — 1888 P-side channels
- permits selection of C-side network planes
- chooses digital pads for every channel

The matrix card supports the following connections:

- P-side to C-side
- P-side to P-side
- C-side to P-side
- C-side to C-side

The system strips off the ABCD bits at the input stage of the matrix card. The system routes these bits to the signal processor (NTMX73) for processing. The system inserts the ABCD bits from the signal processor at the matrix card output stage.

The matrix card allows flexible configuration of DS-1s and EDCHs. This configuration includes a maximum of 40 DS-1s and a maximum of 8 EDCHs. The matrix card permits a special first configuration of 48 DS-1s and four EDCHs in fixed positions. This configuration is not available through upgrades because modification affects service.

Peripheral communication cards

Peripheral communication cards translate between the P-side ports and the parallel speech bus. The SMA2 peripheral communication cards include the NTBX01 and NTMX87. The NTMX87 houses the NTMX81 dual DS-1 interface packlets.

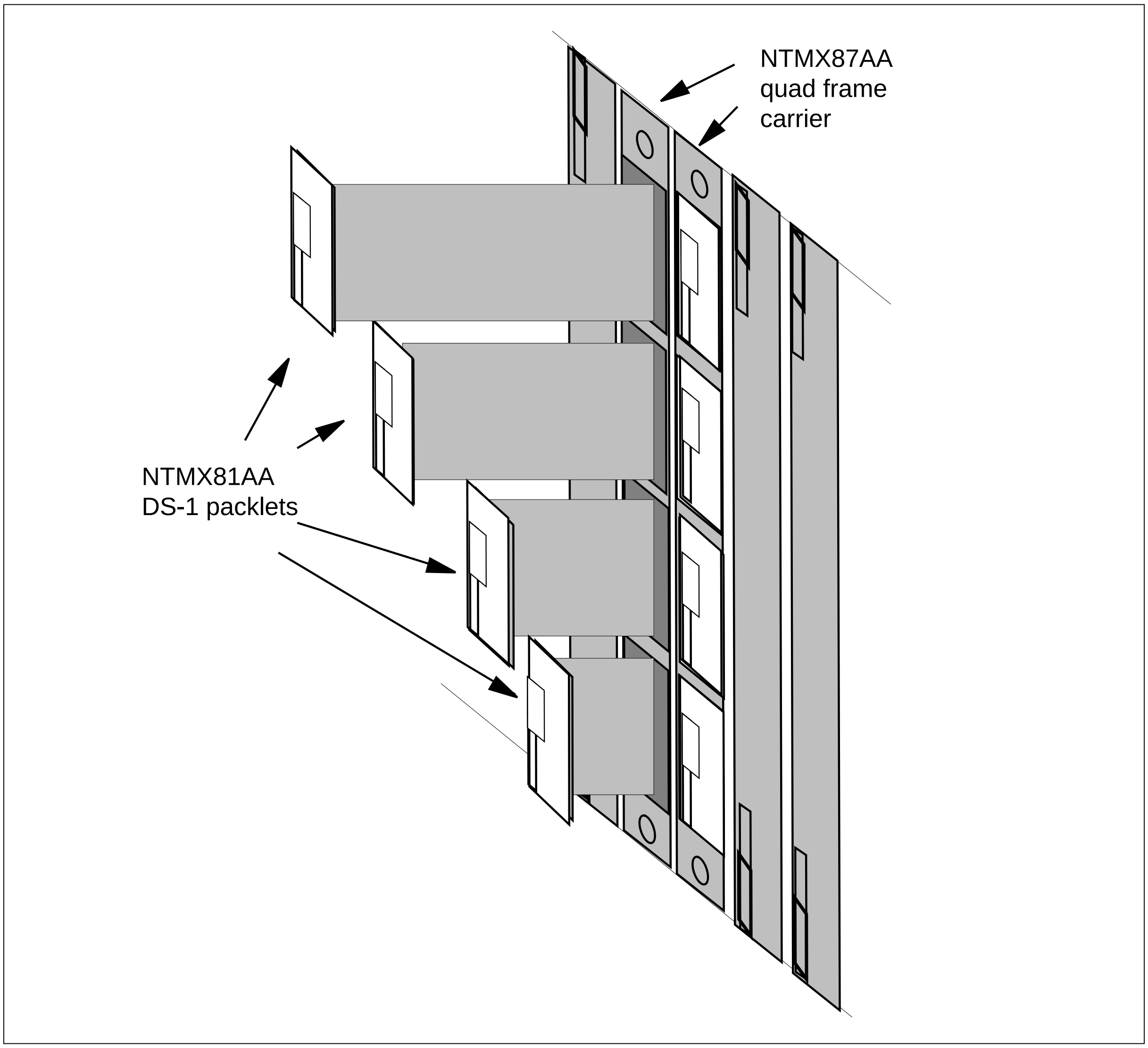
NTMX87AA (quad frame carrier card) The NTMX87 card is a quad frame carrier. The NTMX87 provides a DS-1 interface between the SMA2 and the RDT. The NTMX87AA is a normal sized circuit card that contains four slots in the faceplate of this NTMX87AA. Smaller-sized circuit cards known as dual DS-1 packlets (NTMX81AA) are inserted in these slots. The circuit cards supply the NTMX87AA with working identity. Every NTMX87 holds a maximum of four dual DS-1 (NTMX81AA) packlets. Each packlet has two ports for a total of eight ports per card. The packlets the NTMX87AA uses include the following:

- the NTMX81AA dual DS-1 packlet to interface two DS-1 links
- the NTMX83AA filler packlet blank filler for slots that are not used

The quad frame carrier card is in slots 12, 14 and 16 on the SMA2 shelf. This carrier card provides a maximum of 24 DS-1 P-side ports.

The NTMX87 quad frame carrier with NTMX81AA packlets appears in the following figure.

Figure 2-6 NTMX87AA quad frame carrier card with NTMX81AA packlets



NTBX02BA (EDCH card) The EDCH card handles the D-channel information sent from the RDT. The EDCH card:

- examines ISDN D-channel control messages for circuit switched voice and data calls that connect to the RDT
- sends messages to the EISP for circuit switched voice or data calls to transfer signaling and maintenance data
- passes packet data to and from the packet handler through Bd channel links
- supports a maximum of 108 ISDN D-channel lines
- performs 4 to 1 D-channel multiplexing

- performs terminal endpoint identification (TEI) management
- performs operational measurements (OM) collections

The SMA2 main shelf supports a maximum of two EDCHs. The EDCH cards are provisioned in slots 14 and 16 in the main SMA2 shelf. An EDCH card replaces one NTMX87 card in the SMA2 shelf and reduces the number of ports by eight.

NTMX72AA or AB (power converter)

The NTMX72AA or AB power converters, receive -48 V from office battery and have output voltages of +5 V, +12 V and -12 V. These power converters are found in slots 1 and 2 (unit 0) and 26 and 27 (unit 1) of the SMA2 shelf,

The NTMX72AA provides:

- test jacks to check output voltages
- protection against overvoltage, undervoltage, overcurrent, and over temperature
- detection of the condition of the D-channel handler power fuse
- a +5 V monitoring circuit that checks that the mate converter is in operation

The NTMX72AB provides

- active and fail indicators
- automatic recovery from low battery (ARLB) circuit. This circuit detects the input voltage and signals the auxiliary power supply to shut down the converter. This action occurs when the input voltage falls below the minimum specified operating level. When the input voltage rises above the minimum start level, the ARLB circuit enables the auxiliary supply.
- protection against overvoltage, undervoltage, and overcurrent
- detection of the condition of the D-channel handler power fuse
- a +5 V monitoring circuit to check that the mate converter is in operation
- support for -48 V and -60 V input voltages

SMA2 extension shelf

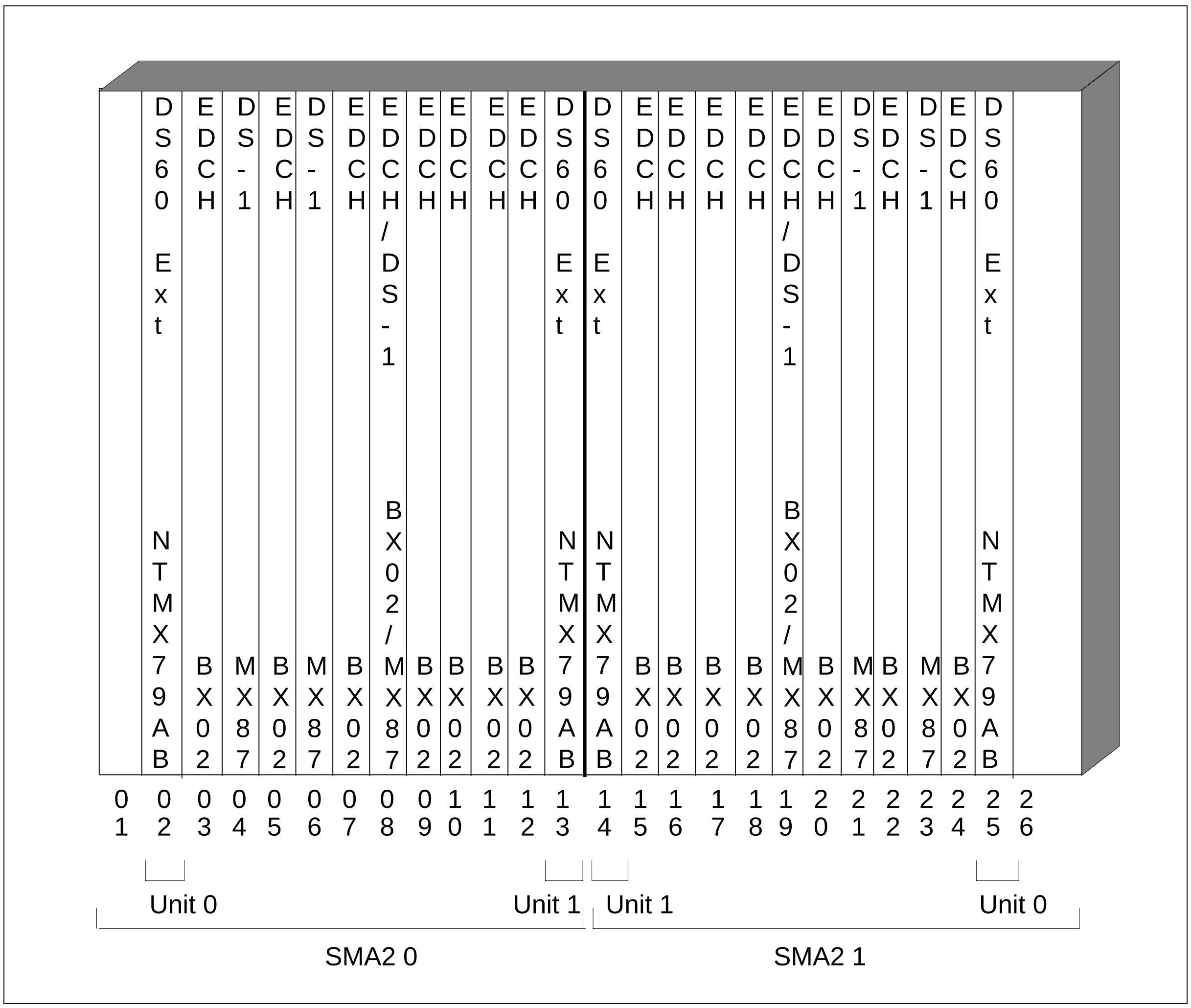
The extension shelf is available in a CMVI and MVIE configuration only. The extension shelf provides room for additional DS-1 interface cards and EDCH cards. Each side of the extension half-shelf (unit 0 and unit 1) requires two NTMX79AB cards.

Circuit cards

The names and abbreviations of the circuit cards in an SMA2 extension shelf are as follows:

- NTMX87AA quad frame carrier DS-1 interface (DS-1) and NTMX81AA-dual DS-1 Packlets
- NTBX02AB enhanced D-channel handler (EDCH)
- NTMX79AB-DS60 extender and power converter

Figure 2-7 SMA2 extension shelf configuration



NTMX87AA (quad frame carrier card)

The quad frame carrier card is in slots 4, 6, and 8 of the left half of the SMA2 extension shelf. The NTMX87AA is also in slots 19, 21, and 23 of the right half of the SMA2 extension shelf. Each extension half shelf provides the SMA2 with a maximum of 24 additional DS-1 P-side ports.

NTBX02BA (EDCH card)

The EDCH card is in slots 3, 5, 7, 8, 9, 10, 11, and 12, of the left half of the SMA2 extension shelf. The NTBX02BA is also in slots 15, 16, 17, 18, 19, 20, 22, and 24 of the right half of the SMA2 extension shelf.

NTMX79AB (DS60 extension and power converter card)

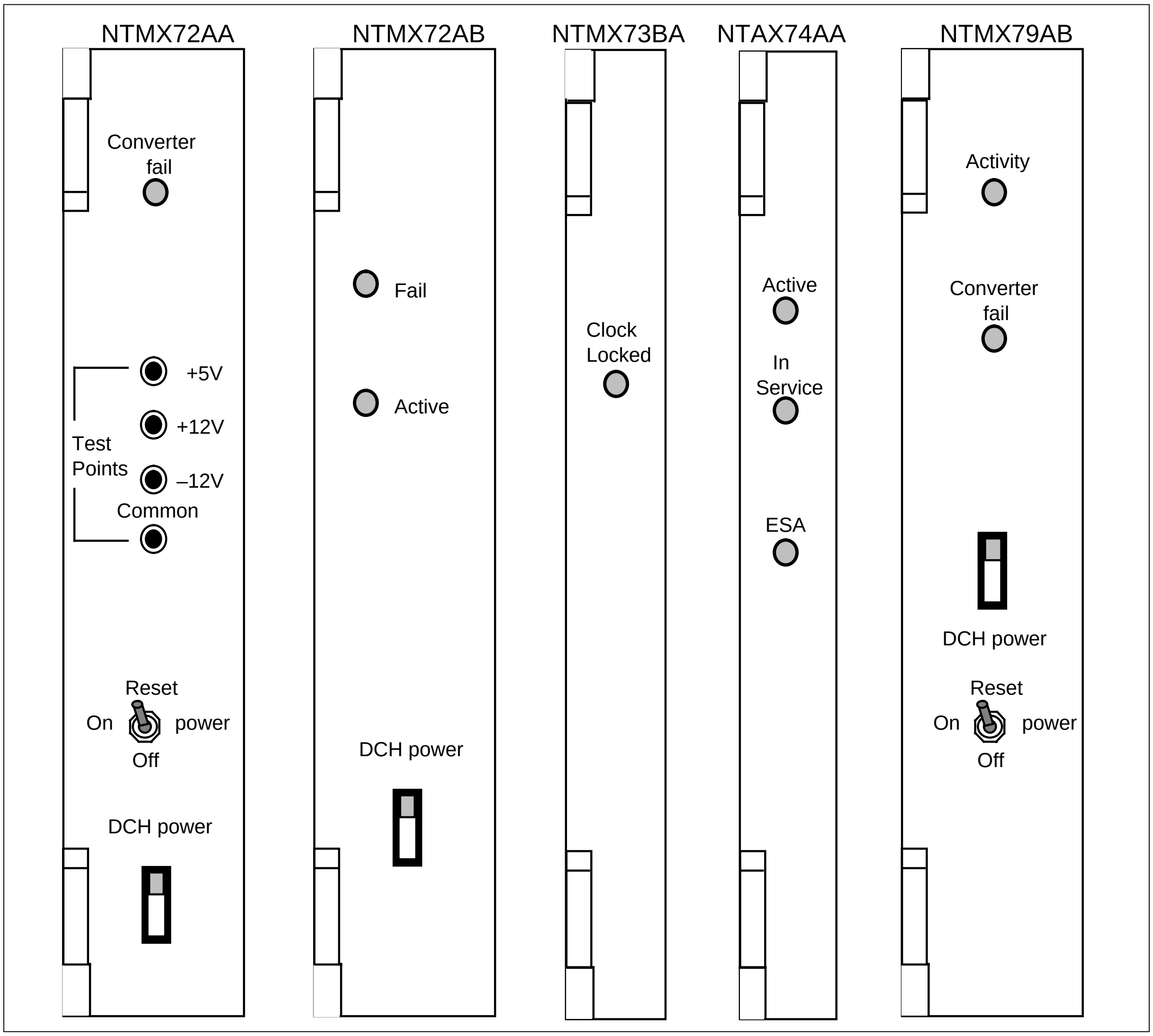
The NTMX79AB DS60 extension and power converter card is in slots 2, 13, 14, and 25 of the extension shelf. The NTMX79AB

- connects 14 DS60 links through backplane cabling from the SMA2 shelf to transfer data between the main shelf and the extension shelf
- supplies +5 V, +12 V and -12 V to EDCHs (BX02BA) and DS-1 packlets (NTMX81AA) for one unit of a half-shelf

Circuit card status indicators

The status indicators for the NTAX74AA, NTMX72AA, NTMX72AB, and NTMX73BA, appear in the following figure. Each indicator is in the SMA2 main shelf, and the NTMX79AB is in the extension shelf.

Figure 2-8 Circuit cards with status indicators



The following table lists the indicators on the circuit cards that appear in the previous figure and identifies the functions.

Table 2-3 System status indicators

Indicator name	Circuit card	LED color	Function
Active	NTAX74AA	Green	Indicates this unit is active
	NTMX72AB	Green	Indicates this converter is operational
	NTMX79AA	Green	Indicates this extension half shelf unit is active

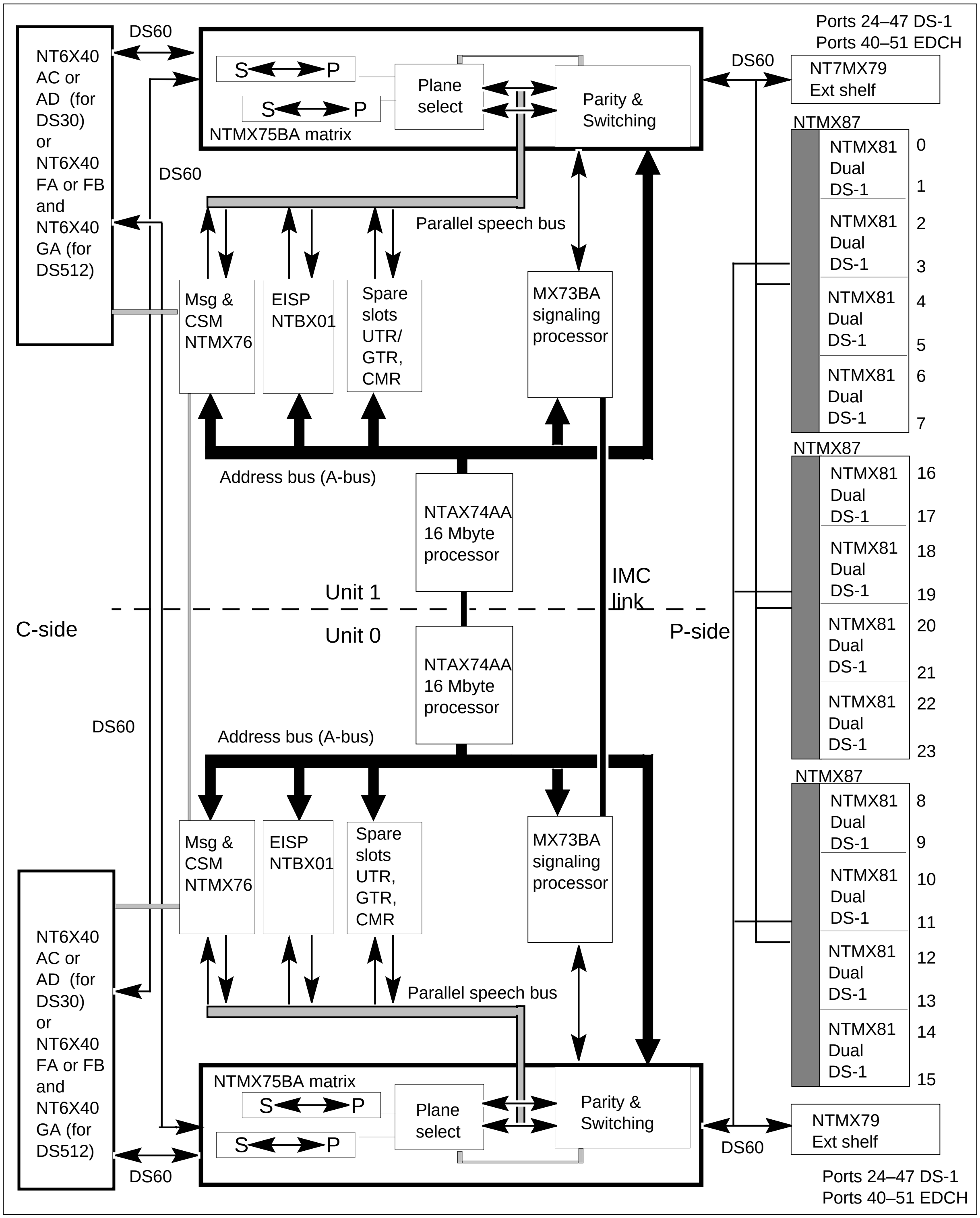
Table 2-3 System status indicators

Indicator name	Circuit card	LED color	Function
Clock-locked	NTMX73BA	Green	Indicates clock source is locked to the C-side
		Flashing green	Indicates the NTMX73BA is out-of-sync with the C-side clock source
Converter fail	NTMX72AA	Red	The converter failed (+5 V, +12 V or -12 V)
	NTMX79AA	Red	The converter failed (+5 V, +12 V or -12 V)
Fail	NTMX72AB	Red	The converter failed (+5 V, +12 V or -12 V)
ESA	NTAX74AA	Red	Does not apply to the SMA2
In-service	NTAX74AA	Green	Indicates this unit is in service

SMA2 circuit card interconnections

The following figure shows how the circuit cards functionally interconnect for the SMA2, based on CPM architecture.

Figure 2-9 Functional block diagram of the SMA2



P-side provisioning

This section provides provisioning information required to provide the functionality of the SMA2 based on capacities desired for the SMA2. This section provides information on what circuit cards are provisioned. This section describes the provisioning of DS-1 and EDCH cards. This section also describes in what configuration these cards are provisioned.

P-side capacities

The line trunk controller P-side link inventory (LTCPSINV) table lists the PM type and number for each SMA2. This link inventory also lists the port identification of the P-side links for each SMA2. The following capacities apply to the datafill of SMA2 P-side ports in table LTCPSINV. The extension shelf is available only in the CMVI and MVIE configurations. The MVDD uses all four shelves to support four SMA2 units.

- The SMA2 provides a maximum of 54 P-side ports where flexible groups of DS-1 and EDCH services can be defined. Datafill must be present for an extension shelf in table LTCINV (CMVI and MVIE only). The condition allows datafill to be possible for DS-1 links in the extension shelf.
- The SMA2 without the extension shelf supports a maximum of:
  - 24 DS-1 links
  - 2 EDCH cards
- The SMA2 with the extension shelf in a CMVI and MVIE supports a maximum of:
  - 48 DS-1 links
  - 6 EDCH cards
- The MVDD with four SMA2 modules supports a maximum of:
  - 96 DS-1 links
  - 8 EDCH cards
- There are ten provisional slots in a CMVI and MVIE with an extension shelf. Two slots are on the SMA2 main shelf and eight slots are on the extension shelf. The EDCH cards can be provisioned on this extension shelf. Of the ten provisionable slots a maximum of eight EDCH cards can be provisioned. Seven slots are active and one slot is spare.

- There are EDCH and DS-1 interface cards that share the same location in the SMA2 module. An EDCH card displaces an NTMX87 quad frame carrier card and 4 DS-1 packlets. The card also reduces the number of DS-1 ports by eight.
- The following table shows the maximum number of EDCH cards and ISDN lines on an SMA2.

Table 2-4 Maximum number of EDCH cards and ISDN lines and DS-1 links on an SMA2

Number of RDTs subtending the SMA2	Maximum number of EDCH cards	Maximum number of provisionable ISDN lines	Maximum number of DS-1 links connected to the SMA2
8	0	0	48
7	4	324 (see note 1)	48 (see note 2)
6	8	756	40
5	10	756	24
4	10	756	24
3	10	756	24
2	10	756	24
1	10	756	24

Note 1: This configuration is subject to limitations imposed by traffic engineering rules.

Note 2: This is a special initial configuration and cannot be obtained through upgrades. Upgrades to this configuration are not supported because they are service affecting.

Note 3: In a MVDD frame, the ISDN requirements for the SMA2 shelf limit the number of DS-1 links to 8. The MVDD can support 24 DS-1 links without ISDN capabilty.

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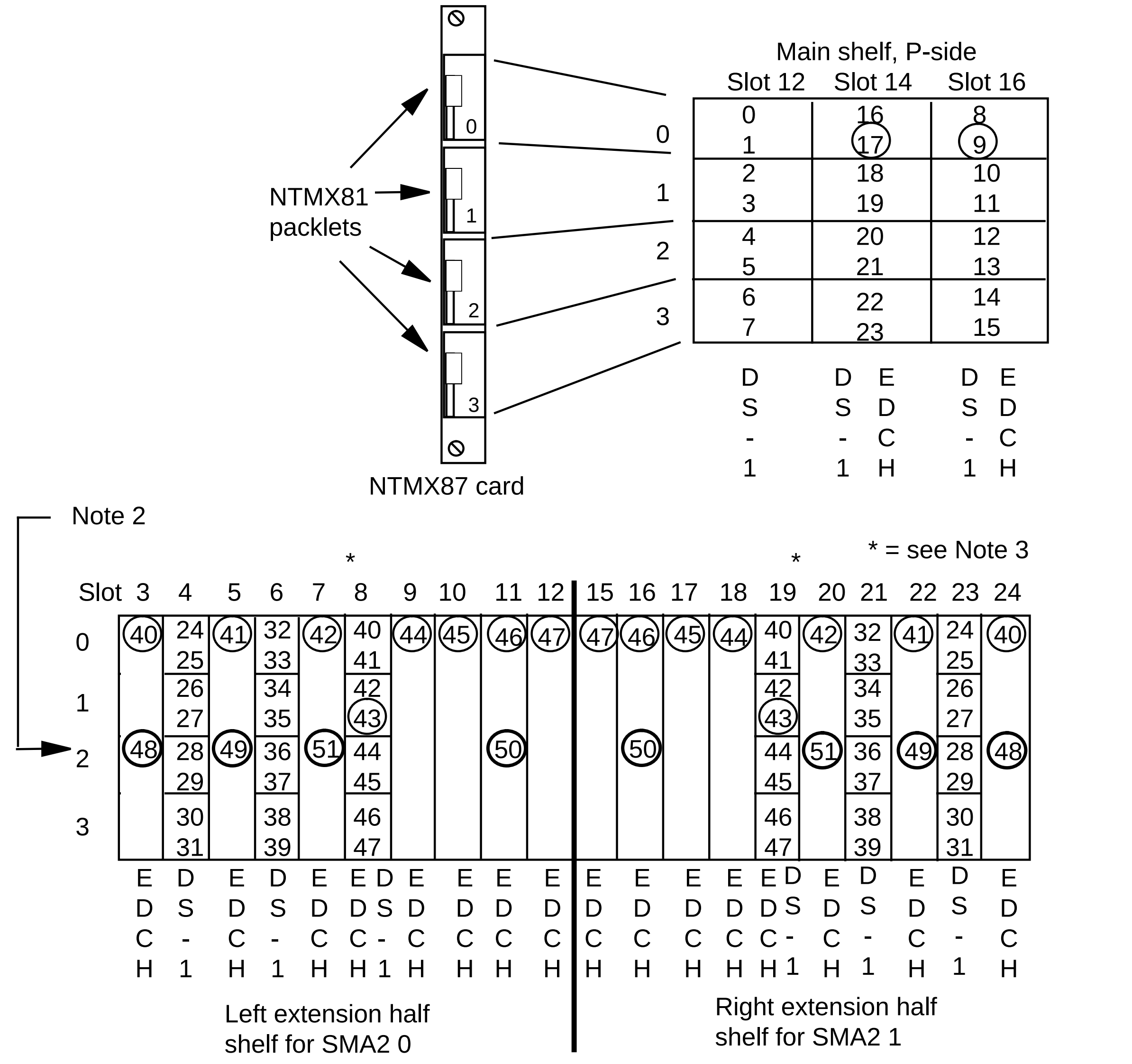
The following figure identifies the location of the EDCH and DS-1 cards in a CMVI and MVIE with an extension shelf. This figure also identifies the P-side port numbers associated with a specified card in a slot. In this figure, the main shelf P-side information is also applicable to the MVDD.

Figure 2-10 P-side port provisioning (in a CMVI and MVIE with an extension shelf)



Note 1: Circled port numbers identify EDCH port numbers.

Note 2: When there is a special initial configuration requirement for 48 DS-1 ports, slot 8 in the left extension shelf and slot 19 in the right extension shelf support DS-1 cards.

Note 3: When there is a special initial configuration requirement for 48 DS-1 ports and four EDCH cards, slots 3, 5, 7, and 11 in the left extension shelf and slots 24, 22, 20, and 16 in the right extension shelf support EDCH cards. The bold circles identify port numbers that support the special initial configuration of 48 DS-1s and four EDCH cards.

P-side rules in provisioning

The following rules and limits apply to DS-1 and EDCH provisioning:

- Declare the ports and slots in a way that does not limit future upgrades and that avoids changes that affect service.
- Provision the slots that support a single card type (DS-1 or EDCH) before you provision the slots that support more than one card type. This action prevents the modification of the SMA2 when upgrades occur.

Rules in provisioning for DS-1 cards

Main shelf provisioning: The following rules apply to provisioning DS-1 cards for the SMA2 main shelf:

- The three SMA2 main shelf P-side slots (12, 14, and 16) can be provisioned with NTMX87AA cards.
- For the CMVI and MVIE configuration you can require an extension shelf at the initial installation. When this condition occurs, do not use slots 14 and 16 of the main shelf. You can use these slots only when other single purpose slots on the extension shelf are provisioned with DS-1 cards.
- Assign DS-1 ports from 0 to 23 when DS-1s are provisioned on the three slots of the main shelf. In this event, you do not require an extension shelf. Start with slot 12, 16, and 14 in that order.
- Packlets are provisioned that start with the top packlet 0 and work down to packlet 3.

Extension shelf provisioning (CMVI and MVIE only): The following rules apply to provisioning DS-1 cards for the SMA2 extension shelf:

- Provision DS-1 left side extension slots. Start this provision with slot 4 and slot 6. Only use slot 8 if an initial requirement is present for 48 DS-1 ports.
- Provision DS-1 right side extension slots. Start this provision with slot 23 and follow with slot 21. Only use slot 19 if the requirement is first present for 48 DS-1 ports.

Rules in provisioning for EDCH cards

Main shelf provisioning: The following rules apply to provisioning EDCH cards for the SMA2 main shelf:

- You cannot provision an EDCH card in slot 12 of the main shelf. Provision EDCH cards in slots 14 and 16.
- For the CMVI and MVIE configuration you can require an extension shelf at the initial installation. When this shelf condition occurs, do not use slots

14 and 16 of the main shelf. You can use these slots when all other single purpose slots on the extension shelf are provisioned with EDCH cards.

- When an extension shelf is not required, assign EDCH cards on the main shelf. Start this assignment at slot 14 and slot 16. Slot 12 is not available for EDCH cards.

Extension shelf provisioning (CMVI and MVIE only): The following rules apply to provisioning EDCH cards for the SMA2 extension shelf:

- Provision EDCH card slots on the extension left side. Start this provision with slots 3, 5, 7, 11, 9, 10, 12, and 8 in that order.
- Provision EDCH card slot on the extension left side. Start this provision with slots 3, 5, 7, and 11, in that order. This arrangement supports the special first configuration of 48 DS-1 ports and four EDCH cards. The system does not support upgrades to this configuration because upgrades affect service.
- Provision EDCH card slots on the extension right side. Start this provision with slots 24, 22, 20, 16, 18, 17, 15, and 19 in that order.
- Provision EDCH card slots on the extension right side. Start this provision with slots 24, 22, 20, and 16, in that order. This arrangement supports the special first configuration of 48 DS-1 ports and four EDCH cards. The system does not support upgrades to this configuration because upgrades affect service.

Port assignments

Refer to the following tables for a list of the slot and port assignments the DS-1 and D-channels use.

Table 2-5 DS-1 provisioning of main and extension shelf in a CMVI and MVIE

DS-1 ports	Slot	Shelf type
0-7	12	Main
8-15	16	Main
16-23	14	Main
24-31	4	Extension - left
32-39	6	Extension - left
40-47 (see Note)	8	Extension - left
24-31	23	Extension - right

Note: The following applies when a one day requirement occurs for 48 DS-1 ports. Use slot 8 in the left extension shelf and slot 19 in the right extension shelf.

Table 2-5 DS-1 provisioning of main and extension shelf in a CMVI and MVIE

DS-1 ports	Slot	Shelf type
32-39	21	Extension - right
40-47 (see Note)	19	Extension - right

Note: The following applies when a one day requirement occurs for 48 DS-1 ports. Use slot 8 in the left extension shelf and slot 19 in the right extension shelf.

Table 2-6 DS-1 provisioning of main shelf in a MVDD (without ISDN capability)

DS-1 ports	Slot	Shelf type
0-7	12	Main
8-15	16	Main
16-23	14	Main

Table 2-7 DCH provisioning of main and extension shelf in a CMVI and MVIE

DCH ports	Slot	Shelf type
9	16	Main
17	14	Main
40 (48, see note)	3	Extension - left
41 (49, see note)	5	Extension - left
42 (51, see note)	7	Extension - left
43	8	Extension - left
44	9	Extension - left
45	10	Extension - left
46 (50, see note)	11	Extension - left
47	12	Extension - left
47	15	Extension - right
46 (50, see note)	16	Extension - right
45	17	Extension - right

Note: The numbers in parentheses identify the port numbers for the EDCH cards. The special first configuration is of 48 DS-1 ports and four EDCH cards.

Table 2-7 DCH provisioning of main and extension shelf in a CMVI and MVIE

DCH ports	Slot	Shelf type
44	18	Extension - right
43	19	Extension - right
42 (51, see note)	20	Extension - right
41 (49, see note)	22	Extension - right
40 (48, see note)	24	Extension - right

Note: The numbers in parentheses identify the port numbers for the EDCH cards. The special first configuration is of 48 DS-1 ports and four EDCH cards.

Table 2-8 DCH provisioning of main shelf in a MVDD

DCH ports	Slot	Shelf type
9	16	Main
17	14	Main

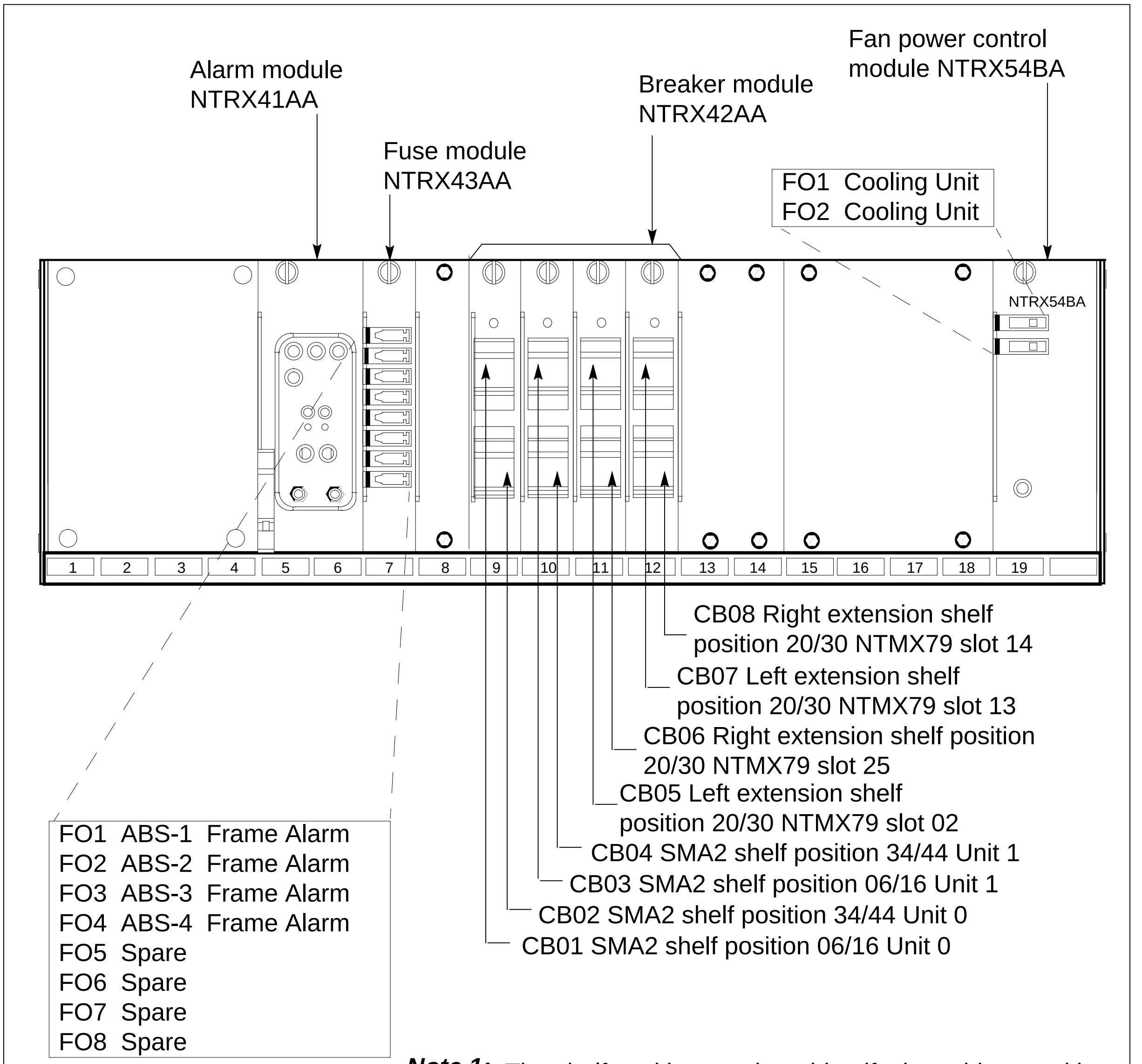
Modular supervisory panel

The modular supervisory panel (MSP) manages the power and alarming requirements for the C28 Model B cabinet and the seven-foot frame. The cabinet and frame house the SMA2. The MSP controls the following equipment functions on the cabinet or frame:

- distribution of -48 V to the power converters
- alarm monitoring and control
- maintenance features like jacks for telephone, data, and alarm battery supply
- power control of cooling unit fans

The layout of the MSP and a list of the circuit breaker and fuse names in a CMVI cabinet or MVIE frame (with extension shelf) appear in the following figure.

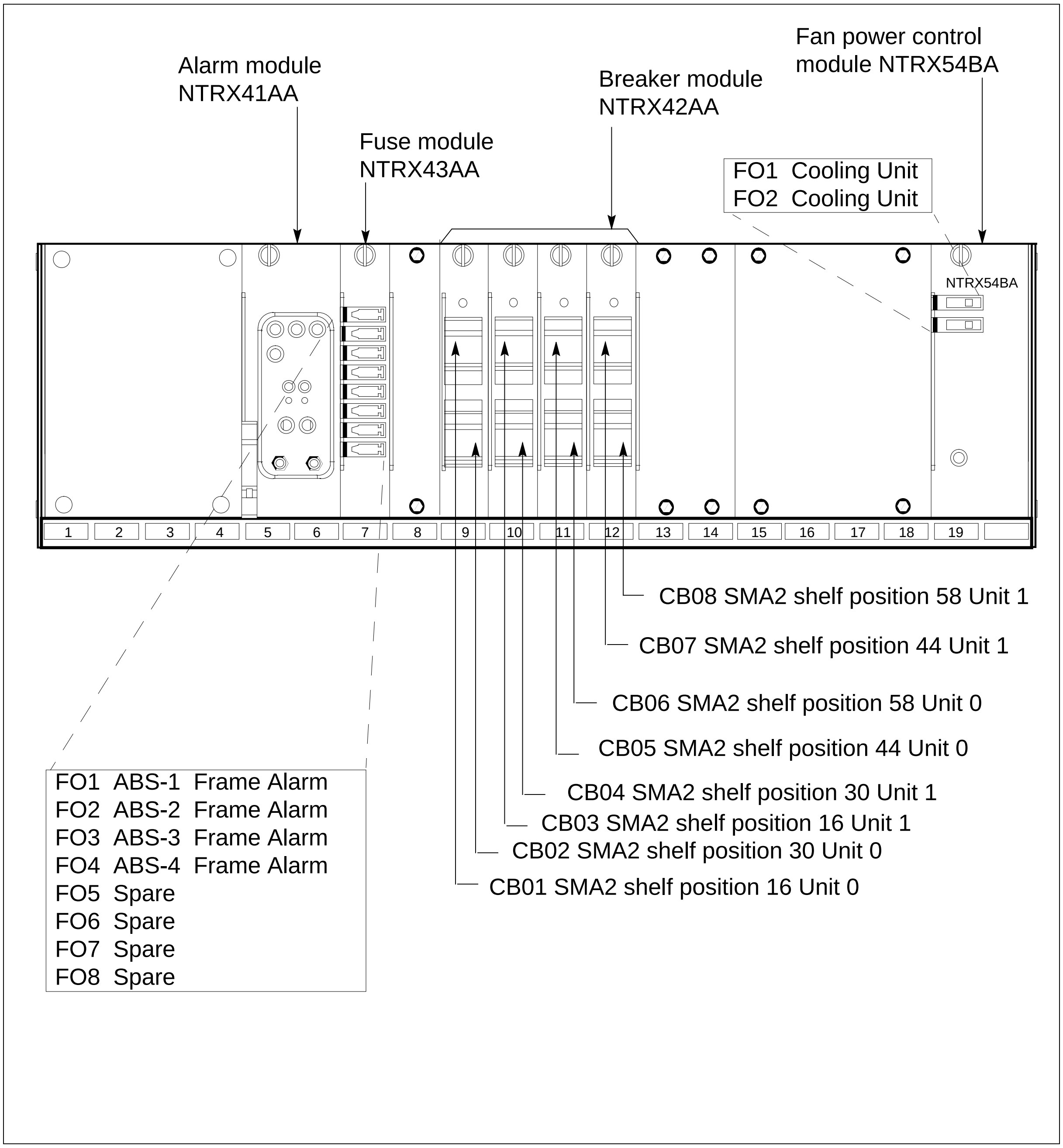
Figure 2-11 MSP shelf for SMA2 cabinet or frame with extension shelf in a CMVI and MVIE



Note 1: The shelf position numbers identify the cabinet position numbers followed by the frame position numbering.

The layout of the MSP and a list of the circuit breaker and fuse names in a MVDD appear in the following figure.

Figure 2-12 MSP shelf for MVDD frame (without extension shelf)



The following sections describe the different MSP components.

NTRX41AA (alarm module)

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

The NTRX41AA monitors and detects the following types of faults:

- converter faults
- thermal breaker failures
- fan failure on one or two cooling units
- inverter failure in the cabinet or frame

If any of the previous fault conditions occur, the NTRX41AA raises alarms and sends signals to the office alarm unit. The NTRX41AA also provides maintenance facilities in the form of telephone, data, and alarm battery supply (ABS) jacks.

The NTRX41AA contains the alarm circuit and maintenance block. The following paragraphs discuss these functional blocks.

Alarm circuit The alarm circuit consists of transistor logic. The following four alarm inputs activate this transistor logic:

- 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 and line concentrating equipment (LCE) alarm
- 90 Vrms, that triggers a FRAMEFAIL signal for a ringing generator (RG) on an LCE cabinet
- 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 can use a connector interface to drive two additional external LEDs.

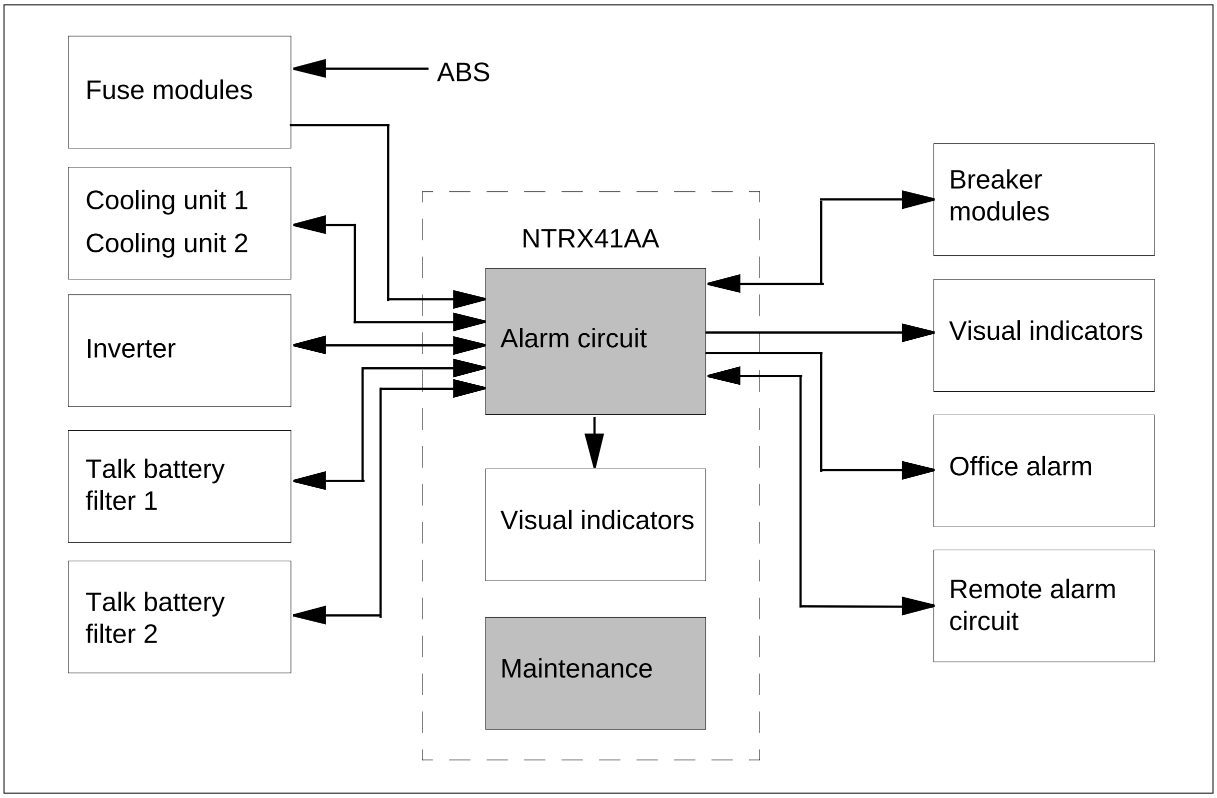
Maintenance block The alarm module provides the following maintenance features:

- Tel jack for headset or telephone connection to MAP terminal stations
- Data jack for Mobile MAP terminal stations
- ABS -48 V and battery return test points

These features provide for interoffice communication and data transmission.

The following figure shows the relationship between the NTRX41AA functional blocks.

Figure 2-13 NTRX41AA functional blocks



Alarm module pin-outs and power requirements follow.

Pin-outs The following table lists pin-outs for the NTRX41AA.

Table 2-9 Connector J1 NTRX41AA

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

Table 2-9 Connector J1 NTRX41AA

Pin	D	C	B	A
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
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 either -48 V or -60 V, but a range from -42 V to -75 V is allowed. The maximum input current is 0.75 A.

NTRX42AA (breaker module)

The NTRX42AA is a breaker module provisioned with the MSP. This module contains two circuit breakers of -48 V or -60 V that provide two 10 A power feeds.

The primary functions of NTRX42AA are:

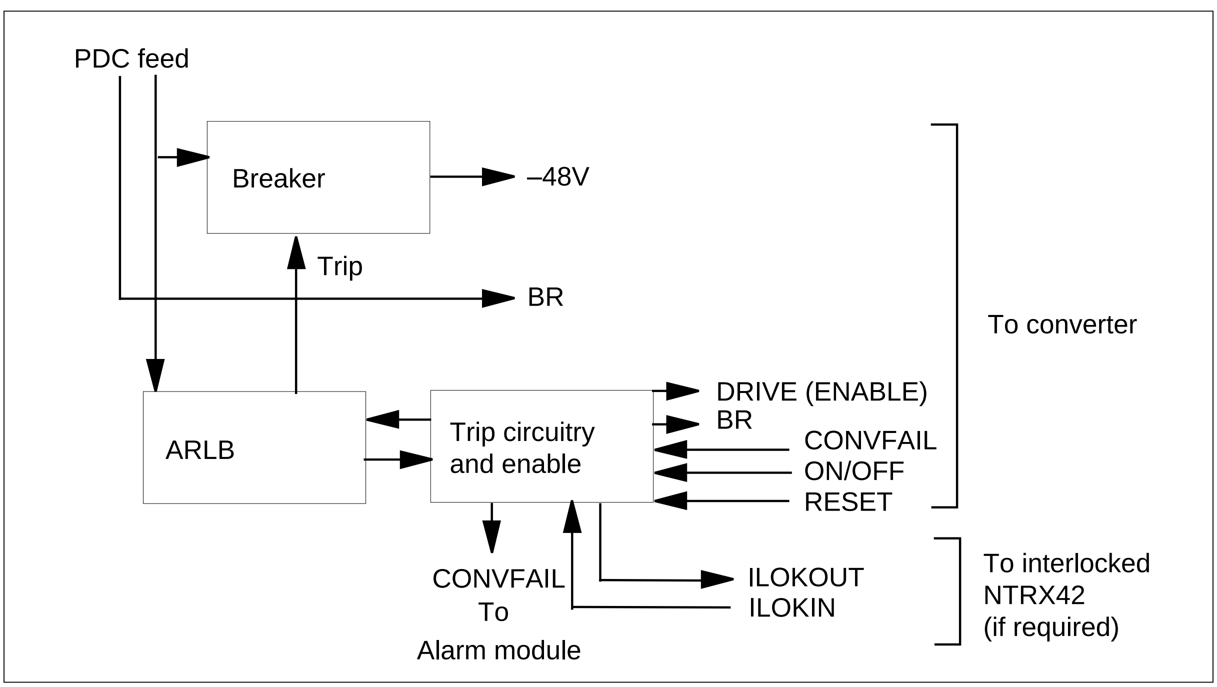
- to monitor and detect converter failures
- to trip breakers when overcurrent conditions exist
- to trip breakers on a converter failure
- to provide termination points for power distribution center (PDC) feeds
- to provide battery feed samples for the alarm module
- to respond to automatic recovery from low battery (ARLB) conditions

The NTRX42AA has the following operating blocks:

- ARLB
- trip circuits and enable
- breakers

The relationship with the breaker module operating blocks appears in the following figure.

Figure 2-14 NTRX42AA functional blocks



Automatic recovery from low battery The breaker module sends the NT6L62AA ARLB hybrid a sample of each of the two breaker module input battery feeds. The ARLB provides two outputs to NTRX42AA. The first output controls the two relays on each breaker module. When the sample voltage falls below -41.5 V ± 0.5 V, the relays turn off. This action prevents breaker trip and removes the DRIVE or ENABLE signal that causes the converters to shut down. The battery voltage must rise above -44.5 V ± 0.5 V before the RESET relay starts again.

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

Breakers Two 10 A magnetic breakers are stacked one on top of the other in this breaker module. The breakers operate over the -48 V to -60 V range.

Breaker module pin-outs, power requirements, and output specifications follow.

Pin-outs A list of pin-outs for NTRX42AA appears in the following table.

Table 2-10 Connector J1 NTRX42AA

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	CONVFAIL2
10	DRIVE1	22	RESET2
11	ILOKOUT	23	BR2
12	CONVFAIL1	24	BAT RTN2

Power requirements The small input voltage is -48 V or -60 V, but a range from -42 V to -72 V is allowed. The maximum input current is 20 A.

Output The following table lists the output specifications for NTRX42AA.

Table 2-11 Output specifications NTRX42AA

Parameter	Value
Voltage	-48 V or -60 V
High voltage shutdown	-72 V
Low voltage shutdown	-42 V
Maximum current	2 x 10 A
Minimum current	0 A

NTRX43AA (fuse module)

The NTRX43AA fuse module provides a maximum of eight current-limited feed outputs and one alarm output for cabinets in a CO. This card is provisioned with the MSP and operates with an input battery voltage range of -48 V to -60 V.

> ***Note:*** This module does not supply the QFF fuses. The QFF fuses are provisioned at the cabinet level.

The NTRX43AA provides the following functions:

- acts as termination point for PDC feeds
- supplies eight current-limited outputs for different circuits
- reports fuse and breaker failures to the NTRX41AA alarm module

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 mounted on the faceplate of the NTRX43AA. Connector J1 provides the fused outputs with currents that range from 0.18 A to 5.0 A. Connector P3 provides alarm outputs that report fuse failure to the NTRX41AA alarm module.

Fuse module pin-outs, power requirements, and output specifications follow.

Pin-outs The following section describes pin-outs for NTRX43AA.

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

Table 2-12 Power input connectors P1 and P2

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

The following table lists pin-outs for output connector J1.

Table 2-13 NTRX43AA output connector J1

Pin	Signal	Pin	Signal
1	-48VOUT 1	10	-48VOUT 5
2	-48VOUT 2	11	BAT RTN5
3	-48VOUT 4	12	BAT RTN6
4	-48VOUT 6	13	BAT RTN3
5	-48VOUT 7	14	BAT RTN4
6	-48VOUT 8	15	NC
7	BAT RTN1	16	NC
8	BAT RTN2	17	BAT RTN7
9	-48VOUT 3	18	BAT RTN8

The following table lists the pin-outs for the FAIL alarm connector P3.

Table 2-14 Fail alarm connector P3

Pin	Signal
1	FUSEALM
2	FUSEALM

Power requirements The nominal input voltage range is -48 V to -60 V. A range from -42 V to -75 V is allowed. The maximum input current is 30 A.

Output The following table lists the output specifications for NTRX43AA.

Table 2-15 Output specifications NTRX43AA

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

NTRX54BA (fan power control module)

The fan power control module:

- receives A- and B-feed inputs from the PDC
- provides a combined output C-feed for the -48 V dc fans
- provides an alarm output
- requires an input voltage range from -48 V dc to -60 V dc

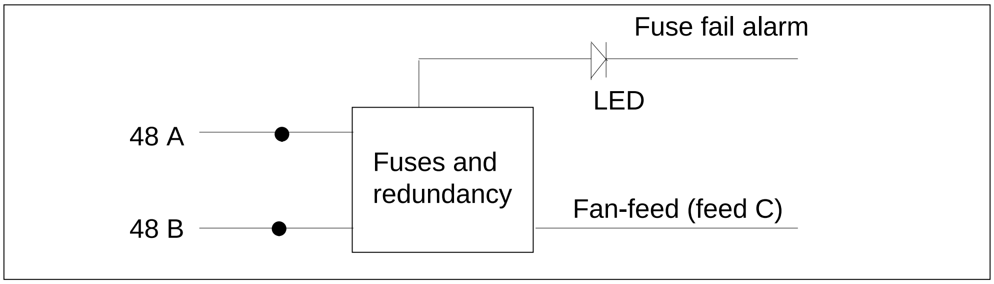
The module includes two faceplate-mounted fuse holders that have 5 A fuses and an LED. A captive screw attached to the faceplate provides positive retention and conductive coupling to the shelf.

Location The fan power control circuit card occupies the last two card positions in an MSP. This connectorized card provides A- and B-feed input with two 6.35 mm (0.25 in) quick-connect plugs (A0381899). The card provides power/alarm output with an 18-pin Positronics power-lok connector (A0380977).

The fan power control circuit card provides a small regulated 48V for fan operation. Features include fuse failure alarm and redundant feed operation.

The following figure illustrates the functionality of the fan power control circuit card.

Figure 2-15 NTRX54BA functional blocks



Feed combining Combined feeds A and B provide redundancy. If one of the feeds is not present, the other feed provides power.

Fuse fail alarm The NTRX43BA provides an alarm indication for a possible fuse failure.

Signaling There are three connectors on the rear of the NTRX54BA. These connectors are the P1 input, P2 input, and the J1 output.

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

Table 2-16 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 lists pin-outs of the P2 input (battery B) connector.

Table 2-17 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 lists pin-outs of the J1 output (18-pin) connector.

Table 2-18 18 pin output (J1) connector

Pin number	Signal	Function	Description
1 -9	L - (FAN1)	Output	-48 Vdc
18	FAIL	Output	O/C -> BR through 3.0k and LED on output failure causes Frame Fail to alarm module
10 -17	L + (FAN)	Output	BAT RTN from fans

Power requirements The following table lists the input power requirements for the fan power control circuit card.

Table 2-19 Power input requirement limits (A and B)

	Limits		
Signal	**Norm**	**Alarm minimum**	**Alarm maximum**
Voltage	-48 Vdc	-39 Vdc	-56 Vdc
Current	1.5 A		2.5 A

The following table lists the output power requirements for the fan power control circuit card.

Table 2-20 Power output requirement limits (A and B)

	Limits		
Signal	**Norm**	**Alarm minimum**	**Alarm maximum**
Voltage	-48 Vdc		-56 Vdc
Current	1.5 A	0.0 A	3.0 A

Environmental conditions The fan power control circuit card performs under limited environmental restrictions as the following table describes.

Table 2-21 Ambient conditions

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

Equipment dimensions The fan power control circuit card dimensions are 101.6 mm (4 in) high, 60.9 mm (2.4 in) wide, and 254 mm (10 in) deep. The approximate weight is 0.68 kg (1.5 lb).

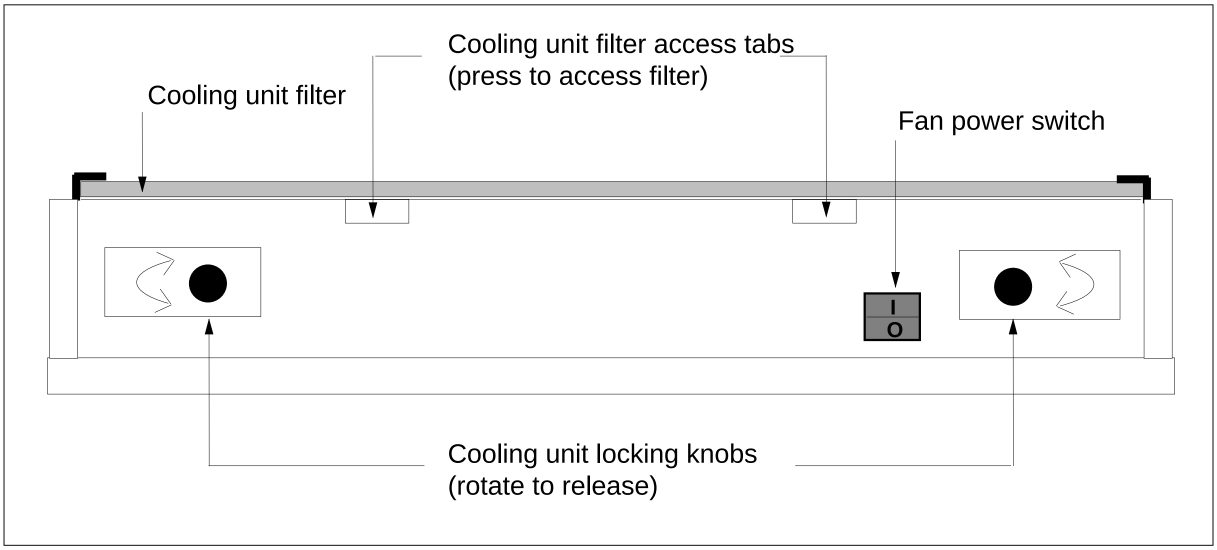
NTRX91AA (cooling unit)

The NTRX91AA cooling unit is in shelf position 00 in the C28 Model B cabinet. The cooling unit is also in position 10 in the standard seven-foot frame configuration. The cooling unit contains

- three cooling fans
- one fan power switch
- two locking knobs that rotate clockwise or counterclockwise to withdraw the cooling unit
- two access tabs above the cooling unit that permit easy access to the cooling unit filter

Fuses in the MSPT fuse-protect the cooling fans. The cooling unit configuration appears in the following figure.

Figure 2-16 NTRX91AA cooling unit



3 SMA system functionality

Introduction

This section describes the following sections of SMA system functionality:

- voice and data communications
- foreign exchange subscriber end (FXS) signaling
- call setup, call take-down, and call monitoring messages
- operations, administration, maintenance, and provisioning (OAM&P) messages
- integrated services digital network (ISDN) Basic Rate Interface (BRI) signaling (functional only, SMA system does not support stimulus signaling)
- Bellcore flexible Analog Display Services Interface (ADSI) tones and compatible voiceband data
- path protection switching
- communications protocols
- call processing
- service abilities

> ***Note:*** The remote digital terminal (RDT) in this section applies to multi-vendor interface (MVI) access remotes and S/DMS AccessNode remotes, also called remote fiber terminals (RFT). In specified references to a remote access vehicle, the name S/DMS AccessNode or RFT refers to the next generation digital loop carrier (NGDLC) by Nortel (Northern Telecom), the S/DMS AccessNode.

Voice and data communications

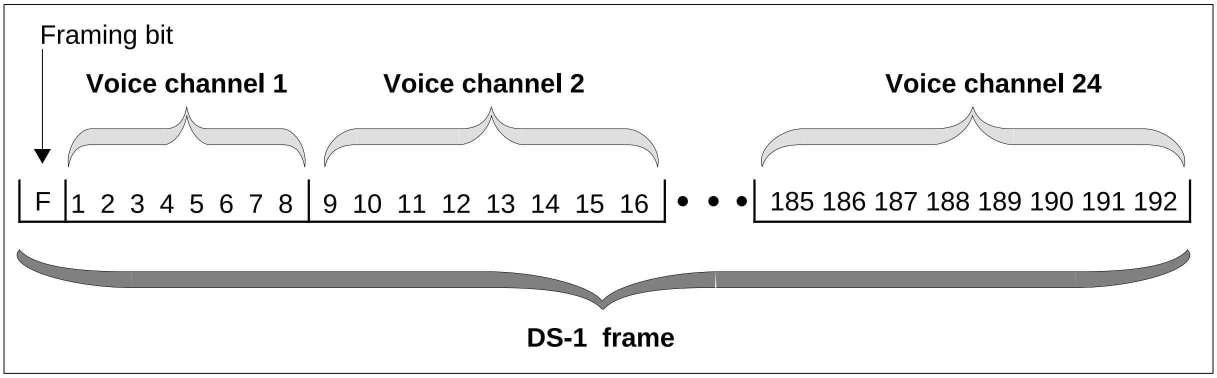
The DS-1 links use extended superframe format (ESF) signaling to transfer voice and data calls. The ESF signaling transfers these calls between the RDT and the Expanded Subscriber Carrier Module-100 Access (ESMA), also called the SMA2.

DS-1 frame format

The SMA2 and RDT exchange information over DS-1 links. TheDS-1 links operate at a rate of 1.544 Mbyte/s with a sampling frequency of 8000 frames each second.

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

Figure 3-1 DS-1 frame format



The framing bit identifies the location of the first time slot in the frame. The RDT or SMA2 can receive a framing bit. In this event, the RDT or SMA2 is notified that the following 8 bits contain information from time slot one. The framing bit is also for frame alignment in the superframe and extended superframe alignment configurations.

Superframe format signaling

A superframe contains twelve 24-channel frames. Framing bits are used in superframe signaling for frame alignment and superframe alignment. The framing bit identifies the location of the first time slot in the frame. The SMA2 or channel bank can receive a framing bit. In this event, the SMA2 or channel bank is notified that the next 8 bits contain information from time slot one.

Superframe alignment identifies frames in which time-slot-associated signaling bits are present. In superframe alignment, the framing bits, one for each 24-channel frame, form a 12-bit pattern. This pattern appears in the following table.

Frame number	Framing bit type	Framing bit value
1	Ft	1
2	Fs	0
3	Ft	0
4	Fs	0
5	Ft	1
6	Fs	1
7	Ft	0
8	Fs	1
9	Ft	1
10	Fs	1
11	Ft	0
12	Fs	0

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

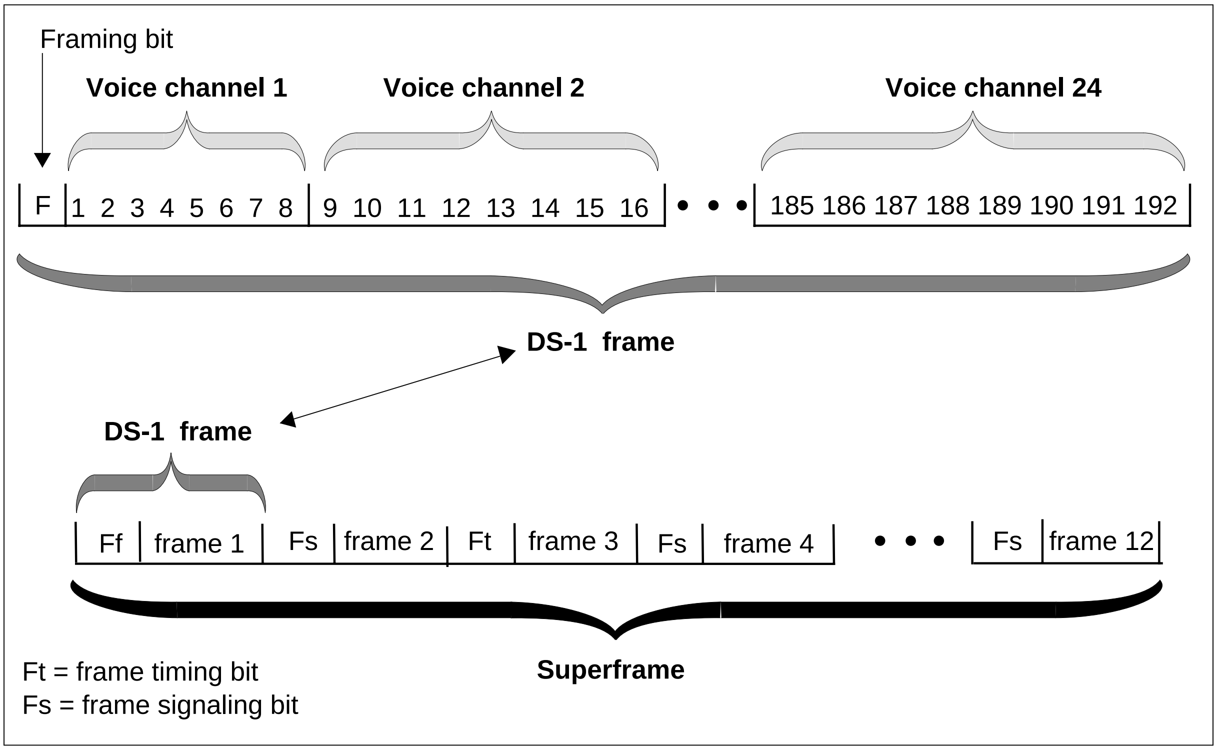
An Fs bit can change from 0 to 1. In this event, the Fs bit signals the SMA2 or integrated channel bank (ICB) that the sixth frame follows the 1 framing bit. An Fs bit changes from 0 to 1 during change from frame 4 to 6. An Fs bit can change from 1 to 0. In this event, the Fs signals the SMA2 or ICB that the 12th frame follows the 0 framing bit. An Fs bit changes from 1 to 0 during the change from frame 10 to 12.

The 6th and 12th frames in a superframe contain time-slot-associated signaling bits. Identify the 6th and 12th frames. These bits are on all 24 time slots of the 6th and 12th frames in the least important bit position. A speech-signal bit occupied this position, but a signaling bit replaced the speech-signal bit. The signaling bit depends on the direction that the data travels.

Signaling bits in the sixth frame are A-bits. Signaling bits in the 12th frame are B-bits.

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

Figure 3-2 DS-1 superframe format



Extended superframe format signaling

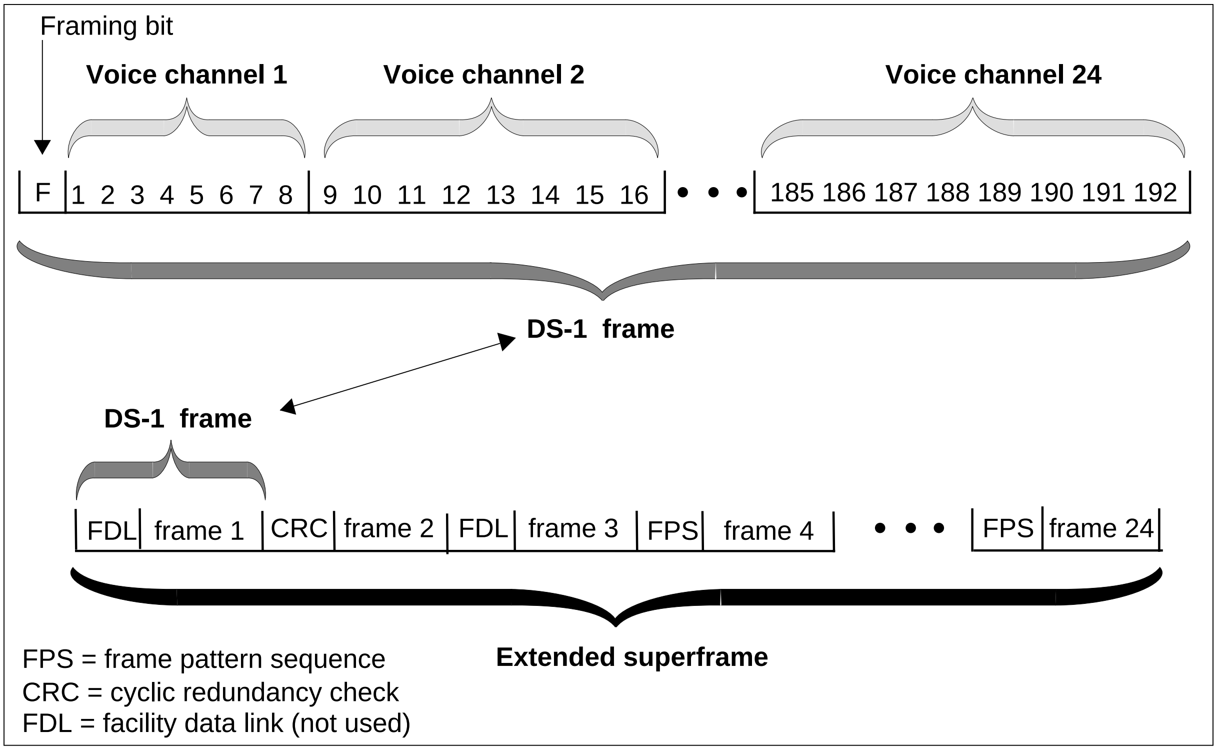
Extended superframe format (ESF) signaling monitors DS-1 link performance and maintenance functions. The ESF signaling allows ABCD bits instead of AB bits to identify messages to improve robbed bit signaling messages. This condition is used in the superframe format.

The ESF contains 24 DS-1 frames. In ESF, the framing bits form a 24-bit pattern. One framing bit is present for each 24-channel frame. The 24-bit pattern indicates three types of information:

- frame pattern sequence (FPS)—The framing bit carries an FPS value of 001010. The FPS starts at the fourth frame and occurs each fourth frame with the framing bits. The FPS and the cyclic redundancy check (CRC) defines an in-frame condition.
- facility data link (FDL) performance (this ability is not used)—The FDL 4 is a Kb/s message. The FDL starts at the first frame and occurs each other frame with the framing bits. The SMA2 does not support facility protection and does not use FDL messaging bits.
- cyclic redundancy check—The CRC starts at the second frame and occurs each fourth frame with the framing bits. In an extended superframe, the CRC checks a block check field six times. The CRC-6 check detects bits that copy an FSP bit and determines if an out-of-frame condition is present.

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

Figure 3-3 DS-1 ESF format



The extended superframe alignment pattern appears in the following table.

Figure 3-4 Extended superframe alignment pattern

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

m = message bits
CB = check bits

FXS signaling for ICB

FXS signaling

For channel bank connectivity, the SMA2 supports foreign exchange subscriber end (FXS) signaling for loop and ground start lines from channel banks. The FXS signaling does not support battery changes, like battery reversal.

The FXS signaling uses AB bit signaling in superframe format (SF) or extended superframe format (ESF). For information on SF, refer to the section “Super format signaling" at the start of this chapter. For information on ESF, refer to the previous section, “Extended superframe format signaling". This section describes the AB bit signaling.

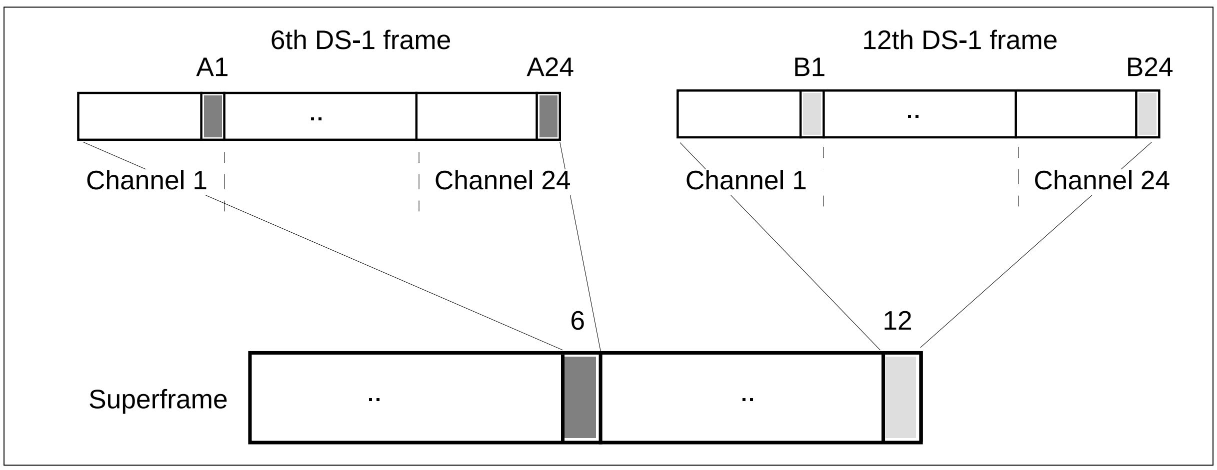
FXS signaling supports

- single party
- Centralized exchange (Centrex)
- custom local area signaling services (CLASS) and analog display services interface (ADSI). The FXS signaling supports these services only if the channel bank provides these services.

AB bit signaling

The AB bit signaling is used for call processing activities between the SMA2 and the ICB. The AB bits are the least important bits of each 8-bit channel in the 6th and 12th frames on the superframe. The group of A and B bits can define a maximum of four codes in each direction. The directions are channel bank to IDT and IDT to channel bank. Two AB bits removed for time slot 1 of a DS-1 superframe appear in the following figure.

Figure 3-5 AB bits removed from a DS-1 superframe



In the 6th and 12th frame, the 8th bit in each eight-bit word is suppressed and replaced by a signaling information bit. This signaling information bit represents the signaling and supervision state of the channel concerned. The following table shows the superframe AB signaling supported by the SMA2 to ICB configuration.

Figure 3-6 Superframe AB bit use in the SMA2 to ICB configuration

Frame number	Bit use in each channel Data	Signaling	Signaling bit
1	1–8	-	
2	1–8	-	
3	1–8	-	
4	1–8	-	
5	1–8	-	
6	1–7	8	A
7	1–8	-	
8	1–8	-	
9	1–8	-	
10	1–8	-	
11	1–8	-	
12	1–7	8	B

In extended superframe signaling, the A and B signaling bits are transmitted in the 6th and 12th frames and repeated in the 18th and 24th frames. In the receive direction, the A bit is read from the 6th frame and the B bit is read from the 12th frame. The A and B signaling bits in the 18th and 24th frames are not used in the receive direction. The following table shows the extended superframe AB signaling supported by the SMA2 to ICB configuration.

Figure 3-7 Extended superframe AB bit use in the SMA2 to ICB configuration

	Bit use in each channel		Signaling bit	
Frame number	Data	Signaling	Transmit	Receive
1	1–8	-		
2	1–8	-		
3	1–8	-		
4	1–8	-		
5	1–8	-		
6	1–7	8	A	A
7	1–8	-		
8	1–8	-		
9	1–8	-		
10	1–8	-		
11	1–8	-		
12	1–7	8	B	B
13	1–8	-		
14	1–8	-		
15	1–8	-		
16	1–8	-		
17	1–8	-		
18	1–7	8	A	-
19	1–8	-		
20	1–8	-		
21	1–8	-		
22	1–8	-		
23	1–8	-		
24	1–7	8	B	-

Call setup, call take-down, and call monitoring

The RDT determines call setup, call take-down, and call monitoring signals. The RDT can be a generic TR-303 RDT or an S/DMS AccessNode. The following signaling types are used:

- TR-303 hybrid signaling the generic RDTs uses, contains
  - robbed bit signaling (RBS)
  - time-slot management channel (TMC) signaling
- common signaling channel (CSC) signaling the S/DMS AccessNode uses

The following sections describes these two signaling types.

TR-303 hybrid signaling

The TR-303 hybrid signaling uses two types of signaling:

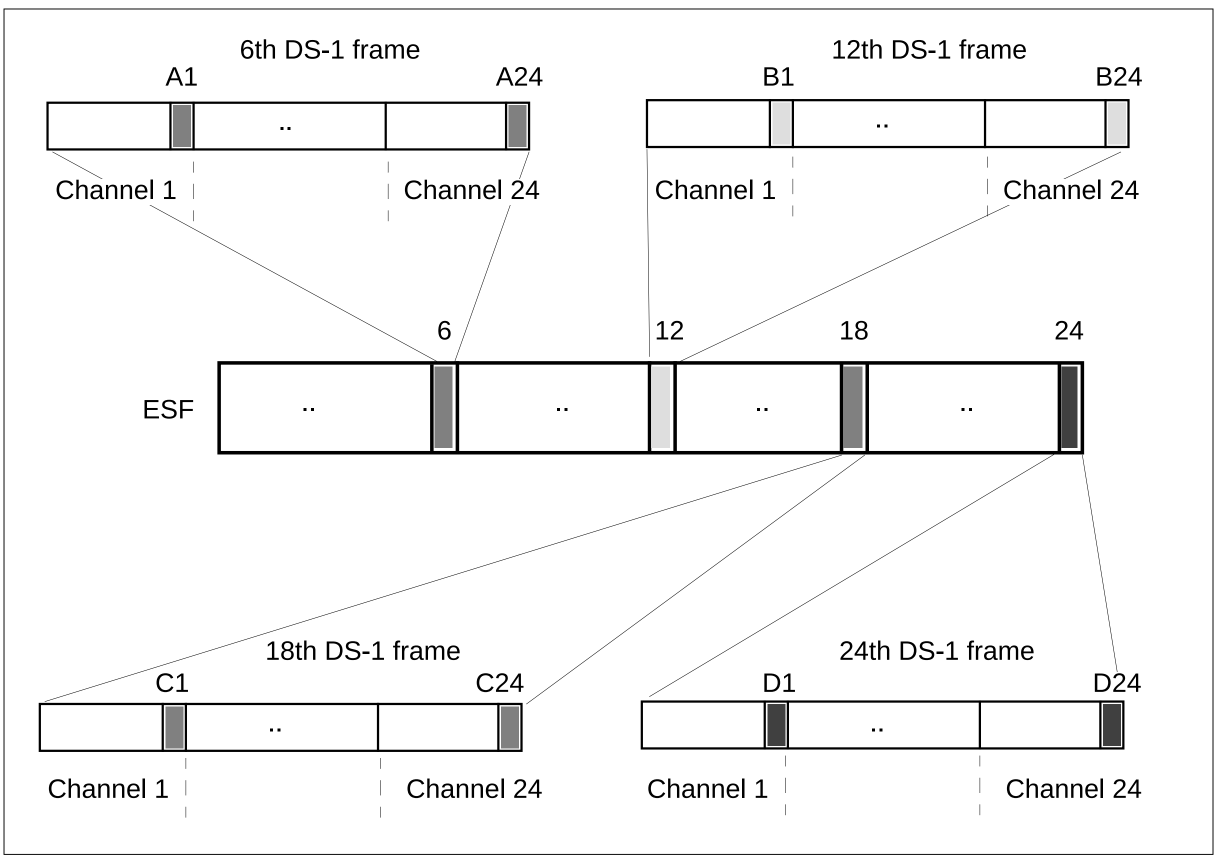
- in-band signaling
- out-of-band signaling

The TR-303 hybrid signaling is required to support integrated digital loop carrier (IDLC) call processing.

Robbed bit signaling

Robbed ABCD bit signaling is also called robbed bit signaling (RBS). The RBS is used for call supervision, ringing, and dial pulse (DP) digit transmission between the IDT and the RDT over the assigned time slot. The ABCD bits are the bits removed or robbed from the ESF least important bits. These bits are from the ESF least important bits of each 8-bit channel in the 6th, 12th, 18th, and 24th frames. The group of A, B, C, and D bits can define a maximum of 16 codes in each direction. These directions are RDT to IDT and IDT to RDT. Four ABCD bits removed for time slot 1 of a DS-1 ESF appear in the following figure. In-band (ABCD) signaling occurs for each channel.

Figure 3-8 ABCD bits removed from a DS-1 ESF



The ABCD bits exchange call supervisory information between the IDT and the RDT. The IDT uses TMC to setup a clear time slot connection at the RDT.

The ABCD signaling provides the following functions:

- scanning for hook state changes

  The ABCD signaling scans and filters hook state changes in the appropriate signaling processor for answer, disconnect, or flash signals from customer lines.

- IDT ringing control to send ringing patterns to the RDT

  The IDT controls ringing cadencing and scheduling and the RDT controls physical ringing to customer lines.

- service to IDT call processing for loop signaling and supervision

  Provides the ability to send and receive ABCD codes for loop signaling and supervision.

- service to IDT coin call processing to perform coin control functions and tests for coin lines

  Coin control functions are coin collect and coin return. Coin tests are coin presence and coin partial presence.

- service to IDT call processing for automatic numbering identification (ANI) test for two-party lines

  This test is required to identify which party of a two-party line originates the call for billing purposes.

- dial pulse (DP) digit collection

  When DP digits are dialed, hook status transients are generated on the line. The ABCD signaling detects these hook transitions and determines if a valid digit was dialed.

- DP digit outpulsing

  The DP digit outpulsing provides digit outpulsing to customer location equipment.

Time-slot management channel signaling

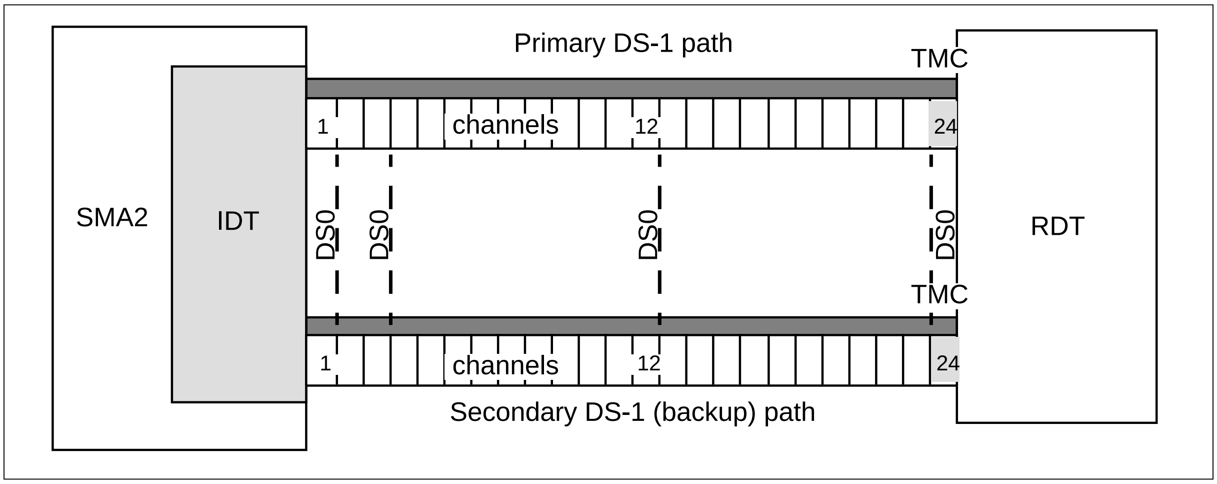
Time-slot management channel (TMC) signaling is also out-of-band signaling. The TMC signaling is a message-oriented signaling type to signal the connection and disconnection of timeslots between the IDT and RDT. The TMC signaling also sets up and removes calls in an MVI RDT. These call processing signals are as follows:

- transmit over channel 24 of a DS-1 link
- use Q.931 message protocol

- are path protected
- can contain a maximum 32 octets (an octet is one byte that contains eight bits).

The following figure describes signaling between an SMA2 and an RDT over a DS-1 link with the TMC channel transmitted over channel 24.

Figure 3-9 SMA2 to RDT connectivity



Common signaling channel signaling

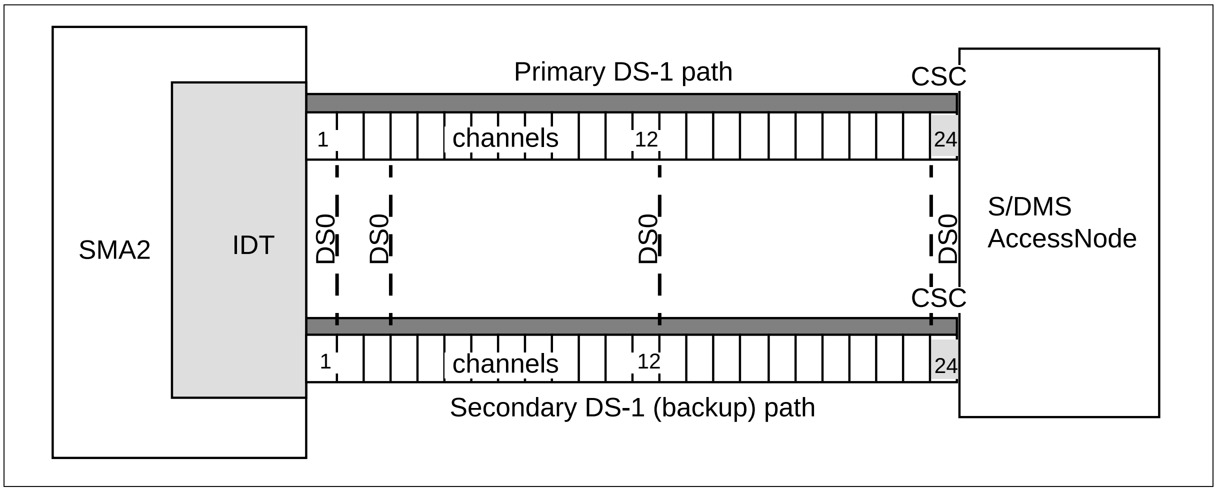
The CSC is a message-oriented signaling type that installs, monitors, and takes down calls in the S/DMS AccessNode. These call processing signals:

- transmit over channel 24 of a DS-1 link
- use Q.931 message protocol
- are path protected
- can contain a maximum of 52 octets

All CSC call processing signals transmit over a dedicated channel. Channel 24 of a DS-1 frame is the dedicated CSC channel. Eight bits of each message or an octet, transmit with each DS-1 frame.

Signaling between an SMA2 and an S/DMS AccessNode over a DS-1 link with the CSC channel transmitted over channel 24, appears in the following figure.

Figure 3-10 SMA2 to S/DMS AccessNode connectivity



Operation, administration, maintenance, and provisioning (OAM&P)

Operations, administration, maintenance, and provisioning (OAM&P) messages transmit for an SMA2 and a generic TR-303 RDT or an S/DMS AccessNode over embedded operations channel (EOC) message channels. This section describes EOC message signaling.

EOC message signaling

The EOC is a message-oriented operations channel that exchanges OAM&P information between the RDT and the IDT. These operations messages are as follows:

- transmit over channel 12 of a DS-1 link
- use EOC communication protocol
- use ASN.1 basic encoding rules
- are path protected

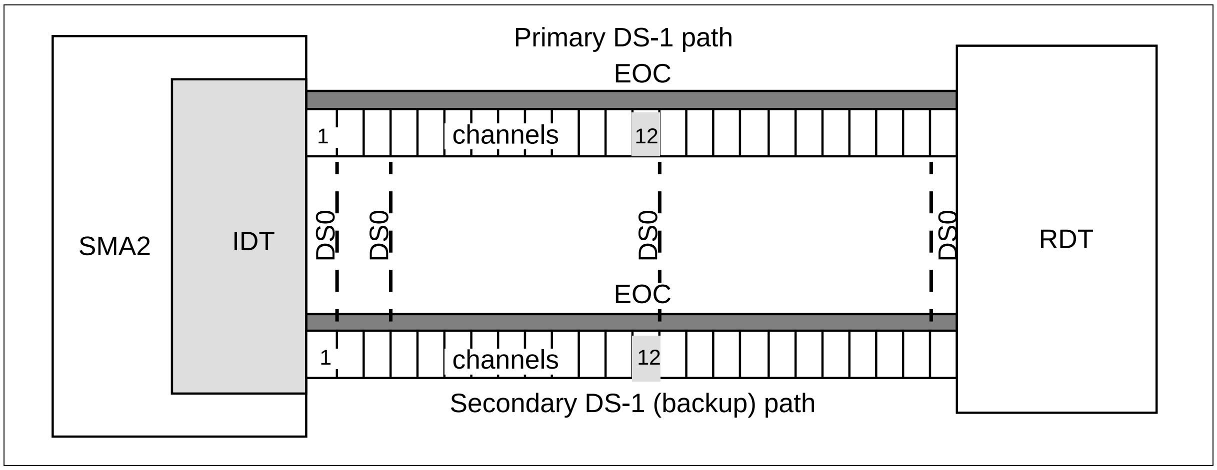
The SMA2 communicates EOC messages between the IDT and the RDT to perform the following functions:

- initialize and maintain object-oriented static data at the RDT
- provide line test position (LTP) capabilities to the RDT
- allow the RDT to connect to external test systems

The RDT uses EOC messages to inform the SMA2 of the activities of the RDT through logs and remote telemetry.

Signaling between an SMA2 and an RDT over a DS-1 link with the EOC channel transmitted over channel 12 appears in the following figure.

Figure 3-11 SMA2 to RDT signaling over the EOC channel



The following DMS applications use EOC message signaling:

- DMS line provisioning, which controls the datafill of subscriber services. Line provisioning refers to hardware provisioning and to service provisioning.
- DMS line maintenance and automatic line testing (ALT), which controls and monitors subscriber line states from the MAP terminal. The DMS line maintenance and ALT allow for diagnostic testing of the lines.
- logs and alarms, which report alarms and events to the DMS MAP terminal and operations support system that connects to the RDT
- node maintenance, which controls voice and data channels between the DMS CM and peripheral devices that include the SMA and the RDT

ISDN BRI signaling

Integrated services digital network basic rate interface (ISDN BRI) is also called 2B+D. The ISDN BRI contains two 64-kbit B-channels for voice and data and a 16-kbit D-channel for signaling and packet data. The two types of ISDN BRI signaling are functional and stimulus.

Software in the set of the functional BRI terminal supports functional BRI signaling. Functional BRI signaling uses Q.931 protocol and the signaling control protocol to send call control messages between the terminal and the network. The SMA2 does not support stimulus BRI signaling.

The ISDN BRI contains two B-channels for voice and packet data and a D-channel for signaling. The TMC messages for voice and data use assign the B-channels. The D-channel is nailed up at provisioning time. This condition indicates that the D-channel is a permanently assigned network connection. Messages over the EOC control assignment of the D-channel.

National ISDN-2/3 BRI feature

The National ISDN-2/3 BRI Phase I feature increases the operational use of BRI line interface configurations. This feature also expands the BRI service options available to end users. The operating company must purchase the software optionality control (SOC) NI000050 in NA007 to access the following improved ISDN abilities:

- Two B-channel access. This ability allows a terminal to access to both B-channels at the same time with one terminal endpoint identifier (TEI). This terminal must already support voiceband information (VI) and circuit mode data (CMD) or VI or CMD. This ability applies to both fully initializing terminals (FIT) and non-initializing terminals (NIT). Provisioning determines the number of B-channels that a terminal can access.
- Support for non-initializing terminals (NIT). This ability supports one non-initializing terminal on a BRI interface that is provisioned with the default logical terminal. An NIT is a new class of BRI terminal that does not initialize Layer 3 and does not require a service profile identifier (SPID). An SPID is an identification number. A terminal uses an SPID in the initialization process.
- Assignment of fixed feature keys to the default logical terminal for NITs. This ability assigns the following features to the NIT: call forwarding, message waiting, conference calling, call transfer, and call drop. The NIT can access these features with dial-access procedures or feature key management procedures.

The National ISDN-2/3 BRI Phase I feature introduces the following actions:

- This feature changes the way additional call offering (ACO) operates for terminals that have access privilege entered for two B-channel access. When the terminal has a call active and one B-channel free, and a termination occurs. The SETUP that terminates contains the channel identifier information element (CID IE) coded to the value of the free B-channel. For terminals that do not have the two B-channel access privilege, this message has the CID IE coded to “no-channel".
- Flexible calling can be active on a 2B FIT/NIT conference controller. In this event, the next VI terminations go to the terminal with the CID IE coded to “no channel".

Bellcore compliant ADSI tones and compatible voiceband data

When the SMA2 has an NTMX76CA message and channel supervision messaging (CSM) card, the system generates alerting tones. These tones indicate the SMA2 supports the Spontaneous Call Waiting Identification (SCWID) or Deluxe SCWID (DSCWID) feature. A line with the SCWID or DSCWID option can have a call established and a second call can attempt to terminate to that line. When this condition occurs, the SMA2 generates one of two types of alarm signals or tones:

- A subscriber alerting signal (SAS), that the subscriber recognizes as the call waiting tone.
- A SAS followed by a customer premises equipment (CPE) alert signal (CAS)—The CAS alerts the CPE of incoming data. The SAS followed by a CAS triggers an ADSI compatible CPE to display the SCWID/DSCWID options. The CAS tone allows the CPE to receive caller identification (CID) data.

The SCWID/DSCWID CPE generates an acknowledge (ACK) tone to indicate the CPE can receive SCWID data. If the CPE is ADSI compatible, the CPE returns a DTMF A ACK signal in response to the CAS. If the CPE is a SCWID CPE, the CPE returns a DTMF D ACK signal in response to the CAS.

For the DSCWID option only, when the CPE sends alerting tones, the subscriber can control the disposition of the incoming call. The subscriber uses the CPE softkeys if the CPE is ADSI. If the CPE is a SCWID or 2500 set, the subscriber uses hard-coded keys.

A T-tone timer sets the maximum amount of time allowed between the process to send a flash and the DTMF digit on an ADSI set. After the SMA2 receives a flash signal from the ADSI compatible CPE of the customer, the SMA2 starts a T-tone timer. The value of T-tone is 600 ms. The speech path is muted during this 600 ms interval. The T-tone timer is the first option used of a SCWID/DSCWID call. The CPE type does not affect whether or not the SMA2 uses a T-tone timer. Any following SCWID/DSCWID options on an ADSI set use the T-tone timer.

Any following DSCWID options on a SCWID or 2500 set use a different timer (T-flash). DSCWID options use T-flash after the subscriber answers a call with a SCWID or 2500 set. T-flash provides operating company personnel time to select an option after a flash. This timer is needed because a subscriber does not have enough time to flash and dial a DTMF digit in 600 ms. T-flash is an operating company controlled timer that is set from 1 to 8 s. The default value is 1.5 s. The SMA2 starts the T-flash timer if the NON-ADSI field is set to Y and the SMA2 receives a flash signal from the SCWID or 2500 set during the held or conference call state. If the SMA2 cannot attach a UTR before 400 ms, the RETURN option is applied.

> ***Note:*** For Bellcore TR-416 compliance, the SMA2 must provide options if the SMA2 detects a flash and cannot attach a UTR. The SMA2 accepts this requirement and sends a flash to CC if the SMA2 cannot attach a UTR in 400 ms.

ADSI interactions

The following ADSI interactions apply:

- A warm SWACT during the download or transmission of softkey data to the CPE does not allow the CPE to receive data. When the CPE cannot receive all of the data, the ADSI call is not stable.
- After a warm SWACT, the next transmit to the CPE set causes the active ADSI session to drop.
- A busy return to service of the CMR circuit card, during an active application session causes an ADSI call that is not stable.
- A busy of the CMR circuit card on the active unit of the XPM does not allow CLASS services to function. This condition only applies to CLASS services that use the CMR card circuit.

ADSI limits

The following ADSI limits apply:

- A complete ADSI session requires an ADSI compatible CPE.
- Only ten ADSI sessions can be active for each CMR circuit card.

ADSI hardware requirements

Hardware requirements to support ADSI ability are as follows:

- an NT6X78AB CMR card is required to transmit softkey and display information to the CPE
- an NTMX76CA message and CSM card

Path protection switching

Path protection switching provides protection for the EOC and TMC or CSC message and signaling channels. The SMA2 supports one-for-one path protection switching for these messaging and signaling channels. Path protection switching controls the activity from the active EOC and CSC or TMC to the backup EOC and CSC or TMC. Path protection switching protects from one end to the other end from failures of message processing hardware in both the SMA2 and the RDT.

Operating company personnel can initiate path protection switching manually. The SMA2 or the RDT can initiate path protection switching automatically when the SMA2 or the RDT detects a fault. The operating company personnel can manually initiate path protection switching for maintenance purposes at the integrated digital terminal (IDT) level of the MAP terminal.

The following concepts are used in protection switching state:

- path—a TMC, CSC, or EOC message channel
- active path—the path or channel that is in the active state. The active path carries TMC, CSC or EOC messages, and messages used for protection switching.
- standby path—the path in the standby state. The standby path carries only messages that allow the path to become the active channel.
- protection switch—this occurs when the active path changes state to standby, and the standby path changes state to the active path.

The rules for protection switching are as follows:

- The IDT or RDT must detect a failure and initiate a protection switch.
- A failure on a channel can occur, and protection switching occurred. In this event, a switch back to the original active or inactive configuration does not occur when the cause of the failure is cleared.
- When possible, a standby path remains in multiple-frame operation.

SMA2 to generic RDT path protection switching

For every IDT to RDT connection, a dedicated TMC and EOC path on two links is present. Only one EOC and TMC messaging path can be active on the two links. The SMA2 reserves inactive EOC and TMC messaging paths for backup. An EOC message channel can be active on one link and the TMC message path can be active on the other link. The EOC and TMC can be active on the same link.

Configuration of the SMA2 and the datafill of associated tables determines application of path protection switching. The first link assignment in table RDTINV, field LINKTAB is the primary link that carries TMC and EOC messaging. Field RDTPPLNK defines the secondary link that carries TMC and EOC messaging. The secondary link can have a value from 2 to 28 at the RDT.

The figure “DS-1 control channels describes TMC and EOC path protection".

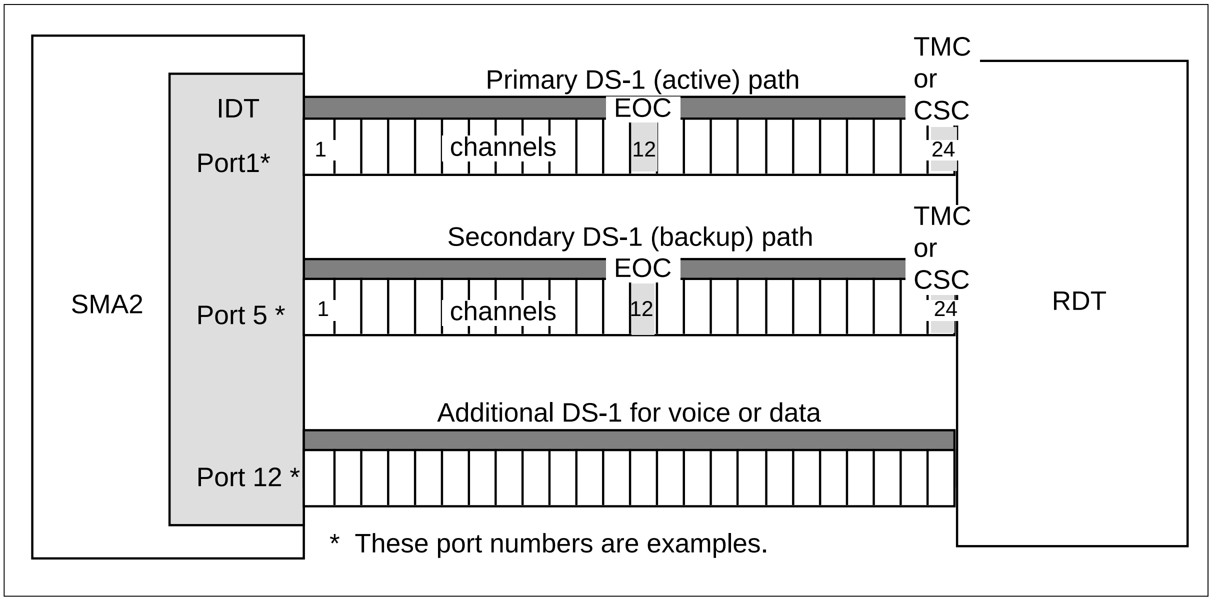
SMA2 to S/DMS AccessNode path protection switching

For each IDT to RFT connection, a dedicated CSC and EOC is present on two links. Only one EOC and CSC messaging path can be active on the two links. The SMA2 reserves inactive EOC and CSC messaging paths for backup. An EOC message path can be active on one link and the CSC message path can be active on the other link. The EOC and CSC can also be active on the same link.

The configuration of the SMA2 and the datafill in the associated tables determines the application of path protection switching. The first two link assignments in table RDTINV, field LINKTAB are the primary and secondary links that carry CSC and EOC messaging.

The TMC or CSC and EOC path protection appear in the following figure.

Figure 3-12 DS-1 control channels



Manual path protection switching control

From the MAP terminal, operating company personnel can control path protection switching with the following procedures:

- initiate a protection switch for the EOC and the CSC or TMC channel
- initiate a forced protection switch for the TMC, CSC, or the EOC channel
- prevent a standby EOC, TMC, or CSC path to becoming active
- allow a standby EOC, TMC, or CSC to become active

Automatic path protection switching

The DS-1 links between the SMA2 and a generic RDT contain primary and secondary TMCs and EOCs. The DS-1 links between the SMA2 and the S/DMS AccessNode contain primary and secondary CSCs and EOCs. If an active CSC, TMC, or EOC fails, an automatic switch to the protection channel occurs.

A protection switch occurs on the CSC, TMC, or EOC during the following conditions:

- failures detected from Q.921 protocol like failure to maintain multiple-frame operation (like when the message frame retransmissions N200 LAPD counter is exceeded)
- the system receives a switch message from the computing module through manual interruption
- the system receives a switch message from the RDT

Manual and automatic protection switching limits

The following limits apply to manual and automatic protection switching:

- If you do not allow a path to become active and that path is active, you do not cause a protection switch.
- When you inhibit a path, you cannot automatically or manually switch to the path.
- When you inhibit a path, you cannot initiate a forced switch to that path.

Communication protocols

The RDT and RFT communicate with the DMS SuperNode over DS-1 links that terminate on the SMA2. To provide subscriber services from an RDT and to support communication between the SMA2 and the RDT, the RDT and RFT use the following protocols:

- Q.921 CCITT link access procedure on the D-channel (LAPD)
- Q.931 CCITT Digital Network Access
- EOC communication protocol
- DS30 protocol

Q.921 CCITT LAPD protocol

The Q.921 LAPD protocol performs the following functions:

- establishes data link communications between an integrated digital terminal (IDT) and an RDT
- transmits information that a higher layer protocol sends
- receives information for delivery to a higher layer protocol

The Q.921 protocol transmits the following messages:

- time-slot management channel (TMC) messages for RDTs
- common signal channel (CSC) messages for RFTs
- embedded operations channel (EOC) messages

The user can configure Q.921 protocol parameters in table RDTINV. To change the LAPD parameters, the user must change the two parameters on both ends (RDT and DMS) at the same time. These LAPD parameters entered in table RDTINV appear in the following table.

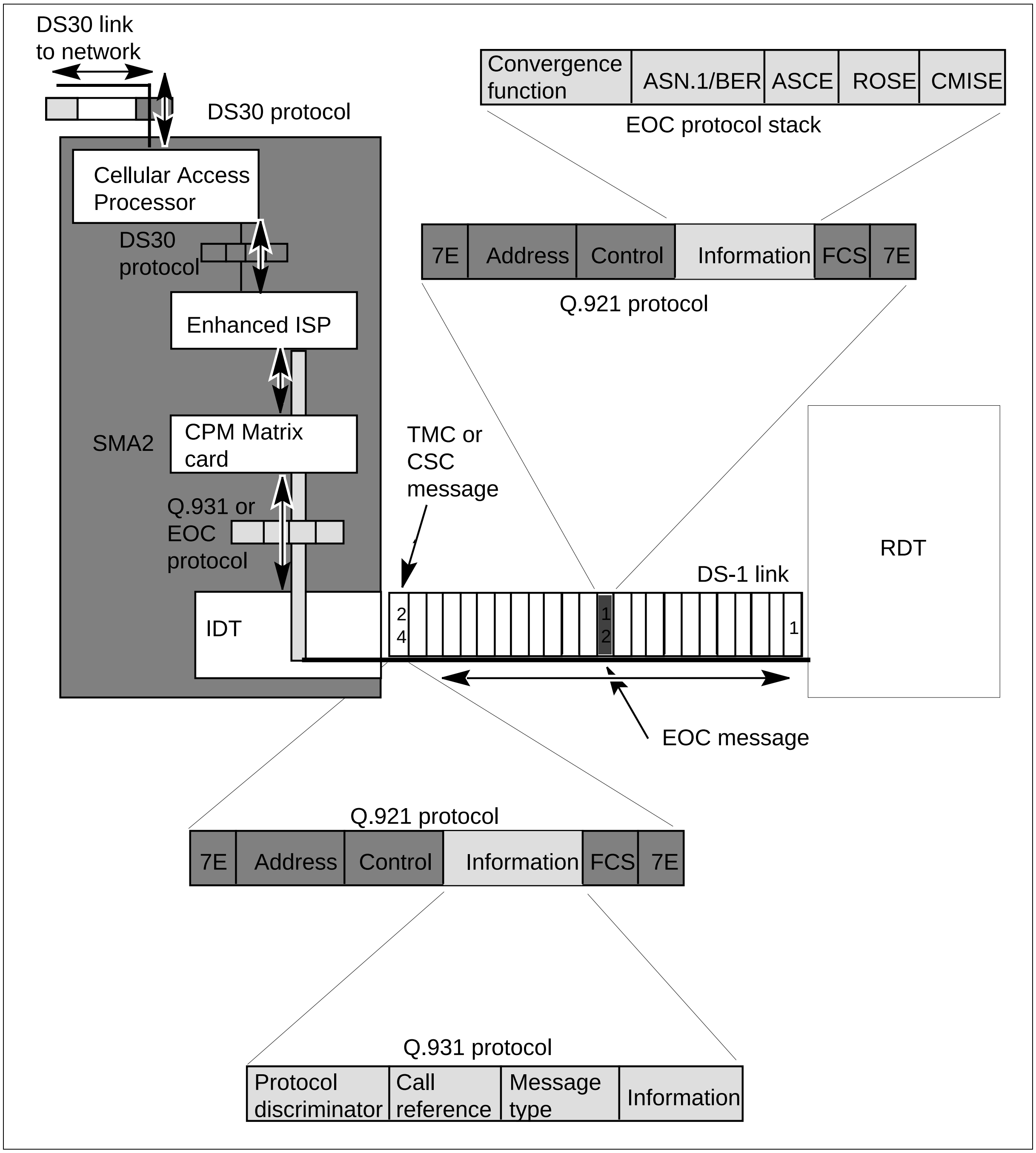
Table 3-1 Table RDTINV LAPD parameters

Parameter	Description
Maximum number of unacknowledged frames (K)	This is the maximum number of remaining unacknowledged message frames that can be sent between the IDT and the RDT. This parameter adjusts the LAPD window size.
Maximum number of retransmissions (N200)	This is the maximum number of message frame retransmissions allowed.
Maximum number of octets in one frame (N201)	This is the maximum number of octets allowed in the information field of a message frame.
Maximum time to wait for acknowledgement for one frame (T200)	This is the maximum length of time in ms a data link layer entity waits for acknowledgement (time-out) of a transmitted message frame.
Period of inactivity on data link (T203)	This is the maximum time in seconds allowed without an exchange of message frames.

Q.931 CCITT protocol

The Q.931 protocol communicates call setup, call take-down, and call monitoring information between the integrated digital terminal (IDT) on the SMA2 and the RDT or the RFT. The SMA2 must translate the Q.931 generic-based signaling messages that the RDT sends to a message format the host can process. The RDT also must translate these Q.931 messages that the SMA2 sends to a message format the host can process. Signal flow from the RDT through the SMA2 appears in the following figure.

Figure 3-13 Message channel routing in the SMA2



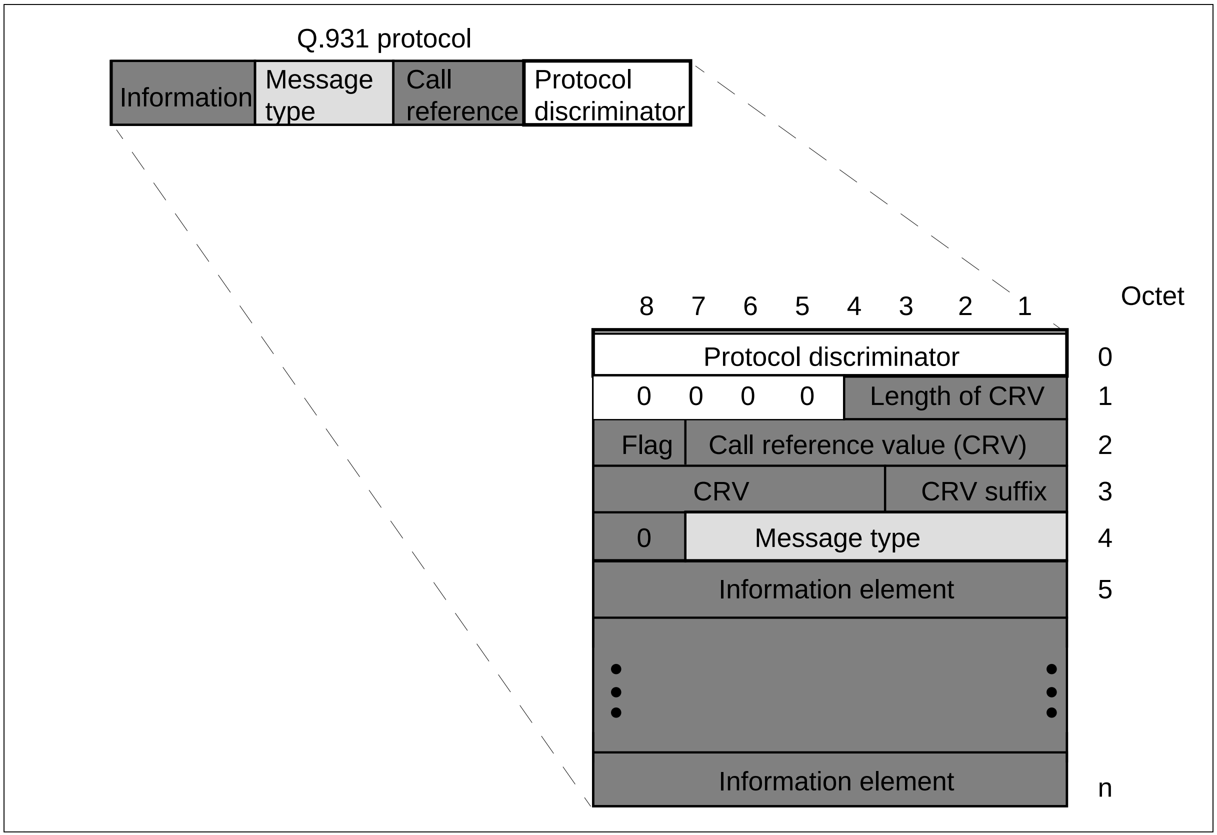
Q.931 protocol message structure

The Q.931 protocol message has a specified structure. Each message contains the following components in the order listed:

- protocol discriminator
- call reference
- message type
- information elements

For some messages, the information element is optional. The Q.931 message structure appears in the following figure.

Figure 3-14 Q.931 protocol message structure



Protocol discriminator The protocol discriminator is the first part of a message. The protocol identifier identifies the type of message. The following bit sequence identifies a Q.931 protocol message: 01001111.

Call reference The call reference is the second part of a message. Call reference identifies the line termination where the message applies. For ISDN, call reference identifies the basic rate access (BRA) B-channel termination.

Call reference length value is 2 octets which allows 4095 line terminations.

The call reference flag identifies the message originator. The message originator sets this flag to a value of 0. The destination side sets this flag to a value of 1.

The call reference value, bits 1 to 7 of octet 2 and bits 4 to 8 of octet 3, identifies the line termination.

The call reference suffix supports ISDN BRA line terminations. A suffix of 000 indicates a line termination of only one channel. A suffix of 001 indicates a line termination associated with a B1 channel. A suffix of 010 indicates a line termination associated with a B2 channel.

Message type The message type is the third part of a message. Message type identifies the type of Q.931 protocol message that follows. Each message has a specified bit assignment.

The two groups of messages for time slot assignment are messages for call establishment and messages for call take-down or disestablishment.

The Q.931 protocol message types with the specific message type identifiers appear in the following list. Message use in the TMC or CSC also appears in the following list:

Table 3-2 Q.931 protocol message types and identifiers (Sheet 1 of 2)

Message type	Specific identifier	Bit sequence	Applicability
Establishment message	Call proceeding	00000010	TMC and CSC
	Alerting	00000001	CSC
	Setup	00000101	CSC
	Setup acknowledge	00001101	CSC
Disestablishment messages	Disconnect	01000101	TMC and CSC
	Release	01001101	TMC and CSC
	Release complete	01011010	TMC and CSC
Messages for signaling	Connect	00000111	TMC and CSC
	Information	01111011	TMC and CSC
	Notify	01101110	CSC

Table 3-2 Q.931 protocol message types and identifiers (Sheet 2 of 2)

Message type	Specific identifier	Bit sequence	Applicability
Messages for management	Status	01110101	TMC and CSC
	Status inquiry	01110101	TMC and CSC
Q.931 messages used by ISDN	Setup	00000101	TMC and CSC
	Connect	00000111	TMC and CSC
	Status	01110101	TMC and CSC
	Audit		TMC and CSC
	Disconnect	01000101	TMC and CSC
	Release	01001101	TMC and CSC
	Release complete	01011010	TMC and CSC

Information element The information element is the last, and an optional, part of a Q.931 message.

Each information element has a specified structure. The only structural element that each information element has in common is the information element identifier.

The names and functions of Q.931 message information elements applicable to TMC and CSC appear in the following table:

Table 3-3 Q.931 message information element names and functions (Sheet 1 of 3)

Message element name	Function	Applicability
Bearer ability	Indicates information transfer ability, mode, and rate	TMC and CSC
Call state	Indicates the following RDT or IDT call states: • null • call initiated • call present • connect request • call active • disconnect indication • release request • permanent signal	TMC and CSC
Cause	Indicates reason for certain messages and provides diagnostic information	TMC and CSC
Channel identification	Identifies a time slot in the interface that the Q.931 message controls	TMC and CSC
Keypad facility	Indicates signaling inputs that normally address information to the user terminal	CSC See note

Note: The information elements that apply only to CSC indicate additional call processing information required to monitor a call. The information elements also contain information required to establish calls other than POTS calls.

Table 3-3 Q.931 message information element names and functions (Sheet 2 of 3)

Message element name	Function	Applicability
Notification indicator	Indicates the following line termination signaling information: • timed battery reversal • reverse battery • normal battery • negative loop mode • ground start mode • positive loop mode • timed negative coin check • timed positive coin check • timed negative coin control • timed positive coin control • coin ground • tip party ground • ring party • activate/deactivate message waiting lamp (Meridian Digital Centrex [MDC] 500/2500 sets only)	CSC See note
Note: The information elements that apply only to CSC indicate additional call processing information required to monitor a call. The information elements also contain information required to establish calls other than POTS calls.		

Table 3-3 Q.931 message information element names and functions (Sheet 3 of 3)

Message element name	Function	Applicability
Signal	Indicates the following alerting information: • negative R ringing (POTS) • reminder ring • specific pattern A • specific pattern B • specific pattern C • specific pattern D • specific pattern E • specific pattern F • alerting off • loop reverse battery alerting • silent alerting (ISDN BRA)	CSC See note
Switch hook	Indicates when a customer goes on-hook, and when a change in on-hook or off-hook status occurs	CSC See note
Note: The information elements that apply only to CSC indicate additional call processing information required to monitor a call. The information elements also contain information required to establish calls other than POTS calls.		

Q.931 message descriptions

A description of each of the Q.931 messages appears in the following table. The table contains a list of the information elements that each message contains and the applicability of the message by message type.

Table 3-4 Q.931 message descriptions (Sheet 1 of 3)

Q.931 message	Description	Information element	Applicability
Alerting	The RDT sends this message to the IDT to indicate that alerting to the called party began, and the time switch connection occurred.	This message contains the channel identification information element. Channel identification applies only if the alerting message is the first response to a setup message.	CSC
Call proceeding	The IDT sends this message to the RDT to respond to a setup message for a loop reverse battery signaling call.	This message contains the channel identification information element.	TMC and CSC
Connect	The RDT sends this message to the IDT to indicate a time slot connected and the terminating party answered the call. The IDT also sends this message to the RDT when digit collection completes to indicate a complete network address is received. The RDT also sends this message to respond to a setup message with an alerting OFF pattern in the signal element.	This condition occurs for ISDN, when the message contains the channel identification information element.	TMC and CSC
Disconnect	The IDT sends this message to the RDT when the IDT determines the call must clear. The RDT also sends this message to the IDT to indicate the subscriber is on-hook.	This message contains the cause information element.	TMC and CSC
Information	The RDT or the IDT sends this message to indicate addressing information or feature activation or both, and signaling information.	This message contains the following information elements: keypad facility, switch hook, and signal.	TMC and CSC

Table 3-4 Q.931 message descriptions (Sheet 2 of 3)

Q.931 message	Description	Information element	Applicability
Notify	The RDT or the IDT sends this message to indicate signaling events on the customer line, for example, battery reversal. The RDT and the IDT also send this message to perform coin functions.	This message contains the notification indicator information element.	CSC
Release Release complete	The RDT or the IDT sends these messages to indicate that the equipment that sends the message disconnected the time slot. This same equipment attempts to release all resources associated with the call. The equipment that receives the message must release the time switch connection and all resources associated with the call.	These messages contain the cause information element.	TMC and CSC
Release resources	The IDT sends this message to the RDT to request the receiver of the message break the time switch connection. The message also requests that the same receiver release all resources associated with the call.	This message contains the cause and signal information elements.	CSC
Setup	The RDT or the IDT sends this message to initiate the start of a call. From the IDT, this message contains the channel identification, keypad facility, and signal information elements.	From the RDT, this message contains only the bearer ability information element.	TMC
Setup acknowledge	The IDT sends this message to respond to a setup message. This message indicates that a connection occurred through the improved time switch for the call. This message also informs the RDT of the port and channel that the system will use for the call.	This message contains the channel identification and notification indicator information elements.	CSC

Table 3-4 Q.931 message descriptions (Sheet 3 of 3)

Q.931 message	Description	Information element	Applicability
Status	The IDT or the RDT sends this message when the IDT or RDT receives a message that was not planned. The IDT or the RDT also sends this message when the IDT or RDT reports other conditions of the call.	This message contains the cause and call state information elements.	TMC and CSC
Status inquiry	The IDT or the RDT sends this message at any time to request a Status message from the receiver.	This message does not contain information elements.	TMC and CSC

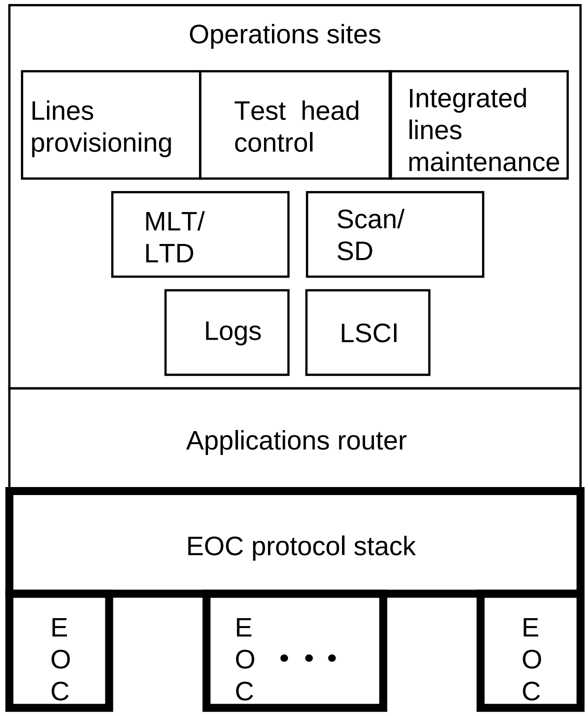
EOC communication protocol

The RDT and the SMA2 communicate through the EOC communications channel. This communication occurs over a dedicated DS0 with the Q.921 LAPD protocol used on ISDN D-channels. Operations messages transmit between the DMS SuperNode switch and the RDT. The EOC communications channel uses the operations gateway (OGW) software to provide the protocol translation and routing abilities required to connect RDTs to operations sites. The OGW contains the following three elements:

- EOC protocol stack—provides the communications function
- applications router—provides the communications function
- operation sites—are the users of this communication function

These elements appear in the following table and are descriced in the text that follows.

Figure 3-15 OGW software functional elements



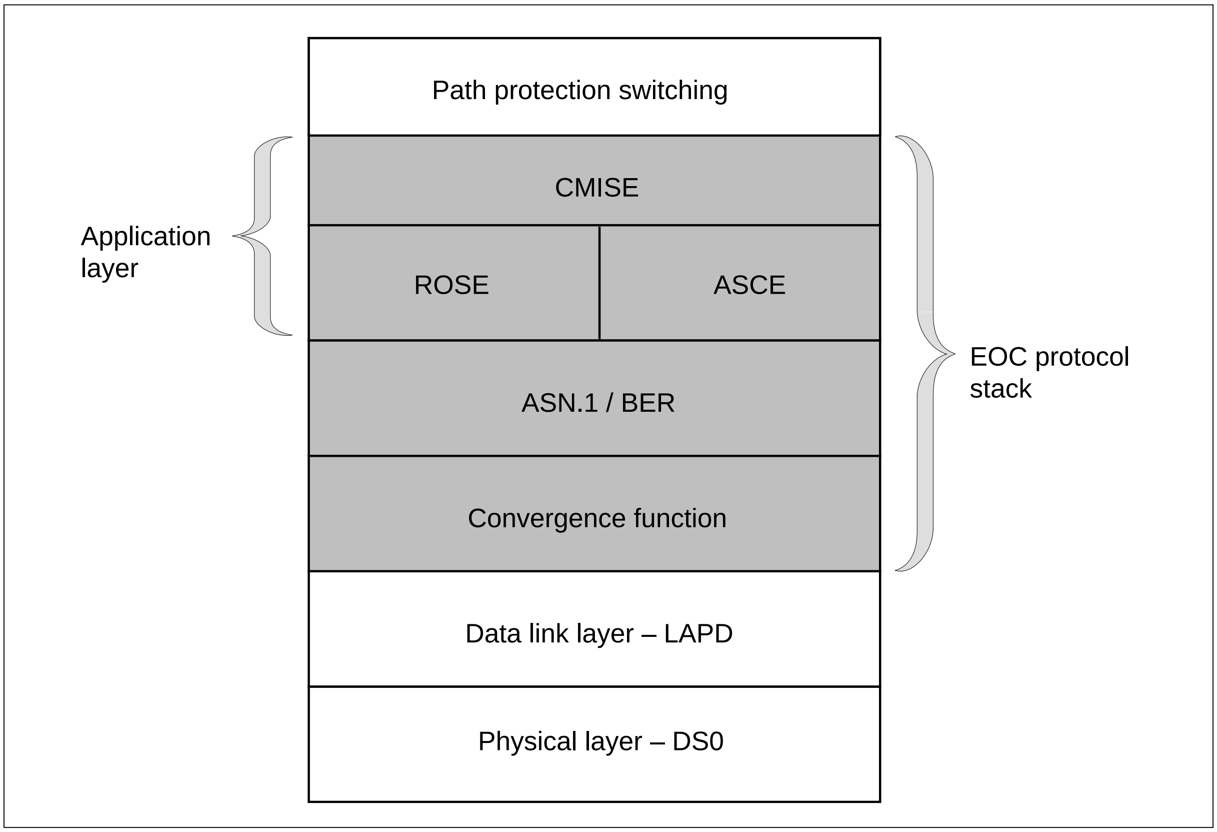
LSCI = local switch craft interface
LTC = line trunk controller
MLT = mechanized loop test
SD = signal distribution

The EOC communication protocol contains the following four functional areas:

- physical layer, which is the DS-0 channel on the first DS-1 link between the local digital switch (LDS) and the RDT
- data link layer, which uses LAPD protocol for processing between the LDS and the RDT
- EOC protocol stack, which is a 3-layer communications protocol stack to communicate OAM&P information between the IDT and the SMA2
- path protection switching, which handles redundant messaging paths and the mechanism of switching activity between the paths and activity

These four functional areas perform common management information service element (CMISE) message transfers between the LDS software and the RDT. The following figure illustrates the relationship between these EOC communication protocol functional areas.

Figure 3-16 EOC communication protocol functional areas



To encode and decode a line test EOC messages occurs in the SMA2. To encode and decode in the SMA2 instead of the computing module (CM) improves real time performance for line testing. The following components are coded and decoded of line test EOC messages:

- metallic test access unit
- test response circuit
- metallic test access path termination
- analog line termination

EOC protocol stack

The EOC protocol stack is a 3-layer communications protocol stack. The EOC protocol stack communicates operations, administration, maintenance, and provisioning information between the IDT and the SMA2 and the RDT over the EOC communications channel. The EOC protocol stack appears in the figure EOC communication protocol functional areas and contains the following three layers:

- convergence function layer—divides and assembles application protocol data units (APDU). The convergence function layer maps between the services of the application and data link layers.
- application layer—contains the following functionalities to allow two application processes to communicate:
  - common management information services (CMISE), which exchanges information and commands to manage the SMA system
  - remote operations service element (ROSE), which supports communication between communicating application users
  - association control services element (ASCE), which controls application associations
- abstract syntax notation one (ASN.1) layer—uses basic encoding rules (BER), parses and formats messages from functional subcomponents

Applications router

The application router provides the internal connection between the operations sites and the EOC protocol stack.

Operations sites

Operations sites are DMS SuperNode applications or external devices that provide end point of operations messages between the SMA2 and the RDT. These sites use the services of the EOC protocol stack to communicate over the EOC with the RDT.

The IDT software sends messages over the EOC to allow operations sites to perform OAM&P tasks. The following applications are external to IDT software and can communicate with IDT software:

- line provisioning, which controls the datafill of subscriber services
- line maintenance, which allows controlling and monitoring subscriber line states from the MAP terminal, and permits diagnostic testing of the lines
- logs and alarms, which allow the system to report alarms and events at the MAP terminal and external operating systems
- node maintenance, which provides for the control of voice and data channels between the CM and the SMA2 and RDT

The IDT software communicates with an RDT over an LAPD channel.

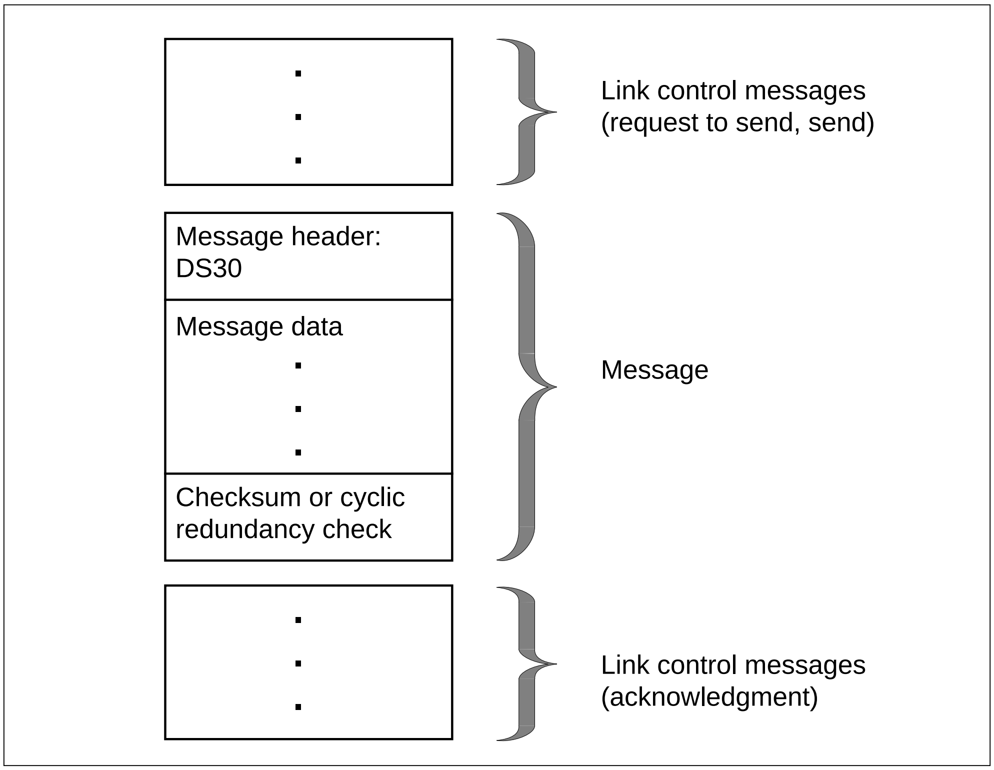
DS30 protocol

The DS30 protocol is a half-duplex protocol used on DS30 or DS512 links and includes a message checksum for error detection.

The DS30 protocol is a form of handshaking protocol. The system uses handshaking protocol for message transfer between nodes. This message transfer allows the nodes to inform each other of their current ability to handle messaging.

A common form of handshaking protocol appears in the following diagram.

Figure 3-17 Handshaking protocol



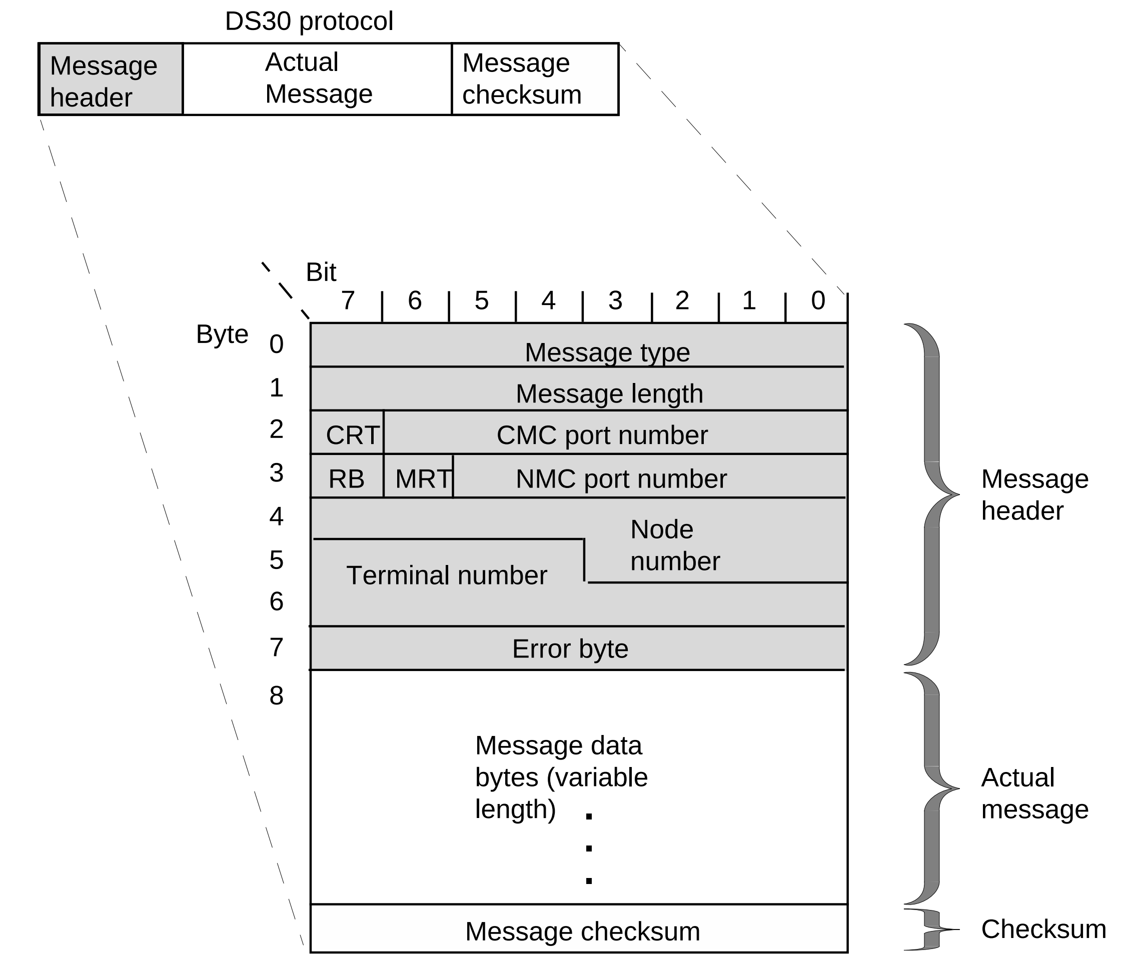
Message time-out and message checksum or CRC calculation performs message error detection. Protocol, checksum, or CRC failure can occur on an outgoing message. In this event, the node that sends the message attempts the send sequence again.

On an incoming message failure, the sending node routes the message again over a different control side (C-side) link. Hardware redundancies provide a minimum of one different path to and from a node.

The DS30 message transmits over a link, with link control messages preceding and following the message. In software terms, messaging occurs between programs in the SMA2 and programs in the CM. Many software tasks or processes communicate through messages over the DS30 links.

The format of DS30 messages appears in the next figure.

Figure 3-18 DS30 message format



CRT = Preferred message switch (MS) (0 or 1)
MRT = Preferred network module (NM) plane
RB = Reroute inhibit flag
CMC= MS port number
NMC= Network module controller

The DS30 message header is the first 8 bytes as follows:

- The first byte specifies the message type:
  - — control, which is 1 byte long
  - — start of message (SOM), for data
- The second byte specifies the total number of bytes in the message.

- The next two bytes specify the route, and contain the following fields:
  — CRT, which specifies the preferred message switch (0 or 1)
  — MRT, which specifies the preferred network plane

  The CRT and MRT fields are used for incoming messages and are set to zero for outgoing messages.
- The next three bytes contain the terminal identifier (TID), which identifies the destination node and terminal number for outgoing messages. The TID also identifies the origination node and terminal number for incoming messages.
- The last byte is the message checksum byte field, which contains a checksum over all bytes in the message. The last byte detects transmission errors.

The number of bytes in the message or data can change.

ADSI protocol

Analog Display Services Interface (ADSI) allows application software to download softkey information to customer premise equipment (CPE). The ADSI provides bi-directional communication between the DMS SuperNode switch and a CPE. The system requires the ADSI protocol to support these functions. The ADSI protocol uses standard dual-tone multifrequency (DTMF) signaling and standard modem based technology. The ADSI protocol uses DTMF signaling and standard modem based technology to transmit caller_id information from a DMS SuperNode switch to a CPE.

The SMA2 in ADSI protocol is a message transfer agent between CM and the CMR circuit card. The SMA2 and CMR act as an interface between CM application software and an ADSI compatible CPE. Any message that the system sends to the SMA2 to support ADSI goes to the CMR. The CMR sends the correct information to the CPE. The features that use the ADSI protocol are as follows:

- Visual Screen List Editing (VSLE)
- Call Logging
- Spontaneous Call Waiting Identification (SCWID)
- Deluxe Spontaneous Call Waiting Identification (DSCWID)

To support the ADSI protocol, the DMS SuperNode switch supports the following interfaces:

- the off-hook interface and protocol that TR-NWT-000030 (TR-30) defines
- the ADSI interface and protocol that TR-NWT-001273 (TR-1273) defines

The TR-1273 divides the ADSI protocol in three layers. The layers are the physical, data link, and message layers.

Physical layer

The physical layer transmits the bit streams between the DMS switch and the CPE. The DMS Supernode switch must generate a voice band CPE alerting signal, and receive standard DTMF signals from the ADSI CPE.

Data link layer

The data link layer provides data transmission between a DMS SuperNode switch and the CPE. This layer also checks for error detection and correction.

Message layer

The message layer controls the character set and data codes when data appears on the CPE.

Call processing

The SMA system performs call processing through Q.921, Q.931, and DS30 protocols. The SMA system performs CSC message signaling or TR-303 hybrid signaling.

Call processing can originate from far away users or from the RDT where calls terminate on an RDT that subtend from the SMA2. In both conditions, the SMA2 provides the translation between the Q.931 generic-based messages of the RDT and the DS30 message format that the host can process.

Call processing (RDT to IDT)

The call processing traces the call from the RDT to the DMS SuperNode switch through the IDT. The following description of call processing depends on POTS/COIN calls. The ISDN calls can be different.

Time slot request

When the originating subscriber goes off-hook, the condition causes a loop closure. Current flows in the loop and exceeds a set threshold. The RDT line card detects this current. Coin calls made from coin first equipment have loop closure only after a customer deposits a coin.

The RDT uses the TMC or CSC message channel to send a setup message to the IDT. The call state is call-initiated. This message contains the call reference and bearer ability associated with the subscriber line that is off-hook.

After the RDT sends the setup message, the RDT sets a timer. The RDT waits for a setup acknowledge or a release-complete message from the IDT. If the IDT does not respond in the specified time interval, the RDT sends the setup message again. If the IDT does not respond again, the RDT sets a delay timer.

The RDT continues to transmit setups until the IDT responds or the subscriber goes on-hook.

Channel selection

The IDT reserves an available channel for the call and sends this information back to the RDT in the setup acknowledge message.

When the IDT sends the setup acknowledge message, the IDT connects the call to the allocated channel. When the RDT receives the setup acknowledge message, the allocated channel connects to the line termination of the originating call.

When the connection occurs, the IDT sends dial tone over the connected channel. The call is now in an overlap sending state.

If channels are not available, the IDT sends a release complete message to the RDT. This message includes the reason specified in the cause information element. The IDT returns the call to a null state.

Sending addressing information   The system collects digits in two methods. The method that the system uses depends on if the subscriber loop uses dial pulse or dual-tone multifrequency dialing (DTMF).

- If the RDT receives dial pulse input, the RDT sends an information message to the IDT with this address information. The RDT uses keypad facility information elements to perform this procedure.
- If the RDT receives DTMF input, the RDT sends this information to the IDT in-band. The universal tone receiver translates this information.

The IDT in-band sends the addressing information to the computing module (CM) in the DMS SuperNode switch.

Tone generation

The CM receives the addressing information and determines that the address is a valid number. When this event occurs, the CM attempts to install a channel for the call through the network. When the CM installs a channel through the network, the IDT sends a connect message to the RDT. The call is now in an active state.

If the CM determines the addressing information is from a toll or coin line, the IDT sends a notify message to the RDT. The notification indication information element is coded as reverse battery to indicate toll diversion. When the RDT receives this message, the RDT sends reverse battery on the subscriber line.

If the CM determines that the addressing information is invalid, or cannot establish a connection through the network, the channel remains open. This condition allows the DMS SuperNode switch to provide in-band call progress information, like reorder tone, to the subscriber.

The message and channel supervision messaging (CSM) card (NTMX76BA) in the SMA2 generates dial tone. The matrix card (NTMX75BA) switches the tone from directions of the NTAX74AA cellular access processor (CAP) card to the correct DS-1 channel. If the called line is busy, the NTMX76BA generates a busy tone. The SMA2 sends this tone to the originating party. Originating subscribers can receive other treatments, like reorder tone and announcements. These treatments depend on conditions present at the time the caller places the call.

Call disconnection

The IDT and RDT monitor the call for new messages. In a system that has flash disabled, one or both ends can go on-hook without flash detection for 250 ms or more. In this event, the system sends a disconnect message to the far end. The disconnect message requests to release the time slot and call reference. With flash enabled, the on-hook signaling bit pattern must continue for 1200 ms or more for the IDT or RDT to send a disconnect message. At the same time, the system sets a timer at the disconnect-message end. If the IDT started call clearing, the call is now in a disconnect indication state. If the clearing started at the RDT, the state is now disconnect request.

The far end sends a release message to indicate that the system released the time slot and call reference. A timer is set at release-message end. When the other end receives the release message, the system cancels the disconnect-message end timer. The system sends a release complete message to the far end. This message indicates that both the time slot and the call reference are available.

The end that sent the disconnect message does not always receive a release message before the disconnect-message end timer expires. When this condition occurs, that end sends a release message and sets a timer. If the same end does not receive a release message before this new timer release-message end expires, the end sends a second release. The timer starts again. If the same end does not receive a release message to the second release, the system releases the call reference and time slot.

Flash detection

The flash is enabled and an off-hook subscriber can go on-hook for a maximum of 250 ms, followed by off-hook. In this event, the system treats the flash as a glitch. The call connection remains. The subscriber can go on-hook for 250 ms or 360 ms and can go off-hook before 1200 ms pass. When this condition occurs, 1200 ms from the time the subscriber first goes on-hook the system handles the sequence as a flash.

The RDT uses dial pulse and DTMF to detect a flash on lines. The RDT uses the keypad facility information element to encode the flash into an information message. The RDT sends the information message to the IDT to process while the call remains in an active state.

If the caller subscribes to call transfer or to three-way calling, the RDT sends the same information message when the RDT detects the flash. The RDT places the call in an overlap sending state to allow for additional digit collection. The message exchange to set up the second call is the same as to set up an end-to-end call. After the second party is reached and the IDT receives a second flash information message, the system transfers or bridges the call.

The RDT can also detect a flash in the overlap sending state when a subscriber activates specified features. These features do not require the presence of an established call, like call forward.

Busy service of subscriber lines

The CM can direct the SMA2 to busy a subscriber line. This action prevents call processing on the subscriber line. This action normally occurs during maintenance. An example is when the user enters a MAP command from the LTP level to test a line.

Call processing (IDT to RDT)

The call processing description that follows traces the call from the DMS SuperNode switch through the IDT to the RDT. The description depends on POTS/COIN calls. The ISDN calls can be different.

Time slot request

The IDT uses the TMC or CSC message channel to send a setup message to the RDT. The call is in a call present state. The setup message contains the call reference and bearer ability associated with the subscriber line that originated the call. The message also includes channel identification, and can include the signal information element.

After the IDT sends the setup message, the IDT sets a timer. The IDT waits for a call proceed, alert, or the release of a complete message from the the RDT. If the RDT does not respond in the specified time interval, the IDT transmits the setup message again. If the RDT does not respond again, the IDT releases the call reference and channel. The IDT sends a release complete message to the RDT with the reason specified in the cause information element. The IDT returns the call to a null state.

Network busy call treatment

If the network is busy, the NTMX76BA message and CSM card in the SMA2 generate a reorder tone to the originating party.

Channel selection

In the setup message, the IDT uses the channel identification information element to indicate the channel to be used for call connection. If the channel is not available, the RDT sends a release complete message back to the IDT.

If the channel is available, the RDT responds with an alerting message or connect message that contains a channel indication information element. The channel indication information element confirms the channel that the IDT reserves for the call.

If the called line is busy, the NTMX76BA message and CSM card in the SMA2 generates a busy tone. The SMA2 sends this tone to the originating party.

Alerting

The RDT can receive a setup message with alerting information coded into the signal information element. When this condition occurs, the RDT returns the alerting message to the IDT. An alerting message indicates that the system alerted the called party. The call is in the call received state. While a called line is ringing, the originator receives a ringback tone.

The SMA2 supports the single-party alert cadence. Ringing abilities include single-party 20 Hz ringing and specific ringing for Meridian Digital Centrex (MDC).

The following table identifies the SMA2-supported ringing cadences.

Table 3-5 SMA2-supported ringing cadences

	Ringing cadences (in seconds)					
Ring types	**On**	**Off**	**On**	**Off**	**On**	**Off**
single party	2.0	4.0				
distinctive 1	1.5	4.5				
distinctive 2	1.5	0.5	1.5	1.5		
distinctive 3	1.5	0.5	0.5	3.5		
distinctive 4	1.5	0.5	0.5	0.5	0.5	2.5
distinctive 5	1.5	0.5	0.5	0.5	1.0	2.0
distinctive 6	1.0	0.5	1.0	3.5		
distinctive 7	0.5	0.5	0.5	0.5	1.0	3.0
distinctive 8	0.5	0.5	1.0	0.5	0.5	3.0

When the called subscriber goes off-hook, the RDT detects the change in the line current. The RDT sends a connect message to the IDT, which trips the ringing. The call is now in a call active state.

On-hook transmission

On-hook transmission allows the network to transmit information like calling number delivery (CND) to the called subscriber. Calling number delivery is an example of an on-hook transmission service that occurs at the same time as a terminating call. Other on-hook transmission services, like message delivery, do not occur at the same time as call terminations.

Custom local area signaling service (CLASS) calling number delivery (CND) If the RDT receives a setup message, the RDT responds with an alerting message. The call is in the call received state. The system delivers the calling number during the first silent ring cycle.

When the called subscriber goes off-hook, the RDT detects the change in the line current and sends a connect message to the IDT. This action triggers the ringing. The call is now in a call active state.

Loss padding

Padding or attenuation of pulse code modulation (PCM) samples occurs in the ring/pad card. Padding or attenuation of PCM are introduced to handle expected signal loss through the network. The CM directs the SMA2 to apply padding to specific lines. The NTMX75BA matrix card in the SMA2 provides the padding and the enhanced time switch circuit card. This NTMX75BA matrix card provides these components under NTAX74AA Cellular Access Processor (CAP) circuit card direction. This card also introduces the padding to correct channels.

Call disconnection

The IDT and RDT monitor the call for new messages. If flash is disabled and one or both ends go on-hook for 250 ms or more, the following event occurs. The IDT and RDT send a disconnect message to the far end to request the release of time slot and call reference.

With flash enabled, the on-hook signaling bit pattern must continue for 1200 ms or more for the IDT or RDT to send a disconnect message. The timer is set at the disconnect-message end at the same time. If the IDT started call clearing, the call is now in a disconnect indication state. If the clearing started at the RDT, the state is now a disconnect request.

The far end sends a release message that indicates that the system released the time slot and call reference. the system sets a timer at the release-message end. When the release-message end receives the release message, the system cancels the disconnect-message end timer. That end sends a release complete message to the other end. The message indicates both the time slot and the call reference are available.

The end that sent the disconnect message does not always receive a release message before the disconnect-message end timer expires. When this condition occurs, that end sends a release message and sets a timer. If the same end does not receive a release message before this new timer release-message end expires, the end sends a second release. The timer starts again. If the same end does not receive a release message to the second release, the system releases the call reference and time slot.

Flash detection

Flash is enabled and an off-hook subscriber can go on-hook for less than 250 ms followed by off-hook. In this event, the system treats the flash as a glitch. The call connection remains. The subscriber can go on-hook for a minimum of 360 ms and can go off-hook before 1200 ms pass. When this condition occurs, the system handles the sequence as a flash 1200 ms from the time the subscriber first goes on-hook.

The IDT uses dial pulse and DTMF to detect and process a flash on the lines. This action occurs while the call remains in an active state.

If the caller subscribed to call transfer or to three-way calling, the IDT places the call in an overlap sending state. This condition allows additional digit collection. The message exchange to establish the second call is the same as to establish an end-to-end call. After the second party is reached and the IDT receives a second flash, the system transfers or bridges the call.

Busy service of subscriber lines

The CM can direct the SMA2 to have an RDT busy a subscriber line. This action prevents call processing on the subscriber line. This action normally occurs during maintenance. An example is when you enter a MAP command from the LTP level to test a line.

Call processing coin operation

Coin commands

This procedure uses the following commands:

- coin collect
- coin return
- coin presence
- coin partial presence (used in local coin overtime)

Coin collect   This command directs a coin first (CCF) or coin dial tone first (CDF) phone to collect money deposited for a telephone call. When coins are first deposited, the coins go to the hopper. The hopper is a temporary holding location to store money before coin collect or coin return. When the system receives the coin collect command, the coins drop from the hopper in to the coin vault.

On coin telephones that require a flat rate, the coin telephone collects the coins when the call completes. On coin telephones that connect to a switching system that supports local coin overtime (LCO), the coin telephone collects the coins every few minutes.

Coin return After the calling party deposits money, a coin return command directs the coin telephone to return the deposited money. This condition occurs when the calling party on a coin telephone hangs up before the terminating party answers.

When channel reassignment occurs and the system cannot assign the call again, the system drops the call for a higher priority call. If a call cannot connect because all channels are busy, the system sends a coin return message.

Coin presence This command directs CDF telephones to check for an initial deposit or stuck coins. This command is also for CCF telephones to check for stuck coins.

An operator monitors tones that the telephone station generates, according to coins deposited to process long distance calls on CCF and CDF telephones.

Coin partial presence This command is used with CCF and CDF telephones when the system supports LCO. The coin partial presence test checks for coins deposited after the initial deposit.

Battery commands

In addition to the coin commands, the CM can send or request the RDT to send reverse battery and normal battery.

Reverse battery All types of coin telephones use this command. This command prevents communication between the calling and called parties. This command can also perform the following functions:

- reset the telephone totalizer, an electromechanical device that totals first rate deposits
- prepare a telephone station for calling
- signal coin denominations to the operator

Normal battery This command allows the talking state. This command resets the totalizer on some CDF and CCF telephones to reset the totalizer.

Subscriber line signaling

The SMA2 can use in-band tone multifrequency analog signaling on the subscriber lines that subtend the RDT. When this condition occurs, the SMA2 transports these coin commands.

Changes to the electrical condition on the loop (metallic signaling) can perform signaling on the subscriber lines that subtend the RDT. When this condition occurs, the IDT must translate these coin commands to notify messages. These messages contain the notification indicator information element.

When the RDT receives the notify messages from the IDT, the RDT applies voltages or opens to the tip and ring of the line. These electrical signals applied to the tips and rings of coin telephone lines cause the coin station to initiate actions. These actions include to return a deposit to a station user, or collect a deposit.

Coin operation limits and interactions   The following limit applies to coin functions. Coin telephone calls, like all calls, cannot initiate during a warm switch of activity (SWACT) or call processing (CP) switchover. This condition cannot occur because messaging between the SMA2 and RDT is inhibited.

> ***Note 1:*** If a DS-1 link fails, the system causes channel reassignment. A coin line call can occupy a channel on the failed link. The system cannot assign the call again. When this condition occurs, the SMA2 sends a coin return message to the RDT. The telephone station user must receive deposited money.
>
> ***Note 2:*** When a warm SWACT occurs, the system cannot add any call that entered the talking state to the records of the newly active unit. The system drops the call, and the system returns the deposited money to the telephone station user. This condition occurs after the user originates again and hangs up.

SMA2 service capabilities

This section describes the services the SMA2 supports. Only switched services terminate on the SMA2. The DS-1 links connected in tandem at the RDT direct nonswitched and nonlocal switched services.

Plain ordinary telephone service (POTS)

The SMA2 supports plain ordinary telephone service (POTS) single-party flat rate and single party multi-rate.

Coin operation service

The SMA2 supports the following three types of coin calls:

- coin first (CCF)
- coin dial-tone first (CDF)
- coin semi-post pay (CSP) (for S/DMS AccessNode)

Coin first

Coin first (CCF) service requires the pay station telephone to be off-hook, and the calling party to deposit the money. The DMS SuperNode switch can only supply the station dial tone after this condition occurs.

For CCF telephones, the calling party must deposit the correct coinage before the RDT detects the off-hook.

The IDT sends a notify message with timed positive coin check information coded in the notification indicator information element. When the RDT receives this message, the RDT signals the coin station to check for the first coin deposit.

The IDT sends a notify message with ground start mode information coded in the notification indicator information element to the RDT. When the RDT receives this message, the RDT sends reverse battery on the line. This action causes the coin station to home the coin station totalizer. The coin station reports on the coins the coin station collected.

If the calling party deposited the correct coins, the RDT sends the IDT a notify message. This message contains coin ground information in the notification indicator information element. This information informs the CM that the calling party deposited a coin.

The IDT sends an information message with negative ring information coded in the signal information element to the RDT. This message allows the calling party in the coin station to receive ring-back. If the called party is on the telephone, the IDT sends a disconnect message. The IDT also sends an information message to allow ring-back.

If the call is a number for where toll is not applied, the IDT sends a notify message. This message contains timed negative coin control information coded in the notification indicator information element. When the RDT receives this message, the RDT signals the coin station to return the deposited coins.

For toll calls, additional coin functions do not occur until the CCF line goes on-hook. When the call completes, the IDT sends a notify message. The message contains timed positive coin control information coded in the notification indicator information element. When the RDT receives this message, the RDT signals the coin station to collect coins.

Coin dial-tone first

For coin dial-tone first (CDF) service, the DMS SuperNode switch provides dial tone when an off-hook condition occurs at the station. The call continues if the calling party deposits the correct amount of money at the end of dialing.

When a call occurs from a CDF telephone, the CM requests information about a coin deposit. The IDT sends a notify message that contains a coin presence request in the notification indicator information element. When the calling party deposits a coin, the RDT responds to the request. The RDT sends the IDT a notify message that contains coin ground information in the notification indicator information element. This information informs the CM that a calling party deposited a coin.

If the call is to a number where toll is not applied, the IDT sends a notify message. This message contains timed negative coin control information coded in the notification indicator information element. When the RDT receives this message, the RDT signals the coin station to return the deposited coins.

When the call completes, the IDT sends a notify message. The message contains timed positive coin control information coded in the notification indicator information element. When the RDT receives this message, the RDT signals the coin station to collect coins.

Coin semi-postpay

For coin semi-postpay (CSP) service, the DMS SuperNode switch provides dial tone and allows dialing. The DMS SuperNode switch also connects the station caller with the called party. The DMS SuperNode switch does not allow talking until the caller deposits money.

The IDT sends a notify message with positive loop mode information coded in the notification indicator information element to the RDT. When the RDT receives this message, the RDT sends reverse battery on the line. This action causes the coin station to home the coin station totalizer. This condition indicates that the coin station reports on the coins that the coin station collected.

The CSP lines do not use coin collect, coin return, or coin presence tests. The CSP lines do use reverse battery. When applied, reverse battery allows an originator to hear the terminating party. The terminating party cannot hear the originator.

If the caller deposited the correct coins, the system applies normal battery to allow the called party to be heard.

When a channel occurs, the system sends dial tone and collects digits. The CM of the DMS SuperNode switch sends commands to the RDT to control and monitor the collection of coins.

Coin call functionality

The system uses several coin call messages when processing coin calls from CCF, CDF, and CSP telephones. CCF telephones use ground start and CDF and CSP (applies to S/DMS AccessNode only) use loop start. Ground start and loop start messages are as follows:

- Ground start telephones require an initial deposit before the system provides dial tone.
- Loop start telephones let the caller receive dial tone without an initial deposit. These telephones do not require a deposit. Loop start telephones allow the caller to dial special assistance calls (n11 calls, like 911 and 411), inward wide area telephone service (INWATS), and operator assistance calls. These calls do not charge the caller. The CCF telephones make these calls without charge, but the caller must first deposit a coin. When the calls complete, the system returns the coin.

Message waiting indicator

The message waiting indicator allows subscribers to have several messages stored against a station in the DMS SuperNode switch or at a message center. When the system queues a message against the station of a subscriber, the system activates the message waiting indicator.

Message waiting lamp

The message waiting lamp feature is available only on S/DMS AccessNode. This feature indicates that action must respond to the request of another station. The request is message waiting or call request. To activate the message waiting lamp, the IDT delivers a notify message. This message contains the notification indicator element coded to Turn On Lamp to the RDT. To deactivate the message waiting lamp, the IDT delivers a notify message. This message contains the notification indicator element encoded to Turn Off Lamp to the RDT.

Meridian business set messaging

The Meridian business set (MBS) describes different Nortel-proprietary customer premises equipment models supporting features. These features include hands-free communication, volume control, and key-driven feature activation. The *DMS-100 Business Set Feature Description and Operation* describes the MBS feature service.

MBS on AccessNode

The MBS is a Nortel product that normally connects to a line concentrating module (LCM). The DMS SuperNode switch and MBS communicate through a proprietary protocol when MBS sets connect to an AccessNode.

A protocol discriminator #4F (hex) and many message types indicate nonproprietary messages that the CSC uses. To allow proprietary communication over the CSC for an MBS, the system uses a different protocol discriminator. This protocol discriminator is #FA. When a message is proprietary, the message type indicates the type of service offered. The message type for an MBS is #7F.

This proprietary protocol discriminator and message type allows the SMA2 to support MBS communication. This MBS communication is the same when the MBS is configured off an LCM. The MBS supports the same feature set.

MBS on MVI RDT

The MBS on MVI RDT supports the same Q.931 messages as the AccessNode. The EBS messages use the #4F (hex) message to identify EBS messages from standard TR-303 messages. The system activates processing specific to the proprietary MBS protocol.

The MBS lines are provisioned on a TR-303 RDT. This condition occurs because the default values for TMC LAPD parameters can support a proprietary EBS INFORMATION message. This message is to send over the TMC for MBS. The electronic business set (EBS) information message allows the RDT to pass signaling and feature-related information between the DMS and MBS.

The TMC signaling handles proprietary MBS call-related messaging. The MBS sets require a clear channel. The system disables all ABCD bit inband signaling for MBS channels.

Universal tone receiver services

The operating company must provision a universal tone receiver (UTR) circuit pack (NT6X92BB) in slots 6 and 22 in the SMA2. The operating company can provision additional UTRs in slots 7 and 21. The UTR card provides a dedicated channel for digit collection during call setup. This action unloads the network of some call setup functions. Enter data for the UTR card in table LTCINV to activate the UTR feature on the SMA2. Refer to the *Translations Reference Manual* for additional information.

Direct Outward Dial (DOD)

This feature allows the private branch exchange (PBX) or Centrex station user to access the exchange network without attendant assistance.

Custom local area signaling service

The SMA2 subsystem supports CLASS features when the optional CMR card is provisioned. Calling number delivery (CND) is a CLASS feature. This feature allows single-party subscribers and Meridian Digital Centrex (MDC) customers to receive information on the call of the incoming party on the customer premises equipment (CPE). This information includes the number, time, and date of call of the incoming party.

If the operating company requires that lines off the RDT have CND, note the following requirements:

- A CMR card (NT6X78AB) must be provisioned in the SMA2. This card transmits the CND data.
- The CMR card must be entered in table LTCINV. Refer to the *Translations Reference Manual* for more information.

Meridian Digital Centrex (MDC) features on 500/2500 sets and attendant consoles

The SMA2 configuration supports all current MDC features. The SMA2 does not support trunks. The MDC features that require trunks cannot terminate on the SMA2.

Multiple appearance directory number (MADN) feature

The SMA2 supports the feature for the multiple appearance directory number (MADN). The MADN feature associates a single directory number to a group of line appearances in a customer group. The following MADN arrangements can occur:

- Multiple call arrangement (MCA) allows each group member to be active with different group members.
- Single call arrangement (SCA) allows only one member in a group to be active at a given time.
- Multi-bridged arrangement (MBA) allows only one call to be active in a group at a given time. The MBA arrangement allows other group members to bridge to the call.
- Single bridged arrangement (SBA) allows one call to be set up with an external party. The SBA arrangement allows one other member to bridge to the call.
- Extension bridging (EXB) allows one call to be set up with an external party. The EXB arrangement allows another group member to bridge to the call for a three-way conference call.

MADN members provisioning The following table provides the MADN members provisioning rules for the SMA2 with an S/DMS AccessNode or AccessNode Express.

Table 3-6 SMA2 to S/DMS AccessNode/AccessNode Express MADN members provisioning rules

Parameter	Value	Meaning
Switch average members for each MADN group	4	The engineering guideline for the total number of MADN members or total number of MADN groups on a DMS SuperNode switch.
Maximum number MADN members/group assigned for each S/DMS AccessNode/AccessNode Express	16	The engineering limit for the maximum number of MADN members in a single MADN group on an AccessNode/AccessNode Express shelf
Maximum number MADN members/group assigned for each S/DMS AccessNode/AccessNode Express	16	The limit for how many MADN members in a single group that a group on an AccessNode/AccessNode Express can have assigned.
Maximum number MADN members/group assigned for each SMA2	16	This parameter is an engineering guideline. This guideline specifies the maximum number of members in a single MADN group that are lines off one or more AccessNode/AccessNode Express on the same SMA2.
Maximum number MADN members/group assigned for each group	32	This parameter is the member limit that any single MADN group can have assigned.

Note 1: Enter the maximum number of MADN members assigned for each group in table OFCENG in field MAX_MADN_MEMBERS_PER_LSG.

Note 2: For information about the traffic capacity of the AccessNode/AccessNode Express, please refer to *Traffic and Bandwidth Engineering Information*, 323-3001-152, chapter “Traffic engineering software tool."

Off-premise extension (bridged service)

The SMA2 configuration uses the MADN feature to support a connection between a remote extension station to a main station line.

Private branch exchange (PBX) central office access

The SMA2 configuration supports the connection of a PBX to a central office that normally serves the PBX location. A station can receive calls through the attendant. The attendant directs the call to a station.

The station user can originate calls outside the PBX with two methods.

- The user can access the attendant. The attendant connects the station to an access line.
- The station user can bypass the attendant. The station user can dial an outside number directly with the direct outward dial (DOD) facility, if appropriate.

Residential services

The SMA2 supports residential services that include features normally available with plain old telephone service (POTS) and additional line features. These features were available only on MDC lines. The essential line (ELN) services feature is included.

Secretarial line

The SMA2 supports secretarial lines. A secretarial line provides an answering service when the called party cannot take calls. Called party lines are bridges to the secretarial line.

Teen service

The SMA2 supports teen service. Teen service provides multiple directory numbers for the same line. Each directory number has a distinctive ringing pattern.

Toll diversion

The SMA2 supports toll diversion. Toll diversion is a service that allows a PBX to block some station-to-station calls beyond a limited area.

Wide area telecommunications services

The SMA2 supports wide area telecommunications services (WATS). The SMA2 allows the operating company to charge a subscriber a specified number of toll calls in a specified geographical area. The operating company charges the subscriber a specified rate each month. The WATS lines can provide incoming service (INWATS), outgoing service (OUTWATS), or both incoming and outgoing service (two-way WATS).

800 service

The SMA2 configuration supports 800 services. With 800 services, the called party subscribes to the service and pays for the toll calls to a specific number. The SMA2 supports improved services for an 800 service switching point (SSP) in offices configured with SSP.

ISDN services

An integrated services digital network (ISDN) provides voice and data services. The ISDN provides these services on a minimum of one

NTBX02BA enhanced D-channel handler (EDCH) circuit card and an NTBX01AC enhanced ISDN signaling pre-processor (EISP) circuit card.

The ISDN voice services include the following features:

- POTS
- electronic key telephone service (EKTS)
- DOD
- network class of service
- call forwarding
- call pickup
- automatic callback (ring again)
- call hold and additional call offering (call waiting)
- flexible calling
- hunt groups
- calling-line identification
- busy override
- authorization codes

The ISDN data services include the following:

- circuit-switched data
- packet-switched data

> ***Note:*** The SMA2 does not support digital trunking or primary rate access (PRA).

Ringing

The SMA2 supports the following ringing:

- single party (DMS Ring Code 0; TR-303 Code 40)
- distinctive, for MDC (DMS Ring Codes 1-8; TR-303 Code 42, 44, and 71-76)
- multiparty fully selective
- coded
- superimposed
- teen
- revertive
- immediate

Dialing

The SMA2 translates the following dialing codes:

- dial pulse
- dual-tone multifrequency dialing (DTMF)

Tones

The following tones are available:

- dial tone
- receiver off-hook
- audible ringback
- reorder
- busy

Deluxe Spontaneous Call Waiting Identification

Deluxe Spontaneous Call Waiting Identification (DSCWID) provides an interface to CPEs compliant with Bellcore specification TR-416. The DSCWID is a CLASS feature that allows a subscriber to perform the following functions:

- receive caller identification (CID) information from a call that waits for connection, while the subscriber is off-hook
- control incoming calls while an off-hook stable call is present

Bellcore TR-416 describes the requirements for DSCWID. Bellcore TR-416 specifies how this feature interfaces with the following:

- ADSI set—a screen based ADSI CPE that can display options.
- SCWID set—a non-ADSI CPE that can deliver CID data.
- 2500 set—a non-ADSI CPE that can signal DTMF. The 2500 set cannot provide off-hook delivery of CID data.

The NT6X78AB, NTMX76CA, and NT6X92BB or EA cards are required in the SMA2 to comply with ADSI protocol. Compliance with the ADSI protocol supports the SCWID/DSCWID feature. The ADSI protocol supports CLASS features that provide display-based information like DSCWID. These features are available to subscribers with CPEs that are compatible with ADSI. The cards function as follows:

- The NT6X92BB UTR or NT6X92EA GTR card identifies and processes tones for channels on the parallel speech bus.
- The NT6X78 CLASS modem resource (CMR) card supports calling number delivery (CND) and other CLASS services. The CMR card

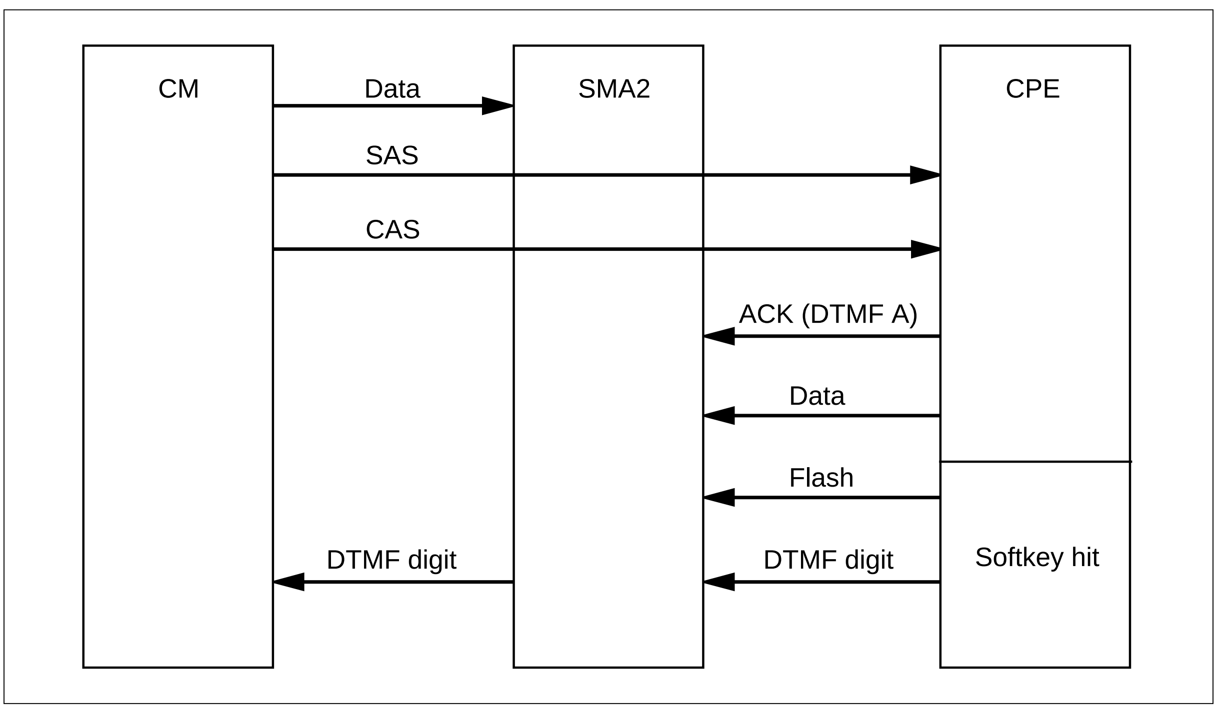
provides the ADSI protocol to transmit CLASS data between the CC and CPE compliant with the ADSI.

- The NTMX76CA message and CSM card contains upgraded firmware required to support ADSI and SCWID/DSCWID.

Tones that the CM sends alert the SCWID/DSCWID subscriber of a pending call. These tones also alert the CPE of incoming caller data. A line with the SCWID/DSCWID option can have a call established and a second call can attempt to terminate to that line. When this condition occurs, the CM provides one of two types of alerting signals or tones. The two types of signals are a subscriber alerting signal (SAS) or a SAS followed by a CPE alerting signal (CAS). The SAS is the tone the subscriber recognizes as the call waiting tone (CWT). The CAS alerts the CPE of incoming data if the subscriber line also has the CID feature.

The SCWID/DSCWID CPE responds to the tones and generates an acknowledgement (ACK) tone in response to alerting tones. This tone indicates the CPE can receive SCWID data. The UTR circuit card in the SMA2 collects the ACK tone. If the CPE is compatible with ADSI, the CPE sends a DTMF A ACK signal in response to the CAS. The following figure describes examples of responses from a set that is compatible with ADSI.

Figure 3-19 Example of a DSCWID call on an ADSI set



If the CPE is a SCWID/DSCWID CPE, the CPE sends a DTMF D ACK signal in response to the CAS. When the CPE sends alerting tones, the subscriber can control the incoming call. The subscriber uses the CPE softkeys if the CPE is ADSI compatible. The subscriber uses hard-coded keys if the CPE is a SCWID or 2500 set. If the CPE does not respond with an acknowledgment tone, the CPE is treated as a 2500 set. The following figures describe examples of responses from a SCWID set and a 2500 set.

Figure 3-20 Example of a DSCWID call on a SCWID set

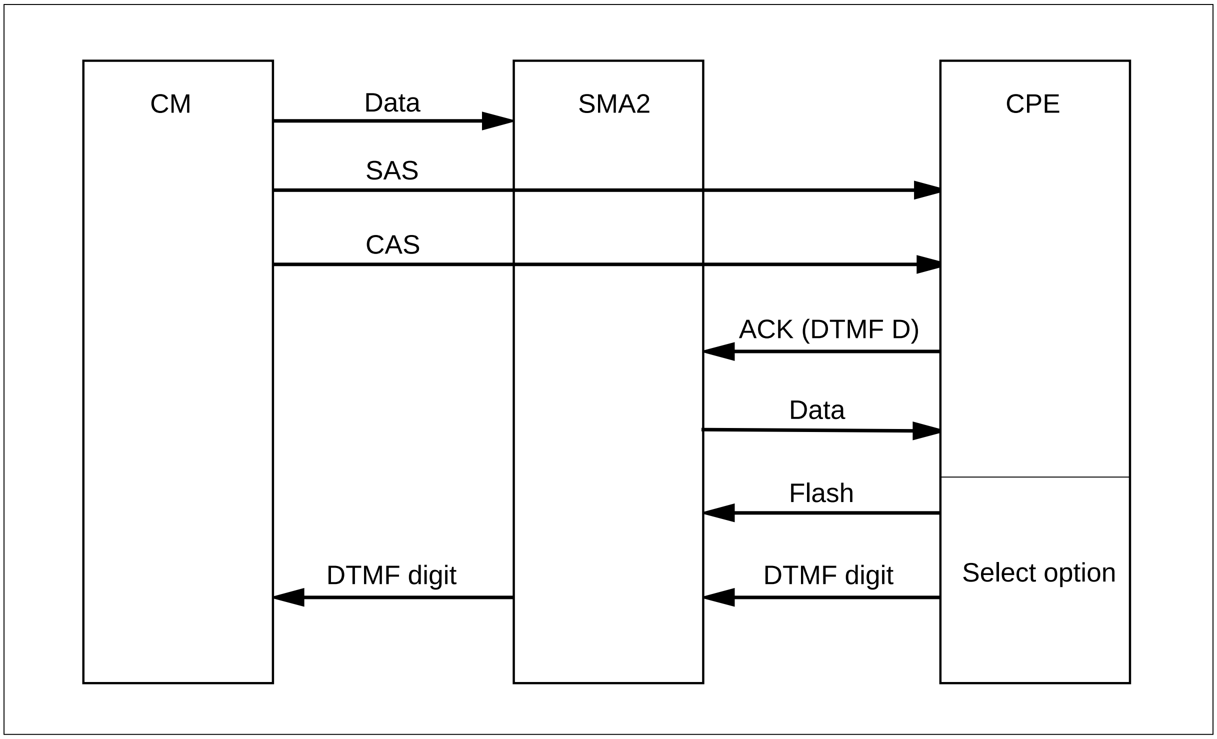
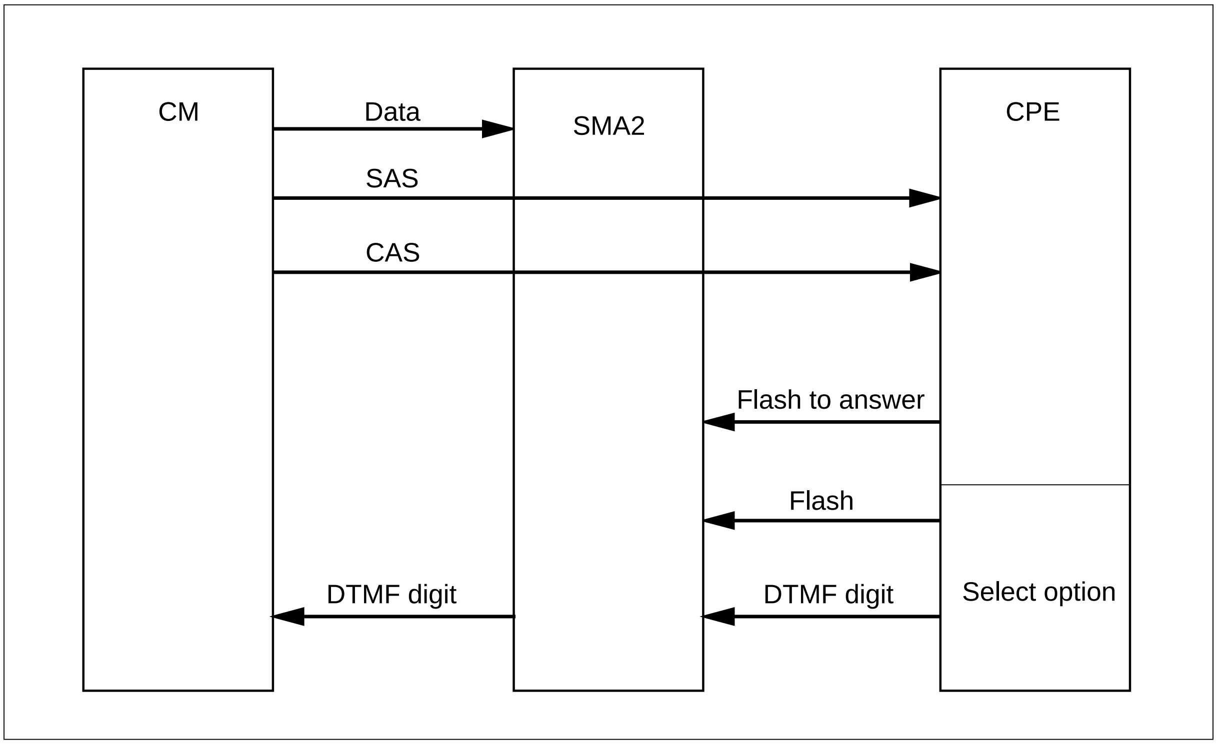


Figure 3-21 Example of a DSCWID call on a 2500 set



Alerting signals are sent to the CPE when a UTR channel is not available. If UTR channels are not available, data is not sent to the CPE. For Bellcore compliancy, the DMS SuperNode switch must provide options if the system detects a flash and cannot attach a UTR. The SMA2 complies with this requirement. The SMA2 sends a flash to the CM if the SMA2 cannot attach a UTR in 400 ms to comply with this requirement. If the CM does not receive the first notification of a pending call in 10 s, the SMA2 sends a second alerting signal. If display data was not sent to the CPE because UTR channels were not available, the SMA2 holds data. The SMA2 sends the data if re-alerting occurs.

After the SMA2 receives a flash signal from the customer CPE that is compatible with the ADSI, the SMA2 starts a T-tone timer. The T-tone timer times for the maximum amount of time allowed between a flash and the DTMF digit on an ADSI set. The timeout is 600 ms. The speech path is muted during this time. The T-tone timer is started for the initial option selection during a DSCWID call. The CPE type does not affect this condition. Following ADSI DSCWID option selections also start the T-tone timer.

DSCWID option selections which follow on a SCWID or 2500 set use a T-flash timer. The T-flash timer is used after a call is answered with SCWID and 2500 sets. This event provides the customer with enough time to select an option after a flash. The T-flash timer is used on these sets because a subscriber does not have enough time to flash and dial a DTMF digit in 600 ms.

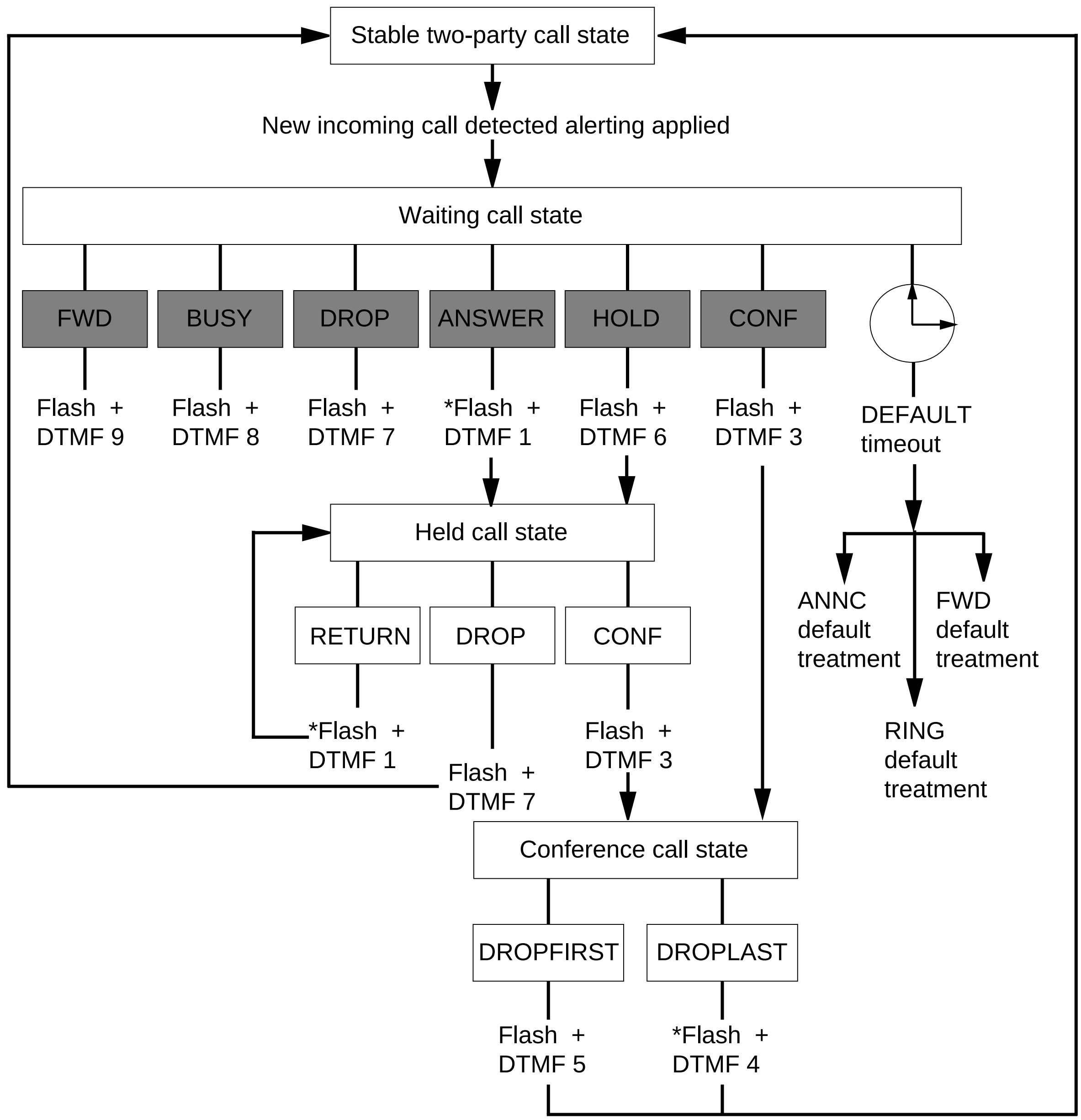
The operating company can set the T-flash timer from 1 to 8 s. The default is 1.5 s. The SMA2 starts the T-flash timer if the NONADSI field in table DSCWDTYP is set to Y. The SMA2 must also receive a flash signal from a customer's SCWID or 2500 set during the held or conference call state. The SMA2 must keep track of the DSCWID call state and the type of CPE. The timer used depends on this information. If the SMA2 cannot attach a UTR before 400 ms, the RETURN option is applied.

The CM attempts to remain synchronized with the CPE at all times. This close supervision prevents possible conditions where the DMS SuperNode switch does not process the option as expected, based on the call state. Call waiting dispositions options for the DSCWID are as follows:

- answer the new call and put the current call on hold
- disconnect the current call and answer the new call
- forward the new call
- connect the new call to a busy announcement
- put the new call on hold after connection to a hold announcement occurs
- conference the new call with the current call

The following figure describes the interaction between the ADSI set dispositions.

Figure 3-22 DSCWID with ADSI set dispositions



Note 1: An * indicates a flash can perform the same function as to send the DTMF code for that digit.

Note 2: If a non-ADSI set is configured for hard-coded keys to perform DSCWID dispositions, or the subscriber can provide a DTMF-digit in 600 ms, dispositions can be available if NONADSI = Y in table DSCWDTYP for the given DSCWID type.

4 SMA2 automatic maintenance

Automatic maintenance

The automatic maintenance software for the Expanded Subscriber Carrier Module-100 Access (ESMA), is like the automatic maintenance software for the line trunk controller (LTC). Another name for the Expanded Subscriber Carrier Module-100 Access is the SMA2. Maintenance software includes software audits and diagnostics. The software audits and diagnostics identify problems in hardware or software. Audits and diagnostics that run for the LTC run for the SMA2. The following sections highlight audit types and the failure conditions the audits detect. Diagnostics are described later in this section.

In the descriptions of automatic maintenance software operations that this chapter presents, the term extended peripheral module (XPM) appears in a generic sense. The term XPM refers to any peripheral module like the SMA2. When the term XPM occurs in this context, the term implies the SMA2.

Parity audit

A parity audit reads memory locations to run as a low priority background task. If a parity audit finds a defective area, the audit reads the location again. If the audit finds the reread defective, the audit attempts to write a test pattern to the defective memory location. The computing module (CM) of the DMS SuperNode acts on a parity audit to correct the memory defect.

Trap recovery

A trap is an error condition that the firmware, software, or hardware detects. The firmware, software, or hardware interrupts a process that runs. The process stops on the instruction that causes the problem. When a trap occurs in the SMA2, the system performs a test to determine if the system can recover the trap. If the system can recover the trap, the system determines the number of traps that occurred in a specified time period. If the number of traps exceed the threshold, the system executes a trap instruction to restart the peripheral. The system first checks the number of restarts that occurred on the peripheral. If the number of restarts exceeds a restart threshold, the system resets the peripheral. The system does not restart the peripheral.

If the system attempts to recover from the trap, the trap-handler software loops back through all the software modules. This action makes sure the system exits each procedure when the system returns from the called procedure. The trap handler exits to the highest procedure in the task.

Switch of activity audits

In a switch of activity (SWACT) process, the two units of an XPM exchange activity states. The unit that handles call processing becomes the inactive unit. The SWACT audits provide a mechanism in the XPM that increases SWACT reliability. The SWACT audits prevent a SWACT to a mate unit that cannot maintain activity. A SWACT can occur to a unit that does not establish two-way communication with the CM. If this condition occurs, the system attempts to SWACT back to the originally active unit. The mechanism in the XPM that provides this additional SWACT reliability is based on the following audits:

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

Each of these audits is present in each XPM unit. During a SWACT, one unit of a peripheral drops activity, and the mate unit becomes active. Each audit has a different function in each state of a SWACT. The following sections provide a detailed description of the audits that control a SWACT in the XPM.

Pre-drop audit

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

The CM can initiate a SWACT of the peripheral. The CM sends a request to the active unit to drop activity. The active unit of the XPM can initiate a SWACT. This type of SWACT is an autonomous SWACT.

The pre-drop audit evaluates the following information to determine if a unit must drop activity:

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

If the CM initiates the SWACT, the SWACT controller queries the XPM. The SWACT controller evaluates all SWACT requests. The pre-drop audit in the XPM responds to this query. The pre-drop audit informs the CM if the active unit can comply with a request to drop.

Pre-gain audit

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

- Facility audits - the XPM records the result of the last run for each diagnostic in the facility audit for a specified peripheral.
- This unit contains state information that indicates if the inactive unit
  - is in-service and ready
  - has CC links OK
  - does not have corrupt static data
  - is synchronized
  - is not jammed as the inactive unit

> ***Note:*** An inactive unit cannot reach all diagnostic paths. The unit can require a manual SWACT with the optional parameter FORCE. A manual SWACT with the optional parameter FORCE clears a failure from the pre-gain audit record.

The pre-gain audit continues to monitor and report unit state and condition information when the unit is inactive. When the pre-drop audit determines the active unit can drop activity, a warm SWACT occurs. The pre-drop audit uses the information the pre-gain audit provides to make this decision. The post-gain audit in the newly active unit runs.

Post-gain audit

The post-gain audit runs in the newly active unit. The post-gain audit verifies that the unit establishes two-way communication with the CM. If the unit establishes two-way communication with the CM, the newly active unit maintains activity. If the communication check fails, the unit forces a drop of activity to initiate a SWACT back to the originally active unit. In this occurrence, the pre-drop audit does not refuse the SWACT and allows the SWACT to proceed. If the SWACT back fails, the system busies the complete XPM node and returns the node to service.

Post-drop audit

The post-drop audit runs in the newly inactive unit. The newly inactive unit remains in service for a limited time without a restart. The post-drop audit cleans up the call processing data structures of calls that are not stable and non-synchronized stable calls. The post-drop audit can determine that a SWACT back is not required or a SWACT back is complete. When this event occurs, the XPM informs the CM. The system busies the inactive unit and returns the unit to service.

Warm SWACT audit

After the warm SWACT, the newly active unit waits until the time-slot management channel (TMC) establishes a multiframe state again. The following events occur as part of the warm SWACT audit:

- The unit begins a state mismatch audit for each IDT. This audit compares the IDT TR-303 terminal states with the RDT TR-303 terminal states.
- The SMA2 sends a STATUS ENQUIRY message to the RDT for each in-service terminal that is active on the IDT.
- The SMA2 starts a T322 2-second timer.
- The RDT must reply to the STATUS ENQUIRY message with a STATUS message. The T322 timer can expire before the SMA2 receives a STATUS message from the RDT. If the timer expires, the SMA2 sends another STATUS ENQUIRY message. The T322 timer starts again. If the T322 timer expires again, a state mismatch occurred and the system takes the call down.
- The SMA2 sends a RELEASE COMPLETE message to the RDT.
- When the system completes the audit of all the terminals in the active state, the system audits the other in-service terminals in the null state.

Path protection switching

Path protection switching is a recovery mechanism for the communication channels of an IDLC system. These channels use the link access procedure on the D-channel (LAPD) protocol. The channels use this procedure for links on separate DS-0 channels of a DS-1 link. Path protection switching maintains active links for control operations and call processing applications. These links are the common signaling channel (CSC), TMC, and embedded operations channel (EOC) links.

Two DS-1 links are configured for active and standby ability. Messaging occurs on the active DS-0 channels of control paths. These paths normally occur on the same DS-1 link. Path protection switching switches path activity to the standby DS-0 of a different DS-1.

Operating company personnel or automatic defect detection starts path protection switching. In both occurrences, the IDT of the LDS or the RDT can start a path switch. System logs and alarms provide the appropriate notification. The system notifies internal system interfaces.

The following terms are associated with protection switching:

- path—a message channel associated with TMC, CSC, or EOC messaging.
- active path—the path or channel that is in the active state. The active path carries either TMC, CSC, or EOC messages and messages for protection switching.
- standby path—the path in the standby state. The standby path carries only messages that allow the path to become the active channel.
- protection switch—this condition occurs when the active path changes state to standby, and the standby changes state to active path.

Use the following rules as a guide for protection switching:

- Both ends must detect a failure and initiate a protection switch.
- When a failure occurs on a channel after protection switching is complete, the units cannot switch back. The units cannot switch even when the system clears the cause of the failure.
- When possible, a standby path stays in multiple-frame operation.

Logical link configuration

The active EOC and TMC paths have default appearances on separate DS-0s of DS-1, number 1 at the RDT end. The associated protection paths occur on the same DS-0s of DS-1, number *n*. The *n* is configured at the IDT according to the RDT appearance.

Each of the four DS-0s use the link access procedure on the D-channel (LAPD) protocol to accommodate several logical links. The Data link connection identifier (DLCI) addresses differentiate the logical links. The DLCI has two parts. The two parts are the service access point identifier (SAPI) and the terminal equipment identifier (TEI). The TMC uses the SAPI=0 and TEI=0 for the call processing logical link.

The EOC uses SAPI=1 and TEI=4 for IDT RDT operations control. The TMC and EOC path types contain a logical link on the DS-0 channels referred to as the path protection link. The path protection link uses SAPI=1 and TEI=0 as its DLCI.

The EOC and TMC applications use separate active links for messaging. Path protection switching uses both the active and standby DS-0s for path switch messaging. The use of both DS-0s permits the transfer of control when the active message path is not available.

The active paths of the EOC and TMC can be present on DS-1 number 1. The active paths can be present on the DS-1 configured for path protection. When the TMC is active, the DS-1 with the active TMC is the primary DS-1 for facility protection switching. When only the EOC is active, the facility protection switching considers the DS-1 that carries that activity as primary.

Path states

The system records the following state information for each of the four DS-0 channels.

- equipped or non-equipped
  - — indicates if the equipment and software are present and enabled for configuration of the service
- in-service or out-of-service
  - — indicates if the LAPD links are in an information transfer state
- active or standby
  - — indicates if the path is selected to carry the traffic of the application
- inhibited or enabled
  - — indicates if path protection procedures are not allowed from switching activity

Path protection switching triggers

The LAPD links are monitored for failures associated with multiple frame establishment (MFE). The following conditions indicate loss of MFE on any supported logical link of the DS-0 path:

- failure to establish multiple frame operations
- A LAPD disconnect command or a disconnect mode response frame is received
- retransmissions that exceed the N200 parameter setting

Other events that can trigger path switching are:

- I-frame data on an application logical link of the standby path is received
- Removal of the inhibit attribute on an in-service standby path when the active path is out-of-service
- Notification of a DS-1 failure

> ***Note:*** A switch back from a standby path to an active path must occur. A manual request or the failure of the current path must trigger this event.

Control

From the maintenance and administration position (MAP) terminal, operating company personnel can perform the following actions to control protection switching:

- initiate a protection switch for the TMC or EOC channel
- initiate a forced protection switch for the TMC or the EOC channel
- Inhibit a standby EOC or TMC from becoming active, or an active path from resuming activity
- allow a standby EOC or TMC to become active, or allow an active path to resume activity

Inhibit status protection switching interact with the following methods:

- If you inhibit a path from becoming active and that path is now active, you do not cause a protection switch.
- When you inhibit a path, the IDT cannot automatically or manually switch to the path.
- When you inhibit a path, you cannot start a forced switch to that path.

Path switch success

When the IDT or RDT requires a path switch, the IDT or RDT end determines if the standby path can take over transmission. If the standby can occur, a request message is sent on the active and standby links. The message is sent for path type EOC or TMC. The receiver of the request verifies the state of the standby link. The receiver of the request sends an acknowledge message on both paths. The acknowledge message depends on the state of the standby link. The caller receives a positive acknowledgment that indicates the switch is complete. The caller makes the requested path active.

Notification

If a path switch succeeds, the system notifies IDT maintenance. The system logs the event. The system logs failed path switches the IDT starts on the first occurrence.

If an automated path switch is required, and the standby link cannot occur, the system notifies IDT maintenance. This action causes the system to generate the appropriate log.

If the inhibit attribute applies to an active path, the system displays a MAP terminal response that indicates the occurrence.

If the force option applies on a path protection switch request, and the result is a path failure, the system notifies IDT maintenance. The IDT maintenance produces a log report.

The MAP display posts an alarm at the PM level when all of the following events occur:

- an IDT node is in-service
- activity of path type EOC or TMC is lost
- path protection switching cannot recover the path activity

CMR card audit

An audit runs in-service diagnostics on the CMR card approximately every minute. If the system detects an in-service fault, the SMA2 is set to ISTb. The audit generates a PM181 log. The PM181 log indicates that CND does not work for lines connected to the SMA2. Operating company personnel can perform maintenance on the defective CMR card.

EISP and EDCH data integrity audit

The enhanced ISDN signal processor (EISP) and enhanced D-channel handler (EDCH) data integrity audit provide an audit of time slot and logical terminal data. This audit makes sure the system detects, reports and corrects static data mismatches. These mismatches occur between the cellular access processor (CAP), EISP, and EDCH processors.

The CAP is data protected. The CAP controls the audit. To start the audit, the CAP sends CAP data to the EISP for comparison. If the data does not match, the EISP returns a failure message to the CAP. A PM180 log provides warning of an update. If the data matches, the EISP requests audits of the EDCH that can be defective and of all spare EDCHs. The EDCH compares the EDCH data with the audit data. The EDCH reports a failure or pass message to the EISP. The EDCH forwards this information to the CAP. If the mismatch occurs in the EDCH, a PM180 log provides an update warning. If the mismatch occurs in a spare EDCH, the system busies the card.

EISP overload control

Overload refers to a condition where the system detects congestion on one or more resources. This overload condition can reduce service to the affected RDT. Overload control mechanisms minimize the reduction of service. Overload control for congestion that affects a single IDT contains the report and control of the congestion.

Congestion reporting

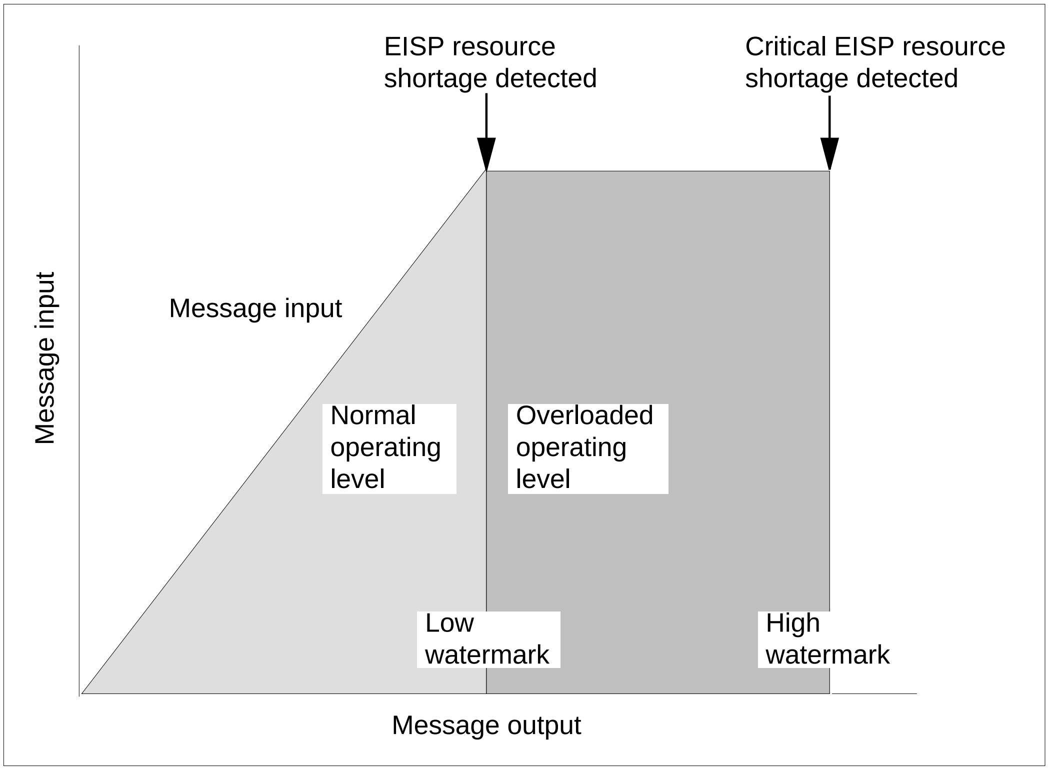
When the system detects an overload condition in the EISP, the system places the affected IDT in an ISTb state. The system generates a PM128 log. This log indicates that a messaging overload condition occurred for the TMC or EOC. The same information is available at the IDT level of the MAP terminal. To receive this information, the user enters the command string QUERYPM FLT. When the overload control mechanisms clear the congestion, the IDT returns to an in-service (InSv) state.

Congestion can occur on a resource common to all IDTs associated with an SMA2. If congestion occurs, the system places the SMA2 in the ISTb state. The system generates a PM128 log to indicate an overload on the messaging system for the P-side node. The P-side node is the SMA2. The system places all IDTs associated with the affected SMA2 in an ISTb state. When the overload control mechanisms clear the congestion, the SMA2 and the associated IDTs return to the InSv state.

Congestion control

A series of mechanisms perform congestion control. These mechanisms restrict the use of common resources by any EOC or TMC channel or link. These mechanisms activate only in overload conditions. The mechanisms minimize the service impact of heavy message traffic on other RDTs with the SMA2. These mechanisms automatically discard messages that are delayed for more than a specified time period. This action makes sure the transmission of invalid messages does not waste common resources. The following figure illustrates the overload control mechanisms that minimize service reduction to P-side nodes.

Figure 4-1 EISP overload control for the IDT



When the system reaches the low watermark for resource congestion, the EISP enters the overloaded operating level. The system places logical links on the EOC in the receiver-not-ready (RNR) state. The system does not place the logical link used for protection switch control on the EOC. This action reduces the number of incoming messages.

The system can reach the high watermark for resource congestion. This event indicates that the EISP reached the maximum overloaded operating level that the system allows. The system disables EOC channels. The system places logical links on the TMC in the RNR state to reduce incoming messages. The system does not place the logical link used for protection switch control on the TMC.

When the control mechanisms reduce resource congestion, the system gradually restores service to the channels and links affected. The EISP gradually returns to a normal operating level.

Routine exercise tests

The system performs routine exercise (REX) tests on an SMA2 unit by one of two methods

- the system scheduler initiates the REX each day
- operating company personnel initiate the REX

The REX sequence is as follows:

1 Test the inactive unit. Run in-service tests only.

2 SysB the inactive unit.

3 RTS the inactive unit for out-of-service tests.

4 Wait for superframe and data sync to occur.

5 Perform a pre-SWACT audit.

6 Perform a warm SWACT.

7 SysB the new inactive unit.

8 RTS the inactive unit.

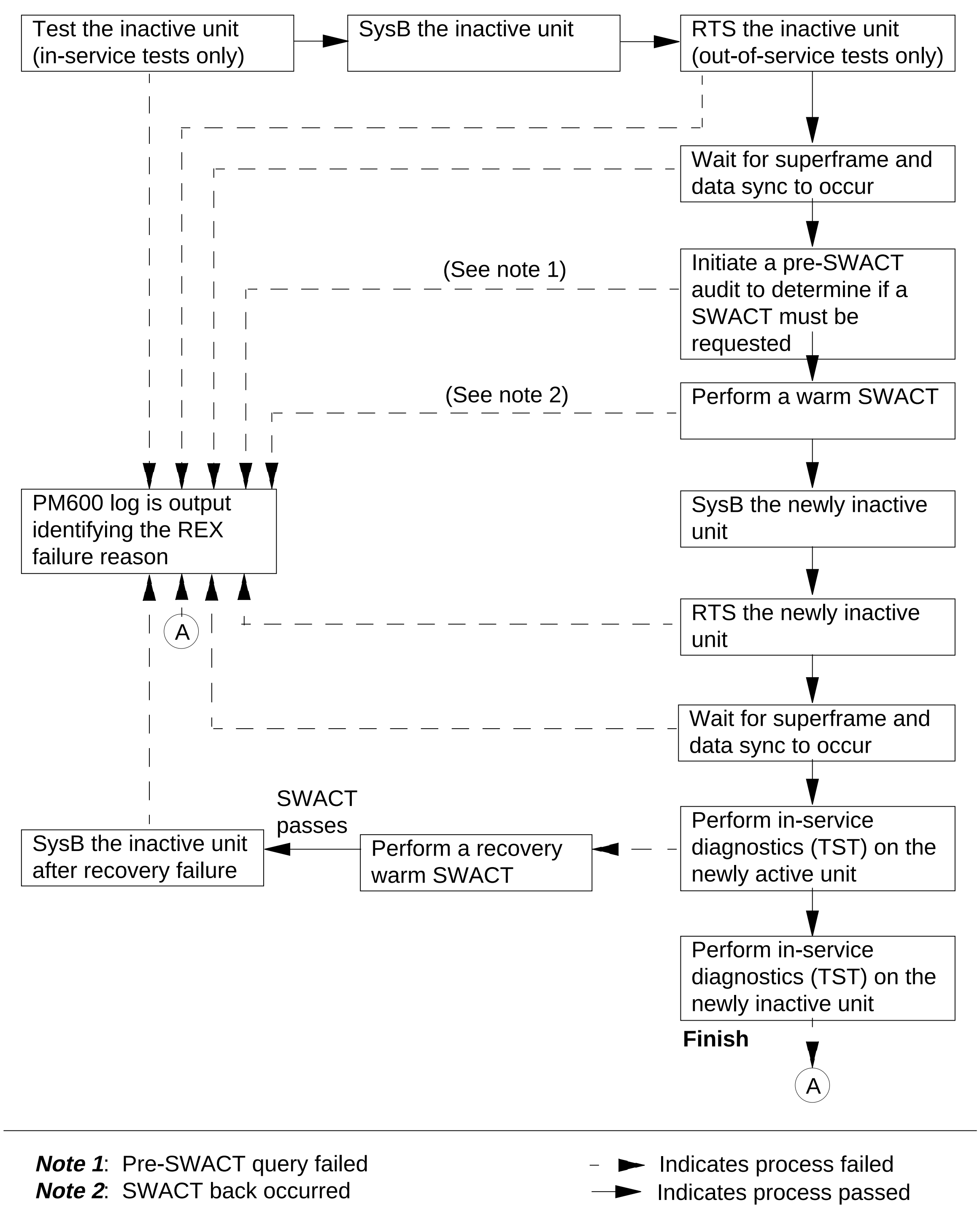
9 Wait for superframe and data sync to occur.

10 Run in-service diagnostics (TST) on the new active unit.

11 Run in-service diagnostics (TST) on the inactive unit.

The REX state machine controller actions appear in the following figure.

Figure 4-2 REX state machine actions



Note 1: Pre-SWACT query failed
Note 2: SWACT back occurred

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 of the diagnostic that failed. A mnemonic is an abbreviation that is easy to remember. The REX failure reason includes the unit that failed. The unit is 0 or 1.

The PM600 log details the start time of each step the REX test performs, the unit the REX step affects, and the failure reason. The REX steps included in the log after the failed step are recovery actions. The REX initiates these recovery actions because of the failure. The log includes the unit number if the REX action is specified for the unit. The unit can be a BSY unit, RTS unit, TST unit, or a sync unit. The action that is specified to the unit cannot affect the node (SWACT, BSY both units). REX actions specified to the unit are BSY unit, RTS unit, TST unit and synchronize. Actions that affect the mode are SWACT, and BSY both units. The log auxiliary data consists of a cardlist and mnemonic of the failed diagnostic. The following table lists the mnemonics for the diagnostics and a description of the diagnostic.

Table 4-1 Diagnostic name and description (Sheet 1 of 2)

Diagnostic name (mnemonic)	Description of diagnostic	Notes
CMRDIAG	CMR card diag	Only if CMR declared
CSMDIAG	CSM diag	
DCHIALB	EDCH inactive loopback diag	Only if EDCH declared and in an out-of-service state
EXTNDIAG	Extension shelf diag	Only if EXTN declared
FDLDIAG	FDL diag	Disabled because FDL application not used
IMCDIAG	IMC link diag	Only if SMA2 is in an in-service state
ISPHDLC	EISP HDLC diag	Only if SMA2 is in an out-of-service state
ISPSPHF	EISP speech bus full diag	Only if SMA2 is in an out-of-service state
ISPSPHI	EISP speech bus internal diag	Only if SMA2 is in an out-of-service state

Table 4-1 Diagnostic name and description (Sheet 2 of 2)

Diagnostic name (mnemonic)	Description of diagnostic	Notes
MSG6X69	MX76 diagnostic	Tests part of card
MTXDIAG	Matrix diag	
PSLDIAG	P-Side loops	
SIGPABDG	SIGP and A/B bits diag	
SPCH DIAG	Speech Path	SPCH DG
SYNC DIAG	Sync Diag	
TONEDIAG	Tone Diag	
UTR DIAG	UTR Card	

The QUERYPM command and command strings QUERYPM FLT and TST REX QUERY contain information about the last REX. REXs that the system or the user restores, store and display a new date/time and state in the REX maintenance record. The state can be passed or failed. The passed state indicates the REX completed correctly. The failed state indicates the REX did not complete because an error occurred. This information is available through the QUERYPM and TST REX QUERY commands. If the REX fails, the user performs a manual RTS, a manual REX, or an automated REX. This action returns the XPM to service from ISTb.

The DMS SuperNode switch stores REX maintenance records for each SMA2 and contains the following information:

- the REX scheduler, if the SMA2 is in the system
- date/time and result (passed/failed) of the last REX
- failure reason, diagnostics failures, and a list of defective cards, if the last REX failed
- date/time of previous failed REX
- date/time of first passed REX that follows the previous failure

The following restrictions apply to REX tests:

- For REX to run, the node must be in-service, in-service trouble because of a REX failure, or in-service trouble because P-side DS-1 links are out-of-service.
- If a warm SWACT is not possible REX terminates.

- After successful completion of REX, the SMA2 has a new active unit because of the SWACT.
- If a restart occurs when the REX test is in progress, the system does not output the PM600 log. The system does not output the PM600 log because the restart changes the allocation of the temporary data store. The system uses the data store to create the PM600 log.
- A SWACT controller override is not provided for a manual REX.

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

The REX state machine, or controller, permits the SWACT controller to refuse an attempted SWACT.

The REX controller

- calls the SWACT controller during the pre-SWACT step. This event occurs before the SWACT request initiates. The SWACT controller determines if a SWACT attempt is recommended. Three conditions determine the decision to attempt a SWACT. The first condition is the diagnostic history of the unit maintained in the diagnostic history database. The second condition is the result of the last SWACT attempt to the inactive unit. The third condition is the data the XPM returns in the pre-SWACT query message. An XPM can fail the pre-SWACT step of REX. The XPM can indicate no failures in the DiagHist level of the MAP display. This condition occurs if the reasons for the pre-SWACT failure do not include diagnostic failures. Refer to the description of the PM diagnostic history in the Trouble isolation and correction chapter.
- accounts for SWACT denial and failure reasons
- terminates a REX test if the SWACT controller denies a SWACT
- terminates a REX test if a SWACT occurs, but the active unit of the XPM did not change since the start of the test. If feature AF5007 is supported, REX terminates before recovery action can occur. REX terminates because the SWACT code submits a BSY/RTS of the inactive unit.
- displays the failure reason for a SWACT denial or failure performed during a manual REX at the MAP terminal as `REX failed`. The command string TST REX QUERY for the posted XPM obtains the detailed reason for the failure. The system generates a PM600 log report to detail the REX failure reason.

Intermodule communication link audit

Intermodule communication (IMC) links allow SMA2 units to exchange data. If the active unit fails, the IMC links make sure that the inactive unit can take over call processing. The system audits both IMC links in the SMA2. One link is between the NTMX75BA cards and one link is between the

NTAX74AA cards. The system audits the links to monitor the sanity of messages between the units. The IMC audit can fail and the system can detect a fault at the node level. If this event occurs, the system places the SMA2 in the ISTb state. If the system detects the fault at the unit level, the system places the defective unit in the ISTb state.

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

- system reports the fault to the CM
- link is closed and SMA2 state changes to ISTb
- the SMA2 processors no longer use link
- warm SWACTs are prevented

Static data integrity audit

An integrity audit verifies the accuracy of the static data in the SMA2. An integrity audit calculates the checksum value of the static data in SMA2 memory. This audit verifies that the checksum value of the static data in SMA2 memory matches the checksum value for the static data load. The system performs this audit for each IDT.

If the audit detects a static data mismatch in the active unit, the system automatically performs a SWACT.

When the SMA2 returns to service, the static data loading is by-passed if the audit determines that the static data is correct. The static data loading is part of the full return-to-service sequence.

RDT alarm audit

Operating company personnel enter datafill in field SDPOINTS in table RDTINV to set signal distribution (SD) points for RDT. Every 10 min, an audit queries the RDTs for the current alarm conditions. The system activates the scan point, and an alarm appears at the EXT level of the MAP terminal when:

- the system raises an alarm condition
- the system raises an alarm of greater severity

RDT lines audit

The RDT lines audit

- runs automatically at intervals of 24 h or the audit starts in response to the RDTLNAUD command
- synchronizes the line states that the RDT and the DMS-100 switch detect
- makes sure DMS-100 call processing features operate correctly. These features depend on correct DMS-100 knowledge of the line state to operate correctly.

The audit occurs for lines that the DMS SuperNode switch provisions. If the audit finds a difference, the audit generates an RDT601 log to attempt to correct the problem. If the audit cannot fix the problem, the audit generates an RDT306 log. The audit runs each day at 2 am. The audit does not run if the audit from the previous day does not complete.

The audited data includes attributes of object instances associated with the following:

- analog lines - if the RDT is not entered with known object creation, the system audits the analog line instances
- ISDN lines - the system audits both access (RDT P-side) and transport (RDT C-side) sides. If the RDT is entered with known object creation, the system audits only the transport side.
- nailed up B channels of MVI RDT ISDN line

The RDT monitors and changes the state of the lines that connect to the RDT. An RDT takes a line out of service because of the following maintenance-related activities:

- diagnostic testing
- hardware failure
- lines provisioning
- loss of data

An RDT removes a line from service and changes the service state of the line to OOS/IDL. The RDT informs the DMS-100 switch of this activity. The DMS-100 switch responds to the state change messages from the RDT. The DMS-100 changes the view of the DMS-100 line state to line module busy (LMB) or idle (IDL). The state of the line that the message to match the RDT indicates, determines the action.

When the MAP terminal displays a posted line that connects to an RDT in the line module busy (LMB) state:

- the RDT is out of service, or
- the RDT indicated a service alarm against the line

Diagnostic tests

Diagnostic tests pinpoint hardware faults to a card level that the user can replace. The system or the user can initiate the diagnostic tests. The system generates system initiated diagnostics when internal counters exceed specified levels.

Use manually initiated diagnostics under the following conditions:

- log reports indicate a common equipment problem
- the system generates system detected alarms
- the OMs show high error counts

ROM diagnostic

The read-only memory (ROM) diagnostic detects faults in the processor and memory cards. The ROM diagnostic starts when the XPM is in the who-am-I (WAI) state.

Note: Reload the after the ROM diagnostic runs.

The system tests the following memory card circuits:

- memory circuitry
- parity circuitry
- holding registers

The system tests the following processor card circuits:

- memory mapper unit
- universal synchronous/asynchronous receive/transmit (USART) integrated circuits
- programmable timers

CSM diagnostic

The channel supervision message (CMS) diagnostic tests the hardware involved in the transmission, reception, and use of the CSM. Most of this hardware resides on the NTMX76BA messaging and CSM card. The CSM diagnostic tests all the memories on the NTMX76 card and the NTMX75 matrix card.

The CSM diagnostic tests the following:

- the integrity match-mismatch logic
- the speech bus parity error generation (NTMX75 matrix card) and detection (NTMX76 card) logic
- the channel data byte (CDB) transmission and reception logic

The CSM diagnostic checks for:

- interactions among bits of the parity error RAM
- correct interaction between the integrity match-mismatch and CDB update logic
- correct operation of the CSM loop on the NTMX75 matrix card

The following CPM hardware components are involved in the CSM diagnostic:

- NTMX76BA messaging and CSM card
- NTMX75BA matrix card
- speech bus

Matrix card diagnostic

The matrix card diagnostic tests the presence and functionality of components on the NTMX75 matrix card. This diagnostic consists of the following tests:

- matrix card presence test—makes sure the basic hardware required for the diagnostic is present.
- 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 in a method like the connection memory test.
- message card presence 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 work correctly.
- C-side link integrity test—checks the validity of all C-side links between the matrix card and the C-side interface card.
- P-side link integrity test—verifies the integrity of the P-side link on each port. These ports are between the DS-1 interface card and the NTMX75 matrix card.
- time switch functioning test—checks the time switching function of the matrix card and the input and output section (serial to parallel and parallel to serial). The NTMX75 supports 80 links, both C-side and P-side. The

NTMX75 allows all types of connections between the C-side and P-side. These connections are P-side to P-side, C-side to C-side, and P-side to C-side. The time switch functioning test checks all types of connections.

- plane select test—checks the plane select function which selects between the C-side and the C-side of the mate for each channel.
- programmable read-only memory (PROM) identification (IDPROM) test - checks the validity of the information burned in the IDPROM. The information includes the design information checksum, and the PEC code of the card and the version.

The diagnostic activates during four diagnostic modes. The diagnostic modes are divided according to PM states, in-service or out of service, and the PM unit activity, active or inactive unit.

Synchronization diagnostics for the NTMX73BA circuit card

The synchronization diagnostic checks related hardware components to verify that the phase lock loop (PLL) functions correctly. The synchronization diagnostic detects defects in the signaling processor synchronization components. The synchronization diagnostic 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 defects detected:

- The phase comparator value does not reset or read correctly.
- The gate cannot close or open during normal mode or test mode.
- Real-time clock interrupts are not received.
- The phase comparator counter results are not correct.
- The frame pulse indicator does not match gate state.
- The frame pulse generator does not generate internal frame pulses.

Message diagnostic

The message diagnostic tests the hardware on the NTMX76 CSM and messaging card.

The message diagnostic checks:

- the correct operation of the on-board processor time slice processes
- the speech bus interface
- the IMC link
- the cyclic redundancy check (CRC) ROM
- the integrity of the message buffer memory and P- and C-side messaging

The following XPM hardware components are involved in the message diagnostic:

- NTMX76 CSM and messaging card
- NTMX75 matrix card
- NTMX81 DS-1 interface packlets
- speech bus

Tones diagnostic

The tones diagnostic runs PCM checksums on the tones of ports 16 and 17. Ports 16 and 17 are phantom ports. The tones diagnostic makes sure that the checksums agree with the checksums in the tone read-only memory (ROM). The NTMX76 message card contains the tone ROM. The tones diagnostic checks the speech bus connection memory for all channels except 0 and 16 of ports 16 and 17. This action occurs to make sure tones are allowed on the speech bus.

Two XPM hardware components are involved in the tones diagnostic: NTMX76 CSM and messaging card, and speech bus.

Speech path diagnostic

The speech path diagnostic checks 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 the highway mux and the PCM enable-disable gates.

The following XPM hardware components are involved in the speech path diagnostic:

- the NTMX76 CSM and messaging card
- the NTMX75 matrix card
- the NTMX81 DS-1 interface packlet
- speech bus

P-side loop diagnostic

The P-side loop diagnostic tests the P-side loops on the P-side interface cards. The P-side loop diagnostic acts as a presence test on the P-side interface cards for the rest of the diagnostics. This diagnostic contains the following tests:

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

To test a DS-1 link at the PM level, post the associated SMA2. Make sure the SMA2 and the associated RDT are InSv. Enter the command string TST LINK <link_no> at the MAP terminal.

With an InSv link, the TST command causes the SMA2 to execute a PCM loopback test on the link. The SMA2 sends a specified PCM pattern over the DS-1 link to the RDT. The RDT loops the PCM pattern in the time switch card and returns the PCM pattern to the SMA2. The SMA2 compares sent and received samples.

If the PCM loopback test fails, the DMS switch generates PM181, PM183, and PM128 logs. Refer to the following examples. The system busies the failed link and places the associated SMA2 ISTb.

```
PM181 MAY16 09:22:12 4588 INFO SMA2 60
Node:  ISTb, Unit0 Inact: InSv,  Unit1 Act:  ISTb
PCM Loopback test failed on P-side link 5

PM183 MAY16 09:23:00 4677 SYSB SMA2 60  P-side LINK: 2,
FROM: InSv

PM128 MAY16 09:23:33 4877 TBL ISTb SMA2 60
Node       : ISTb (PSLink OOS) From InSv
Unit0 Inact: InSv
Unit1   Act: InSv
```

When a system audit detects a SysB link, the DMS SuperNode switch generates the following PM110 log:

```
PM110 MAY16 09:27:33 4899 INFO CARRIER SMA2 60
CARRIER–NO: 8, REASON: REMOTE LINK SYSB
```

When a link returns to service, the SMA2 leaves the ISTb state. The SMA2 enters the InSv state if no other faults are present. The DMS SuperNode switch generates a PM106 log if no other faults are present. If these conditions do not occur, the DMS SuperNode generates a PM128 log. The DMS SuperNode switch generates a PM184 log when a link returns to service.

```
PM106 MAY16 11:23:33 4877 RTS SMA2 60
Node       : InSv From ISTb
           : ISTb Cleared (PSLink OOS)
Unit0   Act: InSv
Unit1 Inact: InSv

PM184 MAY16 09:33:00 7677 RTS SMA2 60  P-side LINK: 2,
              FROM: SysB
```

CMR diagnostic

The CLASS modem resource (CMR) card in the SMA2 is self-diagnosing. The card contains on-board firmware that provides the correct card level diagnostic. The CMR diagnostic detects and reports faults that affect service. The CMR diagnostic provides the SMA2 with the following audit and diagnostics:

CMR audit The system normally uses the CMR audit to run this audit. The system normally uses the facility audit for this purpose. The facility audit has too low a repetition time to provide the detection time required for the CMR card. This repetition time is 7.5 min. A new audit was created for this feature.

In-service diagnostics provide an interface with on-board firmware diagnostics. In-service diagnostics control on-board firmware diagnostics. On-board firmware diagnostics continuously test different critical components of the CMR card. This diagnostic runs one time each minute. The number of times the diagnostic runs depends on the request of an in-service audit. 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 CMR card.

Out-of-service diagnostics are 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 limits do not permit.

The system logs results of the CMR diagnostic test as a PM181 audit exception report. The PM181 audit exception report lists the failed card list and indicates that CMR diagnostics detected the fault.

EISP diagnostic

Diagnostics for the enhanced ISDN signaling preprocessor (EISP) card include ROM and RAM diagnostics. These diagnostics detect and isolate defective hardware. Detection circuitry helps determine if the EISP can function correctly and if the EISP can be downloaded. Diagnostics occur for write protection circuitry. When the processor is reset, the EISP diagnostic set runs.

SMA2 reliability

Computing module datasync

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. The same internal indicies must reference common tuples to both units and the tuples must contain the same data. The maintenance of identical indexes in both units allows processes to communicate between units. Active processes continue to function after a warm SWACT. Current functionalities of the XPMs make the preservation of the synchronization of the mate unit node and port tables more difficult.

Data is set in the active unit of an XPM through the node and link RTS and state changes. These node and link RTS state changes are triggered externally. Data reaches the inactive XPM unit through the bulk and individual messages of the current XPM datasync mechanism with:

- an IMC filter that blocks all separate XPM datasync messages
- an RTS NODATASYNC that blocks all bulk XPM datasync messages and compresses the node table in the XPM
- the CM supplied static and dynamic data for the SMA2 and any subtending P-side nodes in the SMA2 that perform the SWACT

The XPM coordinates the management of node table synchronization. The inactive unit must order the node table the same as the active unit. The active unit sends a map of the node table during a bulk download of configuration data. The inactive unit uses the map to datafill the node table as data is received 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. This condition assumes that when the inactive unit runs, the node and port tables remain synchronized with the active unit. Units can lose synchronization if one unit lost an earlier dynamic update. The active unit can contain a temporary inter-peripheral message link (IPML) in the node table at the time a dynamic update occurs. The IMPL is used for broadcast loading. This condition causes the tables to be out of synchronization. This event occurs because temporary IPMLs are added only in the node table of the active unit.

Unit node table mismatch faults

Each XPM unit has tables that contain information about nodes to which the unit connects. Each table contains information on terminals that the unit uses. The following two systems determine unit table mismatches:

- Mate unit matching compares the inactive unit tables with the active unit. This system sets the XPM ISTb if mismatch occurs. The active unit sends table mapping information to the inactive unit during updates.
- Node table audits determine if this information corresponds to data in the computing module (CM) table PMNODES. To prevent differences in datafill for the XPM units, the CM maintains all node information. For a complete description of the datafill for table PMNODES, introduced in feature AF5678, refer to the *XPM Translations Reference Manual*.

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

- Table control applications that change inventory can reject tuples that the system cannot support. This condition occurs when the required resources are not available to a peripheral.
- The node table audit raises an ISTb condition on an XPM that has a node table mismatch with the CM. To manually clear the ISTb condition, operating company personnel must busy and return to service the whole XPM.
- A negative acknowledgment from the XPM causes the loading or RTS process to abort. This condition occurs when the download of the configuration data table (CDT) node or port information during a bulk download occurs.
- A negative acknowledgment from the XPM raises an ISTb condition on the XPM. This condition occurs when the download of the node CDT or port CDT data during a dynamic configuration update occurs.
- Feature AF5678 creates two new PMDEBUG commands. The commands allow operating company personnel to determine which tables are bound

in the CDT data distribution. These commands can display tuples in the tables. The following is a list of command syntax of these new commands.

— To list the XPM data tables bound in CDT management while in the CHNL:PROT level of PMDEBUG, type

>SHOWTBLS

and press the Enter key.

— To display at least one tuple in a table bound in CDT management while in the CHNL:PROT level of PMDEBUG, type

>DISPTBL table_id [<tuple_no> | R <begtuple> <endtuple> | all]

and press the Enter key.

where

table_id
is the name of the table to display

tuple_no
is the number of an exact tuple to display

R
is a range of tuples to display

begtuple
is the beginning tuple of the range

endtuple
is the end tuple of the range

all
is display all tuples in the table

If the user provides only the table identification, the system lists all tuples. To abort the listing, press the RETURN key.

Enhanced Dynamic Data Sync (EDDS)

Dynamic data describes the link and node states in the XPM required to support call processing. These states are normally set in the active unit of an XPM. The node and link RTS or state changes that external stimuli triggers set these states. These states reach the inactive XPM unit through the bulk and individual messages of the XPM data synchronization mechanism.

The EDDS is a necessary component of warm switch of activity (SWACT). A Warm SWACT preserves processing of ISDN and POTS calls. Warm SWACTs occur when the active unit of an XPM drops activity. The active unit drops activity because of an XPM trap, REX test or other causes. Call and unit states are preserved so that calls continue without interruption. For a warm SWACT to succeed, the inactive unit must be in service (InSV).

The previous state of 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 initiates 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 and 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.

Switch of activity

A SWACT is the process in which the two units of an XPM exchange activity state. The unit that actively handles call processing becomes the inactive unit. At the same time, the inactive unit becomes the active unit and controls call processing. This ability to switch activity makes sure of SMA2 reliability.

A SWACT can be controlled or uncontrolled. A description of controlled and uncontrolled SWACTs follows.

Controlled SWACT

A manual action, like the use of the SWATCH command, implements a controlled SWACT. Planned system requests can implement a controlled SWACT. Planned system requests include the REX test schedule or when the system busies the active unit when the inactive is InSv.

A controlled SWACT can occur if both units are InSv. A controlled SWACT can occur if the SMA2 is ISTb because of a previous REX test failure.

In a controlled SWACT, the following message interchange occurs:

- The CM messages the active unit of the SMA2 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 back to the active unit the pre-SWACT audit results. A warm SWACT initiates based on the audit results.
- The original active unit stays InSv and clears data that is not stable.
- The new active unit sends five gain messages to the CM.
- The CM sends five gain-acknowledge messages to the SMA2.
- The SMA2 sends three gain-acknowledge received messages to the CM.

- The CM tells the original active unit to drop activity.
- The original active unit sends the CM a drop message, and the CM expects to receive this message.

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

- The CM messages the active unit of the SMA2 to start an audit of the inactive unit.
- The pre-SWACT audit runs.
- A warm SWACT initiates based on the audit results.
- The originally active unit stays InSv and clears data that is not stable.
- The newly active unit does not send messages to the CM.
- The wait time of 5 s for the originally active unit expires and a SWACT-back occurs.
- The originally active unit sends a SWACT-failed message to the CM.
- The CM SysB and RTS the inactive SMA2 unit.

Uncontrolled SWACT

The system implements an uncontrolled SWACT when either a hardware defect or a trap occurs in the active unit. The PM181 log messages indicate the reason the active unit dropped activity.

In an uncontrolled SWACT, the SMA2 initiates the pre-SWACT audit. The sequence of messages is as follows:

- The SMA2 active unit messages the inactive unit to start a pre-SWACT audit.
- The system implements the pre-SWACT audit.
- A warm SWACT initiates based on the audit results.
- The newly active unit messages the CM that a gain that is not solicited has occurred.
- The originally active unit stays InSv and clears data that is not stable.
- The newly active unit sends five gain messages to the CM.
- The CM sends five gain-acknowledged messages to the SMA2.
- The SMA2 sends three acknowledge-received messages to the CM.
- The CM tells the originally active unit to drop activity.

The SWACT is considered complete when the CM receives the gain message from the newly active unit. The CM must acknowledge the gain to the originally active unit. This condition applies to SWACTs that are controlled and SWACTs that are not controlled. If a SWACT back is not complete, the system busies and returns to service both units of the XPM.

SWACT operation

During a SWACT, the CM takes down and restores the maintenance connection. The maintenance connection is the application to application logical path between the CM and the RDT. When the maintenance connection is not available, the CM posts an ISTb condition to the IDT.

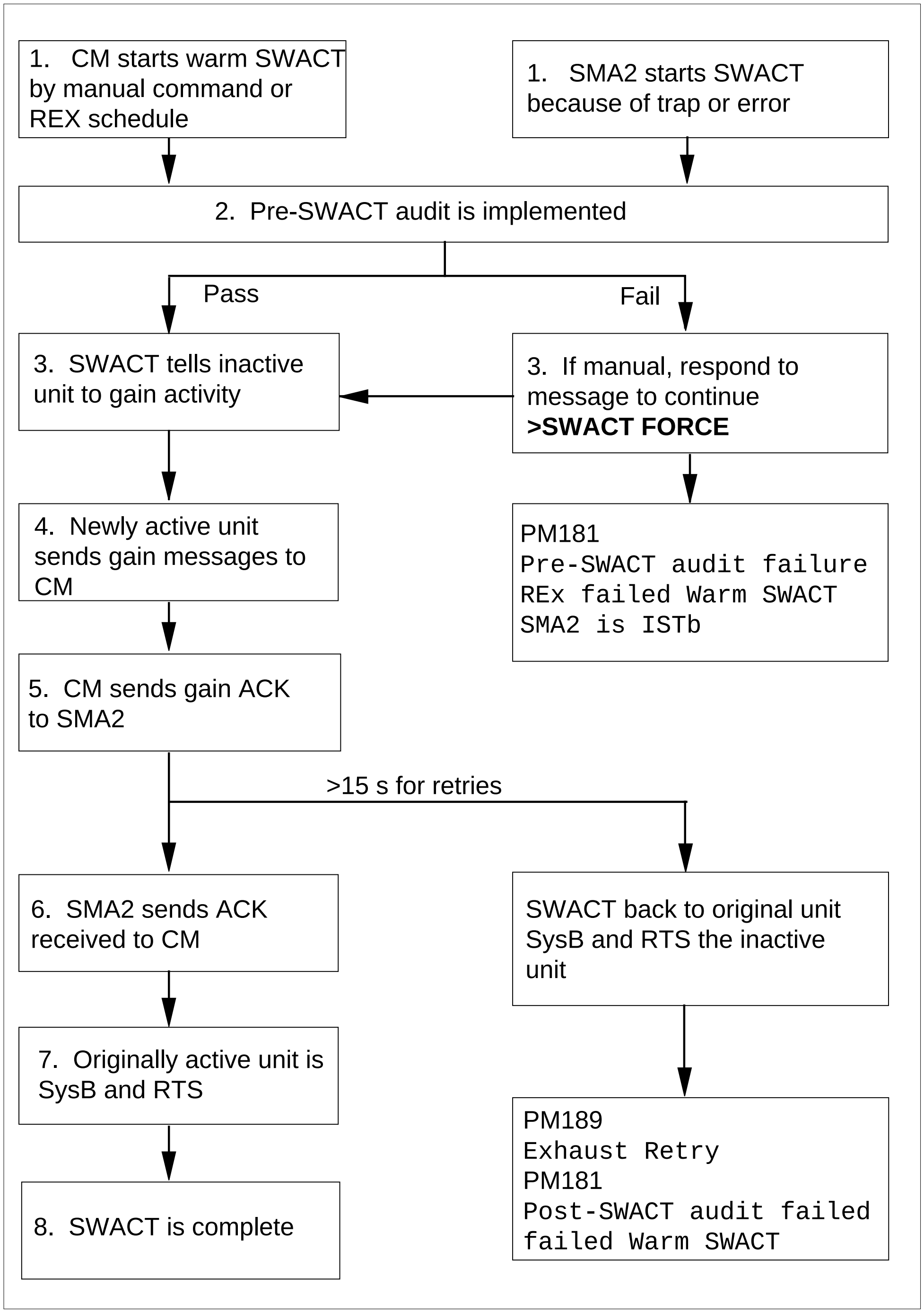
When a SWACT occurs, CM and the SMA2 exchange a series of drop and gain messages. The CM and the SMA2 exchange a series of drop and gain messages. These messages notify the CM and the SMA2 of the events that occur. The following table describes common phrases that appear in these messages.

Table 4-2 Message phrases that describe CM to SMA2 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 the newly active unit (unit 1) sends to the CM to tell the CM the unit gained activity
Gain acknowledge message	The message the CM sends to originally active unit to confirm the newly active unit sends messages
Gain acknowledge received	Message originally active unit sends to CM to confirm the newly active unit passed the post-SWACT audit
Drop message	Message the originally active unit (unit 0) sends to the CM that to tells the CM the unit dropped activity

The following figure illustrates the sequence for a controlled and uncontrolled SWACT. The figure shows the SWACT-back operation. A description of the SWACT-back feature appears later in this section.

Figure 4-3 SWACT sequence



Pre- and post-SWACT audits

The SMA2 pre-SWACT/Post-SWACT audits deny the SWACT to improve the warm SWACT operation. This action occurs if the inactive unit cannot maintain activity or communication with the CM. When these conditions occur, the pre- and post-SWACT audits provide the ability to SWACT-back to the originally active unit. The software that drives this feature is the SWACT controller in the CM. The software includes an autonomous ability added to the SMA2 software. The SWACT controller and pre- and post-SWACT audits are described as follows:

SWACT controller The system routes all manual requests and selected system requests for warm SWACTs to the SWACT controller in the CM. The SWACT controller polls PM diagnostic history data located in the CM and SMA2 state data. The SWACT controller either denies the request for a warm SWACT or allows a warm SWACT to proceed. The data polled determines this decision. During the SWACT, the newly inactive unit stays in service. The newly inactive unit starts a process to clean up data structures left in states that are not stable.

Pre-SWACT audit The active SMA2 unit queries the mate SMA2 unit over the intermodule communication (IMC) links. The active SMA2 unit messages the SWACT controller in the CM. This action occurs before the SMA2 performs a SWACT. The pre-SWACT audit of the inactive unit to include the state of the unit during the diagnostics, and 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 SWACT denies the request, the system notifies operating company personnel on the MAP terminal. The MAP terminal displays a detailed reason for the denial. The system informs operating company personnel that the SWACT FORCE command string can supersede the SWACT controller. If operating company personnel override the SWACT controller, a warm SWACT attempt occurs without reference to diagnostic history or state data.

Post-SWACT audit After a SWACT, two-way communication with the CM can be available. The newly active unit can maintain activity. If this condition occurs, the system busies the inactive unit and returns the unit to service. The system keeps the previously active unit in service. This condition occurs until the newly active unit can verify two-way communication with the CM. The newly active unit must be able to maintain activity. Communication can fail, and the newly active unit can drop activity. If these conditions occur, the SMA2 performs a SWACT-back to the originally active unit.

Warm SWACT functionality

A warm SWACT passes control of maintenance and call processing from the active unit of an SMA2 to the inactive unit. During the switch, the active unit becomes inactive. The previously inactive unit gains control and becomes active.

An uncontrolled warm SWACT occurs when the DMS switch detects a failure in the active SMA2 unit.

A controlled warm SWACT occurs when

- operating company personnel issue the SWACT command from the PM level of the MAP terminal
- a scheduled diagnostic, like the routine exercise (REX) test, occurs

When a warm SWACT occurs, the system maintains calls in the talking state. The system drops calls in transient states like digit collection or ringing. Subscribers receive dial tone after the system drops the call. The subscriber must reoriginate the call. For established calls, the newly active unit continues to supervise the call. In TR-303, an established call is a call that reaches the active state. For idle terminals, the warm SWACT is transparent. In TR-303, an in-service idle terminal is in the null state.

A warm SWACT requires that both SMA2 units be in-service. After a reload or a restart, the system automatically enables the warm SWACT feature.

Warm SWACT supports POTS and coin services.

Warm SWACT operates transparently. This condition makes sure the inactive unit has the data required to maintain established calls when a warm SWACT occurs. The inactive unit can process new calls when the unit becomes the active unit. The inactive unit must know of several types of data to take over call processing. An explanation of these data types follows.

If an SMA2 that supports a subscriber line with an active Deluxe Spontaneous Call Waiting Identification (DSCWID) session undergoes a warm SWACT, the system drops all parties to the call. The SWACT must occur between the alert tones plus the timer default seconds after re-alert and before the incoming call is acknowledged.

Static data Static data is the set of tables that the system sends from the CM to the SMA2. The set of tables define the configuration and use of the SMA2 hardware and software. Examples of SMA2 hardware and software include line data and the association between each IDT and the associated RDT. Inventory tables store line data. Use a table editor from the MAP terminal to obtain inventory tables. The classes of data include call processing data, configuration data, and maintenance data. Methods of static data transfer are bulk download, dynamic table, and tuple update.

Bulk data update A bulk data update occurs when the inactive unit is in a non-in-service state and returns to service. Information in this data transfer includes the state of the RDT and the subscriber states. The subscriber states can be idle or busy.

Dynamic data Dynamic data updates occur often. The data that changes in the active unit is updated in the inactive unit. Information in this data transfer includes subscriber states, channel assignment or reassignment, and port states.

Restrictions to warm SWACT

The operating company must know the following restrictions to a warm SWACT.

The system can drop established calls The SMA2 units communicate with messages the system sends over the IMC link. The bandwidth of the IMC link is 64 kbit/s, and processor real time limits the transmission rate. Dynamic updates occur at a low priority. Dynamic updates occur during heavy traffic periods. Real time is spent on call processing. The inactive unit does not always receive dynamic data updates. If a warm SWACT occurs during this heavy traffic period, the system can drop some established calls.

Established calls cannot use hook flash An established call maintained over an uncontrolled warm SWACT loses hook-flash ability. The hook-flash ability starts flash-activated subscriber features for the remainder of the call. Examples of flash-activated subscriber features include call transfer, three-way calling, conference calls, call parking, and executive busy override. The system ignores hook flash when the subscriber attempts a three-way call.

For example, subscriber A calls subscriber B and the system establishes a speech path. A defect occurs that the system detects. An uncontrolled warm SWACT starts on the XPM that subscriber A connects to. The system maintains a speech path. When subscriber A attempts to set up a three-way call, the system ignores the hook flash.

The system can take coin calls down The system can take a coin call, like other calls, down if a warm SWACT occurs during heavy traffic.

Improvements to warm SWACT

Enhanced warm SWACT allows flash-activated subscriber features to retain hook-flash ability over a controlled warm SWACT. This action occurs under specified conditions. These conditions must be present with the line service options assigned to the line that survived the SWACT. Some line service options, can disable the warm SWACT feature. These options must be active to disable the warm SWACT feature. The following table lists the line service options that do not disable the enhanced warm SWACT feature. Any line service option that does not appear in the following table can disable warm SWACT.

Table 4-3 Line service options compatible with Enhanced Warm SWACT (Sheet 1 of 2)

Residential features	
Automatic Call Back	No Receiver Off-Hook Tone
Automatic Recall	Off-Hook Queuing
Call Screening	Originating Line Select Option
Customer Originated Trace	Permanent Hold
Call Pickup	Private Business Line
Make Set Busy	Private Network
Denied Call Forwarding	Private Virtual Network
Denied Incoming	Query Time Display
Denied Originating Service	Random Make Busy
Denied Terminating Service	Requested Suspension
Directed Call Pickup No Barge In	Security Code
Directory Number Network Attributes	Sleeve Leads for Public File Reporting System
Direct Outward Dialing	Special Billing Number
Electronic Switching Network	Speed Calling Long
Equal Access PIC	Speed Calling Short
Equal Access Toll Denied	Speed Calling User
Essential Line Service	Star Equivalent
Expensive Route	Station Message Waiting
Hunt Groups	Stop Hunt
Last Number Redial	Subscriber Line Usage
Line Screening	Terminating Line Select Option
MADN Hold (POTS)	Toll Essential Service
Make Set Busy	Uniform Call Distribution

Table 4-3 Line service options compatible with Enhanced Warm SWACT (Sheet 2 of 2)

Residential features	
Network Dial Plan Display	Voice Message Exchange
Network Speed Calling	

Note: Enhanced warm SWACT is enabled only for controlled warm SWACTs. This SWACT occurs when operating company personnel enter the SWACT command or when SWACT occurs as part of the REX test sequence.

Examples of enhanced warm SWACT The following examples clarify the abilities and limits of enhanced warm SWACT:

- In the first example, subscriber A calls subscriber B and the system establishes a speech path. A warm SWACT occurs on the XPM that connects to subscriber A because of a scheduled REX test. The system maintains the speech path over the SWACT. Subscriber A flashes the hookswitch to set up a three-way call. Dial tone is received and subscriber A dials the third party number. The third party answers. Subscriber A flashes the hookswitch to connect subscriber B. This action completes the three-way call. In this example, the enhanced warm SWACT feature remained enabled because disabling line service options were not active during the SWACT.
- In the second example, subscriber A calls subscriber B and the system establishes a speech path. Subscriber A has the call waiting (CWT) line service option. A third party dials subscriber A and receives indication of the waiting call. A controlled warm SWACT occurs on the XPM that connects to subscriber A. When subscriber A attempts to place subscriber B on hold to access the waiting call, the system ignores the hook flash. The system maintains the speech path between subscribers A and B. This action disables the enhanced warm SWACT feature. The system loses the hook-flash ability because an incompatible line service option was active during the SWACT.

Pre-SWACT and post-SWACT enhancements

To enhance the pre-SWACT and post-SWACT activities, the system

- increases the number of pre-SWACT checks on the inactive unit, and
- increases the number of diagnostics run on the newly active unit immediately after the SWACT

New checks are added to the pre-SWACT query to expand the coverage that the current pre-SWACT and post-SWACT tests provide. Diagnostics added to the current post-SWACT audit expand the cover that current pre-SWACT and post-SWACT tests provide. The new checks and diagnostics detect additional problems that can cause the newly active unit to fail. These problems must be detected before the SWACT attempt occurs. These problems must be detected when a SWACT back to the originally active unit can occur.

The following functionalities are added to the pre-SWACT query:

- For a manual warm SWACT, improvements occur to the pre-SWACT query to include the number of traps in the inactive unit. If the inactive unit has traps, the MAP terminal displays a warning message.
- Improvements occur to the pre-SWACT query to include static data mismatch in the decision to SWACT. The active unit can be in-service and the inactive unit can be in-service trouble with static data mismatch. When these conditions occur, the pre-SWACT query fails.

The following functionality is added to the post SWACT audit:

- Improvements to the post-SWACT audit include a subset of in-service diagnostics on the newly active unit. The audit includes the current check for two-way communication with the computing module (CM). In-service diagnostics allow detection of specified hardware problems on the newly active unit before the SWACT-back interval expires. This condition permits a return of activity to the originally active unit, and prevents an outage.

The SWACT controller can deny a warm SWACT request if the inactive unit has a history of failures. The SWACT controller can deny a warm SWACT request if the inactive unit has problems at the time of the SWACT request. If the controller denies a request, the MAP terminal displays the reasons for failure. Two categories of failure reasons occur. One category is a list of the history of failures by unit, diagnostic and other. A second category is a list of the current diagnostic failure reports by unit. Reasons in these categories appear as the SWACT refusal reason text and appear as follows:

```
Inactive unit has a history of: <history text> or Inactive unit
is reporting: <CPM text>.
```

The history text displays the following values:

- IMC link failures
- message link failures
- superframe sync failures
- inactive unit cannot keep activity last time
- activity dropped due to <autonomous drop reason>
- pre-SWACT query failure
- static data mismatch

The common peripheral module (CPM) text displays the following values:

- unit is jammed inactive
- in overload
- message link failure
- static data corruption
- IMC link failure
- pre-SWACT difficulties
- activity, in-service or out of service, and diagnostics
- history of traps

SWACT back capability

If an SMA2 does not receive a gain-acknowledged message from the CC, the originally active SMA2 unit initiates a SWACT-back. During a SWACT back, the originally active unit attempts to regain activity. If successful, the system busies the inactive unit and returns the unit to service. The active unit remains in-service. The system preserves stable ISDN and POTS calls from the originally active unit over the SWACT-back. The system drops all new calls that occur after the SWACT and before the SWACT-back. If a SWACT back is not successful, the system busies both units of the XPM and returns the units to service.

Note 1: When a SWACT back occurs, the system does not restart operational measurements and peg counts.

Note 2: This feature is not supported during XPM or CM overload.

The following SWACT commands have SWACT back ability through commands the user enters:

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

Note: A routine exercise (REX) test that the REX scheduler initiates has the SWACT back ability. For more information on how this feature interacts with REX testing, refer to Routine exercise tests.

Manual switch of activity

Operating company personnel enter the SWACT command at the MAP terminal to perform a manual SWACT. After operating company personnel enter the SWACT command, the following message appears at the MAP display.

```
A warm SWACT will be 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

- 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

Each of these states causes different SWACT conditions. 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. The log can contain messages that indicate the following:

- activity time-out
- no CM links—The message links to the CM or host XPM are broken. Messaging cannot occur.
- duplicate defect—A critical hardware defect occurred.
- jammed—The unit is jammed, the unit cannot change state from active to inactive.
- static data is corrupt
- The original active unit sends a drop message to the CM.
- The newly active unit must send a gain message.

As with controlled SWACTs, the XPM continues to resend the gain message up to 15 s.

An uncontrolled SWACT can occur if the original active unit is InSv and the original inactive unit is ISTb. The cause of the ISTb state in the inactive unit determines this condition. If the cause is data synchronization, the same conditions occur as when the active and inactive units are InSv. If the ISTb occurs because of data synchronization, the original active unit drops sync and the XPM restarts.

If the original active unit is InSv less than 3 min, the unit does not require the OOS diagnostics to return to service. This condition occurs because a previous SWACT occurred. The previous SWACT can occur less than 3 min before the current SWACT. This condition indicates that the system completed OOS diagnostics on the active unit at that time. If the original unit is InSv at least 3 min, the active unit returned to service with OOS diagnostics.

The active unit attempts to return to service by any possible method. If the active unit cannot return to service, both units remain SysB. The whole XPM remains SysB.

5 SMA system user interface

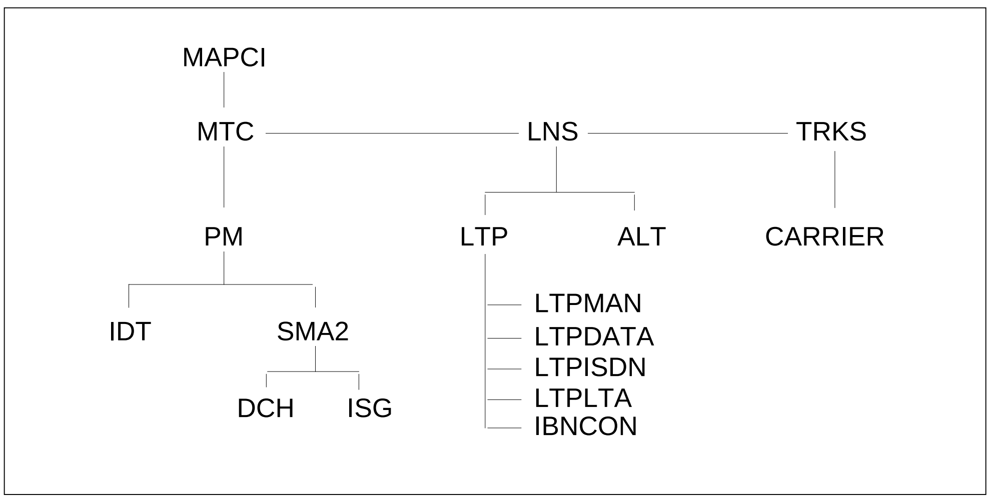
Introduction

This section contains commands to maintain and troubleshoot the SMA system.

In this chapter, the name extended peripheral module (XPM) refers to any peripheral module like the SMA2. When this chapter uses the name XPM in this environment, the name indicates SMA2.

Command levels monitor and maintain elements of the SMA system at the MAP terminal. The directory structure for the command levels that monitor and maintain the elements appear in the following diagram.

Figure 5-1 MAP directory structure



Getting help at the MAP terminal

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

- description of the function of the command
- defaults for information that is not specified
- command syntax for required and optional parameters

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

```
>help queryrdt
QueryRDT: Display the name of the associated IDT for
        a given RDT.
Parms:  <Site>  STRING
        <Frame> {0 TO 99}
        <Unit>  {0 TO 9}
```

Understanding command syntax

The standard command entry sequence is as follows:

- command
- required parameter
- optional parameter

Online help provides information for parameters that use the following special formats and symbols:

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

CI level user interface

Use the NAG command to display all nodes not in service

The command interpreter (CI) level node assessment graph (NAG) command allows operating company personnel to display all nodes not in service. The MAP response to the NAG command is like the response in the NAG400 log report. The command and log report are part of the NAG feature, which provides snapshots of nodes in the system. The feature provides snapshots of nodes that are not in service or have a routine exercise (REx) issue. The system runs the log reports hourly. To include the offline nodes in the output, operating company personnel can enter the command string NAG ALL. To turn the log report function on or off, operating company personnel can enter the command string NAG ON ir NAG OFF.

The system includes a node in the output or log report when the node is in one of the following states:

- system busy (SysB)
- C-side busy (CBsy)
- in-service trouble (ISTb)
- manually busy (ManB)

The system also can include a node if the node fails, aborts or does not complete the last REx test. When a node does not have an REx problem, the string “ATP" appears in the REx column to indicate that all tests passed.

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

```
Front End Load: LECOB006
Level   Node        Status  REX INFO        UNIT 0  UNIT 1
----------------------------------------------------------
   CPU      1         ACT
CM                  NORMAL
MS                  NORMAL
MS                  NORMAL
IOD                 NORMAL
NET                 NORMAL
PM RCCI     0        SYSB   ATP             SYSB    SYSB
   LCM  KOPM 12 0    SYSB   PASS:   PASS    SYSB    SYSB
   RMM      1        SYSB   ----             --      --
   ESA      4        SYSB   ----             --      --
    :       :         :       :               :       :
   LTC      0        ISTB   ATP             ISTB    ISTB
   SMA      1        ISTB   ATP             ISTB    ISTB
   IDT      37       ISTB   ---              --      --
   IDT      38       ISTB   ---              --      --
   SMA2     0        ISTB   ATP             ISTB      .
   RCC2     1        ISTB   ATP             ISTB    ISTB
    :       :         :       :               :       :
   LCM KRCM 03  0     .     PASS:   ----      .       .
Offline Node count:  3
```

Use the QUERYRDT command to display the host IDT

The QUERYRDT command allows operating company personnel to display the host IDT at a MAP terminal and display the associated host IDT. To display the host IDT, the operating company personnel enter the remote digital terminal (RDT) name. To display the controlling host IDT at a terminal, enter the following information at the CI level of the menu:

- parameter RDT site
- frame (0 through 99)
- unit (0 through 9)

An example of the response when operating company personnel enter QUERYRDT RALG 00 0 follows.

```
IDT 5
```

This response indicates that the external number for the IDT is 5.

Using the SHOWTERM command display the number of lines and terminals allocated to an IDT

The SHOWTERM command in the SMAUTIL level allows operating company personnel to

- view terminals and free spaces on a specified SMA or SMA2
- monitor the number of lines and terminals that have been allocated to an IDT
- view the node table before adding more lines
- predict the terminal number fragmentation that would impact call processing

For an understanding of fragmentation, and other issues that affect RDT line capacity changes, refer to the section titled “RDT line capacity changes" in chapter 6 of this manual.

To access the SHOWTERM command, enter SMAUTIL at the CI level with the pm_type and pm_no, where the pm_type is an SMA2 and the SMA2 number. For example, if you enter SHOWTERM SMA2 1, the response can be

```
>showterm sma2 1
|PM NAME  |  TYPE   |# LINES  | NODE #| INDEX #   | START   | # TERMS|
|         |         |         |         |         | TERM    |        |
|-------------------------------------------------------------------|
| IDT   8 |  RFT    |   672   |   83    |   2     |      2  |    673 |
|-------------------------------------------------------------------|
|           *** Free space ***                    |   675   |    673 |
|-------------------------------------------------------------------|
| IDT 100 |  ICB    |    24   |   89    |   4     |  1348   |     25 |
|-------------------------------------------------------------------|
|           *** Free space ***                    |  1373   |   1104 |
|-------------------------------------------------------------------|
| IDT  31 | GENTMC  |  1000   |   90    |   5     |  2477   |   1002 |
|-------------------------------------------------------------------|
| IDT  88 | GENTMC  |  1200   |   88    |   3     |  3479   |   1202 |
|-------------------------------------------------------------------|
|           *** Free space ***                    |  4681   |   8506 |
|-------------------------------------------------------------------|
|   2896 Lines out of a maximum of 5376 have been allocated.        |
|-------------------------------------------------------------------|
```

Use RDTPROV level to reprovision failed lines

Autoprovisioning occurs when the Digital Multiplex System (DMS) SuperNode switch receives an event report from the RDT that indicates a software problem with corrupt data. The RDT requests the switch to reprovision the RDT with line data from the switch. When an RDT loses communication with the host office SMA2, provisioning changes that the host office initiated do not transmit to the RDT.

Purpose of RDTPROV level commands

Operating company personnel can use the RDT line reprovisioning (RDTPROV) tool to update provisioning changes between the RDT and the switch. The RDTPROV tool is available at the CI level of the MAP terminal. The RDTPROV tool allows operating company personnel to reprovision all failed lines on an RDT. Operating company personnel also can reprovision all failed lines on all RDTs. Failed lines are defined as follows:

- For plain-old telephone service (POTS), electronic business sets (EBS), and coin lines, a failed line is a line that has tuples in table LNINV. The line does not have a corresponding tuple in table RDTLT.
- For integrated services digital-network (ISDN) lines, there are three conditions of failed ISDN lines when a tuple occurs in table LNINV. The conditions are as follows:
  - A corresponding tuple does not occur in table RDTLT. When this event occurs, access side provisioning failed.
  - The STATUS field is equal to WORKING and the corresponding tuple in table RDTLT has field TRANSP equal to TRANSP_NIL. When this event occurs, the transport side provisioning failed.
  - A corresponding tuple occurs in table RDTLT. A tuple occurs in table SPECCONN that has B1or B2 channels of the ISDN LEN in the ENDPT1 or ENDPT2 field. The corresponding field NAILUP1 or NAILUP2 in table RDTLT is equal to NAILUP_NIL. When this event occurs, consider nail-up provisioning failed.

Note: Operating company personnel must make sure that ISDN line objects the FORCE command affects are cleared (deleted) at the RDT. The ISDN line objects must clear before the FORCE command can reprovision all the affected lines correctly. Operating company personnel can clear the line objects through maintenance access at the RDT. When operating company personnel do not clear the line objects, the FORCE command fails to provision lines. When the FORCE command fails to provision lines, the user must provision the lines at the RDT manually. The user can run the REPROV command without the FORCE option to correct the problem at the DMS SuperNode switch.

Operating company personnel can use RDTPROV commands to initiate line provisioning requests to the RDT. Line provisioning occurs when the user enters the line in table LNINV. The operating company personnel use RDTPROV commands when the original object provisioning request fails. Two of the most common reasons for failed provisioning requests are as follows:

- The user attempts to provision an integrated digital-loop carrier (IDLC) line in a slot already provisioned for universal digital loop carrier (UDLC) service. An IDLC line provides digital access from the RDT to the central office switch without analog-to-digital conversion. A UDLC line requires analog-to-digital conversion through different access vehicles to the central office switch.

- The user attempts to provision a line on a shelf without an installed line interface card (LIC)

When the condition for provisioning failure clears, the user can use the RDTPROV level commands to initiate a reprovisioning request.

The RDTPROV level commands

Type RDTPROV at the CI level to enter the RDTPROV directory. Enter the REPROV command with the correct parameters to initiate the reprovisioning request. The command parameters are identified as follows:

- REPROV - enables lines to be reprovisioned at the RDT that have previously failed to be provisioned.
- ACTIVATE - activates autoprovisioning
- SUSPEND - suspends autoprovisioning

REPROV command

Enter the REPROV command with the appropriate parameters to initiate the reprovisioning request. The command parameters are identified as follows:

Access the RDT provisioning tool by typing

>rdtprov

and pressing the Enter key.

The system responds

```
RDTPROV:
```

Reprovisioning by IDT Reprovision all the failed lines on a specific RDT by typing

>REPROV IDT ext_idtno {Normal, Force}

and pressing the Enter key.

where

ext_idtno
is the external IDT number and has a value from 0 to 255

The NORMAL (default) or FORCE option is used with the command string REPROV IDT ext_IDT_no.

Note: The FORCE option can be used only if the IDT is offline.

The FORCE option is used only when object information is lost at the RDT. The FORCE option used with the command string REPROV IDT ext_IDT_no will not be able to delete and rewrite ISDN line objects if these objects are already present at RDT. This command should be done if there are lost objects at the RDT.

The FORCE option is used to reprovision all lines on the RDT.

The NORMAL option used with REPROV IDT ext_IDT_no will initiate a request to reprovision all the failed lines on the RDT.

Examples of reprovisioning by IDT Reprovision all lines on the RDT having, for example, external IDT number 107 by typing

`>reprov idt 107`

and pressing the Enter key.

The system sends a request to provisioning all the failed lines to the specified RDT. The system responds

```
Reprovisioning all lines on IDT 107 for which provisioning has failed.
LEN : RDT1  07 0 01 03 RDT line provisioning request completed
LEN : RDT1  07 0 01 04 RDT line provisioning request completed
LEN : RDT1  07 0 01 05 RDT line provisioning request completed
LEN : RDT1  07 0 01 06 RDT line provisioning request completed
LEN : RDT1  07 0 04 54 Warning: Failed to provision line at RDT, Check
RDT306 Logs
5 reprovisioning attempt(s) have been made.
```

If a line provisioning failure message is received for the line, the user should check RDT306 logs. After the condition that caused the provisioning failure is resolved, use the RDTPROV command to initiate the reprovisioning request again.

If operating company personnel attempt to reprovision an unequipped IDT by typing

`>reprov idt 109`

and pressing the Enter key, the system responds

```
IDT 109 is not equipped.
```

Operating company personnel should verify the external IDT number. If there is an error, repeat the command with an equipped external IDT number.

Reprovisioning by LEN Reprovision a failed line by LEN on a specific RDT by typing

```
>REPROV LEN len
```

and pressing the Enter key.

where

len
is any valid LEN which may contain the values for

frame from 0 to 511

unit from 0 to 9

shelf from 0 to RDTINV defined maximum

slot from 0 to RDTINV defined maximum

Examples of reprovisioning by LEN Initiate a reprovisioning request for a line specified by LEN number RDT1 1 0 1 46, by typing

```
>reprov len rdt1 1 0 1 46
```

and pressing the Enter key.

The system sends a line provisioning request to the RDT and displays a message that identifies if the reprovisioning request was successful

```
LEN : RDT1 01 0 01 46 RDT line provisioning request completed
```

If operating company personnel attempt to reprovision non-RDT lines by typing

```
>reprov len RCU0  00 0 00 04
```

and pressing the Enter key, the system responds

```
LEN: RCU0  00 0 00 00 The line must be an RDT line for the REPROV
command
```

The RDTPROV provisioning tool works for RDT lines only.

If operating company personnel attempt to reprovision failed nailed-up connections on ISDN lines (B channel) that are already assigned to some service by typing

>reprov len RDT1 7 0 1 1

and pressing the Enter key, the system responds

```
SPECCONN tuple inactive, no reprovisioning attempt will be made.
```

The SPECCONN tuple becomes inactive and B channels are no longer available for making nail-up connections. Operating company personnel should reprovision failed nail-up connections using the RDTPROV tool after the SPECCONN tuple becomes active.

Reprovisioning by range of LENs Reprovision a range of LENs by typing

>RDTPROV; REPROV RANGE start_len end_len {Normal, Force}

where

start_len and end_len
are the LENs that make up the range of LENs to be reprovisioned.

The NORMAL or FORCE option is chosen depending on whether or not lines have failed provisioning at the DMS SuperNode switch.

- Enter the FORCE option to reprovision all lines within the designated range.
- Enter the NORMAL option to reprovision only lines that have failed provisioning.

Examples of reprovisioning by a range of LENs Reprovision a range of LENs by typing

>reprov range len rdt 4 0 1 1 rdt 5 0 1 32 FORCE

and pressing the Enter key.

The system deletes and reprovisions all tuples datafilled in LNINV within and including the given range. In this example, all lines are from RDT 4 shelf 1 slot 1 to RDT5 shelf 1 slot 32. If line provisioning fails on one or more lines, the lines are set to system busy (SB) at the DMS SuperNode switch until the problem is corrected at the RDT. After the problem is corrected, the line can be reprovisioned manually or automatically by the RDT line audit. Manual reprovisioning using the command string REPROV RANGE, is useful when provisioning data is lost at the RDT without the knowledge of the DMS SuperNode switch.

ATTENTION

Before you use the FORCE option with the RANGE parameter, make sure that line provisioning data are deleted at the RDT. Make sure that line provisioning data are deleted for all lines that the RANGE parameter affects.

The FORCE option deletes and reprovisions all tuples entered in table LNINV in the given range.

The NORMAL option (default) reprovisions only lines that failed provisioning.

The system responds to a request to reprovision a range of LENs with one or more of the following messages, where nn is the number of lines:

- When a reprovisioning request is submitted for a range of lines and the response is

  `REPROV command attempted to reprovision nn line(s)`

  then one or more of the following messages informing of the status of the line reprovisioning request can also be output

  — `nn line(s) was(were) not provisioned.` (if there were any)

  — `nn line(s) was(were) provisioned or being provisioned.` (if there were any)

  — `nn line(s) was(were) found unequipped.` (if there were any)

  — `nn reprovisioning attempt(s) have been made.` (if there were any)

  If none of the reprovisioned lines were in the range of lines submitted in the reprovisioning request, then the following message is output:

  `There are no provisioned lines in given range.`

If the reprovision request is successful, then the response is

`All reprovisioning requests have been submitted or completed` and the following message can also be output if there were lines in the range of lines that failed to reprovision

```
nn line(s) failed to reprovision
```

If attempts to reprovision lines were unsuccessful, then the following message is output

```
No reprovisioning attempts have been made
```

Reprovisioning all failed lines

To reprovision all lines on all RDTs, type

`>REPROV ALL`

and press the Enter key.

> ***Note:*** Operating company personnel can reprovision only failed RDT lines through this command.

Example of reprovisioning all failed lines Operating company personnel attempt to reprovision all lines on all RDTs by typing

`>reprov all`

and pressing the Enter key.

The system sends the reprovisioning request to all failed lines and to all RDTs. The response displays the results of the line reprovisioning requests sent to all the RDTs. If there are no equipped lines datafilled in table LNINV for the IDT, the system responds with a message indicating this condition.

```
Reprovisioning all lines on IDT 101 for which provisioning has failed.
There are no equipped lines datafilled in table LNINV for IDT 101.
Reprovisioning all lines on IDT 102 for which provisioning has failed.
There are no equipped lines datafilled in table LNINV for IDT 102.
Reprovisioning all lines on IDT 103 for which provisioning has failed.
There are no equipped lines datafilled in table LNINV for IDT 103.
Reprovisioning all lines on IDT 104 for which provisioning has failed.
There are no equipped lines datafilled in table LNINV for IDT 104.

Reprovisioning all lines on IDT 107 for which provisioning has failed.
LEN : RDT1  07 0 01 04 RDT line provisioning request completed
LEN : RDT1  07 0 01 05 RDT line provisioning request completed
LEN : RDT1  07 0 01 06 RDT line provisioning request completed
LEN : RDT1  07 0 04 54 Warning: Failed to provision line at RDT, Check
RDT306 Logs
4 reprovisioning attempt(s) have been made.
Reprovisioning all lines on IDT 108 for which provisioning has failed.
LEN : RDT1  08 0 01 23 RDT line provisioning request completed
LEN : RDT1  08 0 01 54 RDT line provisioning request completed
LEN : RDT1  08 0 04 43 Warning: Failed to provision line at RDT, Check
RDT306 Logs
3 reprovisioning attempt(s) have been made.
```

If the reprovisioning request fails, check log RDT306. After the condition that caused the provisioning failure is resolved, use the RDTPROV tool command to initiate a reprovisioning request.

If operating company personnel attempt to reprovision all lines on all RDTs, and there are no RDTs datafilled in table RDTINV, by typing

>reprov all

and pressing the Enter key, the system responds

`No RDTs are datafilled in table RDTINV.`

ACTIVATE command

Activate autoprovisioning for a single RDT by typing

>ACTIVATE IDT <ext_idt_no>

and pressing the Enter key

where

ext_idtno
is a value from 0 to 255.

Activate autoprovisioning for all RDTs by typing

>ACTIVATE ALL

and pressing the Enter key.

SUSPEND command

Suspend autoprovisioning for a single RDT by typing

>SUSPEND IDT <ext_idt_no>

and pressing the Enter key

where

ext_idtno
is a value from 0 to 255.

Suspend autoprovisioning for all RDTs by typing

>SUSPEND ALL

and pressing the Enter key.

Control of RDT line data audits using RDTLNAUD level

When you access the RDTLNAUD level from the CI level of the MAP terminal, the RDT line audit tool is available. From the RDTLNAUD level, operating company personnel can start or stop the RDT line data audit manually. The user can query the status and history of an audit with the commands that follow.

The DMS SuperNode switch runs the RDT lines audit automatically every 24 h. The DMS SuperNode switch runs the RDT lines audit to make sure that the RDT receives the updated data. The audit also updates line data when the line date managed between the IDT and the RDT is not matched. Chapter 4, SMA2 automatic maintenance, describes the RDT lines audit.

> ***Note:*** The system allows only three manual audits to run at any one time.

Table 5-1 Summary of RDTLNAUD level commands (Sheet 1 of 2)

Command	Parameters	Description
STARTLEN	A specified LEN range.	Starts a manual RDT line audit for a specified LEN range.
STARTRDT	The name of the RDT (site, frame, unit) for audit.	Starts a manual RDT line audit for a specified RDT.
STOP	The name of the RDT (site, frame, unit) to audit.	Stops all manual RDT line audits that run on an RDT.

Table 5-1 Summary of RDTLNAUD level commands (Sheet 2 of 2)

Command	Parameters	Description
QUERY	None	Queries the status of manual and system RDT line audit processes.
HISTORY	The name of the RDT (site, frame, unit) to audit.	Displays the start time of the last audit that ran on the given RDT. Also displays the status of the audit for this RDT.

HISTORY command

The HISTORY command provides information for the RDT examined. The HISTORY command provides the time of the last audit and the status of the audit for the RDT. An example of the table of information that the system displays in response to the HISTORY command follows:

```
>RDTLNAUD

RDT Audit command interface (RDTLNACI):

>history RDT1 08 0

  RDT OBJECTS AUDIT PROCESS HISTORY:
Last Audit  05/28/96  20:59:50.765 TUE
Status:  done
```

The following terms identify the status of the RDT audit:

- nil: the audit has not started for this RDT
- awaiting: the audit can start for this RDT
- suspended: the association is down and the audit suspends for this RDT
- inprogress: the audit is in progress for this RDT
- done: the audit completed for this RDT

The QUERY command

The QUERY command takes a snapshot of all audits that run in the system at the time the command executes. The system can audit a maximum of seven RDTs, and a maximum of three manually audited RDTs. The system responds and gives the information in table form. The table can contain from 0 to 10 entries at any time. An example of a system response to the QUERY command follows:

```
Type        RDT Name        Status
----        --------        ------
System1     RDT1 08 0       RDT1 08 00 22
Man 1       RDT1 13 0       RDT1 01 13 43
```

Access the IDT maintenance connection using IDTMCC level

The IDTMCC level monitors and controls the IDT maintenance connection of the IDTs in the CM. The maintenance connection is a logical connection between the DMS SuperNode switch and the RDT. Maintenance commands and messages are carried over the IDT maintenance connection. To access the IDT maintenance connection, enter IDTMCC at the CI level of the MAP terminal.

The commands and parameters available at the IDTMCC level appear in the following table.

Table 5-2 Summary of IDTMCC level commands (Sheet 1 of 3)

Command	Parameters	Description
SUMMARY	None	Lists information as follows: • all IDTs defined in table RDTINV • the SMA2 attached to the IDT • the state of the maintenance connection and the RDT type • if the audit is active on this IDT
QCONN	The number of the IDT from 0 to 255 or all	Provides connection information of one IDT. This information includes the following: • the IDT number • the connection ID • the state of the maintenance connection • the RDT type
DISPLAY	The number of the IDT from 0 to 255 or all	Displays the statistics information for a specified IDT or all IDTs.
CLEAR	The number of the IDT from 0 to 255 or all	Clears statistics information for a specified IDT or all IDTs.
SETUP	The number of the IDT from 0 to 255 or all	Requests a maintenance connection to set up a connection for a specified IDT or all IDTs. ***Note:*** The SETUP command is not directly accessible to the customer. The SETUP command is password protected.

Table 5-2 Summary of IDTMCC level commands (Sheet 2 of 3)

Command	Parameters	Description
SMAAUDIT	The number of the SMA or IDT from 0 to 255, or all SMA or IDT. All have a request type of STOP, START, or QUERY, and TIMER. The timer has a value of 1 to 120 and a selection of timer unit of seconds or minutes	Starts or stops an audit for one SMA or one IDT.
IDTAUDIT	STATUS, START, STOP, and TIMER. The timer has a value of 1 to 120 and a selection of timer unit of seconds or minutes	Starts, stops, or queries an IDT audit.

RELEASE	The number of IDTs, or all IDTs on which to conduct maintenance actions	Aborts the connection of one IDT.
		Note: When the user enters the RELEASE command, the system displays the following warning at the MAP terminal:
		`Warning: This command will drop the maintenance connection. All OAM&P activities are disabled during downtime. An ISTb is posted to the IDT during downtime.`
		`MCC maintenance connection to be aborted?`
		`Please confirm (“YES", “Y", “NO", or “N")`

QUEUES	None	Displays the MCC queue statistics.
STATS	The action to perform, PRINT or CLEAR	Displays or clears the MCC statistics.

Table 5-2 Summary of IDTMCC level commands (Sheet 3 of 3)

Command	Parameters	Description
SIMUL	The number of IDTs, or all IDTs on which to conduct maintenance actions. The parameters also include the action to perform, like ADD, REMOVE, or ISTB.	Simulates IDT maintenance actions.
MCCIPC	The number of the IDT. The parameters also include the action to perform, like STATS with PRINT or CLEAR, and STATUS, ACTIVATE, or DEACTIVATE.	Queries, activates, or deactivates MCC-IPC interface.

IDTMCC level command responses

This section contains responses to commands the user enters at the IDTMCC level of the MAP terminal.

An example of a system response to the QCONN command follows:

```
>QCONN 9
IDT Related Information for IDT  9
- - - - - - - - - - - - - - - - - - -
   IDT Maintenance State        : OffL
   Finite State Machine State   : Idle_Not_Candidate
   Current ISTB Reason Posted   : No Active EOC Path
   Last Abort Reason            : No Active EOC Path
   IDT Type                     : Generic TMC
   IPC Communication Status     : Control Channel is Up
   IPC Communication Status     : Data Channel is Up
   SMA State                    : Swact Not In Progress
   Connection Setup Counter     : 0
   Object Model Type            : TR303 Object Model
   Object Model Release         : 666
   Object Model Subrelease      : 666
   Object Model Version         : NIL_V
   IDT COnnection Timer         :  30 Seconds , State: Stopped
   IDT Transient Timer          :   2 Minutes , State: Stopped

SMA Related Information:
- - - - - - - - - - - - -
   SMA Number                   : SMA 1
   SMA Audit State              : Stopped
   SMA Audit Timer Value        : 5 Minutes
   IDT Audited by SMA audit     : Disable
```

An example of a system response to the SUMMARY command follows:

```
MCC IDT Summary Display:
-----------------------

IDT         SMA      Connection      RDT Type        CM–SMA
  6     SMA     0        Up          AccessNode      Up
  3     SMA     0        Up          Generic TMC     Up
 12     SMA     1        Up          Generic TMC     Up
 24     SMA     1        Up          Generic TMC     up
  4     SMA2    0        Up          AccessNode      up
  8     SMA2    0        Up          Generic TMC     Up
```

An example of a system response to the QUEUES command follows:

```
MCC Queues Information
----------------------
Number of Events queued to MCC process:      0, Max:     4, Min:    0
Number of free Events in SMA Audit queue:  256, Max:   256, Min:  255
Number of free Events in IDT Audit queue:    1, Max:     1, Min:    0
Number of free Events in SMA msg queue:    256, Queue never used
Number of free Events in Abort Req queue:  256, Max:   256, Min:  255
Number of free Events in Setup Req queue:  256, Queue never used
Number of free Events in MTC Req queue:    512, Max:   512, Min:  507
Number of free Events in NoCMSma queue:    256, Queue never used
Number of free Events in timer queue:      256, Queue never used
```

An example of a system response to the STATS command follows:

```
MCC Global Statistics
--------------------

-->  MCC Process Statistics
     - - - - - - - - - - -
   NIL (Errors)                                :    0
   SMA Audit Timer Expired                     :   17
   IDT Audit Timer Expired                     :    5
   SMA Message Received                        :   18
   Abort Connection                            :   22
   Set Up Connection                           :    1
   IDT Maintenance Request                     :   121
   No CM SMA Communication                     :    0
   Connection or Transient Timer expired       :    0

-->  MCC FSM Statistics
     - - - - - - - - -
   IDT Maintenance Criteria Removed            :    4
   IDT Maintenance Criteria Added              :    8
   Connection Confirmation Received            :    1
   Transient Reject Timer Expired              :    0
   Maintenance Cleanup                         :    2
   Connection Setup Requested by CM            :    1
   Connection Setup Timer Expired              :    0
   Connection Aborted by Invalid OM            :    0
   Connection Aborted by SMA or RDT            :    0
   Connection Aborted by Stack Error           :    0
   Connection Aborted by XPM Swact             :    0
   Connection Aborted by Application           :    0
   Connection Aborted by CI Tool               :    0
   Connection Aborted by SMA Audit             :    0
   Connection Aborted by Lost SMA Com.         :   28
```

PM level user interface

The PM level directories and commands in this section monitor and perform maintenance on the SMA system.

PM states

The following table lists PM states that appear at the MAP terminal.

Table 5-3 Summary of PM states

PM state	Code	Description
Central side busy	CBsy	The PM cannot communicate with the central control (CC) because the network interface links are not available. The network interface links carry messages between PM and the DMS SuperNode network.
In service	InSv	The PM is in service and can support any intended process, like call processing.
In-service trouble	ISTb	The PM is in service and has a minor fault.
Manual busy	ManB	The PM is busy because the user entered the BSY command at the MAP terminal.
Offline	Offl	The user removed PM from service for commissioning tests or for a temporary hold of the SMA2 out of service.
System busy	SysB	System maintenance removed PM from service.

SMA2 level user interface

The SMA2 level monitors and maintains the SMA2.

The SMA2 integrates into the PM level MAP display. To access information about an SMA2, the user must post the SMA2. The following table shows a standard response at the MAP display terminal when the user posts an SMA2.

Figure 5-2 Posting an SMA2 at the MAP display terminal

```
   CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext    Appl
    .      .      .       .    4 SysB    .       .       .        .       .
                                  M
SMA2                           SysB     ManB     Offl    CBsy    ISTb   InSv
0  Quit                PM        4        0        10      3       3      3
2  Post_               SMA2      0        0         0      0       1      1
3  ListSet
4                    SMA2 0   ISTb   Links_OOS:  CSide  0  PSide  0
5  Trnsl_
6  Tst_              Unit 0:  Act   ISTb
7  Bsy_              Unit 1:  InAct ManB    Mtce
8  RTS_
9  Offl
10 LoadPM_
11 Disp_
12 Next
13 SwAct
14 QueryPM
15 DCH
16
17 Perform
18 ISG
   userid
TIME  hh : mm>
```

The commands supported for SMA2 at the PM level appear in alphabetical order in the following table.

Table 5-4 Summary of SMA2 commands (Sheet 1 of 3)

Command	Function	Description
BSY	Busy	Busies the following: • a unit of a posted SMA2 • a P-side link • a CLASS modem resource (CMR) card • an SMA2
DCH	DCH sublevel	Accesses the D-channel handler (DCH) sublevel for D-channel handler maintenance. Available on SMA2s that provide ISDN.
DISP	Display	Displays a group of SMA2s in a specified state when the user uses DISP with the STATE option. Also displays a diagnostic history of the SMA2 when the user uses DISP with the DIAGHIST option.

Table 5-4 Summary of SMA2 commands (Sheet 2 of 3)

Command	Function	Description
ISG	ISG sublevel	Accesses the ISDN services group (ISG) sublevel for ISG maintenance. Available on SMA2s that support ISDN.
LISTSET	Lists posted set	Lists the contents of the posted set.
LOADFW (non-menu)	Load firmware	Loads firmware into a PM or a unit. The parameters for this command are presented in the section titled “In-service firmware downloading" that follows this table.
LOADPM	Load PM	Loads software and data into one or both units of a posted SMA2 or the CMR card.
NEXT	Next	Posts the next SMA2 in a displayed set.
OFFL	Offline	Sets a posted SMA2 offline.
PERFORM	Perform sublevel	Allows operating company personnel to view details of the performance and activity of the posted SMA2.
PMRESET	Peripheral reset	Resets posted SMA2 or SMA2 unit.
POST	Post	Posts a specified SMA2, all SMA2s in a specified state, or SMA2 peripherals as a group.
QUERYPM	Query PM	Displays the following information about a posted SMA2: • location • node number • associated peripheral load name • any associated faults • information about faults when the user uses QUERYPM with the FLT option • information about the diagnostic history when the user uses QUERYPM with the DIAGHIST option
QUIT	Quit	Quits the current PM level of the MAP terminal or cancels an SMA2 selection.
RECOVER	Recover SysB PM	Recovers a system busy SMA2. The command determines if the PM is loaded and returns the PM to service to recover the SMA2.
RTS	Return to service	Returns to service a P-side link, one or both units of a posted SMA2, or a CMR card.

Table 5-4 Summary of SMA2 commands (Sheet 3 of 3)

Command	Function	Description
SWACT	Switch activity	Switches SMA2 activity from the active to the inactive unit for a posted SMA2. The SWACT Controller can deny the SWACT request because of the faults or previous performance of the inactive unit.
TRNSL	Translate	Displays information about the interface links between the SMA2 and network. Displays information about the DS-1 links between the SMA2 and remote digital terminal (RDT).
TST	Test	Tests one or both units of a posted SMA2, a CMR card, or a DS-1 link between an SMA2 and RDT.

In-service firmware downloading

In-service firmware downloading permits XPM firmware loading in an SMA2 unit while the unit is in service (InSv). This feature reduces the amount of time one unit of the SMA2 is out-of-service (OOS).

> ***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 SMA2 unit out of service (OOS).

In-service firmware downloading uses 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 SMA2, 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.

The firmware option of the LOADPM command is disabled. 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 SMA2. 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 check 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 an individual unit basis, perform a SwAct followed by the RTS command. Execute the LOADFW command with the UPGRADE option on the now inactive unit.

The following table lists parameters used with the LOADFW command.

Table 5-5 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.

Examples of SMA2 commands

This section provides examples of specified SMA2 level commands.

Example of SWACT command The user enters the command SWACT without parameters for a posted SMA2. The following response appears at the MAP terminal.

```
A Warm SwAct will be performed after data
sync of active terminals.
Please confirm (“YES” or “NO”):
```

The user confirms the request for a SWACT and the following message appears at the MAP terminal.

```
SwAct refused by SwAct Controller
Inactive unit has a history of:
   Message link failures
   Superframe sync failures
```

The user enters the SWACT command with the FORCE option to override the SWACT Controller. The following response appears at the MAP terminal.

```
A Warm SwAct will be performed after data
sync of active terminals.
Overriding the SwAct Controller
Please confirm (“YES” or “NO”):
```

The user confirms the request to override the SWACT Controller, and the following message appears at the MAP terminal.

```
SwAct Failed
Reason:  XPM SwActback
```

The MAP response indicates the SWACT failed and the originally active unit regained activity.

The user adds responses to the history text and CPM text for the SWACT command. Operating company personnel enter the SWACT command and the following responses appear at the MAP terminal.

```
A Warm SwAct will be performed after data
sync of active terminals.
Please confirm (“YES” or “NO”):
```

Operating company personnel confirm the request and the following message appears at the MAP terminal.

```
SwAct refused by SwAct Controller
Inactive unit has a history of:
   Static data mismatch with CC
Warning: The inactive unit has a :
   History of 3 traps
```

Example of the DISP command There are two options of the DISP command. One option of the DISP command is STATE. Use this option with a state like SysB. This option requests the system to list all PMs in the specified state. You can use this option with a specified PM to display all XPMs of the requested type, like SMA2.

The following is an example of the DISP command using the STATE option with a selected PM. The system responds and lists all XPMs of the state and PM type requested.

>MAPCI;MTC;PM;DISP STATE SYSB SMA2

```
    SysB SMA2 : 0
```

The following section on XPM diagnostic history contains an example of the DISP command using the DIAGHIST option.

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. Operating company personnel can use the data in this database to affect DMS maintenance activities. This database provides operating company personnel with MAP command access to data on the results of diagnostics. The system retains data in the history database over warm, cold, and reload restarts. This feature is part of software package New Peripheral Maintenance (NTX270AA), and is not an optional feature.

This feature is one of a group of three related features. The two other features 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, along with past REX tests and SWACT results. The XPM PreSWACT/Post SWACT uses the results to determine if the system must perform a SWACT. This text refers to the functionality introduced by the PreSWACT/Post SWACT Audit as the SWACT Controller. The XPM REX Control and Trouble Notification feature modifies the XPM REX test. The feature uses the SWACT Controller and provides log improvements.

An XPM can execute diagnostics to test the functionality of the XPM hardware. Diagnostics can run as a result of CC or XPM requests. The diagnostics that the XPM performs are normally part of XPM audits. The SWACT Controller and operating company personnel use the diagnostic results that feature AF5006 provides for system analysis.

An option of the DISP command is DIAGHIST. The default for the DIAGHIST with a specified PM to display all XPMs of the requested type.

When the system does not support the requested PM, the system displays the following message.

```
Diagnostic history is not supported
for this PM type.
```

When there are no peripherals on the requested PM, the system displays the following message.

```
None.
```

The following is an example of the DISP command using the DIAGHIST option with a selected PM. The system responds and displays the diagnostic history for all XPMs of the PM requested.

>MAPCI;MTC;PM;DISP DIAGHIST SMA2

```
Diagnostic History for RTPK04AY
Report generated 95/03/29 WED at 13:36:20

SMA2 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
               NTBX01       1            3
               NTBX02*      0           15
             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
              DCHIALB        0           6
              EXTDIAG        0           4
              FAC AUD        0           1
              CPM AUDIT      0           1
             CARDLIST     STF         LTF
               NTBX01       0            2
               NTMX79       0            6
               NTMX76       1            1
               NTAX74       0            1
```

Using the DIAGHIST option with the QUERYPM command

An option called DIAGHIST is an addition to the QUERYPM command. This option displays the history of diagnostic failures for the posted peripheral. The following information appears for the posted SMA2:

- short and long term failure-counts appear for each unit
- last reset date and time for short term failure counters appear for each unit
- last reset date and time for long term failure counters appear for the whole node

This level allows reset of long term failure counters. The last diagnostic failure time is the time of the last diagnostic failure that occurred on the unit. Enter the command string QUERYPM DIAGHIST to provide a summary of diagnostic failures and cards reported as hardware faults. The summary format is the same for the command string DISP DIAGHIST. The MAP responses in the following text are examples.

If the user requests a PM that is not supported, like the IDT, the following message appears.

```
Diagnostic history is not supported
for this PM type.
```

When 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
  - — resets long term failure counters to zero. The system generates a PM601 log. The PM601 log records a summary of the long term failure counters before the 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 are reported as hardware failures. This parameter does not contain diagnostic information.

> ***Note 1:*** Do not use the reset parameter often. Reset changes long term failure counters to zero.
>
> ***Note 2:*** The card parameter provides a asterisk (*) next to any card reported by a diagnostic on the mate unit in the XPM reports.

Examples of the command string QUERYPM DIAGHIST with and without optional parameters follow.

`>MAPCI;MTC;PM;POST SMA2 1; QUERYPM DIAGHIST`

```
SMA2 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
                :NTBX01             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
                :NTBX01             0         1
               :NTBX02 in unit 0    0        15
                :NTMX79             0         5
       EXTDIAG: Total failures      0         4
                :NTBX02 in unit 0   0        12
                 :NTMX79            0         4
       FAC AUD: Total failures      0         1
                :NTMX76             0         1
                :NTAX74             0         1
       CPM AUD: Total failures      0         1
                :NTMX79             0         1
                :NTBX01             0         1
```

This response is the default information for the DIAGHIST option. The default response shows the failed diagnostics and associated cards. This display shows one failure of the CPMAUD on unit 0. The 1 in the STF column indicates this failure. The display shows that the CPMAUD failed from the last time unit 0 gained activity. The last time unit 0 gained activity was at 12:28 A.M. on 3/29. The numbers underneath the 1 indicate the cards involved. The CPMAUD failed a total of four times from the LTF reset time (8:44 A.M. on 3/24).

A single test can result in one or more diagnostic failures. A single test can have zero or more associated cards. The total card counts from this display does not always represent the number of times a diagnostic fails. Also, the cards can be on either unit. Only certain diagnostics report failures on the mate unit. This display shows cards on the same unit the diagnostic runs on.>**QUERYPM DIAGHIST DIAG**

```
SMA2 1  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**

```
SMA2 1 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
               NTBX01        1            3
               NTBX02*       0           15
             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 15:12:15
             CARDLIST      STF          LTF
               NTBX01        0            2
               NTMX79        0            6
               NTMX76        0            1
               NTAX74        0            1



WARNING: The Long Term Failure (LTF) counters will be
         ZEROed.

Please confirm (”YES” ”Y” ”NO” or ”N”):
```

>QUERYPM DIAGHIST RESET

```
LTF counters reset to zero.
```

>YES

SWACT Controller

This feature provides short term diagnostic performance data to the SWACT Controller. A set of query procedures are provided for applications that need query information. The SWACT Controller determines if a SWACT must occur. Short term data for a unit means diagnostic and audit failure counts. The system measures audit and failure counts from the last time a unit gained activity.

Operating company personnel analysis

The XPM Diagnostic History feature provides data on the failure history of diagnostics. This data provides information on the number of failures that occur and the cards that are at fault. The MAP commands display data for an XPM or for all XPMs that this feature supports. Two sets of data are available through the use of MAP commands. These sets of data are short and long term failure counts.

Short term failure counts are accumulated from the last time a unit gained activity. Operating company personnel can use this data to guide maintenance activities and support organizations for outage analysis. When an outage occurs, include the XPM Diagnostic History data for that peripheral with other related data.

Long term failure counts accumulate from the last time manual action or BCS application reset the long term failure counts. Long term failure counts last for the life of the BCS. This system sends this data back to the design group to provide data for more diagnostic system improvements.

Description of diagnostics

The subsystem runs different diagnostics on every type of PM because each PM contains different hardware. There are approximately 75 diagnostics for XPMs. The subsystem only runs a subset of the 75 diagnostics on any given PM. This feature captures failures for the following types of diagnostics:

- in-service
- out of service
- single diagnostic
- facility audit
- other audits

Each diagnostic involves zero or more cards. The XPM determines the number of cards. In some instances, the central control (CC) for display at the MAP terminal or logs generates the card lists. The subsystem includes cards that an XPM diagnostic or audit involves and reports to the CC. The subsystem includes these cards in a list of card failures.

> ***Note:*** The XPM Diagnostic History feature records only the cards that the XPM involves and not cards that the CC generates.

The user can group diagnostics together and run the diagnostics as a set. The user can run the diagnostics as a single test. Standard defined sets are as follows:

- in-service tests
- out-of-service tests
- facility audit tests
- mate diagnostics
- ROM diagnostics

In-service and out-of-service tests

In-service and out-of-service tests are solicited tests. The subsystem runs these tests as a result of CM requests. When the CM requests to test an XPM unit, the XPM runs a set of diagnostics.

The CM requests to test an XPM unit with the following commands:

- manual TST command
- manual or system RTS,
- SWACT
- BSY
- REX commands

The PM type, state, and activity of the XPM unit determine the diagnostics included in the set. When the unit is in service, the XPM runs a set of in-service diagnostics. When the unit is out-of-service, the XPM runs a set of out-of-service diagnostics.

The XPM returns the results of each diagnostic test to the CC with a final result for the set. If cards are defective, the system generates a card list and transfers the list to the CC. The system generates and transfers the list at the termination of the set of tests.

Facility audit

The facility audit is a set of diagnostics. The XPM runs the facility audits to test the XPM. If the XPM encounters a problem, the XPM sends a message to the CC. The message indicates the problem and contains a list of defective cards.

Mate diagnostics

If communications are lost with one unit, the mate unit can diagnose that unit. The mate unit sends the results to the CC.

ROM diagnostics

If the XPM is at ROM level, the XPM can implement a set of ROM diagnostics.

This feature does not capture failures. This feature does not capture the cards that mate and ROM diagnostics involve. For each diagnostic, the system generates a card list or log at the MAP terminal. The system does not record any card list or diagnostic failures in the diagnostic history.

The following table describes the SMA2-related diagnostics that this feature supports. The table classifies the diagnostics as solicited or audit, or both solicited and audit. In addition, the table identifies the diagnostics that the SWACT Controller requires.

Table 5-6 Diagnostics supported (Sheet 1 of 2)

Diagnostic name	Description	Type	Required by SWACT Controller
CMRDIAG	CMR card diag	both	no
CSMDIAG	CSM diag	solicited	no
DCHIALB	DCH inactive loopback diag		no
EXTNDIAG	Extension shelf diag		no
FDLDIAG	FDL diag		no
IMCDIAG	IMC link diag		yes
ISPHDLC	ISP HDLC diag	solicited	no
ISPSPHF	EISP speech bus full diag	solicited	no
ISPSPHI	EISP speech bus internal diag	solicited	no
MSG6X69	MX76 diag	solicited	yes
MTXDIAG	Matrix diag		no

Table 5-6 Diagnostics supported (Sheet 2 of 2)

Diagnostic name	Description	Type	Required by SWACT Controller
PSLDIAG	P-side loops diag		no
SIGPABDG	SIGP and A/B bits diag		no
SPCHDIAG	Speech path	solicited	no
SYNCDIAG	Sync diag	both	yes
TONEDIAG	Tone diag	both	no
UTRDIAG	UTR card	solicited	no

The following table describes the SMA2 cards that the XPM Diagnostic History feature supports.

Table 5-7 Supported cards

Card name	Description
NT6X40	Net Interface Link
NT6X78	CLASS Modem Resource (CMR)
NT6X92	Universal Tone Receiver (UTR)
NTBX01	ISDN Signaling Processor (ISP)
NTBX02	Enhanced D-channel Handler (EDCH)
NTMX75	Matrix card
NTAX74	68040 Cellular Access Processor (CAP)

How diagnostics are stored

This feature stores diagnostic results in the form of counters. Each unit of each peripheral that this feature supports has a set of counters. Counters are kept for diagnostic failures and for cards that have faults. Three types of counters are kept:

- diag - the number of times a diagnostic fails
- card - the number of times the system reports a card as defective
- diag and card - the number of times a diagnostic and card occur together

Two subcounters are kept for each of the three counters. These counters follow:

- Short term failure counters. The XPM Diagnostic History feature uses the short term failure counter to determine if a SWACT must occur. Short term failure counters are reset often in the software release cycle.
- Long term failure counters. Long term failure counters record the diagnostic history of a peripheral or office over a extended period of time. The command string QUERYPM DIAGHIST RESET a product computing-module load (PCL) application resets a long term failure.

A single test failure can report one or more diagnostic failures and zero or more cards that have faults. A diagnostic that runs in one unit can report cards in that unit and 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 every peripheral as follows:

- for the node
  — the time when the system last reset long term failure counters
- for unit 0
  — the time when the system last reset short term failure counters for unit 0
  — the time when the last diagnostic failure occurred on unit 0
- for unit 1
  — the time when the system last reset short term failure counters for unit 1
  — the time when the last diagnostic failure occurred on unit 1

The system resets short term counters to zero internally for each unit when a unit gains activity. This gain of activity can occur because of an RTS or SWACT command.

Long term counters are reset on a node base from an XPM posted at the MAP terminal. When the XPM resets the long term counters, the system generates a log. The log has a summary of the data collected for that node before the reset.

A product computing-module load (PCL) application resets all diagnostic history data. This data includes short and long-term failure counts. When this event occurs, the system does not generate a log with long-term failure counts.

DCH level user interface

The menu display for a posted SMA2 equipped to provide ISDN service provides access to two additional sublevels. These sublevels are DCH and ISG.

The DCH integrates into the PM level MAP display. The DCH level commands maintain the EDCH cards. The following table shows a standard response at the MAP display terminal when an SMA2 equipped to provide ISDN services posts.

Figure 5-3 Example of the DCH level on an SMA2

```
    CM    MS    IOD    Net    PM    CCS    Lns    Trks    Ext    Appl
     .     .     .      .   4 SysB   .      .      .       .       .
                                M
DCH                      SysB    ManB   Offl    CBsy  ISTb   InSv
0  Quit         PM          4       0     10       3     3      3
2  Post_        SMA2        0       0      0       0     1      1
3
4                SMA2 0   ISTb   Links_OOS:  CSide  0 , PSide  0
5  Trnsl         Unit0:  InAact  InSv
6  Tst           Unit1:  Act     InSv
7  Bsy
8  RTS             DCH      0       0      0       0     0      4
9  Offl
10 LoadPM        DCH
11
12 Next          DCH:
13
14 QueryPM
15 Disp
16
17 Swtch_
18
    userid
 TIME  hh : mm>
```

The DCH-level commands appear in the following table.

Table 5-8 Summary of DCH commands (Sheet 1 of 2)

Command	Function	Description
BSY	Busy	Busies a specified enhanced D-channel handler (EDCH) or all posted EDCHs with ALL option.
DISP	Display	Displays EDCH and ISG information.
LOADPM	Load EDCH	Loads software into busy EDCH(s).
NEXT	Next	Steps to the next EDCH in the posted set.

Table 5-8 Summary of DCH commands (Sheet 2 of 2)

Command	Function	Description
OFFL	Offline	Sets a specified EDCH offline.
POST	Post	Selects one or more EDCHs.
QUERYPM	Query EDCH	Displays EDCH location information. The FLT parameter displays the EDCH fault information.
QUIT	Quit	Quits the current level.
RTS	Return to service	Returns a specified EDCH to service, and performs diagnostics.
SPARING	Sparing	Enables or disables sparing.
SWTCH	Switch	Moves the EDCH services to a spare.
TRNSL	Translate	Displays ISG channel information.
TST	Test	Tests the specified EDCH.

The ISG level integrates into the PM level MAP display. The ISG level commands maintain ISDN services that the EDCH cards support. The following table shows a standard response at the MAP display terminal when an SMA2 equipped to provide ISDN services posts.

Figure 5-4 Example of the ISG level on an SMA2

```
   CM     MS     IOD     Net     PM     CCS     Lns      Trks     Ext    Appl
    .      .      .       .    4 SysB    .       .        .        .      .
                                  M
ISG                         SysB     ManB    Offl     CBsy   ISTb    InSv
0  Quit              PM        4        0      10        3      3       3
2  Post_             SMA2      0        0       0        0      1       1
3
4
5                  SMA2 0   ISTb   Links_OOS:  CSide  0 , PSide  0
6                  Unit0:  InAact  InSv
7  Bsy_            Unit1:  Act     InSv
8  RTS_
9  Offl_           ISG                 1111111111  2222222222  33
10                         123456789   0123456789  0123456789  01
11
12 Next            ISG
13
14 QueryCH_
15 Cont_
16 Loopbk_
17
18
   userid
TIME  hh : mm>
```

The ISG-level commands appear in the following table.

Table 5-9 Summary of ISG commands

Command	Function	Description
BSY	Busy	Busies a specified channel.
CONT	Continuity	Performs a channel continuity test on a specified channel.
LOOPBK	Loopback	Sets up, releases, or queries a channel loopback point.
NEXT	Next	Steps to the next ISG on the posted set.
OFFL	Offline	Sets a specified ISG offline.
POST	Post	Selects one or more ISGs.
QUERYCH	Query channel	Displays channel endpoint information.
QUIT	Quit	Quits the current level.
RTS	Return to service	Returns to service a specified channel.

IDT level user interface

The integrated digital terminal (IDT) is a logical entity that corresponds to the part of the switch dedicated to a single access vehicle. Use the IDT level to maintain message channels between the SMA2 and the access vehicle.

The following sections contain the following:

- the IDT MAP level
- a summary of the commands in a table
- a description of some commands to show how the commands work (included are key parameters)
- different examples to show how the user can use the commands
- possible responses to commands in a table

The following figure shows the response at the MAP display when an IDT posts.

Figure 5-5 Posting an IDT at the MAP display

```
  CM    MS    IOD    Net    PM    CCS    Lns    Trks    Ext    Appl
  .     .     .      .      IDT   .      .      .       .      .

IDT
0  Quit           SysB    ManB     Offl    CBsy   ISTb  InSv
2  Post_     PM     0       0        8       0      0     25
3  Listset   IDT    0       1        1       0      0      5
4
5  Trnsl     IDT 17   InSv     LINKS_OOS: 0    RDT Type: GENTMC
6
7  Bsy       POST:
8  RTS
9  Offl
10
11 Disp_
12 Next
13
14 QueryPM
15 RDTalarm
16 PPS_
17 CONT_
18 LOOPBK_
    userid
TIME  hh : mm>
```

A summary of all IDT commands appears in the following table.

Table 5-10 Summary of IDT level commands (Sheet 1 of 2)

Command	Parameters	Description
BSY	The message channel does not have parameters or you must enter parameters, like EOC1 or TMC1.	Busies the whole IDT or a message channel. You cannot busy the last in-service common signaling channel (TMC) path for an IDT that is in-service. When you busy the last embedded operations channel (EOC), you lose the maintenance interface with the RDT.
CONT	The message channel and the type of test, INT or EXT	Allows a continuity test to be run on an IDT path.
DISP	State (DIAGHIST is not operational for IDT)	Displays all IDTs in specified PM state.
LISTSET	ALL or pm_type	Lists the contents of posted sets.
LOOPBK	The type of loopback command, SETUP, RLS, or QUERY, and the message path	Sets up, releases, or queries a loopback for a path at the enhanced ISDN-signaling preprocessor (EISP) towards the RDT. The path must be manually busy, and the SMA2 must be in service.
NEXT	Next	Posts the next IDT in a displayed set.
OFFL	Offline	Sets a posted IDT offline.
POST	Post	Posts a specified IDT, all IDTs in a specified state, or IDT entities as a group.
PPS	QUERY, ACT, INH, or ENA	Allows operating company personnel to enable, limit, or activate protection switching for message channels.
PROGRESS	ON, OFF, or QUERY	Activates, deactivates, or queries the progress field.
QUERYPM	None or FLT	When you use QUERYPM without parameters the system displays the information about the IDT and the RDT name. When you use QUERYPM with the FLT (fault) parameter, QUERYPM gives in-service trouble (ISTb) reasons. The system suppresses the primary operations controller (OPC) ID if the IDT and RDT are of type GENTMC. The system also suppresses the support OPC ID in this condition.
QUIT	None	Quits the current PM level of the MAP terminal or cancels an IDT selection.

Table 5-10 Summary of IDT level commands (Sheet 2 of 2)

Command	Parameters	Description
RDTALARM	None	Provides a count of active alarms on the RDT associated with the IDT. This command sorts alarms into category and degree. The system does not display the primary OPC ID and support OPC ID for the replacement type GENTMC. The system displays the alarm categories: • threshold alert • indeterminate
RTS	None or the message path	Returns the IDT or a message channel to service. The IDT or message channel must be manually busy.
TRNSL	None	Displays the link and channel connectivity for the IDT.

Using specified IDT commands

The following sections contain the IDT level commands. One section contains the relationship between busying and returning to service the TMC channel and IDT associated with the TMC.

To BSY the IDT This command manually busies the IDT. The DMS-core performs the following actions:

1. Commands the SMA2 to update the view of the IDT state to manually busy (ManB).
2. Commands the SMA2 to disable the DS-1 maintenance scan on P-side links of the IDT.
3. Commands the SMA2 to close the P-side links of the IDT.

4. Updates the DMS-core view of the associated RDT line states to the line module busy (LMB) state.
5. Updates the state of the IDT to ManB at the MAP display.

   Note: To implement BSY, the IDT must have one of the following states:

   - in-service (InSv)
   - in-service trouble (ISTb)
   - system busy (SysB)
   - offline (Offl)
   - C-side busy (CBsy)

   When the IDT is SysB or Offl, the DMS-core does not perform steps Item 2, "Commands the SMA2 to disable the DS-1 maintenance scan on P-side links of the IDT." on page 5-44, Item 3, "Commands the SMA2 to close the P-side links of the IDT." on page 5-44, and Item 4, "Updates the DMS-core view of the associated RDT line states to the line module busy (LMB) state." on page 5-45.

To BSY the message channels When you use the busy command with the message channel parameter, the system busies the specified message channel. To busy a message channel can cause one of the following conditions:

- If you busy one of two TMCs or EOCs, the IDT becomes ISTb and the system generates a PM128 log results.
- If you attempt to busy the last TMC available, you receive a message that indicates this action is not permitted. To busy the last TMC stops call processing.
- When you busy the last EOC, there is no maintenance connection to the RDT.

The CONT command The CONT command allows the system to run the continuity test. The command specifies the type of channel, like EOC1. A parameter specifies where the loopback is. One possible value is internal loopback (INT). This value sets the loopback point at the enhanced ISDN-signaling preprocessor (EISP). The system automatically configures the loopback. The system automatically takes down the loopback when the test completes. The other value, external (EXT), assumes a loopback point is already set up at the remote end. The EXT parameter runs the continuity test from the EISP to the loopback point. The user must take down the loopback manually at the far end.

To run the CONT test, the IDT must be in service, but the message channel must be manually busy.

The LOOPBK command Use the LOOPBK command to set up, release, or query a loopback on a path from the RDT. The possible paths include the EOC, CSC, or TMC. When you configure the path, you can run continuity tests on the path.

The RTS the IDT The RTS command returns the IDT to service. The DMS-core performs the following actions:

1. Diagnostics on the IDT.
2. Commands the SMA2 to enable DS-1 maintenance scan on the P-side links of the IDT.
3. Commands the SMA2 to open the P-side links of the IDT.
4. Informs the SMA2 of call processing execs required for the IDT and the lines of the associated RDT are to be active for call processing.
5. Commands the SMA2 to update its view of IDT to InSv.
6. Updates the view of the RDT line states to state idle (IDL).
7. Updates the state of the IDT to InSv at the MAP terminal.

> ***Note:*** To invoke an RTS, the SMA2 and the P-side links of the SMA2 that contain the messaging channels must be InSv.

To RTS the message channels The RTS command for a message channel runs a series of tests and returns the channel to service. When the RTS returns the TMC channel to service, the IDT must already be IsTb. This limit controls the link of TMCs and the associated IDT of the TMCs. The next section explains this link.

How BSY and RTS interact for TMCs and IDTs An IDT requires at least one InSv TMC to enable call processing. The following rules determine how the states of the IDT and the associated TMC or TMCs interact:

- When an IDT goes out-of-service, the system marks the TMCs as out-of-service (OOS). If operating company personnel busy the IDT, the TMC paths remain OOS. If operating company personnel want to busy the TMCs, the operating company personnel must manually busy the paths. Operating company personnel can use the command string PPS QUERY to view the state of these channels.
- When the system returns an IDT to service, a manual busy TMC will not go InSv. This sequence makes sure that the system does not return a bad

TMC to service with the IDT. The system includes the TMCs that are OOS and not manually busy in the return-to-service sequence.

- An OOS TMC can return to service only in the following conditions:
  - — the IDT is already ISTb
  - — the IDT returns to service

The PPS command At the IDT level, use the path protection switch (PPS) command. The command queries and controls the protection switching capability for the posted IDT. The following capabilities are available:

- query the status of all paths subtending the IDT
- set and clear the inhibit attribute for paths subtending the IDT
- manually implement protection switching with the parameter ACT

The parameters for the PPS command appear in the following table.

Table 5-11 Parameters of the PPS command

Parameter	Function	Path	Options
ACT	Activates a path, or performs a protection switch	EOC1, EOC2, CSC1 , CSC2, TMC1, or TMC2 (see note)	FORCE
ENA	Enables protection switching to occur to a path	EOC1, EOC2, CSC1 , CSC2, TMC1, or TMC2 (see note)	None
INH	Does not allow protection switching to occur to a path	EOC1, EOC2, CSC1 , CSC2, TMC1, or TMC2 (see note)	None
QUERY	Shows how the EOCs and TMCs are configured	Does not apply	None

Note: For protection switching to occur, two of each type of path must exist.

The PROGRESS command The PROGRESS command is not on the menu. The command accesses a field to display the steps of maintenance tasks as the tasks occur. The PROGRESS command helps operating company personnel understand the sequence of system events for a maintenance task.

For example, with PROGRESS ON, the LOOPBK and CONT commands cause the system to display the following messages:

```
Sending CONT Int
Sending CONT Ext
Sending LPBK Set
Sending LPBK Rls
```

The RDTALARM command The RDTALARM command generates information about the following:

- alarm counts at the RDT
- the track of the alarms. The command provides:
  - — the RDT name
  - — network element number
  - — network element name

Enter the RDTALARM command to initiate messaging between the DMS switch and the RDT to retrieve the current alarm counts. If messaging fails, the system displays an error message. The type of error message received determines if the system can display the last known alarm counts. This section contains a description of the error messages received. The system stores the alarms table for each IDT. The system provides the number of alarms of each category and degree last active at the RDT. The type of IDT posted determines the response you receive to this command.

The following table provides an example of the response to the RDTALARM command for a generic time-slot management channel (GENTMC) RDT.

Figure 5-6 Active alarms table for GENTMC RDT

```
   CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext     Appl
   .      .       .       .     1IDT     .       .       .      2Crit     .
                                 *C*                             *C*
IDT
0  Quit                  SysB     ManB      Offl     CBsy    ISTb   InSv
2  Post_         PM        0        0         3        0       2     130
3  Listset       IDT       0        0         0        0       2      15
4
5  Trnsl          IDT 3    ISTb      LINKS_OOS: 0       RDT_TYPE: GENTMC
6
7  Bsy            RDTalarm
8  RTS            RDT Name:  RDT1 03 0
9  Offl           Network Element:   3 RALEIGH_AMEX_B13
10
11 Disp_          ACTIVE ALARMS  :  Fac  Eqp  Env  Sfw  Svc  Thr  Ind
12 Next           -------------------------------------------------
13                Critical       :   2    0    0    0    0    0    0
14 QueryPM        Major          :   0    1    0    0    0    0    0
15 RDTalarm       Minor          :   0    0    0    0    0    0    0
16 PPS_           Warning        :   2    0    1    0    0    0    1
17 CONT_
18 LOOPBK_

    userid
 TIME  hh : mm>
```

Note: A summary of active RDT alarms is received if the RDT supports the alarm count list object class.

The following table provides an example of a failure condition for a GENTMC RDT, after the user entered the RDTALARM command.

Figure 5-7 Active alarms table failure for GENTMC RDT

```
   CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext     Appl
   .      .      .       .      1IDT     .       .       .      2Crit     .
                                 *C*                              *C*
 IDT                   SysB     ManB      Offl     CBsy    ISTb   InSv
 0  Quit         PM       0        0         3        0       2     130
 2  Post_        IDT      0        0         0        0       2      15
 3  Listset
 4
 5  Trnsl        IDT 3    ISTb     LINKS_OOS: 0       RDT_TYPE: GENTMC
 6               RDTalarm
 7  Bsy          RDT Name:  RDT1 03 0
 8  RTS          Network Element:   24 Unnamed
 9  Offl
 10
 11 Disp_              * Alarm counting not supported by RDT
 12 Next
 13
 14 QueryPM
 15 RDTalarm
 16 PPS_
 17 CONT_
 18 LOOPBK_
     userid
  TIME  hh : mm>
```

If the RDTALARM command fails, the system displays an error message. This failure message indicates that the messaging to the RDT failed, and that the system cannot verify the current alarm counts. Possible reasons for failure are:

- Maintenance connection is not established. The EOC maintenance connection to the RDT is not established. Messaging to the IDT cannot occur until the problem is corrected.
- Temporary resource allocation problem. The system cannot allocate a needed system resource. The problem can be transient. Operating company personnel must execute the command again.
- The RDT does not respond. The DMS SuperNode switch does not receive a response message that contains the active alarms counts. A problem with the maintenance connection or a failure at the RDT can exist.

- Messaging failure. The messaging protocol between the DMS SuperNode switch and the RDT has a problem. The problem can be a software load mismatch, or a software error in the DMS SuperNode switch or RDT.
- Software error. Check logs. A software error (SWER) occurred. Check the DMS SuperNode switch log system for SWERR logs.
- The RDT does not support the alarm. The RDT queried does not support Alarm Count List object class.
- Alarm counting not configured on RDT. The Alarm Count List object class is not created. The LDS is responsible for creating the object on the RDT.

Note: The DMS SuperNode switch normally reports alarm conditions of the generic TR-303 RDT in the Alarm banner at the MAP display.

When this report does not occur or the user enters the RDTALARM command, one of the following two conditions apply:

- The generic TR-303 RDT connected to the SMA2 does not support the Alarm Count list function.
- The RDT software upgraded to support the Alarm Count List. The function was not enabled at the DMS SuperNode switch. When this condition occurs, follow the procedure in the “SMA2 manual maintenance" chapter. The chapter is in the section titled “Remote digital terminal alarm reporting." Follow the procedure to enable Alarm Count List reports and updates of the alarm banner MAP display.

Example conditions at the IDT level

The following examples show the different uses of commands that relate to SMA2 maintenance.

Finding link and channel information

When the user enters the TRNSL command, the following information appears:

- the IDT P-side link number
- the RDT name and its C-side link number
- capabilities (Cap) of the link (either messaging, speech, or both)
- status of the IDT P-side link, which can be one of the following:
  - — OK
  - — ManB
  - — SysB

— OK, P

— OK, C, P

- condition of the message link, which can be one of the following:

  — OPN (open)

  — CLS (closed)

  — MTC (maintenance)

- the SMA2 name, external number, SMA2 P-side port, and the channel on that port where the control channel associates

The following table provides an example of a MAP display for the TRNSL (translate) command.

Figure 5-8 Example TRNSL display for the IDT

```
  CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext     Appl
   .      .      .       .      IDT     .       .       .        .       .

IDT                 SysB      ManB       Offl     CBsy    ISTb   InSv
0  Quit       PM       0         0          0        0       1      12
2  Post_      IDT      0         0          0        0       1      17
3  Listset
4             IDT 55     ISTb     LINKS_OOS: 0      RDT Type: GENTMC
5  Trnsl
6            trnsl
7  Bsy       Translating SMA2 0 links to RDT1055 0
8  RTS       Link  0;RDT Link  1;Cap MS;Status:OK   MsgCond:OPN
9  Offl      Link  1;RDT Link  2;Cap MS;Status:OK   MsgCond:OPN
10           Link  2;RDT Link  3;Cap  S;Status:OK
11 Disp_
12 Next
13
14 QueryPM
15 RDTalarm
16 PPS_
17 Cont_
18 LoopBk_
   userid
 TIME  hh : mm>
```

The following table provides an example of a MAP display for the TRNSL CHAN command.

Figure 5-9 Example TRNSL CHAN display for the IDT

```
   CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext    Appl
   .      .       .       .     IDT      .       .       .        .       .

 IDT                  SysB     ManB      Offl     CBsy    ISTb   InSv
 0  Quit       PM       0        0         0        0       1      12
 2  Post_      IDT      0        0         0        0       1      17
 3  Listset
 4              IDT 55     ISTb     LINKS_OOS: 0     RDT_TYPE: GENTMC
 5  Trnsl
 6              Trnsl chan
 7  Bsy         TMC1: SMA2 0  5  24; CSPORT: 13; TMCHAN: 10
 8  RTS         EOC1: SMA2 0  5  12; CSPORT: 13; TMCHAN: 11
 9  Offl        TMC2: SMA2 0  8  24; CSPORT: 13; TMCHAN: 12
 10             EOC2: SMA2 0  8  12; CSPORT: 13; TMCHAN: 13
 11 Disp_
 12 Next
 13
 14 QueryPM
 15 RDTalarm
 16 PPS_
 17 Cont_
 18 LoopBk_
     userid
 TIME  hh : mm>
```

Querying the IDT and RDT

When the user enters the QUERYPM command, the system gives the following information:

- PM type and number
- internal number, for advanced tools
- node number, used for advanced tools
- SMA2 name and number
- RDT name, the value the user enters in table RDTINV
- the last three lines of the MAP response provide the
  - — number of lines connected to a posted IDT
  - — total number of lines defined for the host SMA2
  - — total number of lines available for the host SMA2

Note: In XPM81/NA008, the information in the last three lines of the response to the QUERYPM commands was contained in the non-menu command RESOURCE. The RESOURCE command was removed and the information put into the QUERYPM command.

The following table provides an example of a MAP display for the QUERYPM command.

Figure 5-10 Example QUERYPM display for the IDT

```
  CM    MS    IOD    Net    PM    CCS    Lns    Trks    Ext    Appl
  .     .     .      .     IDT    .      .      .       .      .

IDT                SysB     ManB      Offl     CBsy    ISTb   InSv
0  Quit        PM      0        0         0         0       1      12
2  Post_       IDT     0        0         0         0       1      17
3  Listset
4              IDT 55      ISTb     LINKS_OOS: 0     RDT Type: GENTMC
5  Trnsl
6              QueryPM
7  Bsy         PM Type:  IDT  PM No: 23  Int. No: 15  Node No: 52
8  RTS         Prot-switch:  Unavailable
9  Offl        Cside XPM Name: SMA2 5
10             RDT Name: RDT0 00 0
11 Disp_       Network element:  12   Unnamed
12 Next        Lines allocated to IDT 55: 671
13             Lines defined for SMA2 5: 2014
14 QueryPM     Lines available to SMA2 5: 3363
15 RDTalarm
16 PPS_
17 Cont_
18 LoopBk_
   userid
 TIME  hh : mm>
```

When the user enters the command string QUERYPM FLT at the IDT level, the system identifies the state of the IDT. When the state is not ManB or InSv, the system gives a reason for the state. The following ISTb reasons appear in response to the maintenance connection:

- maintenance connection not established. Several reasons can cause the system to not establish the maintenance connection:
  - — set-up information is not present (for example, the IDT is offline, the EOC1 and EOC2 are manually busy)
  - — SMA2 SWACT
  - — abort request received from the RDT
  - — loss of SMA2 to CM communication
- maintenance connection. Transient reject (reject reasons are added to this ISTb reason like, XPM SWACT, stack error, and abort from remote).
- maintenance connection. Permanent reject, where the only reason for a permanent rejection is an object model (OM) incompatibility.

The following table provides an example of a MAP display for the QUERYPM FLT command. This example contains ISTb reasons.

Figure 5-11 Example QUERYPM FLT display for the IDT

```
  CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext     Appl
  .      .       .       .     IDT      .       .       .        .       .

IDT                SysB     ManB      Offl     CBsy    ISTb   InSv
0  Quit       PM     0        0         0        0       1      12
2  Post_      IDT    0        0         0        0       1      17
3  Listset
4             IDT 4     ISTb     LINKS_OOS: 0     RDT_TYPE: GENTMC
5  Trnsl
6             QueryPM Flt
7  Bsy        ISTb Reasons:
8  RTS         Mtc connection not established: No CM–SMA communications
9  Offl        EOC database synchronization in progress
10
11 Disp_
12 Next
13
14 QueryPM
15 RDTalarm
16 PPS_
17 Cont_
18 LoopBk_
    userid
 TIME  hh : mm>
```

If the path is ISTb, the data link access procedure on the D-channel (LAPD) logical link is operational. The path protection switching (PPS) LAPD logical link is not operational. When this event occurs, the data LAPD logical link is multi-frame established (MFE). The system responds to the command string QUERYPM FLT at the IDT level for a posted IDT. The system displays the following ISTb reasons for an ISTb state:

- DS-1 message link busy
- path alarm
- maintenance connection not established
- EOC database synchronization in progress
- EOC database not synchronized
- CSC/TMC P-side node messaging overload
- EOC P-side node messaging overload
- P-side node messaging system overload on SMA

- RDT alarms present. Use the RDTALARM command.
- speech link(s) busy
- RDT alarm reporting not enabled
- maintenance connection: transient rejection
- maintenance connection: permanent rejection

Querying and control protection switching

When the operating company personnel enters

>PPS QUERY

the following display appears at the MAP terminal.

Figure 5-12 Response to PPS QUERY

```
  CM     CMC     IOD     Net     PM     CCS     Lns     Trks     Ext    Appl
  .       .       .       .     IDT      .       .       .        .       .

IDT                    SysB     ManB      Offl     CBsy    ISTb   InSv
0  Quit        PM       0        0         0        0       1      12
2  Post_       IDT      0        0         0        0       1      17
3  Listset
4               IDT 55     ISTb     LINKS_OOS: 0    RDT_TYPE: GENTMC
5  Trnsl
6
7  Bsy          TMC 1: SMA2 4  3  24;InSv;Active;Enable
8  RTS          EOC 1: SMA2 4  3  12;InSv;Active;Enable
9  Offl         TMC 2: SMA2 4 13  24;InSv;Standby;Enable
10              EOC 2: SMA2 4 13  12;ManB;Standby;Enable
11 Disp_
12 Next
13
14 QueryPM
15 RDTalarm
16 PPS_
17 Cont_
18 LoopBk_
    userid
 TIME  hh : mm>
```

If a PPS fails, the user must restore traffic activity (EOC or call processing) on the last active path. The user can restore traffic activity when the data LAPD logical link is MFE. The PPS LAPD logical link state does not affect this process. To provide accurate feedback information to operating company personnel, the path is set to ISTb. The state of the path is as follows:

- InSv when both LAPD logical links are MFE
- OOS when the data logical link is not MFE
- ISTb when the data LAPD logical link is MFE but not the PPS LAPD logical link

When operating company personnel enter the command string PPS QUERY, the system displays the state of the paths. The following conditions determine how the system displays the state of the paths:

- the three path states listed earlier
- the status of a path which is active or standby
- if the path is enabled

If the path is OOS, the data LAPD logical link is not MFE. The PPS LAPD logical link can be MFE. Several reasons can cause an LAPD to be not MFE:

- DS-1 problem
- remote LAPD end point does not configure the connection
- LAPD parameters incompatible between each end of the connection

The following table provides an example of the command string PPS QUERY at the MAP display.

Figure 5-13 Example PPS QUERY display for the IDT

```
   CM     MS     IOD     Net     PM     CCS     Lns     Trks     Ext     Appl
   .      .       .       .     IDT      .       .       .        .       .

 IDT                  SysB     ManB      Offl     CBsy    ISTb   InSv
 0  Quit         PM       0        0         0        0       1      12
 2  Post_        IDT      0        0         0        0       1      17
 3  Listset
 4               IDT 4       ISTb     LINKS_OOS: 0    RDT_TYPE: GENTMC
 5  Trnsl
 6               PPS QUERY
 7  Bsy          CSC 1: sma2 0 0 24;ISTb;Active;Enable
 8  RTS          EOC 1: sma2 0 0 12;InSv;Active;Enable
 9  Offl         CSC 2: sma2 0 0 24;InSv;Standby;Enable
 10              EOC 2: sma2 0 0 12;InSv;Standby;Enable
 11 Disp_
 12 Next
 13
 14 QueryPM
 15 RDTalarm
 16 PPS_
 17 Cont_
 18 LoopBk_
    userid
  TIME  hh : mm>
```

In the previous example, path CSC1 is ISTb. This state indicates that the LAPD logical link is not MFE. The data LAPD logical link is MFE. When one or more paths are in the ISTb state, the IDT node state is ISTb.

To make TCM2 the active channel, operating company personnel can type:

>PPS ACT TMC2

The TMC2 channel becomes the active channel, and TMC1 becomes the standby. If operating company personnel try to activate an inhibited channel, the activation fails. The system displays a message that informs operating company personnel of this failure.

Operating company personnel must use the FORCE option with caution. When operating company personnel use FORCE with the ACT parameter, the channel becomes active. The state of the channel does not affect this process. The state of the channel can be out of service or have faults. When the channel cannot take over the messaging functions, the IDT can lose messaging capability and go ISTb or SysB.

Note: You cannot use the FORCE option on an inhibited path.

Responses to IDT level commands

The following table describes responses to IDT level commands. The table describes the meaning of the responses, and the actions to take when the responses occur.

Table 5-12 Responses to IDT level command (Sheet 1 of 3)

Command	Response	Meaning	Action
ABTK	`All active maintenance activities will be aborted. Please confirm (“YES" or “NO")`	All maintenance actions in progress halt.	Respond. If YES, maintenance (Mtce) flag is removed.
BSY	`Request invalid: would cause the IDT to go SysB WARNING: Maintenance messaging to the RDT will be interrupted - last EOC path will go out of service. Please confirm (Y/N):`	The user attempted to busy the last TMC channel when the associated IDT continues to be in service.	Busy the IDT and the last TMC channel. Perform these actions in this order.
	`Calls on the IDT will be affected. Please confirm (“YES" or “NO")`	The user attempted to busy the last in-service EOC channel. If the channel is busy, you cannot perform maintenance tasks on the RDT.	Respond to the prompt. When you busy the last EOC channel, a loss of maintenance messaging with the RDT occurs.
CONT	`IDT n CONT EXT failed - static data mismatch.`	The peripheral static data does not match the specified path.	The SMA2 becomes ISTb because of the static data mismatch. Refer to “SMA2 manual maintenance" chapter.

Table 5-12 Responses to IDT level command (Sheet 2 of 3)

Command	Response	Meaning	Action
	`IDT n CONT EXT failed - far end.`	The external continuity test failed.	Run the internal continuity test. If the test passes, make sure the external loopback is set. If the external loopback is set, check the distance between the SMA2 and the external loopback point.
	`IDT n CONT INT failed - no response from XPM.`	The SMA2 does not respond to the loopback command.	Check the status of the SMA2.
CONT (continued)	`IDT n CONT INT failed - channel failure.`	The internal continuity test failed.	Check the status of the SMA2.
	`Path must be ManB.`	The user attempted to run a CONT test on a path that is not busy.	Busy the path before you run the CONT test.
LOOPBK	`Path must be ManB`	The user attempted to run a LOOPBK on a path that is not busy.	Busy the path before you configure the LOOPBK.
	`LOOPBK RLS failed - no response from XPM`	The SMA2 does not respond to the request.	Troubleshoot the SMA2. Concentrate on the EISP.
	`LOOPBK SETUP failed - no response from XPM`	The SMA2 does not respond to the request.	Troubleshoot the SMA2. Concentrate on the EISP.
PROGRESS	`Progress field is active.`	You entered PROGRESS QUERY.	Use the ON or OFF parameter to implement or cancel PROGRESS.
TRNSL	`Request invalid: IDT is not equipped.`	An IDT was deleted from table RDTINV while the IDT posted. The status is unequipped (Uneq).	Enter tuple for IDT in table RDTINV again.
RTS	***Note:*** The following responses are for IDT.		

Table 5-12 Responses to IDT level command (Sheet 3 of 3)

Command	Response	Meaning	Action
	`IDT 55 Rts Passed.`	The IDT returned to service. Look for PM106 logs.	There is no action required.
	`Failed to open link0.`	PM114	
	`Bad message received from PM.`	PM114	
	`Fail message received from PM.`	PM114	
	`Check for possible logs.`	PM114	
	`No Action Taken: Mtce in Progress.`	The user entered another command while a previous maintenance request was still in progress.	Wait until previous maintenance request is complete or use ABTK to cancel maintenance in progress.
	`RTS failed: no active TMC.`	A TMC must be in service to RTS the IDT.	RTS at least one TMC.
	`RTS Rejected:Aborted.`	PM180, PM181	
	`path failed - LAPD failure.`	The LAPD cannot come into service.	Check the status of the RDT. Concentrate on the EISP.
	`path failed - channel failure.`	The DS-1 carrier failed.	Check the carrier.
	`Request invalid: path is loopbacked toward far end.`	A LOOPBK SETUP has already been done on this path.	Release the loopback (LOOPBK RLS). Attempt the RTS again.
	`Request invalid: IDT must be InSv for TMC to RTS.`	Before the TMC can return to service, the IDT must be in service.	RTS the IDT (use the RTS command with no parameters).

The ICB maintenance

The DMS-100 switch manages the service state of the ICB IDT. The DMS-100 takes the ICB IDT out of service or brings the ICB IDT into service. The IDT PM level of the MAP terminal displays the state of the ICB IDT. The

MAP terminal also displays other maintenance information, like configuration data for the ICB IDT.

The LNS level user interface

User interface for RDT lines maintenance

Use different MAP levels for remote digital terminal (RDT) lines maintenance. The type of testing determines the commands to use. The type of line to test also determines the commands to use.

Access subscriber line tests and associated maintenance through the LNS subsystem and its sublevels. You can test all types of multi-vendor interface (MVI) RDTs from the LNS subsystem and sublevels of the LNS subsystem.

Engineering limits exist on the RDT because of messaging bandwidth limits between the SMA2 and RDT. The engineering limits are as follows:

- The user can attempt a maximum of six simultaneous line maintenance commands on a given SMA2.
- The amount of central processing unit (CPU) time allotted to line maintenance activities is inversely proportional to CPU usage. When customer traffic and maintenance activities increase in the switch, line maintenance activities take longer to execute. As a result, line maintenance tests can fail. The failure does not always indicate a fault.
- The user must test the suspected line or circuit again, during hours of low traffic. The user can observe these faults when CPU use exceeds 80%.

Remote digital terminal diagnostic tests

The diagnostic tests for subscriber lines at the RDT appear in the following table.

Table 5-13 RDT diagnostics (Sheet 1 of 2)

Test	POTS	COIN	Multi-party
Off-hook detection	x	x	x
Echo return loss	x	x	x
On-hook detection	x	x	x
Single party ringing	x	x	x

Note 1: The coin collect test includes the coin partial presence test.

Note 2: The coin return test includes the coin presence test.

Note 3: The negative tip party ring test on a multi-party multi-vendor interface (MVI) line type includes the automatic number identification (ANI) test.

Table 5-13 RDT diagnostics (Sheet 2 of 2)

Test	POTS	COIN	Multi-party
Carrier channel loss	x	x	x
Idle channel noise	x	x	x
Coin collect test		x	
Coin return test		x	
Reverse battery		x	
Negative tip party ring			x
Positive ring party ring			x
Positive tip party ring			x

Note 1: The coin collect test includes the coin partial presence test.

Note 2: The coin return test includes the coin presence test.

Note 3: The negative tip party ring test on a multi-party multi-vendor interface (MVI) line type includes the automatic number identification (ANI) test.

Testing for MBS lines from a TR-303 RDT

The line test commands are supported for MBS lines that terminate on an S/DMS AccessNode and for MVI RDTs. The following lines are not supported:

- The SDIAG, available from the ALT level, is executable for TR-303 MBS lines. The test cannot run but the SDIAG responds and indicates a successful test.
- The LTA IN, available at the LTPLTA level, is supported for TR-303 RDTs only. The TR-303 RDTs must have ``Y" entered in table RDTINV field BRIDGING. The BRIDGING field is only entered as “Y" if the RDT supports bridging to the line.

The following table describes the impact on the MBS volume setting when the user executes the listed line test commands. The results depend on the entries in table RDTINV, field BRIDGING.

Table 5-14 Supported TR-303 MBS line tests

Level	Test	Causes volume setting loss when BRIDGING = Y	Causes volume setting loss when BRIDGING = N
LTP level	DIAG	No	Yes
LTPLTA level	MONLTA	No	Yes
	TALKLTA	No	Yes
	LNTST	No	Yes
	VDC	No	Yes
	VAC	No	Yes
	RES	No	Yes
	CAP	No	Yes
	LTA IN	No	Not supported
	LTA OUT	No	Yes
LTPMAN level	TONEGEN METALLIC	Yes	Yes
	JACK METALLIC	Yes	Yes
	CKTTST	No	No
	SUSTATE	No	No
ALT level	DIAG	No	Yes
	CKTTST	No	No
	LIT	No	Yes
NTT level	BASIC	Yes	Yes
	MLT	Yes	Yes
Subscriber premise	DSCKT	Yes	Yes
	SSMAN	Yes	Yes
	STRG	No	No

LTP level

The operating company can use the line test position (LTP) level of the MAP terminal to run different tests on lines off the RDT.

> ***Note:*** The shelf and slot subfields of an MVI RDT LEN do not indicate the location of a line card. The user disables commands POST and NEXT when the user uses option D (drawer).

The system displays the DMS SuperNode switch line state at the LTP MAP level. The state does not always match the line card and line termination object state at the S/DMS AccessNode or MVI RDT. A field at the LTP level displays the RDT line state for lines posted at the LTP MAP level. The system clears this field when an MVI RDT posts that does not support line state reporting. The MVI RDT posts in the control position at the LTP MAP level. The system clears the field when the operating company personnel quit from the LTP MAP level. The system also clears the field when a line moves from the control to the hold position. A new RDT line does not post in the control position. The system updates all RDT lines posted in the control position every 5 min. An audit process that displays the latest remote line state updates the RDT lines.

The following table lists the remote line states that appear at the DMS MAP for RDT lines. These RDT lines are for the RDT vendors that support line state reporting to the DMS-100 switch.

Table 5-15 The RDT line states seen at the LTP MAP level (Sheet 1 of 2)

Remote line state	Meaning	Description
IS@RDT	In-service at RDT	Indicates the line at the RDT is ready for call processing
IS-CPB@RDT	In-service call processing busy at RDT	Indicates the line at the RDT is processing a call at this time
IS-TBL@RDT	In-service trouble at RDT	Indicates the line at the RDT is in service trouble, and is not available for call processing
OOS@RDT	Out-of-service at RDT	Indicates the line at the RDT is out-of-service
OOS-TST@RDT	Out-of-service test at RDT	Indicates the RDT is out of service for testing. The system cannot perform call processing.
IS-TST@RDT	In-service test at RDT	Indicates the line at the RDT has a test in progress. The test initiated from the RDT. The RDT is not accessible from the DMS switch.

Table 5-15 The RDT line states seen at the LTP MAP level (Sheet 2 of 2)

Remote line state	Meaning	Description
UNEQP@RDT	Unequipped at RDT	Indicates the line card at the RDT is missing.
UNK@RDT	Unknown at RDT	Indicates the line state at the RDT is not known at this time. After displaying UNK@RDT at the time of the initial post, a background process starts to query the remote line state. When the remote line state becomes available, all the MAP displays that have this line posted at the control position update to reflect the actual RDT remote line state.

A standard response to posting a line with the remote line state field for RDT lines appears in the following table. The display appears at the LTP level of the MAP terminal.

Figure 5-14 The LTP MAP level display with the remote line state field for a posted RDT line

```
  CM    MS    IOD    Net    PM    CCS    Lns     Trks    Ext   Appl
   .     .     .      .   4 SysB   .      .       .       .      .
                             M
LTP
0  Quit      POST  95    DELQ            BUSYQ           PREFIX
2  Post_
3            LCC PTY RNG ....LEN....       DN   STA F S LTA TE Result
4            1FR        RDT1 04 0 01 96 6214196 IDL
5  Bsy
6  RTS                                   IS-TBL@RDT
7  Diag
8
9  AlmStat                               Other remote line states
10 CktLoc                                that  are presented in this
11 Hold                                  field include:
12 Next                                  IS@RDT
13                                       IS-CPB@RDT
14                                       IS-TBL@RDT
15                                       OOS@RDT
16 Prefix                                OOS-TST@RDT
17 LCO_                                  UNEQP@RDT
18 Level_                                IS-TST@RDT
   userid                                UNK@RDT
TIME  hh : mm>
```

The “LTP level commands" table lists the commands available at the various MAP levels for line maintenance. The table describes if the command is supported and if the command requires a specific configuration.

The word *All* appears in the *Line types* column when POTS, coin, MBS, and ISDN lines support the command.

> ***Note:*** When you change state out-of-service operation at the S/DMS AccessNode, busy the line card at the DMS MAP LTP level. When you busy the line card at the DMS MAP LTP level, wrong line treatments and improper pegging of OM registers do not occur.

Table 5-16 LTP level commands (Sheet 1 of 2)

Command	Line types	Description	Configuration notes
QUIT	All	Quits the current level.	Does not apply
POST	All	Places the line in the control position. This command is disabled for MVI RDT lines when you use option D.	Does not apply
BSY	All	Busies the line in the control position.	Does not apply
RTS	All	Returns the line in the control position to the idle state.	Does not apply
DIAG	All	Invokes the long diagnostic series of end-to-end signaling and transmission tests.	Uses a transmission test unit (TTU) and a multiline test unit (MTU).
ALMSTAT	All	Displays status of the LNS subsystem and allows the user to change thresholds.	Does not apply
CKTLOC	All	Identifies the line circuit in the control position and displays the attributes of the lines circuit.	Does not apply
HOLD	All	Places line in the control position to the hold position.	Does not apply
NEXT	All	Places the next line in the posted set in the control position. Option D disables this command for MVI RDT lines.	Does not apply
PREFIX	All	Sets or changes prefix digits.	Does not apply
LCO	None	Operates or releases the cutoff relay in the line circuit.	Not supported

Table 5-16 LTP level commands (Sheet 2 of 2)

Command	Line types	Description	Configuration notes
LEVEL	All	Accesses another LTP level.	Does not apply
FRLS	All	Disconnects the line circuit from test equipment or another circuit and changes the line state to manually busy (MB).	Does not apply
POTSDIAG	None	Allows some POTS lines to connect to the multiline test unit (MTU) for loss test.	Not supported. This test requires the RDT to apply a termination to the line card under test that is not standard.
RECORD_DTSR	All	Enables, disables, or queries dial-tone speed recording.	Does not apply

Access to remote line location information for RDTs and RFTs is available using the CKTLOC command. If the RDT supports line location queries from the DMS switch, the switch displays physical line card location information.

The following figure is an example of the system response to the CKTLOC command that gives the line location information.

Figure 5-15 RDT line location display at the LTP level

```
 CM    MS    IOD    Net    PM    CCS    Lns    Trks    Ext   Appl
  .     .     .      .      .     .      .      .       .     .

LTP
0  Quit      POST  95    DELQ            BUSYQ           PREFIX
2  Post_     LEN RDT1 04 0 01 96
3            LCC PTY RNG                           STA F S LTA TE Result
4            1FR                     DN 6214196 IDL
5  Bsy
6  RTS
7  Diag
8
9  AlmStat
10 CktLoc    CktLoc
11 Hold      RDT Location
12 Next      Frame=1, Shelf=1, Slot=4
13
14           GRD START 2DB LOSS BAL NETWORK MAN OVR SET
15             NO        NO     NON LOADED      NO
16 Prefix
17 LCO_
18 Level_
   userid
TIME  hh : mm>
```

If the RDT does not support physical location information queries from the DMS switch, the system displays the following message:

```
The physical location information is not available from
the RDT.  The RDT interface should be used.
```

This message indicates the physical location information is not available from the RDT. The system tells operating company personnel to query the information from the RDT user interface

If an EOC communication channel is not available, the DMS switch displays the following message:

```
Maintenance connection not available. The CKTLOC command
cannot be performed.
```

This message indicates the circuit location information is not available without the EOC channel.

IBNCON level

The following table summarizes the IBNCON level functionality supported for RDT lines. The IBNCON level commands maintain and monitor Integrated Business Network (IBN) attendant consoles. When POTS, coin, and ISDN lines support the command, the word *All* appears in the *Line types* column. The split and monitor capability of the MVI RDT can determine the support of these commands.

Table 5-17 IBNCON level commands

Command	Supported?	Depends on configuration?
QUIT	Yes	No
SELECT	Yes	No
NEXT	Yes	No
BUSY	Yes	No
RTS	Yes	No
DIAGNOSE	Yes	Yes
SEIZE	Yes	No
RELEASE	Yes	No
CLEAR	Yes	No
PREVDM	Yes	No
QCONLINE	Yes	No
QCUSTGRP	Yes	No
QSEATED	Yes	No
FRLS	Yes	No

The LTPMAN level

The LTPMAN level commands appear in the following table. The LTPMAN level commands access the line test position of the manual test commands level. When POTS, coin, and ISDN lines support the command, the word *All* appears in the *Line types* column. The split and monitor capability of the MVI RDT can determine the support for these commands.

Table 5-18 LTPMAN level commands (Sheet 1 of 2)

Command	Supported?	Line types	Depends on configuration?
QUIT	Yes	All	No
POST	Yes	All	No
LOSS (notes 1 and 7)	Yes	All, except ISDN	Yes
NOISE (notes 1 and 7)	Yes	All, except ISDN	Yes
TONEGEN (notes 1 and 7)	Yes	All, except ISDN	Yes
TONEGEN METALLIC (note 1)	Yes	All	Yes
JACK (notes 2 and 7)	Yes	All, except ISDN	Yes
JACK METALLIC (note 2)	Yes	All, except ISDN	Yes
TSTRING (note 3)	Yes	All	Yes
BAL (note 4)	No	Not applicable	Not applicable
RLSCONN (notes 1, 4 ,6 , and 7)	Yes	All	No
HOLD	Yes	All	No
NEXT	Yes	All	No
CKTTST	Yes	MBS, ISDN	No
SUSTATE	Yes	MBS, ISDN	No

Note 1: Uses external equipment.

Note 2: To test the subscriber lines between the attendant console and the RDT requires a TM.

Note 3: The TSTRING command requires an MTAU with a split access capability of nonsimFullSplit and is supported in NA006 and up.

Note 4: The functionality of this command does not include RDT balance network and pad group functions.

Note 5: These tests also communicate with the IRTU using CSC format.

Note 6: The RLS CONN cleans and releases the line under test and uses EOC messaging.

Note 7: This command supports transmission tests of ICB lines.

Table 5-18 LTPMAN level commands (Sheet 2 of 2)

Command	Supported?	Line types	Depends on configuration?
DCHCON	Yes	ISDN	No
SETLOOPBK	No	Not applicable	Not applicable

Note 1: Uses external equipment.

Note 2: To test the subscriber lines between the attendant console and the RDT requires a TM.

Note 3: The TSTRING command requires an MTAU with a split access capability of nonsimFullSplit and is supported in NA006 and up.

Note 4: The functionality of this command does not include RDT balance network and pad group functions.

Note 5: These tests also communicate with the IRTU using CSC format.

Note 6: The RLS CONN cleans and releases the line under test and uses EOC messaging.

Note 7: This command supports transmission tests of ICB lines.

The LTPLTA level

A list of LTPLTA commands appear in the following table. The LTPLTA level commands verify loop characteristics like impedance, capacitance, and voltage for lines connected to an RDT. When POTS, coin, and ISDN lines support the command, the word *All* appears in the *Line types* column.

Table 5-19 The LTPLTA level commands (Sheet 1 of 2)

Command	Supported?	Line types	Depends on configuration?
QUIT	Yes	All	No
POST	Yes	All	No

Note 1: The MONLTA and TALKLTA are also supported for POTS and COIN lines through a PCM connection. This condition occurs where MONLTA and TALKLTA do not depend on configuration. The user cannot use the ORIG command with a PCM MONLTA or TALKLTA connection.

Note 2: The parameters for this command match the capability of the RDT equipment to support.

Note 3: The functionality of this command for the MVI RDT does not include balance network and pad group functions.

Note 4: For S/DMS AccessNode configurations, these tests use the CSC format to communicate with the IRTU.

Note 5: The functionality of this command for the MVI RDT does not include the ORIG function.

Note 6: This command supports transmission tests of ICB lines.

Table 5-19 The LTPLTA level commands (Sheet 2 of 2)

Command	Supported?	Line types	Depends on configuration?
MONLTA (notes 1 and 6)	Yes	POTS, Coin, MBS	Yes
TALKLTA (notes 1 , 4, and 6)	Yes	POTS, Coin, MBS	Yes
ORIG (notes 4 and 5)	Yes	POTS, Coin	Yes
LNTST (note 4)	Yes	All	Yes
VDC (and VDC C, note 4)	Yes	All	Yes
VAC (and VAC C, note 4)	Yes	All	Yes
RES (and RES C, note 4)	Yes	All	Yes
CAP (and CAP C, note 4)	Yes	All	Yes
HOLD	Yes	All	No
NEXT	Yes	All	No
LTA (notes 2 and 6)	Yes	All	No
BALNET (note 3)	No	Does not apply	Does not apply
COIN	Yes	Coin	Yes
RING (note 6)	Yes	POTS, Coin	Yes
DGTTST (note 6)	Yes	POTS, Coin	Yes

Note 1: The MONLTA and TALKLTA are also supported for POTS and COIN lines through a PCM connection. This condition occurs where MONLTA and TALKLTA do not depend on configuration. The user cannot use the ORIG command with a PCM MONLTA or TALKLTA connection.

Note 2: The parameters for this command match the capability of the RDT equipment to support.

Note 3: The functionality of this command for the MVI RDT does not include balance network and pad group functions.

Note 4: For S/DMS AccessNode configurations, these tests use the CSC format to communicate with the IRTU.

Note 5: The functionality of this command for the MVI RDT does not include the ORIG function.

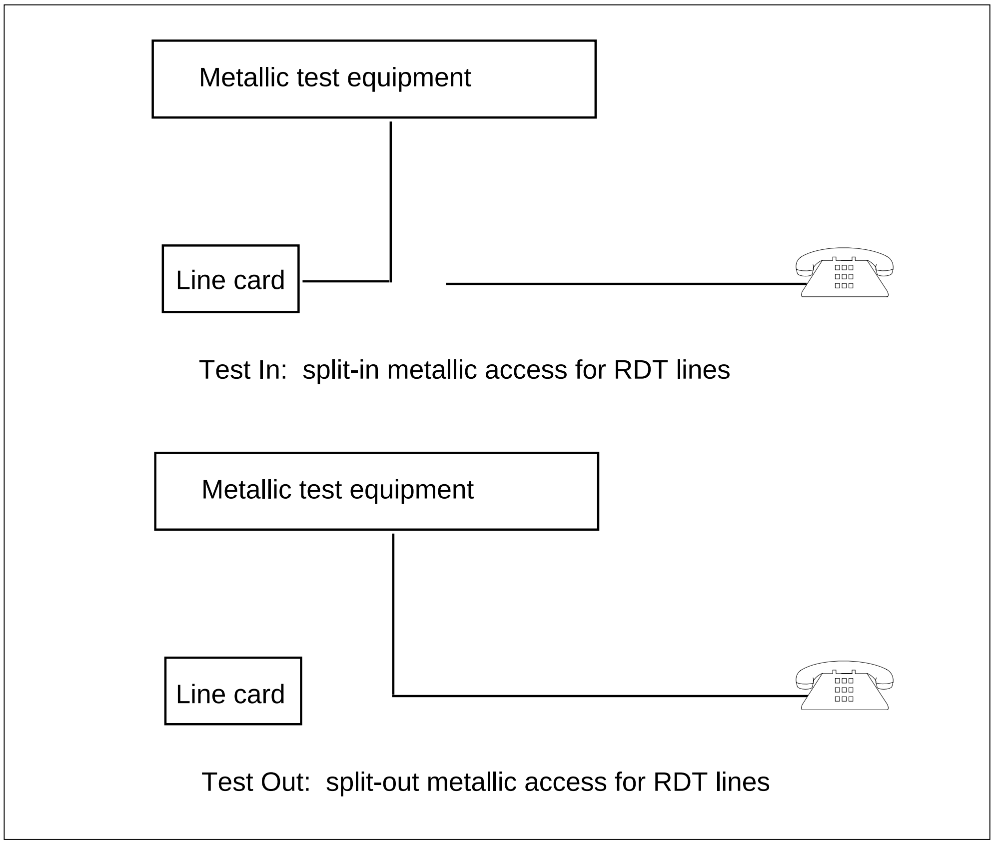
Note 6: This command supports transmission tests of ICB lines.

The LTA command at the LTPLTA level changes the metallic configuration of the line in the control position. The LTA command has one optional parameter that indicates the desired configuration. The configuration can be IN, OUT, RLS. When there is no parameter given with the command, the command toggles the metallic configuration for the line in the control position. The LTA command toggles the configuration between the test-in, and test-out configuration.

Full support of the LTA command for RDT lines requires a split-in metallic access. The support uses an MTAU with a split access capability of nonsimFullSplit. The RDT provides the split access capability.

The test-in, and test-out configurations for RDT lines appear in the following table.

Figure 5-16 Test-in, and test-out configurations for RDT lines



The LTPISDN level

A list of LTPISDN commands appears in the following table. The LTPISDN level commands monitors and maintains ISDN lines. When POTS, coin, and

ISDN lines support the command, the word *All* appears in the *Line types* column.

Table 5-20 The LTPISDN level commands

Command	Supported?	Line types	Depends on configuration?
QUIT	Yes	ISDN	No
POST	Yes	ISDN	No
SUSTATE	Yes	ISDN	No
BCHCON	Yes (for MVI RDT)	ISDN	No
LTLOOPBK	No	ISDN	No
DCHCON	Yes	ISDN	No
HOLD	Yes	ISDN	No
NEXT	Yes	ISDN	No
TSTSGNL	No	Does not apply	Does not apply
TEI	Yes	ISDN	No
QLOOP	Yes	ISDN	No
QLAYER	Yes	ISDN	No
QPHINFO	No	Does not apply	Does not apply
RLAYER	Yes	ISDN	No
TEST	No	Does not apply	Does not apply
L1BLMALM (non-menu)	Yes	ISDN	No

The LTPDATA level

A list of LTPDATA commands appears in the following table. The LTPDATA commands maintain control position data, posted set information and system status updates. The LTPDATA commands also performs additional maintenance action on lines in the control position.

Table 5-21 The LTPDATA level commands

Command	Supported?	Line types	Depends on configuration?
QUIT	Yes	ISDN	No
POST	Yes	ISDN	No
SUSTATE	Yes	ISDN, MBS	No
LOOPBK	Yes	ISDN	Yes
BERT	Yes	ISDN	Yes
BERTTIME	Yes	ISDN	No
DCHCON	Yes	ISDN	Yes
EQUIP (see note)	No	Does not apply	Does not apply
CONNECT (see note)	No	Does not apply	Does not apply
BPVO (see note)	No	Does not apply	Does not apply
HOLD	Yes	All	No
NEXT	Yes	All	No
TEI	Yes	All	No

Note: These tests apply only to Datapath lines.

The ISDN line diagnostic tests

A number of separate tests of ISDN lines run during diagnostics. The test groups appear in the following table.

Table 5-22 Diagnostics supported (Sheet 1 of 2)

Diagnostic name	Description	Test group (and required hardware)
LTP DIAG	Runs the complete ISDN line test group	Test group and hardware are as follows: • Missing card test • LC self test • LC restore test • LU continuity test (EDCH) • Error register query • NT1 restore test (NT1) • NT1 status test (NT1) • T continuity test (NT1, EDCH) • NEBE test (NT1) • FEBE test (NT1)
LTP DIAG INS	Runs an in-service test group	Test group and hardware are as follows: • LC restore test • Error register query • NT1 restore test (NT1) • NT1 status test (NT1) • NEBE test (NT1) • FEBE test (NT1)
LTP DIAG FAST	Runs only the tests that do not require a test-head and long times	Test group and hardware are as follows: • LC restore test • LU continuity test (EDCH) • Error register query • NT1 restore test (NT1) • NT1 status test (NT1) • T continuity (NT1) • NEBE test (NT1) • FEBE test

Table 5-22 Diagnostics supported (Sheet 2 of 2)

Diagnostic name	Description	Test group (and required hardware)
LTP DIAG LC	Runs only the tests that do not require an NT1	Test group and hardware are as follows: • LC self test • LC restore test • LU continuity test • Error register query
No Test Trunk	Does not run any diagnostics	
Shower queue	Runs the same test group as LTP DIAG INS	Test group and hardware are as follows: • LC restore test • Error register query • NT1 restore test (NT1) • NT1 status test (NT1) • NEBE test (NT1) • FEBE test (NT1)

The MVI ISDN maintenance

This section contains a summary of layer 1 loop status monitoring, ISDN line test and maintenance, and ISDN data link layer monitor capabilities.

Layer 1 loop status monitoring Layer 1 loop status monitoring provides the following capabilities:

- Process the change of overhead bit reports from RDT ISDN lines. These reports can make the DMS switch update the computing module (CM) view of line state. These reports can cause the system to generate a LINE 145 or LINE 147 log.
- Prevent or enable loop status log generation on each line. This process uses the L1BLMALM non-menu command. Use this command for a line posted at the LTPISDN level of the MAP display.
- Retrieve the ISDN line state when the user enters the SUSTATE command for a line posted at the LTPISDN level of the MAP display.

This feature retrieves the loop status of an MVI ISDN line. The feature uses the m_get Common Management Information Service (CMIS) request to retrieve attributes specified when the SUSTATE command is requested.

In IDLC systems, the RDT sends the change of overhead bit reports to the Local Digital Switch (LDS). The LDS identifies the changes in ISDN loop status. The system reports the change of overhead bit reports in LINE 145 and LINE 147 logs.

The change of overhead bit report contains old and new states of the superframe overhead bits. The DMS switch examines the overhead bit report, determines the loop status change, and takes action as required.

The ISDN line testing and maintenance The ISDN line testing and maintenance capabilities provide procedures to communicate line test actions. These capabilities communicate line test actions from the DMS switch to the RDT over the EOC. The line test actions respond to test commands entered for an MVI ISDN line. The MVI ISDN line must post at the line test position (LTP) level of the MAP display.

The MVI event handler receives autonomous reports the RDT sends over the EOC. Applications register with the MVI event handler to receive indicated reports. The RDT sends the change of overhead bit reports when an ISDN line changes U-loop synchronization or NT1 test mode status. The reports trigger the LDS to generate logs and update the DMS view of line state.

The TR303-specified m_actions are specified for ISDN Framed Path Termination objects. These m_actions operate and release ISDN loopbacks, and generate corrupt cyclic redundancy checks (CRCs). These actions occur at the ISDN line card or network termination 1 (NT1).

The ISDN data link layer surveillance The following capabilities are provided:

- The daily audit of layer 2 performance includes the SMA2 ISDN lines.
- The ISDN 200, ISDN 201, and ISDN 203 logs generated during the layer 2 audit include information from SMA2 ISDN lines.

A daily CM audit retrieves transmission performance, protocol problems, and service disruption data. The CM audit retrieves the information from each enhanced D-Channel Handler (EDCH), and records the layer 2 problems of each line. The audit reports the layer 2 performance of the DMS switch and resets layer 2 monitor counters in the EDCH.

The QLAYER and RLAYER commands allow the query and reset of performance data for an ISDN line. The ISDN line must post at the LTPISDN level of the MAP display. The user can access layer 1 and 2 data with the QLAYER and RLAYER commands.

Using the POST DK command to post ISDN lines

The customer can activate the following POST command parameters if the customer purchased the SOC NI000050 2B-FIT/NIT feature:

POST DK dn_number [<key#>| `all']

The POST DK command displays a DN appearance on the specified key on an ISDN terminal. An example appears in the following table. When the DN appearance is active, the MAP terminal displays the following information:

- the key number of the DN appearance
- the bearer capability of the call
- the far-end information

Figure 5-17 A posted ISDN line with key number and bearer capability at the LTP MAP level display

```
  CM     MS     IOD     Net     PM     CCS     Lns      Trks     Ext    Appl
   .      .      .       .     4 SysB    .       .        .        .       .
                                 M
LTP
0  Quit      POST  95    DELQ            BUSYQ            PREFIX
2  Post_
3            LCC PTY RNG ....LEN....       DN    STA F S LTA TE Result
4            ISDN LOOP   HOST 02 1 08 02 6215986 CPB       613 6215982
5  Bsy                                     33 SP
6  RTS
7  Diag
8
9  AlmStat
10 CktLoc
11 Hold
12 Next
13
14
15
16 Prefix
17 LCO_
18 Level_
   userid
TIME  hh : mm>
```

Bearer capability

Key number

The user enters the POST DK command to post the ISDN line. After the ISDN line posts, the line below the control position displays the key number and bearer capability. In the previous example the CPE has DN 621-5986 assigned to key 33, and has a speech call active. The possible bearer capabilities appear in the following table.

Table 5-23 Bearer capability display codes

Bearer capability	Display
Speech	SP
3.1 kHz audio	3AU
Circuit mode data, rate adapted to 56 kHz	56C
Circuit mode data 64 kHz	64C
Packet data	PMD

The system checks the DN every 1 s and updates the display.

Responses to LTP level commands

Responses to commands the user enters at the LTP level appear in the following table.

Table 5-24 Responses to LTP level command (Sheet 1 of 3)

Command	Response	Meaning	Action
DIAG	`Invalid request: RDT line provisioning mismatch`	Objects at the DMS switch and RDT do not match for the posted line.	When the system finds the mismatch, the system automatically attempts to correct the problem.
RTS	`Remote failed to RTS this line. This line card does not support the requested service. The line is being set to SB state. The RDT line status audit will attempt to RTS this line.`	The maintenance connection established. A service mismatch condition occurs because the line returns to service.	Replace the line card with a line card that supports the provisioned service.

Table 5-24 Responses to LTP level command (Sheet 2 of 3)

Command	Response	Meaning	Action
POST	`Option NI000050 is not enabled`	The user attempted to enter the POST DK command. The user has not enabled software optionality control (SOC) option NI000050.	Enter a different POST command to post the DN.
	`The DN is not an ISDN DN Posted circuits unchanged`	The user issued the POST DK command on a line that is not ISDN. This command is only valid for ISDN lines.	Enter the command on an ISDN line, or enter a different POST command.
	The system responds by displaying `NO EQUIPMENT` in the LEN field and `NEQ` in the STAtus field.	The posted DN is assigned to an LTID that is not mapped to a LEN in table LTMAP.	Map the LTID to a LEN. Enter the SLT ATT command before you post the DN.

Table 5-24 Responses to LTP level command (Sheet 3 of 3)

Command	Response	Meaning	Action
POST (continued)	`Incorrect DN Appearance.`	The specified DN does not appear on the specified key.	Enter the POST DK command again with the correct key, or use the ALL option to list all keys for the DN.
	`ACO/AFC DN:The key number shown may be different than the actual key in use`	When you post a DN Appearance with AFC or ACO provisioned, the DN Appearance is a member of a group. The DN Appearance is a member of a group of Appearances for the DN. The key numbers used for these DNs and the keys on the ISDN set are not the same. This condition occurs because at the start the Q.931-message protocol refers to the DN with no reference to the key number used. The user or the ISDN set determines the key to use for a call. The key information is not communicated to the CM or XPM.	Information only.

Response to LTPMAN level commands

A response to the SUSTATE command the user entered at the LTPMAN level appears in the following table.

Table 5-25 Responses to LTPMAN level command

Command	Response	Meaning	Action
SUBSTATE	`Invalid request: RDT line provisioning mismatch`	Objects at the DMS switch and RDT do not match for the posted line.	When the system finds the mismatch the system automatically attempts to correct the problem.

Response to LTPLTA level commands

A response to commands for ISDN testing at the LTPLTA level appears in the following table.

Table 5-26 Responses to LTPLTA level command

Command	Response	Meaning	Action
LNTST, VAC, VDC, RES, CAP, LTA	`Invalid request: RDT line provisioning mismatch`	Objects at the DMS switch and RDT do not match for the posted line.	When the system finds the mismatch the system automatically attempts to correct the problem.

The ALT level

The automatic line test (ALT) runs specific tests on lines that terminate on an RDT. The operating company defines the schedule for these tests in table ALTSCHED. These tests are available at the ALT level of the MAP terminal. The commands available at this level appear in the following table.

> ***Note:*** Use the commands at the ALT level that involve specified tests to set the schedule to run these tests. The tests can be SDIAG, DIAG, LIT, CKTTST, and BAL. The schedule set determines how these tests run.

Table 5-27 The ALT level commands

Command	Supported?	Depends on configuration?
QUIT	Yes	No
POST	Yes	No
ALTINFO	Yes	No
SDIAG	No	No
DIAG (see note)	Yes	Yes
LIT (see note)	Yes	Yes
BAL	Not supported	Does not apply
CKTTST	Yes	No

Note: These tests also communicate with the IRTU at the S/DMS AccessNode.

The RDT line tests at the subscriber premises

Tests from the subscriber premises do not involve central office personnel. These tests include the following:

- silent switchman
- station ringer
- dialable short circuit
- dialable cable pair locator
- digitone detection

The RDT subscriber line tests from no test trunk (NTT)

The user can use different loop test systems to start subscriber loop testing for RDT lines from the remote maintenance center. The loop test systems connect to the local digital switch (LDS) with the no test trunk interface. The RDTs support no test trunk line testing. The name NTT refers to a standard protocol. The protocol allows an external test system to gain access to and test lines and loops on a switch. Mechanized loop testing (MLT) and test desk are types of NTT testing. For MLT and test desks, dial a special access code to gain access to the subscriber loop. The switch runs the extended diagnostic on the line under test. The switch reports the test results back to the test equipment.

The POTS, coin, and multi-party line tests that use MLT and test desk

The MLT and test desk testing are supported on POTS, coin, and multi-party lines. The test system seizes the line under test and the system applies a 56.2 kΩ load between the tip and ring of the test trunk. The 56.2 kΩ load is equivalent to the on-hook dc signature. This load indicates the following to the test system:

- the line is idle
- the dialed number is in a loop carrier system
- the test system has metallic access to that line through the test trunk

The test system prepares to receive the diagnostic results from the switch through DC voltage signatures.

The EBS or ISDN line tests that use MLT and test desk For EBS or ISDN lines, the SuperNode switch disables the dc signature. The SuperNode switch disables the dc signature to indicate that test system does not receive the diagnostic results. The system only gives metallic access of that line. When an RDT provides service to a group of lines, the system does not provide the dc signature to all the lines. The RDT can provide service any arrangement of POTS, coin, multi-party, EBS, and ISDN lines. The system provides the dc signature for POTS, coin, and multi-party lines. The system disables the dc signature for EBS and ISDN lines. The test system receives the test results of extended diagnostic and metallic access for POTS, coin, and multi-party lines. The test system receives a metallic connection for EBS and ISDN lines.

To control the NTT dc signature, enter table RDTINV, field NTTOPT as follows:

- When you set the NTTOPT field to “N", the NTT signature is disabled for all line types served by that RDT.
- When you set the NTTOPT field to “Y", the NTT dc signature is enabled for POTS, coin, and multi-party lines. During software upgrades from an old release to a new release, the field is set to “Y".

The user can control the NTT dc signatures for each RDT. The user can disable the NTT signature for all line types for each RDT.

The ICB line maintenance

The DMS-100 switch maintains the state of an ICB line. The DMS-100 provides the capability to bring an ICB line into service. The DMS-100 can remove the ICB line from service at the MAP terminal. The DMS-100 switch can change the state of a line in response to other system events, with no manual interruption. The DMS-100 switch also audits ICB lines and tries to return to service any ICB line in the SB state.

The EXT level user interface

Use the EXT MAP level to track active RDT alarms. Enter the EXT MAP level and type the command string LIST CRIT, LIST MAJ, LIST MIN, or LIST NOALM. This action allows the system to list the active alarms. To display active RDT signal distribution (SD) points are, type the command string DISP SDALARM at the EXT MAP level.

The following table shows the EXT level example of the RDT alarm at the EXT level of the MAP display.

Figure 5-18 EXT MAP level display

```
   CM     MS     IOD     Net     PM     CCS     Lns      Trks     Ext   Appl
    .      .      .       .    1 IDT     .       .        .     1 CRIT   .
                                *C*                               *C*
  EXT
  0  Quit     Ext Alarms  Crit     FSP     Major   Minor   NoAlm
  2                          1       0         0       0        8
  3
  4
  5           disp sdalarm
  6           RDTSD1
  7  List     RDTSD3
  8  TstDSAlm_ RDTSD5
  9  SetSD_   RDTCRIT
  10 SetSC_
  11 Disp_
  12
  13 _Crit
  14 _FSP
  15 _Maj
  16 _Min
  17 _NoAlm
  18
     userid
  TIME  hh : mm>
```

The TRKS level user interface

Use the TRKS; CARRIER level to monitor, find faults, and check repairs on DS-1 links between the RDT and the SMA2. The CARRIER level commands remove a DS-1 link from service and perform different manually activated tests. The tests include hardware diagnostics for the DS-1 interface card and a loopback test. You can use the loopback test to determine if a DS-1 problem is in the SMA2 or in external equipment.

Periodic monitoring of DS-1 links can detect performance directions that indicate equipment failure. This monitoring allows the network provider to take correcting action before a service outage occurs. The SMAs support many performance statistics related to DS-1 links. This feature of the SMA supports better maintenance activity and helps to analyze link failures. The user can access this information from the CARRIER level of the MAP and includes the following parameters:

- loss of frame count
- bit error rate (BER) estimate
- severe errored seconds (SES)
- slip count

- errored seconds (ES)
- alarm count

The user defines thresholds to enter in table CARRMTC to trigger an alarm when a performance parameter reaches a specified level. The user also can define thresholds to remove a DS-1 link from service automatically. Remove a DS-1 link from service if performance reaches a level that is not acceptable.

Use the CARRIER level of the MAP terminal to post the carriers for the DS-1 links on the P-side of the SMA2. The CARRIER level of the MAP terminal is part of the TRKS subsystem. When the SMA2 is at the carrier level, post the SMA2 the same way other PM types are posted.

A sample of a CARRIER level MAP display appears in the following table.

Figure 5-19 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       DS–1
6  Tst_
7  Bsy_      N CLASS SITE SMA2 CKT D ALRM SLIP FRME BER ES SES STATE
8  RTS_      0 REMOTE HOST   0   0 C         1    0 1.0 2   0  INSV
9  Offl_     1 REMOTE HOST   0   1 C         1    0 1.0 2   0  INSV
10 DispOpt   2 REMOTE HOST   0   2 C         0    0 1.0 1   0  INSV
11 Disp_     3 REMOTE HOST   0   3 C         1    0 1.0 1   0  INSV
12 Next      4 REMOTE HOST   0   4 C         1    0 1.0 1   0  INSV
13
14 Detail_   SIZE OF POSTED SET  :   5
15
16
17
18
    userid
 TIME  hh : mm>
```

The BERP level carrier maintenance

The bit error rate performance (BERP) level performance tool is available at the MAP terminal. The BERP allows operating company personnel to measure and monitor the bit error rate performance of the DMS SuperNode switch. The BERP also helps to identify faulty components in the switch. Tests cannot check every path through a switch. Use the BERP tool to make a number of test calls, or bit error rate tests (BERT). This action gets the BERP for a switch. In a test call, a bit stream transmits over a path in the switch for a fixed period of time. A test at the BERP level includes a number of test calls, or BERTs. The results of the test calls are analyzed to get a performance rating for the switch.

The first step in a BERT is to set up a path from an integrated bit error rate tester (IBERT). Set up a path through a specified loopback point in the path, back to the IBERT. When the path is set up, the IBERT can transmit a known bit pattern for a fixed period of time. The path reflects the known bit pattern back to the IBERT. The IBERT compares the bit pattern to the bit pattern that the IBERT sent.

There are three forms of SMA2 BERP testing:

- SMA2 C-side link testing
- SMA2 P-side link testing
- testing up to the NT1 on ISDN lines

The SMA2-related BERP commands and functions appear in the following table.

> ***Note:*** The MBS lines for MVI RDT does not support the BERP testing. The BERP testing is not supported on MBS lines for MVI RDTs.

Table 5-28 BERP level commands (Sheet 1 of 2)

Command	Supported?	Depends on configuration?
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

Table 5-28 BERP level commands (Sheet 2 of 2)

Command	Supported?	Depends on configuration?
RESET	Yes	No
PARMSET	Yes	Yes
SORTKEY	Yes	No
PROCESS	Yes	No
LOOPBK	Yes	Yes
WBERT	No	Does not apply

6 SMA2 manual maintenance

This chapter includes descriptions of faults, test configurations, and test tools for Expanded Subscriber Carrier Module-100 Access (ESMA), or SMA2 manual maintenance.

SMA system trouble indicators

The design of the SMA2 allows maintenance software to report fault conditions that can occur with a useful trouble indicator, like

- operational measurements
- log reports
- alarms

Operational measurements

Operational measurements are a means for detecting both actual and potential system troubles. These measures include the ability to monitor and count events within the system. The system uses the OM thresholding feature to monitor and report key SMA2 activity. The system routinely generates these reports that form an additional method of trouble detection. Log reports and alarms are the primary methods of trouble detection.

Log reports

Logs, used as an analysis tool, provide detailed information on call errors, diagnostic results, and system status. Logs are good indicators of trouble conditions, particularly if any of the following conditions exist:

- sudden increase in volume of logs
- reports generated for messages that are not printed
- large number of like logs

Alarms

Audible and visual alarms indicate a need for action. The level of the alarm, either minor, major, or critical, indicates the corresponding urgency for action. The following table describes alarm conditions.

Table 6-1 Alarm descriptions

Alarm	PM banner	Description
Minor	blank	Normally does not affect service
Major	M	Normally indicates a condition that threatens service
Critical	*C*	Normally indicates a service outage or potential service outage

Follow the following guidelines in response to alarms:

- When more than one alarm of the same urgency appears on the MAP screen, clear the alarms from left to right.
- If an alarm of greater urgency occurs while an alarm correction is in progress, respond to the new alarm. Do not continue attempts to clear the less urgent alarm.

> ***Note:*** When you perform a change state out-of-service operation at the S/DMS AccessNode, busy the line card at the DMS MAP LTP level. To prevent improper line treatments and unnecessary pegging of operational measurements (OM), busy the line card at the DMS MAP LTP level.

Due to messaging bandwidth limits between the SMA2 and the S/DMS AccessNode the following engineering limits are present:

- Only attempt six simultaneous line maintenance commands on a given SMA2.
- The amount of central processing unit (CPU) time allocated to line maintenance activities is inversely proportional to CPU use.
- As customer traffic and maintenance activities increase in the switch, line maintenance activities take longer to execute. As a result, line maintenance tests can fail. The failure may not represent a fault. You must re-test the suspected line or circuit during off peak hours. Faults like these occur when CPU use exceeds 80%.

Remote digital terminal alarm reports

The DMS SuperNode switch monitors and records alarm reports from the remote digital terminal (RDT). The DMS supernode outputs alarm information in the form of:

- log reports
- signal distribution (SD) points
- MAP level displays

An alarm cutoff function masks alarms with the highest alarm state. The next most-severe alarm appears through the SD point. All RDT alarms appear in sequence with a single telemetry interface.

The RDT sends alarms to the DMS SuperNode switch under the following conditions:

- Embedded operations channel (EOC) messaging is active between the RDT and DMS SuperNode switch.
- An event occurs at the RDT, with a corresponding event type. The type of event and the corresponding log reports include the following:
    - transmission (facility) RDT301
    - equipment RDT302
    - environmental RDT303
    - software RDT304
    - service RDT305
    - threshold alert RDT308
    - indeterminate RDT309
- the notification relates to a single alarm

DMS SD and scan (SC) points provide a telemetry interface for RDT alarms. A total of 13 SD points support RDT alarms. Eight SD points indicate the RDT with the highest severity. The eight SD points are RDTSD1 through RDTSD8. The tuple with the matching SD POINTS field in table RDTINV determines the RDT, referenced by the eight SD points. The matching tuple contains the name of the RDT referenced by the SDPOINTS in field RDTNAME.

Four SD points indicate the alarm urgency of the RDT. The system categorizes alarm urgency as:

- critical
- major

- minor
- warning

Four software alarms indicate the alarm urgency for RDTs:

- RDTCRIT operates when the system activates RDTCRIT.
- RDTMJ operates when the system activates RDTMAJOR.
- RDTMN operates when the system activates RDTMINOR.
- RDTWRN operates when the system activates RDTWARN.

> ***Note:*** These alarms are automatically datafilled in table software alarm (SFWALRM).

One SD point indicates the activation of the RDT alarm cutoff function, the SD point used is RDTACO. The RDTACO function indicates active RDT alarms not displayed are present because of the activation of the alarm cutoff. The purpose of the alarm cutoff function is to disable alarms with the most urgent states. The system masks the more urgent alarms, and displays the next most urgent alarms. To enable the alarm cutoff function, operating company personnel must datafill the SC function RDTALRMCO in table alarm scan (ALMSC). Operating company personnel can re-enable RDT alarms previously cut off. If the system uses the RDTALRMCO function when RDT alarms are not displayed through SD points, all RDT alarms are re-enabled. The alarm cutoff applies to EXT software alarms and their corresponding SD points.

If the system uses more than one RDT, the system displays the RDT with the most urgent alarm state. The determination of the alarm state is based on the occurrence of and not the number of alarms of a certain urgency.

> ***Note:*** TR-303 requires SD points remain active for a minimum of 20 s. If an alarm with a more urgent state occurs before the expiration of the 20 s, the system displays the more urgent alarm.

The EXT alarms subsystem of the MAP display reports and monitors alarms that use SC and SD points. The system uses the EXT MAP level to track active RDT alarms. If any RDT alarm is active, the corresponding SD point(s) are also active.

When the system reports an RDT alarm to the DMS SuperNode switch, the corresponding integrated digital terminal (IDT) raises an alarm of the same urgency. The IDT state changes to in-service trouble (ISTb). The system uses the command string QUERYPM FLT to determine if the IDT is ISTb because of RDT alarms. The system uses the RDTALARM command at the IDT MAP level to view the counts of RDT alarms by category and urgency.

> ***Note:*** The IDT becomes ISTb if alarm urgency is critical, major, or minor. Alarm severities of warning or indeterminate do not cause the IDT to become ISTb.

The alarm categories in the IDT MAP level for TR-303 RDTs are

- facility (transmission) (Fac)
- equipment (Eqp)
- environmental (Env)
- software (Sfw)
- service (Svc)
- threshold (Thr)
- indeterminate (Ind)

The RDT stores the current alarms counts. These stores indicate the number of alarms for each urgency for each alarm category. When the user enters the RDTALARM command, the system retrieves the current alarms counts from the RDT. The alarm counts are used to update the following:

- the IDT maintenance status
- the EXT software alarms
- the SD and SC points

The system uses the alarm count list object class to get RDT alarm counts by problem type. If the RDT does not support the Alarm Count List object class, the system displays the following message. Alarm reports to DMS SuperNode switch log reports are limited:

```
Alarm counting not configured on RDT
```

The embedded operations channel (EOC) protocol stack processes event reports from the RDT with service access point identifier/terminal endpoint identifier (SAPI/TEI) addresses SAPI = 1 and TEI = 4. No notifications are sent with SAPI/TEI addresses other than SAPI = 1 and TEI = 4. Alarm reporting capabilities using RDT event reports require an active EOC messaging channel.

If the RDT supports the alarm count list object class and does not send alarm indications, the system performs a periodic audit. The system audits the TR-303 RDT alarm counts. The system performs this audit every 10 min. The information in the audit indicates the alarm counts by urgency and problem type.

Computing module (CM) restarts of all types, have an effect on the data at the DMS SuperNode switch. The system uses this data to provide RDT alarm reports and alarm control functions for RDTs. All RDT alarms are enabled, and the alarm cutoff indicator is reset after all restart types. After a restart cold or restart reload, the system clears all RDT EXT software alarms and SD point. The system initializes the highest alarm counts for each RDT.

Enabling alarm count list support at the DMS SuperNode switch

The EOC channel communicates problems at the RDT to the LDS. The DMS SuperNode switch identifies event reports for remote failures and generates RDT3xx logs. Operating company personnel expect audible and visual indications of serious conditions in the alarm banner at the MAP terminal. For the DMS SuperNode switch to report RDT problems in the alarm banner, the RDT needs to support the alarm count list object.

The DMS SuperNode switch does not report alarm conditions of the generic TR-303 RDT in the alarm banner at the MAP display. If this event occurs, one of the following two conditions apply. The following conditions also apply if you enter the RDTALARM command.

- generic TR-303 RDT connected to your SMA2 does not support the alarm count list function

  or

- the RDT software was upgraded to support the alarm count list but the function is not enabled at the DMS SuperNode switch.

A generic TR-303 RDT upgrades from a software load that does not support the alarm count list object to a load that does support the object. When this event occurs, perform the following procedure. This procedure allows the alarm count list to be reported and the next updates of the alarm banner of the MAP terminal to occur.

1 Upgrade the RDT with the new software load that supports the alarm count list function, according to the recommendations of the RDT manufacturer.

2 Post the RDT at the PM;IDT level

3 Enter the RDTALARM command. Response at the MAP terminal indicates that the command is not supported on this RDT.

> ***Note:*** Busy the maintenance channels to disable OAM&P messages between the SMA2 and RDT for a limited time.

4 To busy the maintenance channels to the RDT being upgraded, type

BSY EOC2

BSY EOC1

5 To return the maintenance channels to service type

RTS EOC1

RTS EOC2

6 Enter the RDTALARM command. The MAP response indicates that the system supports the command and displays the alarm count list summary. The system updates the banner every 10 min if alarms at the RDT are present.

Integrated channel bank alarm reporting

Alarm information for the integrated channel bank (ICB) IDT is not present. The system displays other maintenance related information, like configuration data for the ICB IDT, to operating company personnel at the IDT PM level of the MAP terminal. The DMS-100 switch also displays the state of the ICB IDT at the IDT PM level of the MAP terminal.

DS-1 carrier alarm reports

The system starts audits on carriers. Two different audit processes perform the audits on carriers.

- peripheral audit, which audits the carriers only on a given peripheral. The peripheral audit process accumulates OMs from the peripheral and takes the right action when the counters exceed fixed thresholds.
- carrier audit, which audits all carriers in the system in a single audit cycle. The carrier audit process checks that hardware and software states are in agreement and corrects the hardware and software as necessary. The carrier audit also resets the CM OM counts at midnight and takes the right actions.

When a fault occurs on an SMA2 carrier, the system detects and generates one of the DS-1 alarms. The alarms are received by examination of the right peripheral, where DS-1 maintenance is responsible for returning this information.

Fault conditions

Several types of faults can occur to the components of the SMA system. In the host office, the C-side links from the SMA2 to the network may fail. If these network links are damaged, the system can lose messages from the CM, and subscriber service can be lost. A damaged DS30 or DS512 card in the SMA2 also can damage communication with the CM.

Also, faults in any circuit card in the SMA2, like the power converter card, may affect subscriber service. Faults may also occur in SMA2 equipment other than circuit cards.

The SMA2 P-side links toward the subscriber carry messages that are important to the maintenance of subscriber service. A damaged P-side link can have an effect on subscriber service.

The following sections include the fault types that can occur in SMA2 components and the interfaces between SMA2 components.

SMA2 faults

When the system detects a fault condition in the SMA2, operating company personnel must take action. The fault can occur with any of the SMA2 components. Operating company personnel use fault isolation procedures to determine the location of the fault and to remove the fault condition. Operating company personnel also use fault isolation procedures to report faults to the correct maintenance support group.

Parity fault

The CM handles parity faults when possible, so that a return to service occurs as efficiently as possible.

There are three types of parity faults:

- hard (requires the intervention of operating company personnel)
- soft (the CM clears)
- intermittent (the CM clears)

A PM181 log informs operating company personnel about the type of parity fault. Other logs, like PM106 and PM128, warn operating company personnel of the actions of the CM. These logs also warn operating company personnel when the CM clears the fault. The system also uses the command string QUERYPM FLT to determine the type of parity fault.

Data mismatch

Three types of data updates keep the inactive unit of the SMA2 provided with the data to control maintenance and call processing. This process prevents data mismatch:

- static data
- bulk data
- dynamic data

Static data update To execute call processing and maintenance on the SMA2, IDTs, and RDTs, the SMA2 must know which cards, ports, execs, and terminal types are present. Inventory tables store this information, called static data. Static data refers to the fact that the SMA2 does not change this data. The SMA2 changes data for tasks such as the establishment of a connection when a switched call is set up.

Through a process called dynamic static data update, the SMA2 can update some of the static data contained in the inventory tables. These updates can occur without a disruption to subscriber service. The following static data updates can be made dynamically to in-service SMA2 modules without service interruption:

- C-side link reconfiguration
- P-side link reconfiguration
- IDT reconfiguration
- time slot management channel (TMC) link access procedure for D-channels (LAPD) parameter changes
- EOC and EOC LAPD parameter changes
- ringing data changes
- speech and message link reconfiguration

When operating company personnel alter the following types of static data, the system sets the SMA2 to in-service trouble (ISTb). The system also notifies operating company personnel that a static data mismatch exists, and provides information for appropriate action.

- OPTCARD in table LTCINV
- TONESET in table LTCINV
- PEC6X40 in table LTCINV
- OPTATTR in table LTCINV

Static data are downloaded to the SMA2 when

- The SMA2 is busied and returned to service when the static data has changed from the last time the system downloaded the data.
- The inactive unit is made busy and returned to service, and operating company personnel perform a cold SWACT. This process occurs only if the static data has changed since the last time the system downloaded the data.
- Two cold SWACTs are performed.
- A PMRESET of the SMA2 is performed.

Bulk data update A bulk data update transfers RDT status (in-service or busy) and subscriber states (idle or busy) from the active SMA2 unit to the inactive unit. This transfer occurs when the inactive unit returns to service. A bulk data update brings the inactive unit of the SMA2 up-to-date with the active unit.

Dynamic data update A dynamic data update occurs on a continuous basis as changing data in the active unit are updated in the inactive unit. Dynamic data updates include the following information:

- RDT status (in-service or busy)
- subscriber states
- channel reassignment
- port status
- DS-1 link information

Trap

A trap is a software error serious enough to stop the system's normal process. An example of a trap, is a corrupt task identification (task_id). Hardware-detected traps like bus, address, or parity errors can also occur.

The system reports a trap in two different ways. The way the system reports a trap depends on the state of the peripheral.

- If the peripheral remains in-service during the trap, the peripheral sends an unsolicited message to the CM. The CM uses the PMDEBUG software tool to send the trap information to the appropriate monitor level.
- If the peripheral goes out-of-service during the trap, the CM queries the peripheral for any unreported traps after the next return-to-service sequence. The PM185 log captures the trap information.

Software error

Software errors (SWERRs) are errors software code produces to flag the execution of a given path of code. Normally, a SWERR indicates a change from the normal or expected path.

A buffer stores SWERRs and you view the SWERRs through the SWERR monitor available at the XPM main monitor level. The PM180 log report captures information about SWERRs.

Handling a SysB SMA2 unit

When the system busies an SMA2 unit, the unit is not in service any longer and cannot process calls. If the unit is the active unit, the system attempts a warm SWACT.

The reasons given for a system busy (SysB) SMA2 unit when the user enters the command string QUERYPM FLT are as follows:

- activity dropped
- CM audit
- diagnostic failed

- PM audit
- self-test failed
- trap
- unsol (unsolicited messages) exceeded
- reset
- C-side links

C-side link problems fall outside the scope of PM-level maintenance.

Standard troubleshooting methods requires a test of a specific unit of a SysB SMA2. If the unit passes tests and returns to service, the SysB fault is cleared. A list of SMA2 cards suspected to be damaged, like those that appear in the following example, can accompany test failures:

```
SMA2 60 Unit 0 Tst Failed
Failed to open link
Site Flr RPos  Bay_id Shf  Description     Slot   EqPEC
HOST 00  C05  CMVI 00 33   SMA2 : 60        :09    6X40
HOST 00  C05  CMVI 00 33   SMA2 : 60        :10    MX75
HOST 00  C05  CMVI 00 33   SMA2 : 60        :08    MX76
```

Replace one card at a time, in the order listed, and retest the unit until the identified fault clears.

Often the test fails and a message, like `No Reply From PM`, goes with the failure. The user can reset the SMA2 with the PMRESET command. This action often clears the fault. If the reset fails, a list of suspected damaged cards, like those seen for test failures here, often accompany the failure. Operating company personnel must replace the cards one at a time. If one of the cards has faults, replacement can clear the SysB problem.

To clear faults in a SysB SMA2, operating company personnel must often reload the SMA2 software.

If the reset, reload, or replacement of damaged cards methods fail to clear the SysB fault, a software problem can be present in the SMA2. Contact your maintenance support group.

Handling an ISTb SMA2 unit

When an SMA2 has gone in-service trouble (ISTb), one or both units has a fault but can continue to process calls. Some of the normal responses to the command string QUERYPM FLT at the SMA2 level appear below:

- `Data out of date` The PM must be reloaded.
- `Static data mismatch with CC` The SMA2 requires a download of static data from the central control (CC), also known as the computing module (CM) throughout this chapter. The user must busy and return to service the SMA2, or busy and return to service the inactive unit with the NODATASYNC parameter. Operating company personnel must execute a SWACT FORCE. This action will cause a loss of service.

> **ATTENTION**
>
> Use of the RTS NODATSYNC option is only applicable to XPMs that have not been converted to XPM configuration data table (CDT) management. Feature AF5678, XPM Node Table Sync Redesign introduces CDT to improve synchronization of XPM units. XPMs with software loads that contain this feature synchronize the node and port of tables both units with the CM, rather than synchronizing unit to unit. Feature AF5678 eliminates most out-of-sync causes except hardware failure. Clearing an ISTb condition with configuration download and the resulting synchronization of both units only occurs when the entire XPM is BSYed and RTSed. This can only be done during periods of low traffic to minimize out-of-service impact. For a complete description of this feature refer to the “SMA2 automatic maintenance" section in this document.

- `P-side links out of service` DS-1 link requires maintenance.
- `Load mismatch with CC` The load datafilled in table LTCINV must match the load that the SMA2 uses. For the loads to match, operating company personnel must change the load in table LTCINV. When operating company personnel enter the command string QUERYPM CNTRS, the SMA2 load appears.

Operating company personnel must often test a unit of the SMA2. A fault in an ISTb SMA2 is like a SysB SMA2. Operating company personnel can also clear the fault with a reset or reload of the SMA2 or with the replacement of damaged cards.

Handling data mismatch

When the SMA2 has data mismatch trouble, like a static data mismatch with the CM, the system places the SMA2 in the in-service trouble (ISTb) state.

One method to correct the trouble is to busy the inactive unit of the SMA, return to service (RTS) the unit, and execute a switch of activity (SWACT). After a successful SWACT, busy and RTS the newly inactive unit. This action clears the ISTb alarm. Because this action has an effect on service, perform the action only during periods of low traffic activity.

In some occurrences, the system prompts operating company personnel to busy and return the inactive unit to service, and perform a switch of activity. In other occurrences, the system can prompt operating company personnel to busy and return the inactive unit to service with the NODATASYNC option. Operating company personnel perform a switch of activity.

The NODATASYNC option allows operating company personnel to update the inactive unit with CM data without the transfer of data from the active unit. With all static data mismatches, the system prompts the operating company personnel with the right action to take.

> ***Note:*** When operating company personnel return the inactive unit to service with the NODATASYNC option the system disables the warm SWACT feature. Operating company personnel must perform a SWACT COLD to switch unit activity. This action causes a loss of service.

ATTENTION

Use of the RTS NODATSYNC option is only applicable to XPMs that have not been converted to XPM configuration data table (CDT) management. Feature AF5678, XPM Node Table Sync Redesign introduces CDT to improve synchronization of XPM units. XPMs with software loads that contain this feature synchronize both units' node and port tables with the CM, rather than a unit to unit synchronization. Feature AF5678 eliminates most out-of-sync causes except hardware failure. An ISTb condition that configuration download clears and the synchronization of both units only occurs when the entire XPM is BSYed and RTSed. This can be done only during periods of low traffic to minimize out-of-service impact. For a complete description of this feature refer to the “SMA2 automatic maintenance" section in this document.

To minimize the time required to have the correct data in both SMA2 units, use the NODATASYNC parameter with RTS. When the system issues the RTS

NODATASYNC command for the inactive unit, the following sequence occurs:

1. The system blocks the node translation table transfer from the active to the inactive unit. The system also checks the node tables to make sure they match.
2. The inactive unit loads static data from the CM.
3. When the inactive unit returns to service, the system disables data sync between the active and inactive unit.

A maintenance example that shows how to use the NODATASYNC option follows:

Assume a static data mismatch for the SMA2 is present. Operating company personnel must take the following steps:

1 Busy the inactive unit.

2 RTS the inactive unit with the NODATASYNC option.

The inactive unit will return to service. Note that if static data changes during the RTS, the system produces a PM128 log with the following message: `Mismatch found in node table between the two units`. Also, the command string QUERYPM FLT entered for the SMA2 indicates a node table mismatch.

3 Enter the command string SWACT COLD to perform a cold SWACT.

With the cold SWACT, the newly inactive unit gets data from the newly active unit. The system normally clears all trouble indicators that associate with the data mismatch automatically as the SMA2 returns to service.

Handling an IMC link fault

When the IMC link audit detects data loss or corruption of messages over IMC links, the status of the SMA2 becomes ISTb. The system generates a PM128 log. If operating company personnel enter the command string QUERYPM FLT, the response includes the following statement:

```
NON-CRITICAL HARDWARE FAULT
```

Operating company personnel should perform the following steps:

1 Test both units to confirm the audit result.

2 Busy the inactive unit and replace the damaged cards listed.

3 Return the inactive unit to service.

The node remains ISTb for more than 5 min and the response to the commands string QUERYPM FLT does not change. When this event occurs, the fault is probably in the active unit. If the RTS of the inactive unit is successful, perform the following steps:

1 Switch the activity of the units. Ensure warm SWACT is enabled.

2 Busy the new inactive unit.

3 Test the inactive unit.

4 Replace the damaged cards with good cards.

5 Return the inactive unit to service.

Handling a parity error fault

In most occurrences, a detected parity fault can be corrected without a loss of service. This section provides information on the types of parity faults. A summary of the actions the CM takes to deal with parity faults, and the actions of operating company personnel are also included.

The three types of parity faults are

- An intermittent fault, which occurs when the system detects and does not find an error, during the reread of the location.
- A soft fault, which occurs when the system detects and finds a parity error, when the XPM tries to reread the location. The system does not find an error when the XPM tries to write to the location. The error can occur in either the program store or memory store.
- A hard fault, which occurs when an XPM detects a fault and cannot read again or write to the memory location.

When a parity fault occurs, the CM determines what action to perform on the XPM unit. This action depends on the status of the unit that reports the fault (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 that recovers a parity fault on the active unit is the XPM REX test window. The time for the XPM REX test window is the same as the current time of the switch. An audit checks to see if the active unit of the XPM has an ISTb of parity if this event occurs. If an ISTb exists, the CM performs a SWACT and a reload of the XPM if no dependencies exist. This action clears the ISTb `parity' fault and the short term failure (STF) parity fault peg and resolves the parity fault in the XPM.

When the active unit reports a parity fault, the system generates a PM181 log to notify operating company personnel of the problem. The CM responds with several recovery actions. First the CM performs a SWACT of the XPM. Then the CM loads the newly inactive unit with the XPM software load defined in the corresponding inventory table. The CM considers this 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 a P-side or C-side node of the XPM that is in the recovery process from a parity fault
- on the XPM if a P-side or C-side node that is in the recovery process from a parity fault

The CM does not allow two XPMs in the same configuration to perform a parity reload. As a result, a P-side node cannot perform a parity reload at the same time as the C-side node. In the same way, a C-side parity reload occur at the same time as the P-side node. This restriction guarantees that only one XPM in a configuration is in simplex at a time.

The CM warns operating company personnel of a parity fault through PM181 log reports. This log is the primary trouble indicator. Operating company personnel also can check for related logs. For example, the PM128 explains what actions, if any, the CM takes. Examples of the messages that relate to the PM181 and PM128 logs are provided in this section.

The XPM unit can be set ISTB with multiple reasons at the same time. When the system performs a QUERYPM FLT at the MAP level, all not cleared ISTb reasons on the unit appear.

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

- A parity fault is present on the active unit, and the unit is ISTb
- The CM reloads the unit during the next XPM REX test window

Operating company personnel also 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 SMA2 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  SMA2 : 000   3    AX74
```

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

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 command string QUERYPM FLT displays the faults on a posted XPM. The following example MAP response shows a hard parity fault exists 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.
```

Action by the CM: The CM will SWACT and reload the XPM during the next XPM REX test window. After the reload, the system clears the XPM of this ISTb fault.

User action: There is no action by operating company personnel. Operating company personnel can begin a manual SWACT and reload to clear the parity fault.

Multiple hard parity faults When a unit reports three or more parity faults in a 30 day time period, the system generates a PM181 log. This log notifies operating company personnel about the following:

- the unit has a repeating parity fault
- the card indicated in the card list requires replacement
- operating company personnel must enter a SWACT FORCE to clear the ISTb and reset the counter

An example of a PM181 log report follows:

```
PM181 JUL23 23:29:16 7700 INFO SMA2 0 Unit 0
   Node: Istb, Unit0 Inact: ISTb, Unit1 Act: ISTb
   Parity audit has detected a hard parity fault.
   Three parity faults have occurred on this unit
   within a month. Use Querypm Diaghist for additional
   information on fault. Replace card indicated. A SWACT
FORCE is required to clear this ISTB and to perform a SwAct
   Site Flr  RPos  Bay_id  Shf Description Slot EqPEC
   RAL1 00   C05   CMVI 00  18  SMA2 : 000   3   AX74
```

When a unit changes state to ISTb of Multiple parity, the system generates a PM128 log. This log report warns operating company personnel that this unit changed status.

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 (Multiple Parity)
```

Handling P-side messaging overload

When a P-side messaging overload condition exists with the SMA2, the system can discard messages on time slot management channels (TMC) or embedded operations channels (EOC). The system discards these messages because of excessive queuing delays. This condition may result in service degradation on all subtending remote digital terminals (RDT). This loss of service includes the RDT that associates with the posted integrated digital terminal (IDT). In order to minimize service degradation, operating company personnel must perform the following steps:

1 At the IDT level of the MAP terminal, enter the command string QUERYPM FLT.

2 Check for ISTb reasons of TMC messaging overload or EOC messaging overload.

3 If the system indicates TMC or EOC messaging overload, first check for an indication of channel or logical link failures for the posted IDT. Correct the failures if possible.

4 If the damaged channels or logical links cannot be corrected, operating company personnel must manually busy the failing channel. Personnel also can busy the logical link to prevent the use of additional resources.

5 If there are no channel or logical link failures on the posted IDT an RDT engineering problem may be present. Failure to correct the overload condition with the previous steps is also an indication of an engineering problem with the RDT.

Handling a data communication failure in the communication stack

A data communication failure can occur in the communication stack. When this event occurs, an exchange of maintenance or provisioning information between the S/DMS AccessNode and the DMS SuperNode is not present.

Action by the data communication software The system automatically tries to reinitialize the communications stack. If after six consecutive reinitialization attempts within 20 min, the system cannot reinitialize the communication stack, the system generates an Appl OSIstk alarm and a COMM777 log.

User action Operating company personnel must collect all software error (SWER) and log reports that relate to the problem. Personnel must report these problems to Nortel (Northern Telecom). Nortel determines the cause and corrects the problem verifies with the use of the DACRM test tool. Nortel uses the START ALL command to recover the communication stack.

S/DMS AccessNode faults

Refer to *S/DMS AccessNode Alarm and Trouble Clearing Procedures*, for the fault conditions possible in the S/DMS AccessNode components.

MVI RDT faults

Refer to the maintenance documentation for the MVI RDT installed at your facility for the fault conditions possible in the RDT components.

ICB faults

Refer to the maintenance documentation for the channel bank installed at your facility for the fault conditions possible in the channel bank components.

Locating and clearing faults

This section contains standard troubleshooting steps for locating and clearing faults:

1. Silence audible alarms caused by the system when alarm conditions are detected.
2. To find the fault, read status displays and trace fault codes to the menu level needed to clear the fault.
3. Busy the hardware to remove system access to the damaged component. This action allows for the performance of maintenance activity without system interference.
4. Test the damaged component, and identify which card you must replace. Replace the damaged card, and test the card again.
5. Return the hardware to service.

Fault isolation program

The fault isolation program improves the XMS-based peripheral module (XPM) capability to determine faults and provides the following diagnostics:

- Improved read-only memory (ROM) diagnostics allow the SMA2 to detect a wider range of possible faults which can develop in the processor. These diagnostics also perform better fault isolation, reduced testing time, and safe tests.
- Mate diagnostics provide the CM with a method of diagnosing a damaged SMA2 unit through its mate unit. The XPM_MATE_DIAGNOSTICS_AVAILABLE parameter in table OFCOPT must be set to Y to activate mate diagnostics.
- Intermodule communication (IMC) diagnostics provide diagnostic support for both IMC links of an XPM. An IMC audit drives these diagnostics to verify the integrity of both IMC links at regular intervals. An audit failure begins automatic maintenance activity.
- XPM memory parity audit
- XPM static data audit ensures static data sanity when the SMA2 is in-service. The CM prevents static data downloading when this audit validates the static data.

Office recovery program

The office recovery program improves the reliability and performance of all system restarts. The method for office recovery is to return to service as many good nodes, as quickly as possible. With dual-unit nodes like the SMA2, the primary purpose is to return an active unit to service during the recovery process. This emphasis on the active unit, leaves the recovery of the inactive unit until all active units are back in service.

RDT line capacity changes

Issues that have an effect on line capacity changes for an RDT

Terminal numbers on an a remote digital terminal (RDT) must connect. The RDTs that add and delete can fragment the available area in small spaces. This fragmentation can prevent the addition of an RDT because the spaces are not connected. Fragmentation does not normally prevent the addition of an RDT. Small changes in line size that occur, often require an SMA2 to become offline (OFFL) to recover fragmented space.

> ***Note:*** The operating company personnel can increase the line capacity of an RDT. When the line capacity of an RDT increases by a maximum of 95 lines, the MAP terminal displays a warning message. This message warns operating company personnel that the action is not recommended because small increases can cause fragmentation.

To make line size changes to RDTs that connect to the SMA2, increase the line capacity by 96 lines. This action prevents fragmentation of the terminal identifier (TID) numbers in the TID table.

The system does not allow changes to other fields in table RDTIN while changes to the MAXLINES field occur. If attempts occur to change table RDTINV while MAXLINES changes occur, the system displays an error message. The error message indicates that field MAXLINE cannot be changed while changes occur to other fields.

> ***Note:*** Before the line capacity of an RDT changes, enter the QUERYPM command at the IDT level. This command displays the total number of lines allocated to an SMA2 and the number of lines on the posted IDT.

How to increase the line capacity of an RDT

If you increase the line capacity of an RDT, manually busy (ManB) the SMA2 that connects the RDT to the SuperNode switch. Use the command string BSY PM FORCE to ManB the SMA2. An attempt to increase the line capacity of an RDT in other states causes the system to display an error message. The error message warns the operating company personnel that the SMA2 must be ManB or OFFL to change field MAXLINES.

> **ATTENTION**
> Increase the line capacity of an RDT with the command string BSY PM FORCE during periods of low traffic. If this procedure occurs during periods of high traffic, the system drops active calls. In addition, the SuperNode switch handles all RDTs connected to the SMA2 as CBsy.

Two methods increase the line capacity of an MVI RDT. The first method requires operating company personnel to use two MAP terminals. The second method requires operating company personnel to prepare a read store file. This file lists all the actions in the first method. The system runs the read file as a single activity. This procedure removes delays that manually entered commands cause.

Method 1 contains the following steps and requires the operating company personnel to control two MAP windows.

> ***Note:*** The operating company personnel must have both MAP terminals available. The operating company personnel must complete pre-typing to reduce the time required to perform this procedure. Complete the pre-typing in table RDTINV to the point where data is entered in steps 2and 3.

Releasing digital test access (DTA) connections

The following steps must be followed to determine if DTA connections exist on the RDT and to release DTA connections.

At a MAP terminal

1 Access the LTP level by typing

>MAPCI;MTC;LNS;LTP

and pressing the Enter key

2 Access the LTPDATA sublevel by typing

>LTPDATA

and pressing the Enter key

3 Determine if DTA connections are equipped by typing

>EQUIP DTA QUERY ALL

and pressing the Enter key

Example of a MAP response

```
MTR  EQUIP   US  DS  CONNECT  CHNL  STAT
---------------------------------------------------
1     HOST   04  0     01 12   B1    B2
```

If any DTA equipment is reserved, an equipment number and LEN will be listed under the MTR and EQUIP headings as in the previous example. If a DTA connection exists, a LEN will be listed under the CONNECT, CHNL, and STAT headings.

Perform steps 4and 5 to release the DTA connection and reset the DTA equipment. If there are no DTA connections on the RDT, go to step 6.

4 To release the DTA equipment

>CONNECT eqno RLS

where eqno
is the equipment number given in response to the command string EQUIP DTA QUERY ALL

5 To reset the DTA connection

>EQUIP DTA RESET eqno

where eqno
is the equipment number given in response to the command string EQUIP DTA QUERY ALL

Note: This step is only needed if DTA equipment is reserved and a connection does NOT exist. You must release the DTA connection before you reset the DTA equipment.

6 You have completed this procedure.

Method 1 - use two MAP terminals

Method 1 requires operating company personnel to control two MAP windows and consists of the steps that follow.

Note: Operating company personnel should have both MAP terminals available and do as much pre-typing as possible to reduce the time it takes to increase the line capacity of an RDT. The pre-typing activity can be done in table RDTINV up to the point of adding the data shown in steps 2 and 3 of method 1.

ATTENTION
Before you increase the line capacity of an RDT, verify that all DTA connections are released for the RDT to be resized. The line capacity of an RDT cannot be increased when DTA lines are equipped or connected. Refer to the procedure “How to release digital test access (DTA) connections" to determine if DTA connections exist and how to release them.

ATTENTION
Do not proceed to step 5 until both units are in the ManB state.

ATTENTION
Do not proceed to step 6 until the “Tuple changed" message is received at the MAP terminal.

Perform the following steps to increase the line capacity of an MVI RDT.

Note: Before you change the line capacity of an RDT, enter the QUERYPM command at the IDT level. You can use the QUERYPM command to display the total number of lines connected to an SMA2 and the number of lines on the posted IDT.

At MAP terminal 1

1 Post the SMA2 that connects to the RDT that is to have its line capacity increased by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 to be posted

2 At MAP terminal 2
Position on the affected RDT in table RDTINV by typing

>TABLE RDTINV;FORMAT PACK;POS rdtname

and pressing the Enter key.

where

rdtname
consists of the site, frame, and unit number of the RDT datafilled in table RDTINV, for example, RDT1 0 0

3 Change the value of subfield MAXLINES by typing

`>CHA VARTYPE`

and pressing the Enter key.

The following confirmation message appears

`Enter Y to continue processing or N to quit.`

If you wish to continue, respond to this message by typing

`>Y`

and pressing the Enter key.

Respond to the MAP terminal response as follows:

`>RDTVAR`

Press the Enter key.

`>RDTPPLNK`

Press the Enter key.

`>MAXLINES`

Respond to the MAP terminal response by entering the new MAXLINES value

`>newmaxlines value`

and pressing the Enter key.

where

newmaxlines value
is the new RDT line size to be entered in table RDTINV, field MAXLINES.

Respond to the MAP terminal response as follows:

`>INHLINE`

Press the Enter key.

`>BRIDGING`

Press the Enter key.

The MAP terminal displays the following message

Example of a MAP response

```
ERROR:  MAXLINES field may not be increased while SMA2 1
is INSV.  Busy SMA2 1 or delete and re-add the IDT.
WARNING:  System ID is ignored for MVI RDTs.
WARNING:  Equipment ID is ignored for MVI RDTs.
TUPLE TO BE CHANGED:
RDT1 88 0 88 SMA2 1 88 ANODE_8_MVI $ $ GENTMC 2 1800 N N
Y $ Y (1 2) (2 3) (3 4) $ N STDLN S $ (NETWORK_ID 1)
(SYSTEM_ID 1) (NETWORKELEMENT_ID 24) (EQUIPMENT_ID 1) $

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

Note: You may respond to the request to confirm to check that all DTA connections are released. If the system responds that DTA connections exist, respond by typing “N" to reject the request. Then proceed to the procedure “How to release digital test access (DTA) connections" earlier in this section. However, if the system responds that the SMA2 is InSv, proceed to step 4. Do not enter “Y" to confirm until directed to do so in step 5.

4 At MAP terminal 1
Busy the SMA2 by typing

>BSY PM FORCE

and pressing the Enter key.

The following confirmation message appears

```
This action will take this pm and all of its subtending
nodes out of servicePlease confirm (“Yes", “Y", “No", or
“N"):
```

If you wish to continue, respond to this message by typing

>Y

and pressing the Enter key.

Note: At this point the SMA2 is ManB and any calls that are active on RDTs and ICBs are taken down and an outage occurs.

5 At MAP terminal 2
Ensure step 4 at MAP terminal 1 is complete by noting that both units are ManB before proceeding with this step. Respond “Y" to confirm the change to MAXLINES by typing

>Y

and pressing the Enter key.

6 At MAP terminal 1
Return to service the ManB SMA2 by typing

>RTS PM FORCE

and pressing the Enter key.

At this point the SMA2 returns to service and the state of the IDTs change from CBsy to InSv.

7 You have completed this procedure.

Method 2 - prepare a store file

Method 2 requires operating company personnel to prepare a store file that contains the steps of Method 1. The advantage of Method 2 is that outage time is reduced by removing the delays associated with manually entering commands on two MAP terminals.

ATTENTION

Before you increase the line capacity of an RDT, verify that all DTA connections are released for the RDT to be resized. The line capacity of an RDT cannot be increased when DTA lines are equipped or connected. Refer to the procedure titled “How to release digital test access (DTA) connections" presented earlier in this section to determine if DTA connections exist and how to release them.

CAUTION

An outage longer than planned may result from entering incorrect values.

Ensure all values are correct and entered correctly when compiling this store file. If incorrect values are entered, an outage of longer duration than planned could result.

ATTENTION

When you activate the store file, the SMA2 is put in the ManB state. Any calls that are active on RDTs and ICBs connected to the SMA2 are taken down and an outage occurs. Therefore, conduct this activity during periods of low traffic.

Note 1: If DTA connections are not released, SMA2 P-side channels get “hung." These “hung" channels could result in a complete loss of call processing for the RDT that is to have the line capacity increased.

Note 2: Before changing the line capacity of an RDT, enter the QUERYPM command at the IDT level to display the total number of lines connected to an SMA2 and the number of lines on the posted IDT.

Perform the following steps to create a store file used to increase the line capacity of an MVI RDT:

1 At the CI level, access the store file editor by typing

`>Edit <filename>`

and pressing the Enter key.

where

filename
is the name you choose for the store file.

2 Enter information into the store file by typing

`>Input`

and pressing the Enter key.

3 Enter the content of the store file as follows:

1. **>MAPCI NODISP;MTC;PM;POST SMA2 sma2_no**

   and press the Enter key.

   where

   sma2_no
   is the number of the SMA2 connected to the RDT to be upsized.

2. **>BSY PM FORCE**

   and press the Enter key. This command manually busies the SMA2.

3. **>Y**

   and press the Enter key.

4. **>TABLE RDTINV;FORMAT PACK;POS rdtname**

   and press the Enter key.

   where

   rdtname
   consists of the site, frame, and unit number of the RDT datafilled in table RDTINV, for example, RDT1 0 0

5. **>CHA VARTYPE**

   and press the Enter key.

6. **>Y**

   and press the Enter key.

7. Enter the existing value datafilled in field RDTVAR, for example

   `>GENTMC`

   and press the Enter key.

8. Enter the existing value datafilled in field RDTPPLNK, for example

   >2

   and press the Enter key.

9. **>newmaxlines value**

   where

newmaxlines value
is the new RDT line size to be entered in table RDTINV, field MAXLINES.

and press the Enter key.

10. Enter the existing value datafilled in the INHLINE field, for example

    >N

    and press the Enter key.

11. Enter the existing value datafilled in the BRIDGING field, for example

    >N

    and press the Enter key.

12. Enter the response to the system confirmation message asking you to confirm the change to MAXLINES as

    >Y

    and press the Enter key.

13. **>QUIT**

    and press the Enter key.

14. **>ABORT**

    and press the Enter key.

    Enter the ABORT command to abort any system responses to incorrect data entry. The ABORT command prevents situations that may arise when the DMS switch prompts the user for correct data in response to incorrect data that was entered in the store file. Entering incorrect data prevents the SMA2 from returning to service and may prolong the planned outage.

15. **>RTS PM FORCE**

    and press the Enter key. This command returns the SMA2 to service.

16. **>QUIT ALL**

4 After typing the information in step 3 as the store file, press the Enter key twice to stop editing the store file.

5 Save the store file by typing

>File SFDEV

and pressing the Enter key.

where

filename
is the name of the store file input in step 1.

6 List the store file by typing

>Listsf

and pressing the Enter key. This command lists all the store files in the SFDEV that the user created.

7 Activate the store file to increase the line capacity of the RDT by typing

>Read <filename>

and pressing the Enter key.

where

filename
is the name of the store file to be activated.

This command runs the store file.

8 After the store file has run and the line capacity of the RDT was successfully increased, you may want to delete the store file. Delete the store file by typing

>Erasesf <filename>

and pressing the Enter key.

where

filename
is the name of the store file to be deleted.

9 You have completed this procedure.

How to decrease the line capacity of an RDT

When the line capacity of an RDT is decreased, the SuperNode switch determines if current LENs are above the new value. This value is in table RDTINV field MAXLINES. If LENs are above the new value, the system displays an error message. The error message indicates that the line capacity of the RDT cannot decrease because LENs are provisioned above the new value.

The procedure to decrease the line capacity of an RDT occurs at one MAP terminal. An outage does not occur. Verify table LNINV to make sure the required number of lines are deleted before an update to table RDTINV, field MAXLINES occurs. Before a tuple from table LNINV is deleted, the lines are cleared from the following tables:

- IBNLINES
- KSETLINE
- KSETINV
- LENLINES
- SPECCONN.

The system updates table RDTLT after table LNINV because of provisioning delays. Check if tuples that were deleted from table LNINV remain in table RDTLT.

> ***Note:*** When you decrease the line capacity of an RDT, the system allows a decrease in the value of the MAXLINES field in table RDTINV. This change is allowed only after all LENs that are above the new MAXLINES value are removed.

To decrease the line capacity of an RDT, perform the following procedure.

At the MAP terminal

1 To position on the affected RDT in table RDTINV, type:

>TABLE RDTINV;FORMAT PACK;POS rdtname

and press the Enter key.

where

rdtname
contains the site, frame, and unit number of the RDT in table RDTINV, for example, RDT1 0 0

2 To change the value of subfield MAXLINES, type:

>CHA VARTYPE

and press the Enter key.

The following message appears:

`Enter Y to continue processing or N to quit.`

To continue, type:

>Y

and press the Enter key.

Respond to the MAP terminal response as follows:

`>RDTVAR`

Press the Enter key.

`>RDTPPLNK`

Press the Enter key.

`>MAXLINES`

To respond to the MAP terminal response, enter the new MAXLINES value

>newmaxlines value

and press the Enter key.

where

newmaxlines value
is the new RDT line size to enter in table RDTINV, field MAXLINES.

`>INHLINE`

Press the Enter key.

`>BRIDGING`

Press the Enter key.

3 To confirm the new MAXLINES value into table RDTINV, type:

>Y

and press the Enter key.

4 This procedure is complete.

RFT line capacity changes

Issues that have an effect on a line capacity changes for an RFT

Changes to other fields in table RDTINV are not allowed while changing the SHELFSLT field. If other changes to table RDTINV are attempted while SHELFSLT is being changed, an error message is displayed warning operating company personnel that field SHELFSLT cannot be changed while other fields are being changed.

> ***Note:*** Before you change the line capacity of an RFT, enter the QUERYPM command at the IDT level. The QUERYPM command displays the total number of lines allocated to an SMA2 and the number of lines on the posted IDT.

The SHELFSLT value is a four-digit number of which only the second is a variable. The other three digits are constants. If any attempt is made to change these values, a warning message is displayed.

Example of a MAP response

```
WARNING: minslot and minshelf are being changed to 1 and maxslot
is being changed to 96.
```

How to increase the line capacity of an RFT

Before you increase the line capacity of an RFT, the SMA2 that connects the RFT to the SuperNode switch must be put in the manually busy (ManB) state using the command string BSY PM FORCE. Any attempt to increase the line capacity of an RFT in another state results in an error message being displayed that warns operating company personnel that the SMA2 must be ManB or Offl to change field SHELFSLT.

ATTENTION

When increasing the line capacity of an RFT using the command string BSY PM FORCE, conduct this activity during periods of low traffic. This is because active calls will be dropped and all RFTs connected to the SMA2 will be viewed as CBsy by the SuperNode switch.

There are two methods to increase the line capacity of an RFT:

- method 1 - use two MAP terminals
- method 2 - prepare a read (store) file. This store file is a set of all the actions in the first method. The read file is then executed as a single activity. This method removes the delays introduced by manually entering the commands.

Before you increase the line capacity of an RFT, verify that all DTA connections are released for the RFT to be resized. The line capacity of an RFT cannot be increased when DTA lines are equipped or connected. Refer to the procedure “How to release digital test access (DTA) connections" that follows to determine if DTA connections exist and how to release them.

> ***Note:*** If DTA connections are not released, SMA2 P-side channels get “hung." These “hung" channels could result in a complete loss of call processing for the RFT that is to have the line capacity increased.

How to release digital test access (DTA) connections

The following steps must be followed to determine if DTA connections exist on the RFT and to release DTA connections.

At a MAP terminal

1 Access the LTP level by typing

>MAPCI;MTC;LNS;LTP

and pressing the Enter key

2 Access the LTPDATA sublevel by typing

>LTPDATA

and pressing the Enter key

3 Determine if DTA connections are equipped by typing

>EQUIP DTA QUERY ALL

and pressing the Enter key

Example of a MAP response

```
MTR EQUIP US DS  CONNECT  CHNL STAT
---------------------------------------------------
1   HOST  04  0   01 12     B1   B2
```

If any DTA equipment is reserved, an equipment number and LEN will be listed under the MTR and EQUIP headings as in the previous example. If a DTA connection exists, a LEN will be listed under the CONNECT, CHNL, and STAT headings.

Perform steps 4 and 5 to release the DTA connection and reset the DTA equipment. If there are no DTA connections on the RFT, go to step 6.

4 To release the DTA equipment

>CONNECT eqno RLS

where eqno
is the equipment number given in response to the command string EQUIP DTA QUERY ALL

5 To reset the DTA connection

>EQUIP DTA RESET eqno

where eqno
is the equipment number given in response to the command string EQUIP DTA QUERY ALL

Note: This step is only needed if DTA equipment is reserved and a connection does NOT exist. You must release the DTA connection before you reset the DTA equipment.

6 You have completed this procedure.

Method 1 - use two MAP terminals

Method 1 requires operating company personnel to control two MAP windows and consists of the steps that follow.

> ***Note:*** Operating company personnel should have both MAP terminals available and do as much pre-typing as possible to reduce the time it takes to increase the line capacity of an RFT. The pre-typing activity can be done in table RDTINV up to the point of adding the data presented in steps 2 and 3 of method 1.

ATTENTION

Before you increase the line capacity of an RFT, verify that all DTA connections are released for the RFT to be resized. The line capacity of an RFT cannot be increased when DTA lines are equipped or connected. Refer to the procedure “How to release digital test access (DTA) connections" to determine if DTA connections exist and how to release them.

Perform the following steps to increase the line capacity of an RFT.

> ***Note:*** Before you change the line capacity of an RFT, enter the QUERYPM command at the IDT level. You can use the QUERYPM command to display the total number of lines connected to an SMA2 and the number of lines on the posted IDT.

ATTENTION

Do not proceed to step 5 until both units are in the ManB state.

ATTENTION

Do not proceed to step 6 until the “`Tuple changed" message is received at the MAP terminal.`

At MAP terminal 1

1 Post the SMA2 that connects to the RFT that is to have its line capacity increased by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 to be posted

2 At MAP terminal 2
Position on the affected RFT in table RDTINV by typing

>TABLE RDTINV;FORMAT PACK;POS rdtname

and pressing the Enter key.

where

rdtname
consists of the site, frame, and unit number of the RFT datafilled in table RDTINV, for example, RFT1 0 0

3 Change the value of subfield SHELFSLT by typing

>CHA VARTYPE

and pressing the Enter key.

The following confirmation message appears

`Enter Y to continue processing or N to quit.`

If you wish to continue, respond to this message by typing

>Y

and pressing the Enter key.

Respond to the MAP terminal response as follows:

`>RDTVAR`

Press the Enter key.

`>SHELFSLT`

Respond to the MAP terminal response by entering the new SHELFSLT value

>newshelfslot value

and pressing the Enter key.

where

newshelfslot value
is the new RFT shelf size to be entered in table RDTINV, field SHELFSLT.

Note: You may respond to the request to confirm in order to verify that all DTA connections are released. If the system responds that DTA connections exist, respond by typing “N" to reject the request. Then proceed to the procedure “How to release digital test access (DTA) connections" earlier in this section. However, if the system responds that the SMA2 is InSv, proceed to step 4. Do not enter “Y" to confirm until directed to do so in step 6.

4 At MAP terminal 1
Busy the SMA2 by typing

>BSY PM FORCE

and pressing the Enter key.

The following confirmation message appears

```
This action will take this pm and all of its subtending
nodes out of servicePlease confirm (“Yes", “Y", “No", or
“N"):
```

If you wish to continue, respond to this message by typing

>Y

and pressing the Enter key.

> ***Note:*** At this point the SMA2 is ManB and any calls that are active on RFTs are taken down and an outage occurs.

5 At MAP terminal 2
Ensure step 4 at MAP terminal 1 is complete by checking that both units are ManB before proceeding with this step. Respond “Y" to confirm the change to SHELFSLT by typing

>Y

and pressing the Enter key.

6 At MAP terminal 1
Return to service the ManB SMA2 by typing

>RTS PM FORCE

and pressing the Enter key.

At this point the SMA2 returns to service and the state of the IDTs change from CBsy to InSv.

7 You have completed this procedure.

Method 2 - prepare a store file

Method 2 requires operating company personnel to prepare a store file that contains the steps of Method 1. The advantage of Method 2 is that outage time is reduced by removing the delays associated with manually entering commands on two MAP terminals.

ATTENTION

Before you increase the line capacity of an RFT, verify that all DTA connections are released for the RFT to be resized. The line capacity of an RFT cannot be increased when DTA lines are equipped or connected. Refer to the procedure titled “How to release digital test access (DTA) connections" presented earlier in this section to determine if DTA connections exist and how to release them.

CAUTION
Entering incorrect values may result in an outage longer than planned.
When compiling this store file, ensure all values are correct and entered correctly. If incorrect values are entered, an outage of longer duration than planned could result.

ATTENTION
When you activate the store file, the SMA2 is put in the ManB state. Any calls that are active on RFTs connected to the SMA2 are taken down and an outage occurs. Therefore, conduct this activity during periods of low traffic.

Note 1: If DTA connections are not released, SMA2 P-side channels get “hung." These “hung" channels could result in a complete loss of call processing for the RFT that is to have the line capacity increased.

Note 2: Before changing the line capacity of an RFT, enter the QUERYPM command at the IDT level to display the total number of lines connected to an SMA2 and the number of lines on the posted IDT.

Perform the following steps to create a store file used to increase the line capacity of an RFT:

1 At the CI level, access the store file editor by typing

`>Edit <filename>`

and pressing the Enter key.

where

filename
is the name you choose for the store file.

2 Enter information into the store file by typing

`>Input`

and pressing the Enter key.

3 Enter the content of the store file as follows:

1. **>MAPCI NODISP;MTC;PM;POST SMA2 sma2_no**

   and press the Enter key.

   where

   sma2_no
   is the number of the SMA2 connected to the RFT to be upsized.

2. **>BSY PM FORCE**

   and press the Enter key. This command manually busies the SMA2.

3. **>Y**

   and press the Enter key.

4. **>TABLE RDTINV;FORMAT PACK;POS rdtname**

   and press the Enter key.

   where

   rdtname
   consists of the site, frame, and unit number of the RFT datafilled in table RDTINV, for example, RFT1 0 0

5. **>CHA VARTYPE**

   and press the Enter key.

6. **>Y**

   and press the Enter key.

7. Enter the existing value datafilled in field RDTVAR, for example

   >RFT

   and press the Enter key.

8. **>newshelfslot value**

   where

   newshelfslot value
   is the new RFT shelf size to be entered in table RDTINV, field SHELFSLT.

   and press the Enter key.

9. Enter the response to the system confirmation message asking you to confirm the change to SHELFSLT as

   >Y

   and press the Enter key.

10. **>QUIT**

    and press the Enter key.

11. **>ABORT**

    and press the Enter key.

    Enter the ABORT command to abort any system responses to incorrect data entry. The ABORT command prevents situations that may arise when the DMS switch prompts the user for correct data in response to incorrect data that was entered in the store file. Entering incorrect data prevents the SMA2 from returning to service and may prolong the planned outage.

12. **>RTS PM FORCE**

    and press the Enter key. This command returns the SMA2 to service.

13. **>QUIT ALL**

4 After typing the information in step 3 as the store file, press the Enter key twice to stop editing the store file.

5 Save the store file by typing

`>File  SFDEV`

and pressing the Enter key.

where

filename
is the name of the store file input in step 1.

6 List the store file by typing

`>Listsf`

and pressing the Enter key. This command lists all the store files in the SFDEV that the user created.

7 Activate the store file to increase the line capacity of the RFT by typing

`>Read <filename>`

and pressing the Enter key.

where

filename
is the name of the store file to be activated.

This command runs the store file.

8 After the store file has run and the line capacity of the RFT was successfully increased, you may wish to delete the store file. Delete the store file by typing

`>Erasesf <filename>`

and pressing the Enter key.

where

filename
is the name of the store file to be deleted.

9 You have completed this procedure.

How to decrease the line capacity of an RFT

If the line capacity of an RFT is being decreased, the SuperNode switch determines if any LENs are present above the new (lowered) value datafilled in table RDTINV field SHELFSLT. If any LENs are present above the new value, an error message is displayed informing operating company personnel that the line capacity of the RFT cannot be decreased because there are currently LENs provisioned above the new provisioned value.

The procedure to decrease the line capacity of an RFT occurs at one MAP terminal. An outage does not occur. Verify table LNINV to make sure the required number of lines are deleted before an update to table RDTINV, field MAXLINES occurs. Before a tuple from table LNINV is deleted, the lines are cleared from the following tables:

- IBNLINES
- KSETLINE
- KSETINV
- LENLINES
- SPECCONN.

The system updates table RDTLT after table LNINV because of provisioning delays. Check if tuples that were deleted from table LNINV remain in table RDTLT.

> ***Note:*** When you decrease the line capacity of an RDT, the system allows a decrease in the value of the SHELFSLT field in table RDTINV. This change is allowed only after all LENs that are above the new SHELFSLT value are removed.

Perform the following procedure to decrease the line capacity of an RFT.

At the MAP terminal

1 Position on the affected RFT in table RDTINV by typing

`>TABLE RDTINV;FORMAT PACK;POS rdtname`

and pressing the Enter key.

where

rdtname
consists of the site, frame, and unit number of the RFT datafilled in table RDTINV, for example, RFT1 0 0

2 Change the value of subfield SHELFSLT by typing

`>CHA VARTYPE`

and pressing the Enter key.

The following confirmation message appears

`Enter Y to continue processing or N to quit.`

If you wish to continue, respond to this message by typing

`>Y`

and pressing the Enter key.

Respond to the MAP terminal response as follows:

`>RDTVAR`

Press the Enter key.

`>SHELFSLT`

Respond to the MAP terminal response by entering the new SHELFSLT value

>newshelfslot value

and pressing the Enter key.

where

>newshelfslot value
is the new RFT shelf size to be entered in table RDTINV, field SHELFSLT.

3 Confirm the new SHELFSLT entry into table RDTINV by typing

>Y

and pressing the Enter key.

4 You have completed this procedure.

Line testing functionality

This section summarizes the following:

- testing lines off the RDT
- how operating companies install line testing systems
- different types of testing equipment and how the equipment operates with the DMS SuperNode switch and the SMA system.

Operating company line testing

Operating companies use the nonintegrated and integrated line testing systems. Tests that operating company personnel can start from the subscriber premises are as follows:

- silent switchman
- station ringer
- dialable short circuit tests.

Nonintegrated

In this system, control of the line testing functions is disconnected from the local switch. This procedure allows the operating company to use one type of line testing system for different types of switches. The DMS SuperNode-SMA system supports the nonintegrated system when some configurations are used.

Integrated

In this system, the local switch controls line testing. This system allows complete testing of the lines because the local switch can test lines that use proprietary equipment. An example of integrated testing is the line test position (LTP) commands used to test subscriber lines.

Subscriber premises line testing

The operating company initiates the following types of tests from the subscriber premises.

Silent switchman

In this test, the subscriber line is separated from the RDT line card. This condition allows external test equipment to identify facility faults. When the DMS SuperNode switch receives a dial-up service code, the DMS SuperNode sends a confirmation tone. The system disconnects the subscriber line from the RDT line card. Datafill in DMS tables control the period of time the loop is disconnected from the line card.

Station ringer test

This series of tests checks the subscriber station equipment. The test contains one or more of the following subtests:

- dial pulse collection
- dual-tone multifrequency (DTMF) collection
- coin return
- Meridian business set (MBS) checks.

Dialable short circuit

This test causes the tip and ring leads of the line under test to short circuit at the same time. When the DMS switch receives a dial-up service code, the switch sends a confirmation tone. The system applies the short circuit. Datafill in DMS tables control the period of time the tip and ring of the subscriber line that the system short circuits.

Supported nonintegrated line testing systems

The DMS SuperNode-SMA2 supports several different nonintegrated testing systems. The testing systems are as follows:

- Local test desk—This system is a #3 local test cabinet or a #14 local test desk.
- Centralized Automatic Loop Reporting System/Enhanced Line Test Unit (CALRS/ELTU)—Bell Canada uses this system. This system is a Northern Telecom product, and is a nonintegrated system.
- 3703 local test cabinet—This system is a series 3703 local test cabinet.
- Mechanized loop test—This system is the mechanized loop tester (MLT) system that most of the Bell Canada operating companies use.
- Reliance Telecommunications Electronics Company (RTEC)—This system is the RTEC MITS70 system from the Reliance Telecommunications Electronics Company. The MITS70 system contains the T-9/15 or T-9/SX central office unit, the T-916 remote test unit (RTU) selector, and the T-9/X RTU.
- Teradyne—This system is the 4-Tel system from Teradyne. The 4-Tel system contains the computer control unit (CCU) and the RMU230 test head.

Shared metallic bypass procedure

Operating companies that configure RDTs to share a common metallic bypass pair for line tests, must include an inhibit lead. This inhibit lead prevents access to the shared bypass pair by both RDTs at the same time.

To install a shared metallic bypass in a DMS-100 central office environment, perform the following procedure:

1 Define pairs of scan points (SC) and scan distribution (SD) points for each RDT that share the same bypass pair.

2 Define SC and SD in tables SDGRP and SCGRP, as shown in the following examples:

```
TABLE: SDGRP:
0    MTM    1      20    2X57AA

TABLE: SCGRP:0    MTM    3       8    0X10AA
```

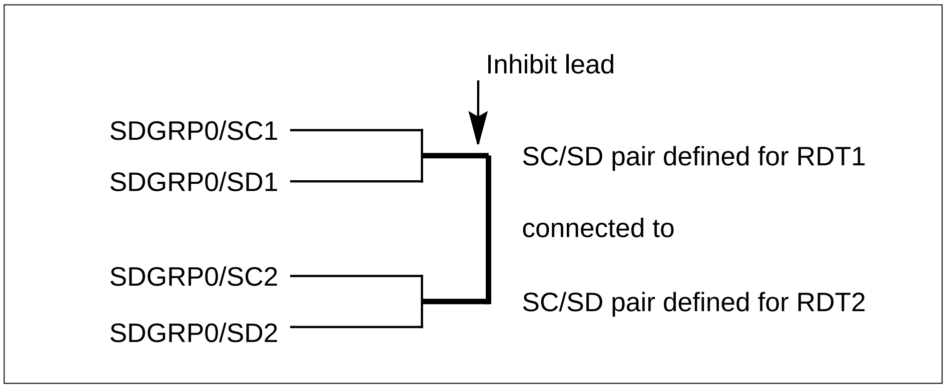
> ***Note:*** Refer to *XPM Translations Reference Manual* to datafill tables SCGRP, SDGRP, and RDTINV to support a shared metallic bypass inhibit lead configuration.

3 To reserve an SC and an SD point for an inhibit lead for an RDT, add the group and point number of the SC or SD point in table RDTINV.

An example of the table datafill follows:

```
TABLE: RDTINV:
RDT1 101 0 101 SMA2 1 101 $ $ $ GENTMC 2 671 N Y (TBP BOTH
4 TAP1 Y 0 1 0 1) $ (1 6) (2 7) $ N STDLN S $ (NETWORK_ID
1)(NETWORKELEMENT_ID 100) $
```

4 Connect the defined SC and SD points together to function as an inhibit lead.



Transmission tests of ICB lines

Commands at the LTPMAN and LTPLTA levels of the MAP allow you to perform transmission tests on ICB lines. Transmission tests detect faults in the line that terminates on D4 channel banks.

The following table lists the commands at the LTPMAN level for transmission tests of ICB lines.

Table 6-2 Transmission test commands for ICB lines at LTPMAN level

Command	Related parameters	Description
LOSS		Measure the insertion loss of a test tone sent from the subscriber end of the loop to the line circuit.
NOISE		Measure the C-message weighted circuit loss on a subscriber loop.
TONEGEN	**[<Metallic Option> {METALLIC}]** **[<Frequency (Default 1004 Hz)>{4 to 3996}]** **[<Level (Default 0 dB) {-600 to 30}]**	Transmit a tone to a subscriber loop.
JACK		Connect a jack to the line in the control position.
RLSCONN		Release the test equipment connected to the line.

The following table lists the commands at the LTPLTA level for transmission tests of ICB lines.

Table 6-3 Transmission test commands for ICB lines at LTPLTA level

Command	Related parameters	Description
MONLTA		Connect a headset to the line for listening purposes.
TALKLTA	**[<BATTERY> {B}]**	Connect a talk circuit on a subscriber line.
LTA	**[<LTA Con Type> {IN, OUT, RLS}]**	Release the PCM connections on the subscriber line.
RING	**[<Line Type:Individual or Party Line> {R1, R2, R3, R4, R5, T1, T2, T3, T4, T5, 1FR}]**	Place the ringing voltage on the subscriber loop.
DGTTST	**[<RCVRDGT Member> {0 to 1023}]**	Test the digitone page on the subscriber station.

Line testing configurations for MVI RDTs

The following sections describe the configurations used for the different types of line testing. Each type of configuration has a figure. Each figure has text that describes how to install the test. Each figure shows the sequence of events that occur when the test operates.

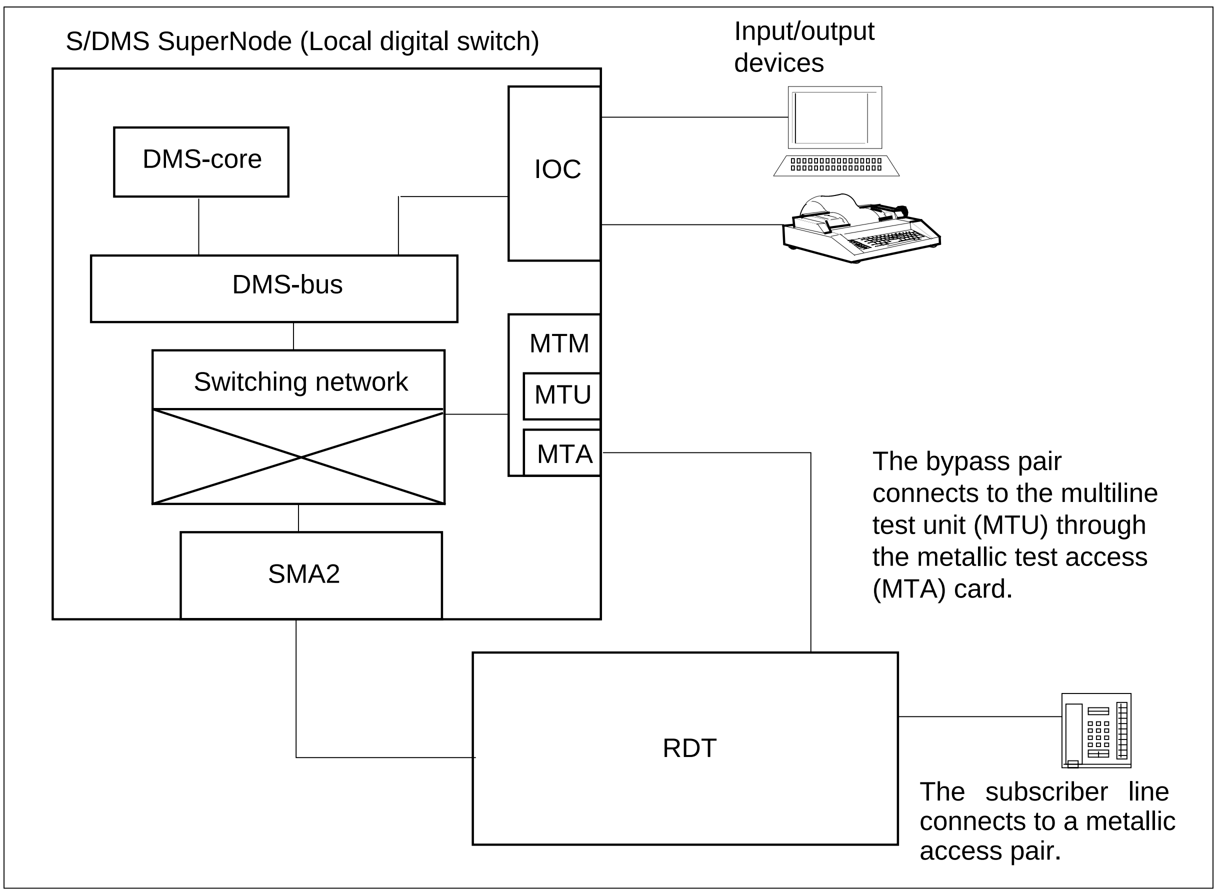
Testing the subscriber line (DIAGNOSE, LNTST)

Many tests of subscriber lines make different measurements on the subscriber line. The line card is by-passed. The commands that run these tests are as follows:

- LNTST
- LIT, VDC, VAC, and CAP commands that perform a subset of the LNTST command, DIAGNOSE, and the station ringer test ground check.

To perform these tests in the SMA2 configuration, use a metallic bypass. The following figure describes the metallic bypass configuration:

Figure 6-1 Testing the subscriber line with a metallic bypass

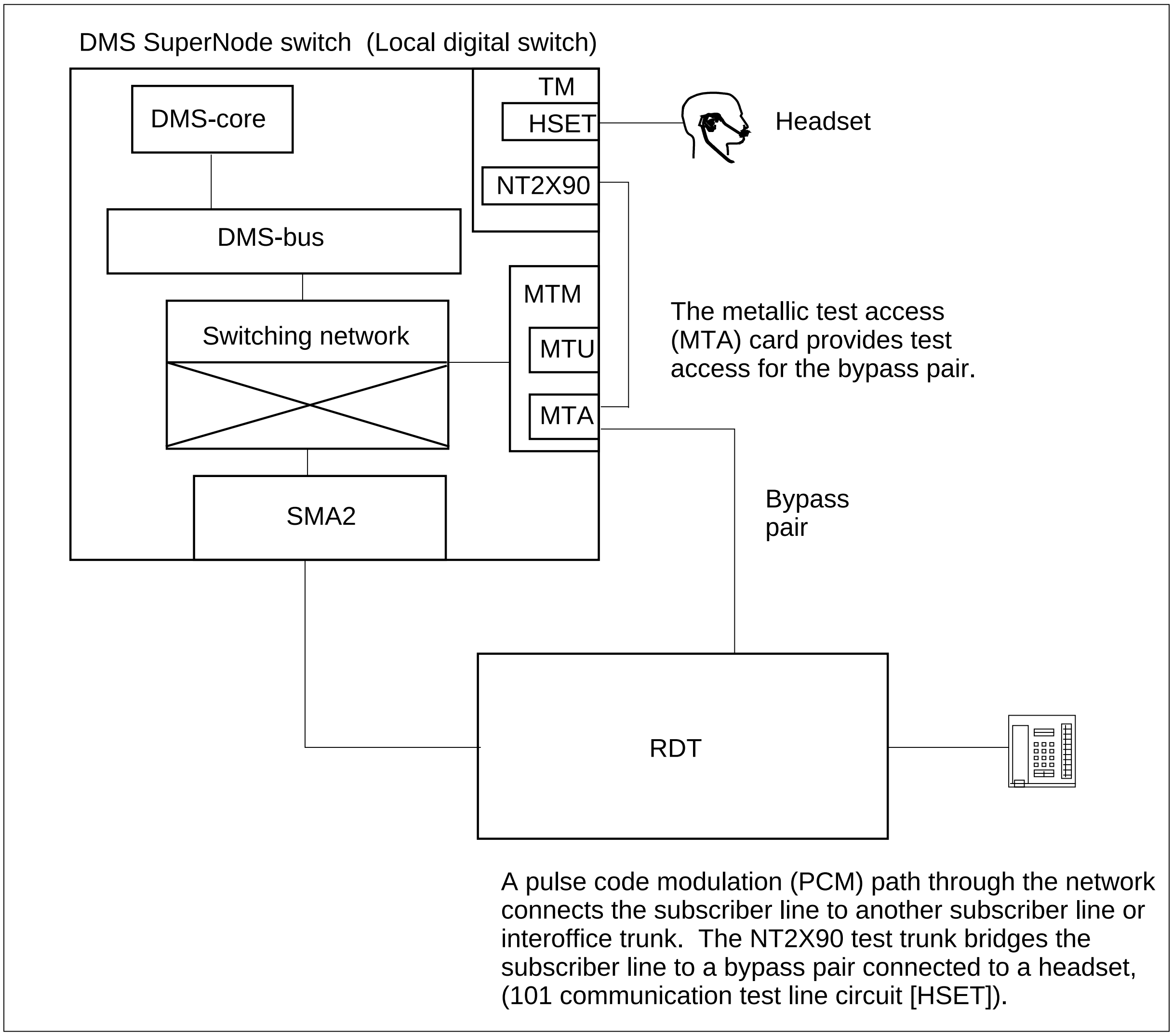


Monitoring the subscriber line (MONLTA)

The MONLTA command connects a headset circuit to a subscriber line to allow the operating company personnel to listen to a line. To perform these tests in the SMA2 configuration, use a metallic bypass. The following figure describes the metallic bypass configuration:

Note: This configuration must have monitor mode abilities for metallic connection.

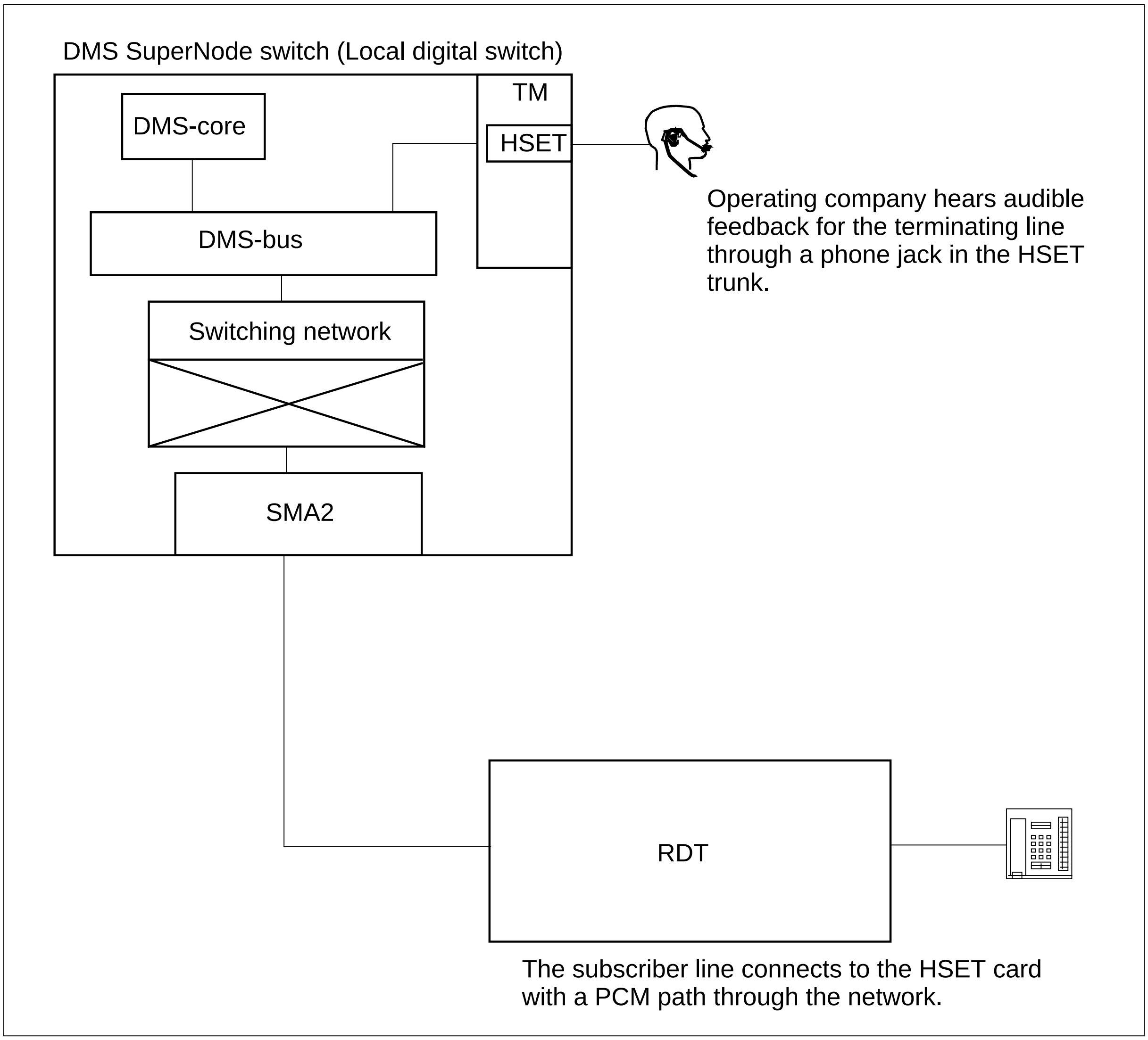
Figure 6-2 MONLTA



Testing line signaling (TALKLTA, COIN, RING, DGTTST)

These tests use a headset to test for specified signaling conditions. The operating company uses the actual terminal equipment. The following figure describes the configuration used:

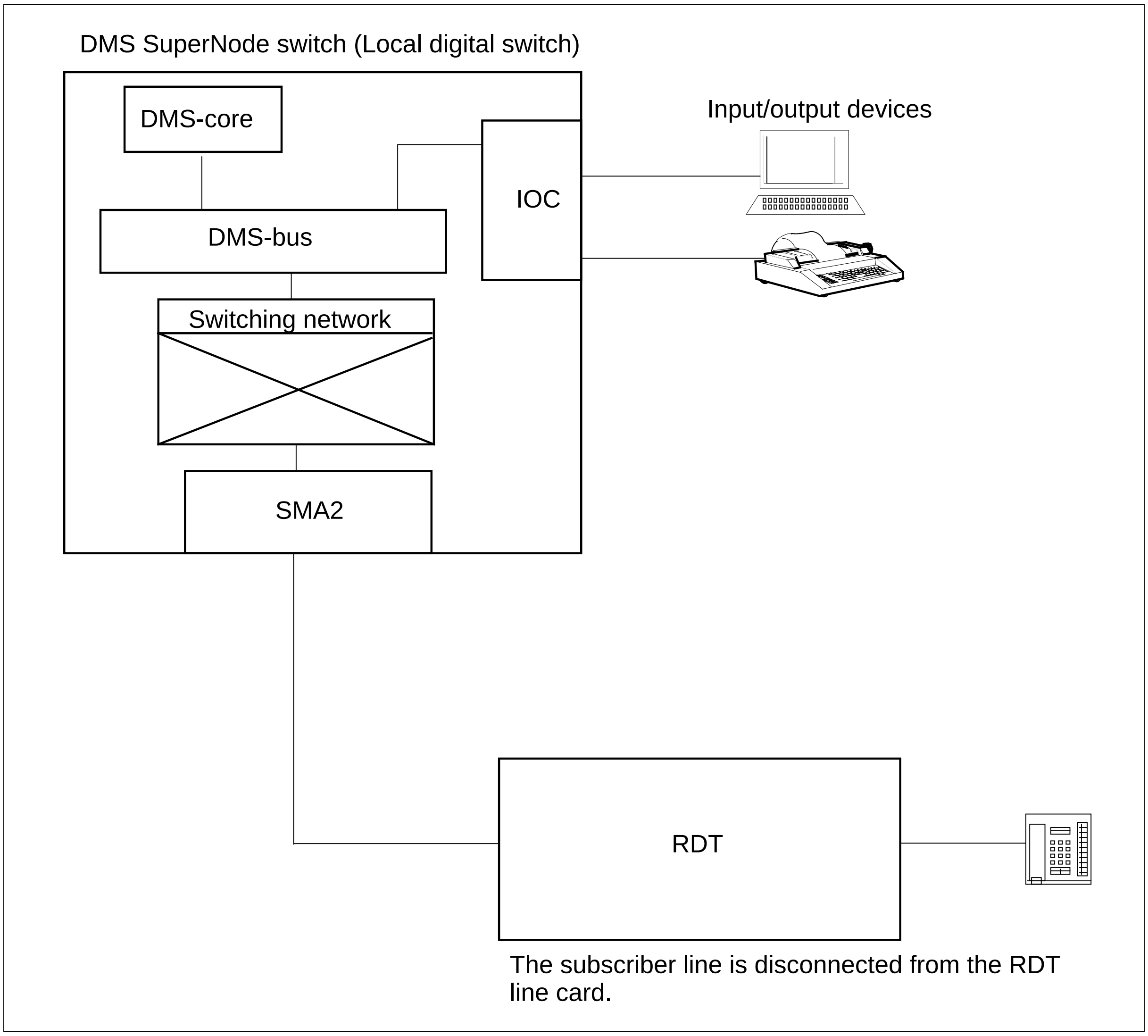
Figure 6-3 To test line signaling



Testing the station ringer

The station ringer test compares the digits that the central office (CO) receives with digits that transmit from the station. This procedure verifies subscriber station equipment. Tests include dial pulse collection, and dual-tone multifrequency (DTMF) collection. The following figure describes the configuration:

Figure 6-4 To test the station ringer

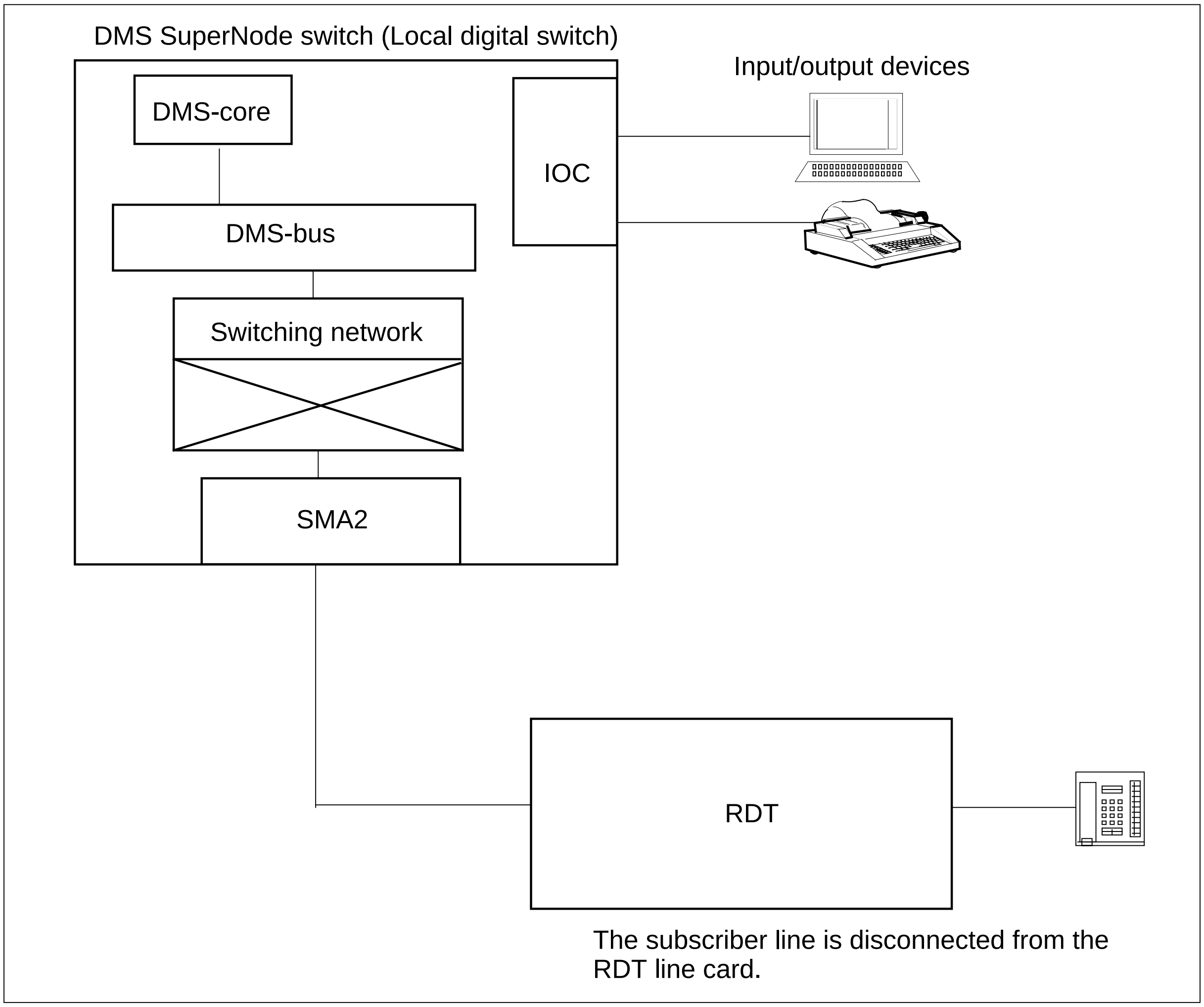


Using the silent switchman test

The silent switchman test allows operating company personnel to check the subscriber loop for facility faults. This procedure does not require the help of maintenance personnel at the central office. The operating company personnel isolates the subscriber line from the RDT so that external test equipment can identify facility faults.

A dialed service code or a seven-digit directory number (DN) accesses the test circuit. When the DMS SuperNode switch receives a dial-up service code, the DMS SuperNode sends a confirmation tone. The system disconnects the subscriber line for an indicated period of time. This procedure allows operating company personnel to check facility faults. The following figure describes the configuration:

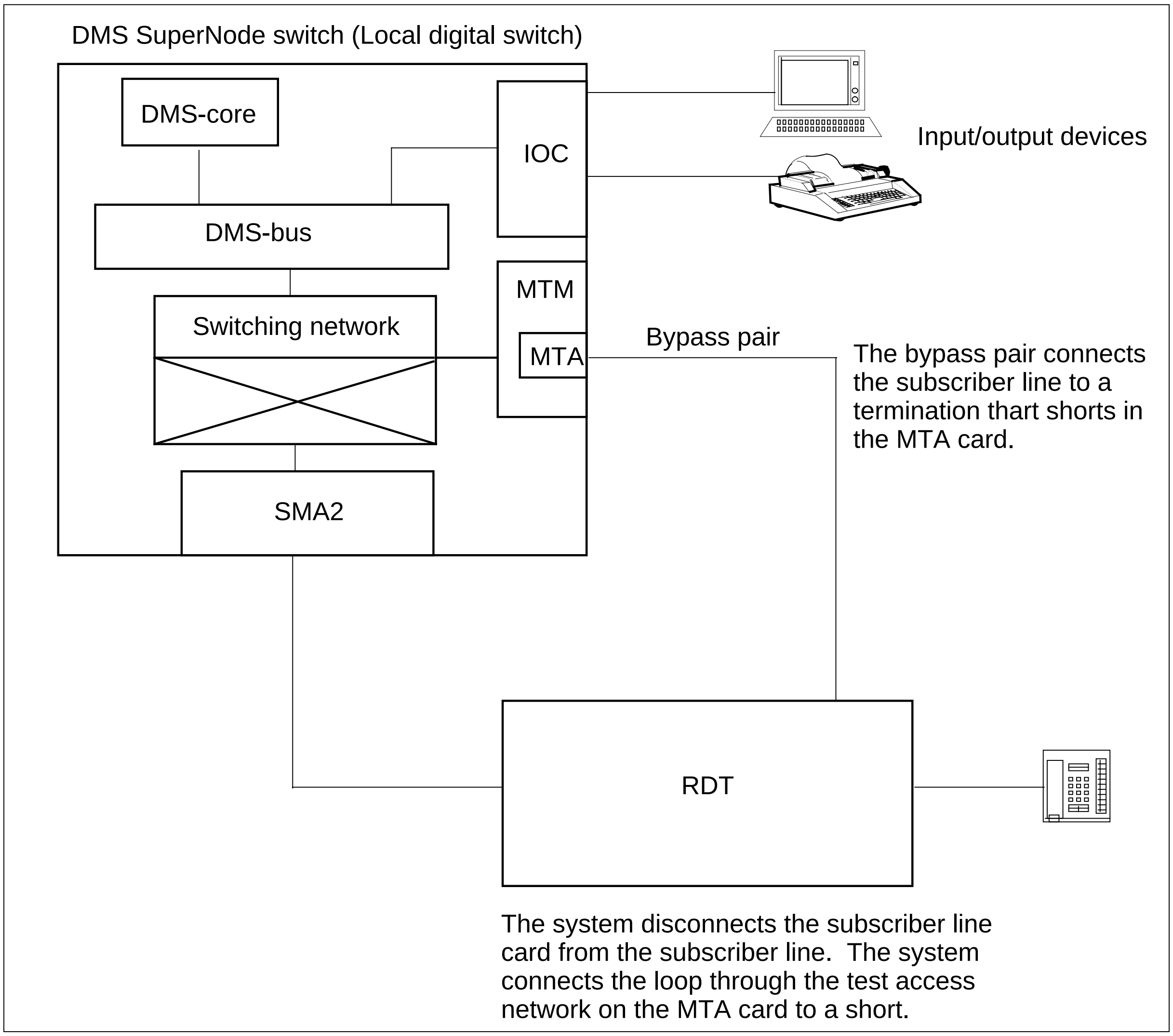
Figure 6-5 Silent switchman configuration



Using the dialable short circuit test

In this test, the DMS SuperNode short circuits the tip and ring leads of the line under test at the same time. At the subscriber location, the operating company personnel sends a dial-up service code from the subscriber location. The DMS SuperNode switch responds with a confirmation tone and applies the short circuit. To perform these tests in the SMA2 configuration, use a metallic bypass. The following figure describes the metallic bypass configuration:

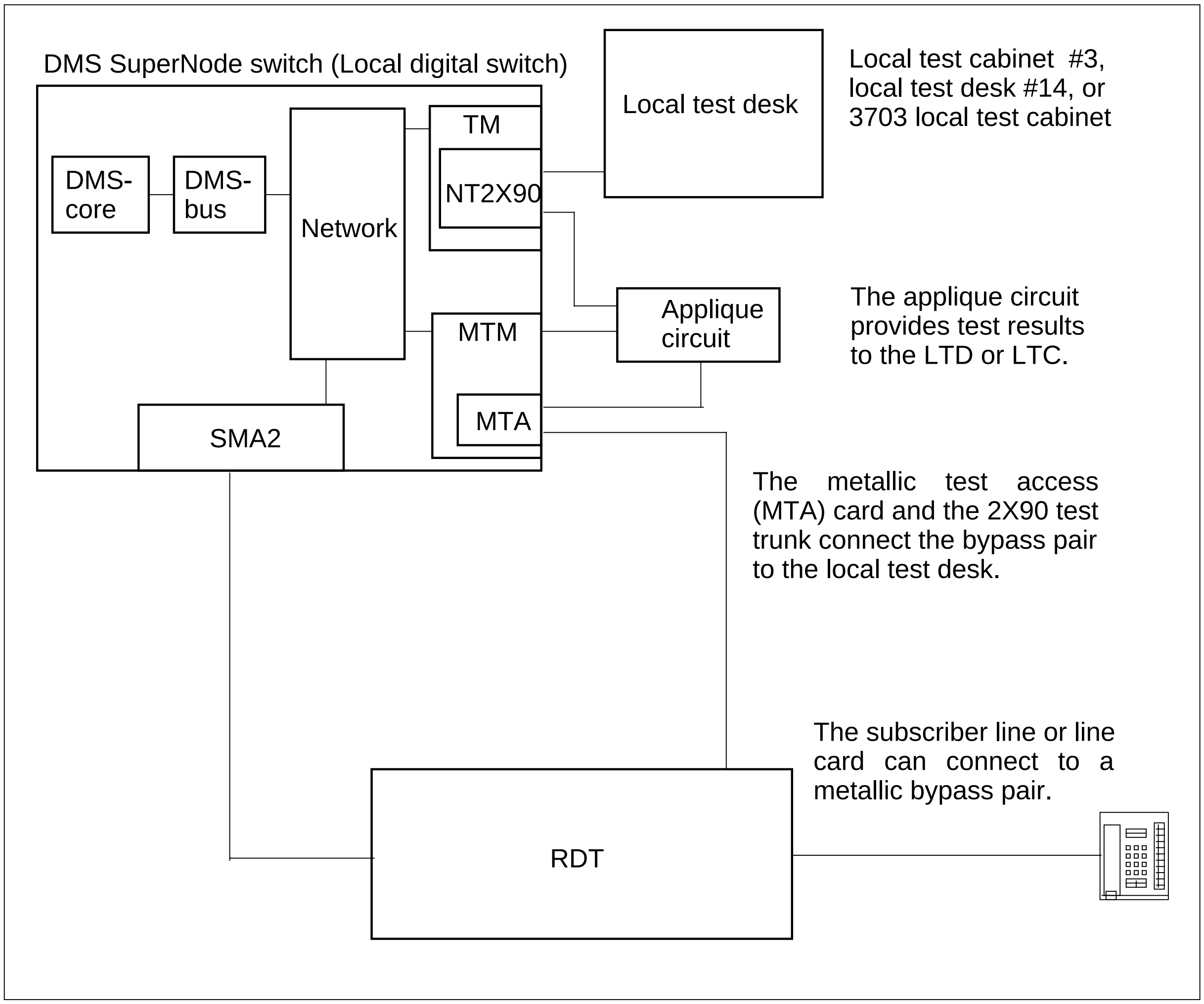
Figure 6-6 Dialable short circuit



Using the local test desk

Examples of local test desks (LTD) are the local test cabinet (LTC) #3, LTD #14, and 3703 LTC. To perform these tests in the SMA2 configuration, use a metallic bypass. The following figure describes the configuration:

Figure 6-7 Local test desk

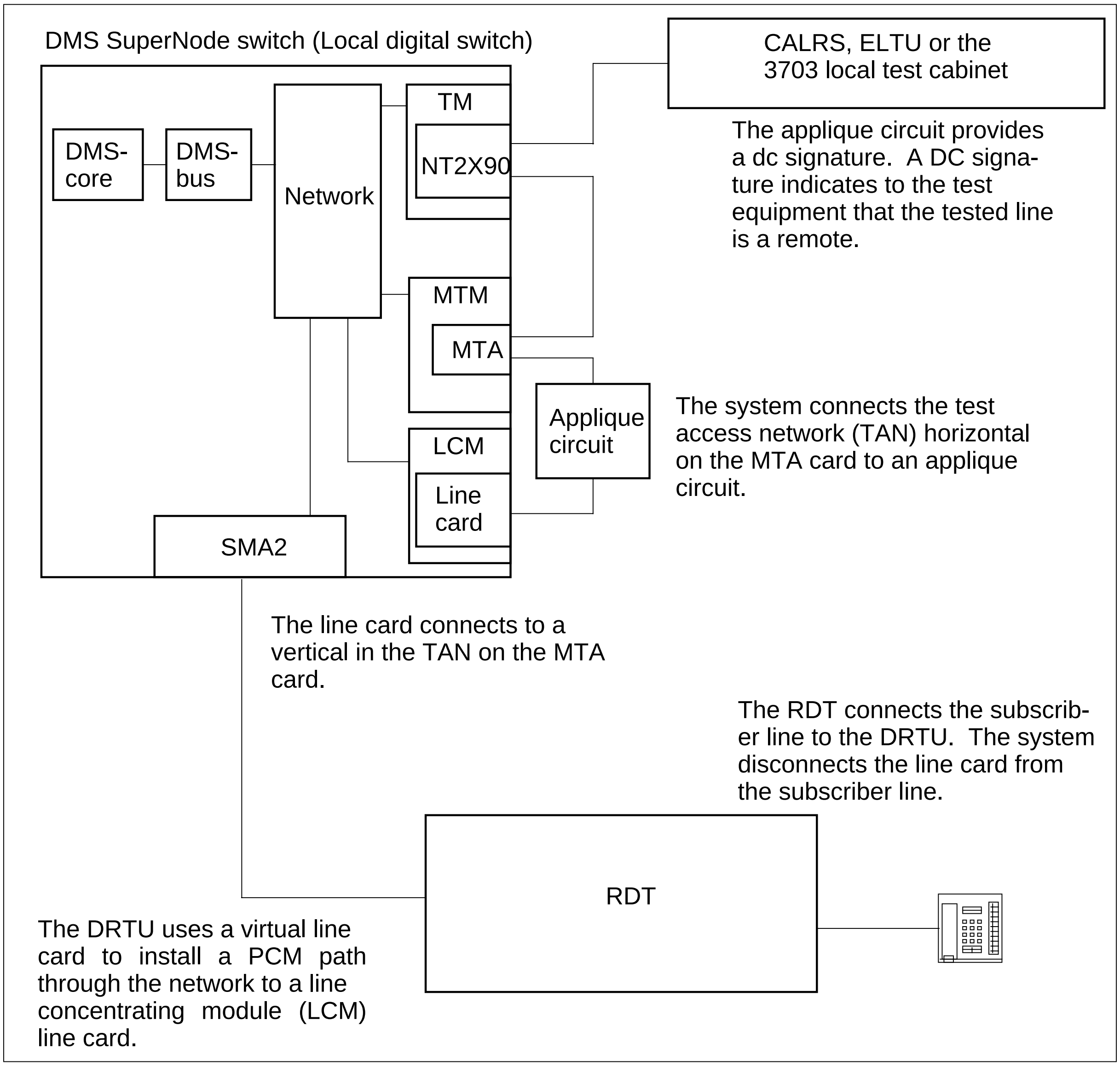


Using the CALRS or ELTU external test systems

External test systems include the Centralized Automated Loop Reporting System (CALRS) and the external line testing unit (ELTU). To perform these tests in the SMA2 configuration, use the digital remote test unit (DRTU) and a metallic bypass. The following figure describes the configuration:

Note: This configuration also applies for the 3703 local test cabinet.

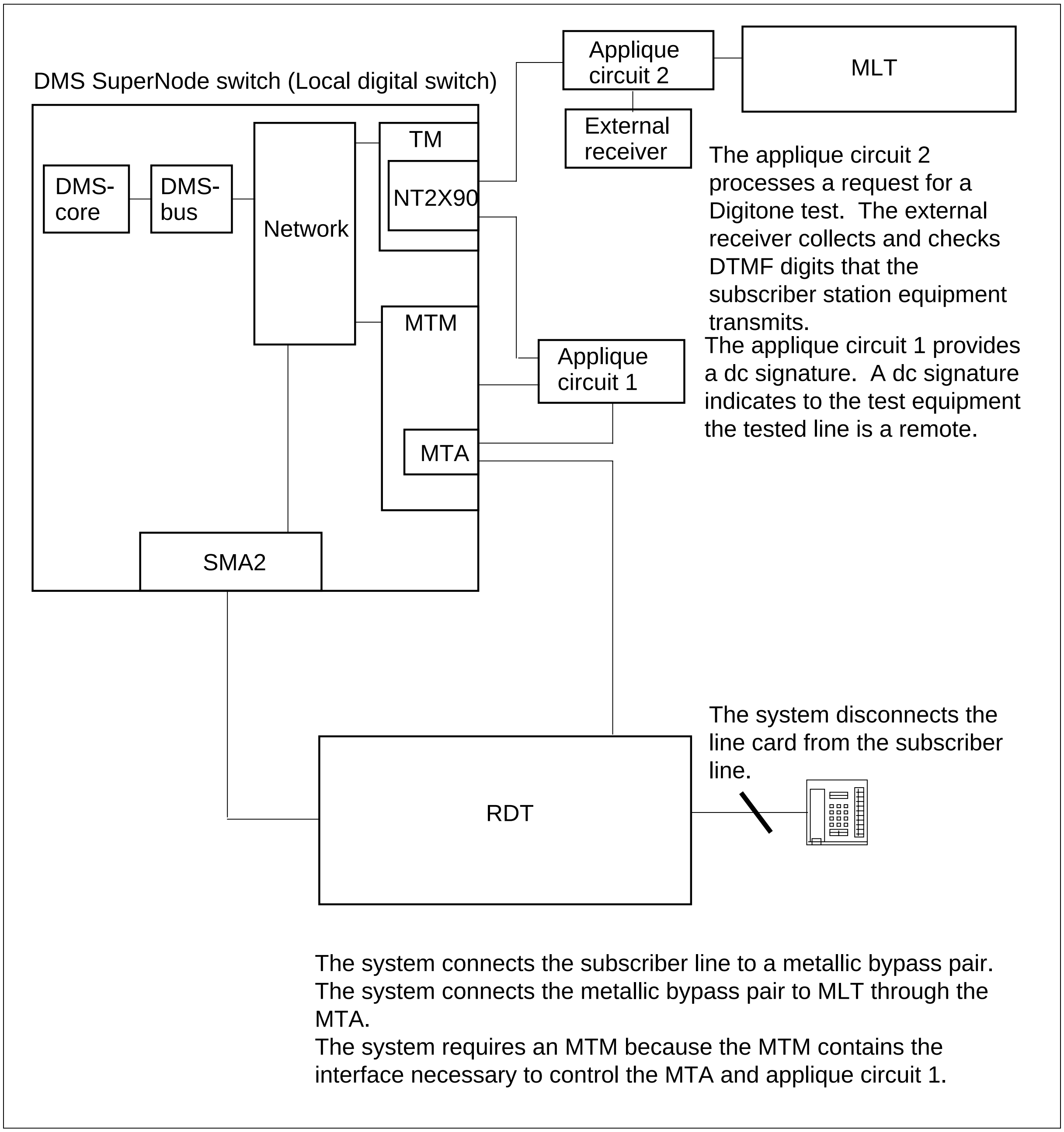
Figure 6-8 CALRS or ELTU



Using the mechanized loop tester (without the RMU)

In the SMA2 configuration, these tests can be performed with or without the remote measurement unit (RMU). The following figure describes the configuration without the RMU:

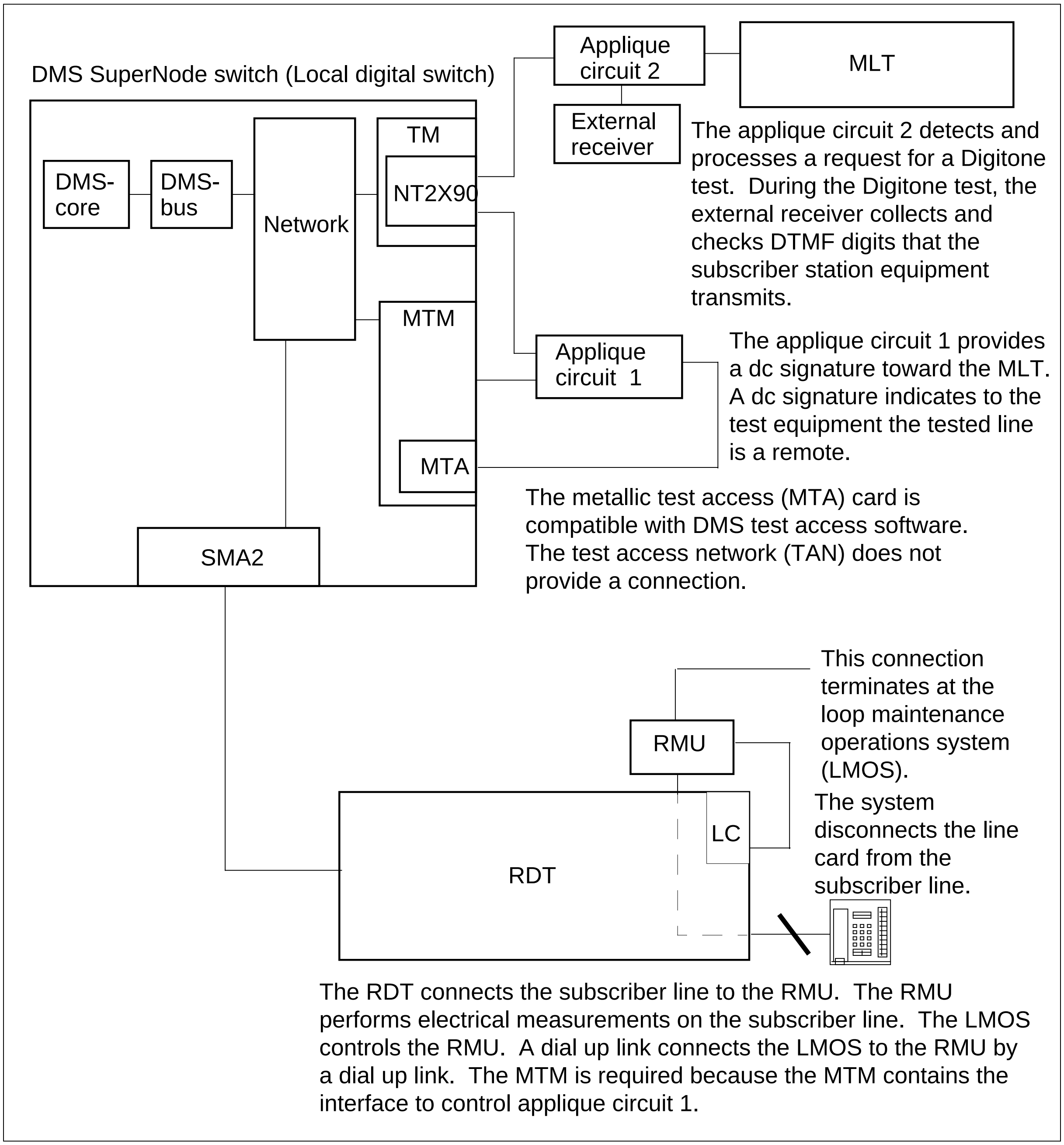
Figure 6-9 Installing the MLT (without the RMU)



Using the mechanized loop tester (with the RMU)

In the SMA2 configuration, tests that use the MLT can be performed with or not with the RMU. The following figure describes the configuration with the RMU:

Figure 6-10 Setting up MLT (with RMU)



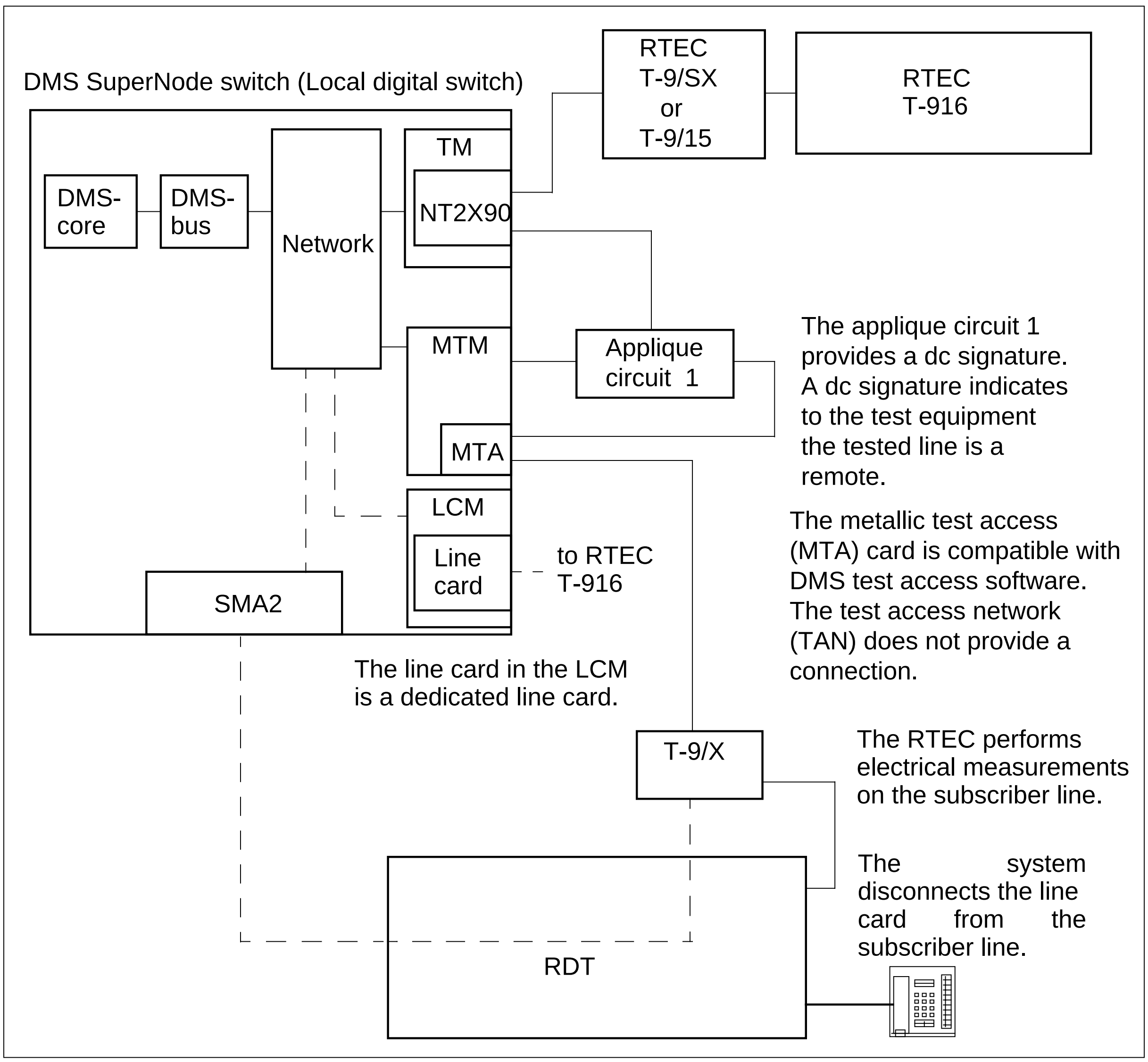
Line testing with RTEC equipment

Reliance Telecommunication Electronics, Inc. provides an MITS system that contains the following:

- T-9/15 or T-9/SX central office unit
- T-916 RTU selector
- T-9/X remote test unit.

The following figure describes the configuration. This configuration is complicated, and the next section describes how the configuration works in more detail.

Figure 6-11 Line testing with RTEC equipment



How the RTEC configuration works

The RDT connects the subscriber line to the RTEC T-09/X. The Version 6 Y-9/SX Remote Test System of the T-9/15 Automatic Line Test System controls the T-9/X. The Version 6 Y-9/SX Remote Test System of the T-9/15 Automatic Line Test System is in the central office. The T-9/X uses a dial-up control path to communicate with the host controller of the T-9/X. A dial-up control occurs at the start of each test and terminates when the test completes. This dial-up path contains the following links:

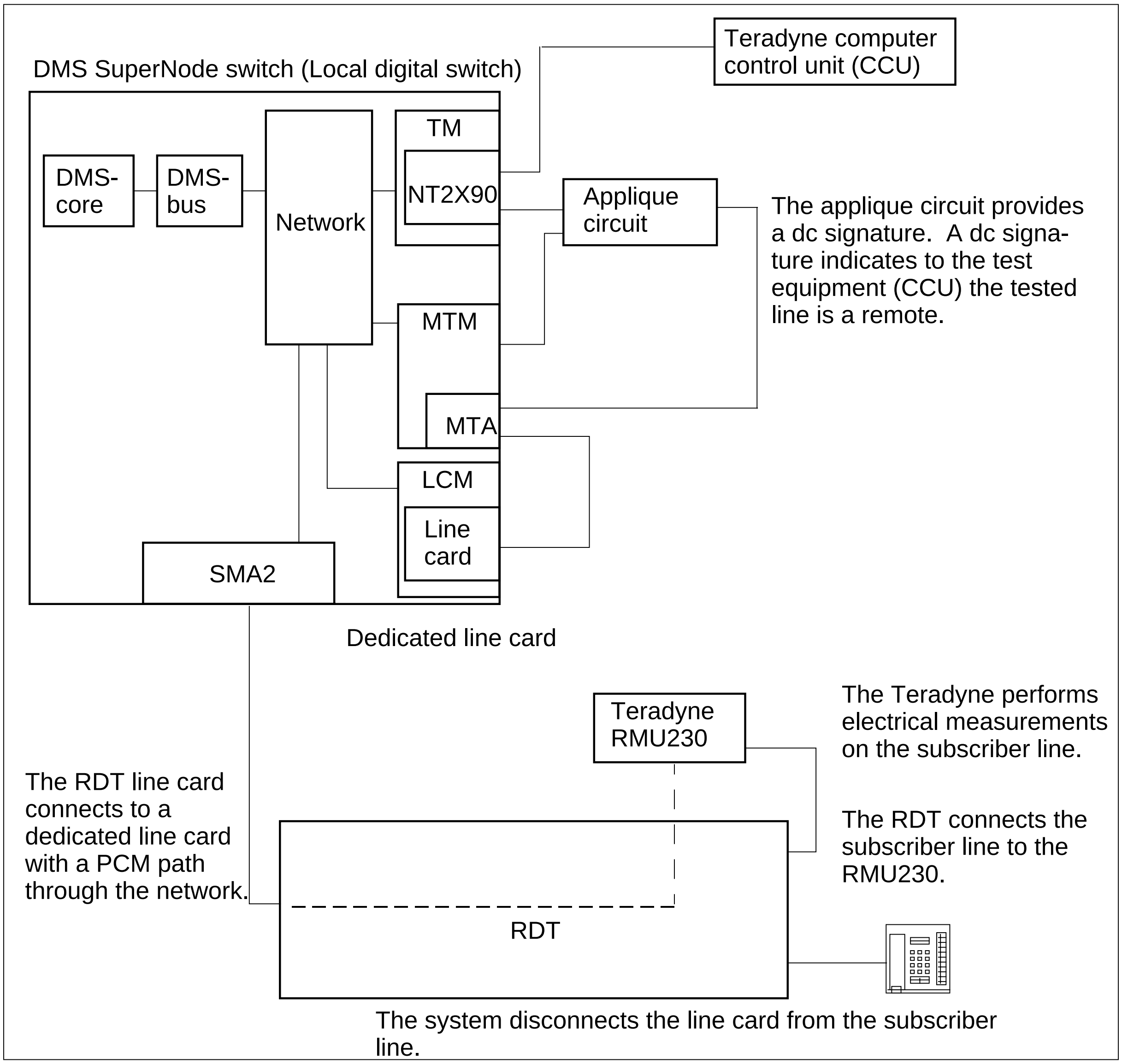
- from the T-/X to a dedicated RDT line card
- from the dedicated line card to a dedicated line card in an LCM. The T-9/X can sense when this test access occurs. When this test access occurs, the T-9/X sends a call to a dedicated line card in a host LCM.
- from the LCM line card to the T-916 RTU selector. The T-916 answers the call for the T-9/X and completes the connection to the T-9/15 or T-9/SX.

The T-9/SX and T-9/15 perform interactive tests that require a direct metallic path between the T-9/SX or T-9/15 and the subscriber line. Examples of interactive tests include talk, ring, or monitor. The figure that has the title Line testing with RTEC equipment before, describes the direct metallic path.

Preparing line tests with Teradyne

The following figure describes the configuration with the Teradyne testing system:

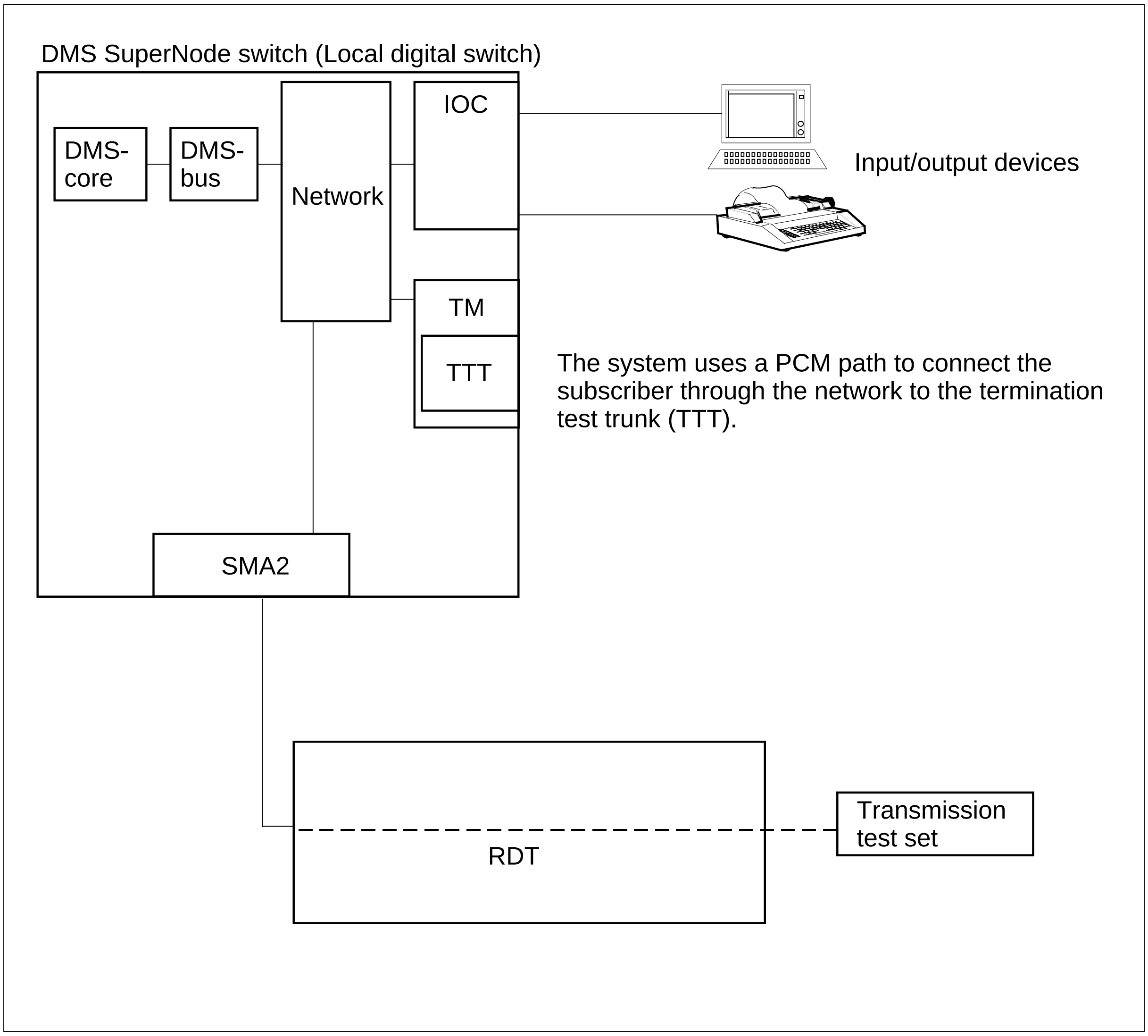
Figure 6-12 Line testing with Teradyne



Using a transmission test set

A transmission test set sends voice frequency signals through the network. At the MAP terminal, the user enters LOSS, NOISE, and TONEGEN commands to make measurements through the network. The following figure describes the test configuration:

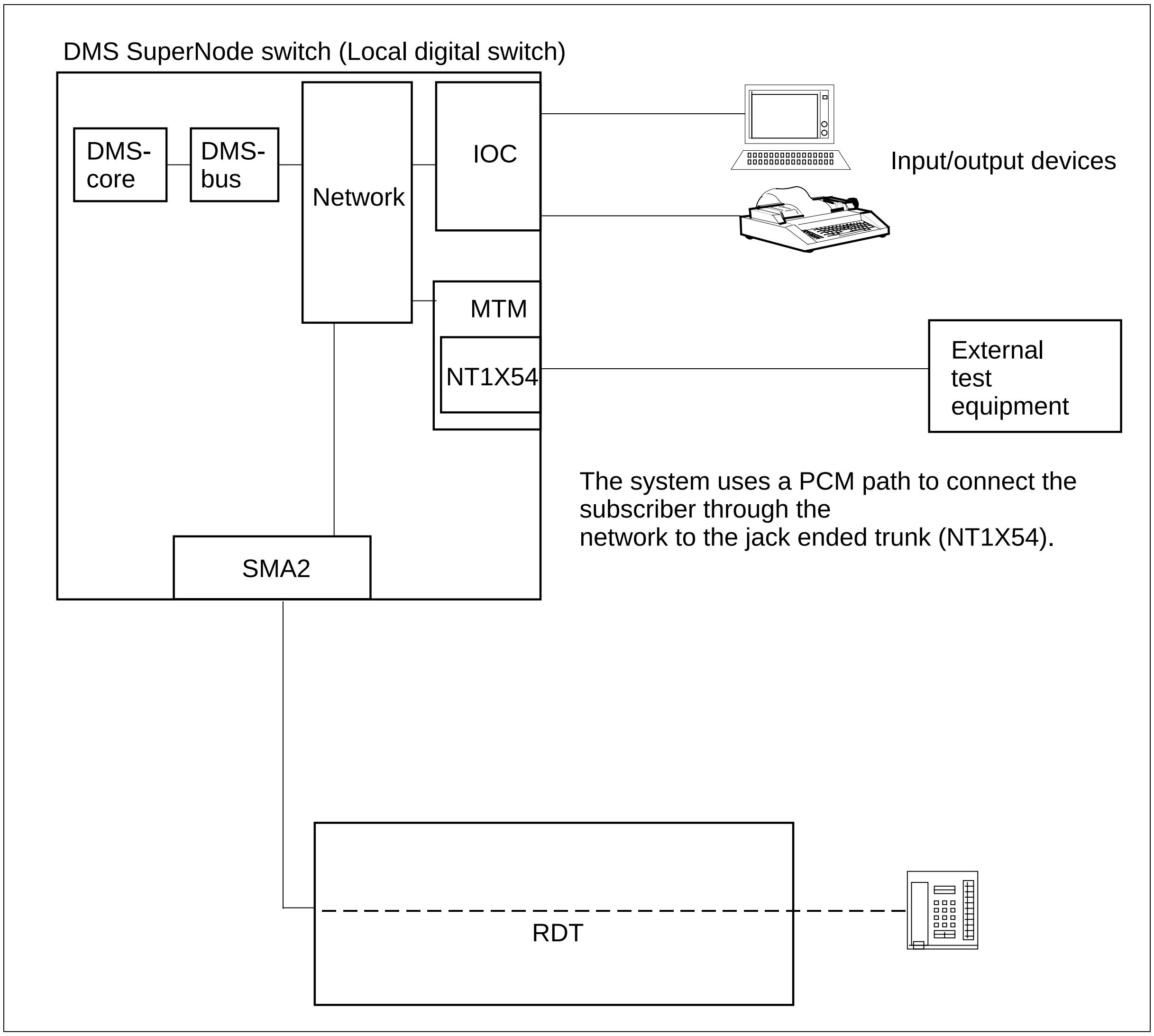
Figure 6-13 Line testing with a transmission test set



Using a jack to connect external equipment

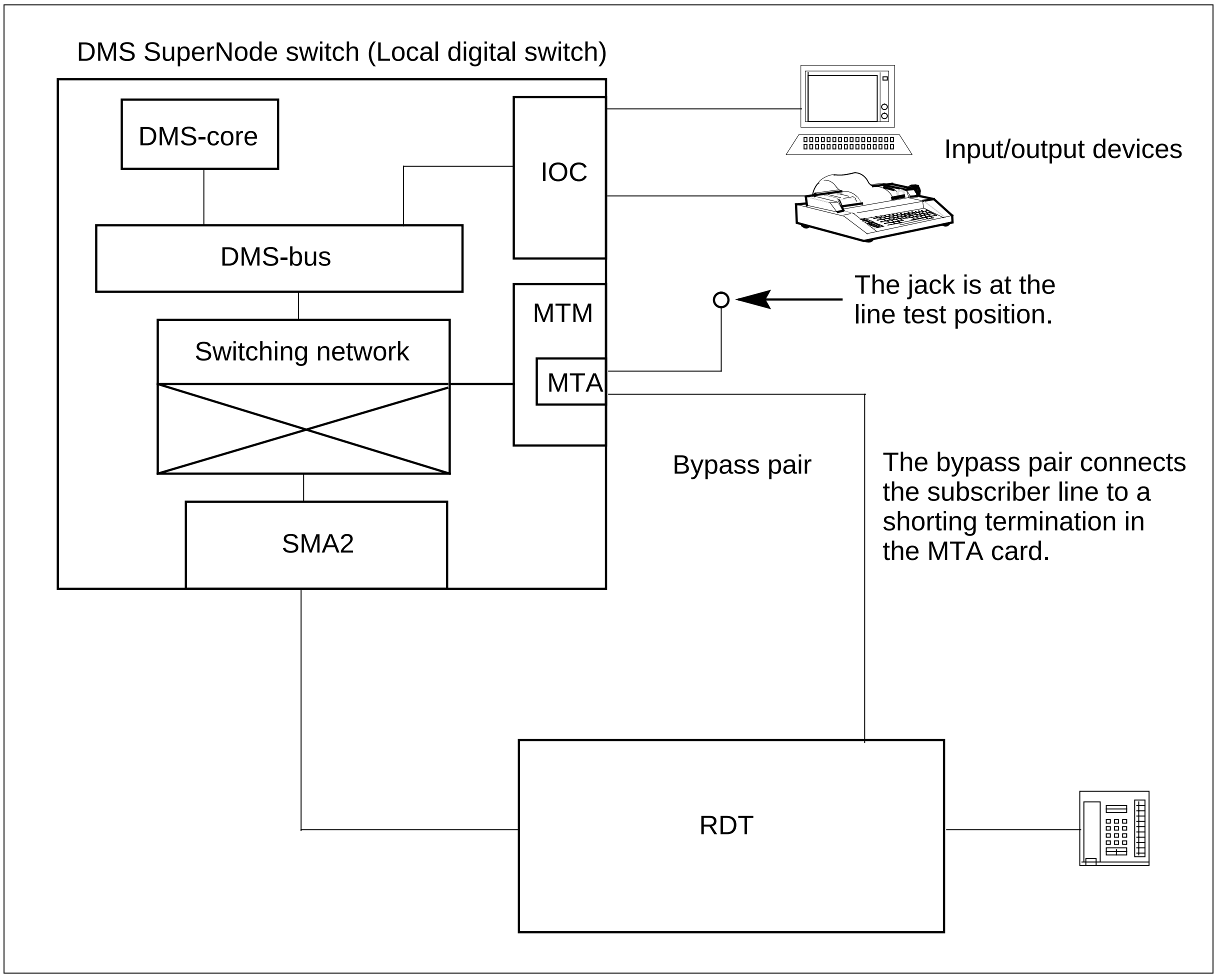
The following figure describes a jack that connects external test equipment for line testing:

Figure 6-14 Line testing with external test equipment



The following figure describes the configuration when operating company personnel enter the command string JACK METALLIC at the MAP terminal:

Figure 6-15 JACK METALLIC configuration



Lines testing configurations for S/DMS AccessNode

The following sections discuss line maintenance functions the DMS SuperNode switch provides when connected to an S/DMS AccessNode.

Digital test access

Digital test access (DTA) is a digital monitoring method that accesses subscriber loop information. The system copies the digital data streams to and from a subscriber line to establish the DTA. The system allows DTA on integrated services digital network (ISDN) lines. The host SMA2 of the ISDN lines must have the CPM improved matrix circuit card NTMX75BA.

The system provides DTA for upstream and downstream directions for the following ISDN channel types:

- time division multiplex (TDM) D channels
- Bd channels the system routes to a DMS SuperNode switch packet handler

- provisioned B (PB) channels
- circuit switched B (CSB) channels.

The ISDN basic rate interface (BRI) service contains two 64 kbit/s B-channels and one 16 kbit/s D-channel. The DTA allows operating company personnel to monitor these channels. The system copies the data stream to and from the ISDN telephone and sends the data to the protocol analyzer. The protocol analyzer removes data from the B1 and B2 channels of an ISDN line. The B1 channel receives the upstream data. The B2 channel receives the downstream data from the monitored line. The DTA is not invasive because the system sends the data of the monitored channel to the normal destination of the data, and the protocol analyzer. The system copies B, D, and Bd channel data in the time-switch in the SMA2.

Nailed-up connections establish connection between the monitoring equipment and the monitored channel. The system maintains the connections until the operating company personnel removes the nailed-up connections. The monitoring equipment is not limited to the SMA2 that hosts the monitored ISDN line. The monitoring equipment can be situated off DMS-100 ISDN line card (ISLC). Monitored equipment is reserved for DTA use. The EQUIP and CONNECT commands connect the monitored equipment to the monitored channel. The EQUIP command permits the operating company personnel to define an ISDN loop. The CONNECT command establishes the upstream and downstream monitor connection for the ISDN loop posted to the DTA monitor equipment.

The protocol analyzer required for DTA must connect to an ISDN network termination 1 (NT1) S/T interface. The protocol analyzer must resolve separate D-channel members from the TDM group. The protocols are X.25, Q.921, and Q.931.

When an ISLC is used for DTA, the ISLC must be entered in table LNINV. The status field of the ISLC must be assigned as hardware assigned software unassigned (HASU). The B-channels of the ISLC can be nailed-up for PB channel service. The loop state must be installation busy.

The steps required for DTA use are as follows:

1. Identify the loop to monitor.
2. Identify the monitor equipment.
3. Make sure the monitor equipment is provisioned correctly.
4. Connect the protocol analyzer to the selected access point.
5. Enter the LTPDATA or PRADCH level of the MAP display.
6. Post the loop to monitor.

7. Reserve the monitoring equipment.
8. Connect the monitoring equipment.
9. Query all DTAs (optional).
10. Check connection accuracy (optional).
11. Release the DTA connection.
12. Release the monitoring equipment.

Interactions The removal of a DTA connection while an SMA2 is out-of-service (OOS) can increase the time required to return the SMA2 to service. This condition occurs because the system downloads DTA connection information as static data. To remove a DTA connection while the SMA2 is OOS requires all static data to download when the SMA2 RTS. This procedure causes an increased recovery time for the SMA2.

Limits The following is a summary of limits of the DTA process:

- Office parameter MAX_DTA_ON_SWITCH in table OFCENG limits the number of DTA connections active in an office.
- The system accepts a maximum of six DTA connections at one time in an SMA2.
- The DTA allocates channels on the links between the loop monitoring point and the monitoring equipment. The DTA makes connections across peripheral and network modules between the allocated channels. The allocated channels are not available for call processing when the DTA connection is active.
- Junctor Network (JNET) to Enhanced Network (ENET) retrofits require the deletion of all DTA special connections.
- Central side (C-side) ports used for DTA applications can be deleted when the removal of DTA special connections occurs.
- The system deletes all DTA connections automatically when the DTA connections perform a process that occurs during the night.
- The DTA protocol analyzer cannot interface with a SMA2 DS-1 port.

Integrated remote test unit

The IRTU is a type of remote metallic test equipment in the S/DMS AccessNode. The IRTU provides line circuit measurement abilities for lines that connect to an S/DMS AccessNode.

The IRTU replaces the multiline test unit (MTU) with one of the following:

- test bypass pair (TBP), in the DMS SuperNode switch
- external remote test unit (ERTU) at the S/DMS AccessNode.

This condition occurs because the IRTU can emulate the MTU and DRTU. The DRTU is one type of ERTU. When the system removes the TBP and MTU, the IRTU removes the following:

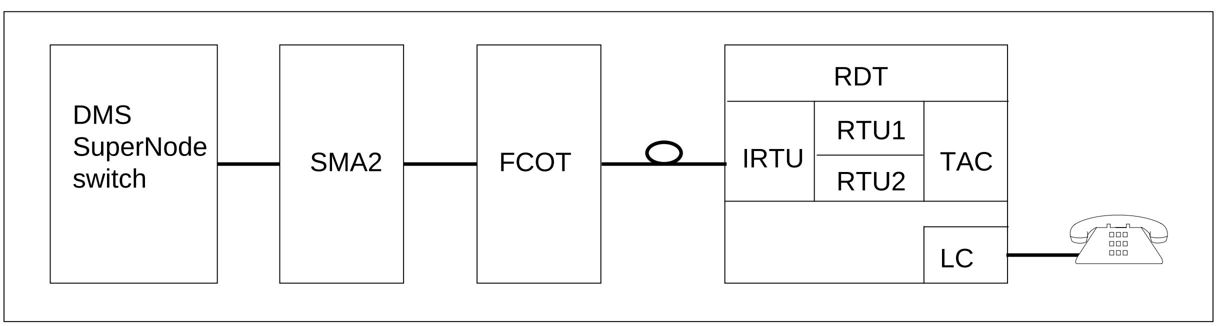
- distance limits and electrical differences that the TBP created
- the need for a metallic path and the associated hardware of the data.

The IRTU has two analog test heads, remote test unit 1 (RTU 1) and RTU 2. Before tests can occur, the line to be tested must be accessed through the metallic test access unit (MTAU) and the metallic test access path termination (MTAPT). The RTU relates to the test access point (TAP). The RTU 1 connects to TAP 1. The RTU 2 connects to TAP 2.

An ERTU device requires control and talk or monitor paths that line cards provide. The control path sends commands to the test head. The talk or monitor path monitors or talks to the tested line. For the IRTU, the IRTU line cards (ILC) on the test access card in the S/DMS AccessNode provide this functionality. The MAP display MONLTA and TALKLTA connections require the ILC talk path.

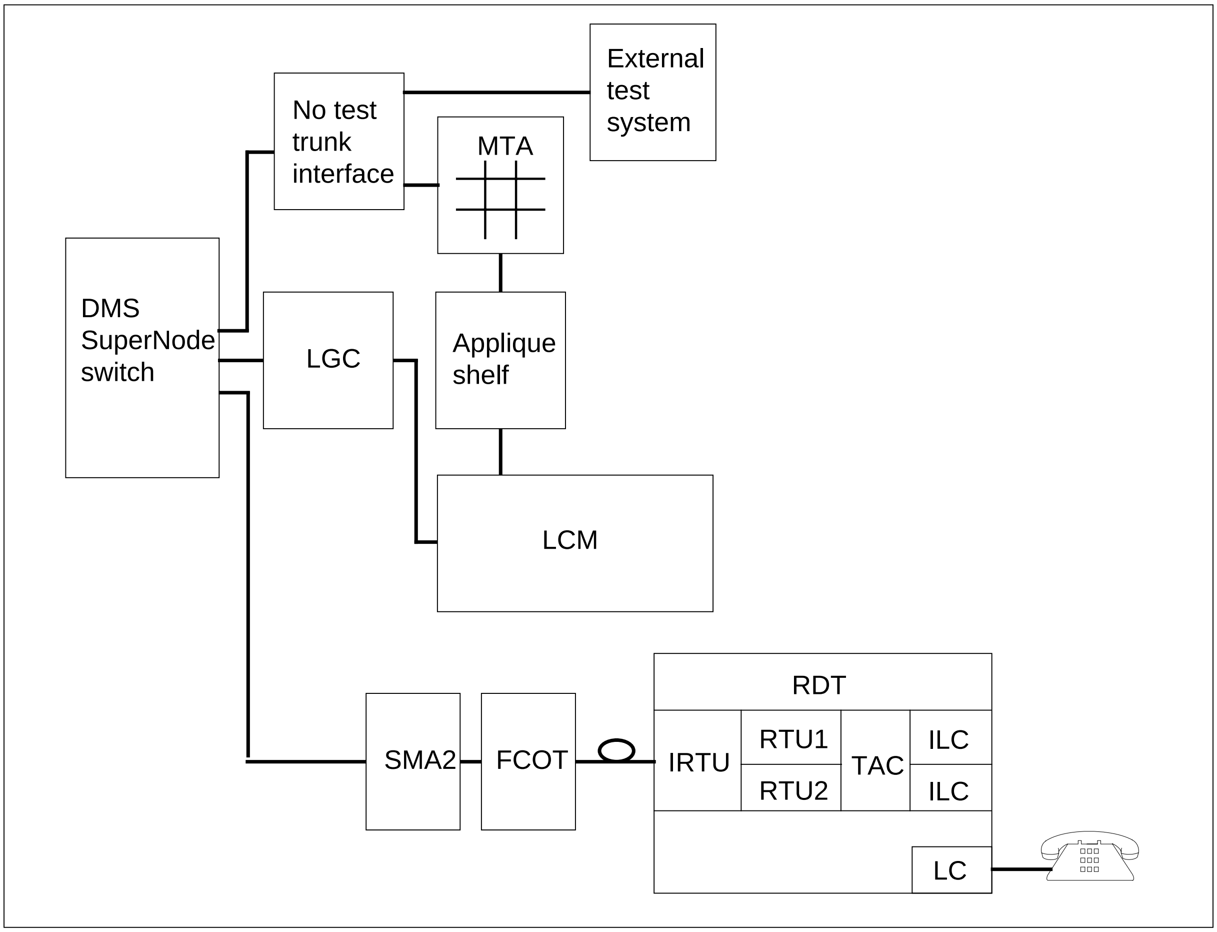
The IRTU connects to internal and external testing systems. An example of an internal test system is the MAP terminal. The IRTU provides MTU emulation to perform line maintenance tests started from the MAP terminal. The following is an example of an internal test system:

Figure 6-16 Internal IRTU interface



Examples of external test systems include a central automatic loop reporting system (CALRS) and a local test cabinet. The IRTU provides DRTU emulation for external test system line maintenance activities. Access to the IRTU occurs through the control and talk or monitor paths through ILCs. The control path is a connection that passes through the MTA matrix. This matrix includes a horizontal and vertical connection. The horizontal connection is the interface of the external system to the S/DMS SuperNode. The vertical connection is the exact control path to the tested line. An example of an external test system appears in the following figure:

Figure 6-17 External IRTU interface



The IRTU line card is a virtual design that does not require a circuit card. A line card cannot be in the slot where the ILCs are defined. Operating company personnel can use line cards normally reserved for control, talk, or monitor paths for other purposes. The IRTU line cards require definition in current line card slots. The line size of the remote decreases because the IRTU use current slots. The IRTU line card provides two test heads. Each test head requires both control, talk, or monitor paths when an external test system uses the test head. This condition decreases the line size of the IDLC configuration by a maximum of four lines, two for each test head. In a combined IDLC, universal digital loop carrier (UDLC), the line size of the remote can decrease by a maximum of six lines. The UDLC configuration requires a separate control path from the IDLC.

Vertical connections for test heads are provisioned in table RDTINV. Information entered in table RDTINV includes:

- the type of test head
- the associated vertical identification number
- the metallic test access path.

Connection information is added to metallic test access point field (MTSTACPT) . A maximum of three test heads can be entered in table RDTINV. Only two of these test heads can be provisioned with verticals because of the limit table MTAVERT sets. Both TBP and ERTU, that are valid entries for field MTSTACPT, require a vertical. The IRTU requires a vertical if an external test system uses the IRTU. The IRTU is accessed through TAP 1 or 2. The TBP is accessed through the TBP TAP. The ERTU is accessed through TAP 1, 2, or the TBP TAP.

Note: Only one test head can occupy a specified TAP.

The following groups of test heads are valid:

- IRTU separately. One or both test heads defined. One testhead is defined for no test trunk (NTT) use.
- ERTU separately
- TPB separately
- IRTU and TBP one or both test heads defined with one test head that an external system used.
- IRTU and ERTU one or both test heads defined; IRTU must be MAPIF, ERTU must be NTT and provisioned on TBP TAP.
- ERTU and TBP where TBP provides MAPIF.

Note 1: The RTU 1 and TBP cannot be used together but RTU 1 and TBP can be provisioned together. Both RTU1 and TBP use the same internal test bus in the S/DMS AccessNode. If MAP testing requires IRTU and TBP, the recommended group is TBP with RTU 2.

Note 2: The IRTU must be provisioned on TAP 1 or TAP 2. The ERTU or TBP must be provisioned on TBP TAP.

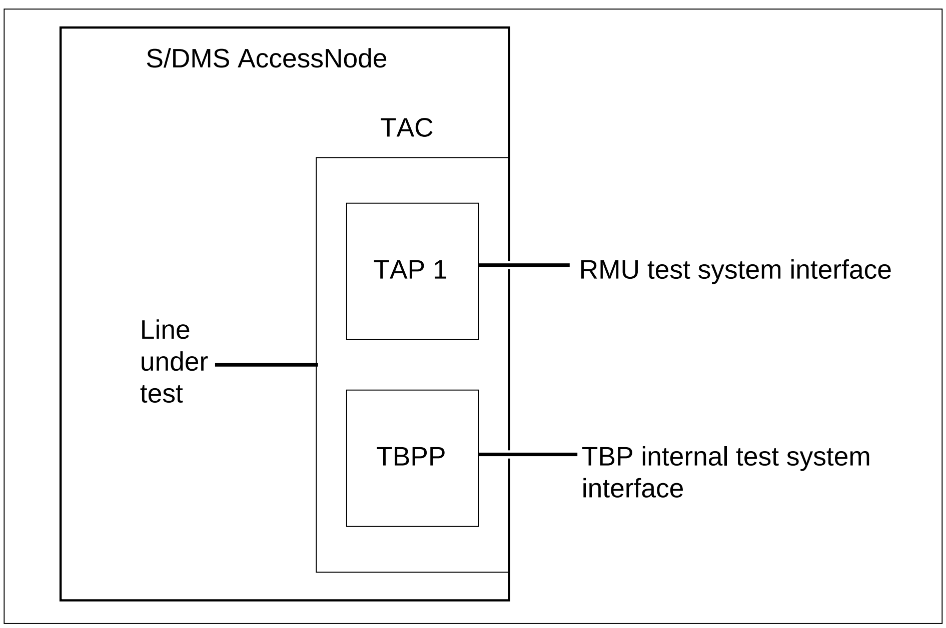
For SMA2s that can support an S/DMS AccessNode, ALT can use both IRTU test heads. This condition occurs if both IRTU test heads are provisioned in table RDTINV, field MTSTACPT. The ALT uses IRTU or TBP for tests. The ALT starts a separate test stream for each RTU provisioned on a specified RDT that have ALTUSE set to Y (yes) in table RDTINV. The line test range that the user enters has two subranges. Each RTU tests one subrange separate from the other RTU. The line test range is divided on a shelf limit to make sure the two test streams do not interfere.

The following section provides test configuration examples.

This example describes when operating company personnel require internal MAP terminal testing through TBP, and external NTT/MLT/TERADYNE/RTEC testing. The testing is performed through the external remote maintenance unit. An IRTU is not configured, and current ILCs are not used. Datafill for table RDTINV for the field this feature affects appear below. The following figure describes this installation:

	TEST HEAD	TEST HEAD
TSTUTTYP	TBP	ERTU
TSTHDUSR	MAPIF	N/A
VERTID	11	12
TSTACCPA	TBPP	TAP1

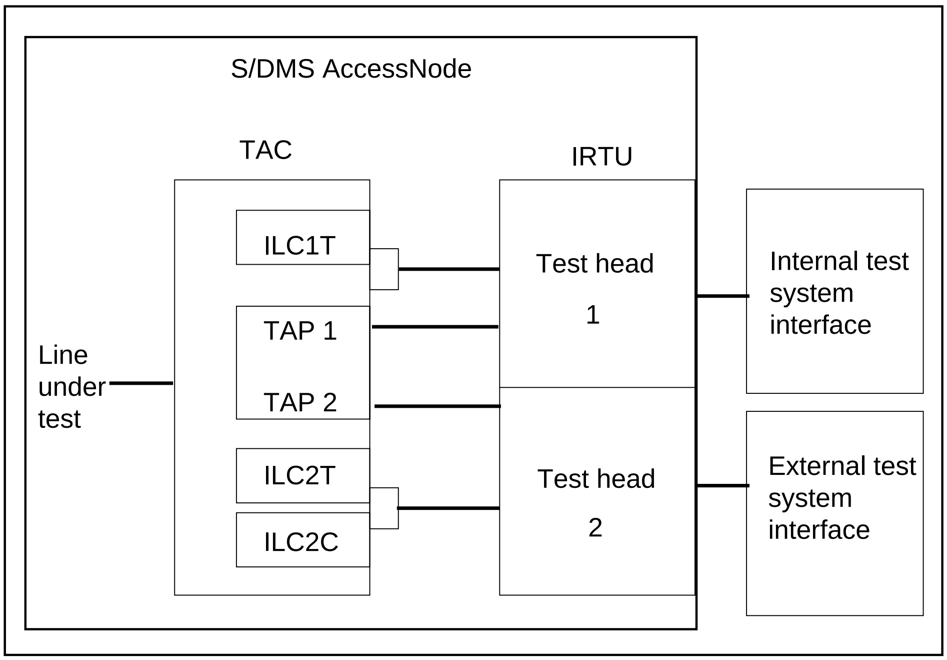
Figure 6-18 MAP terminal through test bypass pair, remote maintenance unit or NTT through TAP 1



This example describes when the operating company personnel require both internal MAP terminal and external testing through IRTU. Both IRTU test heads and four current line appearances for ILCs are assigned. Datafill for table RDTINV for the fields this feature affects appears below. The following figure describes this installation:

```
          TEST HEAD   TEST HEAD
TSTUTTYP  IRTU        IRTU
RTUNUM    RTU1        RTU2
TSTHDUSR  MAPIF       BOTH
VERTID    N/A         10
TSTACCPA  TAP1        TAP2
```

Figure 6-19 MAP terminal through IRTU, NTT through IRTU



The following table contains possible test equipment groups for MAP testing:

Figure 6-20 Test equipment groups

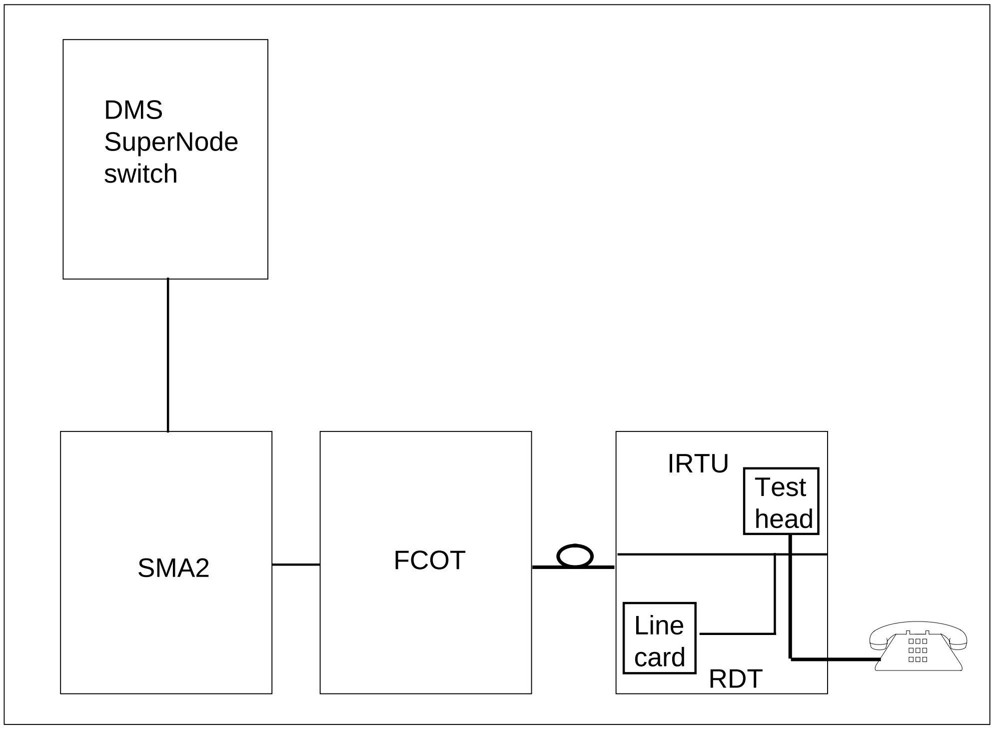
```
TBP MAPIF
TBP NTTIF
TBP BOTH
TBP MAPIF ERTU TAP 1
TBP MAPIF ERTU TAP 2
TBP MAPIF RTU2 MAPIF
TBP MAPIF RTU1 NTTIF
TBP MAPIF RTU2 NTTIF
TBP MAPIF RTU1 BOTH
TBP MAPIF RTU2 BOTH
TBP MAPIF RTU1 MAPIF and RTU2 MAPIF
TBP MAPIF RTU1 MAPIF and RTU2 NTTIF
TBP MAPIF RTU1 MAPIF and RTU2 BOTH
TBP MAPIF RTU1 NTTIF and RTU2 MAPIF
TBP MAPIF RTU1 BOTH and RTU2 MAPIF
TBP NTTIF RTU2 MAPIF
TBP NTTIF RTU1 MAPIF and RTU2 MAPIF
TBP BOTH RTU1 MAPIF
TBP BOTH RTU2 MAPIF
TBP BOTH RTU1 MAPIF and RTU2 MAPIF
ERTU TAP 1
ERTU TAP 2
ERTU TBPP
RTU1 MAPIF only
RTU2 MAPIF only
RTU1 NTTIF only
RTU2 NTTIF only
RTU1 BOTH
RTU2 BOTH
RTU1 MAPIF and RTU2 MAPIF
RTU1 MAPIF and RTU2 NTTIF
RTU1 MAPIF and RTU2 BOTH
RTU2 MAPIF and RTU1 NTTIF
RTU2 MAPIF and RTU1 BOTH
```

IRTU test configurations

The following section is a summary of test configurations with the IRTU, for MAP display testing.

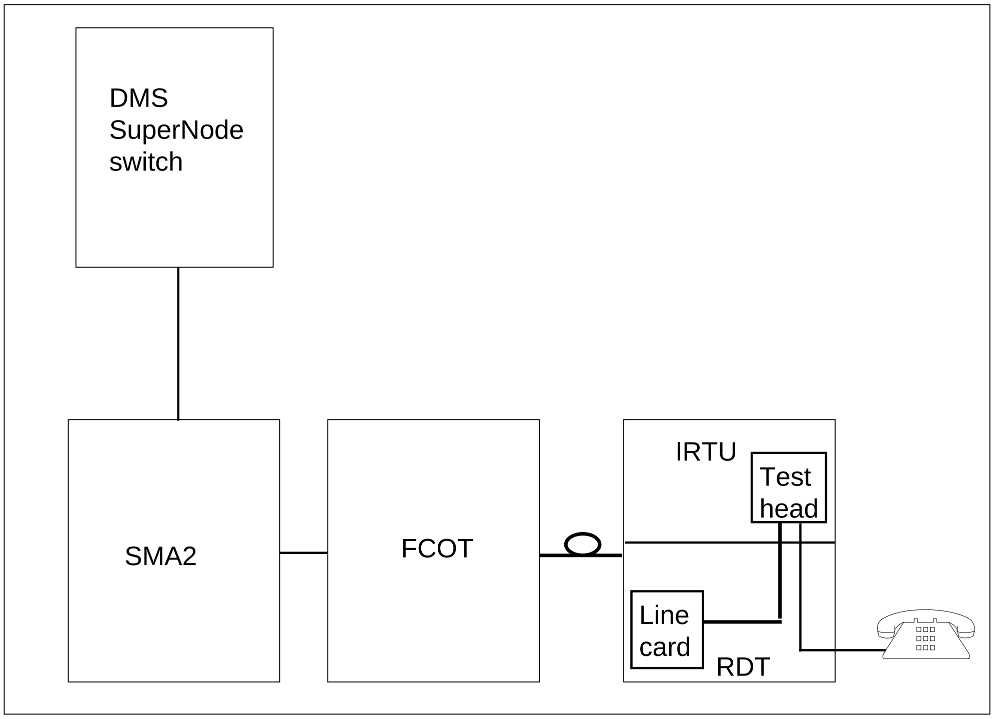
The following configuration is the test configuration for the VDC, VAC, RES, CAP, and LNTST commands when the IRTU is available. The S/DMS AccessNode line card is disconnected from the subscriber loop because the line test access (LTA) direction selected is outward. The AccessNode connects the subscriber loop to the IRTU test head. In this configuration, the IRTU test head performs DC, AC, RES, and CAP electrical measurements on the subscriber loop.

Figure 6-21 Test configuration for VDC, VAC, RES, CAP, and LNTST



The following configuration is the test configuration for TSTRING command when the IRTU is available. The S/DMS AccessNode line card is disconnected from the subscriber loop because the LTA direction is inward. The S/DMS AccessNode connects the line card to the IRTU test head. In this configuration, the IRTU test head must detect ringing voltage that the line card applies.

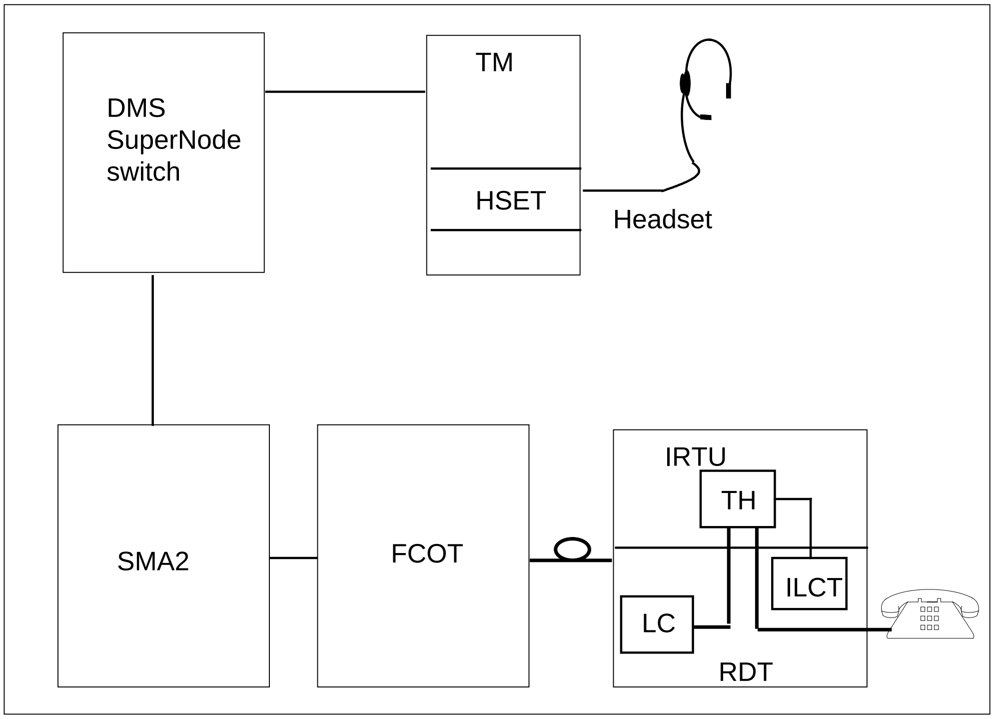
Figure 6-22 Test configuration for TSTRING



The MONLTA, TALKLTA, and ORIG commands use this test configuration when IRTU is available. The subscriber loop connects to the IRTU test head. The loop connects through the ILC talk monitor path to a pulse code modulation (PCM) path that terminates on the 101 communication test line circuit (HSET). The HSET is in the trunk module (TM). Each command is as follows:

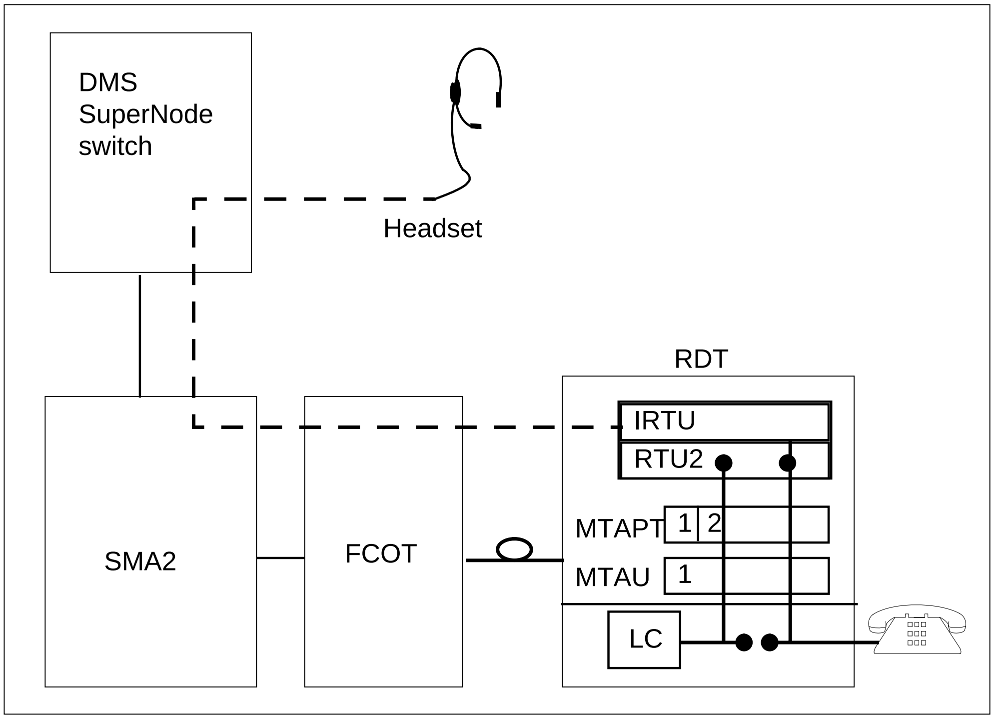
- The MONLTA command connects a headset circuit to a subscriber line to allow operating company personnel to listen to a line.
- The TALKLTA command tests for certain signaling conditions. For the TALKLTA command, the actual terminal equipment is used.
- The ORIG command installs the IRTU to simulate on- and off-hook conditions, and subscriber dialing. At the same time audible feedback is available through a headset that connects to the HSET trunk.

Figure 6-23 Test configuration for MONLTA, TALKLTA and ORIG



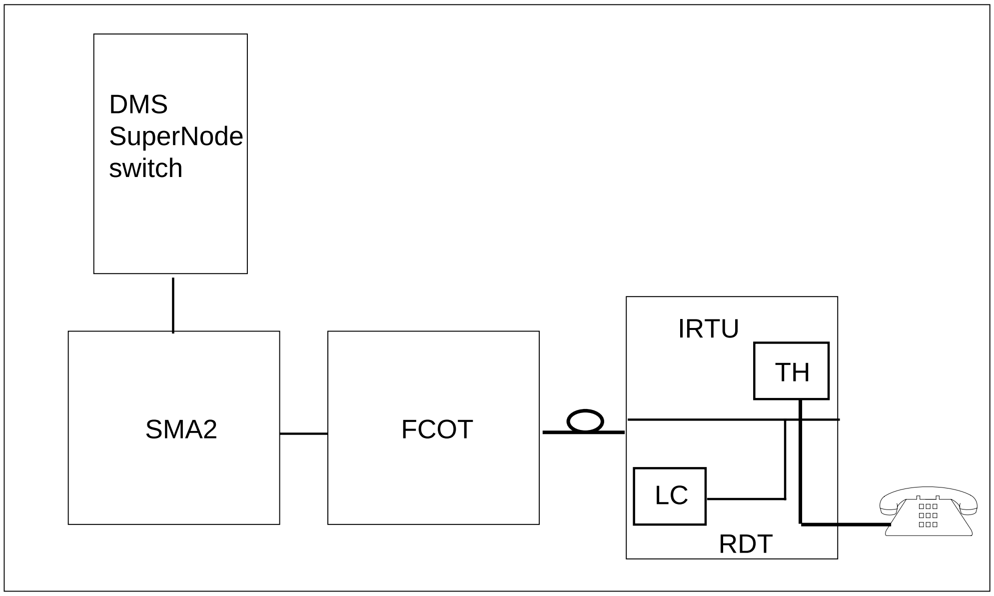
The following configuration is the test configuration that the TALKLTA command uses with battery command when IRTU is available. The TALKLTA B command establishes a talk connection between the subscriber set and the CM headset when an MTE maintains battery to the loop. Operating company personnel can talk to the subscriber when the line card is cutoff from the loop. The TALKLTA B test configuration for RDTEBS lines is not supported.

Figure 6-24 Test configuration for TALKLTA with battery



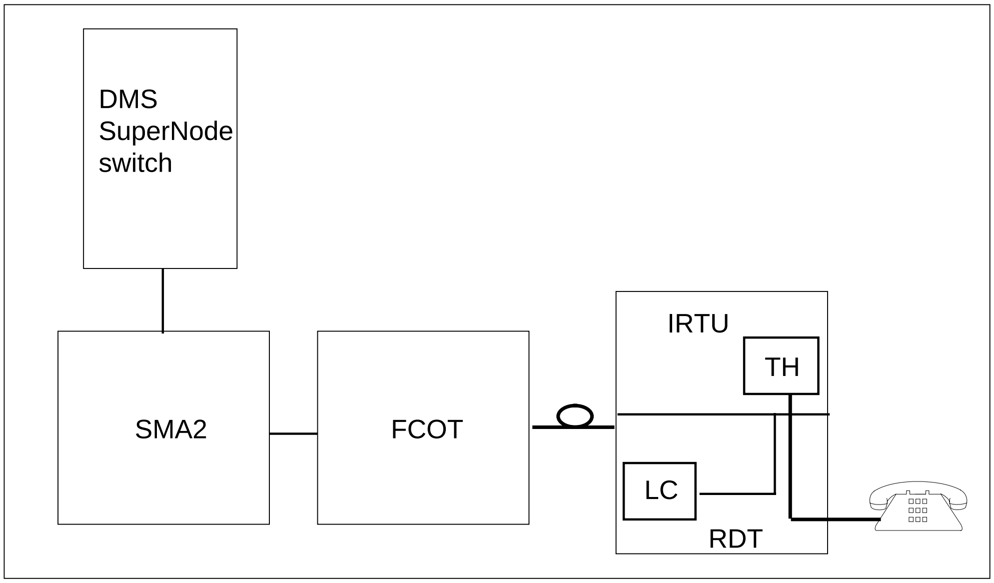
The following configuration is the test configuration for the TONEGEN METALLIC command when the IRTU is available. The S/DMS AccessNode line card disconnects from the subscriber loop. The AccessNode connects the subscriber loop to the IRTU test head. In this configuration, the IRTU test head provides tones on the subscriber loop.

Figure 6-25 Test configuration for tonegen metallic



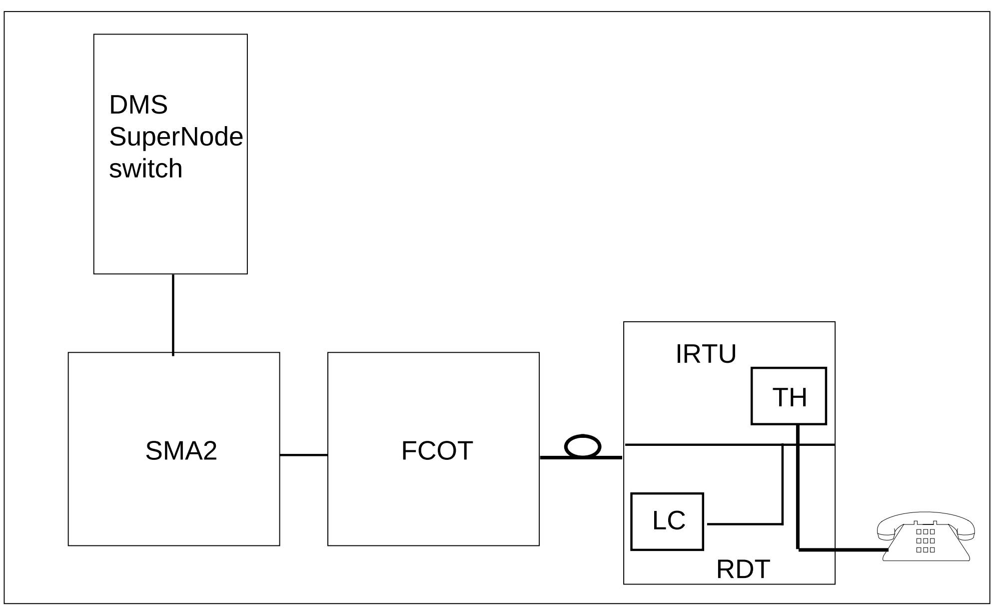
The following diagram shows the test configuration for DIALABLE SHORT CIRCUIT command when the IRTU is available. The S/DMS AccessNode line card is disconnected from the subscriber loop. The S/DMS AccessNode connects the subscriber loop to the IRTU test head. In this configuration, the IRTU test head provides a short across the tip and ring leads of the subscriber loop. Dialable short circuit is used on plain ordinary telephone service (POTS), COIN, and Meridian business set (MBS) lines.

Figure 6-26 Test configuration for dialable short circuit



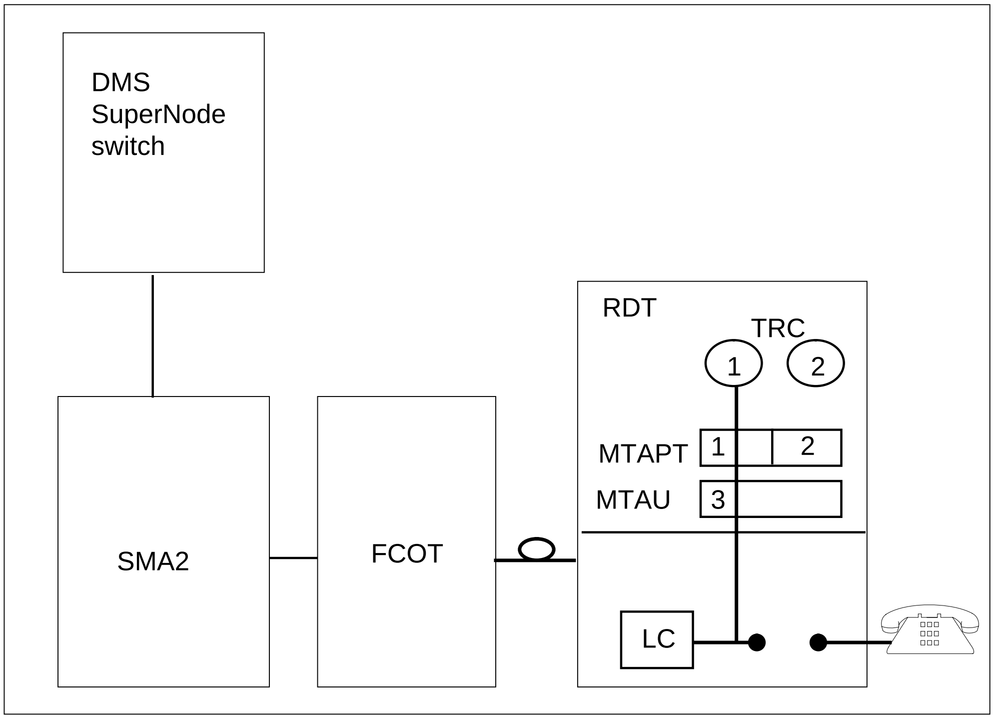
The following diagram shows the test configuration for the ALT LIT command when the IRTU is available. The S/DMS AccessNode line card is disconnected from the subscriber loop. The S/DMS AccessNode connects the subscriber loop to the IRTU test head. In this configuration, the IRTU test head conducts DC, AC, RES, and CAP measurements on the subscriber loop.

Figure 6-27 Test configuration for ALT LIT



The following diagram shows the test configuration for the SDIAG command that supports POTS and COIN lines. Tests do not occur for EBS lines because this condition causes a battery loss on the loop.

Figure 6-28 Test configuration for SDIAG



The ISDN SDIAG runs the complete ISDN DIAG. The POTS/COIN SDIAG performs the following tests as part of the subset of the standard DIAG test target:

- P-side channel check
- missing card test
- single party ringing test
- carrier channel loss test that is the same as the transhybrid loss test
- idle channel noise test.

This subset of tests requires the use of the test response circuitry (TRC). The TRC requires MTAU/MTAPT access. Log report ALT107 report connection failures associated with SDIAG tests. Possible reasons for connection failure are:

- a free test session is not available
- test access card (TAC), metallic test access card (MTAC), or TRC is out of service at the AccessNode.

When connection failure occurs, the ALT test stream stops for 30 min and attempts a restart.

Integrated remote test unit messaging

Line test access and line test functionality messages sent over the EOC channel are now sent over the CSC. This condition improves real time performance on the S/DMS AccessNode. Messages sent over the DS-1 channel of the EOC are now sent over the DS-1 channel of the CSC. Message conversion from EOC to CSC improves real-time performance on the S/DMS AccessNode.

The SMA2 sends and receives IRTU messages to and from the DMS SuperNode. The SMA2 state machine guides the operating line test application message to the CSC channel. The exact function that the state machine selects, sends the message to the S/DMS AccessNode. The AccessNode responds to the message, that comes to the SMA2 through the CSC of the DS-1 link. The SMA2 interprets the incoming message and the state machine implements a message that the system sends to the DMS SuperNode computing module (CM).

Message functionality is added to the SMA2 to perform remote test unit activities. These activities map to software objects in the S/DMS AccessNode. The remote test unit activities created in the SMA2 send and receive data. This action occurs to perform functions to control the IRTU in the S/DMS AccessNode. These tasks are:

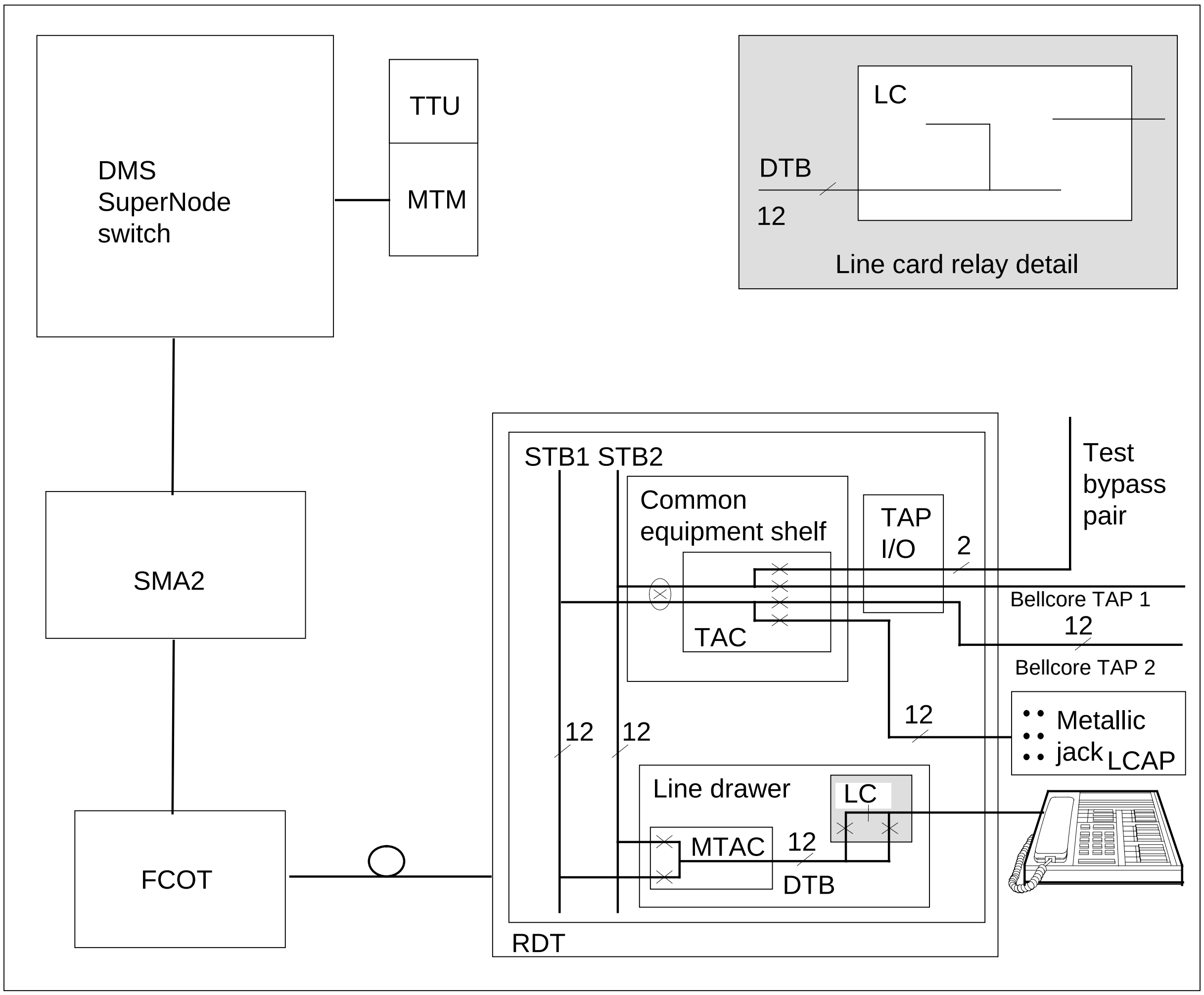
- emulate the MTU
- emulate the DRTU
- connect the test access
- disconnect the test access
- short circuit
- reset a 75-second timer.

Line maintenance test configurations for AccessNode

This section describes test configurations for different types of line testing. A numbered diagram indicates each configuration. The diagram identifies different equipment modules required and displays the connections between equipment modules. This section provides additional information after each diagram.

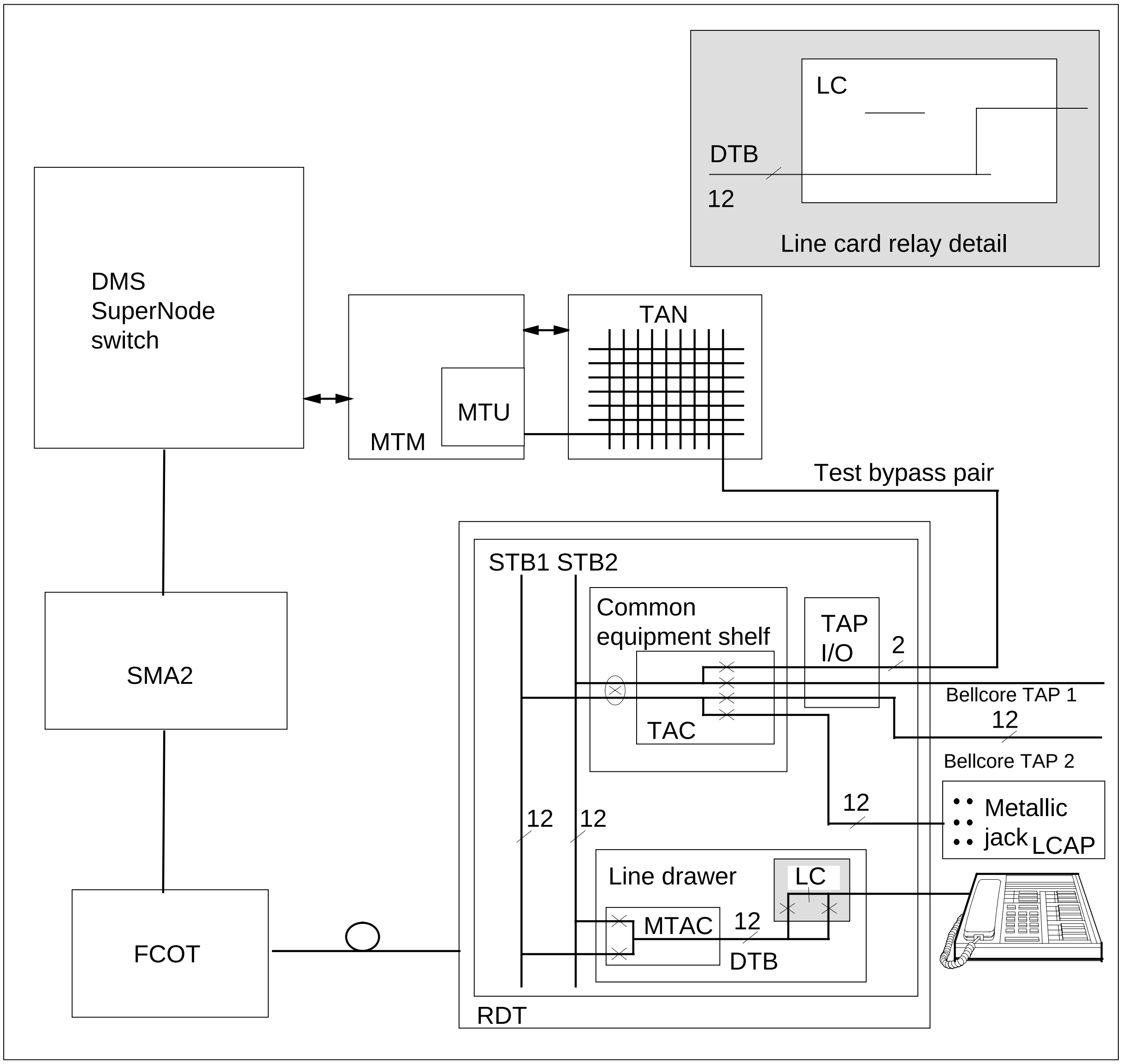
The DIAG and SDIAG tests use test configuration 1. The S/DMS AccessNode line card connects to an internal test response circuit and not a subscriber line. The test response circuit applies different reflective and absorbent terminations toward the line card. The signaling conditions that test response circuit detects determine the type of terminations. The transmission test unit (TTU) performs different transmission performance measurements. A pulse code modulation connects the TTU to the S/DMS AccessNode line card.

Figure 6-29 Test configuration 1



The LNTST, LIT, VDC, VAC, RES, and CAP commands use test configuration 2 when the IRTU option is not equipped. The system disconnects the S/DMS AccessNode line card from the subscriber line. The S/DMS AccessNode connects the subscriber line to a metallic bypass pair. The test access network (TAN) connects this pair to the MTU. In this configuration, the MTU performs electrical measurements on the bypass pair and subscriber line.

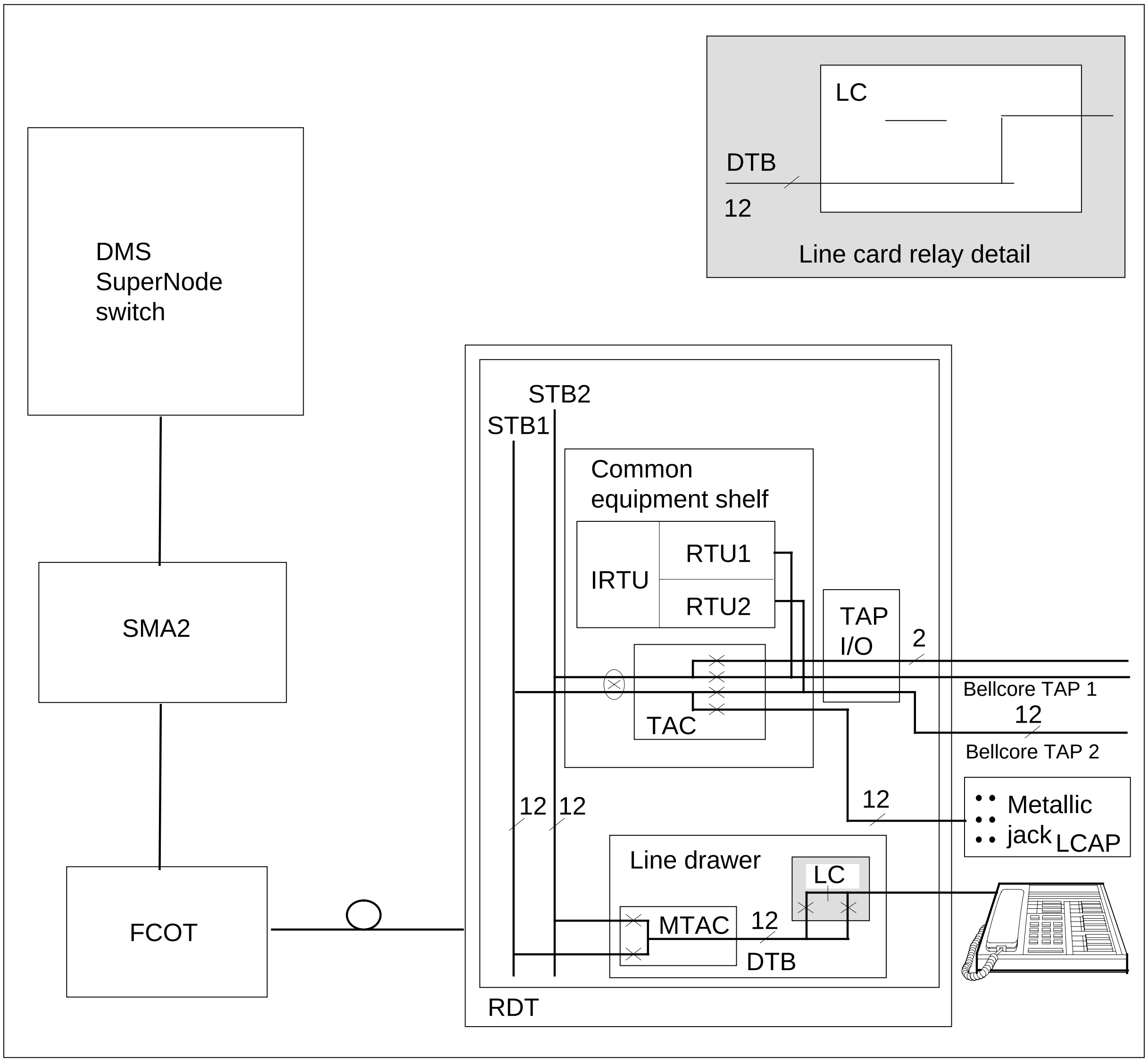
Figure 6-30 Test configuration 2



The following commands:

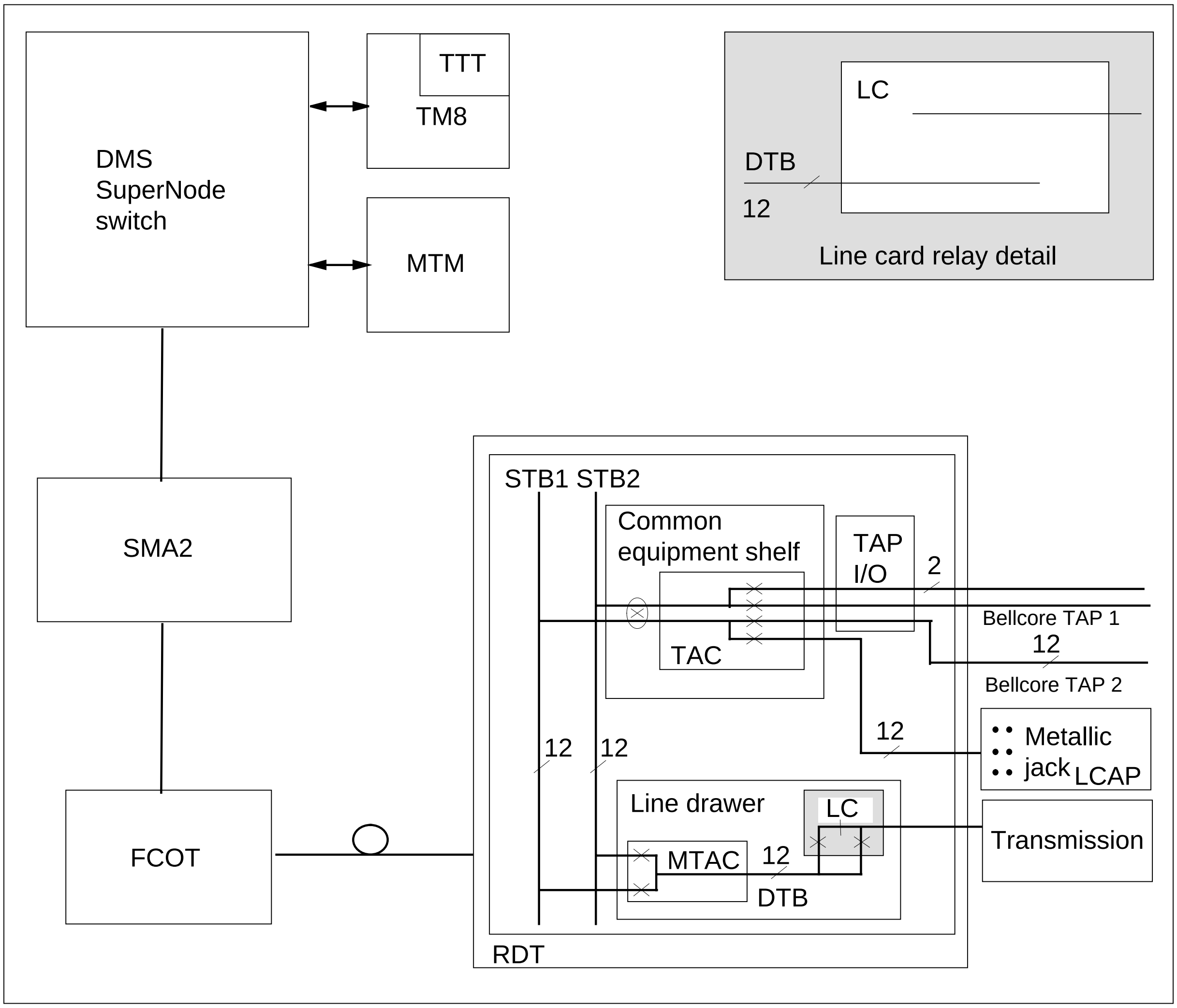
- LNTST
- LIT
- VDC
- VAC
- RES
- CAP

Figure 6-31 Test configuration 3



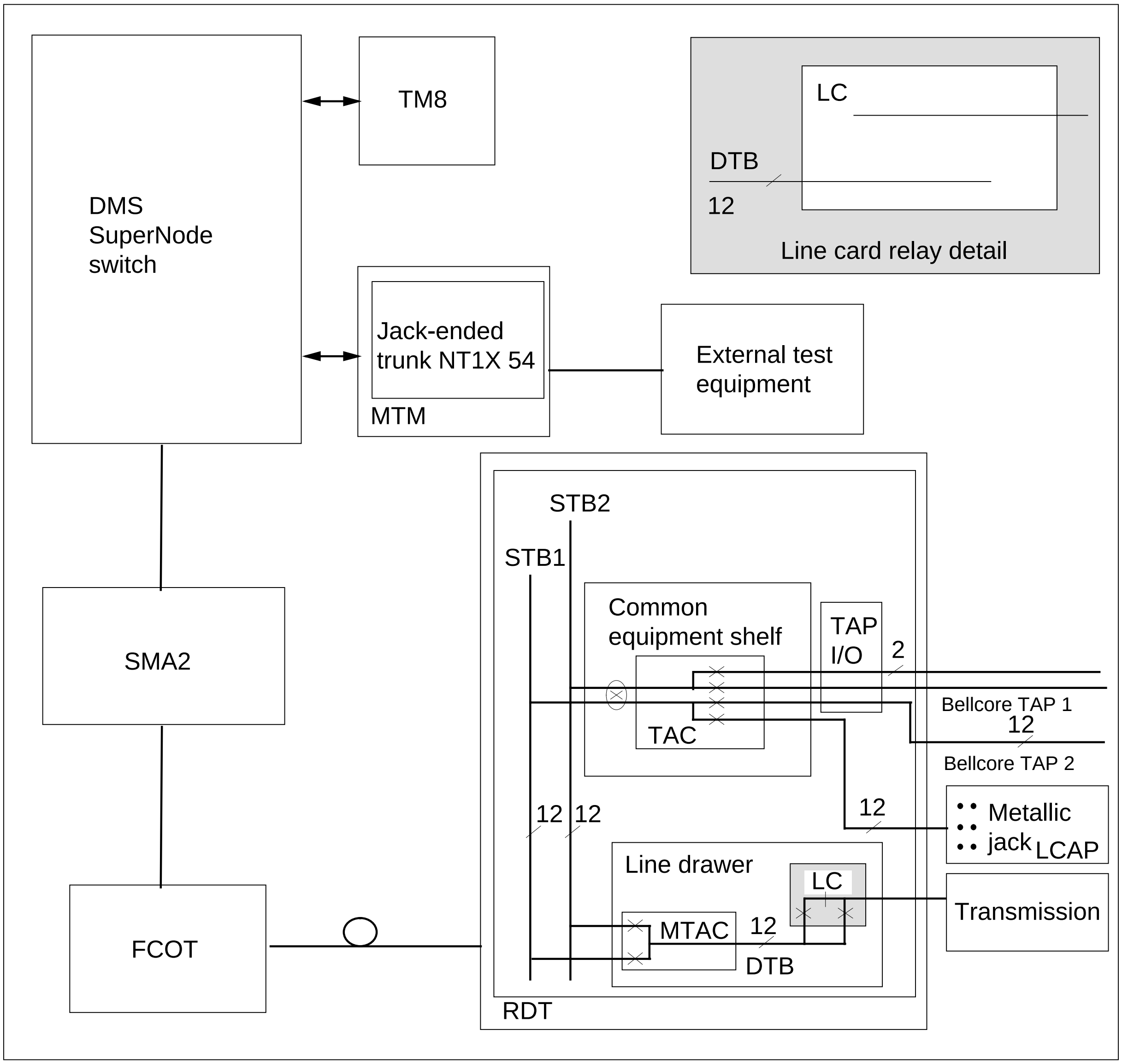
The LOSS, NOISE, and TONEGEN commands use test configuration 4. A PCM path through the network connects the subscriber line to the TTT. The transmission test set contains portable test equipment that can generate and measure voice frequency signals. This test configuration does not require a specified brand of test equipment.

Figure 6-32 Test configuration 4



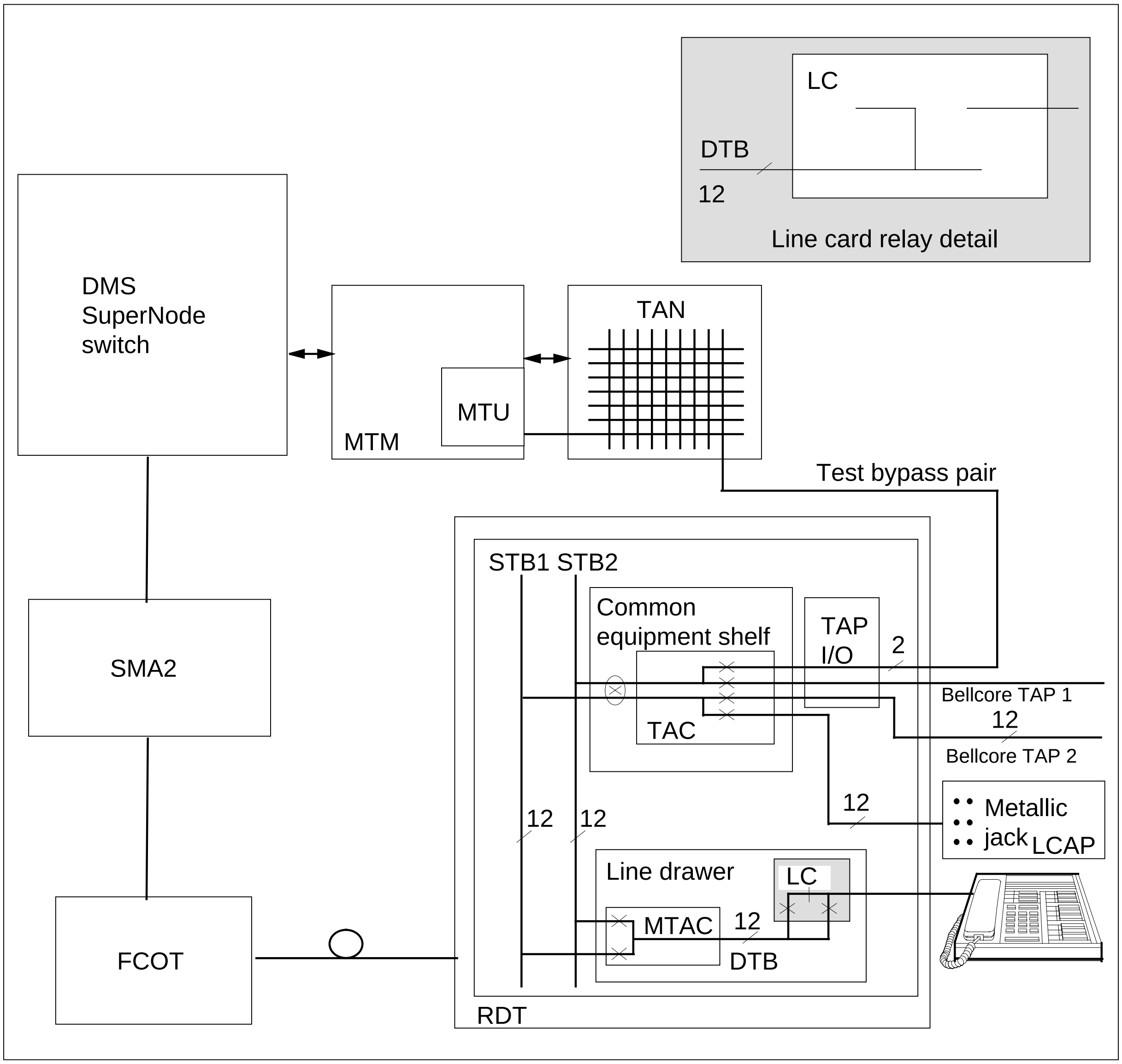
The JACK command uses test configuration 5. A PCM path through the network connects the subscriber line to the jack-ended trunk. The jack-ended trunk allows external test equipment connected to the circuit.

Figure 6-33 Test configuration 5



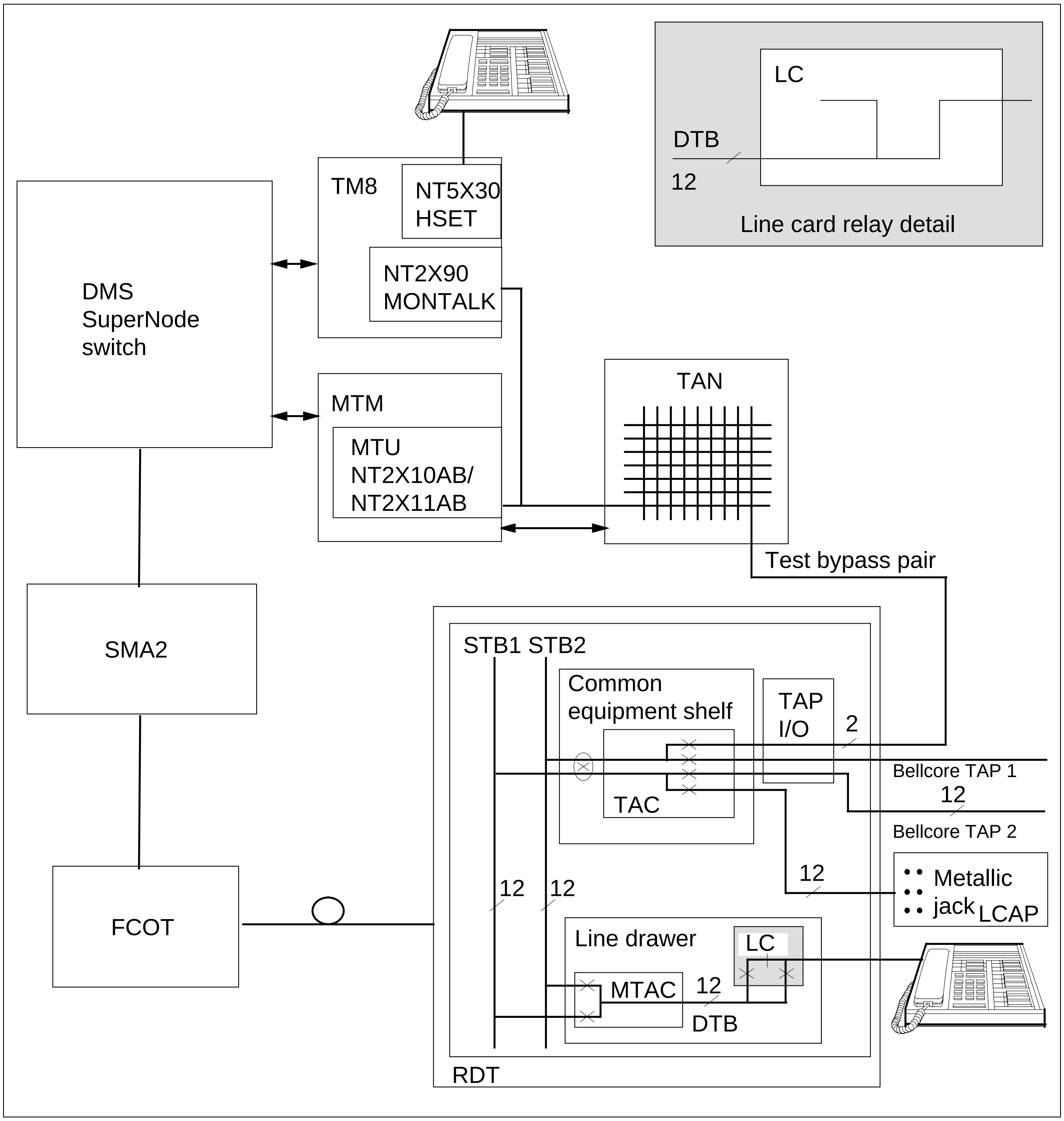
The TSTRING command uses test configuration 6. The system disconnects the subscriber line from the S/DMS AccessNode line card. The S/DMS AccessNode line card connects to the TAC. The TAC detects ringing voltage that the line card applies when the implementation of TSTRING occurs.

Figure 6-34 Test configuration 6



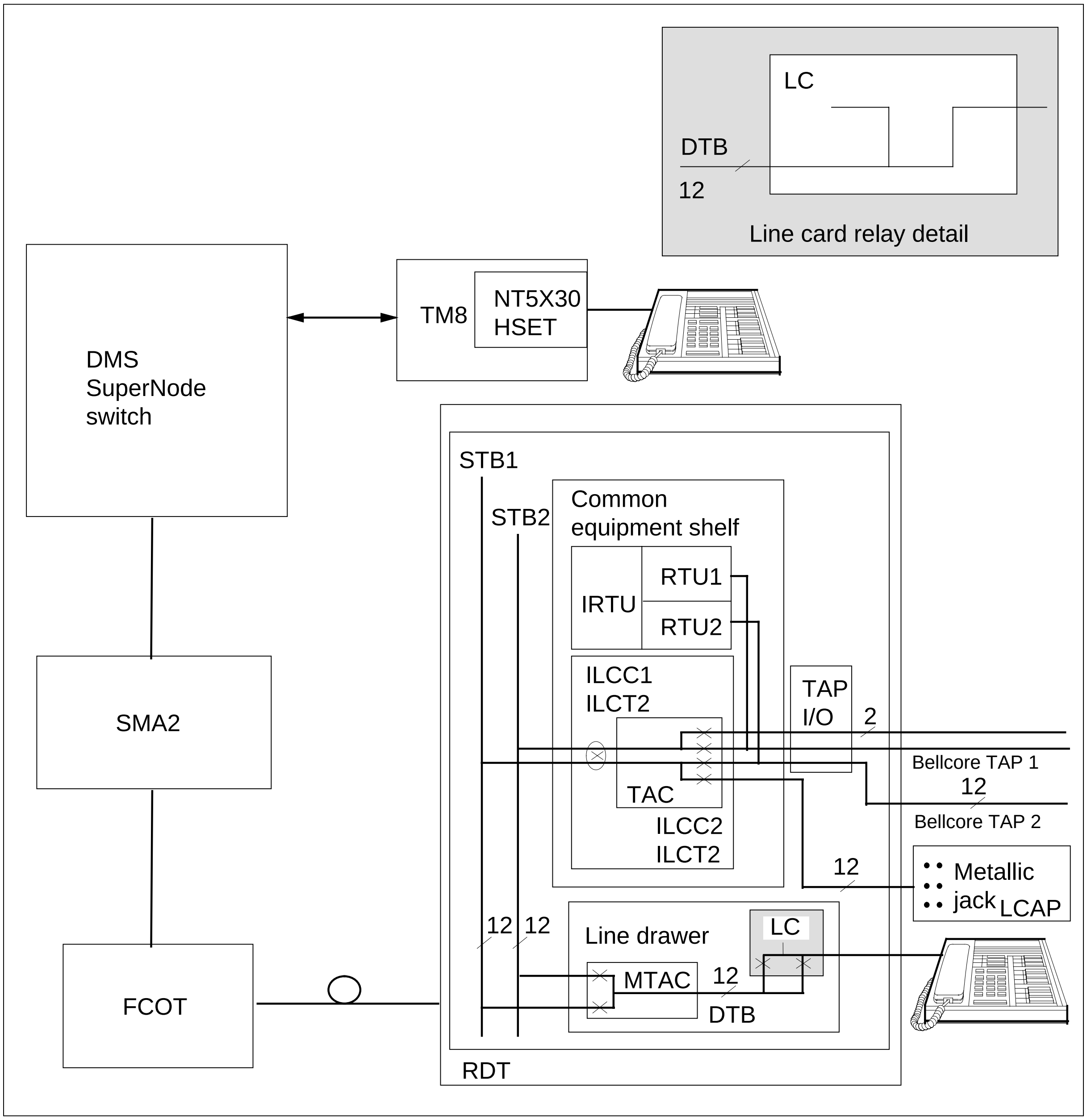
The MONLTA command uses test configuration 7 when the IMC option is not equipped. A PCM path through the network connects the subscriber line to another subscriber line or interoffice trunk. The intermediate test NT2X90 trunk bridges the subscriber line to a metallic bypass pair. Test NT2X90 trunk connects the line to the 101 communication test line (HSET) circuit.

Figure 6-35 Test configuration 7



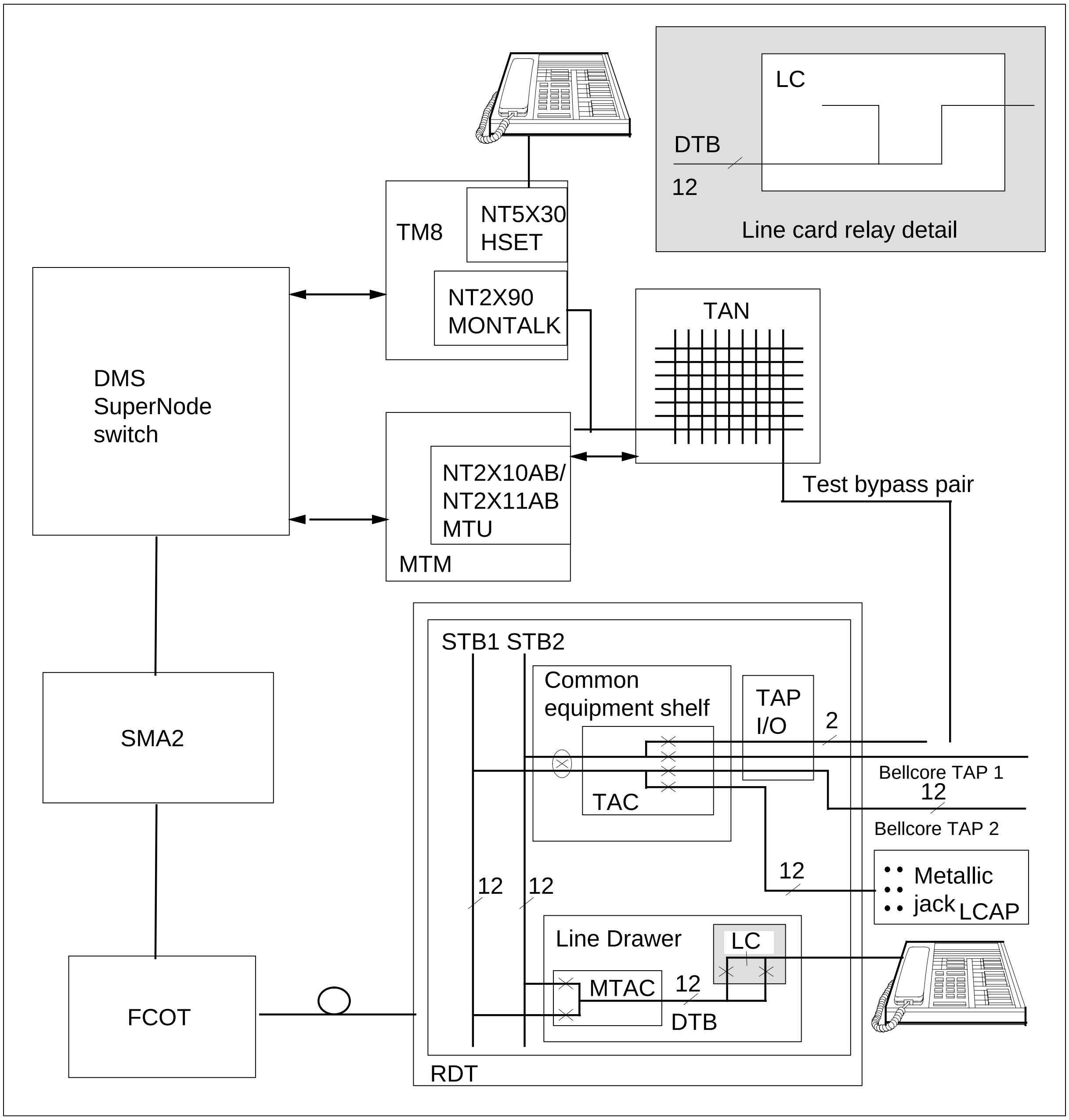
The MONLTA command uses test configuration 8 when the IMC option is equipped. A PCM path through the network connects the subscriber line to another subscriber line or an interoffice trunk. A digital bridge in the IMC connects the subscriber line to a PCM path that terminates on the HSET in the TM. In this configuration, a telephone that connects to an HSET allows operating company personnel to monitor an active S/DMS AccessNode circuit.

Figure 6-36 Test configuration 8



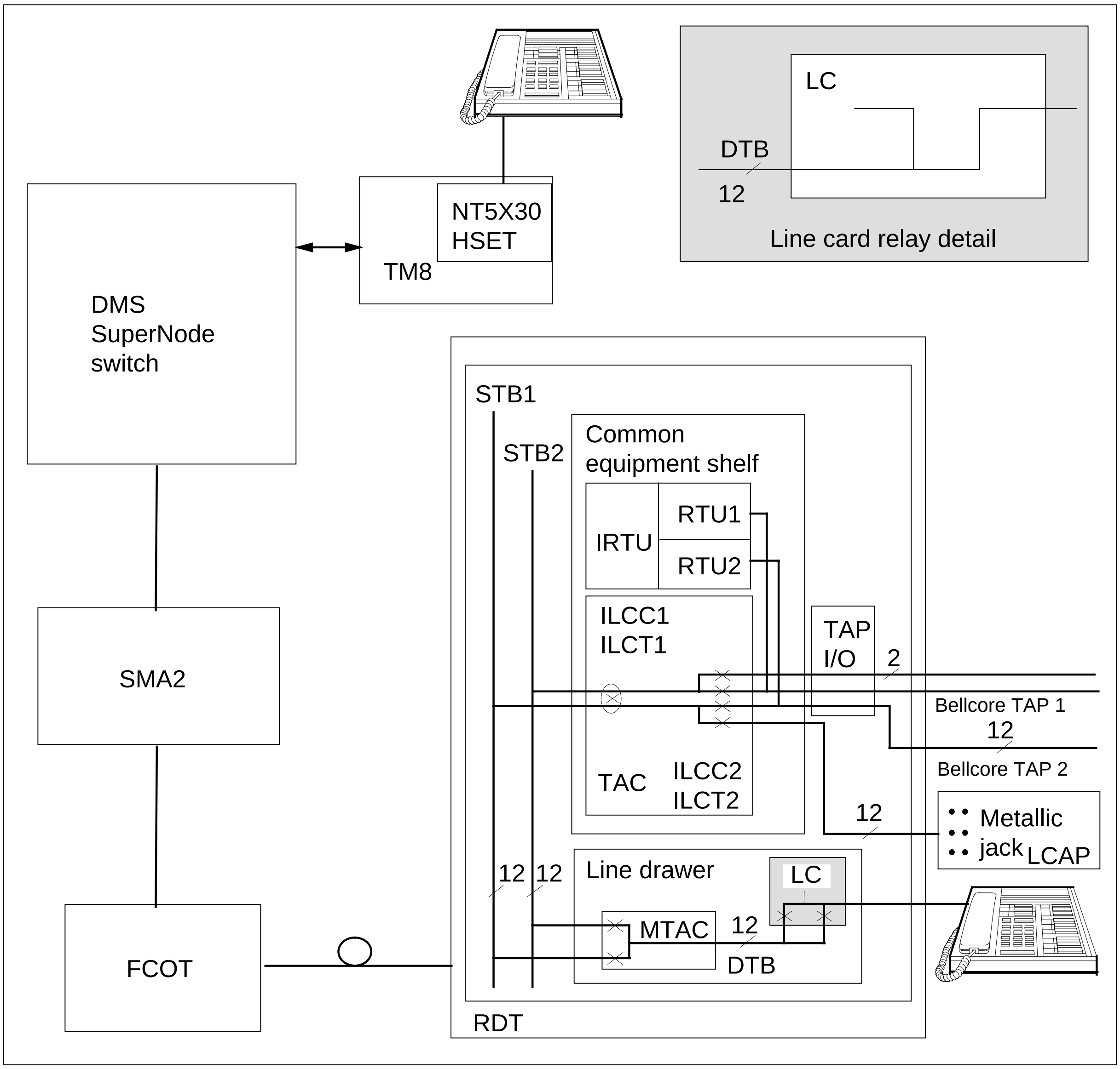
The ORIG command uses test configuration 9 when the IMC option is equipped. The system disconnects the subscriber line from the S/DMS AccessNode line card. The S/DMS AccessNode line card connects to a metallic bypass pair. The TAN connects the bypass pair to the MTU by the TAN. An intermediate NT2X90 test trunk connects the bypass pair to the HSET.

Figure 6-37 Test configuration 9



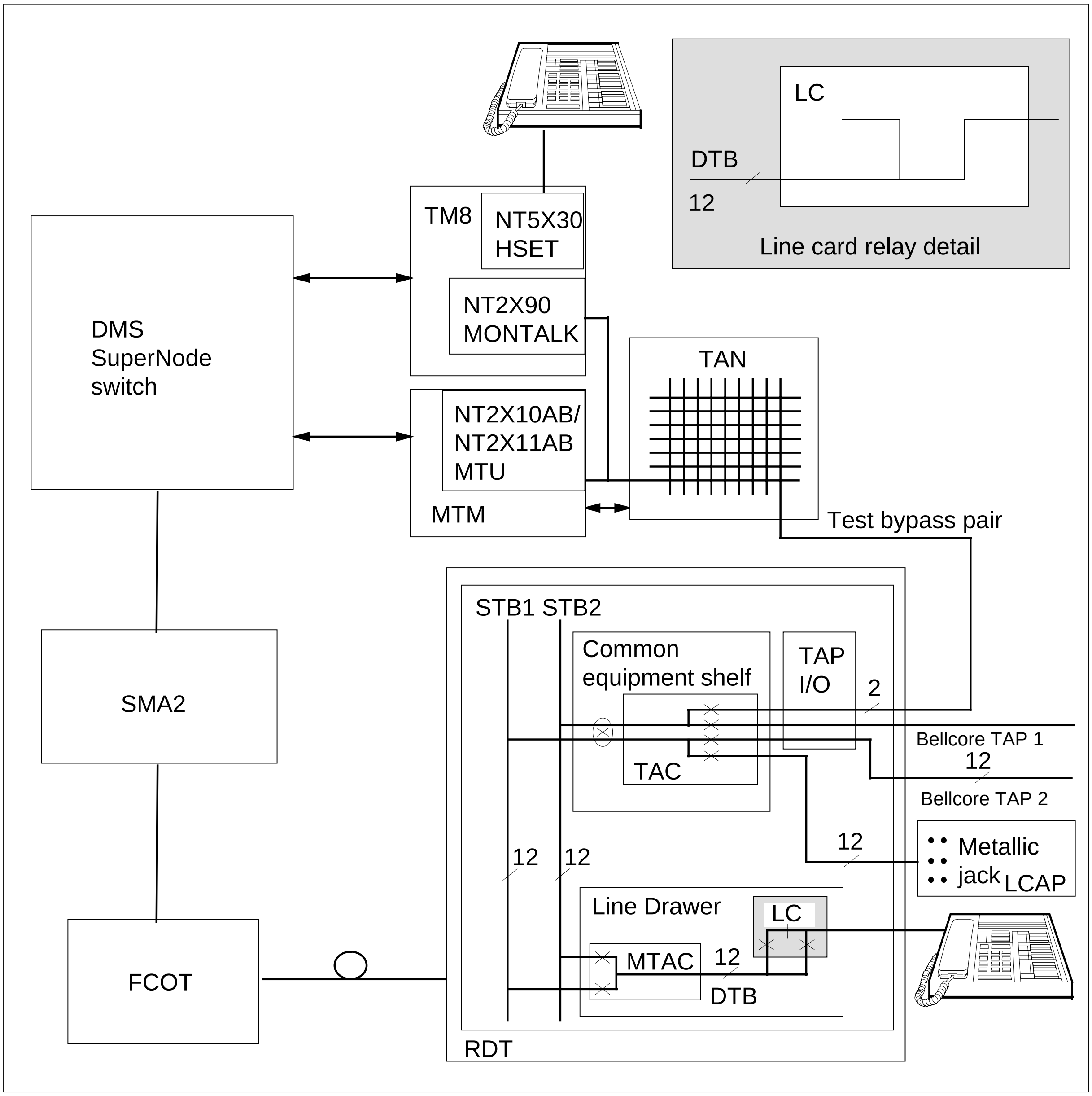
The ORIG command uses test configuration 10 when the IMC option is equipped. The system disconnects the subscriber line from the S/DMS AccessNode line card. The S/DMS AccessNode line card connects to circuits in the IMC that can simulate off-hook, on-hook, and subscriber dialing. An ILCT path from the TAC that terminates on the HSET in the TM connects the S/DMS AccessNode. In this configuration, the IMC can simulate the signaling conditions associated with an originating call. At the same time, an audible feedback is available through a telephone jacked in the HSET trunk.

Figure 6-38 Test configuration 10



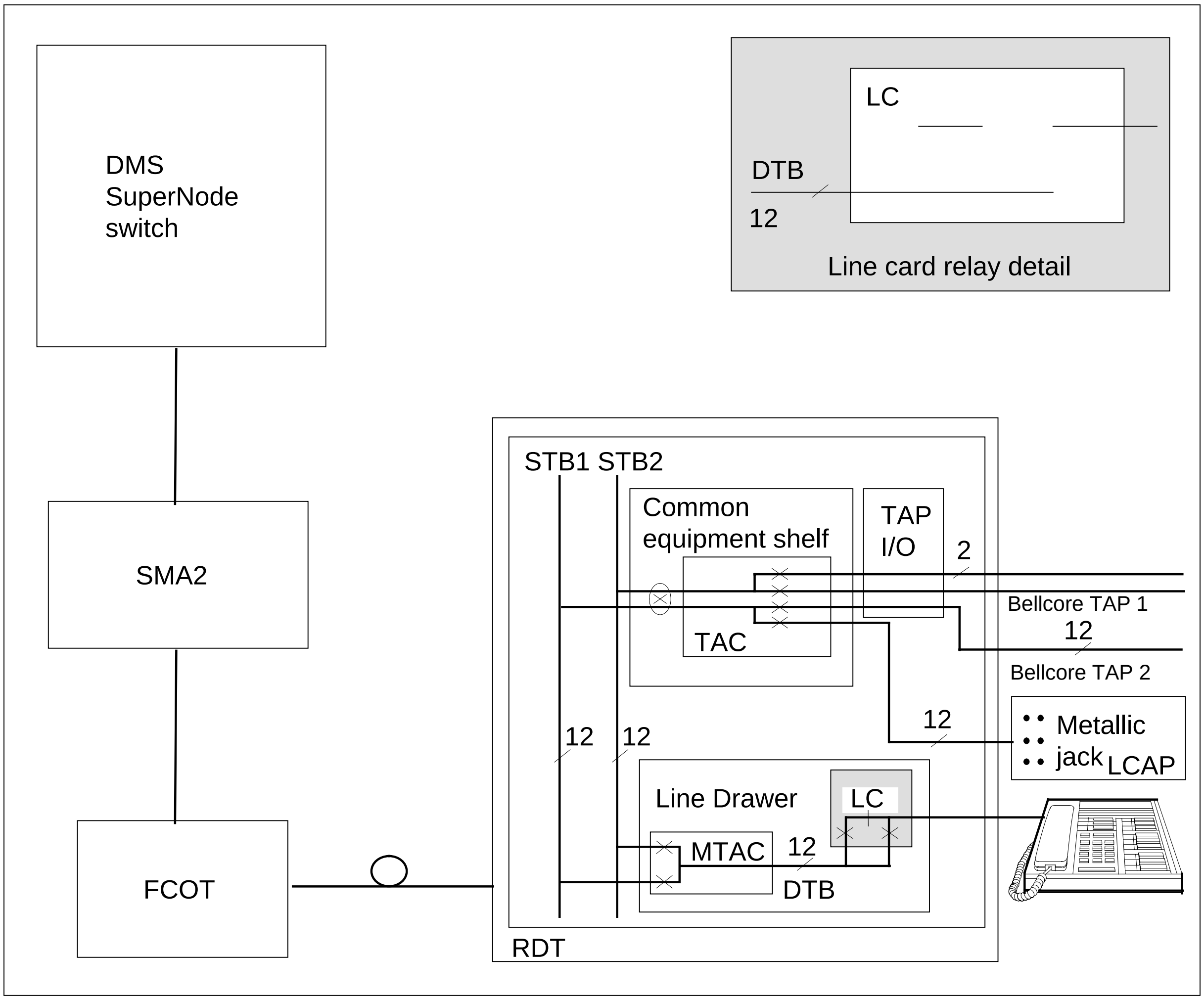
The TALKLTA, COIN, RING, and DGTTST tests use test configuration 11 when the IMC card is not equipped. A PCM path through the network connects the subscriber line to the HSET with a MONTALK circuit.

Figure 6-39 Test configuration 11



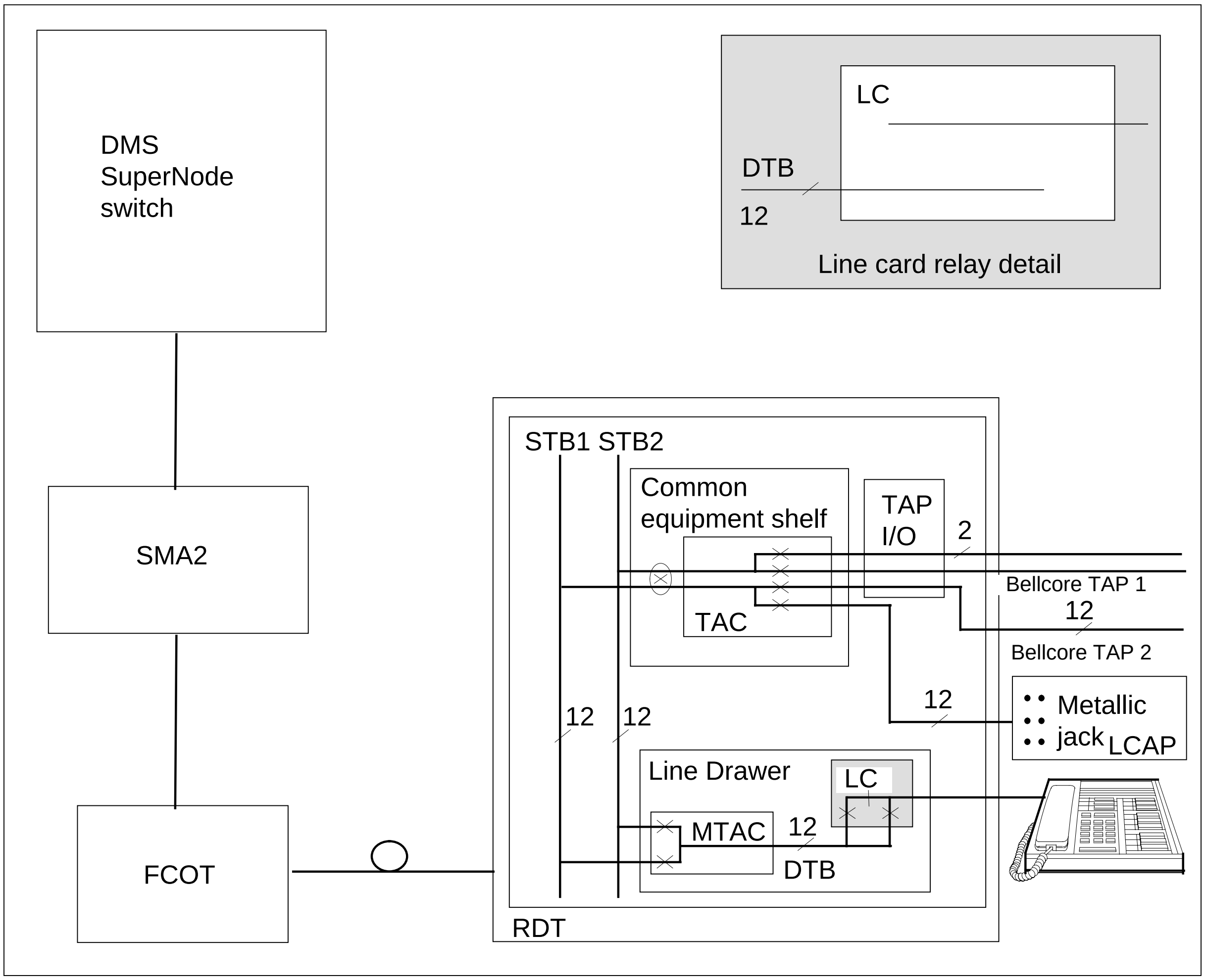
The silent switchman test uses test configuration 12. The system disconnects the S/DMS AccessNode line card from the subscriber line.

Figure 6-40 Test configuration 12



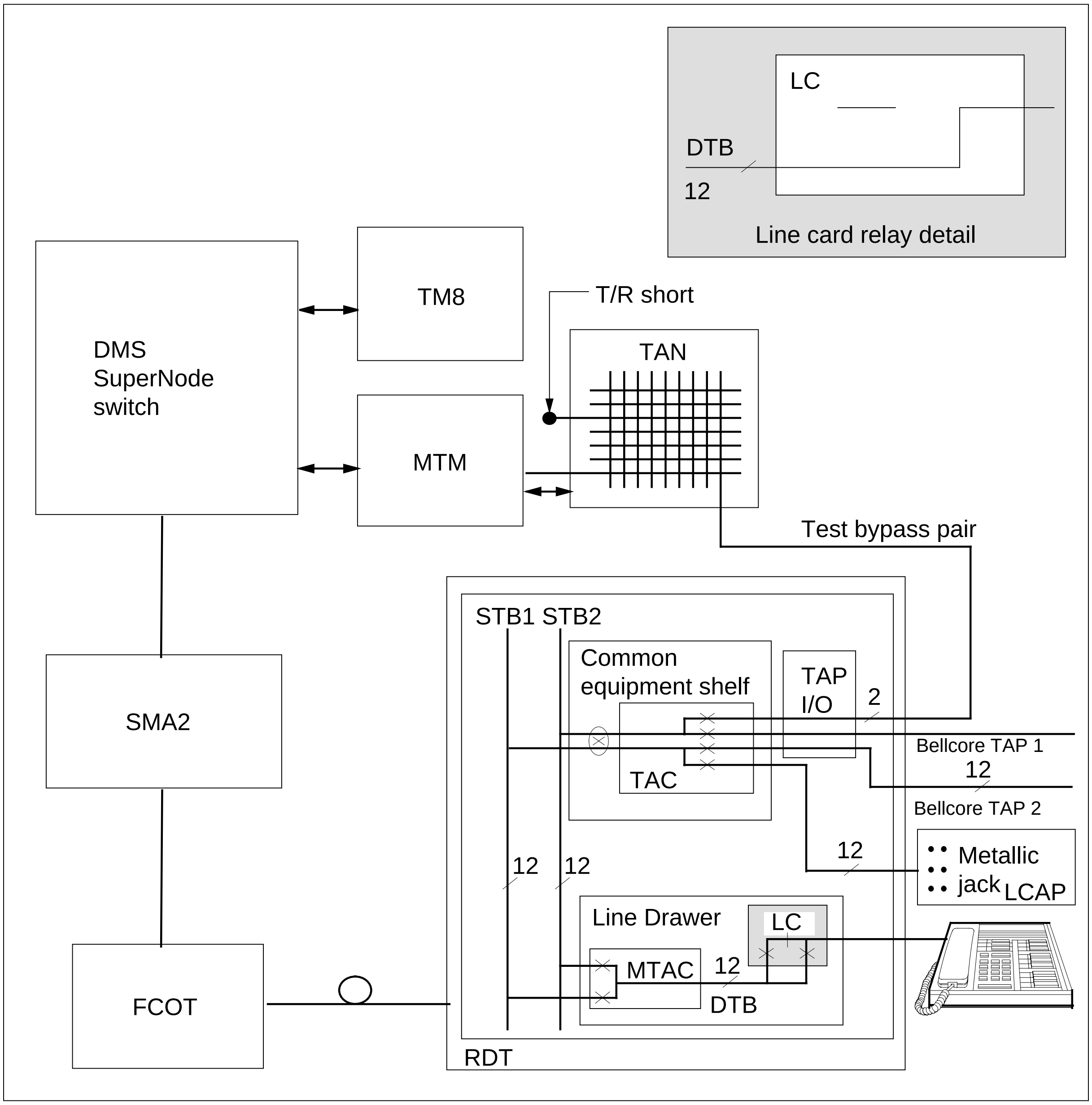
The station ringer test uses test configuration 13.

Figure 6-41 Test configuration 13



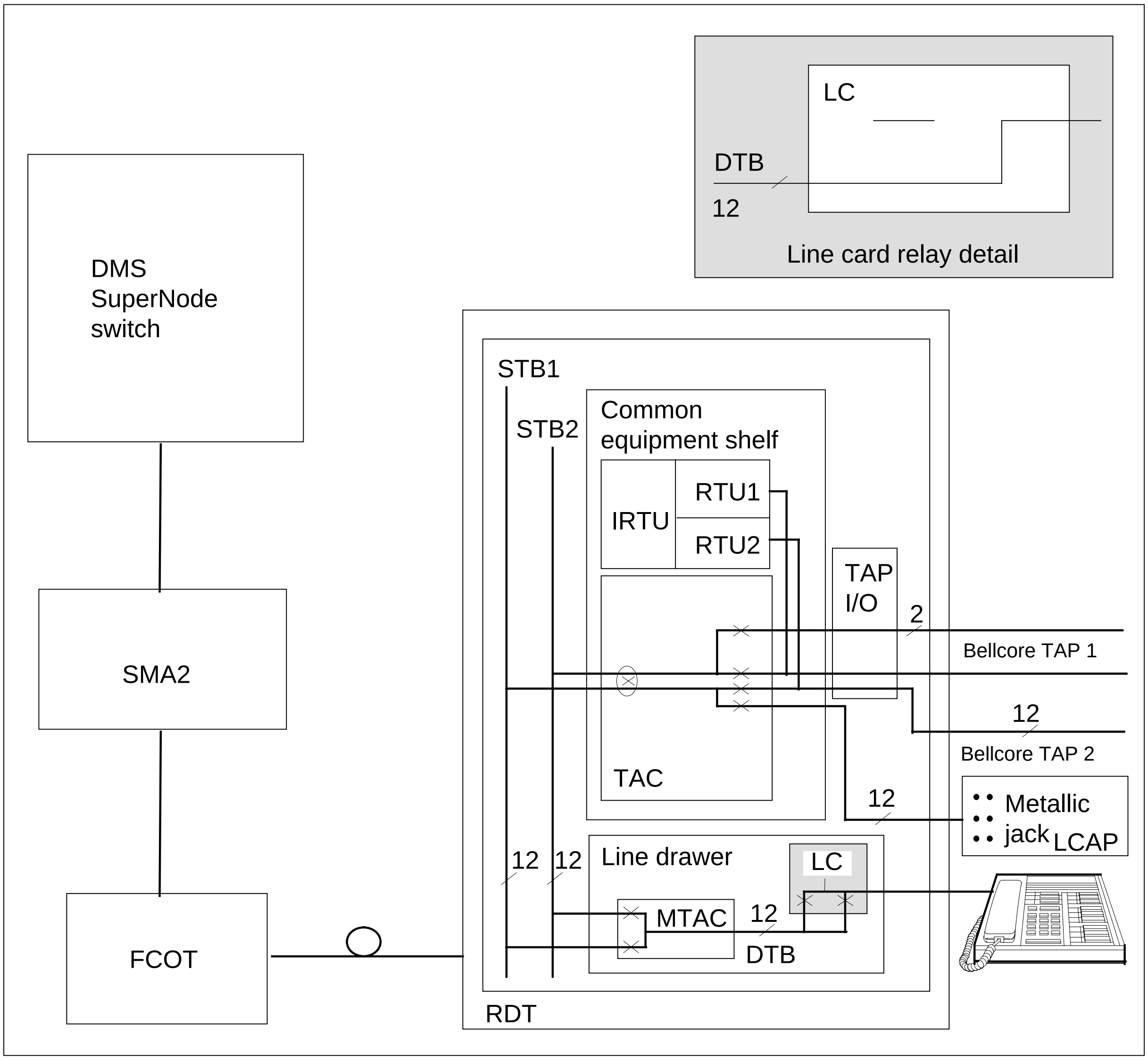
The dialable short circuit test uses test configuration 14 when the IMC option is not equipped. The system disconnects the S/DMS AccessNode line card from the subscriber line. The S/DMS AccessNode connects the subscriber line to a metallic bypass pair. The TAN connects the bypass pair to a termination that has a short circuit. The MTM contains the interface necessary to control the TAN.

Figure 6-42 Test configuration 14



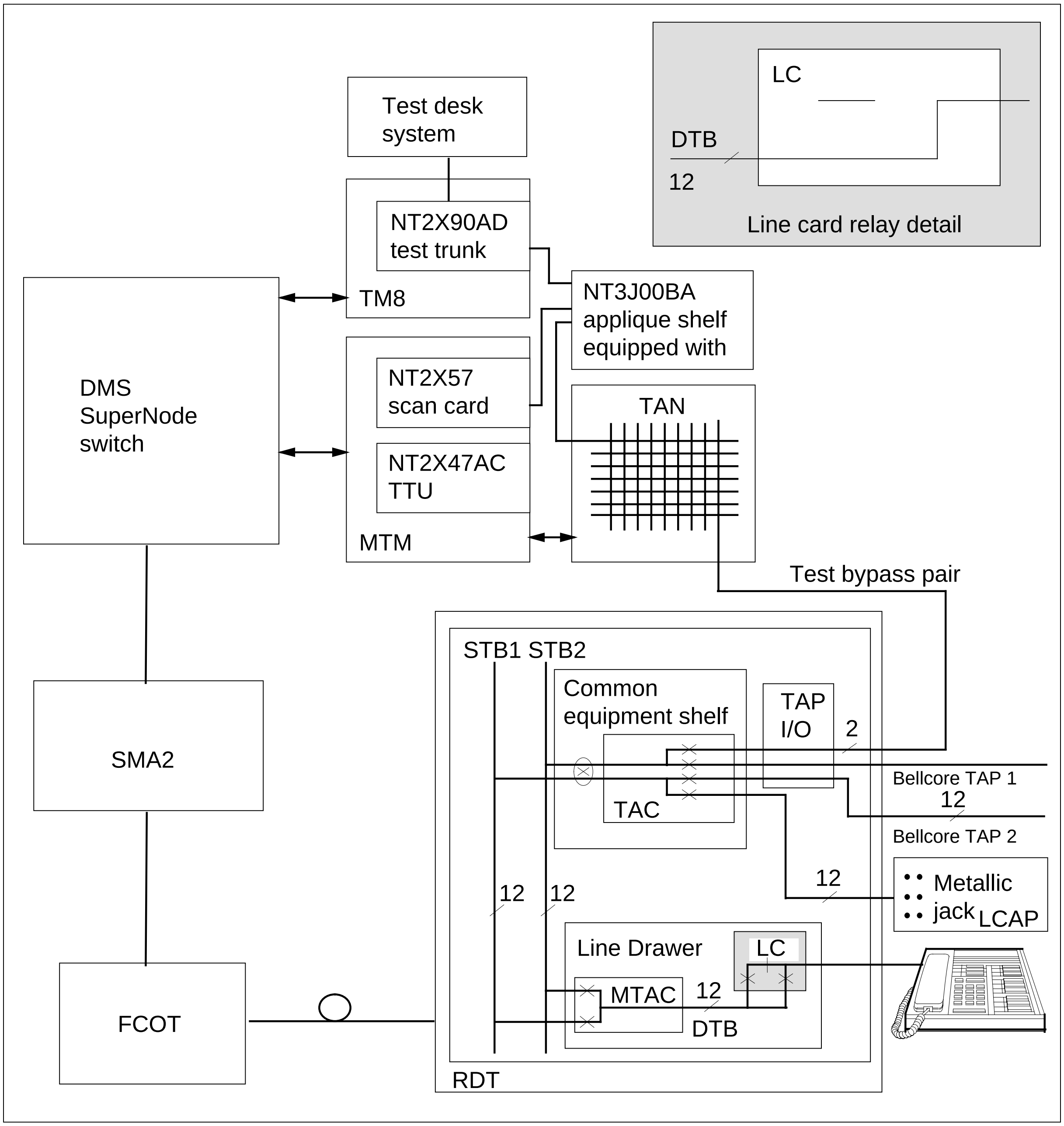
The dialable short circuit test uses test configuration 15 when the IMC option is equipped. The system disconnects the S/DMS AccessNode line card from the subscriber line. The S/DMS AccessNode connects the subscriber line to a termination that has a short circuit, in the IMC card.

Figure 6-43 Test configuration 15



The local test cabinet number 13 and local test desk number 14, use test configuration 16. The 3703 local test cabinet uses this test configuration when the IMC option is not equipped. The TAN and the NT2X90 test trunk can connect the subscriber line or S/DMS AccessNode line card. The MTM contains the necessary interface to control the TAN.

Figure 6-44 Test configuration 16

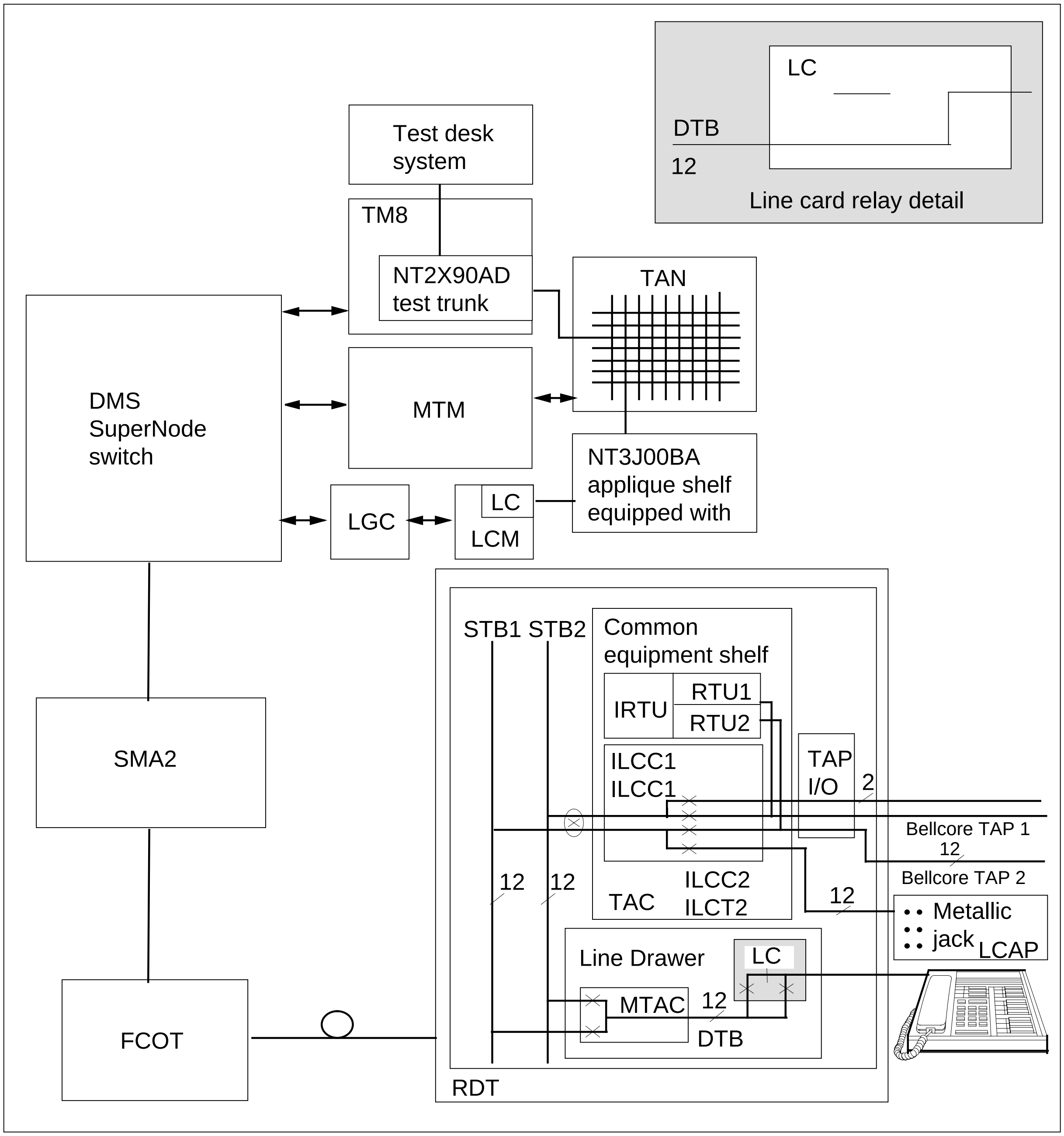


The Central Automated Loop Reporting System (CALRS) and the ELTU, or the 3703 local test cabinet when the IMC option is equipped, use test configuration 17. The system disconnects the S/DMS AccessNode line card from the subscriber line. The S/DMS AccessNode connects the subscriber line to the IMC TH. In this configuration, the IMC test head emulates a DRTU and performs electrical measurements on the subscriber line. The applique circuit provides a DC signature to the ELTU or 3703 local test cabinet. This DC signature indicates that the tested line is on a remote access vehicle. The MTM contains the necessary interfaces to control the TAN and applique circuit.

The ELTU or 3703 local test cabinet controls the IMC test head with a path that the following links form:

- An internal virtual line card connects the IMC test head to a PCM path.
- The PCM path connects through the DMS SuperNode network to a LCM line card.
- A metallic pair connects the LCM line card to a vertical on the TAN.
- The TAN vertical connects to a TAN horizontal.
- A metallic pair connects the TAN horizontal to the applique circuit.
- A metallic pair connects the applique circuit to the NT2X90 test trunk.
- A metallic pair connects the NT2X90 test trunk to the ELTU or the 3703 local test cabinet.

Figure 6-45 Test configuration 17



The mechanized loop tester (MLT) uses test configuration 18 when the RMU option is not equipped. The system disconnects the S/DMS AccessNode line card from the subscriber line.

The subscriber line connects to the MLT by a metallic path that the following links form:

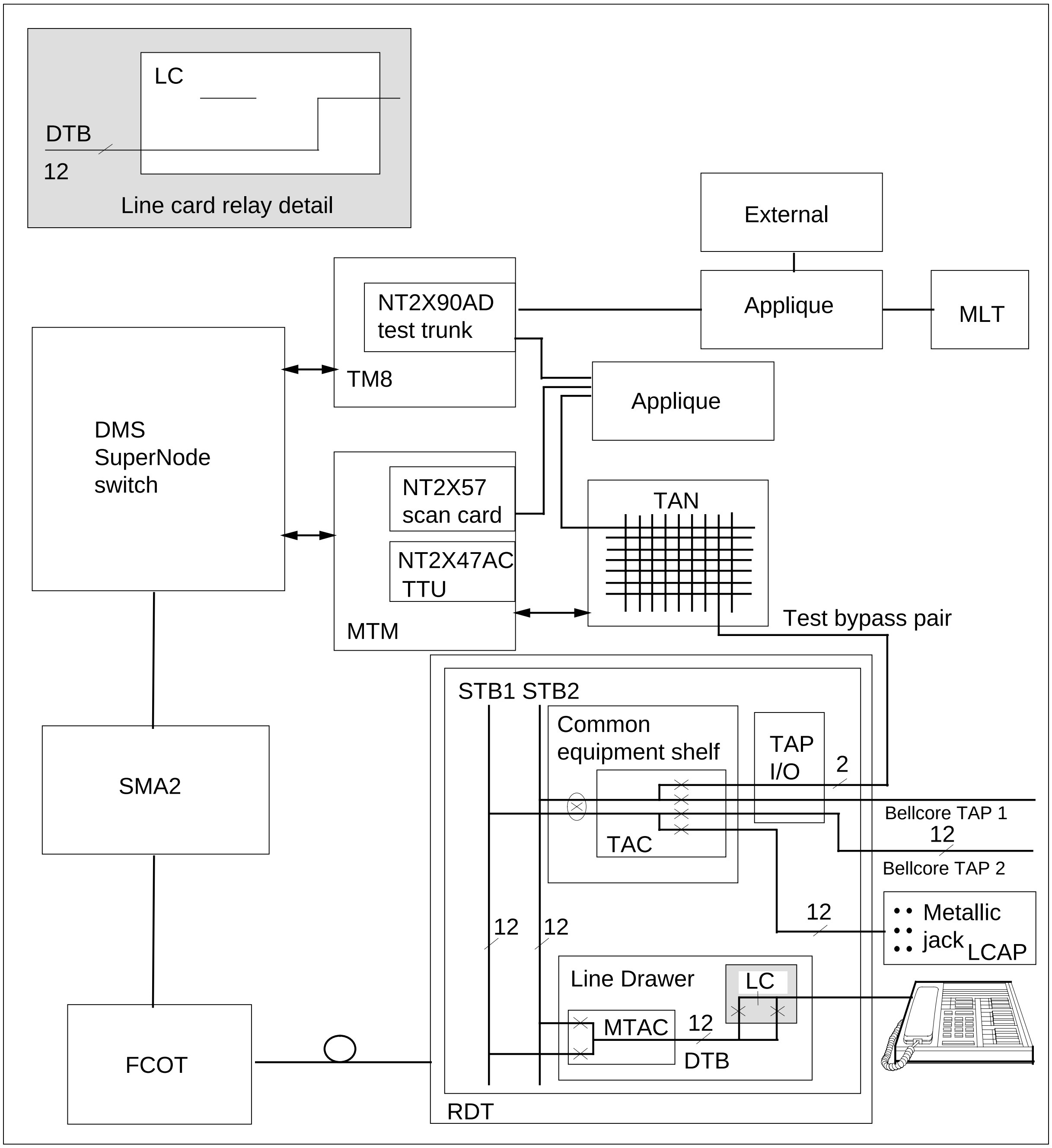
- The S/DMS AccessNode connects the subscriber line to a metallic bypass pair.
- The metallic bypass pair connects to a vertical on the TAN.
- The TAN vertical connects to a TAN horizontal.
- A metallic pair connects the TAN horizontal to applique circuit 1.
- A metallic pair connects applique circuit 1 to the NT2X90 test trunk.
- A metallic pair connects the NT2X90 to the MTL.

Applique circuit 1 provides a DC signature to the MLT. The DC signature informs the MLT that the tested line is on a remote access vehicle.

The MTM contains the necessary interfaces that control the TAN and applique circuit.

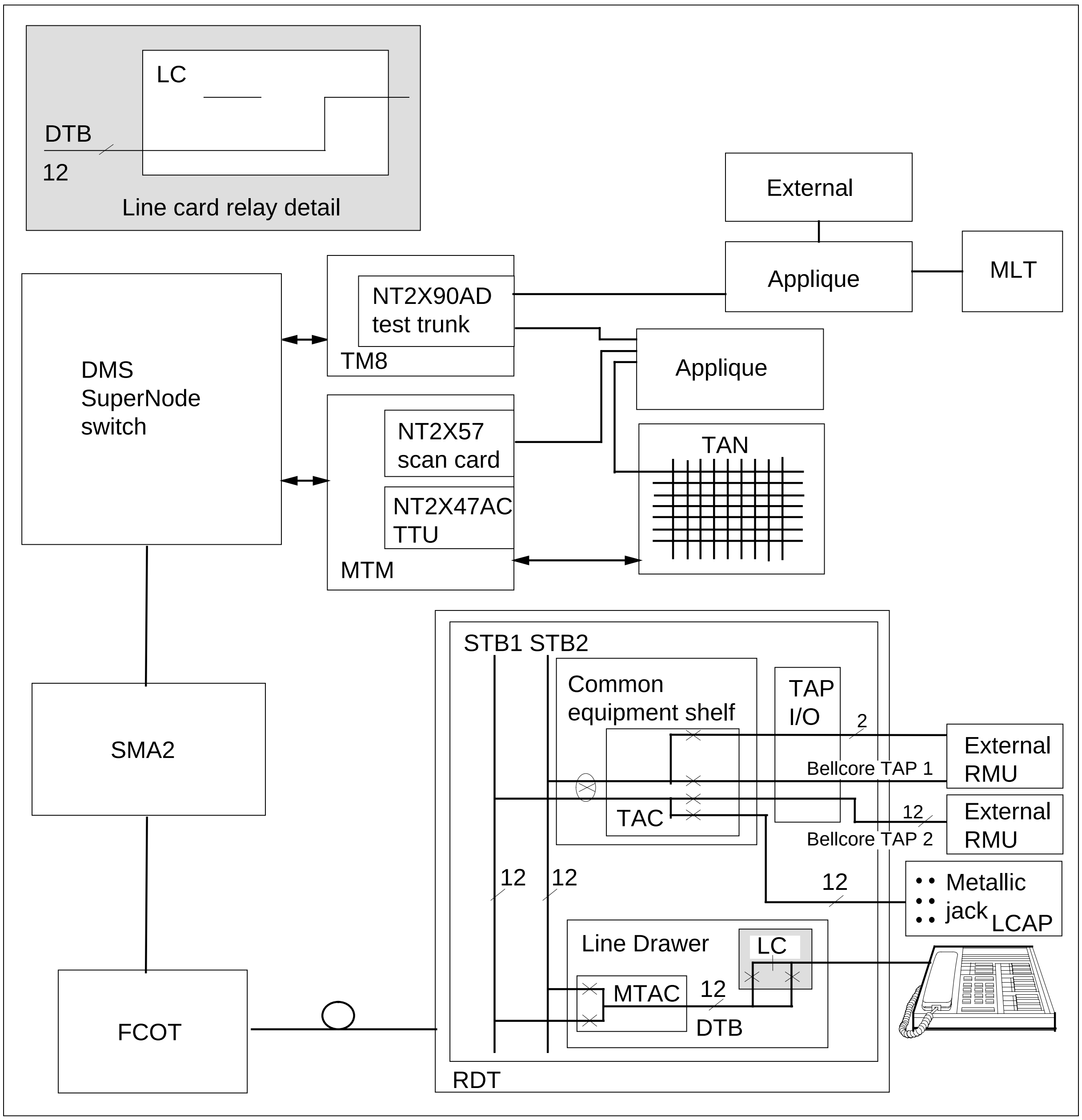
Applique circuit 2 is required to process a request for a Digitone test. The external receiver collects and checks dual tone multi-frequency (DTMF) digits that subscriber station equipment transmits.

Figure 6-46 Test configuration 18



The MLT use test configuration 19 when the RMU option is equipped. The system disconnects the S/DMS AccessNode line card from the subscriber line. The S/DMS AccessNode connects the subscriber line to the RMU. The RMU performs electrical measurements on the subscriber line. Applique circuit 1 provides a DC signature to the MLT to indicate the tested line is on a remote access vehicle. The TAN maintains compatibility with current DMS-100 test access software. The TAN does not provide a connection service in this configuration. The MTM contains the necessary interfaces that control the TAN and applique circuit 1. Applique circuit 2 is required to process a request for a Digitone test. The external receiver collects and checks DTMF digits that the subscriber station equipment transmits.

Figure 6-47 Test configuration 19



Reliance Telecommunication Electronics Inc. (RTEC) use test configuration 20. The system disconnects the S/DMS AccessNode line card from the subscriber line. The S/DMS AccessNode connects the subscriber line to the RTEC T-9/X. The T9/X performs electrical measurements on the subscriber line. The version 6 T-9/SX Remote Test System, or the T-9/15 Automatic Line Test System in the central office (CO) control the T-9/X. The T-9/X communicates with the host controller through a dial-up control path. The system establishes this path at the start of each test. The system maintains the connection until the test completes.

This dial-up path contains the following links:

- The T-9/X connects to a dedicated S/DMS AccessNode line card.
- The T-9/X can detect when the test access connects to a line in the S/DMS AccessNode. After detection occurs, the T-9/X places a call to a dedicated line card in the CO on a LCM.
- The LCM line card connects to the T-916 RTU selector. The T-916 answers the call from the T-9/X and completes the connection to the T-9/15 or T-9/SX.

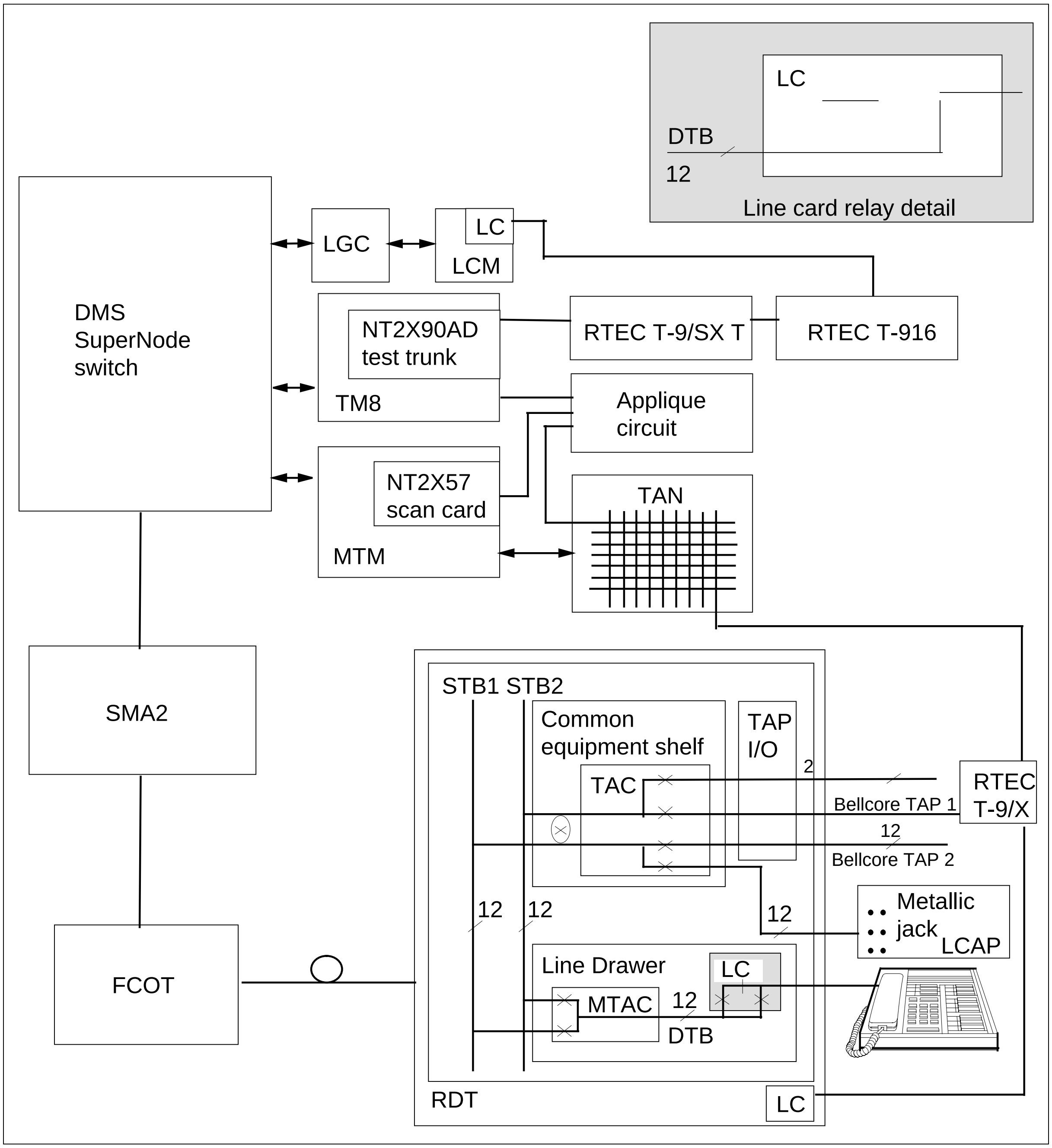
The T-9/SX and T-9/15 can perform interactive tests that require a direct metallic path between the T-9/SX or T-9/15, and the subscriber line.

The following links form this path:

- The S/DMS AccessNode connects the subscriber line to the T-9/X.
- The T-9/X connects the subscriber line to the metallic bypass pair. This action occurs when the T-9/X receives an appropriate command from the host controller.
- The bypass pair connects to a vertical on the TAN.
- The TAN vertical connects to a TAN horizontal.
- A metallic pair connects the TAN horizontal to the applique circuit.
- A metallic pair connects the applique circuit to the NT2X90 test trunk.
- A metallic pair connects the NT2X90 to the T-9/SX or the T-9/15.

The applique circuit provides a DS signature to the T-9/15 or the T-9/SX. The DS signature is to indicate the tested line is on a remote access vehicle. The MTM contains the necessary interfaces to control the TAN and the applique circuit.

Figure 6-48 Test configuration 20



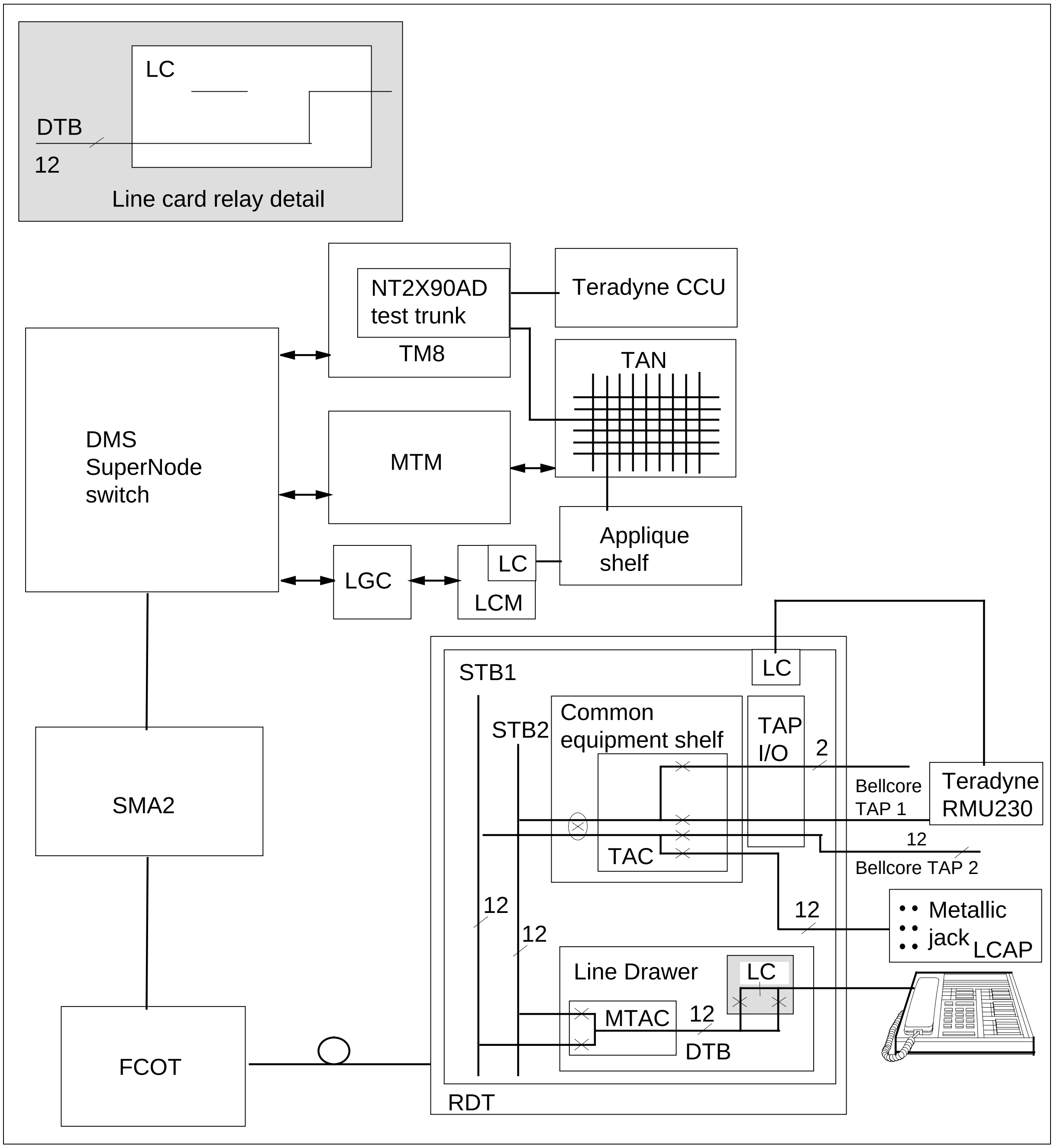
Teradyne uses test configuration 21. The system disconnects the S/DMS AccessNode line card from the subscriber line. The S/DMS AccessNode connects the subscriber line to the RMU230. The RMU230 performs electrical measurements on the subscriber line.

Teradyne CCU controls the RMU230 with a path that the following links form:

- A metallic pair connects the RMU230 to a dedicated S/DMS AccessNode line card.
- A PCM path connects the S/DMS AccessNode line card through the DMS-100 network to a dedicated LCM line card.
- A metallic pair connects the LCM line card to a vertical on the TAN.
- The TAN vertical connects to a TAN horizontal.
- A metallic pair connects the TAN horizontal to the applique circuit.
- A metallic pair connects the applique circuit to the NT2X90 test trunk.
- A metallic pair connects the NT2X90 test trunk to the Teradyne CCU.

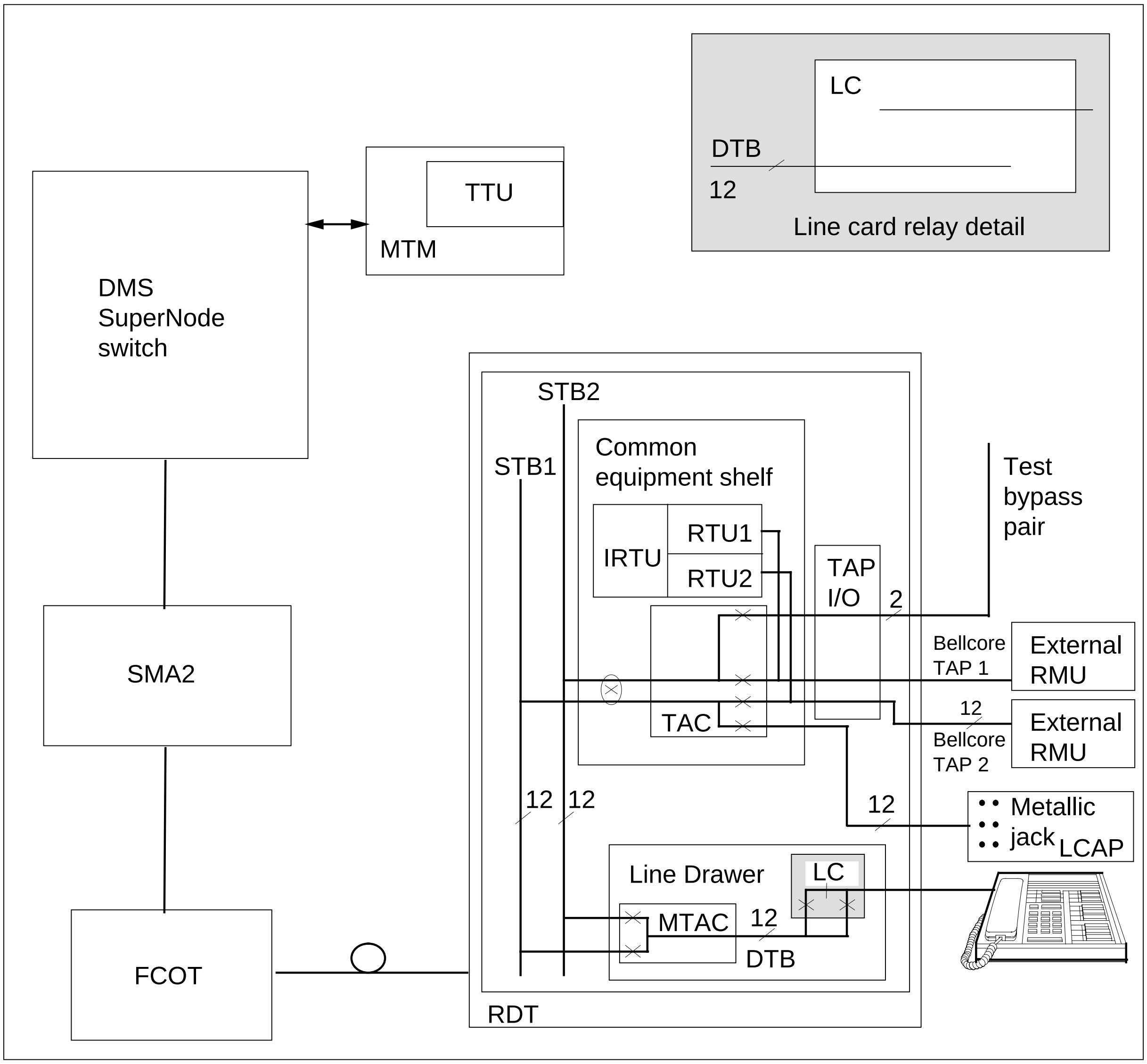
The applique circuit provides a DC signature to inform the Teradyne CCU the tested line is on a remote access vehicle.

Figure 6-49 Test configuration 21



The BAL and BALNET commands use the test configuration 22. A PCM path through the network connects the subscriber line to the TTU. Now, the BAL and BALNET commands are not supported on S/DMS AccessNode lines.

Figure 6-50 Test configuration 22

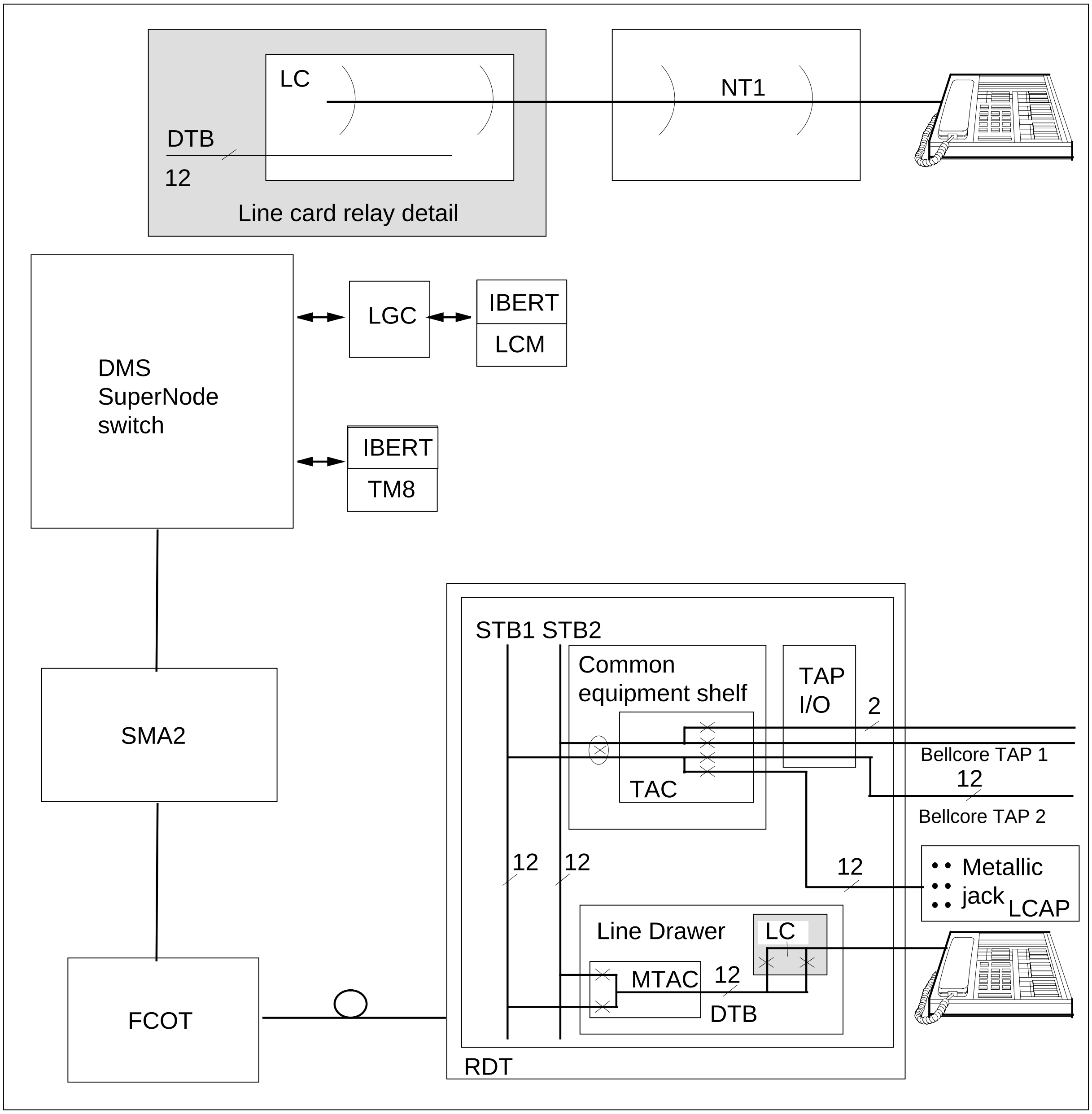


The BERT and LOOPBK commands use test configuration 23. One of the B-channels on the subscriber line connects the NT1 to an integrated bit error rate tester (IBERT) card on a LCM through the following:

- the S/DMS AccessNode
- fiber central office terminal (FCOT)
- SMA2
- digital network
- the line trunk controller (LTC).

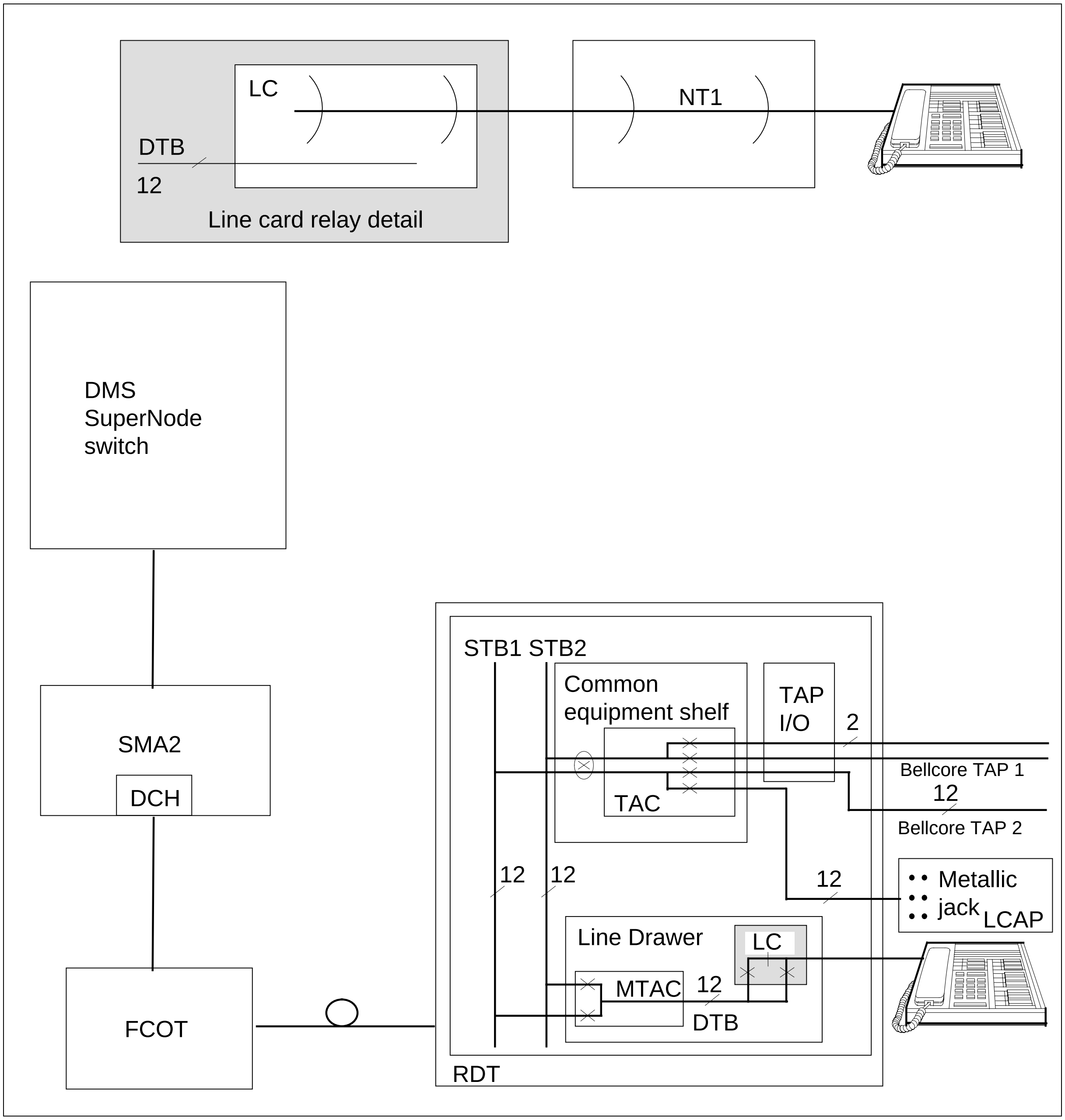
The LOOPBK command causes a loopback point at a point in the S/DMS AccessNode or NT1. The IBERT card injects a continuous test pattern. This pattern passes the B-channel to the loopback point and reflects back. The IBERT card monitors the return signal and maintains data that reflect signal quality.

Figure 6-51 Test configuration 23



The DCHCON command uses test configuration 24. The D-channel on the subscriber line is looped back in the AccessNode or NT1. The number, location, and type of loopback points in the S/DMS AccessNode are to be determined. The NT1 loopback contains a 2B+D loopback. The CM instructs the DCH to insert a test message in the looped back D-channel. In this test configuration, the CM starts the test request message.

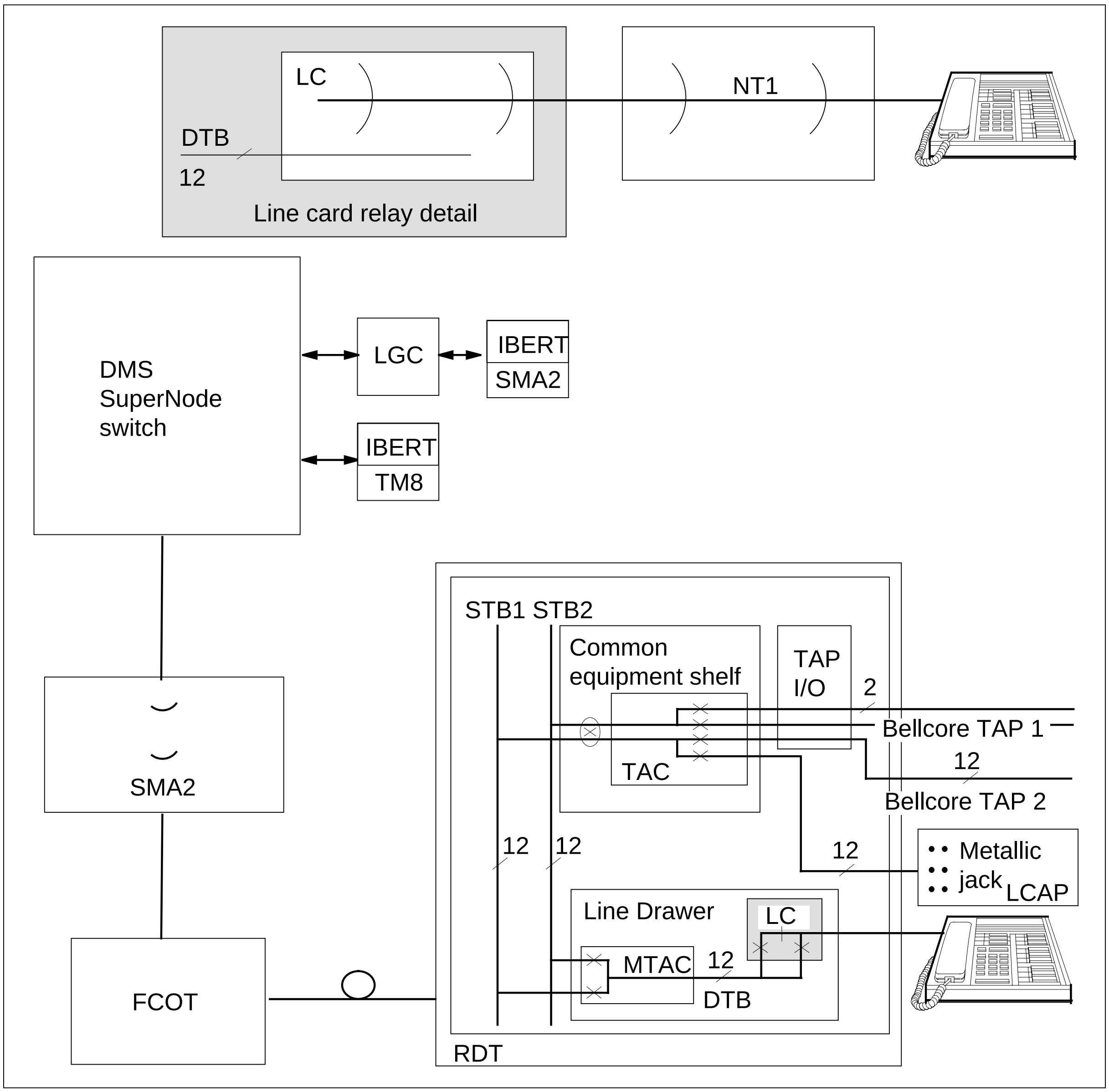
Figure 6-52 Test configuration 24



The BERP command uses test configuration 25. The LOOPBACK command establishes a loopback point at a point in the SMA2, S/DMS AccessNode, or

NT1. The IBERT card inserts a continuous test pattern. This pattern passes to the loopback point and reflects back. The IBERT card monitors the return signal and maintains data that indicate signal quality.

Figure 6-53 Test configuration 25



Product-specific test tools

This section describes test tools for the SMA2.

CALLTRAK

The CALLTRAK is a call processing tool environment that provides complete information on calls. The CALLTRAK provides the ability to select one or more line or trunk terminals. The CALLTRAK collects information on calls made from the selected terminal or terminals. The CALLTRAK tools that are enabled determine the information that CALLTRAK collects.

The TIMECALL is a CALLTRAK tool. To enable TIMECALL, select the terminals, or type CALLTRAK from the CI prompt and select the terminals. The TIMECALL lists call events, real time cost of the events, and the total real time cost for the call.

The SELECT command provides different methods to select an originating terminal. Options TID, TRK, ALL, DN, LEN, or LTID can select terminals. The options TID, DN, and ALL are supported for RDT lines.

MSGTRC

The message trace (MSGTRC) feature provides a sublevel to the master processor (MP) monitor. Operating company personnel can obtain information from Q.931 messages when sent from one enhanced ISDN signaling preprocessor (EISP) task to another. To tailor the trace, the user must use commands available at the MSGTRC sublevel.

For example, the VERBOSE option displays the integrated digital loop carrier (IDLC) subset of Q.931 messages in a simple format. The following figure shows an example of a display where an information element is lost or contains invalid values in the ID number:

Figure 6-54 Example of VERBOSE format for a Q.931 message

```
<0002> SRC:  ISP IDLCSP B4  DEST: ISP IDLCCP 04  BUF#: 003
GET:01:04:35:59.11 SEND:01:04:35:59.11 RELEASE:01:04:35:59.12

     Message Type : SETUP
         CR length :       2
                PD : #4F
         CR Suffix :      0
               CRV :      5
           CR Flag :      0
    *************<reason invalid>**************
    DATA:xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
     xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
     xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
     xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
     xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx
```

The function of the MSGTRC tool depends on the selection of information used to perform the trace. A Narrower message trace selection produces the best trace. To limit the trace to the IDLC subset of Q.931 messages, both the protocol discriminator and message type bytes must have values recognized as the IDLC subset of Q.931 messages. Refer to the following tables and the following figure for descriptions of these values:

Table 6-4 Q.931 message types

Hex	Call establishment messages
01	ALERTing
02	CALL PROCeeding
05	SETUP
07	CONNect
0D	SETUP ACKnowledge

Hex	Call clearing messages
45	DISConnect
4D	RELease
5A	RELease COMplete

Hex	Call supervision messages
7B	INFOrmation
6E	NOTIFY

Hex	Other messages
75	STATUS ENQ
7D	STATUS

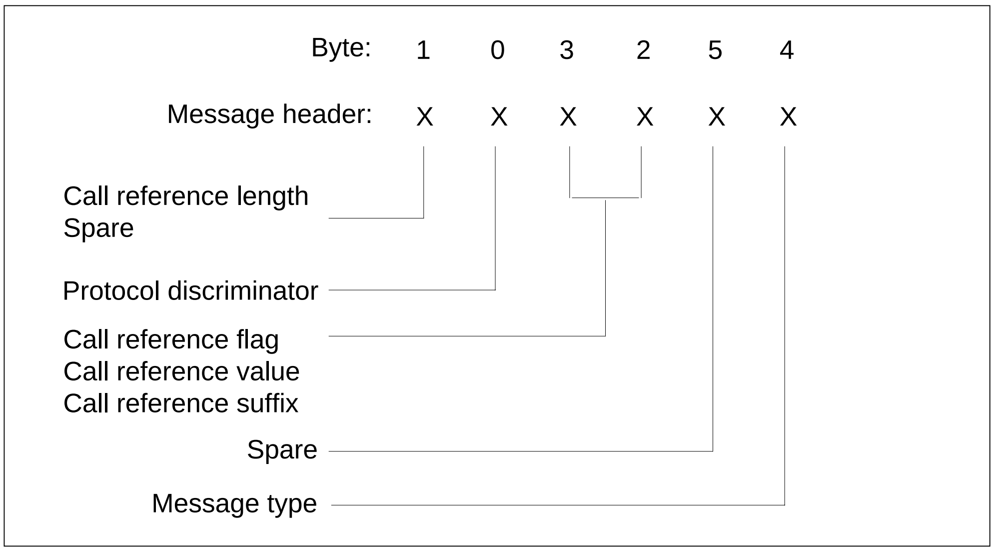
Table 6-5 Q.931 information element identifiers

Hex	Variable length information elements
04	Bearer ability
08	Cause
14	Call state

Table 6-5 Q.931 information element identifiers

Hex	Variable length information elements
2C	Keypad facility
18	Channel notification
27	Notification identifier
34	Signal

Figure 6-55 Byte assignments for Q.931 message header



7 SMA2 troubleshooting chart

The following chart provides operating company personnel with easy access to troubleshooting procedures for Expanded Subscriber Carrier Module-100 Access (ESMA) alarms. Another name for Expanded Subscriber Carrier Module-100 Access (ESMA) is SMA2.

Table 7-1 SMA2 alarm clearing (Sheet 1 of 7)

Alarm condition	Possible cause	Action
SMA2 Critical	Power problems caused both units to be out of service.	Proceed as follows: 1. Verify that you powered up the SMA2. Check for EXT alarm and end aisle alarm lights. 2. Identify SMA2 in critical state. 3. Post and busy the defective SMA2. 4. RTS the defective SMA2. 5. Replace displayed cards in card list. Use correct card replacement procedures. 6. If reply from the peripheral module (PM) does not occur, reset the defective SMA2. 7. If reset fails, load the defective SMA2. 8. Return SMA2 to service.

Table 7-1 SMA2 alarm clearing (Sheet 2 of 7)

Alarm condition	Possible cause	Action
SMA2 Major	Defective card caused one unit to be out of service.	Proceed as follows: 1. Identify the SysB SMA2 unit. 2. Post the defective SMA2 unit. Busy the defective SMA2 unit. 3. Perform out-of-service test. 4. Replace displayed cards in card list. Use correct card replacement procedures. 5. Load SMA2 unit again.
SMA2 Minor	Defective card caused some degradation of service.	Proceed as follows: 1. Identify the in-service trouble (ISTb) SMA2 unit. 2. Post the defective SMA2 unit. Busy the defective SMA2 unit. 3. Perform out-of-service test. 4. Replace displayed cards in card list. Use correct card replacement procedures. 5. RTS SMA2 unit.
	P-side links out-of-service caused some degradation of service.	Proceed as follows: 1. Display P-side links at the MAP terminal. 2. Busy and test system busy (SysB) links. 3. When test fails, replace cards in card list. Test again. 4. When test passes, return links to service.

Table 7-1 SMA2 alarm clearing (Sheet 3 of 7)

Alarm condition	Possible cause	Action
SMA2 Minor (continued)	C-side links out-of-service caused some degradation of service.	Proceed as follows: 1. Display C-side links at the MAP terminal. 2. Busy and test SysB links. 3. When test fails, replace cards in card list. Test again. 4. When test passes, return links to service.
	PM load mismatch with inventory table.	Proceed as follows: 1. Calculate the load the SMA2 must use. 2. Enter correct load name in table LTCINV. 3. Busy, load and return the SMA2 unit to service.
	Data is out of date or static data mismatch with CC.	Proceed as follows: 1. Busy the defective unit. 2. Load the unit with central control (CC) data. 3. Return the unit to service.

Table 7-1 SMA2 alarm clearing (Sheet 4 of 7)

Alarm condition	Possible cause	Action
IDT Critical	Problem is on time-slot management channels (TMC) or common signaling channels (CSC).	Proceed as follows: 1. Identify the SMA2 associated with the damaged integrated digital terminal (IDT). Post the SMA2. 2. When SMA2 has alarms, clear the alarms first. 3. When IDT alarm persists, display SMA2 P-side message links and attempt to return to service (RTS) closed link. 4. When RTS fails, post the SysB IDT and display P-side message channels. 5. When TMC or CSC is not active, busy, and return the TMC or CSC to service. 6. When TMC or CSC alarm continues, make sure path protection is enabled for both TMCs. 7. When TMC or CSC remains out-of-service, busy. RTS the IDT. 8. When alarm continues, busy and test, the defective TMC or CSC for internal continuity. 9. When the internal continuity test fails, post the SMA2 associated with the defective IDT. 10. Busy and test the inactive unit and replace any cards displayed in a card list. 11. Load, test, and RTS the inactive SMA2 unit. 12. RTS the TMC or CSC and set up an external loopback at the RDT.

Table 7-1 SMA2 alarm clearing (Sheet 5 of 7)

Alarm condition	Possible cause	Action
IDT Critical (continued)	CC restart. Link audit occurs when IDT message links go out of service. State mismatch. Unsolicited message limit exceeded.	Proceed as follows: 1. Monitor alarm state. 2. System action can clear the alarm condition.
	Remote digital terminal (RDT) alarms present.	Proceed as follows: 1. Find the number and type of RDT alarms. 2. Clear the error conditions at the RDT.
	SMA2 is system busy (SysB).	The IDT remains CBsy until the SMA2 returns to service. Refer to SMA2 alarm clearing steps.

Table 7-1 SMA2 alarm clearing (Sheet 6 of 7)

Alarm condition	Possible cause	Action
IDT Major and Minor	DS-1 message link busy. Path alarm.	Proceed as follows: 1. Identify the defective IDT. Post the defective IDT. 2. Identify the associated SMA2. Post the associated SMA2. 3. When SMA2 has alarms, clear the alarms first. 4. When IDT alarm continues, display SMA2 P-side message links. 5. Attempt to return SysB link to service. 6. When RTS fails, post the ISTb IDT and display C-side links. 7. Display message channels and identify those on the defective link. 8. Busy the TMC or CSC and EOC on the defective link and test continuity for both channels. 9. Return the TMC or CSC and EOC to service.

Table 7-1 SMA2 alarm clearing (Sheet 7 of 7)

Alarm condition	Possible cause	Action
IDT Major and Minor (continued)	Maintenance connection not established. TMC or CSC P-side node messaging overload. EOC P-side node messaging overload. P-side node messaging system overload on SMA2.	Proceed as follows: 1. Identify the defective IDT. 2. Post the SMA2 associated with the IDT. 3. Identify and post the defective IDT. 4. Display the C-side links. When messaging links close, post the SMA2 and return the correct links to service. 5. At the IDT level, display message channel information. 6. Activate EOC and TMC or CSC paths if not active. 7. Return EOC and TMC or CSC paths to service. 8. When overload conditions remain, check RDT engineering parameters.

8 SMA2 power up and power down procedures

Powering up the SMA2

The SMA2 is part of the host office. Use the general host office procedure. Complete the following steps to power up the SMA2.

At the SMA2:

1 Set the switch on the power converter for unit 0 to the ON position.

2 Press the reset button for SMA2 unit 0. At the same time, tip the circuit breaker that connects to the unit to the up position. Release the circuit breaker. The circuit breaker must stay up. If the circuit breaker does not stay up, the power circuits are defective.

3 Repeat steps 1 and 2 for SMA2 unit 1.

4 To post the SMA2 powered up, type:

>MAPCI;MTC;PM;POST SMA2 sma2_number

5 To busy both SMA2 units, type:

>BSY PM

Go to step 9.

6 To determine the name of the PM load data file, type:

>QUERYPM

Note: The display provides the name of the load file. Cross-reference the name to the disk volume name on the PMLoad File Office Record. You can cross-reference the name to a list of all PM load files maintained in your office.

7 Access the disk utility program. To list all files contained on the disk volume, type:

>DSKUT;LISTVOL volume_name ALL

or

>DSKUT;LF volume_name

8 To exit the disk utility program, type:

>QUIT

9 To load the SMA2, type:

>LOADPM PM

If the LOADPM PM fails and indicates Loadfile not found, go to step 6.

10 To load the firmware of the SMA2, type:

>LOADFW PM

11 To return the SMA2 to service, type:

>RTS PM

12 To load the CMR card, type:

>LOADPM PM CC CMR

13 To prepare to load the EDCH cards, perform the following steps:

1. To access the DCH level, type:

   >DCH

2. To post all EDCH cards, type:

   >POST ALL

3. To busy all EDCH cards:

   >BSY ALL

4. To load the EDCH cards, type:

   >LOADPM

5. To return all EDCH cards to service, type:

   >RTS ALL

14 This procedure is complete.

Powering down the SMA2

Use the following steps to power down the SMA2.

At the SMA2:

1 To post the SMA2 for shut-down, type:

>MAPCI;MTC;PM;POST SMA2 sma2_number

2 To busy the SMA2, type:

>BSY PM

3 To set to offline the SMA2 busied in step 2, type:

>OFFL

4 To remove the power from the SMA2, set the switch on the power converters in both units to OFF.

5 This procedure powers down the SMA2.

9 SMA2 recovery procedures

This section contains recovery procedures for the Expanded Subscriber Carrier Module-100 Access (ESMA) and references to recovery procedures. Another name for ESMA is SMA2. These procedures describe how to recover an SMA2 manually. Maintenance engineering and field maintenance personnel use these procedures.

Recovering an out of service SMA2

Application

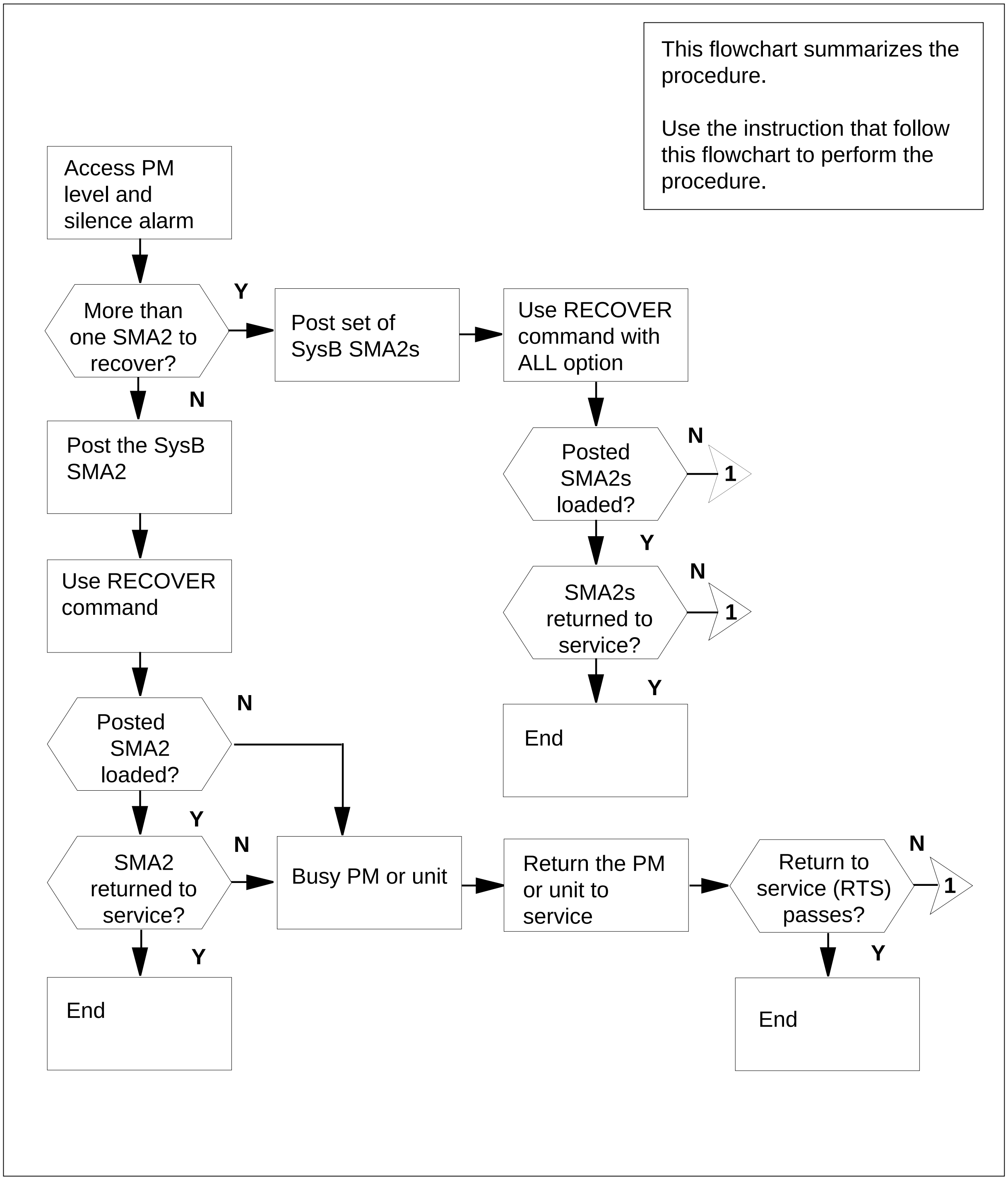
Use this procedure to return a system busy (SysB) SMA2 to service.

Action

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

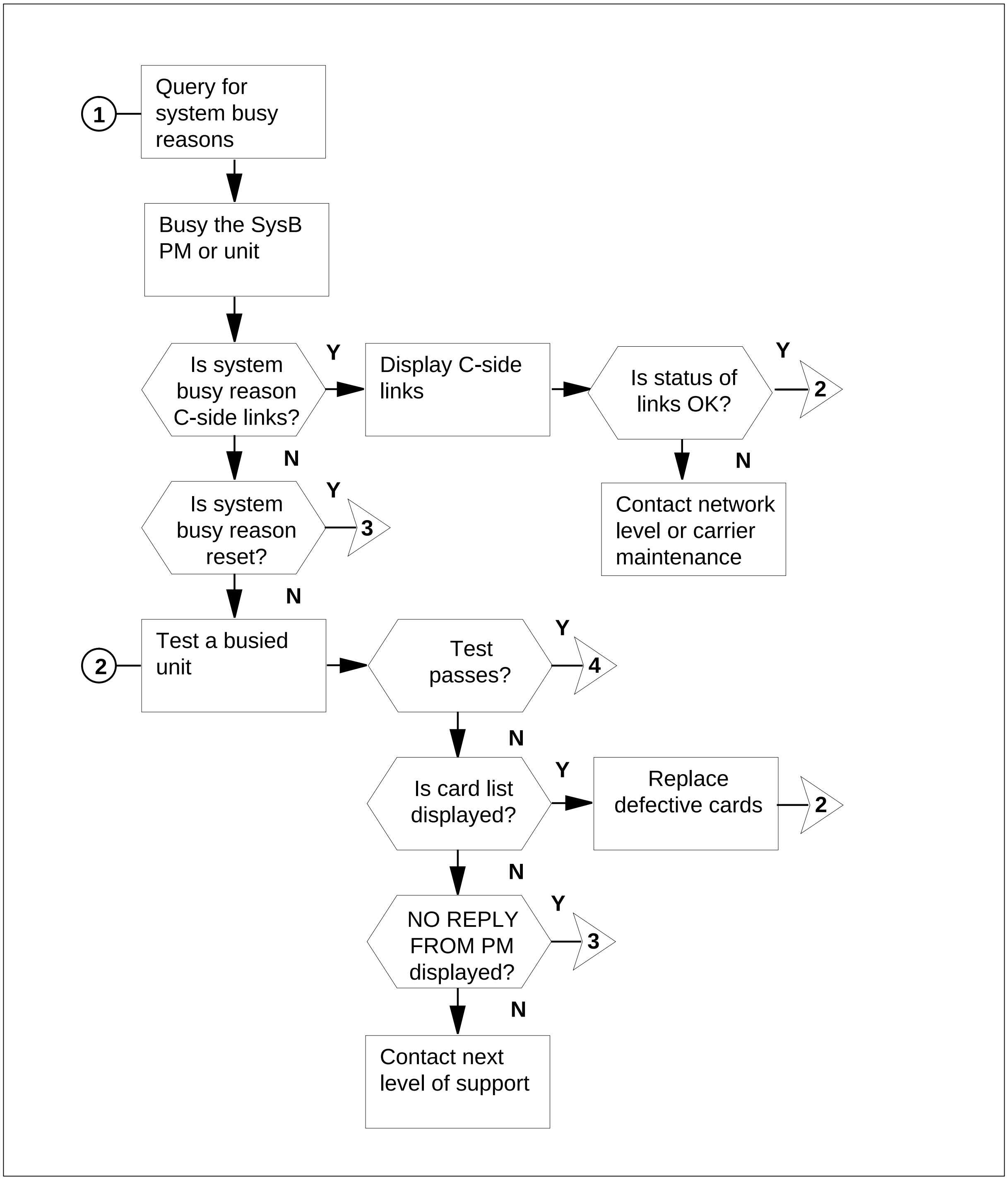
Recovering an out of service SMA2 (continued)

Summary of Recovering an out of service SMA2



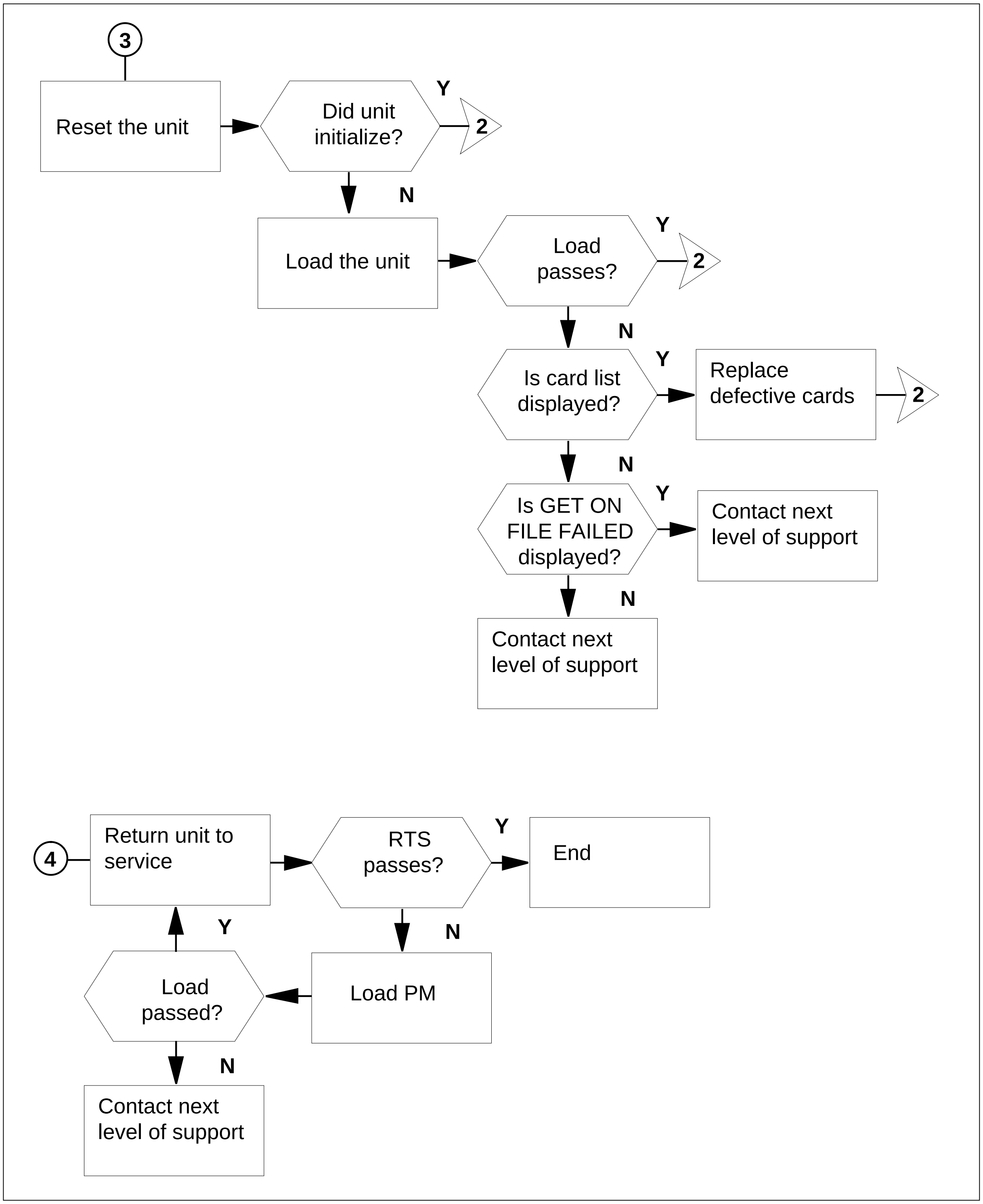
Recovering an out of service SMA2 (continued)

Summary of Recovering an out of service SMA2 (continued)



Recovering an out of service SMA2 (continued)

Summary of Recovering an out of service SMA2 (continued)



Recovering an out of service SMA2 (continued)

Recovering an out of service SMA2

At the MAP terminal

1 When the system detects a fault, the system can trigger an audible alarm. Access the peripheral module (PM) level of the MAP display. To silence the alarm, type

>MAPCI;MTC;PM;SIL

and press the Enter key.

2 To display the SysB SMA2, type

>DISP STATE SYSB SMA2

and press the Enter key.

Example of a MAP response:

```
SysB SMA2: 0
```

If	Do
one SMA2 is SysB	step 5
more than one SMA2 is SysB	step 3

3 To access the set of SysB SMA2s, type

>POST SMA2 SYSB

and press the Enter key.

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0     1     3     2    13
    SMA2    2     0     0     3     0     7

SMA2 0 SysB  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   SysB
Unit1:  Inact SysB
```

4 To recover the SysB SMA2s 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 SMA2s.
Please Confirm (“YES” or “NO”):
```

Note: In the MAP terminal response, *n* is the number of all SMA2s in the posted set.

Recovering an out of service SMA2 (continued)

5 To confirm the need for the recovery operation, type

>YES

and press the Enter key.

Go to step 8.

6 To access the SysB SMA2, type

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the number of the SMA2 identified in step 2

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     3     2    13
    SMA2    1     0    0     3     0    7

SMA2 0 SysB  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   SysB
Unit1:  Inact SysB
```

7 To recover the SysB SMA2s with the PM recovery tool, type

>RECOVER

and press the Enter key.

Example of a MAP response:

```
recover
SMA2 1  Recover request submitted
```

8 The following is an example of a recover request for each posted SMA2. The recovery tool submits the recover request.

Example of a MAP response:

```
SMA2 0 Recover request submitted
SMA2 1 Recover request submitted

SMA2 n Recover request submitted
```

The recovery tool determines which of the posted SMA2s need recovery. For each SMA2 that needs recovery, the recovery tool attempts to load the PM units 0 and 1. For each SMA2 loaded and all other SMA2s that need recovery, the recovery tool attempts to RTS the active unit.

The following actions occur in the example:

- SMA2 0 is loaded and returned to service.
- SMA2 1 is returned to service.

Recovering an out of service SMA2 (continued)

- SMA2 2 failed to load unit 0, but loaded unit 1. SMA2 2 returns unit 1 to service.
- SMA2 3 failed to load.

Example of a MAP response:

```
SMA2 1 Recover passed
SMA2 0 Unit 0  LoadPM passed
SMA2 0 Unit 1  LoadPM passed
SMA2 2 Unit 0  LoadPM failed
              Failed to initialize
SMA2 2 Unit 1  LoadPM passed
SMA2 3 Unit 0  LoadPM failed
              Failed to initialize
SMA2 3 Unit 1  LoadPM failed
              Failed to initialize
SMA2 2 Unit 0  Reloading required.
              RTS attempted on mate
SMA2 0 Recover passed
SMA2 2 Recover passed
 .
SMA2 n Recover passed
```

The recovery tool provides a summary of the operation. The following example displays the summary.

Example of a MAP response:

```
Summary:
3 passed
1 failed
```

9 Determine if all the SMA2s recovered.

If	Do
all SMA2s recover	step 34
one or more SMA2s do not recover	step 10

Note: The recovery process places 1 unit InSv and 1 unit ManB. To complete the recovery process, refer to the appropriate alarm clearing procedure in the *Alarm Clearing Procedures* section.

10 Record the SMA2s that do not recover.

Recovering an out of service SMA2 (continued)

11 Work on the SMA2s with both units out-of-service. Use the *Alarm Clearing Procedures* to clear any SMA2s with 1 unit out-of-service.

If	Do
one or more SMA2s cannot be loaded and both units are out-of-service	step 12
one unit of a SMA2 cannot be loaded or returned to service	step 34

12 To post the SysB SMA2, type

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the number of a SMA2 recorded in step 10

13 To busy the SysB SMA2, type

>BSY PM

and press the Enter key.

14 To return the SMA2 to service, type

>RTS PM

and press the Enter key.

Note: The system can respond with instructions to RTS 1 unit after an RTS PM fails. In this event, ignore this message and follow the If-Do table below.

If RTS	Do
passes on both units	step 33
fails on one or both units	step 15

15 To check for fault indicators, type

>QUERYPM FLT

and press the Enter key.

16 Determine if one or both units need recovery.

If recovery is needed	Do
on both units	step 17
on one unit	step 34

Recovering an out of service SMA2 (continued)

17 Identify the error message reported in step 15.

If the error reason is	Do
activity dropped	step 18
CC audit	step 18
diagnostics failed	step 18
PM audit	step 18
self test failed	step 18
trap	step 18
unsol exceeded	step 18
reset	step 22
C-Side links	step 30
load fails	step 19
none of the above	step 35

18 To return the unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the number of one of the units made busy in step 13

If RTS	Do
passes	step 36
fails (initial failure)	step 19
fails (subsequent failures)	step 20

19 To reload the unit, type

>LOADPM UNIT unit_no CC

and press the Enter key.

where

Recovering an out of service SMA2 (continued)

unit_no
is the number of the unit that did not RTS in step 18

If LOADPM	Do
passes	step 18
fails	step 20

20 Identify the failure message.

If display	Do
is `NO REPLY FROM PM`	step 21
is `FAIL MESSAGE RECEIVED 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 appeared earlier.

If message	Do
appeared before	step 35
is the first time this message appeared	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 busied in step 13

Note: The MAP terminal indicates the reset events, as the events occur, when the unit is reset. These events occur in the order that appears in the following MAP response.

Example of a MAP response:

Recovering an out of service SMA2 (continued)

```
RESET
 STATUS
 RUN
 INITIALIZE
 LOADING DATA
```

If unit	Do
fails to initialize	step 23
initializes	step 27

23 Determine if the `NO REPLY FROM PM` message appeared.

If	Do
appeared	step 35
is no longer displayed	step 24

24 Determine if the `NO WAI AFTER RESET` message appears.

If	Do
appears	step 25
does not appear	step 18

25 Observe the card list at the MAP terminal.

Example of a MAP response:

```
SITE FLR RPOS  BAY_ID SHF DESCRIPTION SLOT EQPEC
HOST  00  M07  CMVI 00  06  SMA2 : 000  03  AX74
HOST  00  M07  CMVI 00  06  SMA2 : 000  25  AX74
```

If all cards	Do
are replaced	step 35
are not replaced	step 26

26 Refer to *Card Replacement Procedures* for the next card on the list. After you check *Card Replacement Procedures*, go to step 17 of this procedure.

27 To load the unit, type

>LOADPM UNIT unit_no CC

and press the Enter key.

where

Recovering an out of service SMA2 (continued)

unit_no
is the number of the unit you want to load

If LOADPM	Do
passes	step 18
fails	step 28

28 Identify the failed load reported in step 27.

If message that appears	Do
is `NO WAI AFTER RESET`	step 25
is `FAIL ROM DIAG`	step 25
is `GET ON FILE FAILED`	step 29
is none of the above	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 central-side (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 of the numbers and conditions of the links.

If	Do
MS link condition is CLS	step 32
status of all links is not OK	step 32
status of all links is OK	step 18

32 A problem with the network interface card or the enhanced network (ENET) port interface card is the probable cause. Contact the next level of support.

33 Recover the next SMA2 unit or next SMA2 PM recorded in step 10.

If	Do
another SMA2 PM needs recovery	step 12

Recovering an out of service SMA2 (end)

If	Do
all SMA2 PMs are recovered	step 36

34 ,Refer to the *Alarm Clearing Procedures* manual, to determine the next correct steps.

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

36 The procedure is complete. If other alarms appear, perform the appropriate alarm clearing procedures.

Recovering an RDT

Application

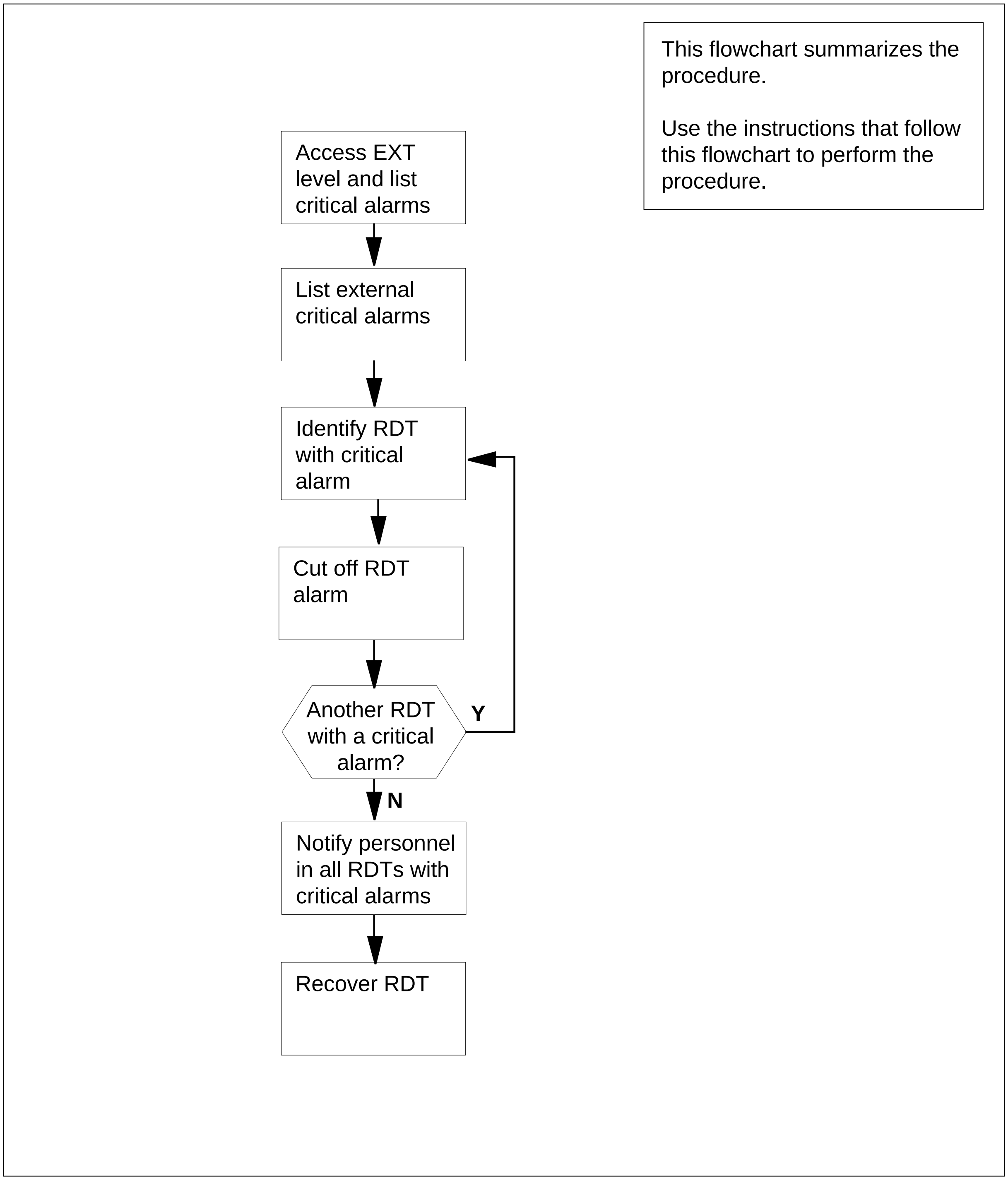
Use this procedure to return to service (RTS) an remote digital terminal (RDT) busied by the system (SysB).

Action

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

Recovering an RDT (continued)

Summary of Recovering an RDT



Recovering an RDT (continued)

Recovering an RDT

At the MAP terminal

1 When the system detects an RDT failure, the system raises a critical alarm at the EXT level of the MAP display. Access the EXT level when the system raises a critical EXT alarm, type

>MAPCI;MTC;EXT

and press the Enter key.

2 When the system detects a fault, the system can trigger an audible alarm. To silence the alarm, type

>SIL

and press the Enter key.

3 To determine if the external critical alarms relate to an RDT, type

>LIST CRIT

and press the Enter key.

If RDT CRIT	Do
appears	step 5
does not appear	step 4

4 Identify the unit that causes the alarm. Refer to correct documentation to correct the problem.

5 To determine the signal distribution (SD) alarm points that operate for each critical alarm, type

>DISP SDALARM

and press the Enter key.

A series of SD points that correspond to the location of the RDT appears. One SD point that corresponds to the state of the active alarm also appears. The system displays SD points for one RDT at a time. The RDT with the most important condition is the RDT that appears.

Example of a MAP terminal display:

Recovering an RDT (continued)

```
CM      MS      IOD      Net      PM      CCS      Lns     Trks      Ext   Appl
                                  2IDT                              2 Crit
 *       *       *        *       *C*      *        *       *        *C*

Ext
 0 Quit         Ext Alarms      Crit   FSP      Major   Minor   NoAlm
 2              EXT:             1      0         0       0       0
 3
 4              DISP SDALARM
 5              SD Points In Alarm State
 6              RDTSD1
 7 List_        RDTSD3
 8 TstDSAlm     RDTSD8
 9 SetSD_       RDTCRIT
10 SetSC_
11 Disp_
12
13 _Crit
14 _FSP
15 _Maj
16 _Min
17 _NoAlm
18
   userid
Time  hh:mm >
```

6 Record all the RDT SD points (RDTSDn) associated with each RDTCRIT alarm.

For example, in the MAP display shown in step 5, record the following in association with the RDTCRIT alarms:

- RDTSD1
- RDTSD3
- RDTSD8

The SD points (RDTSDn) displayed identify each RDT in table RDTINV.

7 To silence the alarm, type

>SETSC RDTALRMCO OP;SETSC RDTALRMCO REL

and press the Enter key.

The scan point for the RDT alarm cut-off operates and releases. If other RDTs with alarms are present, the system displays the RDT with the most critical alarm. The system displays the signal distribution points for at least

Recovering an RDT (continued)

20 s a more critical alarm occurs or the system does not activate the alarm cutoff.

If the system	Do
shows other RDT alarms	step 3
shows no other RDT alarms	step 8

8 To access table RDTINV from the CI level of the MAP display, type

>TABLE RDTINV

and press the Enter key.

Example of a MAP response:

```
TABLE:  RDTINV
```

9 To display table RDTINV headings, type

>HEADING

and press the Enter key.

Example of a MAP response:

```
RDTNAME      ADNUM            IDTNAME              NENAME
             PRIMOPC                              BACKOPC
                                           VARTYPE
                                                MTSTACPT
                                                 LINKTAB
PROT       POTSPADG            EOC
                                                SDPOINTS
                                                   RDTDN
```

10 To display the tuple that contains the pattern identified in step 6, type

>LIST ALL (SDPOINTS eq `sdpoint_name sdpoint_name')

and press the Enter key.

where

sdpoint_name
is the signal distribution point pattern identified in step 5

The tuple that contains the specified pattern appears.

Example of a MAP response:

Recovering an RDT (end)

```
RDTNAME      ADNUM       IDTNAME              NENAME
           PRIMOPC                         BACKOPC
                                           VARTYPE
                                              MTSTACPT
                                               LINKTAB
      PROT     POTSPADG       EOC
                                            SDPOINTS
                                                RDTDN
------------------------------------------------------
 REM3  0 1   3     SMA2 0 0                     $
          $                                 $
                              GENTMC   7 96  Y  Y
                                                 $
                                    (1 0) (2 1)  $
 N        STDLN         S         C              $
                                                 $
(NETWORK_ID 1) (NETWORKELEMENT_ID 14)            $
```

11 Identify the name of the RDT that experiences the critical alarm. For example, the name of the RDT in step 10 is REM3.

12 Notify operating company personnel at each RDT that experiences a critical alarm.

13 To recover the RDT, refer to correct RDT documentation.

Recovering an S/DMS AccessNode

Application

Use this procedure to return to service an S/DMS AccessNode that the system busied.

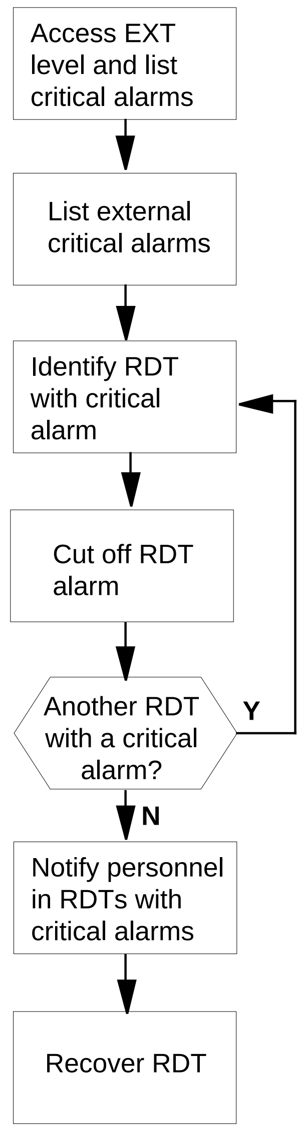
> ***Note:*** Remote digital terminal (RDT) is a generic term. The S/DMS AccessNode remote fiber terminal (RFT) is one type of RDT. In an integrated S/DMS AccessNode configuration, the term RDT means RFT.

Action

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

Recovering an S/DMS AccessNode (continued)

Summary of Recovering an S/DMS AccessNode



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

Recovering an S/DMS AccessNode

At the MAP terminal

1 When the system detects an RDT failure, the system raises a critical alarm at the EXT level of the MAP display. To access the EXT level when the system raises a critical EXT alarm, type

>MAPCI;MTC;EXT

and press the Enter key.

2 When the system detects a defect, the system can trigger an audible alarm. To silence the alarm, type

>SIL

and press the Enter key.

3 To determine if the external critical alarms are related to an RDT, type

>LIST CRIT

and press the Enter key.

If the display	Do
lists RDT CRIT	step 5
does not list RDT CRIT	step 4

4 An S/DMS AccessNode is not the external unit that causes the EXT critical alarm. Identify the unit that causes the alarm. Refer to appropriate documentation to correct the problem.

5 To determine which signal distribution (SD) alarm points operate for each critical alarm, type

>DISP SDALARM

and press the Enter key.

A series of SD points that correspond to the location of the RDT appears. A single SD point that corresponds to the state of the active alarm also appears. Only SD points for one RDT appear one at a time. The RDT with the most severe condition is the RDT that appears.

Example of a MAP terminal display:

Recovering an S/DMS AccessNode (continued)

```
 CM     MS     IOD     Net     PM     CCS     Lns     Trks      Ext   Appl
                               2IDT                             2 Crit
  *      *      *       *      *C*     *       *       *        *C*

 Ext
  0 Quit        Ext Alarms     Crit   FSP      Major   Minor   NoAlm
  2             EXT:            1      0         0       0       0
  3
  4             disp sdalarm
  5             RDTSD1
  6             RDTSD3
  7 List_        RDTSD8
  8 TstDSAlm    RDTCRIT
  9 SetSD_
 10 SetSC_
 11 Disp_
 12
 13 _Crit
 14 _FSP
 15 _Maj
 16 _Min
 17 _NoAlm
 18
    userid
 Time  hh:mm >
```

6 Record all the RDT SD points (RDTSDn) associated with each RDTCRIT alarm. For example, in the MAP display that appear in step 5, record RDTSD1, RDTSD3, and RDTSD8 in association with the RDTCRIT alarm. The SD points (RDTSDn) identify each RDT in table RDTINV.

7 To cut off the alarm, type

>SETSC RDTALRMCO OP;SETSC RDTALRMCO REL

and press the Enter key.

The scan point for the RDT alarm cut-off operates and releases. If other RDTs with alarms, the RDT with the most severe alarm appears. Signal distribution points appear for a minimum of 20 s. If a more critical alarm does not occur or the alarm cutoff is not activated.

If	Do
there are other RDT alarms	step 3
there are no other RDT alarms	step 8

8 To access table RDTINV from the CI level of the MAP display, type

>TABLE RDTINV

and press the Enter key.

Recovering an S/DMS AccessNode (continued)

Example of a MAP response:
TABLE: RDTINV

9 To display table RDTINV headings, type

>HEADING

and press the Enter key.

Example of a MAP response:

```
RDTNAME      ADNUM           IDTNAME            NENAME
             PRIMOPC                           BACKOPC
                               VARTYPE   CLAPDFLT
                                             MTSTACPT
                                              LINKTAB
PROT       POTSPADG           EOC
                                              SDPOINTS
                                                 RDTDN
```

10 To display the tuple that contains the pattern identified in step 6, type

>LIST ALL (SDPOINTS eq `sdpoint_name sdpoint_name')

and press the Enter key.

where

sdpoint_name
is the signal distribution point pattern identified in step 5

The tuple that contains the specified pattern appears.

Example of a MAP response:

```
RDTNAME     ADNUM      IDTNAME             NENAME
           PRIMOPC                      BACKOPC
                              VARTYPE   CLAPDFLT
                                           MTSTACPT
                                            LINKTAB
PROT    POTSPADG       EOC
                                          SDPOINTS
                                               RDTDN
------------------------------------------------------
 REM3  0 1   3     SMA2 0 0               AccessNode
        BRTPY205                            $
                              RFT 1 7 1  96  Y    $
                                (TBP 12   2 3 N)  $
                            (1 0) (2 3) (4 5)     $
 N        STDLN         S
 RDTSD1 RDTSD3 RDTSD6  $
(NETWORK_ID 1) (SYSTEM_ID 1) (NETWORKELEMENT_ID 14)
(EQUIPMENT_ID 1)  $
```

11 Identify the name of the RDT that experiences the critical alarm. For example, the name of the RDT in step 10 is REM3.

Recovering an S/DMS AccessNode (end)

12 Notify operating company personnel for each RDT that experiences a critical alarm.

13 Use S/DMS AccessNode documentation to recover the RDT. Refer to *S/DMS AccessNode Maintenance, Alarm and Trouble Clearing Procedures* for details.

14 The procedure is complete.

Reference

You need to access *S/DMS AccessNode Alarm and Trouble Clearing Procedures*.

10 SMA2 alarm clearing procedures

This section contains alarm clearing procedures for the Expanded Subscriber Carrier Module-100 Access (ESMA or SMA2). The procedures describe alarm clearing tasks which maintenance engineering and field maintenance personnel use.

PM DCH major

Alarm display

CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**1DCH**	.	.	.	.	.
				M					

Indication

The alarm code DCH appears under the PM header at the MTC level of the MAP display. This code indicates a D-channel handler (DCH) alarm.. A number precedes the code, and an M appears below the code. The number preceding the alarm code indicates the number of DCHs affected. The M indicates that the alarm class is major.

The multivendor interface (MVI) 28 project provides enhanced DCH (EDCH) circuit cards. References to the DCH circuit card in this document apply to the EDCH circuit card provided.

Meaning

A DCH is system busy. A system-busy DCH resides in a peripheral module (PM). A system-busy causes the PM to go in-service trouble (ISTb). A DCH can be system-busy for the following reasons:

- the ISDN signaling preprocessor (ISP) and the central control (CC) cannot communicate with the DCH
- a DCH returns to service from a C-side busy state
- a DCH undergoes system-initiated diagnostics
- a DCH initializes after the PM starts again.
- a DCH takeover failed
- a DCH appears to be babbling
- traps caused a DCH reset

Result

The affected DCH cannot support ISDN service. The system automatically reassigns ISDN service groups (ISG) to the spare DCH. All offices are equipped with DCH sparing.

Common procedures

This procedure references the common procedure “Loading a PM".

PM DCH
major (continued)

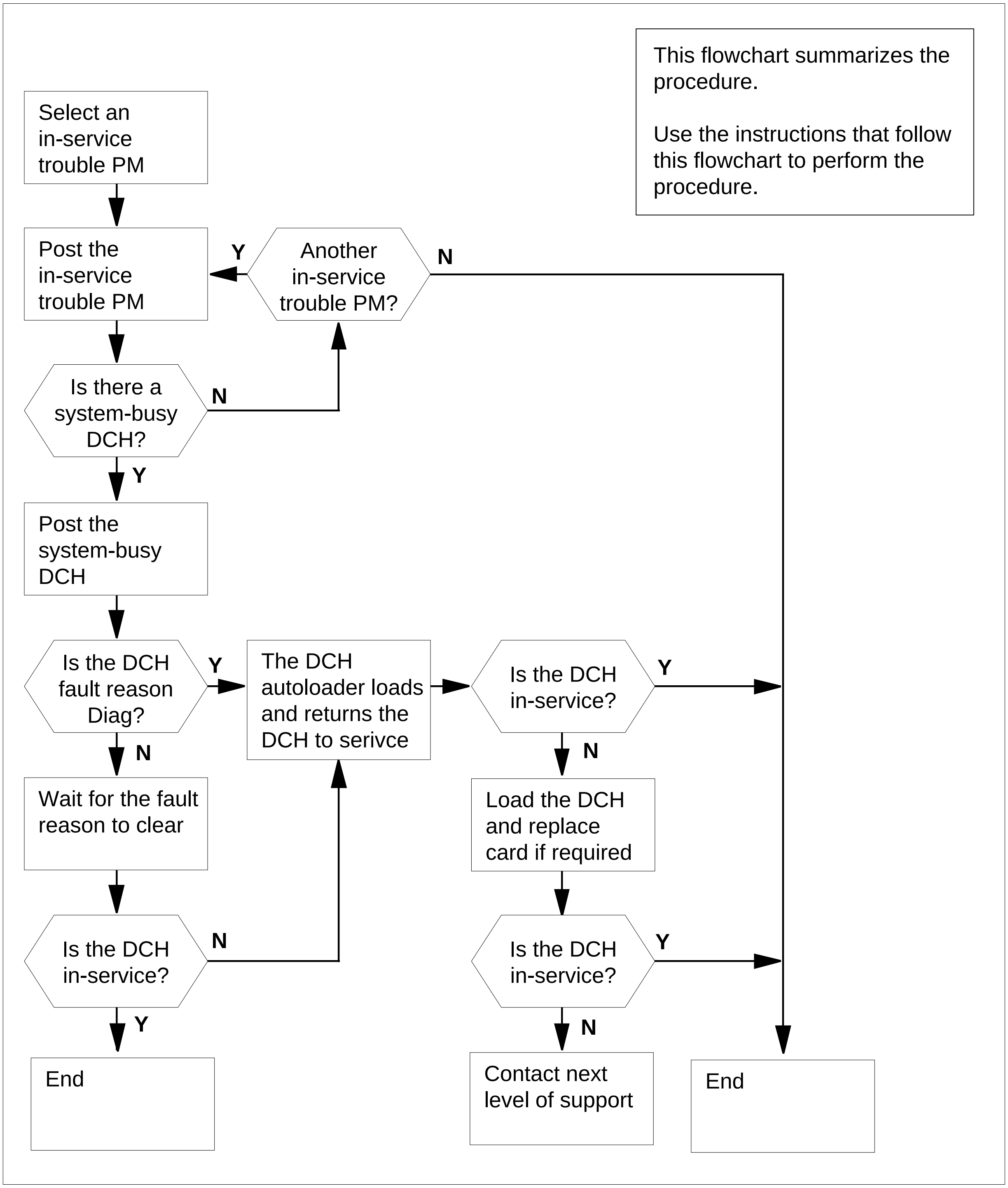
Do not go to the common procedure unless the step-action procedure directs you to go.

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 DCH
major (continued)

Summary of clearing a PM DCH major alarm



PM DCH
major (continued)

Clearing a PM DCH major alarm

At the MAP terminal

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

>MAPCI;MTC;PM

and press the Enter key.

Example of a MAP response:

```
              SysB    ManB    OffL    CBsy    ISTb    InSv
PM               8       0      19      19       3      13
```

2 To display all in-service trouble PMs, type

>DISP STATE ISTB

and press the Enter key.

Example of a MAP response:

```
ISTb LTC : 0,10,90
ISTb LCME: 30
ISTb SMA2: 1
```

3 Record the PM type and the PM numbers for all in-service trouble for PMs that are equipped with DCHs.

Note: The system displays the PM type to the right of the ISTb header in the MAP display response. The PM number for each in-service trouble PM appears to the right of the PM type. Where multiple in-service trouble PMs are present, commas separate the PM numbers.

4 To post a PM from the list recorded at step 3, type

>POST SMA2 sma2_no

and press the Enter key.

where

pm_no
is the SMA2 number recorded at step 3

Example input:

>POST SMA2 1

Example of a MAP response:

```
          SysB    ManB    OffL    CBsy    ISTb    InSv
PM           8       0      19      19       3      13
SMA2         0       0       0       0       1       1

SMA2     1 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:   Act   InSv
Unit1:   Inact InSv
```

PM DCH
major (continued)

5 To access the DCH level of the MAP display, type

>DCH

and press the Enter key.

Example of a MAP response:

```
          SysB    ManB    OffL    CBsy    ISTb    InSv
PM           8       0      19      19       3      13
SMA2         0       0       0       0       1       1

SMA2      1 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:    Act   InSv
Unit1:    Inact InSv

DCH          2       1       0       0       2       1
```

Note: The states for all DCHs associated with the posted SMA2 appear on the bottom line of the MAP display.

6 Determine the states of the DCHs.

If	Do
one or more DCHs are system busy	step 7
all DCHs for the posted PM are in-service or in-service trouble (ISTb)	step 20

7 To post all system busy DCHs type

>POST SYSB

and press the Enter key.

Example of a MAP response:

```
            SysB    ManB    OffL    CBsy    ISTb    InSv
PM             8       0      19      19       3      13
SMA2           0       0       0       0       3       4

SMA2      1 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:    Act   InSv
Unit1:    Inact InSv

DCH            2       1       0       0       2       1
DCH   82 ISG 200 SysB LTC    0 port  3 Access error
```

PM DCH
major (continued)

Note: When two or more DCHs are included in the posted set, the system displays each DCH one at a time. The system begins the display with the first member of the posted set.

8 Determine the fault reason for the displayed DCH.

Note: The fault reason appears at the end of the line for the current DCH of the posted set. In the example at step 7, the fault reason is Access error.

If the fault	Do
displayed is `Diag`	step 10
displayed is other than listed here	step 9

9 Wait 1 min for the fault to clear.

If within 1 min	Do
the state of the DCH is system busy, and the fault reason is `Diag`	step 10
the state of the DCH is system busy, and the fault reason is not changed	step 10
the state of the DCH is in-service or in-service trouble	step 19

Note: The DCH autoloader loads and returns to service one DCH at a time. Log DCH604 documents which DCHs the loader has an effect on.

10 To cancel any maintenance action that can be in progress for this DCH, type

>ABTK

and press the Enter key.

Note: The autoloader services one DCH at a time. The operating company might decide to abort the autoloader process and manually load multiple DCHs in parallel. Manually loading DCH cards in parallel is faster than the autoloader process.

11 To manual busy the DCH, type

>BSY

and press the Enter key.

Example of a MAP response:

```
DCH 82 Bsy Passed
```

PM DCH
major (continued)

12 To return the DCH to service, type

>RTS

and press the Enter key.

Example of a MAP response:

```
DCH 82   Out-of-service test initiated
Fail message received from PM
Site Flr RPos   Bay_id   Shf  Description   Slot     EqPEC
HOST  01 B02   CMVI 00  06   SMA2 : 001      14      BX02
DCH 82 Tst Failed Testid :  DCHIFdiag
```

If the RTS command	Do
passed, and the DCH is in-service or in-service trouble	step 19
failed, and the DCH is manual busy and the system does not gnerate a card list	step 13
failed and the system gnerates a card list	step 13

13 To replace the first or next card on list, go to the correct card replacement procedure.

14 To load the DCH, type

>LOADPM

and press the Enter key.

Example of a MAP response:

```
Request submitted on DCH 82
DCH 82  load Passed : EDH81AZ
```

If the LOADPM command	Do
passed	step 17
failed, first failure	step 14
failed, more than one time	step 18

15 Perform the procedure Loading a PM in this document. Complete the procedure and return to this point.

PM DCH
major (continued)

16 Determine your next step.

If the procedure Loading a PM	Do
is successful	step 17
is not successful	step 16

17 Perform the correct procedure in *Card Replacement Procedures* to change the DCH (NTBX02) card. When you have completed the procedure, return to step 13.

18 To return the DCH to service, type

>RTS

and press the Enter key.

Example of a MAP response:

```
DCH 82 Out–of–service test initiated
DCH 82 Tst Passed
DCH 82 Rts Passed
```

If the RTS command	Do
passes, and the DCH is either in-service or in-service trouble	step 19
fails, and the DCH continues to be manual busy	step 18

19 Record the following information about the DCH where you are working:

- the PM type and number
- the DCH number
- both the original and the current fault reason, and the state of the DCH

After returning to service (RTS) as many system-busy DCHs as possible, give this information to your next level of support.

20 To display the next DCH in the posted set, type

>NEXT

and press the Enter key.

If	Do
the system displays another system busy DCH	step 8
The system displays `End of post set`	step 20

PM DCH
major (end)

21 Determine your next step.

If you	Do
posted all in-service trouble SMA2s, and worked on all system-busy DCHs, and returned all DCHs to service	step 24
posted all in-service trouble SMA2s, and worked on all system-busy DCHs, and you cannot return all DCHs to service	step 23
did not post all in-service trouble SMA2s	step 21

22 To return to the PM level of the MAP display, type

`>QUIT`

and press the Enter key.

23 To post the next SMA2 on the list made at step 3, type

`>POST SMA2 sma2_no`

and press the Enter key.

where

sma2_no
is the SMA2 number recorded at step 3

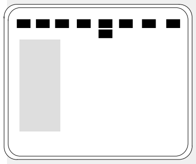
Go to step 5.

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

25 The procedure is complete.

PM DCH minor

Alarm display



CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**1DCH**	.	.	.	.	.

Indication

At the MTC level of the MAP display, the alarm code DCH appears after a number under the PM header in the alarm banner. This code indicates a D-channel handler (DCH) minor alarm.

> ***Note:*** The multivendor interface (MVI) 28 project provides enhanced DCH (EDCH) circuit cards. The EDCH circuit card appears in the MAP display as a DCH circuit card. Any description of a DCH circuit card in this document refers to an EDCH circuit card.

Meaning

A DCH is in-service trouble. The DCH can be in-service trouble for any of the following reasons:

- a congested or overloaded DCH
- a command protocol violation
- ISDN service group (ISG) channels associated with a DCH are manual busy or system busy
- DCH product engineering code (PEC), load, or sparing problems
- DCH is manual busy

A central-side busy (CBsy) DCH can also cause a DCH minor alarm. If central-side busy causes a DCH minor alarm, all DCHs that are not manual-busy or offline (Offl) are central-side busy.

Central-side busy DCHs occur when the PM is system-busy (SysB). When the PM is system busy, the PM-related alarm indicator masks the DCH minor alarm.

The number that appears in the alarm banner under the PM header indicates the number of affected DCHs.

PM DCH
minor (continued)

Result

This condition does not affect service.

Common procedures

This procedure refers to the common procedure “Loading a PM".

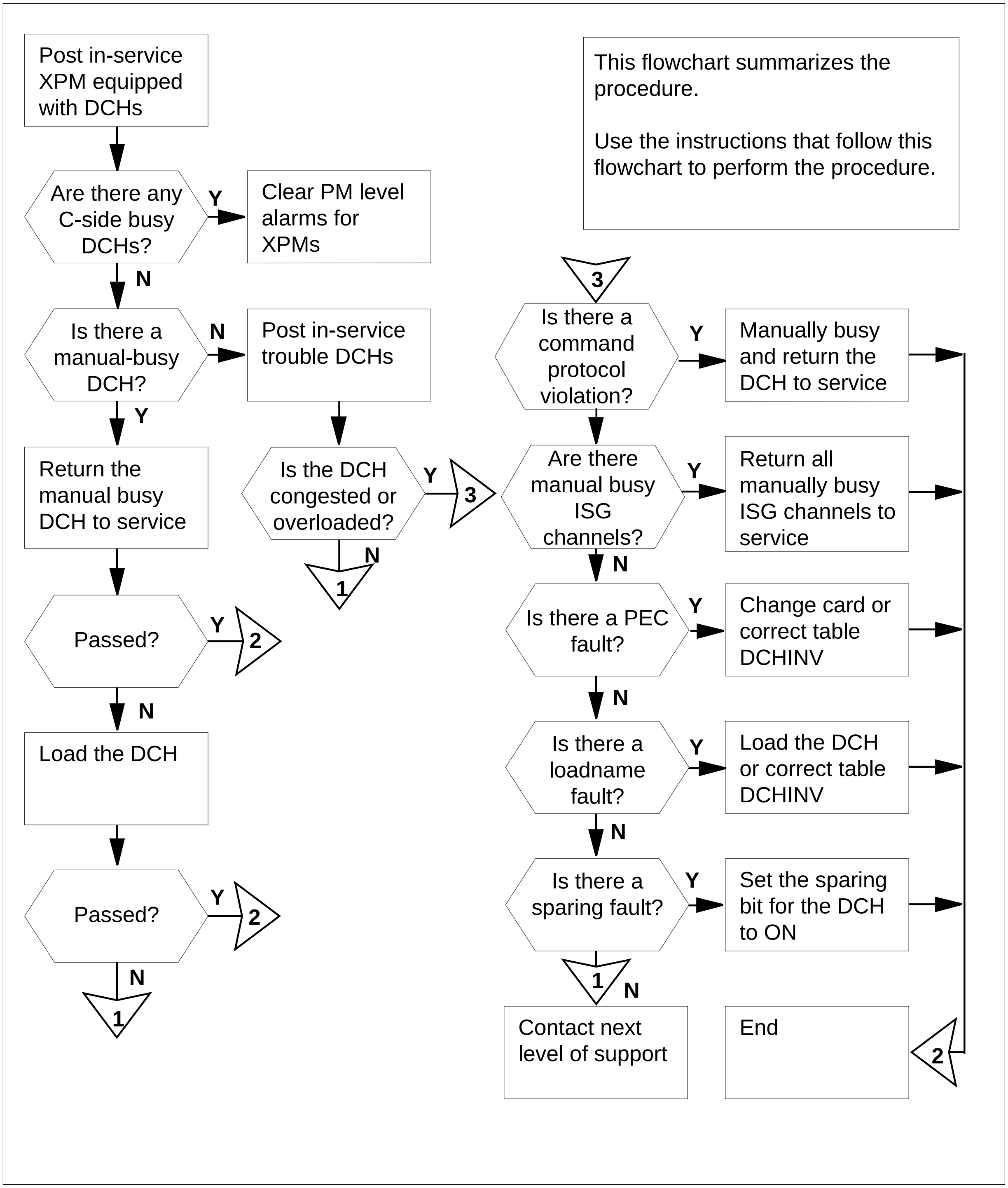
Refer to the common procedure only if the step-action procedure directs you to the common procedure.

Action

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

PM DCH
minor (continued)

Summary of clearing a PM DCH minor alarm



PM DCH
minor (continued)

Clearing a PM DCH minor alarm

At the MAP display:

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

>MAPCI;MTC;PM

and press the Enter key.

Example of a MAP response:

```
                SysB    ManB    OffL    CBsy    ISTb    InSv
    PM             8       0      19      19       3      13
```

2 To display all in-service peripheral modules (PM), type

>DISP STATE INSV

and press the Enter key.

Example of a MAP response:

```
InSv MTM : 1,2
InSv STM : 0,2,4,8,10
InSv LTC : 3
InSv DTCI: 2
InSv LCME: HOST 55 0,HOST 86 0,HOST 67 0,HOST 65 0
InSv SMA2: 1
```

3 Record the SMA2 numbers for all in-service SMA2s equipped with DCHs. Consult office records or office personnel.

Note: The MAP response displays SMA2. The SMA2 appears on the right of the InSv header. The SMA2 number for each in-service SMA2 appears to the right of the colon. If multiple in-service SMA2s are present, commas separate the numbers.

4 To post the first SMA2 in the list recorded at step 3, type

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the SMA2 number recorded at step 3

Example input:

>POST SMA2 1

Example of a MAP response:

```
            SysB     ManB     OffL     CBsy     ISTb     InSv
PM             8        0       19       19        3       13
SMA2           0        0        0        0        3        4

SMA2      1 InSv  Links_OOS: CSide  0 , PSide  0
Unit0:    Inact InSv
Unit1:    Act   InSv
```

5 To access the DCH level of the MAP display, type

>DCH

and press the Enter key.

Example of a MAP response:

```
            SysB     ManB     OffL     CBsy     ISTb     InSv
PM             8        0       19       19        3       13
SMA2           0        0        0        0        3        4

SMA2      1 InSv  Links_OOS: CSide  0 , PSide  0
Unit0:    Inact InSv
Unit1:    Act   InSv

DCH            0        1        0        0        1        3
```

Note: The states for all DCHs associated with the posted PM appear on the last line of the MAP display.

6 From the MAP display, determine if C-side busy DCHs are present.

If	Do
C-side-busy DCHs are present	step 7
C-side-busy DCHs are not present	step 8

7 The problem is either in the PM or on the C-side of the PM. The DCH resides on the C-side of the PM. Perform the correct alarm clearing procedure in this document to clear any other PM-related alarms. When you complete the procedure, return to this point.

8 From the MAP display, determine if manual-busy DCHs are present.

If	Do
manual-busy DCHs are not present and in-service trouble DCHs are not present	step 90

PM DCH
minor (continued)

If	Do
manual-busy DCHs are present	step 9
manual-busy DCHs are not present and in-service trouble DCHs are present	step 18

9 To post all manual-busy DCHs, type

>POST MANB

and press the Enter key.

Example of a MAP response:

```
            SysB    ManB    OffL    CBsy    ISTb    InSv
PM             8       0      19      19       3      13
SMA2           0       0       0       0       3       4

SMA2     1 ISTb  Links_OOS: CSide  0 , PSide  1
Unit0:   Act   InSv
Unit1:   Inact InSv

DCH            0       1       0       0       1       3
DCH  82 ISG 200 ManB LTC    0 port  3
```

Note: When the system displays two or more DCHs in the posted set, the DCHs appear one DCH at a time in the display. The display starts with the first member of the posted set.

10 From office records or from office personnel, determine the why the DCH is manual busy. Determine if the DCH can return to service.

If the DCH	Do
can return to service	step 11
cannot return to service	step 16

11 To return the DCH to service, type

>RTS

and press the Enter key.

Example of a MAP response:

```
RTS
DCH 82   Out-of-service test initiated
Fail message received from PM
 Site Flr RPos  Bay_id   Shf  Description  Slot     EqPEC
 HOST  01  B02  CMVI 00   06  SMA2 : 001    14       BX02
DCH 82 Tst Failed Testid :  DCHIFdiag
```

If the RTS command	Do
passes	step 16
passes or fails, and C-side busy DCHs are present for the posted PMs	step 7
fails, and C-side busy DCHs are not present for the posted PM	step 12

12 To load the DCH, type

>LOADPM

and press the Enter key.

Example of a MAP response:

```
Request submitted on DCH 82
DCH 82  load Failed : S00DTEMP
Failed To Open File
```

If the LOADPM command	Do
passes	step 14
fails	step 13

13 Perform the correct procedure in *Card Replacement Procedures,* to change the ISDN D-channel handler card. When you complete the procedure, return to this point.

14 To return the DCH to service, type

>RTS

and press the Enter key.

If the RTS command	Do
passes, and the DCH is in-service or in-service trouble	step 16

PM DCH
minor (continued)

If the RTS command	Do
fails	step 15

15 Record the information that follows about the DCH you are working on:

- the PM type and number
- the DCH number
- the original fault reason (manual busy)

Return service the maximum number of manual-busy DCHs. Give this information to the next level of support.

16 To display the next manual-busy DCH in the posted set, type

>NEXT

and press the Enter key.

If the system	Do
displays another manual busy DCH	step 10
displays `End of post`	step 17

17 From the MAP display, determine if in-service trouble DCHs are present.

If	Do
in-service trouble DCHs are present	step 18
in-service trouble DCHs are not present	step 90

18 To post all DCHs in-service trouble, type

>POST ISTB

and press the Enter key.

Example of a MAP response:

PM DCH
minor (continued)

```
             SysB    ManB    OffL    CBsy    ISTb    InSv
PM              8       0      19      19       3      13
SMA2            0       0       0       0       3       4

SMA2     1 InSv  Links_OOS: CSide  0 , PSide  0
Unit0:   Inact InSv
Unit1:   Act   InSv

DCH             0       1       0       0       1       3
DCH  50 ISG 200 ISTb LTC   3 port  3 Overloaded
```

Note: When the system displays two or more DCHs in the posted set, one DCH at a time appears in the display. The display starts with the first member of the posted set.

19 Determine the fault reason for the displayed DCH.

Note: The system displays the fault reason at the end of the line for the posted DCH. In the example at step 18, the fault reason is overloaded.

If fault reason that appears in the display	Do
is Congested	step 20
is `CPV`	step 22
is `DCH Chnls BSY`	step 27
is `Sparing Off`	step 37
is Incorrect PEC	step 40
is `Loadname`	step 72
is `Overloaded`	step 20

20 A DCH provisioning problem is present. Record the following information about the DCH you are working on:

- PM type and number
- DCH number
- fault reason obtained at step 19

Return to service the maximum number of DCHs. Give this information to the next level of support.

21 To display the next DCH in the posted set, type

>NEXT

PM DCH
minor (continued)

and press the Enter key.

If the system	Do
displays another in-service trouble DCH	step 19
displays `End of post` set	step 90

22 To cancel any maintenance action in progress for this DCH, type

>ABTK

and press the Enter key.

23 To manually busy the DCH, type

>BSY

and press the Enter key.

Example of a MAP response:

```
DCH 50 Bsy Passed
```

24 To return the DCH to service, type

>RTS

and press the Enter key.

Example of a MAP response:

```
DCH 50   Out-of-service test initiated
Fail message received from PM
 Site Flr RPos  Bay_id   Shf  Description  Slot     EqPEC
 HOST 01  B02  CMVI 00   06   SMA2 : 001    14       BX02

DCH 50 Tst Failed Testid :  DCHIFdiag
```

If the RTS command	Do
passes	step 26
fails	step 25

25 Record the information the following information about the DCH you are working on:

- PM type and number
- DCH number
- original fault reason and the current fault reason, if the reason differs from the original

Clear ISTb fault reasons for the maximum number of DCHs possible. Give this information to the next level of support.

PM DCH
minor (continued)

26 To display the next DCH in the posted set, type

>NEXT

and press the Enter key.

If the system	Do
displays another in-service trouble DCH	step 19
displays the `End of post` set	step 90

27 Record the DCH number and the ISG number for the posted set.

Note: The DCH number appears on the right of the DCH header on the last line of the MAP display. The ISG number appears on the right of the ISG header on the last line of the MAP display.

Example of a MAP response:

```
             SysB    ManB    OffL    CBsy    ISTb    InSv
PM              8       0      19      19       3      13
SMA2            0       0       0       0       3       4

SMA2     1 InSv  Links_OOS: CSide  0 , PSide  0
Unit0:   Inact InSv
Unit1:   Act   InSv

DCH             0       0       0       0       1       4
DCH  50 ISG 200 ISTb LTC   3 port  3 DCH CHNLS BSY
```

28 To access the ISG level of the MAP display, type

>ISG

and press the Enter key.

29 To post the ISG for the in-service trouble DCH, type

>POST isg_no

and press the Enter key.

where

isg_no
is the number of the ISG (0 to 255) that you recorded at step 27

Example of a MAP response:

PM DCH
minor (continued)

```
             SysB    ManB    OffL    CBsy    ISTb    InSv
PM             8       0      19      19       3      13
SMA2           0       0       0       0       3       4

SMA2     1 InSv  Links_OOS: CSide  0 , PSide  0
Unit0:   Inact InSv
Unit1:   Act   InSv
ISG                1111111111 2222222222 33
         123456789 0123456789 0123456789 01
         ......... .....OOOOO OOOO...... MM

ISG  42 DCH  50 ISTb LTC    3 port  3 DCH Chnls BSY
```

30 Determine the state of the ISG channels associated with the DCH you are working on.

If one or more channels	Do
are manual busy and no channels are in any other out-of-service state	step 31
are in any other out-of-service state	step 35

31 To return the ISG channels to service, type

>RTS ALL

and press the Enter key.

If all manual-busy ISG channels	Do
returned to service	step 33
did not return to service	step 32

32 Record the state of the ISG channels.

Note: The state of the ISG channels appears to the right of the DCH number.

33 To access the DCH level of the MAP display, type

>DCH

and press the Enter key.

PM DCH
minor (continued)

34 Determine the state of the DCH you work on.

Note: The state of the DCH appears to the left of the ISG number on the last line of the MAP display.

If the state of the DCH is	Do
`InSv`	step 36
anything else	step 35

35 Record the following information about the DCH you are working on:

- PM type and number
- DCH
- original fault reason and the current fault reason if this reason is different from the original

Clear ISTb fault reasons for the maximum number of DCHs possible. Give this information to the next level of support.

36 To display the next DCH in the posted set, type

>NEXT

and press the Enter key.

If the system	Do
dislays another in-service trouble DCH	step 19
dislays `End of post set`	step 90

37 To turn on the sparing bit, type

>SPARING ON

and press the Enter key.

Example of a MAP response:

```
DCH 50 Enable Takeover Passed
```

If the SPARING command	Do
passes	step 39
fails	step 38

38 Record the following information about the DCH you are working on:

- PM type and number
- DCH number
- original fault reason (Sparing off)

PM DCH
minor (continued)

Clear ISTb fault reasons for the maximum number of DCHs possible. Give this information to the next level of support.

39 To display the next DCH in the posted set, type

>NEXT

and press the Enter key.

If the system	Do
displays another in-service trouble DCH	step 19
dislays `End of post set`	step 90

40 From office records or from office personnel, determine the PEC and suffix the DCH requires.

41 To determine the PEC entered for the DCH, type

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
Site Flr RPos  Bay_id   Shf  Description   Slot   EqPEC
HOST  01  B02  CMVI 00   06  SMA2 : 001     14     BX02
Loadnames : DCHINV – EDH81AZ , DCH – EDH81AZ  ; INTL
INDEX : 18
```

> ***Note:*** The PEC appears under the EqPEC header on the MAP display. In this example, the PEC entered for the DCH is NTBX02. The prefix NT does not appear on the display.

42 Determine the location of the DCH.

> ***Note:*** The location of the DCH appears under the Site, Flr, RPos, Bay_id, and Shf headers on the MAP display.

At the MAP display:

43 Locate the DCH. Record the PEC and suffix of the DCH in the slot.

> ***Note:*** The PEC and suffix appear on the faceplate of the card.

PM DCH
minor (continued)

At the MAP display:

44 Determine the limit of the PEC mismatch.

If the PEC obtained from office personnel or from office records	Do
matches the entered PEC obtained at step 41, but does not match the PEC on the faceplate of the card obtained at step 43	step 45
matches the PEC on the faceplate of the card obtained at step 43, but does not match the entered PEC obtained at step 41	step 53
does not match the entered PEC obtained at step 41, and does not match the PEC on the faceplate of the card obtained at step 43	step 68

45 To manually busy the DCH, type

>BSY

and press the Enter key.

Example of a MAP response:

```
Services may be affected
Please confirm (”YES”, ”Y”, ”NO”, OR ”N”):
```

46 To confirm the command, type

>YES

and press the Enter key.

Example of a MAP response:

```
DCH 50 Bsy Passed
```

47 Perform the correct procedure in *Card Replacement Procedures,* to replace the DCH with a DCH that has the correct PEC and suffix. When you complete this procedure, return to this point.

48 To test the DCH replaced, type

>TST

and press the Enter key.

Example of a MAP response:

PM DCH
minor (continued)

```
DCH 50   Out-of-service test initiated
Fail message received from PM
 Site Flr RPos  Bay_id   Shf  Description  Slot     EqPEC
 HOST  01 B02  CMVI 00   06   SMA2 : 001    14       BX02


DCH 50 Tst Failed Testid :  DCHIFdiag
```

If the TST command	Do
generates a card list	step 49
does not generate a card list	step 50

49 Record the location, and the PEC and suffix, of the card on the list. Obtain a good card before you proceed.

Go to step 47.

50 To load the DCH, type

>LOADPM

and press the Enter key.

Example of a MAP response:

```
Request submitted on DCH 50
DCH 50  load Failed : S00DTEMP
Failed To Open File
```

If the LOADPM command	Do
passes	step 52
fails	step 51

51 Perform the procedure Loading a PM. The porcedure is in this document. When you complete this procedure, return to this point.

52 To return the DCH to service, type

>RTS

and press the Enter key.

Example of a MAP response:

```
DCH 50   Out-of-service test initiated
DCH 50 Tst Passed
DCH 50 Rts Passed
```

Go to step 67.

PM DCH
minor (continued)

53 Determine if the DCH is a spare.

If the DCH is	Do
a spare	step 60
not a spare	step 54

54 Record the number of the posted DCH.

55 To post all DCHs, type

>POST ALL

and press the Enter key.

56 To display all members of the posted set, type

>DISP ALL

and press the Enter key.

Example of a MAP response:

```
DCH  51 ISG 203 ISTb LTC   1 port 15
DCH  91 ISG 202 ISTb LTC   1 port 17
DCH  92 spare   InSv LTC   1 port 19
```

57 Determine the number of a spare DCH from the MAP response obtained at step 56.

58 To post the DCH you work on, type

>POST dch_no

and press the Enter key.

where

dch_no
is the number of the ISTb DCH you recorded at step 54

59 To switch the ISG to the spare DCH, type

>SWTCH dch_no

and press the Enter key.

where

dch_no
is the number of the spare DCH you recorded at step 57

60 To access table DCHINV, type

>TABLE DCHINV

and press the Enter key.

Example of a MAP response:

```
TABLE: DCHINV
```

PM DCH
minor (continued)

61 To position on the entry for the DCH, type

>POS dch_no

and press the Enter key.

where

dch_no
is the number of the DCH (0 to 255) you work on

Example of a MAP response:

```
50        SMA2    1 BX02BA  ECH06BH    3
```

62 To change the PEC entered for the DCH to match the PEC for the installed card, type

>CHA DCHPEC

and press the Enter key.

Example of a MAP response:

```
ENTER Y TO CONTINUE PROCESSING OR N TO QUIT
```

63 To confirm the command, type

>Y

and press the Enter key.

64 To enter the correct PEC, type

>pec

and press the Enter key.

where

pec
is the PEC of the DCH, which you recorded at step 43

Example of a MAP response:

```
TUPLE TO BE CHANGED:
   50        LTC    0 BX02BA  EDH81AZ    3
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
```

65 To confirm the command, type

>Y

and press the Enter key.

66 To quit table DCHINV, type

>QUIT

and press the Enter key.

PM DCH
minor (continued)

67 From the MAP display, determine the state of the DCH you are working on.

Note: The state of the DCH you work on appears on the right of the ISG number. The ISG number appears on the bottom line of the MAP display.

If in 3 minutes the state of the DCH	Do
is `InSv`	step 69
is any other state	step 68

68 Record the following information about the DCH you are working on:

- PM type and number
- DCH number
- original fault reason and the current fault reason if this reason is different from the original reason
- cards replaced
- PEC obtained from office records or from office personnel

Clear ISTb fault reasons for DCHs. Give this information to the next level of support.

69 To post in-service trouble DCHs, type

>POST ISTB

and press the Enter key.

If	Do
the post set includes DCHs	step 70
the post set does not include DCHs	step 90

70 Determine if you worked on the displayed DCH.

If	Do
you worked on the DCH and recorded the reason that the DCH is ISTb	step 71
you did not work on the DCH	step 19

71 To display the next DCH in the posted set, type

>NEXT

PM DCH
minor (continued)

and press the Enter key.

If	Do
another in-service trouble DCH appears in the display	step 70
`End of post set` appears	step 90

72 From office records or from office personnel, determine the correct load for the DCH.

73 To determine both the load entered for the DCH and the load that runs on the DCH, type

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
Site Flr RPos  Bay_id   Shf  Description  Slot   EqPEC
HOST  01  B02  CMVI 00   06  SMA2 : 001    14      BX02

Loadnames: DCHINV – EDH81AZ, DCH – EDH81AZ;INTL INDEX:18
```

> ***Note:*** The loadname entered for the DCH appears on the right of the DCHINV header. The loadname that runs on the DCH that appears on the right of the DCH header. In this example, the loadname EDH07BH applies to both fields.

74 Determine the limit of the loadname mismatch.

If the loadname obtained from office personnel or from office records	Do
matches the entered loadname obtained at step 73 but does not match the name of the load that runs on the DCH	step 75
matches the name of the load that runs on the DCH but does not match the entered loadname obtained at step 73	step 80
does not match the entered loadname obtained at step 73, and does not match the name of the load that runs on the DCH	step 68

PM DCH
minor (continued)

75 To manually busy the DCH, type

>BSY

and press the Enter key.

Example of a MAP response:

```
Services may be affected
Please confirm (”YES”, ”Y”, ”NO”, OR ”N”):
```

76 To confirm the command, type

>YES

and press the Enter key.

Example of a MAP response:

```
DCH 50 Bsy Passed
```

77 To load the DCH, type

>LOADPM

and press the Enter key.

Example of a MAP response:

```
Request submitted on DCH 50
DCH 50  load Failed : S00DTEMP
Failed To Open File
```

If the LOADPM command	Do
passes	step 79
fails	step 78

78 Perform the procedure Loading a PM in this document. When you complete the procedure, return to this point.

79 To return the DCH to service, type

>RTS

and press the Enter key.

Example of a MAP response:

```
DCH 50   Out–of–service test initiated
DCH 50 Tst Passed
DCH 50 Rts Passed
```

Go to step 87.

80 To access table DCHINV, type

>TABLE DCHINV

PM DCH
minor (continued)

and press the Enter key.

Example of a MAP response:

```
TABLE: DCHINV
```

81 To position on the entries for the DCH, type

>POS dch_no

and press the Enter key.

where

dch_no
is the number of the DCH (0 to 255)

Example of a MAP response:

```
50        SMA2    1 BX02ABA EDH81AZ    3
```

82 To change the loadname datafilled for the DCH to match the loadname running on the DCH, type

>CHA LOAD

and press the Enter key.

Example of a MAP response:

```
ENTER Y TO CONTINUE PROCESSING OR N TO QUIT
```

83 To confirm the command, type

>Y

and press the Enter key.

84 To enter the correct DCH load name, type

>loadname

and press the Enter key.

where

loadname
is the loadname running on the DCH, which you recorded at step 72

Example of a MAP response:

```
TUPLE TO BE CHANGED:
   50        SMA2    1 BX02BA  EDH81AZ    3
ENTER Y TO CONFIRM, N TO REJECT OR E TO EDIT.
```

85 To confirm the command, type

>Y

and press the Enter key.

86 To quit table DCHINV, type

>QUIT

and press the Enter key.

87 Determine the state of the DCH you are working on.

Note: The state of the DCH appears on the right of the ISG number. The ISG number appears on the last line of the MAP display.

If in 3 minutes the state of the DCH	Do
is `InSv`	step 89
is any other state	step 88

88 Record the following information about the DCH you are working on:

- PM type and number
- DCH number
- original fault reason (Loadname)
- load name obtained from office records or from office personnel

Clear ISTb fault reasons for DCHs. Give this information to the next level of support.

89 To display the next DCH in the posted set, type

>NEXT

and press the Enter key.

If the system	Do
displays another in-service trouble DCH	step 19
displays `End of post set`	step 90

90 Determine the next step.

If you	Do
posted all in-service SMA2s and worked on all in-service trouble DCHs and all DCHs are in-service	step 94
posted all in-service SMA2s and worked on all in-service trouble DCHs and you cannot return to service (RTS) all DCHs	step 93

PM DCH
minor (end)

If you	Do
did not post all in-service SMA2s	step 91

91 To exit from the DCH level of the MAP display, type

>QUIT

and press the Enter key.

92 To post the next PM on the list recorded at step 3, type

>POST pm_type pm_no

and press the Enter key.

where

pm_type
is the PM type recorded at step 3

pm_no
is the PM number recorded at step 3

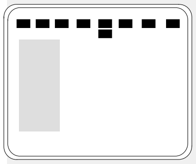
Go to step 5.

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

94 This procedure is complete.

PM IDT
critical

Alarm display



CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nIDT**	.	.	.	.	.
				C					

Indication

The integrated digital terminal (IDT) alarm appears under the peripheral module (PM) header in the MAP subsystem display. This alarm indicates an alarm condition exists for an IDT.

The *n* indicates the number of IDT modules with alarms. The *C* that appears under the alarm indicates the alarm class is critical.

Meaning

This alarm indicates the links or message channels between the remote digital terminal (RDT) and the IDT that have problems.

Result

A critical alarm class code indicates the IDT cannot process calls.

Common procedures

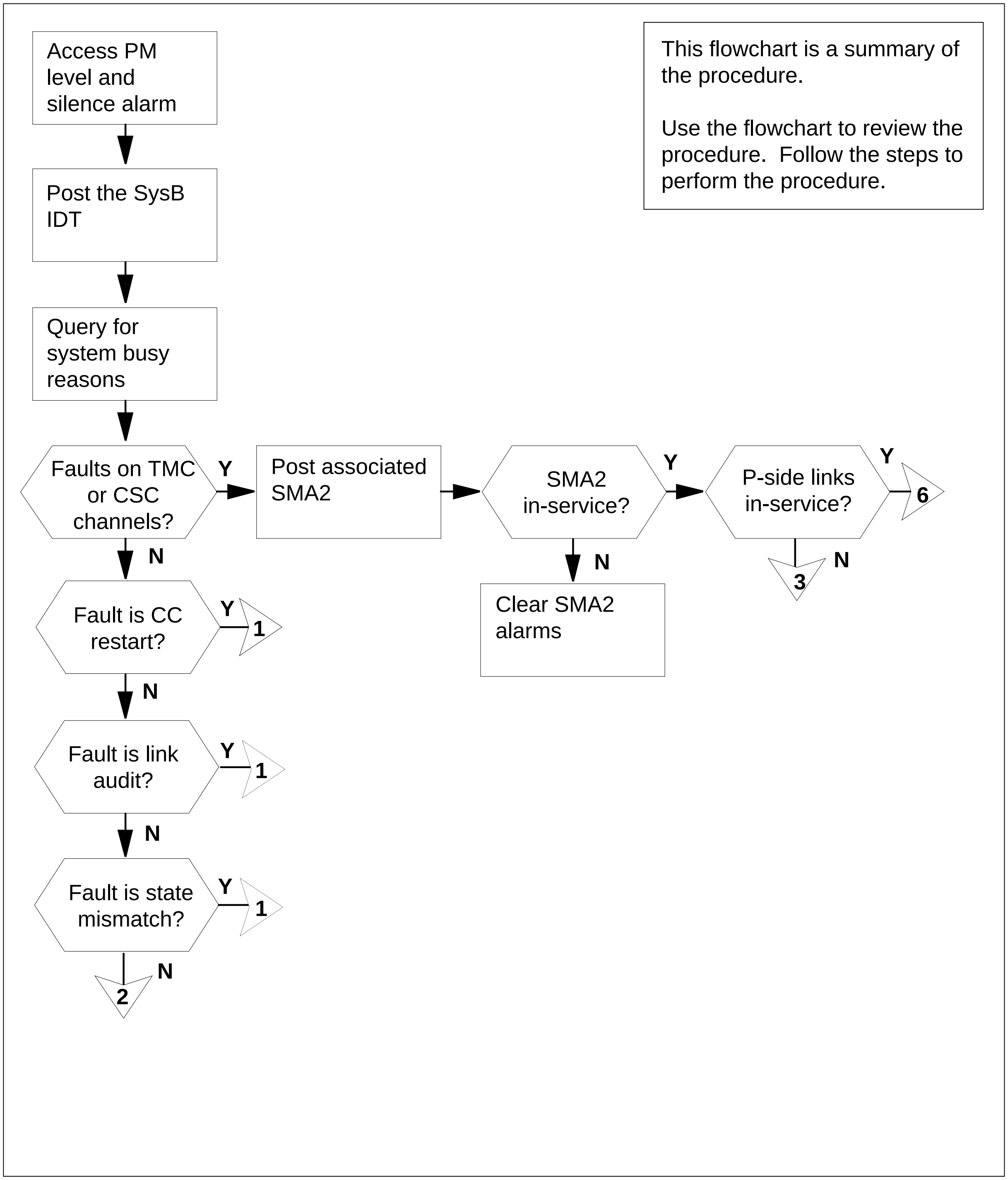
There are no common procedures.

Action

The procedure includes a summary flowchart and a series of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

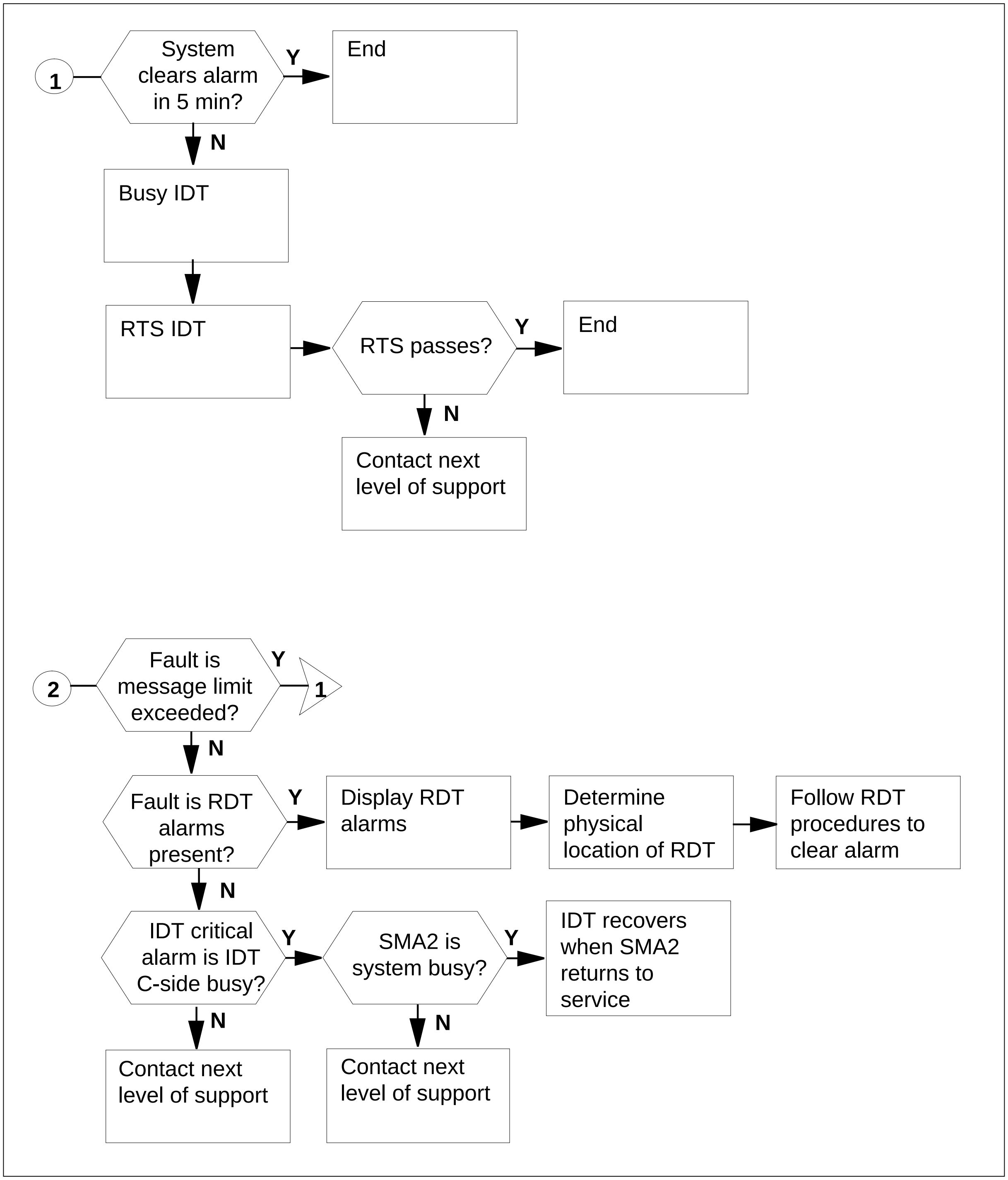
PM IDT
critical (continued)

Summary of clearing a PM IDT critical alarm



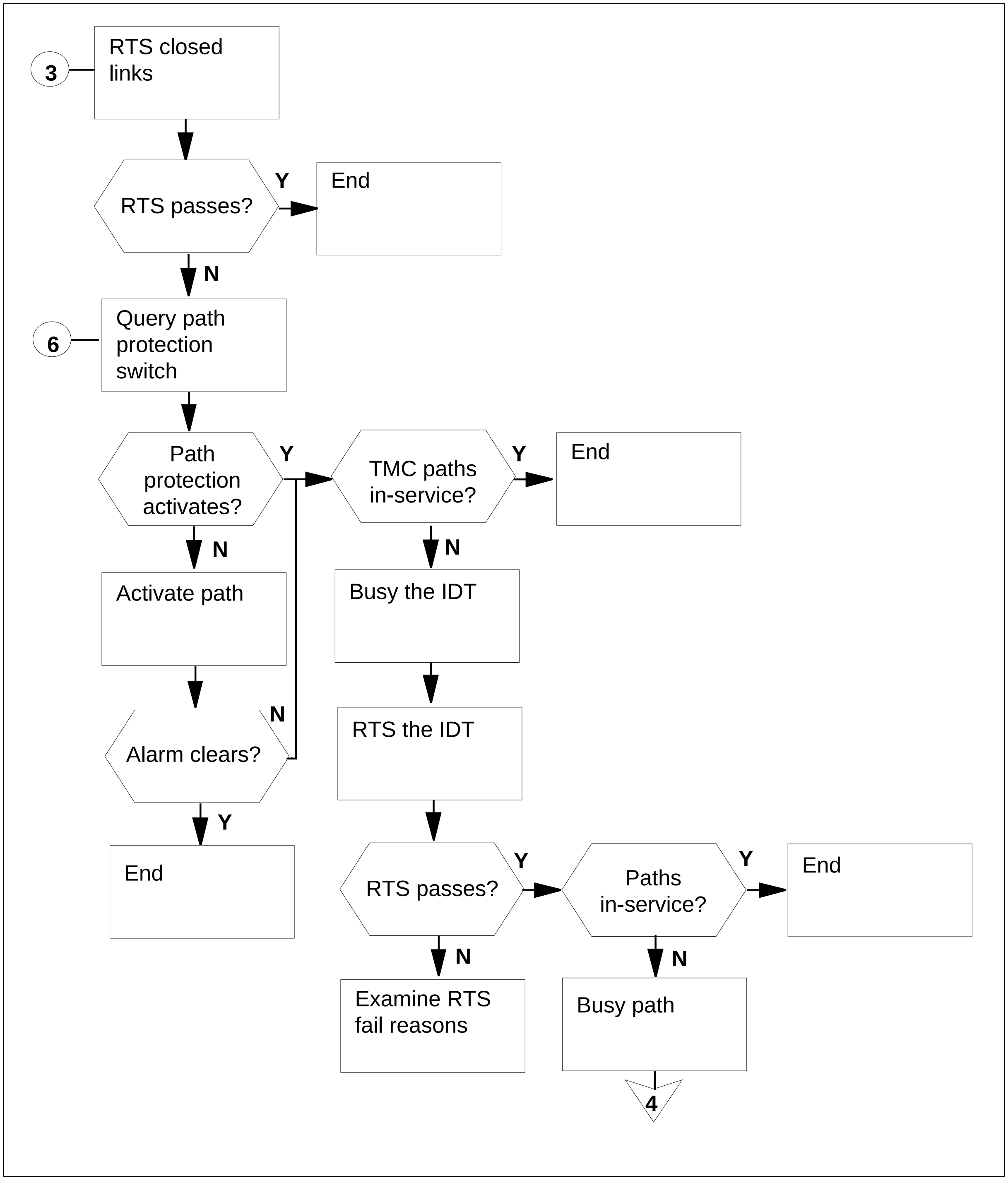
PM IDT
critical (continued)

Summary of clearing a PM IDT critical alarm (continued)



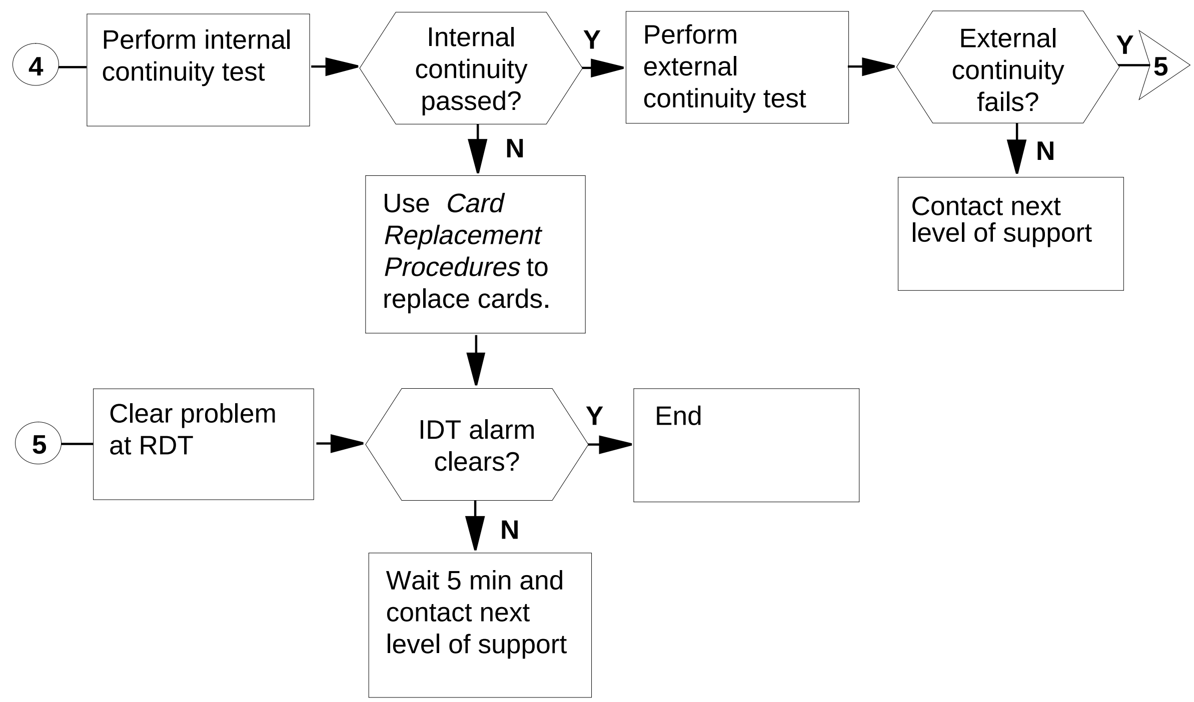
PM IDT
critical (continued)

Summary of clearing a PM IDT critical alarm (continued)



PM IDT
critical (continued)

Summary of clearing a PM IDT critical alarm (continued)



PM IDT
critical (continued)

Clearing a PM IDT critical alarm

At the MAP terminal:

1 When the system detects a fault, the system can trigger an audible alarm. To access the PM level of the MAP display and silence the alarm, type:

>MAPCI;MTC;PM;SIL

and press the Enter key.

2 To display the system busy (SysB) IDT, type:

>DISP STATE SYSB IDT

and press the Enter key.

Example of a MAP response:

SysB IDT: 1

3 To access the SysB IDT, type:

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the IDT displayed in step 2

Example of a MAP response:

```
        SysB  ManB  Offl  CBsy  ISTb  InSv
    PM     3     0    1     0     2    13
    IDT    1     0    0     0     0     5
IDT 14 SysB  Links_OOS:  0
```

4 To check for fault indicators, type:

>QUERYPM FLT

and press the Enter key.

5 Identify the SysB message reported in step 4.

If SysB reason	Do
is fault occurs on time management channel (TMC) or common signaling channel (CSC) channels	step 6
is central control (CC) restart	step 47
is link audit	step 48

PM IDT
critical (continued)

If SysB reason	Do
is state mismatch	step 49
is unsolicited message limit exceeded	step 50
is RDT alarms present	step 51
is no message reported-IDT central-side busy (CBsy)	step 53
is none of the above	step 54

6 To identify the SMA2 for the posted IDT, type:

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM type: IDT PM No: 14 Int. No: 1 Node No: 38
Prot–Switch: Available
SMA2 Name: SMA2 1
RDT Name: RDT 14 0
```

7 To post the SMA2 identified in step 6, type:

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the number of the SMA2 displayed in step 6

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMA2    0     0    0     0     1     7
SMA2 1 InSv  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact InSv
```

8 Verify the SMA2 identified in step 6 is in-service (INSV).

If SMA2	Do
is INSV	step 9
is not INSV	step 10

PM IDT
critical (continued)

9 Verify the peripheral side (P-side) links displayed in step 7 are INSV.

If P-side links	Do
are INSV	step 16
are not INSV	step 11

10 SMA2 alarms are present. To clear the SMA2 alarms, use *Alarm clearing procedures* and return to this point.

If IDT critical	Do
clears	step 55
does not clear	step 11

11 To display information about the P-side message links, type:

>TRNSL MSG P

and press the Enter key.

Example of a MAP response:

```
Link 0: IDT 3  0;Cap; MS:Status:OK   ;MsgCond;OPN
Link 1: IDT 3  1;Cap; MS:Status:OK   ;MsgCond;OPN
Link 7: IDT 14 0;Cap; MS:Status:OK   ;MsgCond;OPN
Link 8: IDT 14 1;Cap; MS:Status:OK ,P;MsgCond;CLS
```

If message links	Do
CLS	step 12
OPN	step 15

12 To return to service (RTS) the closed link, type:

>BSY LINK link_no

and press the Enter key.

where

link_no
is the number of the closed link in step 11

13 To RTS the closed link, type:

>RTS LINK link_no

and press the Enter key.

where

PM IDT
critical (continued)

link_no
is the number of the closed link in step 11

If the RTS command	Do
passes	step 15
fails	step 14

14 The SMA2 alarms are present. To clear the SMA2 alarms, use *Alarm Clearing Procedures* and return to this point.

15 Determine if the IDT alarm clears.

If IDT critical	Do
clears	step 55
does not clear	step 16

16 To post the SysB IDT, type:

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the IDT displayed in step 2

Example of a MAP response:

```
        SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    IDT     1     0    0     0     0     5
IDT 14 SysB  Links_OOS:  0
```

17 To display information about the state of the channels between the IDT and the RDT, type:

>PPS QUERY

and press the Enter key

Example of a MAP response:

```
TMC1: SMA2 1  7 24; OOS;Standby;Enable
EOC1: SMA2 1  7 12;InSv;Active ;Enable
TMC2: SMA2 1  8 24; OOS;Standby;Enable
EOC2: SMA2 1  8 12; OOS;Standby;Enable
```

PM IDT
critical (continued)

18 Determine if path protection is active for all channels.

If	Do
one or both TMC or CSC channels are inhibited	step 19
one or both TMC or CSC channels are active	step 21

19 To activate path protection on an inhibited TMC, CSC, or embedded operations channel (EOC), type:

`>PPS ENA path`

and press the Enter key.

where

path
is the inhibited TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

20 Repeat step 19 for each channel that is inhibited.

21 When path protection is active for all channels, return to step 17.

22 Determine if the TMC or CSC message channels queried in step 17 are INSV.

If TMC or CSC channels	Do
are INSV	step 55
are out-of-service (OOS)	step 22

23 To busy (BSY) the channel that has faults, type:

`>BSY path`

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2 that has faults

24 To return the channel that has faults to service, type:

`>RTS path`

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2 that has faults

If the RTS command	Do
passes	step 30
fails	step 31

PM IDT
critical (continued)

25 Determine if the IDT alarm clears.

If IDT critical	Do
clears	step 55
does not clear	step 31

26 To BSY the channel that has faults, type:

>BSY path

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2 that has faults

27 To test the channel that has faults for internal continuity, type:

>CONT path INT

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2 that has faults

If CONT path INT	Do
passes	step 43
fails	step 33

28 To post the SMA2 for the IDT with a critical alarm, type:

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the number of the SMA2

29 To perform a Switch of Activity (SWACT) the units, type:

>SWACT

and press the Enter key.

A confirmation prompt for the SWACT command displays at the MAP terminal.

If SWACT	Do
cannot continue	step 30
can continue	step 31

PM IDT
critical (continued)

30 To reject the prompt to SWACT the units, type:

>NO

and press the Enter key.

The system stops the SWACT.

31 To confirm the system prompt, type:

>YES

and press the Enter key.

The system runs a pre-SWACT audit to determine if the inactive unit can accept activity.

> ***Note:*** A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before you proceed with the next maintenance action.

If the message	Do
is `SWACT passed`	step 33
is `SWACT failed Reason: XPM SWACTback`	step 32
is `SWACT refused by SWACT Controller`	step 32

32 The inactive unit cannot establish two-way communication with the CC and SWACTs back to the original active unit. You must clear all faults on the inactive unit before you attempt to clear the alarm condition on the active unit.

Go to step 54.

33 To BSY the new inactive unit, type:

>BSY UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the inactive unit

34 To return the inactive unit to service, type:

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the inactive unit

If RTS	Do
passes	step 42

PM IDT
critical (continued)

If RTS	Do
fails	step 36

35 Determine if card list appears.

If card list	Do
appears	step 37
does not appear	step 54

36 Check the card list that displays at the MAP terminal.

Example of a MAP response:

```
Site Flr RPos  Bay_id Shf Description  Slot EqPEC
HOST  00  M07  CMVI 00  06 SMA2 : 001   04  BX01
HOST  00  M07  CMVI 00  06 SMA2 : 001   12  MX81
```

37 Go to *Card replacement procedures* to replace the cards on the list and return to this point.

38 To load the inactive SMA2 unit, type:

>LOADPM UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the SMA2 unit busied in step 34

If load	Do
passes	step 41
fails	step 54

39 To return the inactive unit to service, type:

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the inactive unit

If RTS	Do
passes	step 42
fails	step 54

PM IDT
critical (continued)

40 To post the IDT, type:

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the IDT with the fault

41 To return the IDT to service, type:

>RTS IDT idt_no

and press the Enter key.

where

idt_no
is the IDT posted in step 42

If RTS	Do
passes	step 42
fails	step 54

42 To RTS the channel that has faults, type:

>RTS path

and press the Enter key.

where

path
is the busied TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

If RTS	Do
passes	step 55
fails	step 54

43 To RTS the channel that has faults, type:

>RTS path

and press the Enter key.

where

path
is the busied TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

44 Set up a loopback path at the RDT to prepare for an external continuity test. Refer to RDT documentation to set or release a loopback on a DS-1 facility.

45 To test the active TMC channel that has faults for external continuity, type:

>CONT path EXT

and press the Enter key.

PM IDT
critical (continued)

where

path
is the busied TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

Note: You must conduct the external continuity test on an active path.

If CONT	Do
fails	step 48
passes	step 54

46 The problem is at the RDT. Go to RDT documentation for information on how to clear the problem, and return to this point.

Go to step 55.

47 Monitor the alarm. System action can correct the alarm condition. This message occurs when the CC unit starts again.

If after 15 min	Do
alarm clears	step 55
alarm does not clear	step 54

48 Monitor the alarm. System action can correct the alarm condition. This message occurs when message links on an in-service IDT go out of service.

If after 15 min	Do
alarm clears	step 55
alarm does not clear	step 54

49 Monitor the alarm. System action can correct the alarm condition. This message occurs when the state of the IDT in the SMA2 does not match the state of the IDT in the switch.

If after 15 min	Do
alarm clears	step 55
alarm does not clear	step 54

50 Monitor the alarm. System action can correct the alarm condition. This message occurs when SMA2 internal maintenance component sends more than one hundred unsolicited messages during a 10 min time period.

If after 15 min	Do
alarm clears	step 55
alarm does not clear	step 54

PM IDT
critical (end)

51 To determine the number and type of critical RDT alarms, type:

>RDTALARM

and press the Enter key.

Example of a MAP response

```
RDTalarm
RDT Name:  RDT 1 03 0
Network Element:  3 RALEIGH_AMEX_B13

ACTIVE ALARMS :  Fac    Eqp   Env    Sfw    Svc    Thr    Ind
--------------------------------------------------------------
Critical      :  2      0     0      0      0      0      0
Major         :  0      0     0      0      0      0      0
Minor         :  0      0     0      0      0      0      0
Warning       :  0      0     0      0      0      0      0
```

> ***Note 1:*** Active alarms that display are different in the AccessNode environment.
>
> ***Note 2:*** For multi-vendor interface (MVI) RDTs, this response does not always appear.

52 To correct the fault conditions at the RDT identified in step 51, refer to RDT procedures to clear alarms. The IDT in-service trouble (ISTb) is retired, after the alarm clears at the RDT. Go to step 55.

53 The SMA2 is SysB. The IDT returns to an INSV condition from the CBsy condition when the SMA2 RTS. To correct the problem on the SMA2, refer to one of the following procedures in this document:

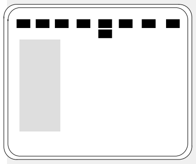
- SMA2 critical alarm clearing procedures
- SMA2 major alarm clearing procedures
- SMA2 minor alarm clearing procedures

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

55 This procedure is complete.

PM IDT
major

Alarm display



CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nIDT**	.	.	.	.	.
				M					

Indication

The integrated digital terminal (IDT) alarm code appears under the peripheral module (PM) header in the MAP subsystem display. This code indicates that an alarm condition is present in the IDT. The digit *n* indicates the number of IDT modules with alarms. The letter *M* that appears under the alarm indicates a major alarm class.

Meaning

This alarm normally indicates a fault with messaging channels between the remote digital terminal (RDT) and the IDT. This alarm can also indicate RDT alarms.

Result

A major alarm class code indicates the IDT has an in-service trouble (ISTb) condition. The IDT continues to process calls, but a potential service-affecting fault condition is present. To reduce the potential effect on subscriber service, isolate the fault condition. Correct the fault condition as directed by the procedure that follows.

Common procedures

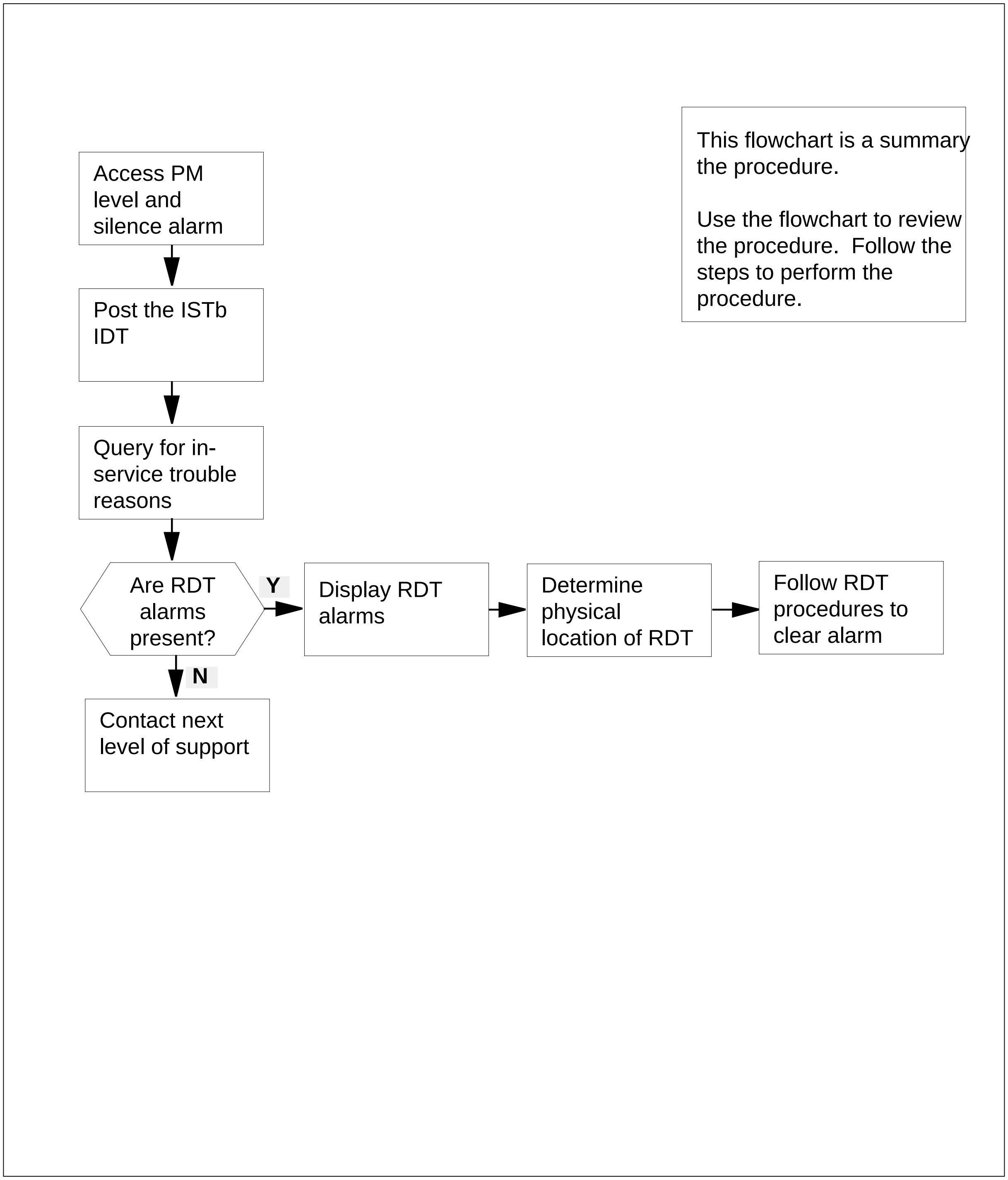
There are no common procedures.

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 IDT
major (continued)

Summary of clearing a PM IDT major alarm



Clearing a PM IDT major alarm

At the MAP terminal:

1 When the system detects a fault, the system can trigger an audible alarm. Access the PM level of the MAP display. To silence the alarm, type:

>MAPCI;MTC;PM;SIL

and press the Enter key.

2 To display the ISTb IDT, type:

>DISP STATE ISTB IDT

and press the Enter key.

Example of a MAP response:

```
ISTb IDT: 1
```

3 To access the ISTb IDT, type:

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the IDT displayed

Example of a MAP response:

```
        SysB  ManB  Offl  CBsy  ISTb  InSv
    PM     3     0     1     0     2    13
    IDT    0     0     0     0     1     5

IDT 14 ISTb  Links_OOS:  0
```

4 To check for fault indicators, type:

>QUERYPM FLT

and press the Enter key.

5 Identify the ISTb message reported.

If in-service trouble reason	Do
is RDT alarms present	step 6
is not RDT alarms present	step 8

6 Determine the number and type of alarms, type:

>RDTALARM

PM IDT
major (end)

and press the Enter key.

Example of a MAP response:

```
RDTalarm
RDT Name:  RDT 1 03 0
Network Element:  3 RALEIGH_AMEX_B13

ACTIVE ALARMS : Fac     Eqp   Env    Sfw    Svc    Thr    Ind
-------------------------------------------------------------
Critical      : 2       0     0      0      0      0      0
Major         : 0       0     0      0      0      0      0
Minor         : 0       0     0      0      0      0      0
Warning       : 0       0     0      0      0      0      0
```

Note 1: Active alarms that appear are different in the AccessNode environment.

Note 2: For multi-vendor interface (MVI) RDTs, this response can appear.

7 To correct the fault conditions at the RDT, refer to RDT procedures for clearing alarms. The IDT ISTb indication stops after the alarm clears at the RDT.

8 For additional help, contact the personnel responsible for the next level of support.

9 The procedure is complete.

PM IDT
minor

Alarm display

CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nIDT**	.	.	.	.	.

Indication

The integrated digital terminal (IDT) alarm code appears under the PM header on the MAP subsystem display. This code indicates an alarm condition in the IDT. The *n* indicates the number of IDT modules with alarms. The blank that appears under the alarm indicates a minor alarm.

Meaning

This alarm normally indicates a problem with messaging channels between the remote digital terminal (RDT) and the IDT.

Result

A minor alarm class code indicates the IDT has an in-service trouble (ISTb) condition. The IDT continues to process calls, but a possible fault condition exists that can affect service.

To reduce the impact to subscriber service, isolate the fault condition and correct the fault according to the procedure.

Common procedures

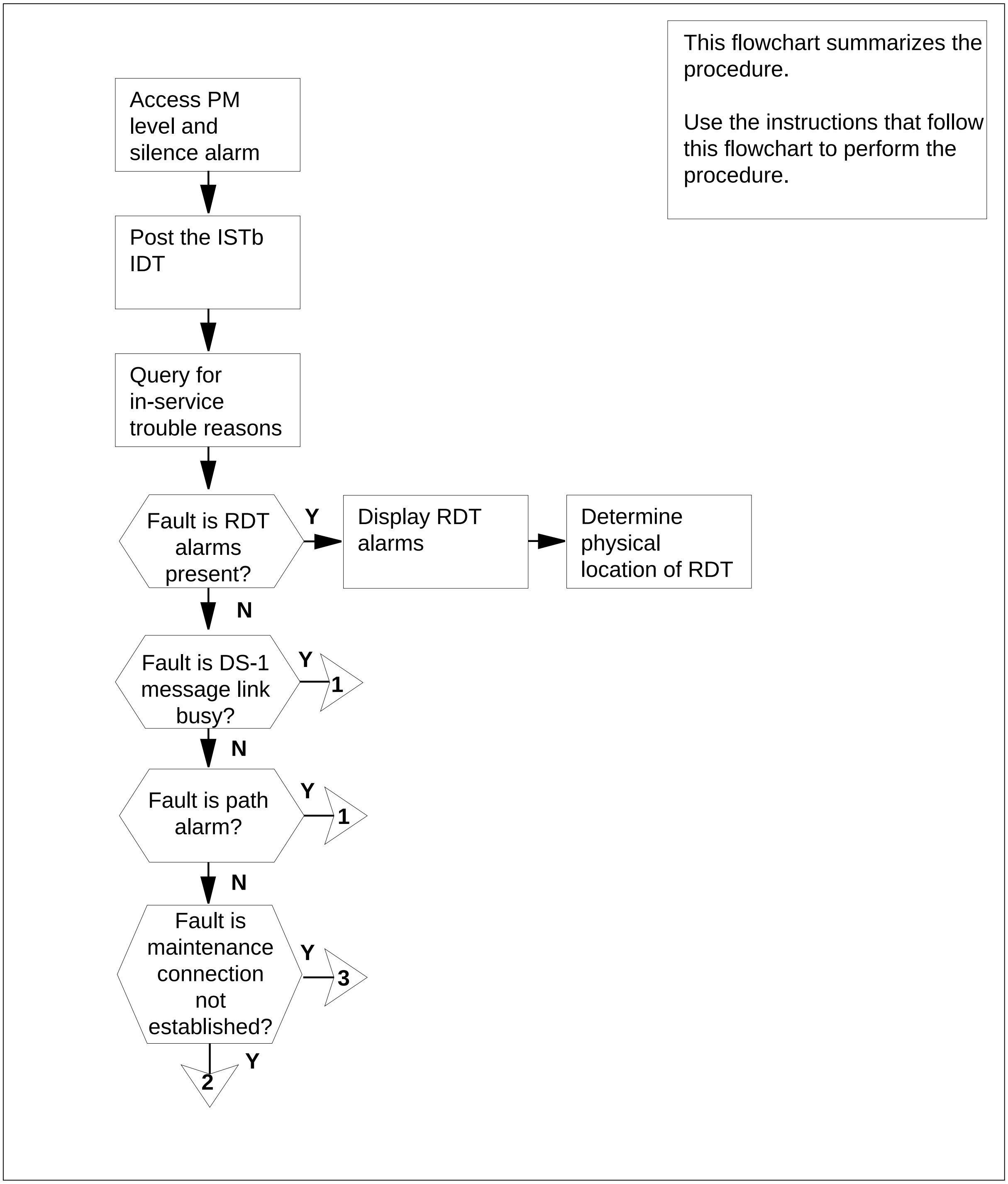
There are no common procedures.

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.

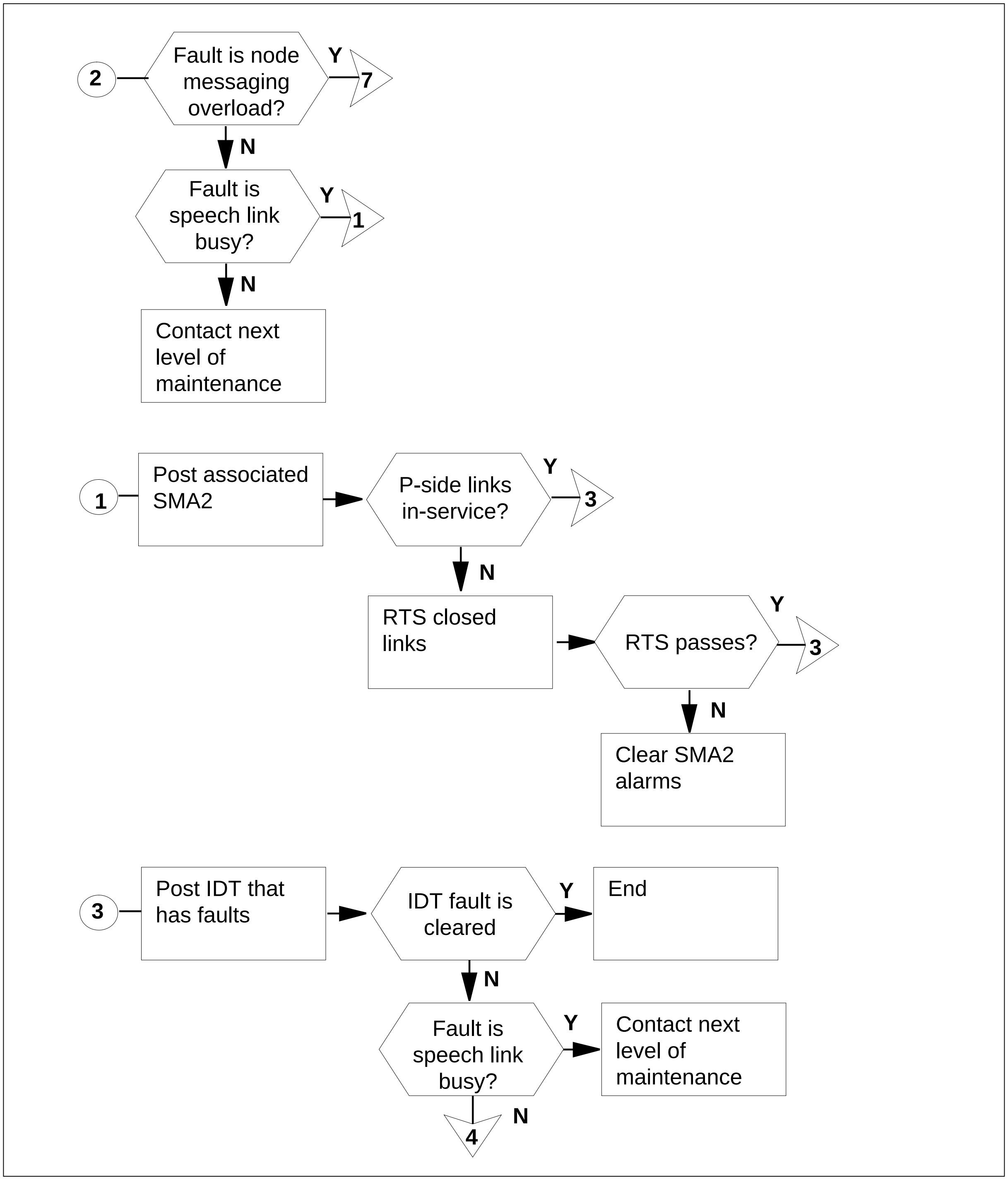
PM IDT
minor (continued)

Summary of clearing a PM IDT minor alarm



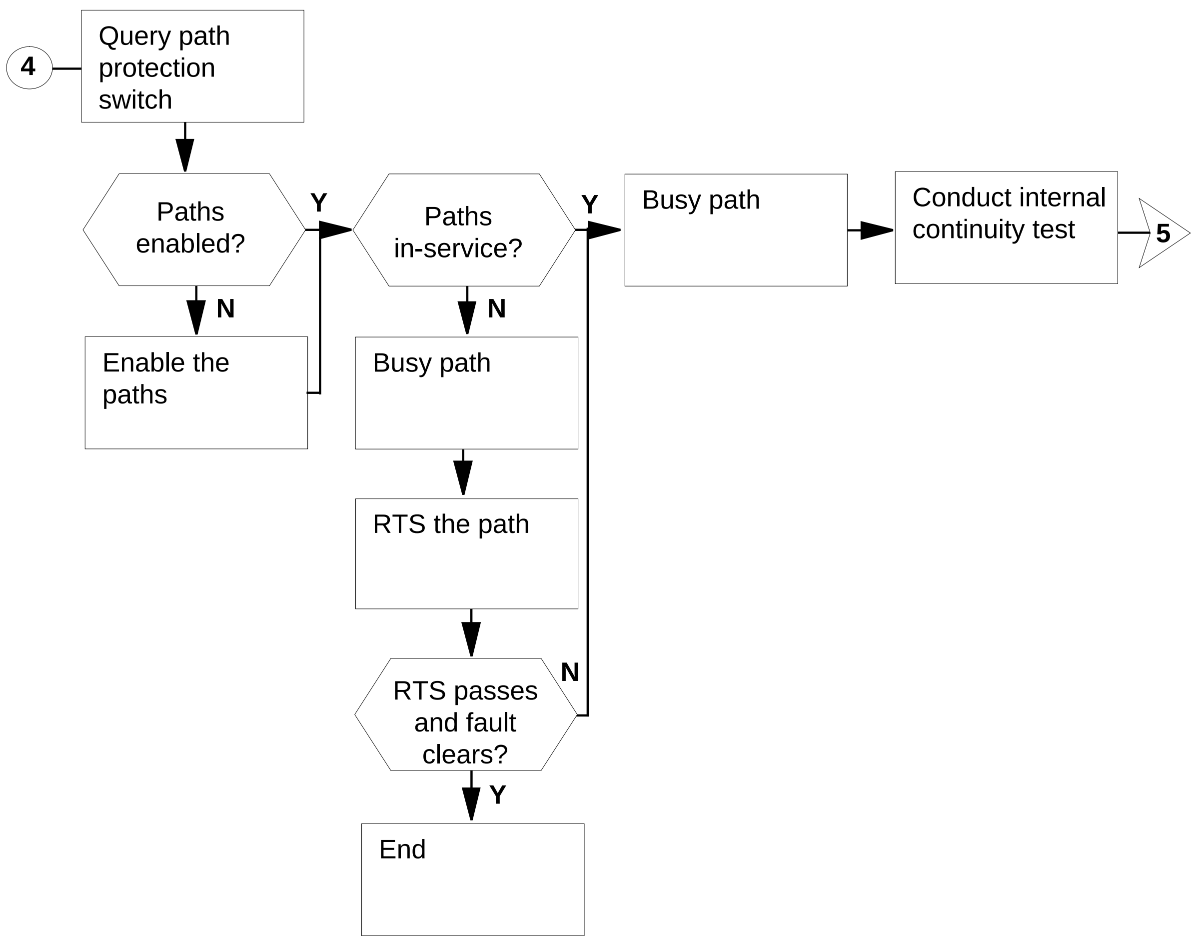
PM IDT
minor (continued)

Summary of clearing a PM IDT minor alarm (continued)



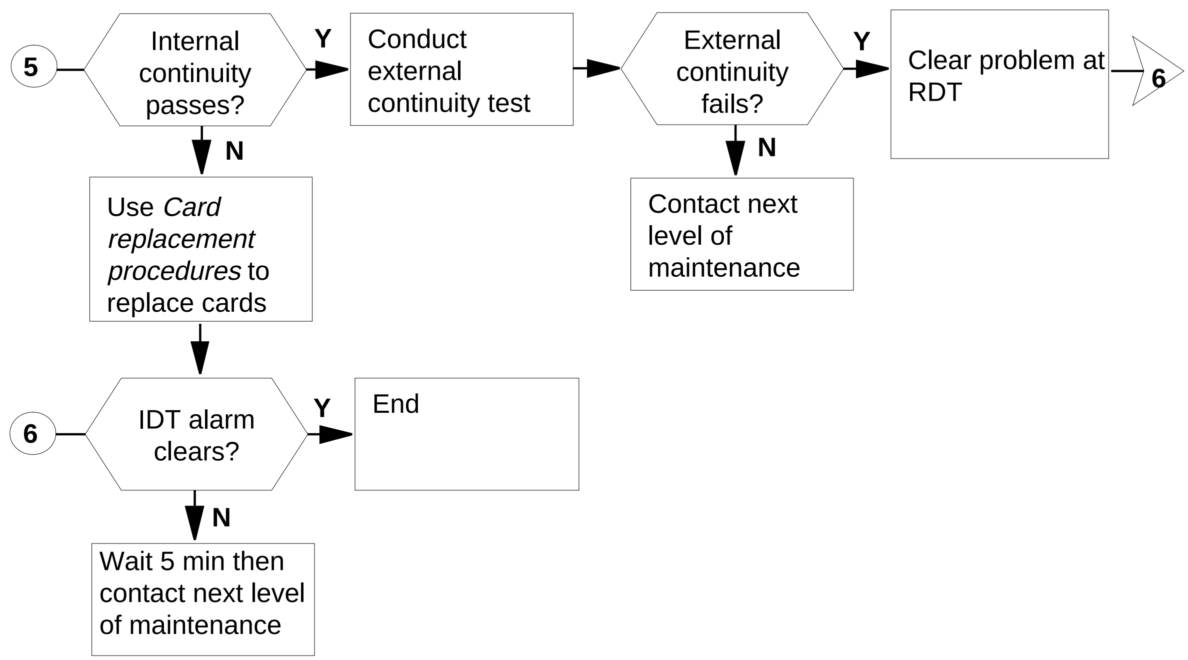
PM IDT
minor (continued)

Summary of clearing a PM IDT minor alarm (continued)



PM IDT
minor (continued)

Summary of clearing a PM IDT minor alarm (continued)



PM IDT
minor (continued)

Clearing a PM IDT minor alarm

At the MAP terminal:

1 When the system detects a fault, the system can trigger an audible alarm. To access the PM level of the MAP display, and silence the alarm, type

>MAPCI;MTC;PM;SIL

and press the Enter key.

2 To display the ISTb IDT, type

>DISP STATE ISTB IDT

and press the Enter key.

Example of a MAP response:

```
ISTb IDT: 1
```

3 To access the ISTb IDT, type

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the IDT displayed in step 2

Example of a MAP response:

```
        SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    IDT     0     0    0     0     1     5

IDT 14 ISTb  Links_OOS:  2
```

4 To check for fault indicators, type

>QUERYPM FLT

and press the Enter key.

5 Identify the ISTb message from step 4.

If system busy reason	Do
is speech link busy	step 6
is DS-1 message link busy	step 6
is path alarm	step 6

If system busy reason	Do
is maintenance connection not established	step 43
is TMC or CSC P-side node messaging overload	step 70
is EOC P-side node messaging overload	step 70
is P-side node messaging system overload on SMA2	step 70
is RDT alarms present	step 72

6 Identify the SMA2 associated with the posted IDT, type

>QUERYPM

and press the Enter key.

Example of a MAP response:

```
PM type IDT PM No: 14 Int. No: 1 Node No: 38
Prot–Switch: Available
SMA2 Name: SMA2 1
RDT Name: RDT 14 0
```

7 To post the SMA2 from step 6, type

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the number of the SMA2 that appears in step 6

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0     1     0     2    13
    SMA2    0     0     0     0     1     7

SMA2 1 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact IsTb
```

8 To verify the SMA2 P-side links are in-service, type

>TRNSL P

and press the Enter key.

Example of a MAP response:

PM IDT
minor (continued)

```
Link 1 IDT 17  0;Cap MS;Status:OK ,P;MsgCond;OPN
Link 2 IDT 17  1;Cap MS;Status:OK ,P;MsgCond;OPN
Link 3 IDT 17  2;Cap  S;Status:OK ,P;
Link 4 IDT 17  3;Cap  S;Status:SysB
```

If P-side links	Do
are in-service	step 16
are not in-service	step 9

9 To busy the system busied link, type

>BSY LINK link_no

and press the Enter key.

where

link_no
is the number of the system busied link displayed in step 8

10 To test the busied link, type

>TST LINK link_no

and press the Enter key.

where

link_no
is the number of the link busied in step 9

If test	Do
passes	step 13
fails	step 11

11 Check the card list that appears at the MAP display.

Example of a MAP response:

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  05  SMA2 : 001    03  AX74
HOST  00  M07  CMVI 00  06  SMA2 : 001    12  MX81
```

If you	Do
replaced all the cards	step 74
did not replace all the cards	step 12

12 Refer to *Card replacement procedures* for the next card on the list and return to this point.

PM IDT
minor (continued)

Go to step 10.

13 To return the link to service, type

>RTS LINK link_no

and press the Enter key.

where

link_no
is the number of the link tested in step 10

14 To access the ISTb IDT, type

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the IDT displayed in step 3

Example of a MAP response:

```
          SysB  ManB  Offl  CBsy  ISTb  InSv
    PM       3     0     1     0     2    13
    IDT      0     0     0     0     1     5

IDT 14 ISTb  Links_OOS:  2
```

15 To determine if the IDT alarm cleared, type

>QUERYPM FLT

and press the Enter key.

If	Do
the speech link busy did not clear	step 74
the DS-1 message link busy or path alarm did not clear	step 17
the speech link busy, DS-1 message link busy, or path alarm cleared	step 75

16 To post the ISTb IDT, type

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the IDT that appears in step 2

Example of a MAP response:

PM IDT
minor (continued)

```
        SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    IDT     0     0    0     0     1     5

IDT 14 ISTb  Links_OOS:  2
```

17 To display information about the state of the message channels between the IDT and the RDT, type

>PPS QUERY

and pressing the Enter key.

Example of a MAP response:

```
TMC1: SMA2 1  7 24; OOS;Standby;Enable
EOC1: SMA2 1  7 12;InSv;Active ;Enable
TMC2: SMA2 1  8 24; OOS;Standby;Enable
EOC2: SMA2 1  8 12; OOS;Standby;Enable
```

If channels	Do
are inhibited	step 18
are enabled	step 25

18 To enable path protection on a disabled TMC message channel, type

>PPS ENA path

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

19 Repeat step 18 for the disabled channels.

20 Determine if the message channels are in-service.

If channels	Do
are in-service	step 24
are out of service	step 21

21 To busy the out-of-service message channel, type

>BSY path

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

PM IDT
minor (continued)

22 To return to service busied TMC or CSC channels, type

>RTS path

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

If RTS	Do
passes	step 23
fails	step 27

23 Repeat steps 21 and 22 for all channels that are out of service. Go to step 24.

24 Determine if an active TMC, CSC, or EOC message channel exists.

If a channel	Do
is active	step 25
is not active	step 26

25 To determine if the DS-1 message path alarm has cleared, type

>QUERYPM FLT

and press the Enter key.

If alarm	Do
has cleared	step 75
has not cleared	step 50

26 To busy the channel that has faults, type

>BSY path

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, or CSC2 that has faults

27 To test the TMC or CSC channel that has faults for internal continuity, type

>CONT path INT

and press the Enter key.

where

PM IDT
minor (continued)

path
is TMC1, TMC2, CSC1, or CSC2 busied in step 26

If CONT	Do
passes	step 39
fails	step 28

28 To post the SMA2 associated with the IDT that has a minor alarm, type

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the number of the SMA2

29 To SWACT the units, type

>SWACT

and press the Enter key.

A confirmation prompt for the SWACT command appears at the MAP terminal.

If SWACT	Do
cannot continue	step 30
can continue	step 31

30 To reject the prompt to SWACT the units, type

>NO

and press the Enter key.

The system discontinues the SWACT.

31 To confirm the system prompt, type

>YES

and press the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before you proceed with the next maintenance action.

If the message	Do
is `SWACT passed`	step 33

PM IDT
minor (continued)

If the message	Do
is `SWACT failed Reason: XPM SWACTback`	step 32
is `SWACT refused by SWACT Controller`	step 32

32 The inactive unit cannot establish two-way communication with CC. The inactive unit switches activity back to the unit that was first active. Clear the faults on the inactive unit before you attempt to clear the alarm condition on the active unit.

Go to step 74.

33 To busy the newly inactive unit, type

`>BSY UNIT unit_no`

and press the Enter key.

where

unit_no
is the number of the inactive unit

34 To test the inactive unit, type

`>TST UNIT unit_no`

and press the Enter key.

where

unit_no
is the number of the inactive unit

If test	Do
passes	step 74
fails	step 31

35 Determine if the system generates a card list.

If the system	Do
generates a card list	step 32
does not generate a card list	step 74

36 Check the card list that appears at the MAP display.

Example of a MAP response:

PM IDT
minor (continued)

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  06  SMA2 : 001    04  BX01
HOST  00  M07  CMVI 00  06  SMA2 : 001    12  MX81
```

37 Go to *Card replacement procedures* to replace the cards on the list and return to this point.

38 To load the inactive SMA2 unit, type

>LOADPM UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the SMA2 unit busied in step 29

If load	Do
passes	step 36
fails	step 74

39 To return the inactive SMA2 unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the SMA2 unit loaded in step 34

If RTS	Do
passes	step 37
fails	step 74

40 To post the ISTb IDT that appears in step 16, type

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the IDT displayed in step 16

41 To RTS the busied channel, type

>RTS path

and press the Enter key.

where

PM IDT
minor (continued)

path
is TMC1, TMC2, CSC1, or CSC2 from step 26

Go to step 75.

42 To RTS the channel that has faults, type

>RTS path

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, or CSC2 from step 26

43 Set up a loopback path at the RDT in preparation for an external continuity test. Refer to RDT documentation for setting or releasing a loopback on a DS-1 facility.

44 To test the active TMC or CSC channel that has faults for external continuity, type

>CONT path EXT

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, or CSC2 from step 26

Note: Conduct the external continuity test on an active path.

If CONT	Do
fails	step 42
passes	step 74

45 The problem is at the RDT. Refer to RDT documentation.

Go to step 75.

46 To post the IDT that has faults, type

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the defective IDT

47 To display information about the state of the message channels between the IDT and the RDT, type

>PPS QUERY

and press the Enter key.

Example of a MAP response:

PM IDT
minor (continued)

```
TMC1: SMA2 1  7 24; OOS;Standby;Enable
EOC1: SMA2 1  7 12;InSv;Active ;Enable
TMC2: SMA2 1  8 24; OOS;Standby;Enable
EOC2: SMA2 1  8 12; OOS;Standby;Enable
```

If the channels	Do
are inhibited	step 45
are enabled	step 47

48 To enable path protection on a disabled TMC or CSC message channel, type

>PPS ENA path

and press the Enter key.

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

49 Repeat step 45 for disabled channels.

50 Determine if the message channels are in-service.

If	Do
one EOC is out of service	step 48
two EOCs are in-service and one EOC is in-service and active	step 50

51 To busy EOC channel, type

>BSY path

and press the Enter key.

where

path
is EOC1 or EOC2

52 To busy one EOC channel, type

>RTS path

and press the Enter key.

where

path
is EOC1 or EOC2

If RTS	Do
passes	step 50

PM IDT
minor (continued)

If RTS	Do
fails	step 52

53 Wait 5 min for the maintenance connection to establish again.

If connection	Do
is established	step 75
is not established	step 51

54 To determine if the `maintenance path not established` alarm has cleared, type

>QUERYPM FLT

and press the Enter key.

If alarm	Do
has cleared	step 75
has not cleared	step 52

55 To busy the EOC channel, type

>BSY path

and press the Enter key.

where

path
is defective EOC1 or EOC2

56 To test the EOC channel that has faults for internal continuity, type

>CONT path INT

and press the Enter key.

where

path
is EOC1 or EOC2

If CONT	Do
passes	step 71
fails	step 54

57 To post the SMA2 that associates with the IDT that has the minor alarm, type

>POST SMA2 sma2_no

and press the Enter key.

PM IDT
minor (continued)

where

sma2_no
is the number of the SMA2

58 To SWACT the units, type

>SWACT

and press the Enter key.

A confirmation prompt for the SWACT command appears at the MAP terminal.

If SWACT	Do
cannot continue	step 59
can continue	step 60

59 To reject the prompt to SWACT the units, type

>NO

and press the Enter key.

The system discontinues the SWACT.

60 To confirm the system prompt, type

>YES

and press the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before you proceed with the next maintenance action.

If the message	Do
is `SWACT passed`	step 62
is `SWACT failed Reason: XPM SWACTback`	step 61
is `SWACT refused by SWACT Controller`	step 61

61 The inactive unit cannot establish two-way communication with CC and switches activity back to the unit that was first active. Clear the faults on the inactive unit before you attempt to clear the alarm condition on the active unit.

Go to step 74.

62 To busy the newly inactive unit, type

>BSY UNIT unit_no

PM IDT
minor (continued)

and press the Enter key.

where

unit_no
is the number of the inactive unit

63 To test the inactive unit, type

>TST UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the inactive unit

If test	Do
passes	step 75
fails	step 57

64 Determine if the system generates a card list at the MAP display.

If the system	Do
generates a card list	step 58
does not generate a card list	step 74

65 Check the card list that appears at the MAP display.

Example of a MAP response:

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  06  SMA2 : 001  04  BX01
HOST  00  M07  CMVI 00  06  SMA2 : 001  12  MX81
```

66 Go to *Card replacement procedures* to replace the cards on the list and return to this point.

67 To load the inactive SMA2 unit, type

>LOADPM UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the SMA2 unit busied in step 55

If load	Do
passes	step 62
fails	step 74

PM IDT
minor (continued)

68 To return the inactive unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the inactive unit

If RTS	Do
passes	step 63
fails	step 74

69 To post the defective IDT, type

>POST IDT idt_no

and press the Enter key.

where

idt_no
is the number of the IDT that appears in step 43

Example of a MAP response:

```
        SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0     1     0     2    13
    IDT     0     0     0     0     1     5

IDT 14 ISTb  Links_OOS:  2
```

70 To display information about the state of the message channels between the IDT and the RDT, type

>PPS QUERY

and press the Enter key.

Example of a MAP response:

```
TMC1: SMA2 1  7 24; OOS;Standby;Enable
EOC1: SMA2 1  7 12;InSv;Active ;Enable
TMC2: SMA2 1  8 24; OOS;Standby;Enable
EOC2: SMA2 1  8 12; OOS;Standby;Enable
```

71 To return to service the message channel that has faults, type

>RTS path

and press the Enter key.

where

PM IDT
minor (continued)

path
is the busied EOC1, EOC2, TMC1, TMC2, CSC1, or CSC2

If the message channel returns to service	Do
is EOC channel	step 75
is TMC or CSC channel	step 72

72 Set up a loopback path at the RDT to prepare for an external continuity test. Refer to RDT documentation.

73 To test the active TMC or CSC channel that has faults for external continuity, type

`>CONT path EXT`

and press the Enter key.

where

path
is the busied TMC1, TMC2, CSC1, or CSC2

If CONT	Do
fails	step 69
passes	step 74

74 The problem is at the RDT. Refer to RDT documentation.

Go to step 75.

75 Wait until overload conditions clear. Consult local operating procedures for the required length of time to wait.

If overload conditions	Do
clear in time frame	step 75
remain after time frame	step 71

76 The congestion can be the result of an engineering problem on the RDT.

Go to step 74.

77 To determine the number and type of critical RDT alarms, type

`>RDTALARM`

and press the Enter key.

Example of a MAP response

PM IDT
minor (end)

```
RDTalarm
RDT Name:  RDT 1 03 0
Network Element:  3 RALEIGH_AMEX_B13

ACTIVE ALARMS : Fac      Eqp   Env    Sfw    Svc    Thr    Ind
-------------------------------------------------------------
Critical      : 2        0     0      0      0      0      0
Major         : 0        0     0      0      0      0      0
Minor         : 0        0     0      0      0      0      0
Warning       : 0        0     0      0      0      0      0
```

Note 1: The active alarms that appear are different in the AccessNode environment.

Note 2: For multi-vendor interface (MVI) RDTs, this response can or cannot appear.

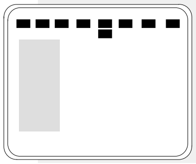
78 To correct the fault conditions at the RDT from step 72, refer to RDT procedures for alarm clearing procedures. The system retires the IDT in-service-trouble after the alarm is cleared at the RDT. Go to step 75.

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

80 The procedure is complete.

Ext MSP
CMVI, MVIE and MVDD major

Alarm display



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

Indication

An FSP that follows a number under the Ext header of the alarm banner indicates an Ext modular supervisory panel (MSP) alarm. An M under the FSP indicates that the alarm class is major. The alarm display is at the MTC level of the MAP display. Current software does not reflect the change from FSP to MSP in the MAP display.

Meaning

An MSP alarm occurs when one or more cabinets in the office has a power fault or a cooling unit fault. The number that precedes FSP is the number of cabinets with an MSP alarm.

Result

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

Common procedures

This procedure refers to the common procedure “Replacing the cooling unit," located in the routine maintenance section of this manual.

Action

This procedure applies to the following cabinets and frames:

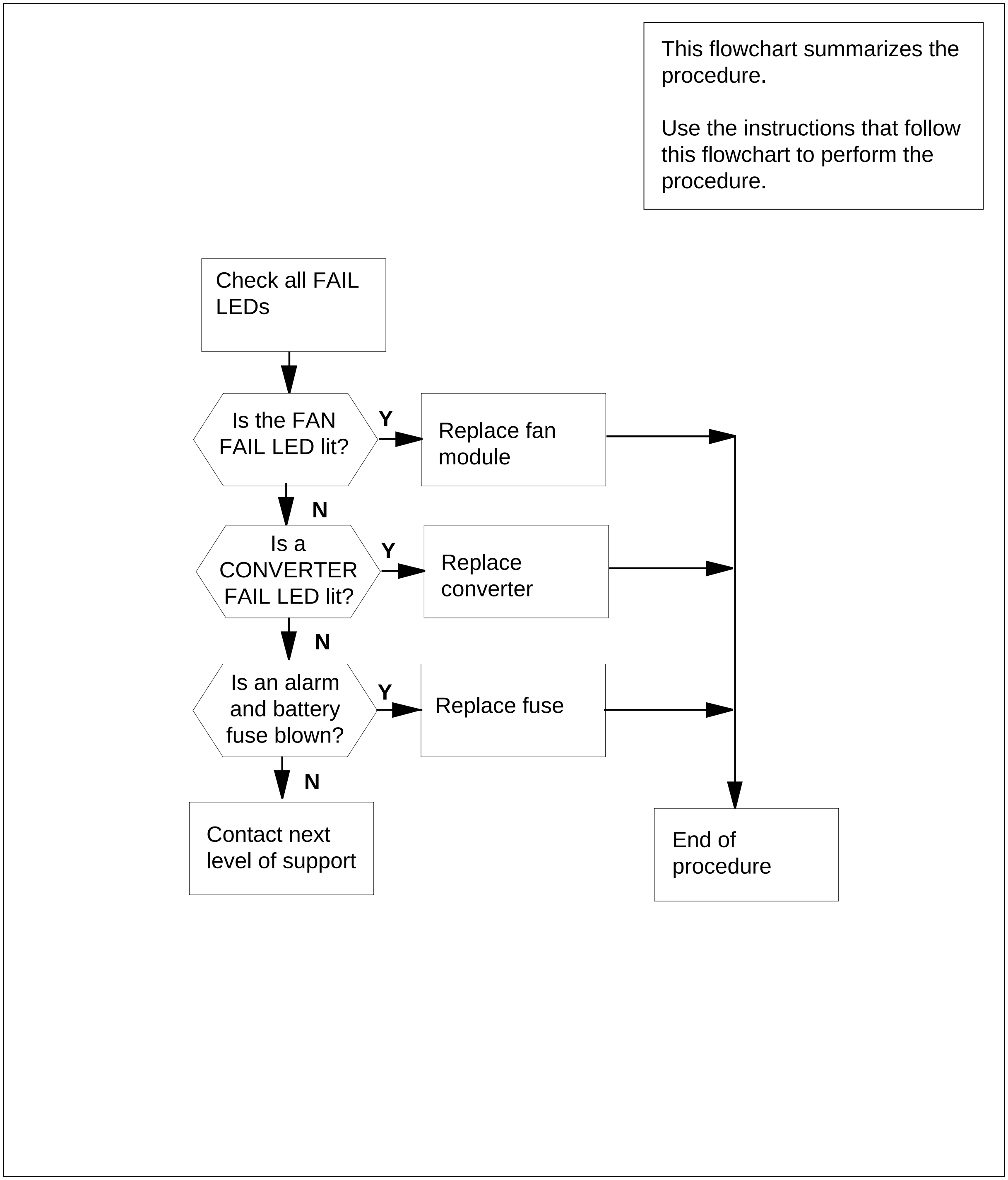
- cabinetized multi-vendor interface (CMVI), NTMX90BA
- multi-vendor interface equipment (MVIE), NTQX90AA
- multi-vendor double density (MVDD), NTQX90BA

> ***Note:*** Diagrams of the CMVI, MVIE, MVDD and MSP appear at the end of this procedure.

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 MSP
CMVI, MVIE and MVDD major (continued)

Summary of clearing an Ext MSP CMVI, MVIE and MVDD major alarm



Clearing an Ext MSP CMVI, MVIE and MVDD major alarm

At the frame or cabinet

1 Check the FAN FAIL LEDs.

If	Do
any FAN FAIL LEDs are lit	step 30
FAN FAIL LEDs are not lit	step 2

2 Check the CONVERTER FAIL LED on each converter in the cabinet.

If	Do
any CONVERTER FAIL LEDs are lit	step 11
CONVERTER FAIL LEDs are not lit	step 3

3 Check the ABS fuses 01 to 04 located on the MSP.

If	Do
a fuse is blown	step 4
the fuses are not blown	step 5

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

5 Check the DCH power fuses located on the power converter circuit cards (NTMX72AA or AB) in shelf positions:

- 06 and 34 in the CMVI cabinet.
- 16 and 44 in the MVIE frame.
- 16, 30, 44, and 58 in the MVDD frame.

Check the DCH power fuses located on the DS60 extender circuit card (NTMX79AB) in shelf position 20 in the CMVI cabinet.

Check the DCH power fuses in shelf position 30 in the MVIE frame.

6 Remove the blown fuse.

Ext MSP
CMVI, MVIE and MVDD major (continued)

7

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

Insert the replacement fuse.

If	Do
the fuse blows (protrudes) again	step 8
the fuse does not blow	step 27

8 Obtain a replacement fuse with the same voltage as the blown fuse.

9 Remove the blown fuse.

10

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

Insert the replacement fuse.

If the fuse	Do
has blown (protrudes) again	step 11
has not blown	step 27

11 Note the number of the shelf that contains the converter with the lit CONVERTER FAIL LED.

12 Use the following information to identify circuit breakers associated with the numbered shelf noted in step 11. The circuit breakers are on the MSP.

If the cabinet or frame shelf number is	Do use circuit breaker number
06 (CMVI) or 16 (MVIE, MVDD)	1, 3

Ext MSP
CMVI, MVIE and MVDD major (continued)

If the cabinet or frame shelf number is	Do use circuit breaker number
20 (CMVI) or 30 (MVIE) with extension shelf	5, 6, 7, 8
30 (MVDD)	2, 4
34 (CMVI) or 44 (MVIE)	2, 4
44 (MVDD)	5, 7
47 (CMVI) or 58 (MVIE)	nil - blank shelf
58 (MVDD only)	6, 8

13 Check the associated circuit breaker.

If the circuit breaker is	Do
ON	step 22
OFF	step 14

14 Set the circuit breaker just identified to ON.

If the circuit breaker	Do
goes OFF (the CONVERTER FAIL LED is lit)	step 15
remains ON and the CONVERTER FAIL LED is lit	step 22
remains ON and the CONVERTER FAIL LED is not lit	step 27

15 Note the numbers of the cabinet or frame and shelf that contain the converter with the lit CONVERTER FAIL LED.

At the cabinetized power distribution center (CPDC)

16 Locate the fuse that powers the shelf in the CMVI or MVIE.

If	Do
a fuse is blown (protruding)	step 17
a fuse is not blown	step 22

17 Remove the fuse holder with the blown fuse.

18 Replace the cartridge fuse inside the fuse holder.

Ext MSP
CMVI, MVIE and MVDD major (continued)

19

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

Replace the blown fuse.

20 Install the fuse holder back on to the CPDC cabinet.

At the frame or cabinet

21 Set the circuit breaker to ON.

If the circuit breaker	Do
goes OFF (the CONVERTER FAIL LED is not lit)	step 23
remains ON and the CONVERTER FAIL LED is not lit	step 27
remains ON and the CONVERTER FAIL LED is lit	step 22

22 Set the circuit breaker to OFF.

23 To replace the converter, refer to *Card replacement procedures*. After you replace the converter, return to this step.

24 Check the replaced converter and the associated circuit breaker.

If the circuit breaker	Do
goes OFF (the CONVERTER FAIL LED is lit)	step 29
remains ON and the CONVERTER FAIL LED is not lit	step 27
remains ON and the CONVERTER FAIL LED is lit	step 25

25 Set the circuit breaker to OFF.

26 Go to the step that is not completed in this procedure (step 2 or 3).

Ext MSP
CMVI, MVIE and MVDD major (continued)

At the MAP terminal

27 To determine if an MSP alarm is present, access the Ext level of the MAP display and type

>MAPCI;MTC;EXT

and press the Enter key.

If a MSP alarm	Do
is present, and you have not accessed all the cabinets with a MSP alarm	step 28
is present, and you accessed all the cabinets with a MSP alarm	step 29
is not present	step 31

28 Go to the table of contents in this document to find the procedure for cabinets with MSP alarms. Perform the procedure.

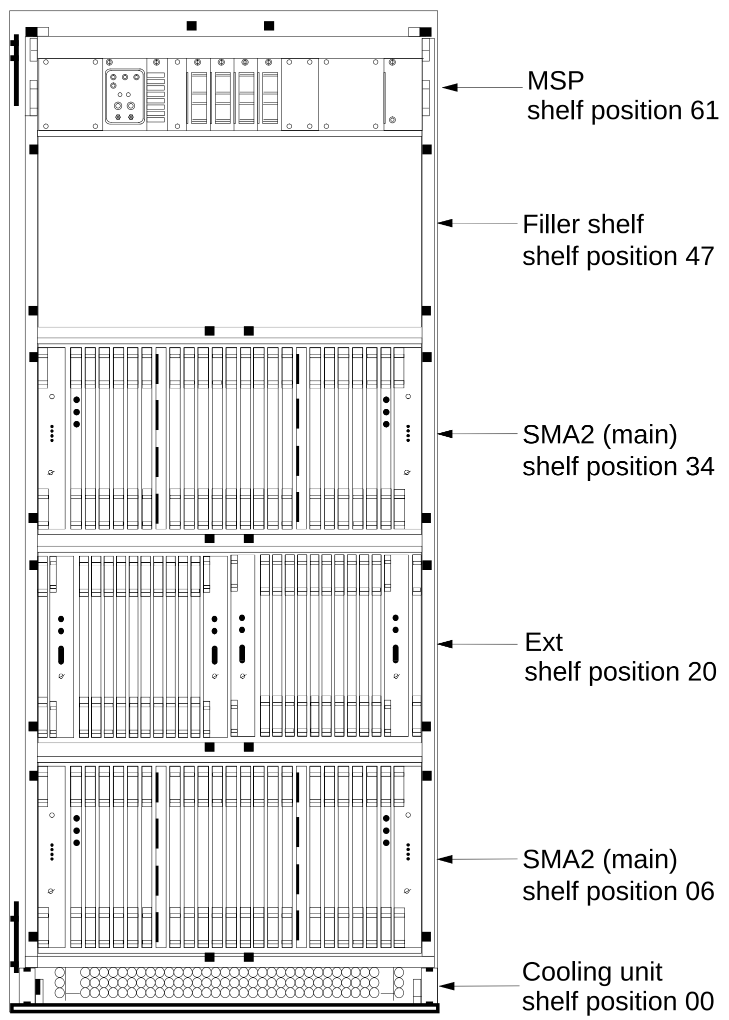
29 For additional help, contact the next level of support.

30 Go to the table of contents, under routine maintenance procedures, to find the procedure “*Replacing the cooling unit*." Perform the procedure. If the MSP alarm is still present, return to this procedure at step 26

31 This procedure is complete.

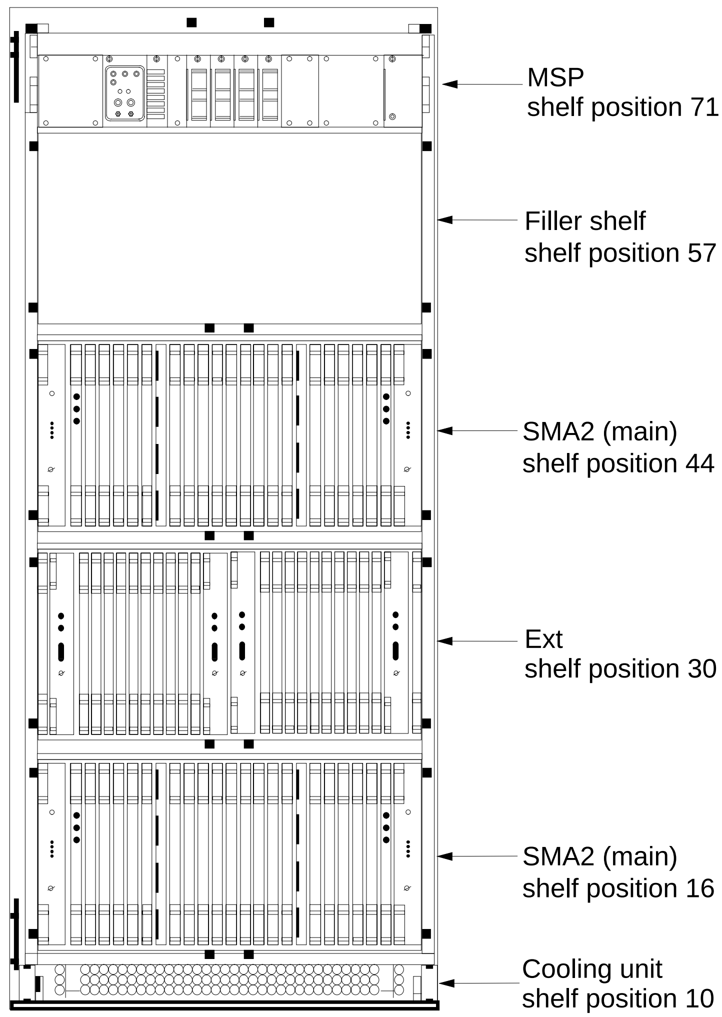
Ext MSP
CMVI, MVIE and MVDD major (continued)

Cabinetized multi-vendor interface (CMVI)



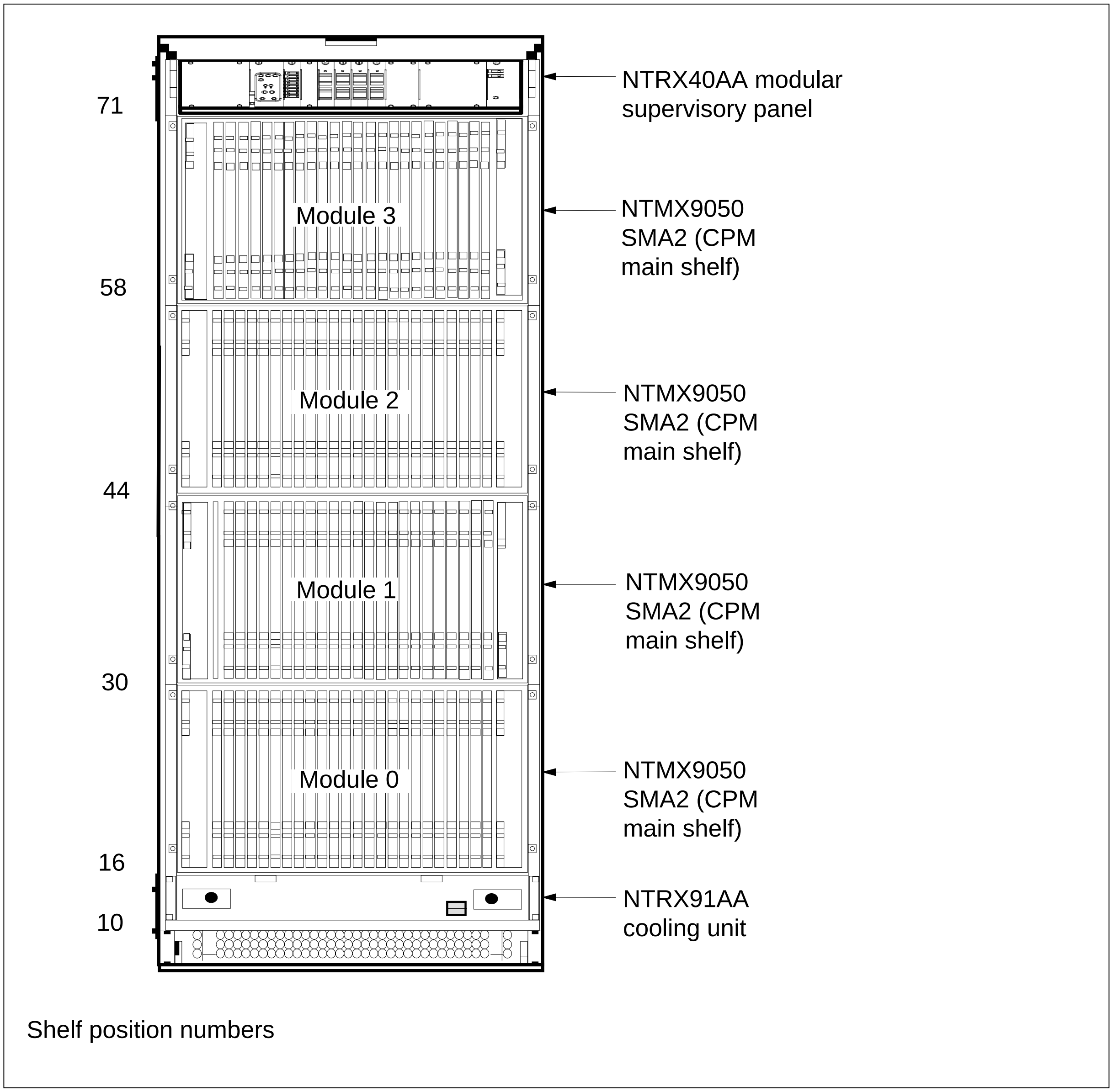
Ext MSP
CMVI, MVIE and MVDD major (continued)

Multi-vendor interface equipment (MVIE)



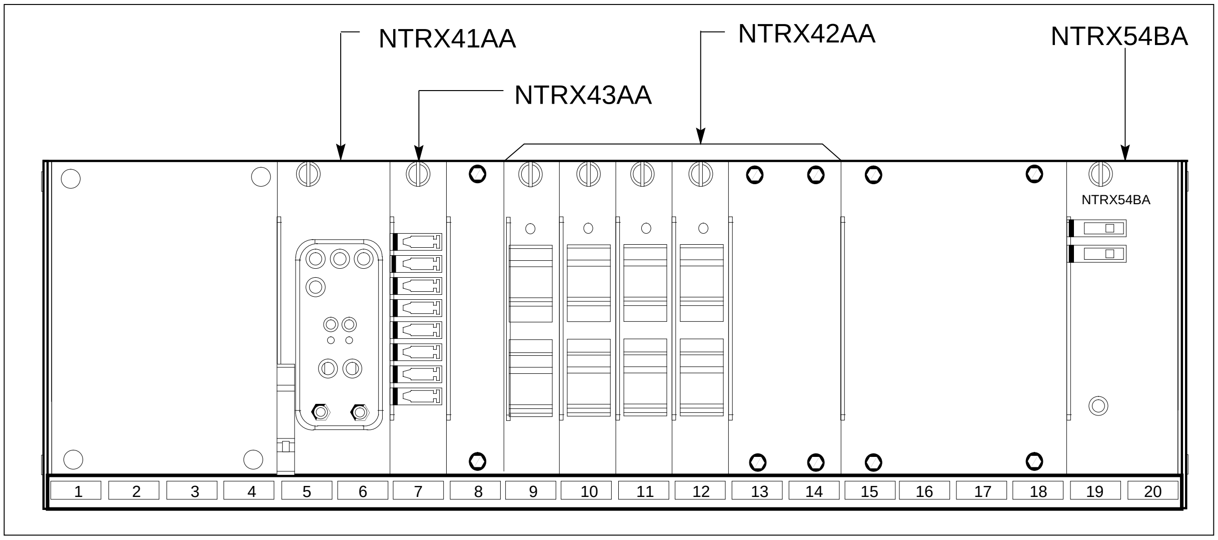
Ext MSP
CMVI, MVIE and MVDD major (continued)

Multi-vendor double density (MVDD) frame



Ext MSP
CMVI, MVIE and MVDD major (end)

MSP shelf for CMVI, MVIE and MVDD



Ext RDT critical/major/minor

Alarm display

CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nIDT**	.	.	.	**nCrit**	.
				C				***C***	

CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nIDT**	.	.	.	**nMaj**	.
				M				**M**	

CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nIDT**	.	.	.	**nMin**	.

Indication

The abbreviation for the most important external alarm appears under the Ext header in the MAP subsystem display. This alarm indicates an alarm condition in an external unit connected to the switch.

The *n* indicates the number of alarms with the seriousness indicated. The **C** that appears under the alarm indicates that the alarm class is critical. The *M* that appears under the alarm indicates that the alarm class is major. A blank below the alarm indicates that the alarm class is minor.

Meaning

These alarms indicate alarm conditions in an external unit like an S/DMS Remote Digital Terminal (RDT). Operating company personnel must investigate to determine if the alarm is related to RDT. If an Ext alarm is related to RDT, an alarm in the RDTs corresponding Integrated Digital Terminal (IDT) in-service trouble (ISTb).

Impact

The type and seriousness of the problem on the RDT that raises the alarm determines impact.

Ext RDT
critical/major/minor (continued)

Common procedures

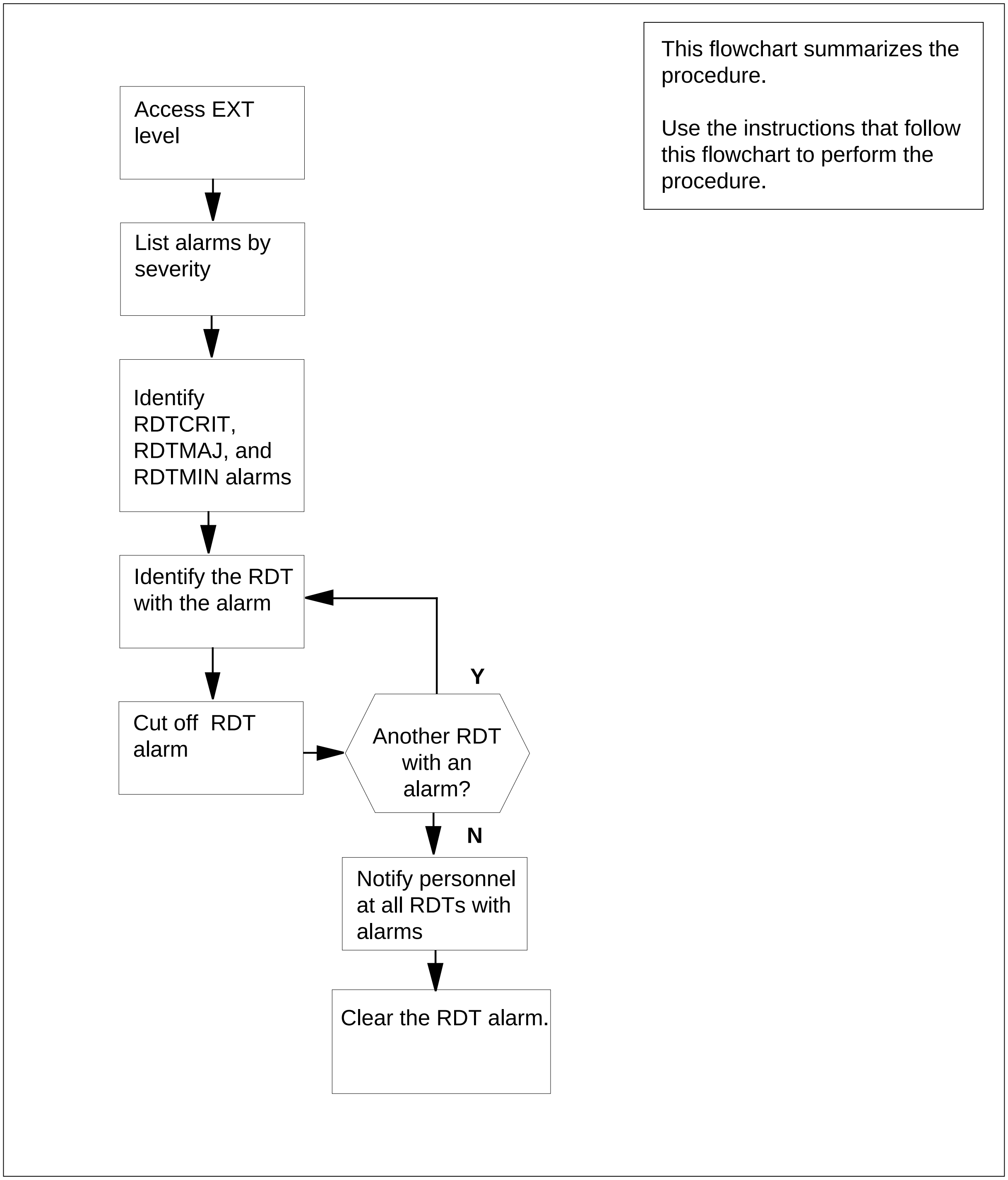
There are no common procedures.

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 RDT critical/major/minor (continued)

Summary of clearing an Ext RDT alarm



Ext RDT critical/major/minor (continued)

Clearing an Ext RDT alarm

At the MAP display

1 When the system detects a failure in an external unit, the system raises a critical alarm at the EXT level of the MAP display. To access the EXT level when the system raises an EXT alarm, type

>MAPCI;MTC;EXT

and press the Enter key.

2 When the system detects a fault, the fault can trigger an audible alarm. To silence the alarm, type

>SIL

and press the Enter key.

3 Determine the severity of the Ext alarm.

If Ext alarm	Do
is Crit	step 4
is Maj	step 5
is Min	step 6

4 Determine if the external critical alarms are related to a RDT. To determine if the external critical alarms are related to a RDT, type

>LIST CRIT

and press the Enter key.

If RDTCRIT	Do
is displayed	step 8
is not displayed	step 5

5 To determine if the external major alarms are related to a RDT, type

>LIST MAJ

and press the Enter key.

If RDTMJ	Do
is displayed	step 8
is not displayed	step 6

Ext RDT critical/major/minor (continued)

6 To determine if the external minor alarms are related to a RDT, type

>LIST MIN

and press the Enter key.

If RDTMN	Do
is displayed	step 8
is not displayed	step 7

7 Identify the unit that caused the alarm. To correct the problem, refer to the correct documentation.

8 To determine which signal distribution alarm points operate for each alarm, type

>DISP SDALARM

and press the Enter key.

A series of signal distribution (SD) points that correspond to the location of the RDT appears. A signal distribution point(s) that correspond to the status of the active alarm also appears. The system only displays SD points for one RDT at a time. The RDT that appears is the RDT with the most severe condition.

Example of a MAP display:

```
CM    MS     IOD      Net     PM    CCS      Lns       Trks      Ext   APPL
                                                               2 Crit
 *    *       *         *        *     *         *         *   *C*

Ext
 0 Quit        Ext Alarms     Crit FSP  Major     Minor   NoAlm
 2             EXT:            1    0     0         0       0
 3
 4             disp sdalarm
                 SD points in alarm state:
 5               RDTSD1
 6               RDTSD3
 7 List_         RDTSD8
 8 TstDSAlm      RDTCRIT
 9 SetSD_
10 SetSC_
11 Disp_
12
13 _Crit
14 _FSP
15 _Maj
16 _Min
17 _NoAlm
18
   userid
Time  hh:mm >
```

Ext RDT critical/major/minor (continued)

9 Record all the RDT signal distribution points (RDTSDn) associated with each RDTCRIT alarm. For example, in the MAP display shown in step 8, record RDTSD1, RDTSD3 and RDTSD8 in association with the RDTCRIT alarm. The signal distribution points (RDTSDn) that the system displays identify each RDT in table RDTINV.

10 To cut off the alarm, type

>SETSC RDTALRMCO OP;SETSC RDTALRMCO REL

and press the Enter key.

The scan point for the RDT alarm cut off operates and releases. If there are other RDTs with alarms, the system displays the next RDT with the most important alarm.

The RDTALRMCO function allows the user to enable RDT alarms again that the user cut off earlier. The status of the interruption does not affect the display of new alarms. The system displays signal distribution points for a minimum of 20 s. The system displays signal distribution points. When a more critical alarm occurs or the user activates the alarm cutoff, the system does not display signal distribution points.

If	Do
other RDT alarms exist	step 3
other RDT alarms do not exist	step 11

11 To access table RDTINV, type

>TABLE RDTINV

and press the Enter key.

Example of a MAP display:

```
TABLE:  RDTINV
```

12 To display table RDTINV headings, type

>HEADING

and press the Enter key.

Example of a MAP display:

```
RDTNAME      ADNUM        IDTNAME          NENAME
             PRIMOPC                       BACKOPC
                                        CLAPDFLT VARTYPE
                                                  MTSTACPT
                                                  LINKTAB
PROT         POTSPADG        EOC
                                                  SDPOINTS
                                                  RDTDN
```

13 To display the tuple that contains the pattern identified in step 9, type

>LIST ALL (SDPOINTS EQ `sdpoint_name sdpoint_name')

Ext RDT
critical/major/minor (end)

and press the Enter key.

where

sdpoint_name
is the signal distribution points pattern identified in step 8

The tuple that contains the specified pattern appears.

Example of a MAP display:

```
RDTNAME      ADNUM       IDTNAME         NENAME
             PRIMOPC                     BACKOPC
                                              VARTYPE
                                                  MTSTACPT
                                                  LINKTAB
   PROT   POTSPADG       EOC
                                                  SDPOINTS
                                                  RDTDN
---------------------------------------------------
REM3 01 0    10          SMA2 1 3            $
               $                            $
                               GENTMC  7  96  Y Y $
                                                  $
                             (1 0) (2 1 ) (3 4 )  $
N         STDLN              S         C
         (NETWORK_ID 1) (NETWORKELEMENT_ID 14)    $
```

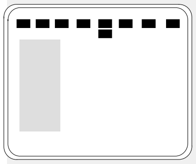
14 Identify the name of the RDT with the critical alarm. For example, the name of the RDT in step 13 is REM3.

15 Notify operating company personnel for each RDT with an alarm.

16 To correct the fault conditions at the RDT, refer to RDT procedures on how to clear alarms.

PM SMA2 critical

Alarm display



CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nSMA2**	.	.	.	.	.
				C					

Indication

The SMA2 alarm appears under the PM header in the MAP subsystem display. This alarm indicates an alarm condition in the SMA2. The *n* indicates the number of SMA2 modules with alarms. The *C* under the alarm indicates the alarm class is critical.

Meaning

This alarm normally indicates that one or more common peripheral module cards in the SMA2 have defects.

Result

A critical alarm class code indicates the SMA2 cannot process calls.

Common procedures

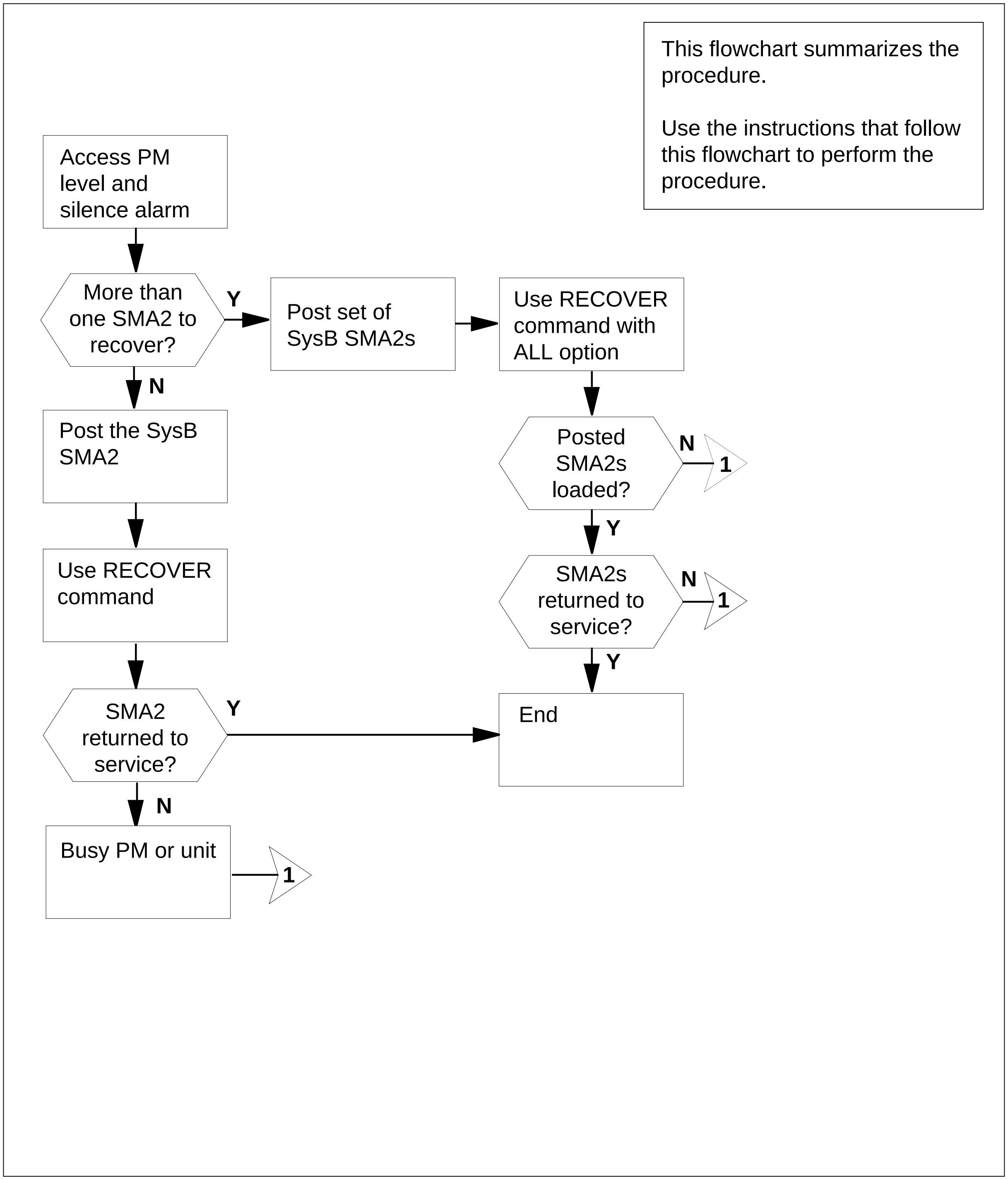
There are no common procedures.

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.

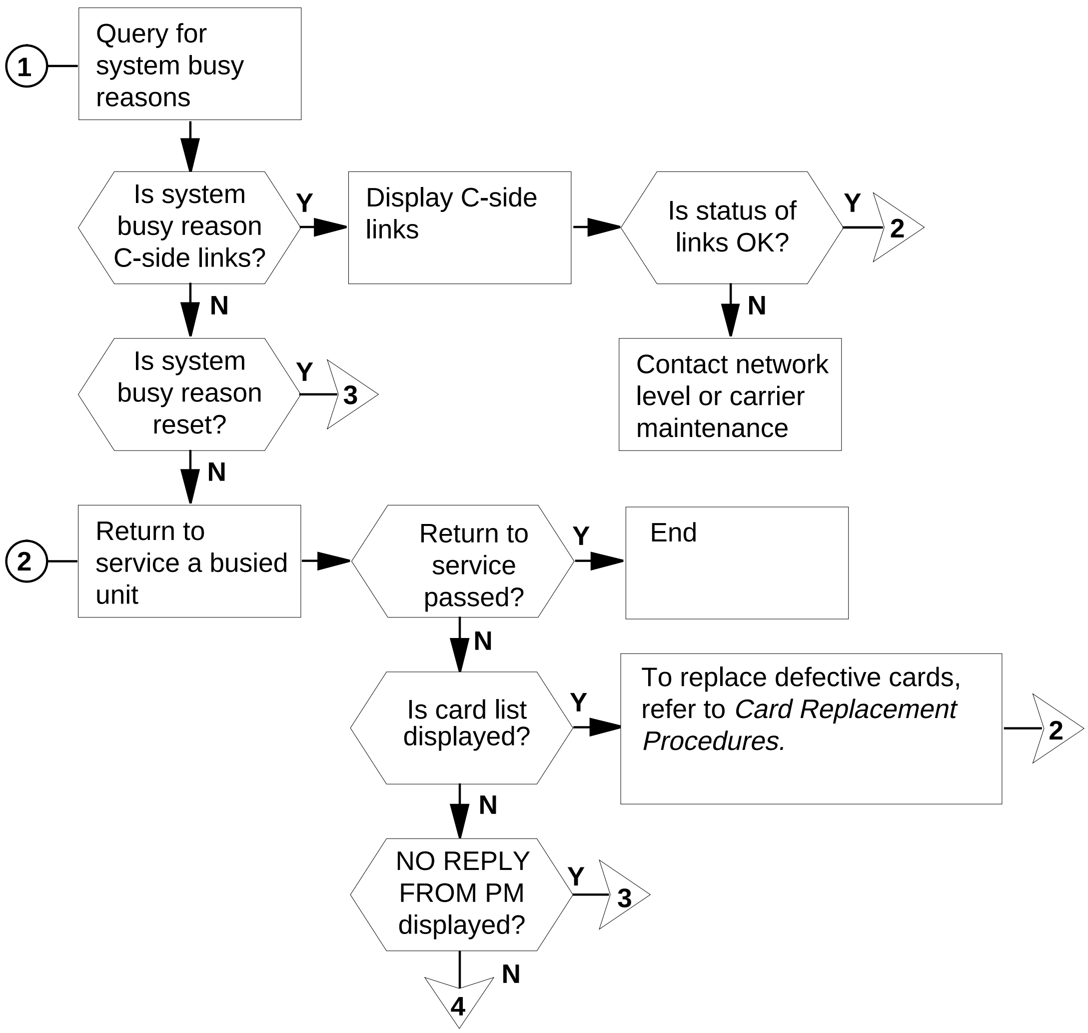
PM SMA2
critical (continued)

Summary of clearing a PM SMA2 critical alarm



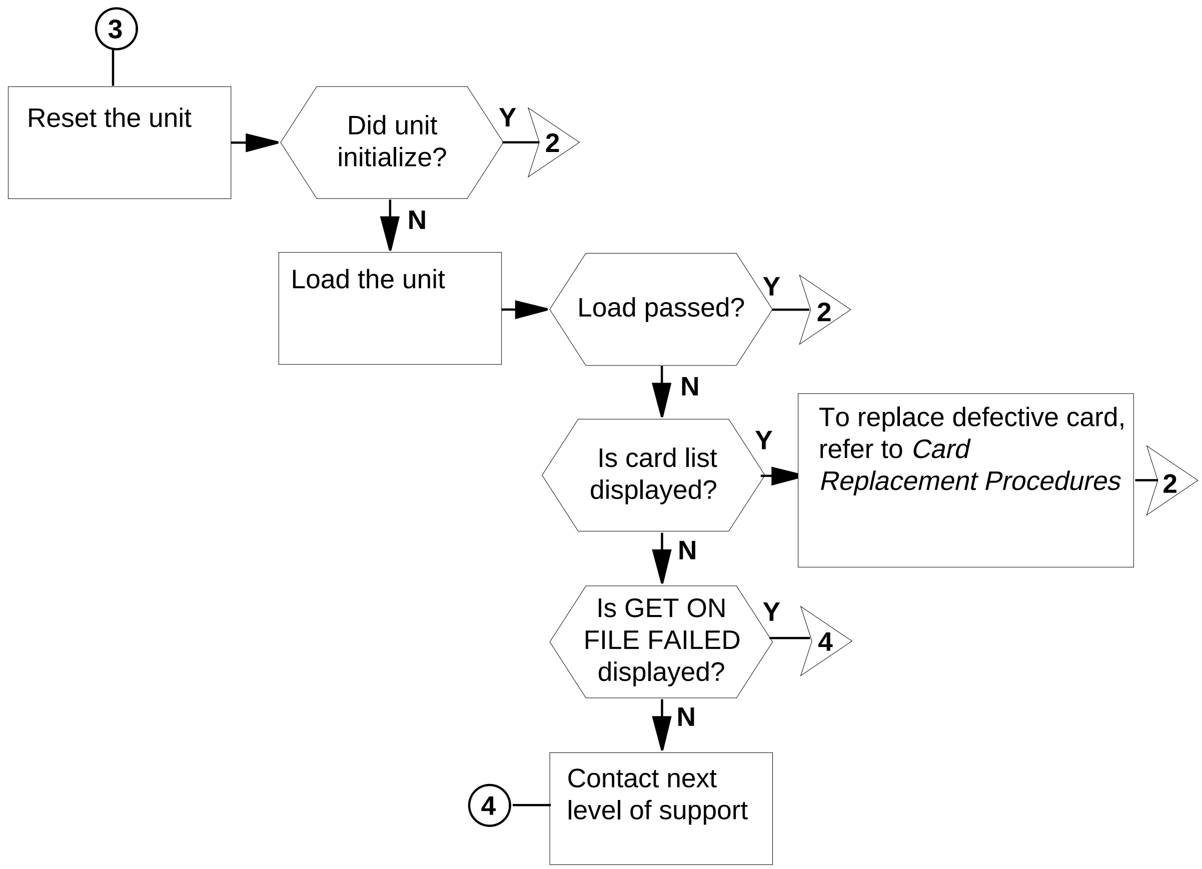
PM SMA2
critical (continued)

Summary of clearing a PM SMA2 alarm (continued)



PM SMA2
critical (continued)

Summary of clearing a PM SMA2 critical alarm (continued)



Clearing a PM SMA2 critical alarm

At the MAP terminal:

1 When the system detects a fault, the system can trigger an audible alarm. To access the 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 SMA2, type

>DISP STATE SYSB SMA2

and press the Enter key.

Example of a MAP response:

```
SysB SMA2: 1
```

If	Do
one SMA2 is SysB	step 6
more than one SMA2 is SysB	step 3

3 To access the set of SysB SMA2s, type

>POST SMA2 SysB

and press the Enter key.

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM       3     0     1     0     2    13
    SMA2     2     0     0     0     0     7

SMA2 1 SysB  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   SysB
Unit1:  Inact SysB
```

4 To recover system busy SMA2s 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 SMA2s.
Please Confirm (“YES” or “NO”):
```

PM SMA2
critical (continued)

Note: In the MAP terminal response, n is the number of all SMA2s in the posted set.

5 To confirm recovery, type

>YES

and press the Enter key.

Go to step 8.

6 To access the SysB SMA2, type

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the number of the SMA2 displayed in step 2

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     3     2    13
    SMA2    1     0    0     3     0     7
SMA2 1 SysB  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   SysB
Unit1:  Inact SysB
```

7 To recover the system busy SMA2 with the PM recovery tool, type

>RECOVER

and press the Enter key.

Example of a MAP response:

```
recover
SMA2 1  Recover request submitted
```

8 The following example of a MAP response describes a recovery request that the recovery tool submits for each posted SMA2.

Example of a MAP response:

```
SMA2 0 Recover request submitted
SMA2 1 Recover request submitted


SMA2 n Recover request submitted
```

The tool determines which of the posted SMA2s requires recovery. For each SMA2 that requires recovery, the tool attempts to load the PM units 0 and 1. For each SMA2 loaded, and for all other SMA2s that require the recovery tool, the tool attempts to return to service the active unit.

PM SMA2
critical (continued)

In the following example:

- the system loads and returns SMA2 0 to service
- the system returns SMA2 1 to service.
- SMA2 2 did not load unit 0
- SMA2 2 did load unit 1, and returned to service unit 1.
- SMA2 3 did not load.

Example of a MAP response:

```
SMA2 1 Recover passed
SMA2 0 Unit 0  LoadPM passed
SMA2 0 Unit 1  LoadPM passed
SMA2 2 Unit 0  LoadPM failed
              Failed to initialize
SMA2 2 Unit 1  LoadPM passed
SMA2 3 Unit 0  LoadPM failed
              Failed to initialize
SMA2 3 Unit 1  LoadPM failed
              Failed to initialize
SMA2 2 Unit 0  Reloading required.
              RTS attempted on mate
SMA2 0 Recover passed
SMA2 2 Recover passed
 .
 .
SMA2 n Recover passed
```

The following example describes a summary of the operation that the tool provides:

Example of a MAP response:

```
Summary:
3 passed
1 failed
```

9 Determine if all the SMA2s are recovered.

> ***Note:*** The recovery process places one unit InSv and one unit ManB. If the recovery process cannot recover these units, the recovery process leaves both units in a ManB state.

If	Do
all SMA2s recover	step 31
one or more SMA2s do not recover	step 10

PM SMA2
critical (continued)

10 Record the SMA2s that did not recover.

11 To post the ManB SMA2, type

>POST SMA2 sma2_no

and press the Enter key.

where

sma2_no
is the number of an SMA2 recorded in step 10

12 To check for fault indicators, type

>QUERYPM FLT

and press the Enter key.

13 Identify the failure message reported in step 12.

If the failure reason	Do
is reset	step 17
is C-Side links	step 25
is other than listed here	step 14

14 To select a unit to work on and return the unit to service, type

>RTS UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the unit to return to service

If RTS	Do
passes	step 28
fails	step 15

15 Identify the return to service failure message.

If display	Do
is NO REPLY FROM PM	step 16
is FAIL MESSAGE RECEIVED FROM PM	step 29
is a card list	step 20

PM SMA2
critical (continued)

16 Determine if the `NO REPLY FROM PM` message already occurred.

If message	Do
occurred before	step 29
did not occur before	step 17

17 To reset the unit, type

>PMRESET UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the unit selected in step 14

Note: During reset, the MAP display must indicate the reset events as the events appear the following MAP response .

Example of a MAP response:

```
RESET
STATUS
RUN
INITIALIZE
STATIC DATA
```

If unit	Do
does not initialize	step 22
initializes	step 18

18 Determine if the `NO REPLY FROM PM` message appears.

If message	Do
appears	step 29
does not appear	step 19

19 Determine if the `NO WAI AFTER RESET` message appears.

If message	Do
appears	step 20
does not appear	step 14

20 Check the card list at the MAP terminal.

Example of a MAP response:

PM SMA2
critical (continued)

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  06  SMA2 : 000  03  AX74
HOST  00  M07  CMVI 00  06  SMA2 : 000  25  AX74
```

If you	Do
replaced all the cards	step 29
did not replace all the cards	step 21

21 Go to *Card Replacement Procedures* for the next card on the list. Return to this point.

If you	Do
replaced the card because a LOADPM failure occurred	step 22
replaced the card because an RTS failure occurred	step 14

22 To load the unit, type

>LOADPM UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the unit to load

If LOADPM	Do
passes	step 14
fails	step 23

23 Identify the failed load message reported in step 22.

If	Do
the system generates a card list	step 20
the system does not generate a card list	step 29
GET ON FILE FAILED message appears	step 24
none of the above occurs	step 29

PM SMA2 critical (end)

24 The message `GET ON FILE FAILED` indicates a problem with the storage device. Go to step 30.

25 To display the status of C-side links, type

>TRNSL C

and press the Enter key.

Example of a MAP terminal response:

```
LINK0 ENET0 0 30 00  0;Cap:MS;Status:OK  ;MsgCond:OPN,Restricted
LINK1 ENET1 0 30 00  0;Cap:MS;Status:SBsy;MmgCond:CLS,Restricted
LINK2 ENET0 0 30 00  1;Cap:MS;Status:OK
LINK3 ENET1 0 30 00  1;Cap:MS;Status:OK
```

26 Record the numbers and conditions of the links.

If	Do
MS link condition is CLS	step 27
state of all links is not OK	step 27
state of all links is OK	step 14

27 Problems with the network interface card or the ENET port interface card can cause this condition. Contact the network level maintenance group.

28 Recover the next SMA2 recorded in step 10.

If	Do
another SMA2 require recovery	step 11
all SMA2s are recovered	step 31

29 Determine the next step.

If you attempted to recover	Do
only one unit, attempt to recover the next unit	step 14
both units, and both units failed	step 30

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

31 The recovery process places one unit INSV and one unit ManB. Go to the appropriate procedure to clear alarms in the *Alarm Clearing Procedures* section to complete the recovery process.

32 This procedure is complete. If other alarms appear, refer to the correct procedures to clear the indicated alarms.

PM SMA2 major

Alarm display

CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nSMA2**	.	.	.	.	.
				M					

Indication

The SMA2 alarm appears under the PM header in the MAP subsystem display. This alarm indicates an alarm condition exists in the SMA.

The *n* indicates the number of SMA2 modules with alarms. The M appearing under the alarm indicates the alarm class is major.

Meaning

This alarm usually indicates that one or more common peripheral module cards in the SMA2 are faulty.

Impact

A major alarm class code indicates the SMA2 has an in-service trouble (ISTb) condition. The SMA2 continues to process calls, but a potential service-affecting fault condition exists. To reduce the potential impact to subscriber service, isolate the fault condition to the faulty component and replace it as directed by the procedure that follows.

Common procedures

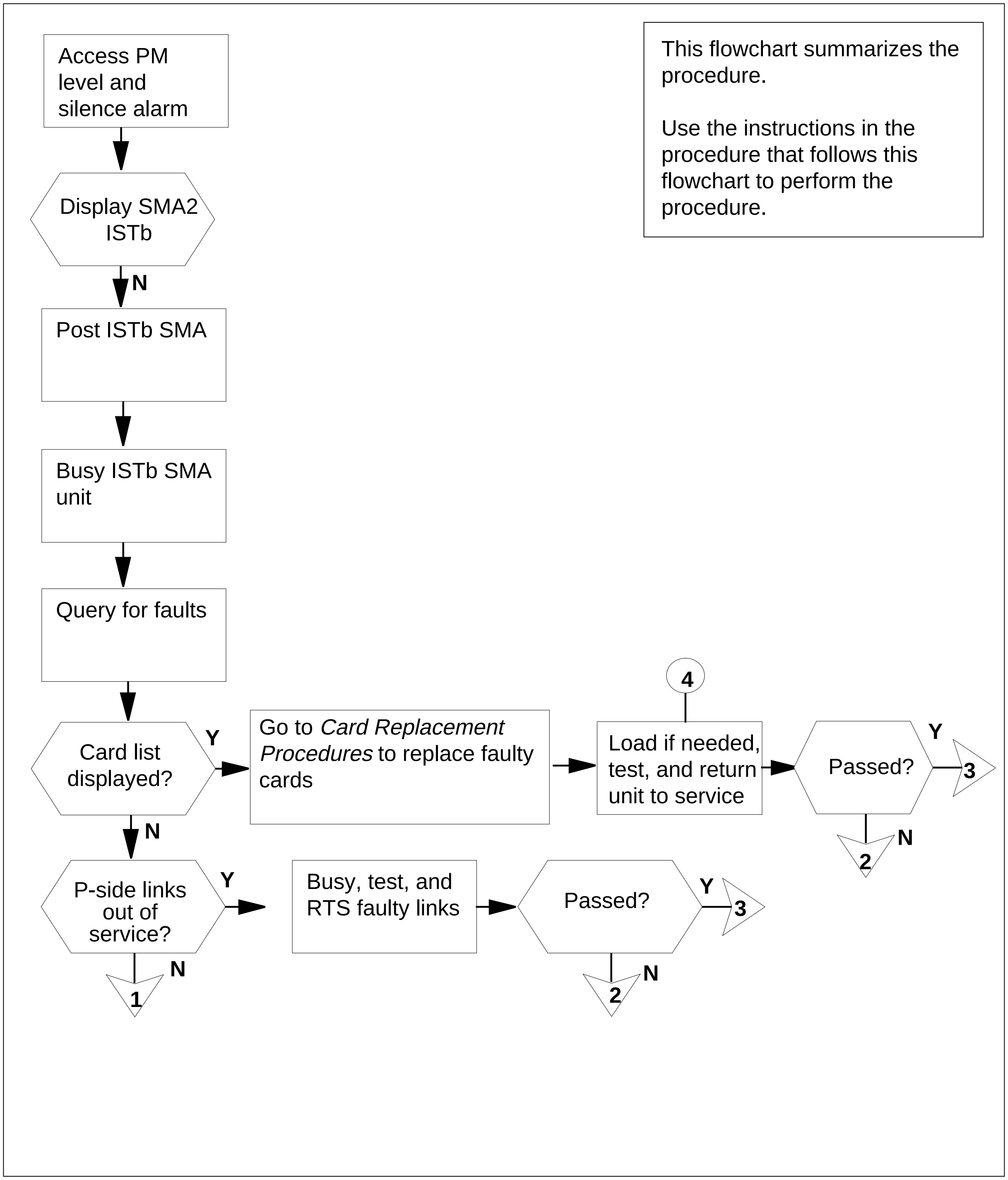
None

Action

The following flowchart is only a summary of the procedure. Use the instructions in the step-action procedure that follows the flowchart to clear the alarm.

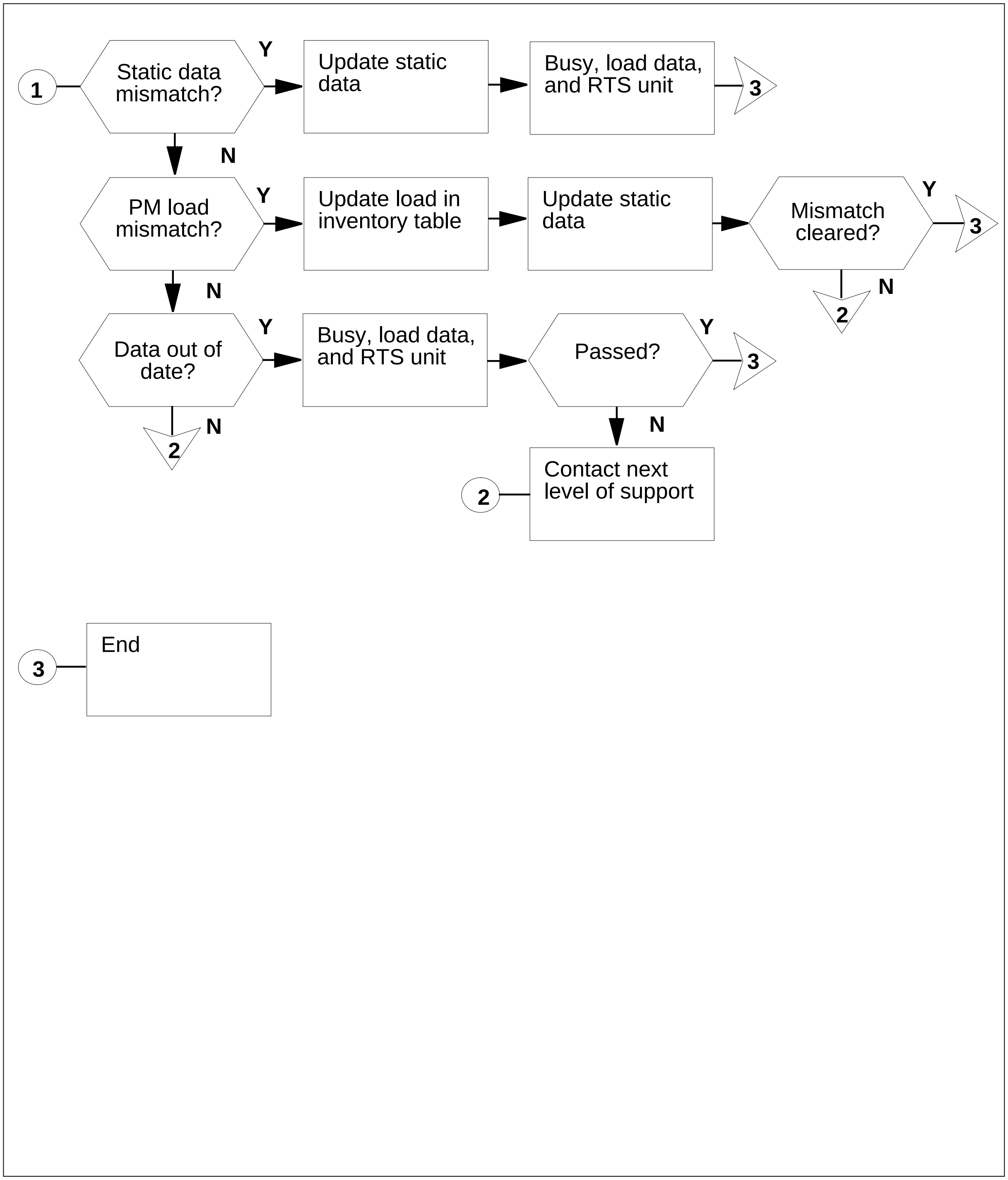
PM SMA2
major (continued)

Summary of clearing a PM SMA2 alarm



PM SMA2
major (continued)

Summary of clearing a PM SMA2 alarm (continued)



PM SMA2
major (continued)

Clearing a PM SMA2 alarm

At the MAP terminal:

1 When the system detects a fault, it may trigger an audible alarm. Access the PM level of the MAP display and silence the alarm by typing

>MAPCI;MTC;PM;SIL

and pressing the Enter key.

2 Determine which SMA2s are ISTb by typing

>DISP STATE ISTB SMA2

and pressing the Enter key.

Example of a MAP response:

```
ISTb SMA2:  1
```

3 Access the faulty SMA2 by typing

>POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 displayed in step 2

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM       3     0    1     0     2    13
    SMA2     0     0    0     0     1     7

SMA2 1 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact SysB
```

If	Do
one unit is SysB	step 4
one unit is CBsy	step 15

4 Busy the inactive unit by typing

>BSY UNIT unit_no

and pressing the Enter key.

where

PM SMA2
major (continued)

unit_no
is the number of the inactive unit

5 Return the unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

If the RTS	Do
passed	step 9
failed, and no card list appears	step 6
failed, and a card list appears	step 7

6 Load the inactive unit by typing

>LOADPM UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

If the load	Do
passed	step 5
failed, and no card list appears	step 17
failed, and a card list appears	step 7

7 Observe the card list displayed at the MAP display.

Example of a MAP response:

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  06 SMA2 : 001   14  BX02
HOST  00  M07  CMVI 00  06 SMA2 : 001   16  BX02
```

If all cards in the card list	Do
have been replaced	step 17
have not been replaced	step 8

8 Go to *Card Replacement Procedures* for the next card on the list, then return to this point.

PM SMA2
major (continued)

Determine if the card was replaced as a result of a LOADPM or RTS failure.

If the card was replaced as a result of a	Do
LOADPM failure	step 6
RTS failure	step 5

9 Perform a QueryPM FLT, and wait for static data updates to finish before proceeding.

If the active unit	Do
stays in an ISTb condition	step 17
is inservice	step 10

10 You have returned the inactive unit to service. Determine if the active unit is in-service.

If the active unit is	Do
in-service	step 18
in-service trouble and static data has finished updating	step 11

11 Switch the activity of the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 12
can continue at this time	step 13

12 Reject the prompt to SWACT the units by typing

>NO

and pressing the Enter key.

The system discontinues the switch of activity.

Return to step 11 during a period of low traffic.

13 Confirm the system prompt by typing

>YES

PM SMA2
major (end)

and pressing the Enter key.

The system runs a preSWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag (`Mtce`) appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 14
`SWACT failed. Reason: XPM SWACTback`	step 17
`SWACT refused by SWACT Controller`	step 17

14 Determine the condition of the newly inactive unit.

If the newly inactive unit	Do
stays in an ISTb condition	step 4
is in service	step 18

15 Display the SMA2 C-side links by typing

>TRNSL C

and pressing the Enter key.

Example of a MAP response:

```
LINK 0 ENET 0 1 30 00 0;Cap MS;Status SysB;MsgCond: CLS, Unrestricted
LINK 1 ENET 1 1 30 00 0;Cap MS;Status OK;MsgCond:OPN Unrestricted
LINK 2 ENET 0 1 30 00 1;Cap MS;Status OK
LINK 3 ENET 1 1 30 00 1;Cap MS;Status OK
LINK 4 ENET 0 1 30 00 2;Cap MS;Status OK;MsgCond:OPN Restricted
LINK 5 ENET 1 1 30 00 2;Cap MS;Status OK;MsgCond:OPN Restricted
```

16 Note the numbers and conditions of the links. Report this information to the personnel responsible for network level maintenance.

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

18 You have successfully completed this procedure. If there are other alarms displayed, refer to the appropriate alarm clearing procedures for the indicated alarms.

PM SMA2
minor

Alarm display

CM	MS	IOD	Net	PM	CCS	Lns	Trks	Ext	APPL
.	.	.	.	**nSMA2**	.	.	.	.	.

Indication

The SMA2 alarm appears under the PM header in the MAP subsystem display. This alarm indicates an alarm condition exists in the SMA2. The n indicates the number of SMA2 modules with alarms. The blank below the alarm indicates the alarm class is minor.

Meaning

This alarm usually indicates one or more common peripheral module cards in the SMA2 is faulty. It may also indicate that message links on the network side are out of service.

Impact

A minor alarm class code indicates the SMA2 has an in-service trouble (ISTb) condition. The SMA2 continues to process calls, but a potential service-affecting fault condition exists. To reduce the potential impact to subscriber service, isolate the fault condition to the faulty component and replace it as directed by the procedure that follows.

Common procedures

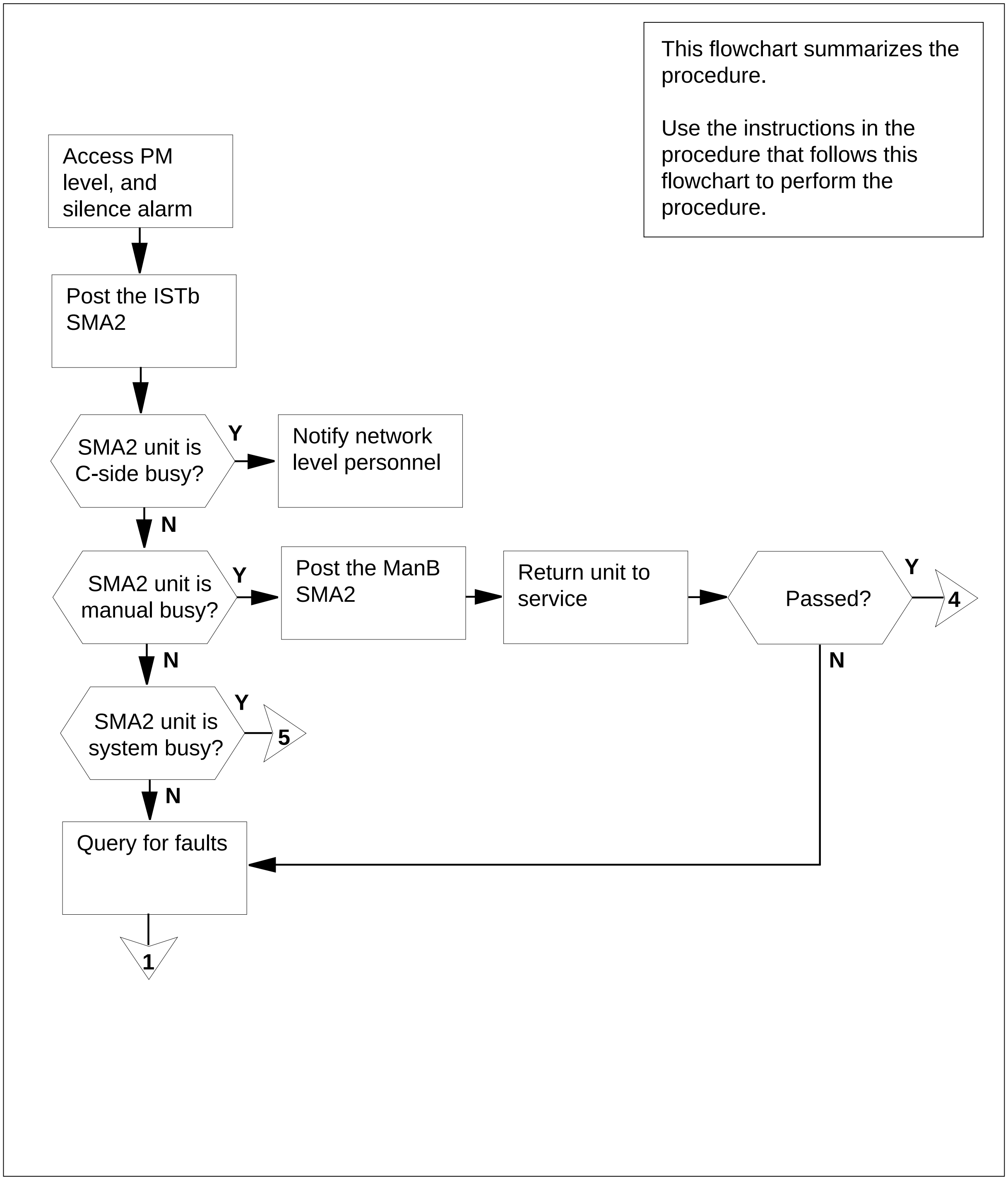
Not applicable

Action

The following flowchart is only a summary of the procedure. Use the instructions in the step-action procedure that follows the flowchart to clear the alarm.

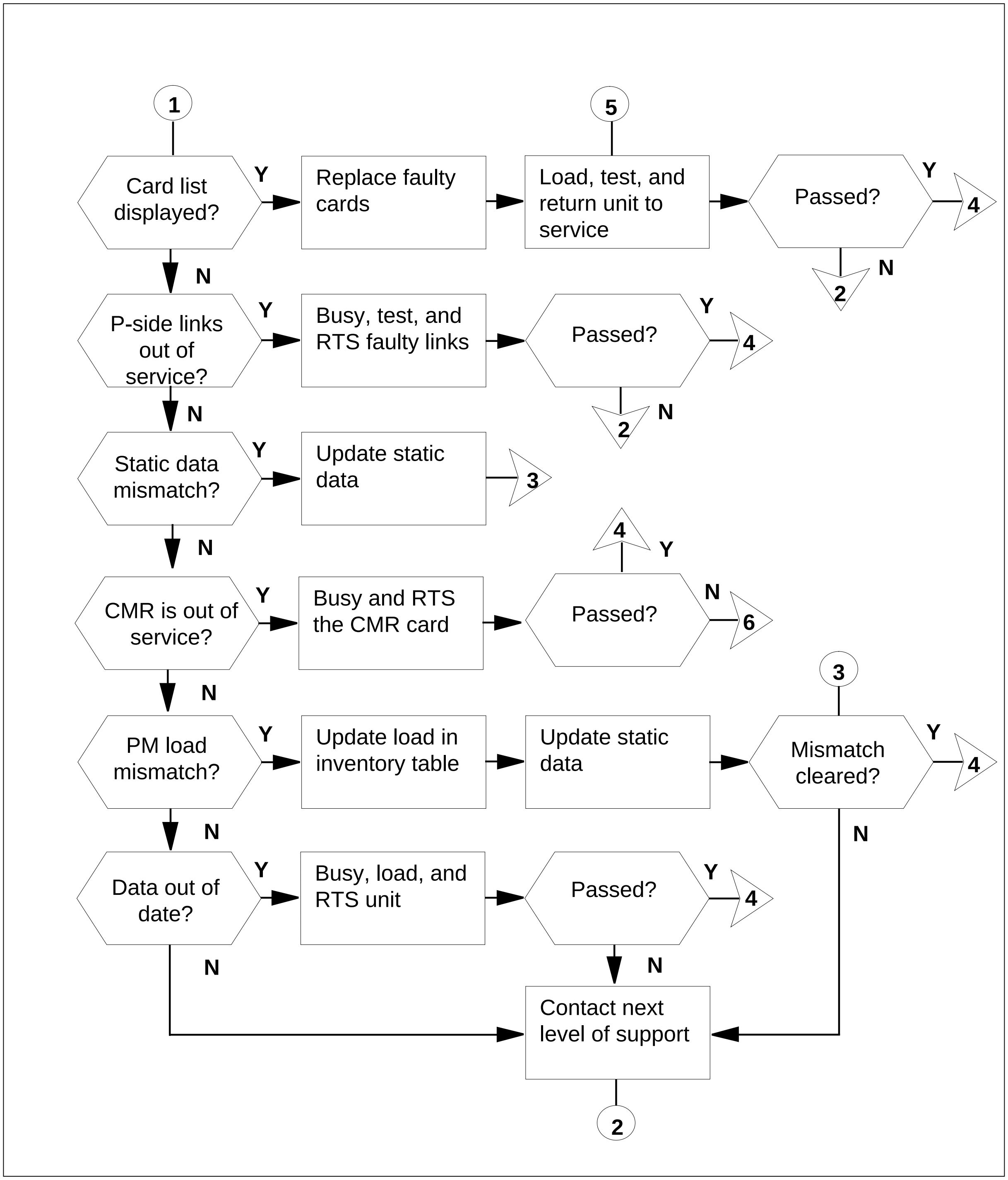
PM SMA2
minor (continued)

Summary of clearing a PM SMA2 minor alarm



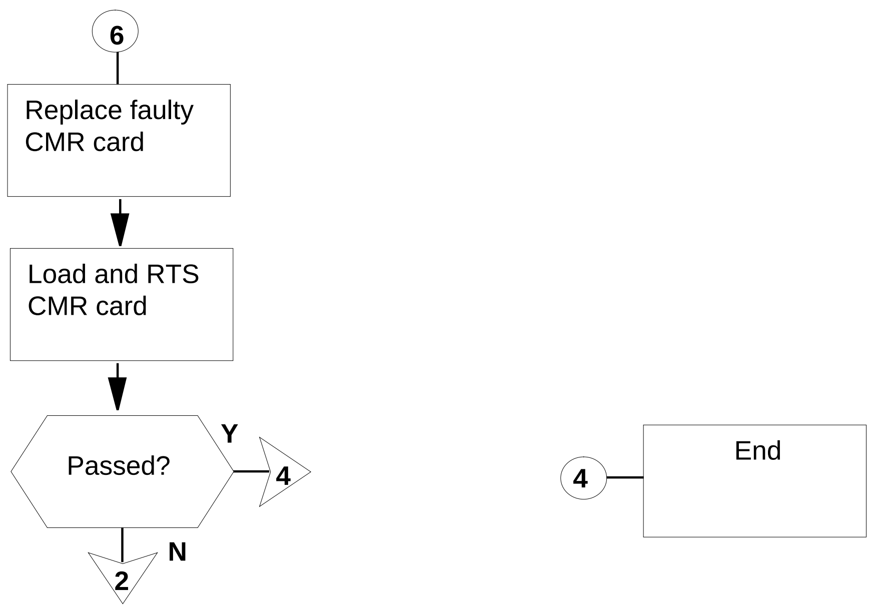
PM SMA2
minor (continued)

Summary of clearing a PM SMA2 minor alarm (continued)



PM SMA2
minor (continued)

Summary of clearing a PM SMA2 minor alarm (continued)



Clearing a PM SMA2 minor alarm

At the MAP terminal

1 When the system detects a fault, it may trigger an audible alarm. Access the PM level of the MAP display and silence the alarm by typing:

>MAPCI;MTC;PM;SIL

and pressing the Enter key.

2 Display the SMA2s that are in-service trouble by typing

>DISP STATE ISTB SMA2

and pressing the Enter key.

Example of a MAP response:

```
ISTb SMA2:  1
```

3 Post the ISTb SMA2 by typing

>POST SMA2 ISTB

and pressing the Enter key.

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMA2    0     0    0     0     1     7

SMA2 1 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   ISTb
Unit1:  Inact InSv
```

4 Determine if the posted SMA2 is manually busy by looking for the state of unit 0 and unit 1 on the MAP display.

If an SMA2 unit is	Do
manually busy	step 5
not manually busy	step 9

5 Return the inactive unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

PM SMA2
minor (continued)

unit_no
is the number of the inactive unit

If RTS	Do
passed	step 50
failed, and no card list appears	step 6
failed, and a card list appears	step 7

6 Load the inactive unit by typing

>LOADPM UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

If the load	Do
passed	step 5
failed, and no card list appears	step 55
failed, and a card list appears	step 7

7 Observe the card list displayed at the MAP display.

Example of a MAP response:

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  06 SMA2 : 001  03  AX74
HOST  00  M07  CMVI 00  06 SMA2 : 001  12  MX81
```

If all cards in the card list	Do
have been replaced	step 55
have not been replaced	step 8

8 Go to *Card Replacement Procedures* for the next card on the list, then return to this point.

If the card was replaced as a result of a	Do
LOADPM failure	step 6
RTS failure	step 5

PM SMA2
minor (continued)

9 Determine if both units in the posted SMA2 are in-service trouble by looking for the state of unit 0 and unit 1 on the MAP display.

If	**Do**
both units are ISTb	step 14
one unit is ISTb and inactive	step 14
one unit is ISTb and active	step 10

10 Switch the activity of the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	**Do**
cannot continue at this time	step 11
can continue at this time	step 12

11 Reject the prompt to SWACT the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

Return to step 10 during a period of low traffic.

12 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag (`Mtce`) appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	**Do**
`SWACT passed`	step 14
`SWACT failed because XPM SWACTback`	step 13
`SWACT refused by SWACT Controller`	step 13

PM SMA2
minor (continued)

13 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 55.

14 Check for fault indicators by typing

>QUERYPM FLT

and pressing the Enter key.

Example of a MAP response:

```
Node is ISTb
  One or both units inservice trouble
Unit 0
The following inservice troubles exist:
   Static data mismatch with CC
Unit 1
The following inservice troubles exist:
   Static data mismatch with CC
```

If the fault on the inactive unit is	Do
P-side links are out of service	step 43
C-side links are out of service	step 15
static data mismatch with CC	step 17
PM load mismatch with inventory table	step 24
CMR is out of service	step 38
none of the above	step 55

15 Display the SMA2 C-side links by typing

>TRNSL C

and pressing the Enter key.

Example of a MAP response:

```
LINK 0 ENET 0 1 30 00 0;Cap MS;Status SysB;MsgCond: CLS, Unrestricted
LINK 1 ENET 1 1 30 00 0;Cap MS;Status OK;MsgCond:OPN Unrestricted
LINK 2 ENET 0 1 30 00 1;Cap MS;Status OK
LINK 3 ENET 1 1 30 00 1;Cap MS;Status OK
LINK 4 ENET 0 1 30 00 2;Cap MS;Status OK;MsgCond:OPN Restricted
LINK 5 ENET 1 1 30 00 2;Cap MS;Status OK;MsgCond:OPN Restricted
```

16 Note the numbers and conditions of the links. Report this information to the personnel responsible for network level maintenance. Go to step 55.

PM SMA2
minor (continued)

17 Busy the inactive unit by typing

>BSY UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

18 Load the inactive unit by typing

>LOADPM UNIT unit_no CC DATA

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

If LOADPM	Do
passed	step 19
failed	step 20

19 Return the inactive unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

If RTS	Do
passed	step 23
failed	step 20

20 Determine if card list appears.

If card list	Do
appears	step 21
does not appear	step 55

21 Observe the card list displayed at the MAP display.

Example of a MAP response:

PM SMA2
minor (continued)

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  06 SMA2 : 001  03  AX74
HOST  00  M07  CMVI 00  06 SMA2 : 001  12  MX81
```

If all cards in the card list	Do
have been replaced	step 55
have not been replaced	step 22

22 Go to *Card Replacement Procedures* for the next card on the list, then return to this point.

If the card was replaced as a result of a	Do
LOADPM failure	step 18
RTS failure	step 19

23 After updating static data, determine if the fault is cleared by typing

>QUERYPM FLT

and pressing the Enter key.

If the fault is	Do
cleared	step 50
not cleared	step 55

24 Determine the correct load name for the SMA2 you are working on by checking the PM Load File Office Record (or similar list of all PM load files maintained in your office).

25 Determine the load name datafilled in table LTCINV for the posted SMA2 by typing

>QUERYPM

If the office record	Do
matches what is datafilled in table LTCINV	step 33
Does not match what is datafilled in table LTCINV	step 26

26 Access table LTCINV by typing

>TABLE LTCINV

and pressing the Enter key.

27 Position on the tuple for the faulty SMA2 by typing

>POS SMA2 SMA2_no

and pressing the Enter key.

where

SMA2_no
is the number of the faulty SMA2

28 Change the load name by typing

>CHA LOAD

and pressing the Enter key.

Example of a MAP response:

```
LOAD:  XM207BH
```

29 Enter the correct load name by typing

>load_name

and pressing the Enter key.

where

load_name
is the load name identified in step 24

Note: The name entered must be present in table PMLOAD.

Example of a MAP response:

```
TUPLE TO BE CHANGED:
   SMA2 1
       1006 CMVI  0  51  3  C  11  MX85AB  XM207BH
                       (      POTS   POTSEX)(   KEYSET  KSETEX)$
              (0 30 1 0) (0 30 1 1) (0 30 1 2) (0 30 1 3) (0 30 1 4) (0
30 1 5)                      (0 30 1 6)  (0 30 1 7)  (0 30 1 8)  (0 30
1 9)  (0 30 1 10)                           (0 30 1 11)  (0 30 1 12)
(0 30 1 13)  (0 30 1 14)  (0 30 1 15)$
    (UTR6) (UTR7)  ( MSGMX76 HOST )  (  CMR5 CMR07A) (ISP16)$
   NORTHAM   AX74AA AX74AA AX74XE01  $
   6X40AC    Y CMVI   0  19  0  P 22  MX86AB R
```

30 Respond affirmatively to the confirmation request by typing

>Y

and pressing the Enter key.

31 Leave table LTCINV by typing

>QUIT

and pressing the Enter key.

Go to step 49.

PM SMA2
minor (continued)

32 Manually busy the inactive SMA2 unit by typing

>BSY UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

33 Load the inactive SMA2 unit by typing

>LOADPM UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

If load	Do
passed	step 34
failed	step 35

34 Return the inactive unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

If RTS	Do
passed	step 50
failed	step 35

35 Determine if card list appears.

If card list	Do
appears	step 36
does not appear	step 55

36 Observe the card list displayed at the MAP display.

Example of a MAP response:

PM SMA2
minor (continued)

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  06 SMA2 : 001  03  AX74
HOST  00  M07  CMVI 00  06 SMA2 : 001  12  MX81
```

If all cards in the card list	Do
have been replaced	step 55
have not been replaced	step 37

37 Go to *Card Replacement Procedures* for the next card on the list, then return to this point.

If the card was replaced as a result of a	Do
LOADPM failure	step 33
RTS failure	step 34

38 Manually busy the CMR in the inactive unit by typing

>BSY UNIT unit_no CMR

and pressing the Enter key.

where

unit_no
is the number of the inactive unit

39 Return the CMR card to service by typing

>RTS UNIT unit_no CMR

and pressing the Enter key.

where

unit_no
is the number of the unit containing the faulty CMR card

If RTS	Do
passed	step 50
failed and the following message appears: `CMR RTS failed No reply from PM`	step 40
failed, and a card list appears	step 41
failed, and no card list appears	step 55

PM SMA2
minor (continued)

40 Load the CMR card by typing

>LOADPM UNIT unit_no CC CMR

and pressing the Enter key.

where

unit_no
is the number of the unit containing the faulty CMR card

If load	Do
passed	step 39
failed, and a card list appears	step 41
failed, and no card list appears	step 55

41 Observe the card list displayed at the MAP terminal.

If the NT6X78 card in the card list has	Do
been replaced	step 55
not been replaced	step 42

42 Go to the *Card Replacement Procedures* for the first (or next) card on the list. After returning from the card replacement procedures.

If the card was replaced as a result of a	Do
LOADPM failure	step 40
RTS failure	step 39

43 Display information about the P-side links by typing

>TRNSL P

and pressing the Enter key.

Example of a MAP response:

```
Link 1 IDT 17  0;Cap MS;Status:OK  ,P:MsgCond;OPN
Link 2 IDT 17  1;Cap MS;Status:OK  ,P:MsgCond;OPN
Link 3 IDT 17  2;Cap  S;Status:SysB
Link 4 IDT 17  3;Cap  S;Status:SysB
```

Record all the links that are not in an “OK" state.

44 Busy the SysB link recorded in step 43 by typing

>BSY LINK link_no

PM SMA2
minor (continued)

and pressing the Enter key.

where

link_no
is the number of the SysB link displayed in step 43

45 Return the busied link to service by typing

>RTS LINK link_no

and pressing the Enter key.

where

link_no
is the number of the link busied in step 44

If RTS	Do
passed	step 48
failed, and a card list appears	step 46
failed, and no card list appears	step 55

46 Observe the card list displayed at the MAP screen.

Example of a MAP response:

```
Site Flr RPos  Bay_id Shf Description Slot EqPEC
HOST  00  M07  CMVI 00  06 SMA2 : 001  12  MX81
HOST  00  M07  CMVI 00  06 SMA2 : 001  14  MX81
```

If all cards	Do
have been replaced	step 55
have not been replaced	step 47

47 Go to *Card Replacement Procedures* for the first or next card on the list, then return to this point.

Go to step 45.

48 Determine if there are additional links not in-service as recorded in step 43.

If	Do
there are additional links not in service	step 44
all links are in service	step 49

PM SMA2
minor (continued)

49 Determine the state of both units of the SMA2.

If both units are	Do
in service	step 56
not in service	step 14

50 You have returned the inactive unit to service. Determine if the active unit is in-service.

If the active unit is	Do
in-service	step 56
in-service trouble	step 51

51 Switch the activity of the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 52
can continue at this time	step 53

52 Reject the prompt to SWACT the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

Return to step 51 during a period of low traffic.

53 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag (`Mtce`) appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 54

PM SMA2
minor (end)

If the message is	Do
`SWACT failed because XPM SWACTback`	step 55
`SWACT refused by SWACT controller`	step 55

54 Determine if the newly inactive unit is in service.

If the newly inactive unit is	Do
not in service	step 14
in service	step 56

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

56 You have successfully completed this procedure. If there are other alarms displayed, refer to the appropriate alarm clearing procedures for the indicated alarms.

Loading a PM

Application

Use this procedure to load a peripheral module (PM) after a LOADPM failure.

Action

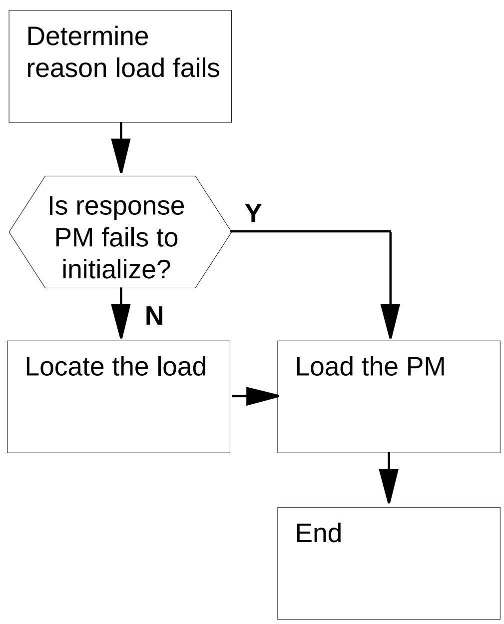
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Loading a PM (continued)

Summary of loading a PM

This flowchart summarizes the procedure.

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



Loading a PM (continued)

Loading a PM

At your current location

1

> **CAUTION**
> **Possible loss of service**
> Make sure to perform this procedure in periods of low traffic to avoid loss of service or service degradation.

Proceed if a step in a maintenance procedure directed you to this procedure. Separate use of this procedure can cause equipment damage or loss of service.

2 Follow the appropriate procedure according to the reason the load fails.

If the load fails and	Do
the MAP response is `Load File not in directory`	step 6
the MAP response is `PM Failed to Initialize`	step 3
the system generates a card list	step 4

3 Go to step 23 to apply the LOADPM command again.

4 Record the locations and product equipment codes (PEC) of the cards on the card list. The locations and PECs include suffixes.

5 Refer to the appropriate procedure in *Card Replacement Procedures* to change the first card on the list. Return to step 23 in this procedure.

6 Determine the type of device in which the PM load files are located.

If load files are on	Do
a tape	step 7
an input/output controller (IOC) disk	step 14
a system load module (SLM) disk	step 19

7 Locate the tape that contains the PM load files.

8 Mount the tape on a magnetic tape drive.

At the MAP display

9 To download the tape, type

>MOUNT tape_no

and press the Enter key.

where

tape_no
is the number of the tape that contains the PM load files

10 To list the contents of the tape in your user directory, type

>LIST Ttape_no

and press the Enter key.

where

tape_no
is the number of the tape

Go to step 23.

11 Record the results from the LOADPM command. To demount the tape, type

>DEMOUNT Ttape_no

and press the Enter key.

where

tape_no
is the number of the tape

12 Remove the tape from the magnetic tape drive.

13 Determine the results from the LOADPM command.

If LOADPM	Do
passes	step 29
fails, and the reason is different from the first time LOADPM fails	step 2
fails, but the reason is the same as the first time LOADPM fails	step 28
fails, and you did not replace every card in the list in step 4	step 27
fails, and you replaced every card in the list in step 4	step 28

14 From office records, determine and note the IOC disk and volume name that contains the PM load files.

15 To access the disk utility level, type

>DSKUT

Loading a PM (continued)

and press the Enter key.

16 To list the IOC file names in your user directory, type

>LISTVOL vol_name ALL

and press the Enter key.

where

vol_name
is the name of the volume that contains the loads

17 To exit the disk utility, type

>QUIT

and press the Enter key.

18 Go to step 23 and continue as directed.

19 From office records, determine and record the SLM disk and volume name that contain the PM load files.

20 To access the disk utility level, type

>DISKUT

and press the Enter key.

21 To list the SLM file names in your user directory, type

>LISTFL vol_name

and press the Enter key.

where

vol_name
is the name of the volume that contains the loads from step 19

22 To exit the disk utility, type

>QUIT

and press the Enter key.

23 What you load determines your next action.

If you load	Do
a single-unit PM or a D-channel handler (DCH) card	step 24
a dual-unit PM	step 25
a CLASS module resource (CMR) card	step 26

24 To load the PM, type

>LOADPM

and press the Enter key.

If the LOADPM command	Do
passes	step 29

Loading a PM (continued)

If the LOADPM command	Do
fails, and the reason is different from the first time LOADPM fails	step 2
fails, but the reason is the same as the first time LOADPM fails	step 28
fails, and you did not replace every card in the list in step 4	step 27
fails, and you replaced every card in the list in step 4	step 28
is loaded from tape	step 11

25 To load the PM unit, type

>LOADPM UNIT unit_no

and press the Enter key.

where

unit_no
is the number of the unit to be loaded (0 or 1)

If the LOADPM UNIT unit_co command	Do
passes	step 29
fails, and the reason is different from the first time LOADPM fails	step 2
fails, but the reason is the same as the first time LOADPM fails	step 28
fails, and you did not replace every card in the list in step 4	step 27
fails, and you replaced every card in the list in step 4	step 28
is loaded from tape	step 11

26 To load the CMR card, type

LOADPM UNIT unit_no CMR

and press the Enter key.

where

Loading a PM (end)

unit_no
is the number of the unit that contains the CMR card you must load (0 or 1)

If LOADPM UNIT unit_no CMR command	Do
passes	step 29
fails, and the reason is different from the first time LOADPM fails	step 2
fails, but the reason is the same as the first time LOADPM fails	step 28
fails, and you did not replace every card in the list in step 4	step 27
fails, and you replaced every card in the list in step 4	step 28
is loaded from tape	step 11

27 Refer to the appropriate procedure in *Card Replacement Procedures* to change the next card on the list that the system generates. Return to this procedure.

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

29 The procedure is complete. Return to the main procedure that directed you to this procedure. Continue as directed.

11 SMA2 card replacement procedures

This section contains card replacement procedures for the Expanded Subscriber Carrier Module-100 Access (ESMA) or SMA2. These procedures describe the removal and replacement of faulty cards and are intended for use by maintenance engineering and field maintenance personnel.

NT6X40
in an SMA2

Application

ATTENTION
Replacement restrictions apply to certain versions of the NT6X40 card. Carefully read the caution and note following the equipment chart before removing or installing any cards.

WARNING
Possible service disruption or loss of diagnostic functionality when installing or replacing NT6X40 cards versions AD, FB, or C
NT6X40AD, FB, or FC cards must be mismatched with other versions between the two units of an XPM if table LTCINV is datafilled with interface card types of NT6X40AD or NT6X40FB. For example, you cannot have an AC version of the card in unit 0 and an AD version in unit 1. A PM777 log is generated citing the mismatch and the XPM is put in an ISTb state. For more information read the following notes.

Note: The NT6X40AD, NT6X40FB, and NT6X40FC cards provide enhanced diagnostic capabilities. If table LTCINV datafill is set to the NT6X40AC or NT6X40FA version of the card, cards can be mismatched but the new diagnostics capabilities will not be initiated. The CM will treat the interface as NT6X40AC/NT6X40FA regardless of the card installed. For more information see the section on datafilling table LTCINV in the data schema section of the *Translations Guide.*

NT6X40
in an SMA2 (continued)

Use this procedure to replace an NT6X40 card in an SMA2.

PEC	Suffixes	Name
NT6X40	AC, AD	DS30 Network Interface
NT6X40	FA, FB, FC	DS512 Network Interface
NT6X40	GA	DS512 Network Interface Paddleboard

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- “Manually busying SMA2 C-side links"
- replacing a card
- returning a card

Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

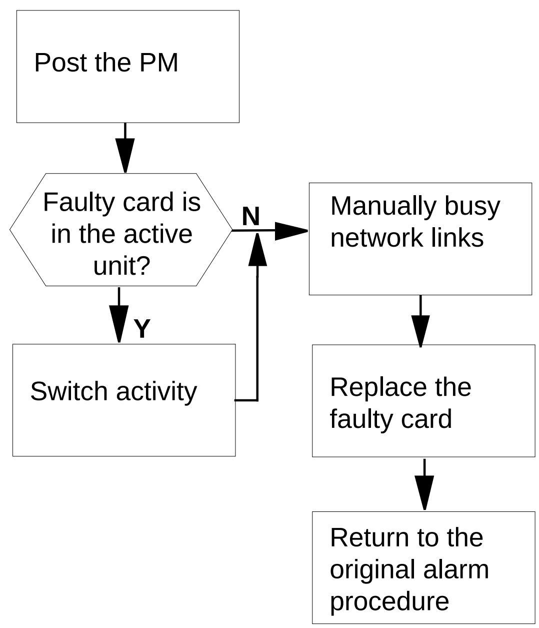
The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X40
in an SMA2 (continued)

Summary of card replacement procedure for an NT6X40 card in an SMA2

This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.



NT6X40
in an SMA2 (continued)

Replacing an NT6X40 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

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

At the MAP terminal

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response:

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMA2    0     0    0     0     1     7

SMA2 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact ISTb
```

NT6X40
in an SMA2 (continued)

6 Determine the state and activity of the SMA2 unit in which the card you are replacing is provisioned.

If the state of the SMA2 unit is	Do
ISTb, InSv, SysB, or CBsy, and active	step 7
ISTb, InSv, SysB, or CBsy, and inactive	step 12
ManB	step 12
OffL	step 38

7 From the MAP display, determine the state of the mate SMA2 unit.

If the SMA2 unit is	Do
ISTb or InSv	step 8
any other state	step 41

8 SWACT the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 9
can continue at this time	step 10

9 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

Return to step 8 during a period of low traffic.

10 Confirm the system prompt by typing

>YES

and pressing the Enter key.

NT6X40
in an SMA2 (continued)

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 12
`SWACT failed Reason: XPM SWACTback`	step 11
`SWACT refused by SWACT Controller`	step 11

11 The inactive unit could not establish two-way communication with the central control (CC) and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 41.

12 A maintenance flag (Mtce) may appear, indicating that system-initiated maintenance tasks are in progress. Wait until the flag disappears from the status lines for both PM units before proceeding to the next step.

13 Manually busy all C-side links associated with the inactive PM unit you are working on using the procedure “Manually busying SMA2 C-side links" in this document. When you have completed the procedure, return to this point.

At the frame or cabinet

14 Hang a sign on the active unit bearing the words: *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

15 Determine the suffix of the faulty card.

If the faulty card suffix is	Do
GA	step 16
AC, AD, FA, FB, or FC	step 29

NT6X40
in an SMA2 (continued)

At the front shelf of the frame or cabinet

16

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Unseat the NT6X40 card in the inactive unit.

At the backplane of the frame or cabinet

17

> **DANGER**
> **Risk of electrocution**
> Voltage is present on the backplane. Remove all jewelry before continuing with this procedure. Do not touch pins or terminals except as instructed.

Locate the circuit card to be replaced.

Note: NT6X40 circuit cards are located in slot 9 of unit 0, and slot 19 of unit 1.

18 Label each connector to the NT6X40 card.

19

> **WARNING**
> **Avoid contaminating the fiber tip surface**
> Do not touch the tip of the fiber. Dirt or oil from the skin transferred to the fiber tip surface degrades fiber performance.

> **WARNING**
> **Fiber cable may become damaged**
> Take care when handling fiber cables. Do not crimp or bend fiber cables to a radius of less than 25 mm (1 in.).

NT6X40
in an SMA2 (continued)

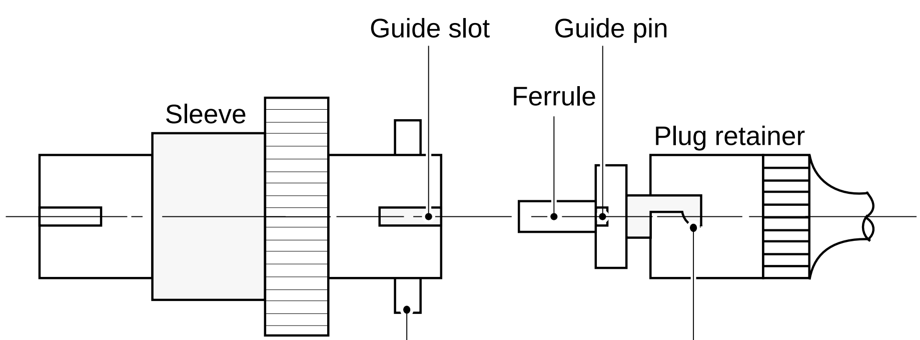
Disconnect the fiber optic cables by performing the following steps:

a Twist the plug retainer to unlock the retaining pin from the retaining groove.

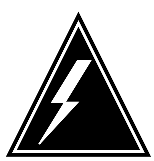
b Rotate the plug retainer so the retaining pin enters the guide slot.

c Gently pull on the plug retainer, moving the guide pin along the slot to remove the ferrule from the sleeve.

d Fit dust caps to the open ends of the fiber links.



20



WARNING
Protect backplane pins
Do not allow screws to drop onto or touch the backplane pins. When removing and replacing the screws for the card, the backplane pins above and below must be protected to prevent shorting out. Use of a magnetic screw or nut driver is recommended.

Protect exposed back plane pins in one of the following ways:

- Wrap electrical tape around a group of pins. Do not bend the pins.
- Cover the pins with NOMEX paper.

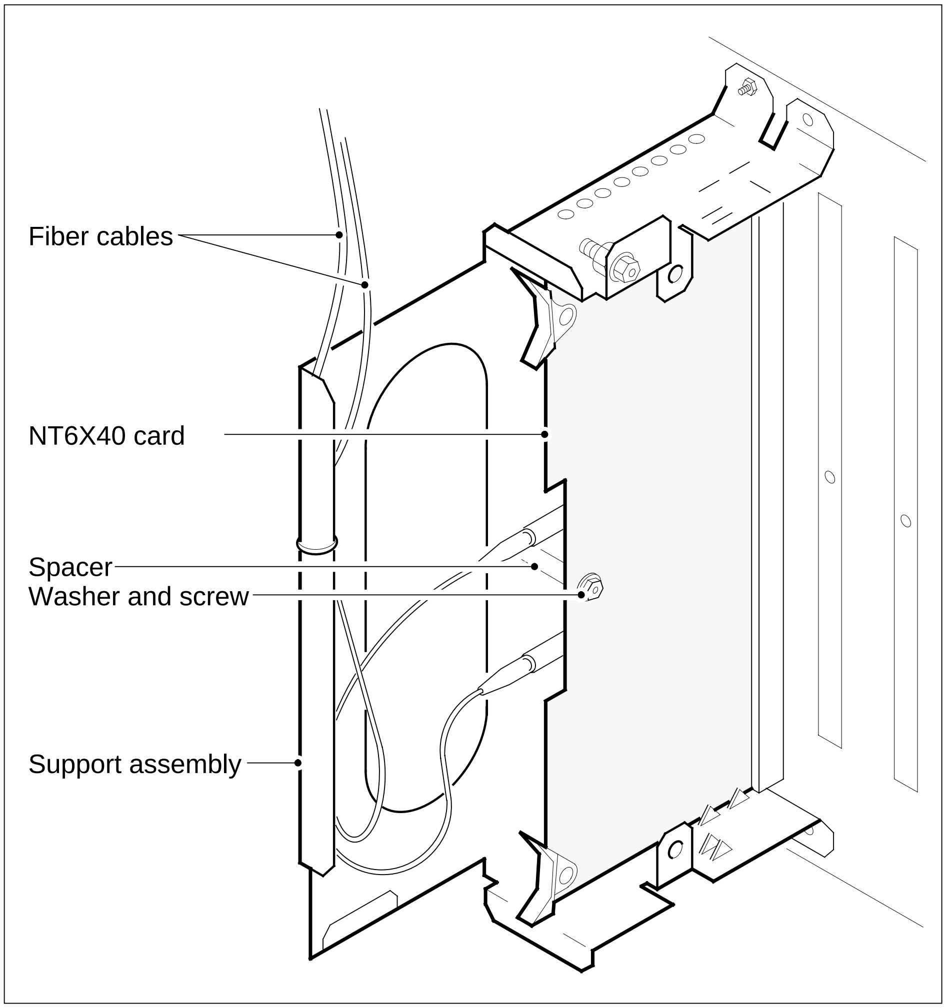
21 Remove the screw that holds the card to the support assembly by performing the following steps:

a Locate the screw positioned halfway down the outer edge of the card.

b Remove the washer holding the screw in place.

NT6X40
in an SMA2 (continued)

c Remove the screw and the spacer located between the card and the support assembly.



22 Remove the card from the support assembly by firmly pulling horizontally until the connector pin socket on the card has cleared the connector pins on the backplane.

23 Place the card just removed in an electrostatic discharge protective container.

Note: If the card you are replacing has switches, ensure the switches on the replacement card have the same settings.

24 Line up the replacement card with the slots in the support assembly.

25 Using the levers located at the top and bottom of the 6X40 card, firmly press the connector pin socket on the card onto the connector pins on the backplane.

26 Secure the card to the support assembly by performing the following steps:

NT6X40
in an SMA2 (continued)

- **a** Locate the screw hole positioned halfway down the outer edge of the card.
- **b** Position the spacer at the screw hole between the card and the support assembly.
- **c** Insert the screw, moving it in the direction of the support assembly, through the spacer to the outer surface of the support assembly.
- **d** Fasten the washer to hold the screw in place.

27 Reconnect the two fiber-optic cables by performing the following steps. See the illustration in step 19.

- **a** Remove the dust caps from the ends of the fiber links.
- **b** Gently insert the ferrule into the sleeve so the guide pin enters the guide slot.
- **c** Rotate the plug retainer so the retaining pin enters the retaining groove.
- **d** Push the connectors together and twist the plug retainer to lock the retaining pin into the retaining groove.

At the front shelf of the frame or cabinet

28

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Reseat the NT6X40 card unseated in step 16. Go to step 30.

29 Perform the common replacing a card procedure in this document. When you have completed the procedure, return to this point.

At the MAP terminal

30 The next action depends on the type of network in the office.

If you are working on	Do
JNET	step 31
ENET	step 33

31 Return to service one of the network links by typing

>RTS plane_no link_no

and pressing the Enter key.

where

NT6X40 in an SMA2 (continued)

plane_no
is the number of the plane (0 or 1) for the link

link_no
is the link number (0 to 63)

If the link	Do
returned to service and there are more manual-busy links	step 32
returned to service and there are no more manual-busy links	step 34
did not return to service	step 41

32 Repeat step 31 for each manually busy C-side link. When you have successfully returned all C-side links to service, go to step 34.

33 Return the network link to service by typing

>RTS plane_no LINK link_no

and pressing the Enter key.

where

plane_no
is the number of the plane (0 or 1) for the link

link_no
is the link number (0 to 3)

Example of a MAP response:
Request to RTS ENET Plane:0 Shelf:00 Slot:32 Link:01 submitted.Request to RTS ENET Plane:0 Shelf:00 Slot:32 Link:01 passed.

If the link	Do
returned to service	step 34
did not return to service	step 41

34 Post the SMA2 you are working on by typing

>PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the SMA2 number (0 to 255)

35 Determine the status of the SMA2 unit containing the NT6X40 card you replaced by typing

>QUERYPM

and pressing the Enter key.

NT6X40
in an SMA2 (end)

```
PM Type: SMA2  PM No.: 0  PM Int. No.:11 Node_No.: 192
 PMs Equipped: 139 Loadname: XM281AZ
 WARM SWACT is supported and available.
 SMA2 0 is included in the REX schedule.
 REX on SMS 0 has not been performed.
 Node Status: {OK, FALSE}
 Unit 0   Act, Status: {OK, FALSE}
 Unit 1 Inact, Status: {OK, FALSE}
 Site Flr RPos  Bay_id  Shf Description Slot EqPEC
 HOST  01  E31  CMVI  01  18     SMA2 :   000  6X02AA
```

If the inactive unit status is	**Do**
InSv	step 36
anything else	step 41

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

If you were	**Do**
directed to this procedure from a maintenance procedure	step 37
not directed to this procedure from a maintenance procedure	step 39

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

38 Consult office personnel to determine why the component is offline. Continue as directed by office personnel.

39 Remove the sign from the active SMA2 unit.

40 Go to the procedure in this document for returning a card for repair or replacement.

Go to step 42.

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

42 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT6X78 in an SMA2

Application

Use this procedure to replace an NT6X78 card in a Subscriber Module AccessNode 2 (SMA2).

PEC	Suffixes	Name
NT6X78	AB, BA	CLASS Modem Resource (CMR)

Common procedures

The following procedures are referenced in this procedure:

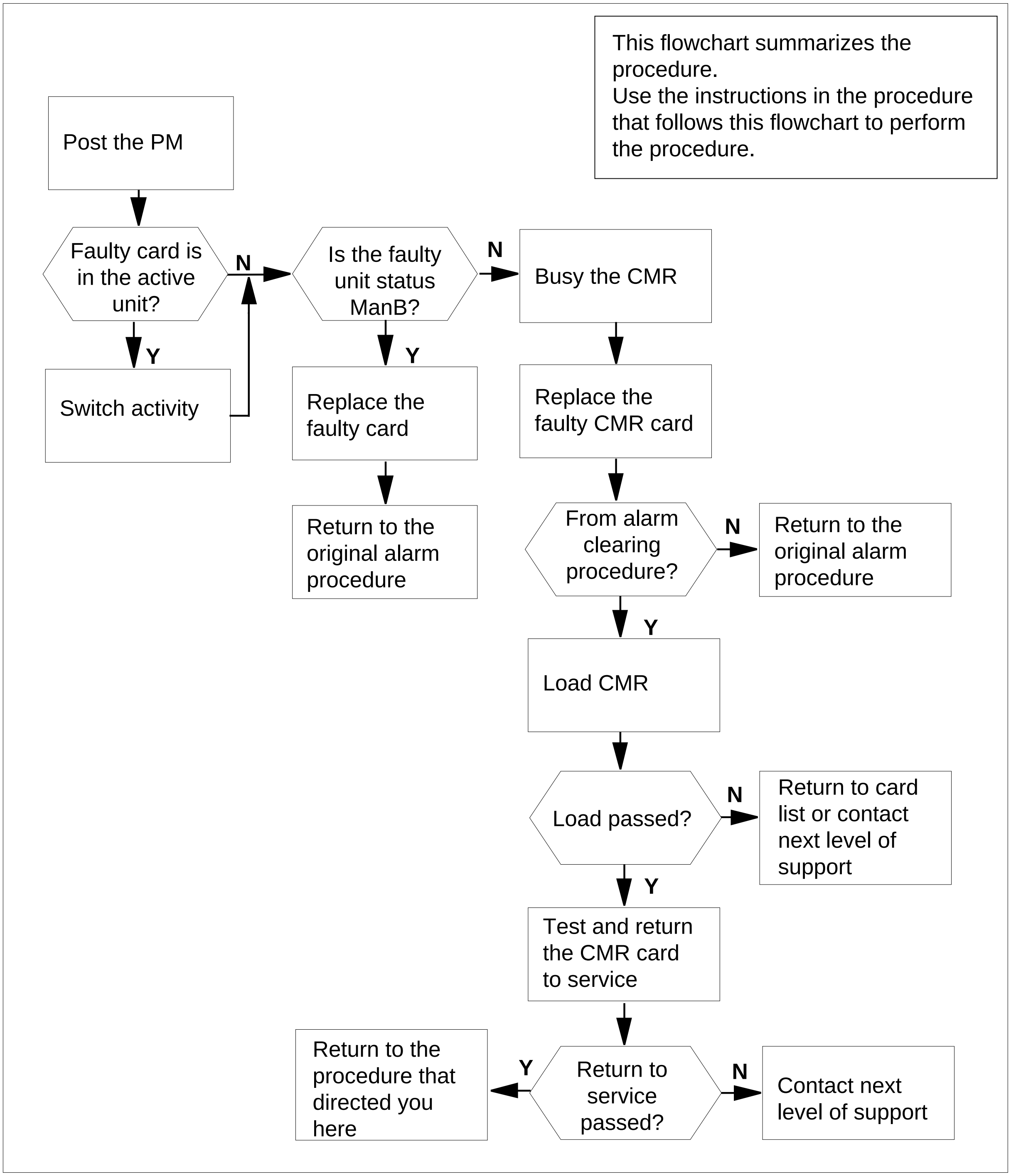
- “Removing and inserting cards in an SMA2”
- “Locating a faulty card in an SMA2"
- “Returning a card for repair or replacement”

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X78
in an SMA2 (continued)

Summary of card replacement procedure for an NT6X78 card in an SMA2



NT6X78
in an SMA2 (continued)

Replacing an NT6X78 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

CAUTION
Loss of service
When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

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

At the MAP terminal

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response:

NT6X78
in an SMA2 (continued)

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0     1     0     2    13
    SMA2    0     0     0     0     1     7

SMA2 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact SysB
```

6 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If the faulty card is in the	Do
active unit	step 7
inactive unit	step 11

7 SWACT (switch activity) the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11

NT6X78
in an SMA2 (continued)

If the message is	Do
`SWACT failed Reason: XPM SWACTback`	step 10
`SWACT refused by SWACT Controller`	step 10

10 The inactive unit could not establish two-way communication with the central control (CC) and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 21.

At the frame or cabinet

11 Hang a sign on the active unit bearing the words: *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

At the MAP terminal

12 Observe the MAP display and determine the state of the inactive unit.

If state is	Do
`ManB`	step 14
`SysB, CBsy, ISTb, or InSv`	step 13

13 Busy the CMR card in the inactive unit by typing

`>BSY UNIT unit_no  CMR`

and pressing the Enter key.

where

unit_no
is the number of the inactive SMA2 unit (0 or 1)

NT6X78
in an SMA2 (continued)

At the frame or cabinet

14

> **WARNING**
> **Static electricity damage**
> Wear a strap connected to the wrist strap grounding modular supervisory panel (MSP) while handling cards. This strap protects the cards against damage caused by static electricity.

Perform the common replacing a card procedure in this document.

15 Use the following information to determine the next step.

If your were directed here from	Do
alarm clearing procedures	step 18
other	step 16

At the MAP terminal

16 Load the CMR in the inactive SMA2 unit by typing

>LOADPM UNIT unit_no CC CMR

and pressing the Enter key.

where

unit_no
is the number of the busied SMA2 unit

If LOAD	Do
passed	step 17
failed	step 21

17 Test and return to service the CMR in the inactive SMA2 unit by typing

>RTS UNIT unit_no CMR

and pressing the Enter key.

where

unit_no
is the number of the SMA2 unit loaded in step 16

If RTS	Do
passed	step 18

NT6X78
in an SMA2 (end)

If RTS	Do
failed	step 21

At the frame or cabinet

18 Remove the sign from the active SMA2 unit.

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

20 Go to step 22.

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

22 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NT6X92 in an SMA2

Application

Use this procedure to replace an NT6X92 card in an SMA2.

PEC	Suffixes	Name
6X92	BB	Universal Tone Receiver

Common procedures

The following procedures are referenced in this procedure:

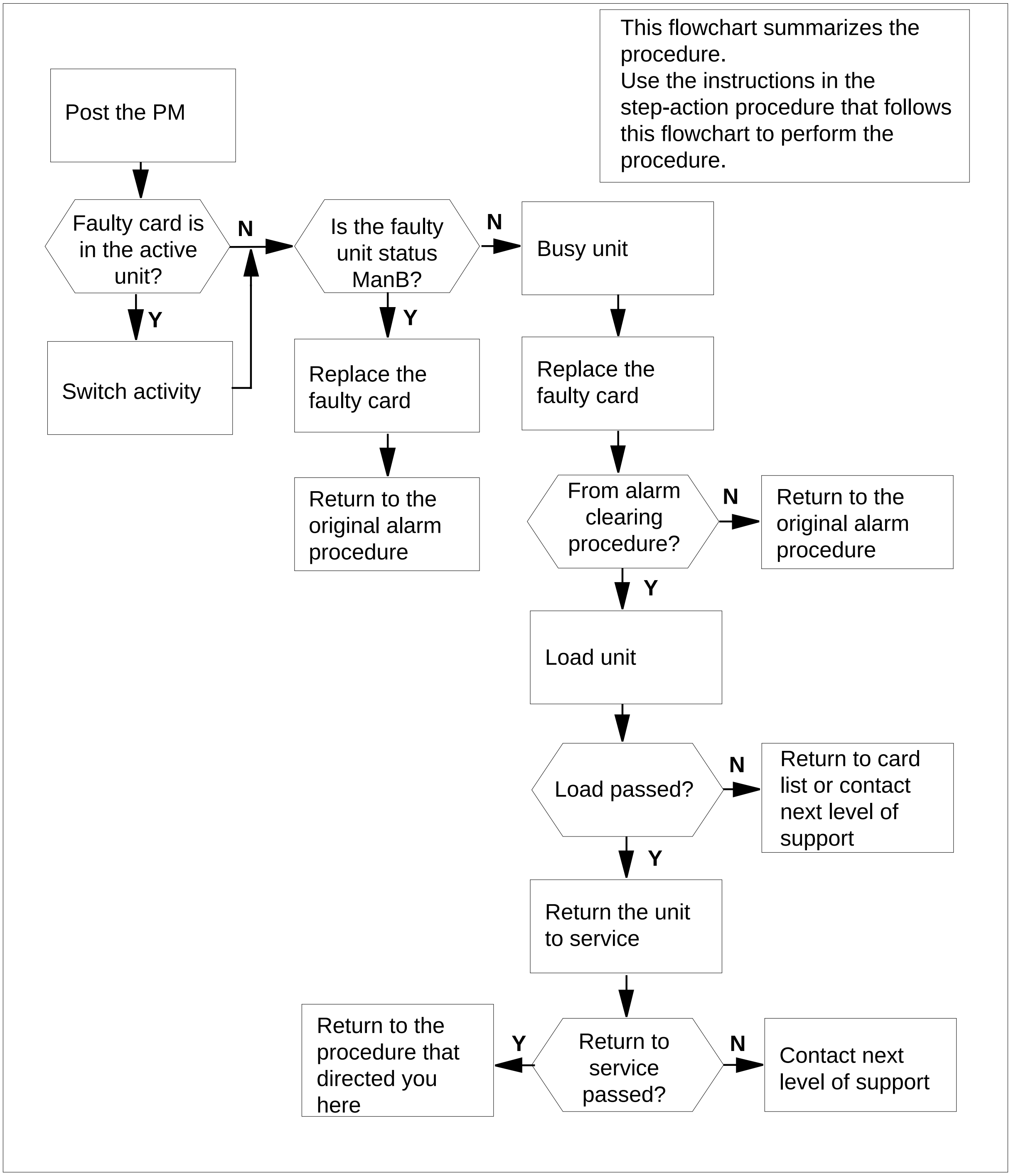
- “Locating a faulty card in an SMA2"
- replacing a card
- returning a card

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NT6X92
in an SMA2 (continued)

Summary of card replacement procedure for an NT6X92 card in an SMA2



NT6X92
in an SMA2 (continued)

Replacing an NT6X92 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

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

At the MAP terminal

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response

NT6X92 in an SMA2 (continued)

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMA2    0     0    0     0     1     7

SMA2 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact SysB
```

6 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If the faulty card is in the	Do
active unit	step 7
inactive unit	step 11

7 SWACT the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11

NT6X92
in an SMA2 (continued)

If the message is	Do
SWACT failed Reason: XPM SWACTback	step 10
SWACT refused by SWACT Controller	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 21.

At the frame or cabinet

11 Hang a sign on the active unit bearing the words: *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

At the MAP terminal

12 Observe the MAP display and determine the state of the inactive unit.

If state is	Do
ManB	step 14
SysB, CBsy, ISTb, or InSv	step 13

13 Busy the inactive PM unit by typing

>BSY UNIT unit_no

and pressing the Enter key

where

unit_no
is the number of the inactive SMA2 unit (0 or 1)

NT6X92
in an SMA2 (continued)

At the frame or cabinet

14

> **WARNING**
> **Static electricity damage**
> Wear a strap connected to the wrist strap grounding modular supervisory panel (MSP) while handling cards. This strap protects the cards against damage caused by static electricity.

Perform the common replacing a card procedure in this document.

15 Use the following information to determine the next step.

If you were directed here from	Do
alarm clearing procedures	step 18
other	step 16

At the MAP terminal

16 Load the inactive SMA2 unit by typing

>LOADPM UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the busied SMA2 unit

If load	Do
passed	step 17
failed	step 21

17 Return the inactive SMA2 unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the SMA2 unit loaded in step 17

If RTS	Do
passed	step 18

NT6X92 in an SMA2 (end)

If RTS	Do
failed	step 21

At the frame or cabinet

18 Remove the sign from the active SMA2 unit.

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

20 Go to the common returning a card procedure in this document.

Go to step 22.

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

22 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTAX74 in an SMA2

Application

Use this procedure to replace an NTAX74 card in an SMA2.

PEC	Suffixes	Name
NTAX74	AA	Cellular Access Processor with 16Mb Memory

Common procedures

The following procedures are referenced in this procedure:

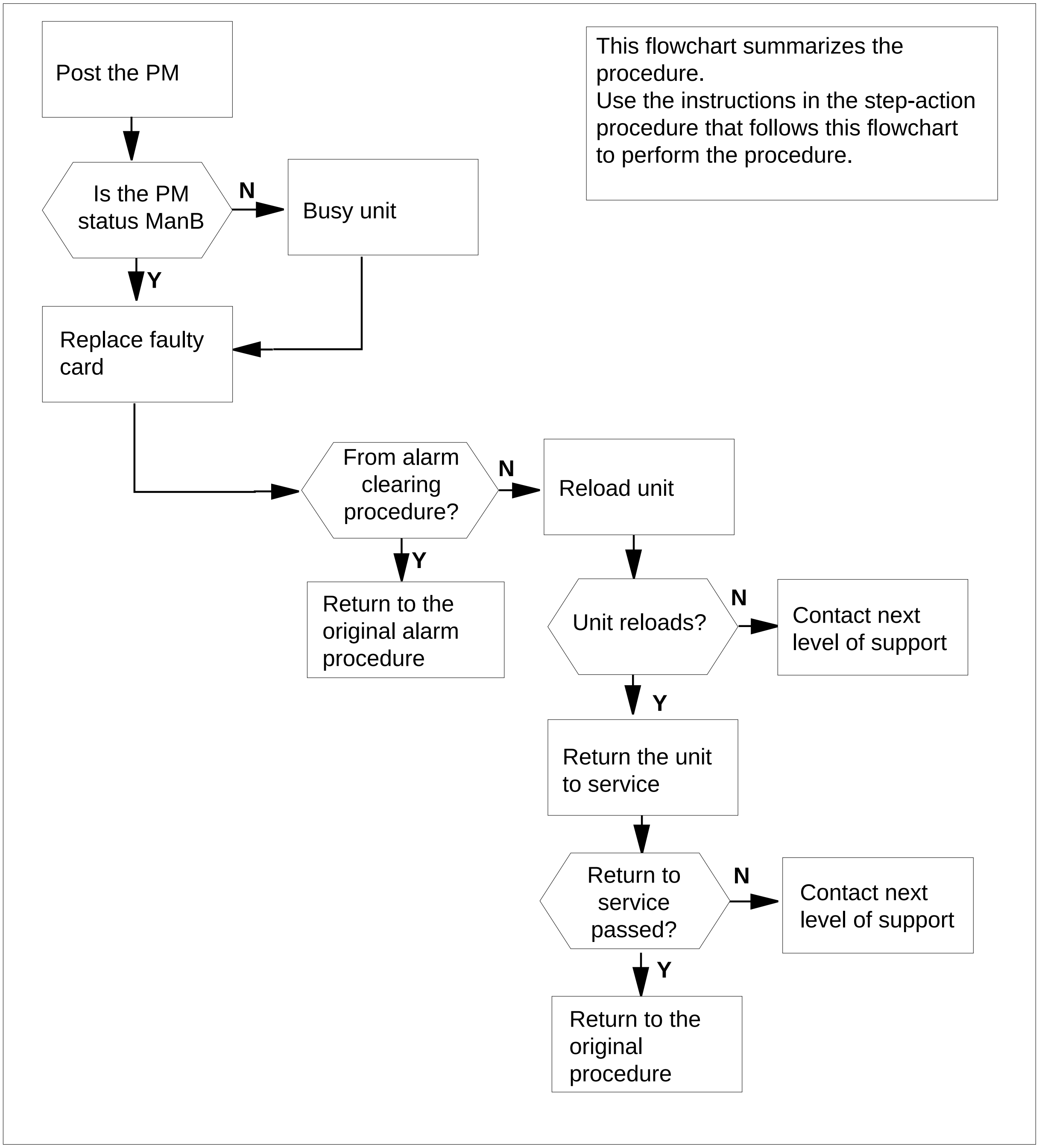
- “Locating a faulty card in an SMA2"
- replacing a card

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTAX74
in an SMA2 (continued)

Summary of card replacement procedure for an NTAX74 card in an SMA2



NTAX74
in an SMA2 (continued)

Replacing an NTAX74 card in an SMA2

At your current location

1 Proceed only if you are directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or are directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

Get an NTAX74 replacement card. Ensure the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed

At the MAP terminal

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response

NTAX74
in an SMA2 (continued)

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMA2    0     0    0     0     1     7

SMA2 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:   Act   InSv
Unit1:   Inact SysB
```

6 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If the faulty card is in the	Do
active unit	step 7
inactive unit	step 11

7 SWACT the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11

NTAX74
in an SMA2 (continued)

If the message is	Do
SWACT failed Reason: XPM SWACTback	step 10
SWACT refused by SWACT Controller	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 27.

At the frame or cabinet

11 Hang a sign on the active unit bearing the words: *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

At the MAP terminal

12 Observe the MAP display and determine the state of the inactive unit.

If state is	Do
SysB, CBsy, ISTb, or InSv	step 13
ManB	step 15

13 Busy the inactive PM unit by typing

>BSY INACTIVE

and pressing the Enter key.

14 Prevent the PM from trapping by typing

>PMRESET UNIT unit_no NORUN

and pressing the Enter key.

where

unit_no
is the number of the inactive SMA2 unit (0 or 1)

At the frame or cabinet

15 Remove the faulty NTAX74 card using the common replacing a card procedure in this document.

NTAX74
in an SMA2 (continued)

16

> **DANGER**
> **Possible loss of P-side nodes**
> When installing the replacement NTAX74, monitor the LEDs on the faceplate of the NTAX74 for the following:
>
> 1. The INSV and ESA LEDs will come ON and remain ON until loading begins.
>
> 2. The ACT LED may come ON and light for less than 1 second. If the ACT LED remains ON for more than 1 second, immediately remove the NTAX74 circuit card and return to this step. If the NTAX74 circuit card is allowed to remain with both units having an active processor, a condition of dual activity exists, which results in the loss of P-side nodes.

Insert the new NTAX74 card using the common replacing a card procedure in this document.

17 Use the following information to determine the next step.

If you were directed here from	Do
alarm clearing procedures	step 26
other	step 18

At the MAP terminal

18 Load the inactive SMA2 unit by typing

>LOADPM INACTIVE

and pressing the Enter key.

If load	Do
passed	step 19
failed	step 27

19 Determine the name of the firmware load file by typing

>QUERYPM CNTRS

and pressing the Enter key.

NTAX74 in an SMA2 (continued)

Cross-reference this name to the disk volume name on the PMLoad File Office Record (or similar list of all PM load files maintained in your office).

If the firmware load file name displayed is	Do
the same	step 22
different	step 20

20 Load the NTAX74 firmware In the inactive unit by typing

>LOADFW INACTIVE

and pressing the Enter key.

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

If LOADFW	Do
passed	step 21
failed	step 27

21 To upgrade the firmware on the inactive unit type

>LOADFW INACTIVE UPGRADE

and pressing the Enter key.

If LOADFW UPGRADE	Do
passed	step 22
failed	step 27

22 Return the inactive SMA2 unit to service by typing

>RTS INACTIVE

and pressing the Enter key.

If RTS	Do
passed	step 23
failed	step 27

At the frame or cabinet

23 Remove the sign from the active SMA2 unit.

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

NTAX74
in an SMA2 (end)

25 Go to the common procedure “Returning a card for repair or replacement" in this section.

Go to step 28

26 Return to the *Alarm Clearing Procedure* or other procedure that directed you to this procedure. If necessary, go to the point where the faulty card list was produced, identify the next faulty card on the list, and go to the appropriate procedure for that card in this manual.

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

28 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTBX01 in an SMA2

Application

Use this procedure to replace an NTBX01 card in an SMA2.

PEC	Suffixes	Name
NTBX01	AC	Enhanced ISDN Signal Pre-processor

Common procedures

The following procedures are referenced in this procedure:

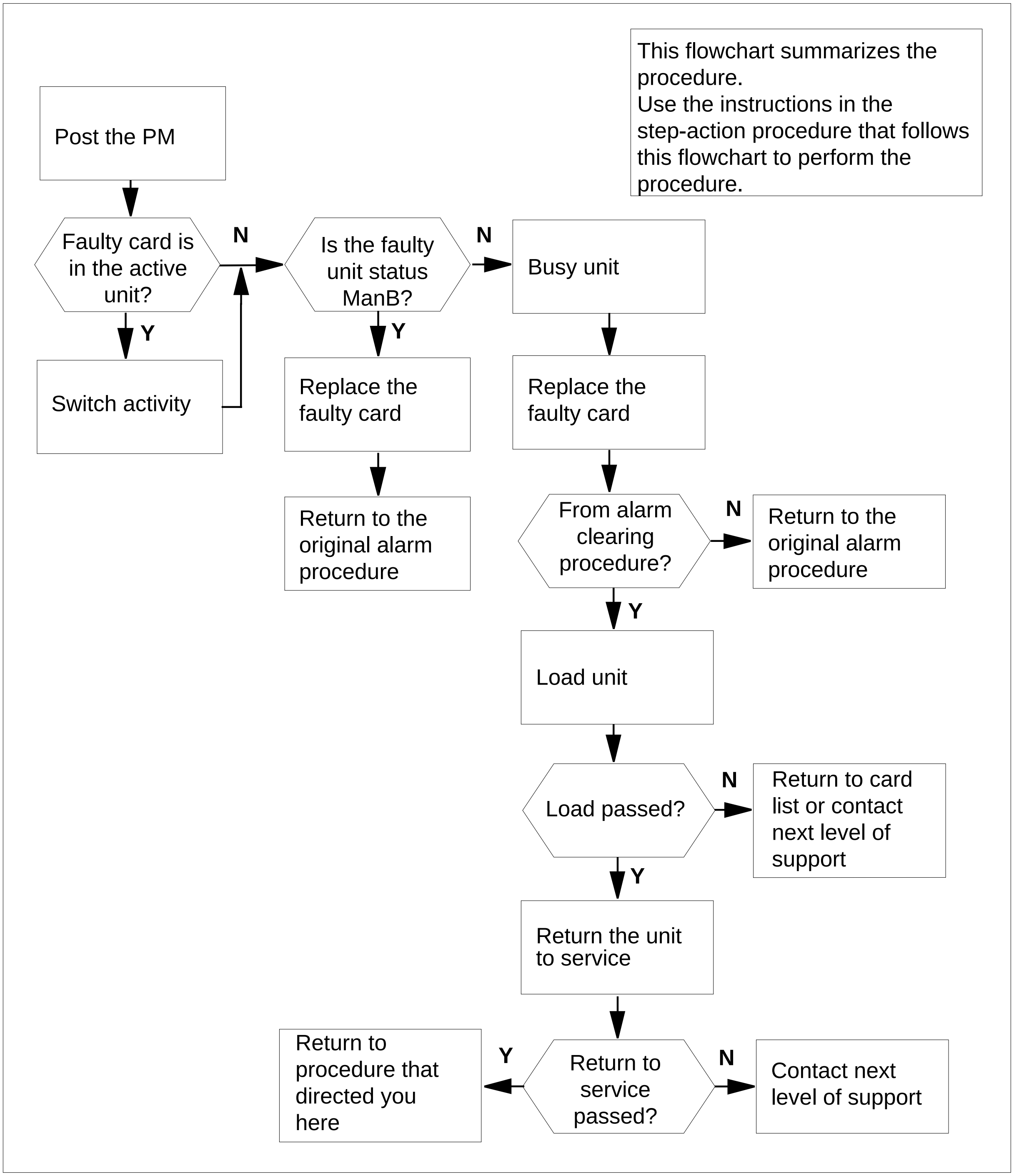
- “Locating a faulty card in an SMA2"
- replacing a card
- returning a card

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTBX01
in an SMA2 (continued)

Summary of card replacement procedure for an NTBX01 card in an SMA2



NTBX01
in an SMA2 (continued)

Replacing a NTBX01 card in a SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

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

At the MAP terminal

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response

NTBX01
in an SMA2 (continued)

```
          SysB  ManB  Offl  CBsy  ISTb  InSv
    PM       3     0    1     0     2    13
    SMA2    0     0    0     0     1     7

SMA2 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact ISTb
```

6 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If the faulty card is in the	Do
active unit	step 7
inactive unit	step 11

7 SWACT the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11

NTBX01
in an SMA2 (continued)

If the message is	Do
`SWACT failedReason: XPM SWACTback`	step 10
`SWACT refused by SWACT Controller`	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 21.

At the frame or cabinet

11 Hang a sign on the active unit bearing the words: *Active unit-Do not touch.*. This sign should not be attached by magnets or tape.

At the MAP terminal

12 Observe the MAP display and determine the state of the inactive unit.

If the state is	Do
`Manb`	step 14
`SysB, CBsy, ISTb, or InSv`	step 13

13

> **WARNING**
> **Static electricity damage**
> Wear a strap connected to the wrist strap grounding modular supervisory panel (MSP) while handling cards. This strap protects the cards against damage caused by static electricity.

Busy the inactive PM unit by typing

`>BSY UNIT unit_no`

and pressing the Enter key.

where

unit_no
is the number of the inactive SMA2 unit (0 or 1)

NTBX01
in an SMA2 (continued)

At the frame or cabinet

14 Perform the common replacing a card procedure in this document.

15 Use the following information to determine the next step.

If you were directed here from	Do
alarm clearing procedures	step 18
other	step 16

At the MAP terminal

16 Load the inactive SMA2 unit by typing

>LOADPM UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the busied SMA2 unit

If load	Do
passed	step 17
failed	step 21

17 Return the inactive SMA2 unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the SMA2 unit loaded in step 17

If RTS	Do
passed	step 18
failed	step 21

At the frame or cabinet

18 Remove the sign from the active SMA2 unit.

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

20 Go to the common returning a card procedure in this document.

Go to step 22.

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

NTBX01 in an SMA2 (end)

22 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTBX02
in an SMA2

Application

Use this procedure to replace an NTBX02 card in an SMA2.

PEC	Suffixes	Name
NTBX02	BA	Enhanced D-Channel Handler (DCH) card

D-channel handler (DCH) circuit cards are not provided with the multi-vendor interface (MVI) 28 project, enhanced DCH (EDCH) circuit cards are provided instead. At the MAP position DCH is displayed, meaning an EDCH circuit card. Any reference to a DCH circuit card in this document means an EDCH circuit card.

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- replacing a card
- returning a card

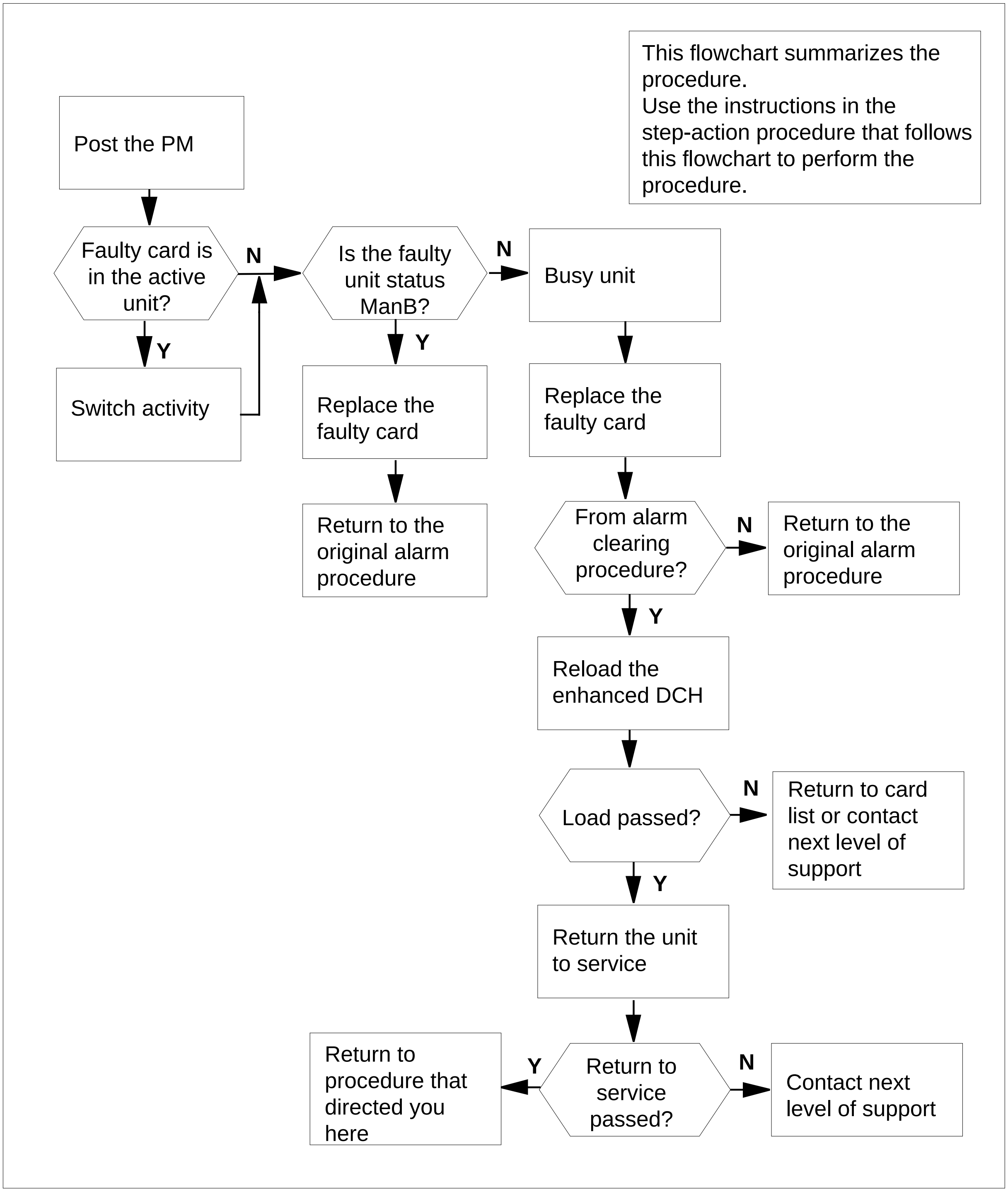
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTBX02
in an SMA2 (continued)

Summary of card replacement procedure for an NTBX02 card in an SMA2



NTBX02
in an SMA2 (continued)

Replacing an NTBX02 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2" and return to step 4

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

At the MAP terminal

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 to be posted

Example of a MAP response

```
SMA2      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM      3     0    1     0     2    13
    SMA2    0     0    0     0     0     7

SMA2 0 InSv  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact InSv
```

6 Go to the DCH level of the MAP display by typing

>DCH

and pressing the Enter key.

7 Post all DCH cards associated with the posted SMA2 by typing

>POST ALL

NTBX02
in an SMA2 (continued)

and pressing the Enter key.

8 Display all DCH cards associated with the posted SMA2 by typing

>DISP ALL

and pressing the Enter key.

Note: Identify the number of a spare DCH card.

9 Post the faulty DCH circuit card by typing

>POST dch_no

and pressing the Enter key.

where

dch_no
is the number of the DCH card you are replacing

If the DCH card to be replaced is	Do
already a spare	step 11
not a spare	step 10

10 Make the posted DCH card a spare by typing

>SWTCH spare dch_no

and pressing the Enter key.

where

spare dch_no
is the number of the spare DCH card identified in step 8

If the switch is	Do
successful	step 11
not successful	step 18

11 Busy the link to the faulty DCH circuit card by typing

>BSY

and pressing the Enter key.

NTBX02
in an SMA2 (continued)

At the frame or cabinet

12

> **WARNING**
> **Static electricity damage**
> Wear a strap connected to the wrist strap grounding modular supervisory panel (MSP) while handling cards. This strap protects the cards against damage caused by static electricity.

Replace the faulty DCH circuit card using the common replacing a card procedure in this document.

At the MAP terminal

13 Use the following information to determine the next step.

If you were directed here from	Do
alarm clearing procedures	step 19
other	step 14

14 Load the replaced DCH circuit card by typing

>LOADPM

and pressing the Enter key.

If load	Do
passed	step 15
failed	step 18

15 Return-to-service one of the DCH circuit cards with ports connected to the inactive unit by typing

>RTS

and pressing the Enter key.

If RTS	Do
passed	step 16
failed	step 18

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

17 Go to the common returning a card procedure in this document.

Go to step 19.

NTBX02
in an SMA2 (end)

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

19 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTMX72 in an SMA2

Application

Use this procedure to replace an NTMX72 card in an SMA2.

PEC	Suffixes	Name
NTMX72	AA, AB	Power Converter

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- replacing a card
- returning a card

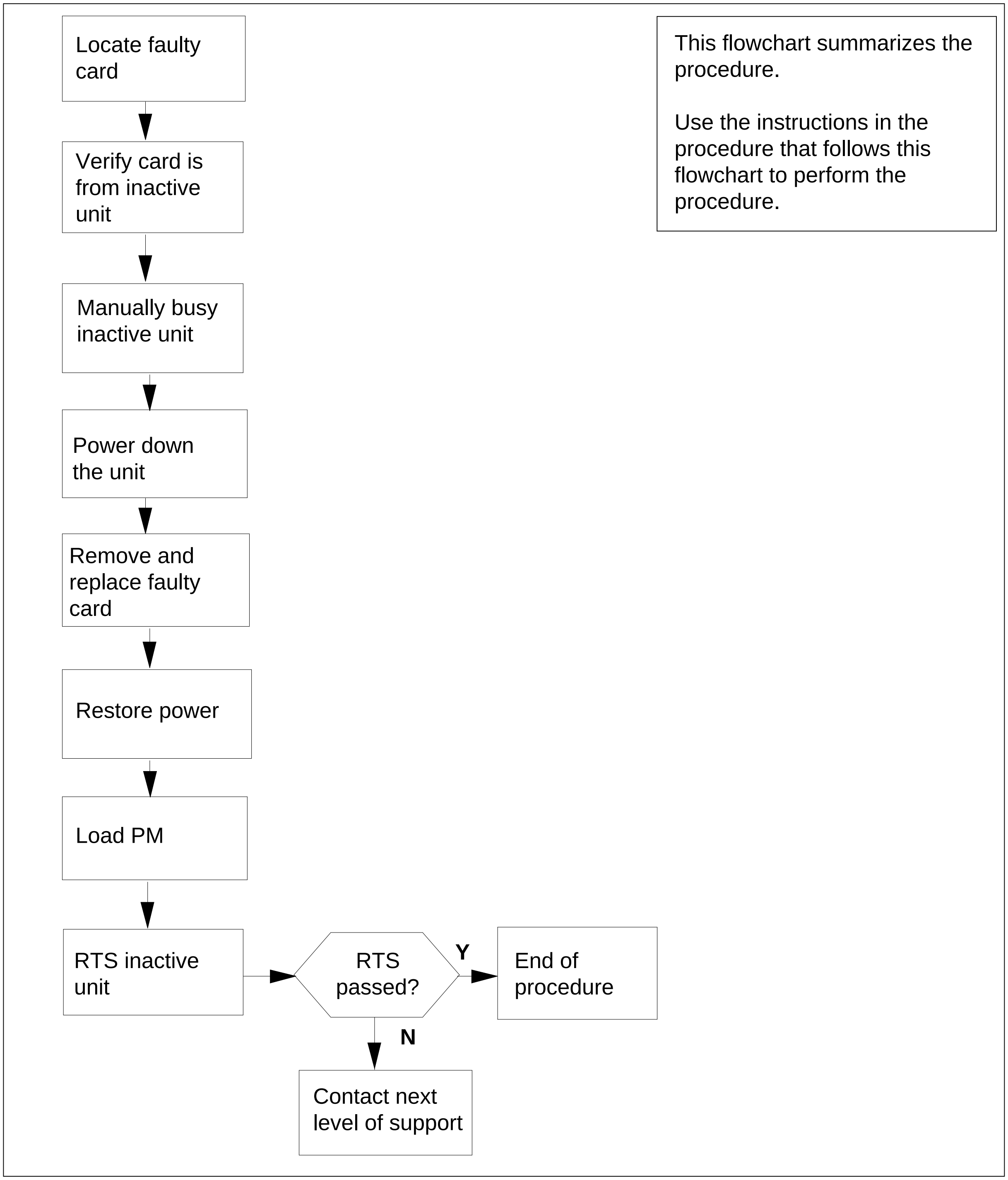
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTMX72
in an SMA2 (continued)

Summary of card replacement procedure for an NTMX72 card in an SMA2



NTMX72
in an SMA2 (continued)

Replacing an NTMX72 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

Obtain an NTMX72 replacement card. Ensure the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 with the faulty card

Example of a MAP display:

NTMX72 in an SMA2 (continued)

```
        SysB    ManB   OffL     CBsy     ISTb   InSv
   PM     3       0      1        0        2      13
   SMA2   0       0      0        0        1      7

SMA2   0 ISTb  Links_OOS:  CSide  0, PSide   0
Unit0:   Act   InSv
Unit1:   InAct IsTb
```

6 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If faulty card is on	Do
active unit	step 7
inactive unit	step 11

7 Switch the processing activity (SWACT) to the inactive unit by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If prompt indicates	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11

NTMX72
in an SMA2 (continued)

If the message is	Do
`SWACT failed Reason: XPM SWACTback`	step 10
`SWACT refused by SWACT Controller`	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 23.

At the frame or cabinet

11 Place a sign on the active unit bearing the words *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

At the MAP terminal

12 Busy the inactive PM unit by typing

>bsy INACTIVE

and pressing the Enter key.

At the frame or cabinet

13 Use the following information to determine where to proceed:

If the card you are replacing has a suffix of	Do
AA	step 14
AB	step 15

14

WARNING
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Power down the NTMX72 power converter by setting the POWER switch on the face plate to the OFF position.

Perform the common replacing a card procedure in this document.

NTMX72
in an SMA2 (continued)

Go to step 16.

15

DANGER
Static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Power down the NTMX72AB power converter by setting the circuit breaker on the MSP for the inactive unit to the OFF position.

Perform the common replacing a card procedure in this document.

Go to step 16.

16 Power up the inactive SMA2 unit as follows:

a Ensure the power converter (NTMX72) is inserted. A major audible alarm may sound. This alarm is silenced when power is restored to the converter.

b If the power converter you replaced is an NTMX72AA, set the POWER switch to the ON position. Set the POWER switch to RESET when setting the circuit breaker on the MSP to the ON position.

c If the power converter you replaced is an NTMX72AB, set the circuit breaker on the MSP to the ON position for the NTMX72AB that was powered down in step 15.

17 After replacing the faulty card, load the inactive SMA2 unit by typing

>LOADPM INACTIVE

and pressing the Enter key.

where

unit_no
is the number of the inactive SMA2 unit

If load	Do
passed	step 18
failed	step 23

18 Use the following information to determine where to proceed.

If you entered this procedure from	Do
alarm clearing procedures	step 22

NTMX72
in an SMA2 (end)

If you entered this procedure from	**Do**
other	step 19

19 Return the inactive SMA2 unit to service by typing

>RTS inactive

and pressing the Enter key.

If RTS	**Do**
passed	step 20
failed	step 23

20 Remove the sign from the active SMA2 unit.

21 Go to the common returning a card procedure in this document.

Go to step 23.

22 Return to the procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

23 Obtain further assistance in replacing this card by contacting operating company maintenance personnel.

24 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTMX73
in an SMA2

Application

Use this procedure to replace an NTMX73 card in an SMA2.

PEC	Suffixes	Name
NTMX73	BA	PCM Signaling Processor

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- replacing a card
- returning a card

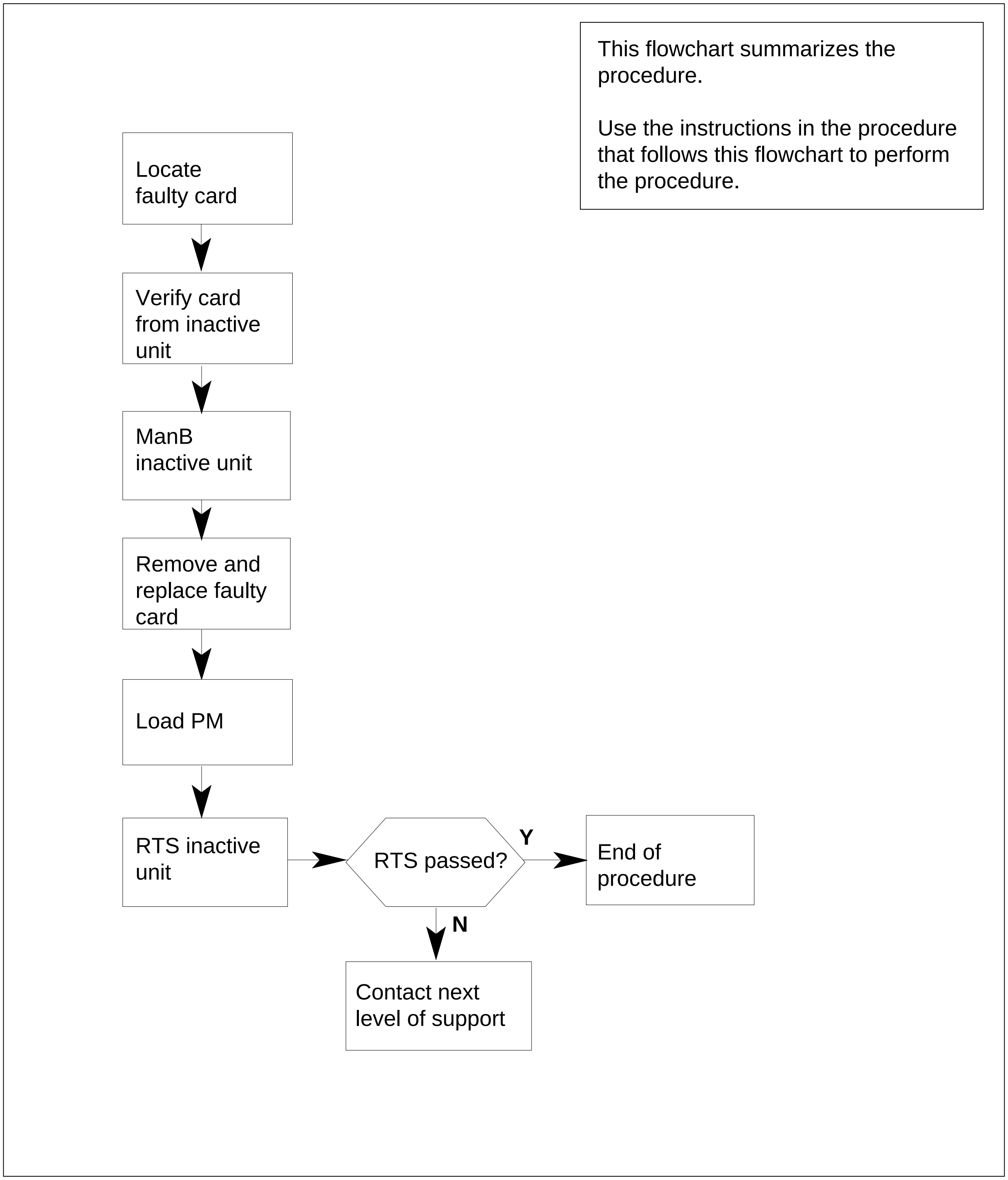
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTMX73
in an SMA2 (continued)

Summary of card replacement procedure for an NTMX73 card in an SMA2



NTMX73
in an SMA2 (continued)

Replacing an NTMX73 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

Obtain an NTMX73 replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP display

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 with the faulty card

Example of a MAP display:

NTMX73
in an SMA2 (continued)

```
SMA2      SysB    ManB    OffL    CBsy    ISTb     InSv
    PM       3       0       1       0       2       13
    SMA2     0       0       0       0       1       7

SMA2   0 ISTb  Links_OOS:  CSide  0, PSide   0
Unit0:   Act   InSv
Unit1:   InAct IsTb
```

6 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If the faulty card is on the	Do
active unit	step 7
inactive unit	step 11

7 Switch the processing activity (SWACT) to the inactive unit by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If prompt indicates	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11

NTMX73 in an SMA2 (continued)

If the message is	Do
`SWACT failed Reason: XPM SWACTback`	step 10
`SWACT refused by SWACT Controller`	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 18.

At the frame or cabinet

11 Place a sign on the active unit bearing the words *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

At the MAP display

12 Busy the inactive PM unit by typing

>bsy unit **unit_no**

and pressing the Enter key.

where

unit_no
is the number of the unit to be busied (0 or 1)

At the frame or cabinet

13

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Perform the common replacing a card procedure in this document.

At the MAP display

14 Load the inactive SMA2 unit by typing

>loadpm unit **unit_no CC**

and pressing the Enter key.

where

NTMX73
in an SMA2 (end)

unit_no
is the number of the faulty SMA2 unit

If load	Do
passed	step 15
failed	step 18

15 Use the following information to determine where to proceed.

If you entered this procedure from	Do
alarm clearing procedures	step 17
other	step 16

16 Return the inactive SMA2 unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the faulty SMA2 unit

If RTS	Do
passed	step 19
failed	step 18

17 Return to the procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

18 Obtain further assistance in replacing this card by contacting operating company maintenance personnel.

19 Remove the sign from the active SMA2 unit.

20 Go to the common returning a card procedure in this document.

21 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTMX75 in an SMA2

Application

Use this procedure to replace an NTMX75 card in an SMA2.

PEC	Suffixes	Name
NTMX75	BA	Enhanced Matrix

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- replacing a card
- returning a card

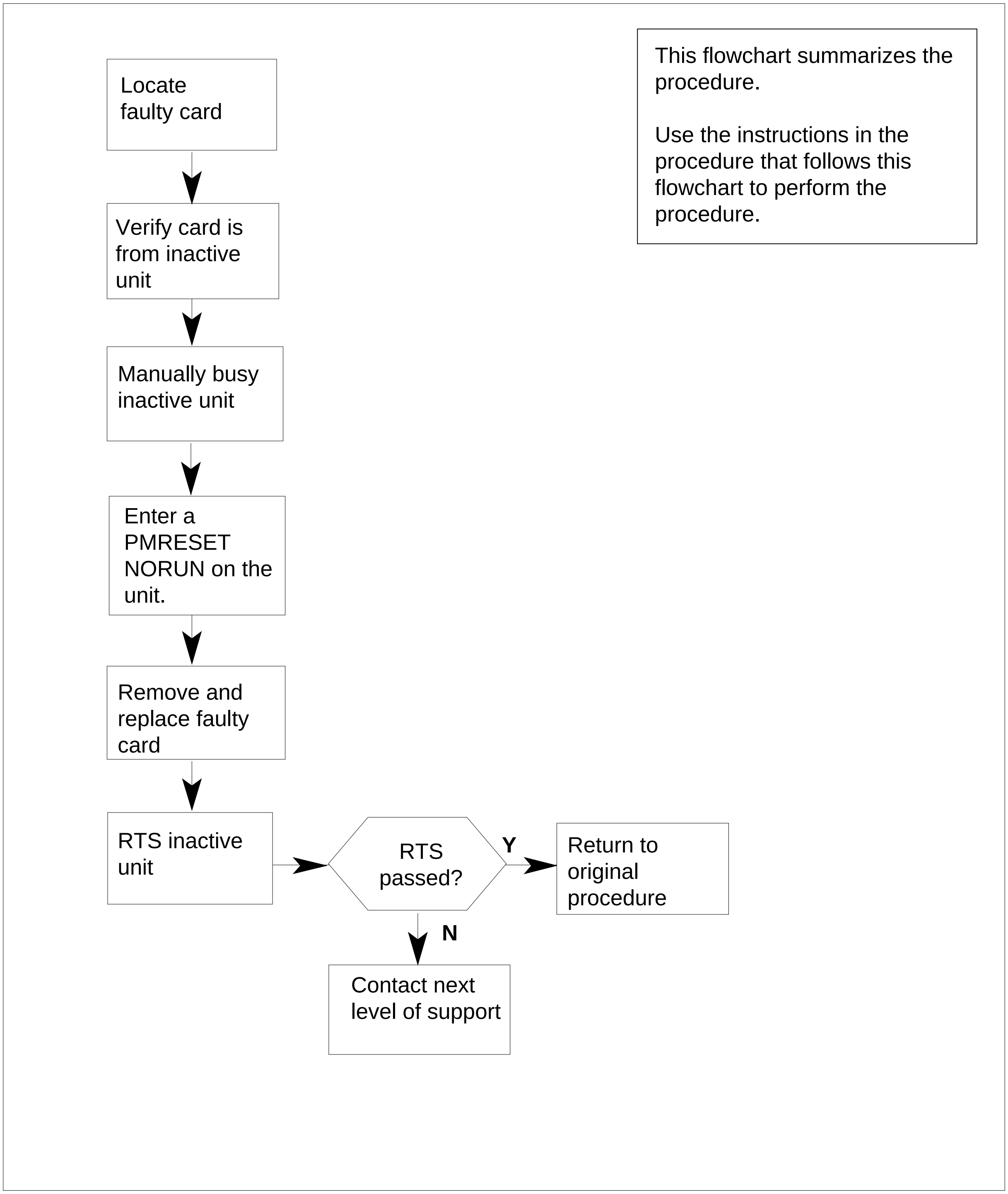
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTMX75
in an SMA2 (continued)

Summary of card replacement procedure for an NTMX75 card in an SMA2



NTMX75 in an SMA2 (continued)

Replacing an NTMX75 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

Obtain an NTMX75 replacement card. Ensure the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

5 Set the MAP display to the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 to be busied

Example of a MAP display:

```
SMA2      SysB    ManB    OffL    CBsy    ISTb     InSv
    PM       3       0       1       0       2      13
    SMA2     0       0       0       0       1      7

SMA2   0 ISTb  Links_OOS:  CSide  0, PSide   0
Unit0:   Act   InSv
Unit1:   InAct IsTb
```

NTMX75
in an SMA2 (continued)

6 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If faulty card is on	Do
active unit	step 7
inactive unit	step 11

7 Switch the processing activity (SWACT) to the inactive unit by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If prompt indicates	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11
`SWACT failed Reason: XPM SWACTback`	step 10
`SWACT refused by SWACT Controller`	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on

NTMX75
in an SMA2 (continued)

the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 20.

At the frame or cabinet

11 Place a sign on the active unit bearing the words *Active unit—Do not touch.* Place this sign in an electostatic discharge (ESD) bag. Do not attach the sign with magnets or tape.

At the MAP terminal

12 Busy the inactive PM unit by typing

>bsy **`INACTIVE`**

and pressing the Enter key.

13 Reset the inactive unit by typing

`>PMRESET unit_no NORUN`

and pressing the Enter key.

where

unit_no
is the number of the unit to be reset (0 or 1)

At the frame or cabinet

14

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Perform the common replacing a card procedure in this document.

At the MAP terminal

15 Reset the inactive unit by typing

`>PMRESET unit_no`

and pressing the Enter key.

where

unit_no
is the number of the unit to be reset (0 or 1)

NTMX75
in an SMA2 (end)

16 Use the following information to determine what step to go to next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 19
other	step 17

17 Return the inactive SMA2 unit to service by typing

>RTS INACTIVE

and pressing the Enter key.

If RTS	Do
passed	step 18
failed	step 19

18 Go to the common returning a card procedure in this document.

Go to step 21.

19 Return to the procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

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

21 You have successfully completed this procedure. Remove the sign from the active unit and return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTMX76 in an SMA2

Application

Use this procedure to replace an NTMX76 card in an SMA2.

PEC	Suffixes	Name
NTMX76	BA, CA	HDLC/DMSX Messaging Interface Card

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- replacing a card
- returning a card

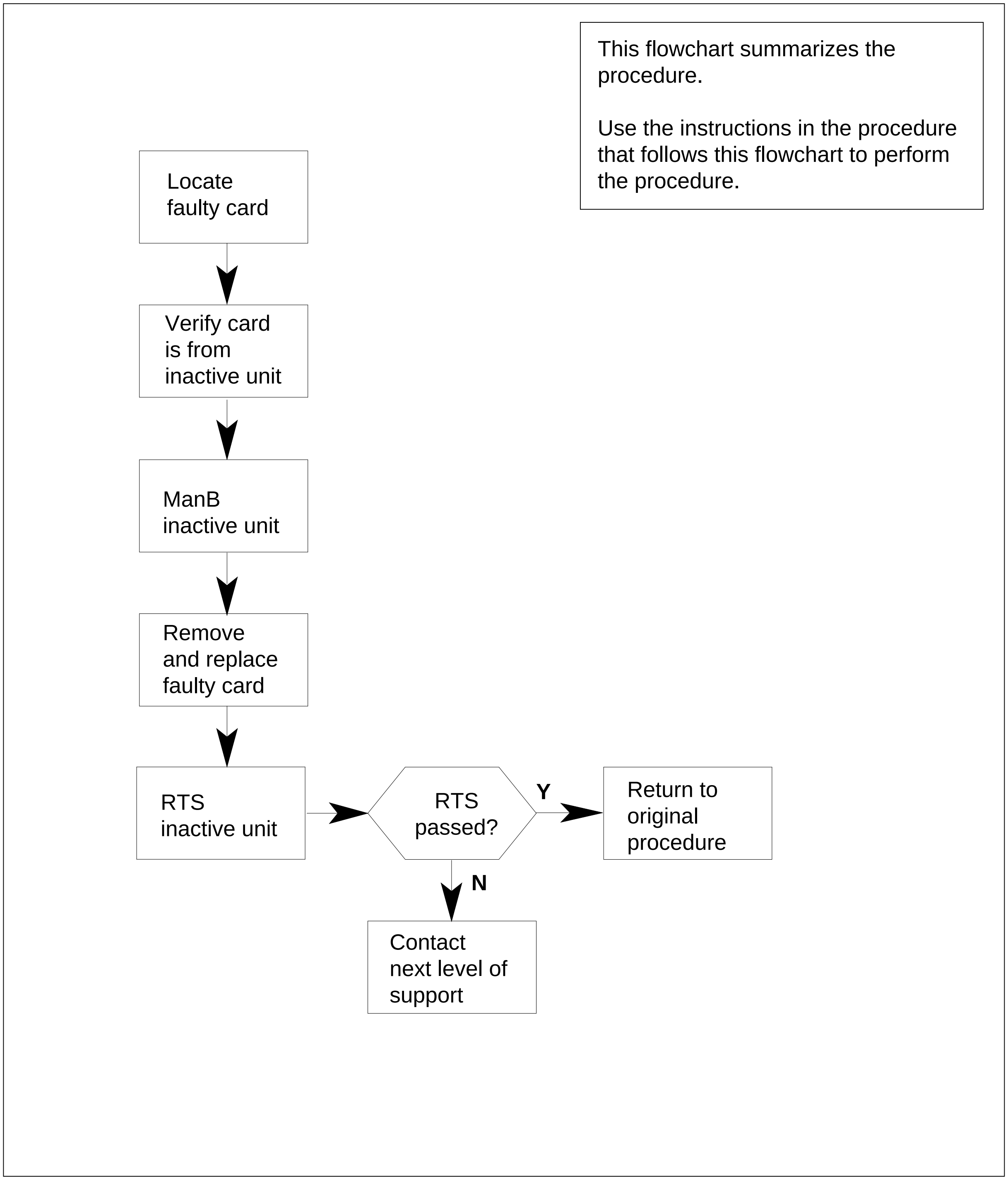
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTMX76
in an SMA2 (continued)

Summary of card replacement procedure for an NTMX76 card in an SMA2



NTMX76 in an SMA2 (continued)

Replacing an NTMX76 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

Obtain an NTMX76 replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

5 Ensure the current MAP display is at the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 to be busied (0 or 1)

Example of a MAP display:

NTMX76
in an SMA2 (continued)

```
SMA2      SysB     ManB     OffL     CBsy     ISTb      InSv
    PM       3        0        1        0        2        13
    SMA2     0        0        0        0        1        7

SMA2   0 ISTb  Links_OOS:  CSide  0, PSide   0
Unit0:   Act   InSv
Unit1:   InAct IsTb
```

6 By observing the MAP display, be sure the card to be removed is on the inactive unit.

If faulty card is on	Do
active unit	step 7
inactive unit	step 11

7 Switch the processing activity (SWACT) to the inactive unit by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If prompt indicates	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11

NTMX76
in an SMA2 (continued)

If the message is	Do
`SWACT failed Reason: XPM SWACTback`	step 10
`SWACT refused by SWACT Controller`	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 19.

At the frame or cabinet

11 Put a sign on the *active* unit bearing the words *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

At the MAP terminal

12 Busy the inactive SMA2 unit by typing

>bsy unit **unit_no**

and pressing the Enter key.

where

unit_no
is the number of the SMA2 unit to be busied (0 or 1)

13 Prevent the SMA2 from trapping by typing

>PMRESET UNIT unit_no NORUN

and pressing the Enter key.

where

unit_no
is the number of the inactive SMA2 unit (0 or 1)

At the frame or cabinet

14

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

> **CAUTION**
> **Loss of subscriber service**
> Subscriber service may be lost in the *active* unit when reseating the MX76 card. It is recommended this procedure be performed during low traffic periods.

Perform the common replacing a card procedure in this document.

15 Use the following information to determine what step to go to next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 18
other	step 16

16 Return the inactive SMA2 unit to service by typing

>RTS UNIT unit_no

and pressing the Enter key.

where

unit_no
is the number of the SMA2 unit being returned to service (0 or 1)

If RTS	Do
passed	step 17
failed	step 19

17 Go to the common returning a card procedure in this document.

Go to step 20.

NTMX76
in an SMA2 (end)

18 Return to *Alarm Clearing Procedures* or other procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

19 Obtain further assistance in replacing this card by contacting operating company maintenance personnel.

20 You have successfully completed this procedure. Remove the sign from the active unit and return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTMX79
in an SMA2

Application

Use this procedure to replace an NTMX79 card in an SMA2 extension shelf (CMVI and MVIE frame).

PEC	Suffixes	Name
NTMX79	AB	DS60 Extender

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- replacing a card
- returning a card

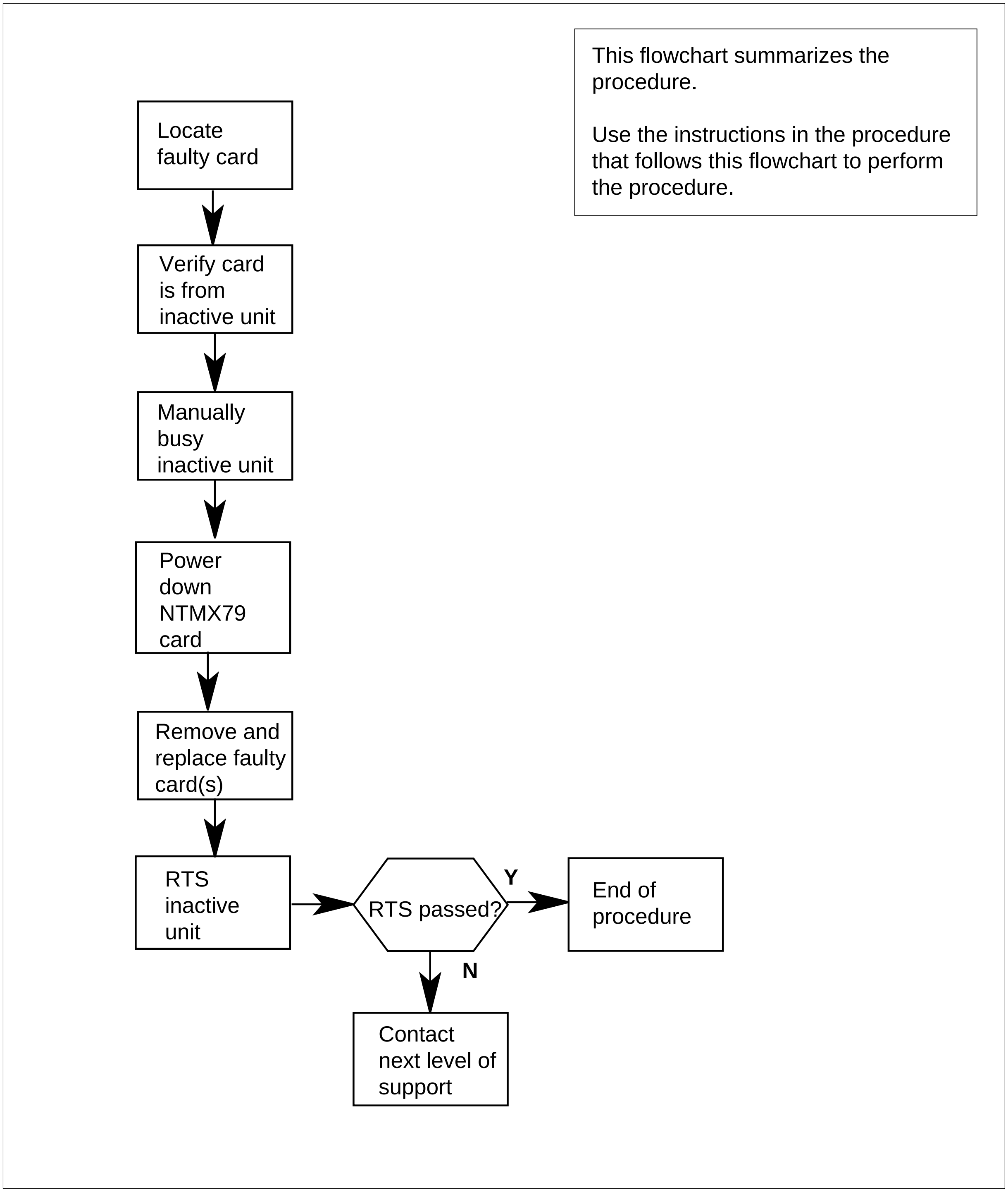
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the step-action instructions in the procedure that follows the flowchart.

NTMX79
in an SMA2 (continued)

Summary of card replacement procedure for an NTMX79 card in an SMA2



NTMX79
in an SMA2 (continued)

Replacing an NTMX79 card in an SMA2

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card.

If card location is	Do
known	step 4
unknown	step 3

3 Perform the procedure “Locating a faulty card in an SMA2."

4

> **CAUTION**
> **Loss of service**
> When replacing a card in the SMA2, ensure the unit in which you are replacing the card is *inactive* and the mate unit is *active*.

Obtain an NTMX79 replacement card. Verify the replacement card has the same product engineering code (PEC), including suffix, as the card to be removed.

At the MAP terminal

5 Set the MAP display to the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 with the faulty card

Example of a MAP display:

```
          SysB    ManB    OffL    CBsy    ISTb     InSv
     PM      3       0       1       0       2       13
     SMA2    0       0       0       0       1       7

SMA2   0 ISTb  Links_OOS:  CSide  0, PSide   0
Unit0:   Act   InSv
Unit1:   InAct IsTb
```

NTMX79 in an SMA2 (continued)

6 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If faulty card is on	Do
active unit	step 7
inactive unit	step 11

7 Switch the processing activity (SWACT) to the inactive unit by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If prompt indicates	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11
`SWACT failed Reason: XPM SWACTback`	step 10
`SWACT refused by SWACT Controller`	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on

NTMX79
in an SMA2 (continued)

the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 23.

At the frame or cabinet

11 Place a sign on the active unit bearing the words *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

At the MAP terminal

12 Busy the inactive PM unit by typing

>bsy INACTIVE

and pressing the Enter key.

At the frame or cabinet

13

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Power down the NTMX79 card on the extension shelf.

Perform the common replacing a card procedure in this document.

14 Power up the NTMX79 as follows:

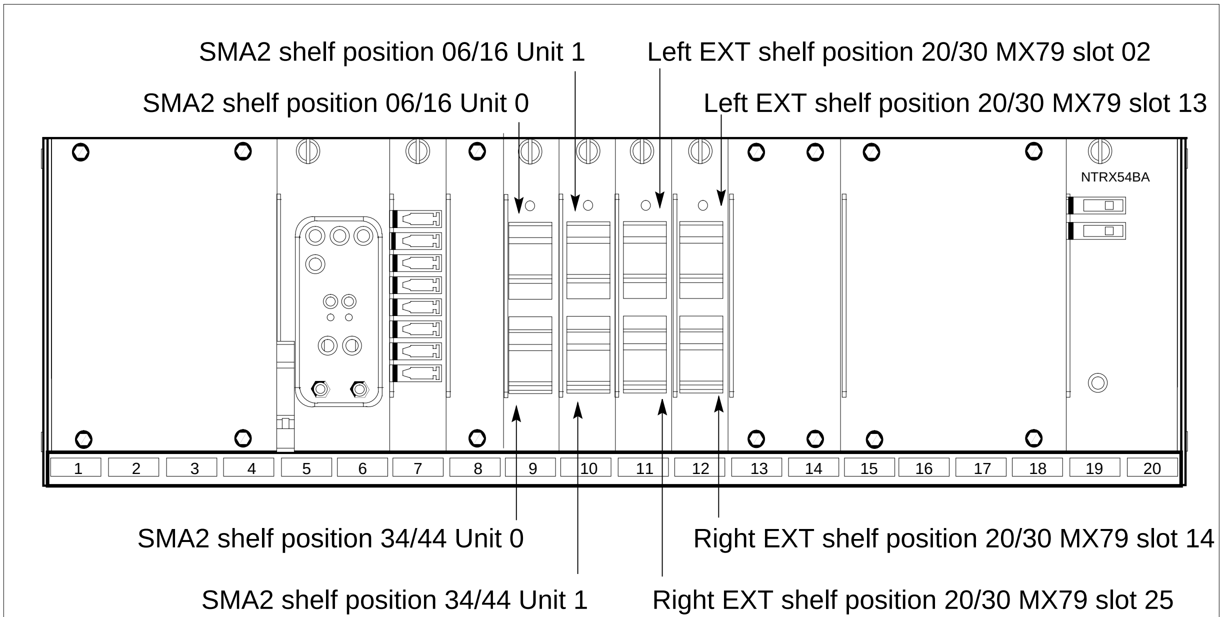
a Ensure the NTMX79 is inserted.

b Set the POWER switch to the ON position.

15 Determine which circuit breaker controls the NTMX79 being replaced by observing the MSP and noting the circuit breaker that is tripped. In addition, verify that you are selecting the correct circuit breaker based on the figure that follows.

NTMX79
in an SMA2 (continued)

MSP (CMVI and MVIE with an extension shelf)



16 Press and hold the circuit breaker on the MSP to the ON position while placing the power switch on the NTMX79 card to the RESET position. Both the CONVERTER FAIL LED on the NTMX79 card and the FRAME FAIL lamp on the MSP will be ON.

17 Use the following information to determine what step to go to next in this procedure.

If you entered this procedure from	Do
alarm clearing procedures	step 22
other	step 18

18 Return the inactive SMA2 unit to service by typing

>RTS INACTIVE

and pressing the Enter key.

19 Use the following information to determine where to proceed.

If RTS	Do
passed	step 20
failed	step 23

20 Remove the sign from the active unit.

NTMX79
in an SMA2 (end)

21 Go to the common returning a card procedure in this document.

Go to step 24.

22 Return to the procedure that directed you to this procedure. At the point where a faulty card list was produced, identify the next faulty card on the list and go to the appropriate card replacement procedure for that card in this manual.

23 Obtain further assistance in replacing this card by contacting operating company maintenance personnel.

24 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTMX81 in an SMA2

Application

Use this procedure to replace an NTMX81 card in an SMA2.

PEC	Suffixes	Name
NTMX81	AA	Dual DS-1 Interface

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- returning a card

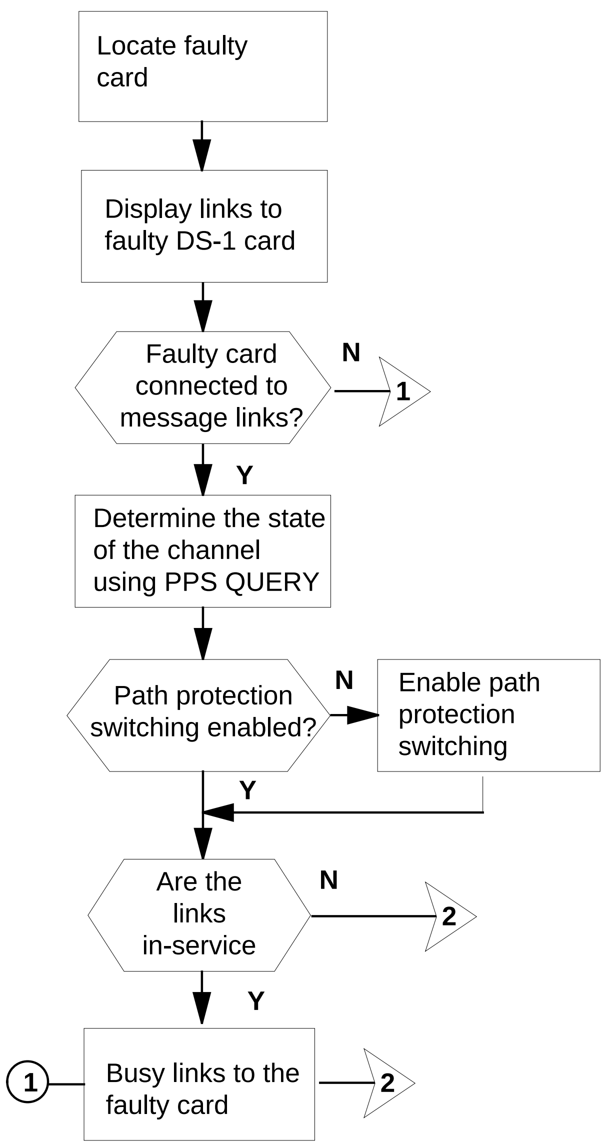
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTMX81
in an SMA2 (continued)

Summary of card replacement procedure for an NTMX81 card in an SMA2

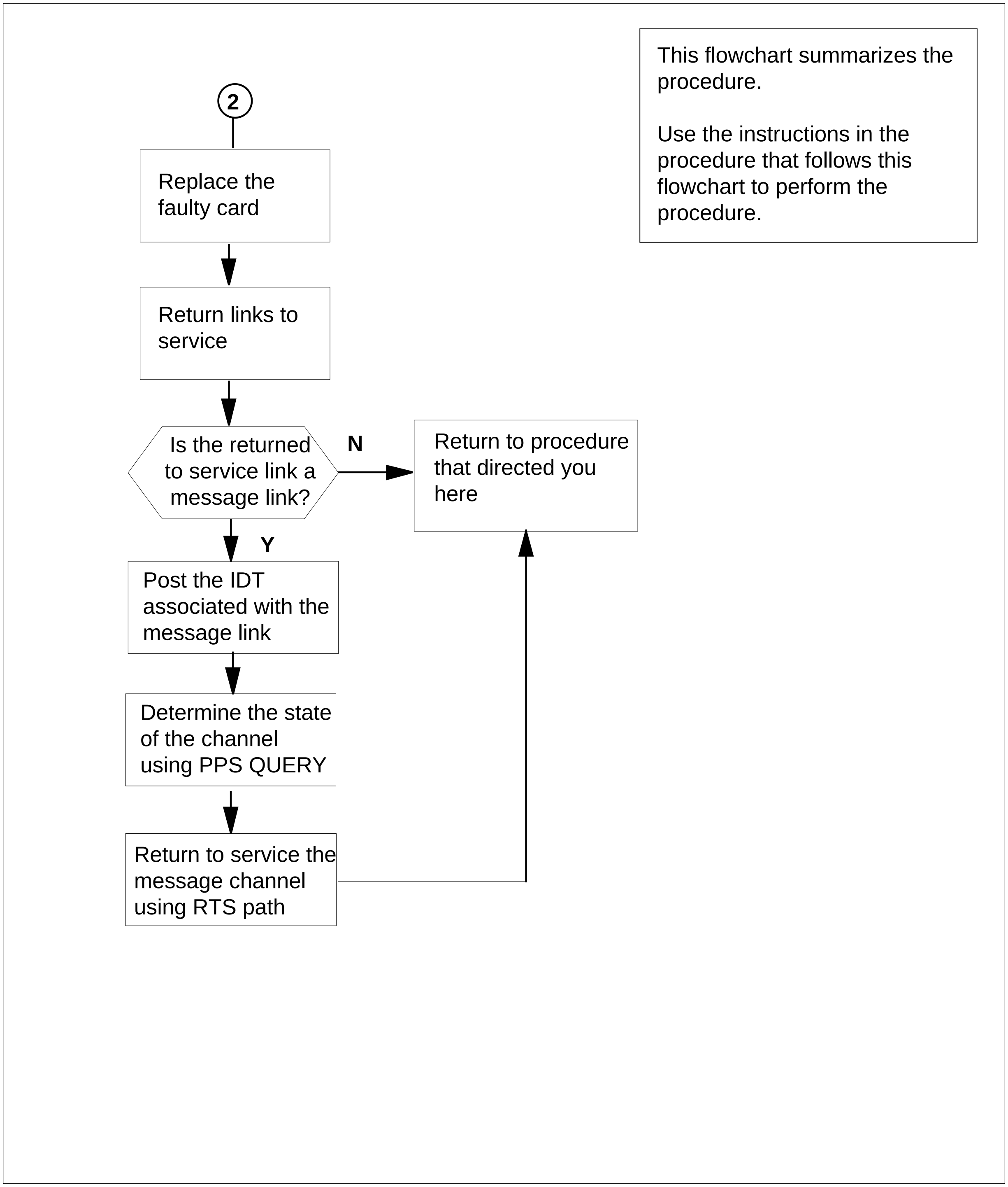


This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

NTMX81 in an SMA2 (continued)

Summary of card replacement procedure for an NTMX81 card in an SMA2 (continued)



NTMX81
in an SMA2 (continued)

Replacing an NTMX81 card in an SMA2

CAUTION
Service disruption: calls may be dropped!
Perform this card replacment activity only during a period of low traffic. All calls being handled by the links connected to the DS-1 interface card being replaced will be dropped.

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card. If card location is known continue to step 3, if card location is unknown refer to “Locating a faulty card in an SMA2".

3

CAUTION
Loss of service
Ensure that you replace the card in the inactive unit and verify the mate unit is active.

Obtain an NTMX81 replacement card. Ensure the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP terminal

4 Ensure the PM level of the MAP display is currently displayed by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 with the faulty card

Example of a MAP display:

NTMX81 in an SMA2 (continued)

```
SMA2     SysB    ManB    OffL    CBsy    ISTb     InSv
    PM      3       0       1       0       2      13
    SMA2    0       0       0       0       1      7

SMA2   0 ISTb  Links_OOS:  CSide  0, PSide   0
Unit0:   Act   InSv
Unit1:   InAct IsTb
```

5 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If the faulty card is in the	Do
active unit	step 6
inactive unit	step 10

6 SWACT the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 7
can continue at this time	step 8

7 Reject the prompt to SWACT the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT. Go to step 48.

8 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 10

NTMX81
in an SMA2 (continued)

If the message is	Do
`SWACT failed` `Reason: XPM SWACTback`	step 9
`SWACT refused by SWACT Controller`	step 9

9 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 48.

At the equipment frame

10 Hang a sign on the active unit bearing the words: *Active unit—Do not touch*. This sign should not be attached by magnets or tape.

At the MAP terminal

11 Display the P-side links associated with the DS-1 card by typing

>TRNSL P

and pressing the Enter key.

Example of a MAP response

```
Link 1 IDT 1  0;Cap: MS;Status:OK ;MsgCond;OPN
Link 2 IDT 1  1;Cap  MS;Status:OK ;MsgCond;CLS
Link 3 IDT 1  2;Cap   S;Status:OK
Link 4 IDT 1  3;Cap   S;Status:SysB
```

The first line indicates that DS-1 link 1 is connected to IDT1 at C-side link 0.

Record the link numbers, IDT number, and capability (CAP) of the links connected to the NTMX81 card to be replaced.

> ***Note:*** Each NTMX81 card has two links associated with it. Therefore, each link must be manually busied. Possible link number pairs are as follows: 0,1; 2,3; 4,5; 6,7; and so forth.

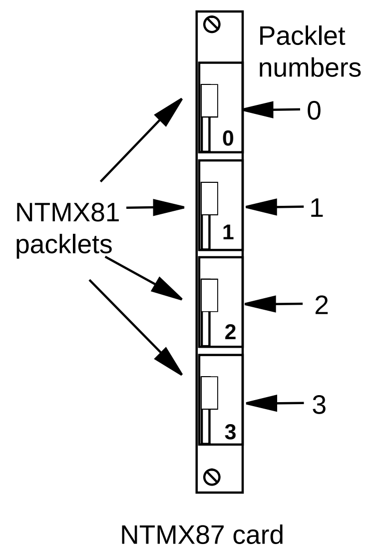
12 After identifying the faulty link, use the following figure to determine which NTMX81 is to be removed in the main or extension shelf. The extension shelf is available only in the CMVI and MVIE frame or cabinet. In the MVDD frame the NTMX81 is found in the main shelf. Match the link number with the slot number and the packlet number to the left of the table. Each NTMX81 packlet is connected to two DS-1 links.

NTMX81
in an SMA2 (continued)

Main shelf, P-side

	Slot 12	Slot 14	Slot 16
0	0 1	16 17	8 9
1	2 3	18 19	10 11
2	4 5	20 21	12 13
3	6 7	22 23	14 15

NTMX81 packlet slot number in the NTMX87 card located in the specified card slots.



Extension shelf (Note 2)

Left side P-side

	Slot 4	Slot 6	Slot 8
0	24 25	32 33	
1	26 27	34 35	
2	28 29	36 37	
3	30 31	38 39	

Right side P-side

	Slot 19	Slot 21	Slot 23
0		32 33	24 25
1		34 35	26 27
2		36 37	28 29
3		38 39	30 31

NTMX81 packlet slot number in the NTMX87 card located in the specified card slots.

Note 1: Slots 8 and 19 are recommended for EDCH circuit cards only.

Note 2: The extension shelf is available in the CMVI and MVIE frame only. The MVDD frame does not contain an extension shelf.

13 If the NTMX81 to be replaced is connected to IDT message links, then the appropriate message channels (TMC or CSC and EOC) must be busied.

If the link has a CAP of	Do
MS, as identified in step 11	step 14
S, as identified in step 11	step 22

NTMX81
in an SMA2 (continued)

14 Post the IDT associated with the DS-1 link to be taken out of service, as recorded in step 11, by typing

>POST IDT idt_no

and pressing the Enter key.

where

idt_no
is the number of the IDT being posted

Example of a MAP response:

```
IDT      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0    1     0     2    13
    IDT   0     0    0     0     1     7

IDT 2 ISTb  Links_OOS:1
```

15 Display information about the state of the channels between the IDT and the RDT by typing

>PPS QUERY

and pressing the Enter key

Example of a MAP response:

```
TMC1: SMA2 7  7 24; OOS;Standby;Enable
EOC1: SMA2 7  7 12; OOS;Standby ;Enable
TMC2: SMA2 7  8 24;InSv;Active;Enable
EOC2: SMA2 7  8 12;InSv;Active;Enable
```

Determine if path protection is enabled for all channels.

If one or both TMC, CSC, or EOC channels are	Do
inhibited	step 16
enabled	step 18

16 Enable path protection on an inhibited TMC, CSC, or EOC message channel by typing

>PPS ENA path

and pressing the Enter key.

where

path
is the inhibited TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

NTMX81 in an SMA2 (continued)

17 Determine if path protection switching must be enabled on additional TMC, CSC, or EOC message channels.

If	Do
additional channels must be enabled	step 16
all channels are enabled	step 18

18 Determine if the TMC, CSC, or EOC message channels for the link to be taken out of service are in-service.

If TMC, CSC, or EOC channels are	Do
in-service	step 19
out-of-service (OOS)	step 21

19 Busy the TMC, CSC, or EOC message channel associated with the link to be taken out of service by typing

`>BSY path`

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

20 Determine if there are additional TMC,CSC, or EOC message channels to be taken out of service.

If	Do
more channels must be taken out of service	step 19
no more channels are to be taken out of service	step 21

21 Determine if an additional link, as recorded in step 11, must be taken out of service associated with the NTMX81 to be replaced.

If	Do
an additional link must be taken out of service	step 13
no more links are to be taken out of service	step 22

NTMX81
in an SMA2 (continued)

22 Post the SMA2 identified in step 4 by typing

>POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response:

```
SMA2     SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0     1     0     2    13
    SMA2  0     0     0     0     1     7

SMA2 7 ISTb  Links_OOS:  CSide 0, PSide 1
Unit0:  Act   InSv
Unit1:  Inact InSv
```

23

> **CAUTION**
> **Service disruption: calls may be dropped!**
> If you are prompted to confirm a BSY LINK command, perform this activity only during a period of low traffic. All calls being handled by the busied link will be dropped.

Busy one of the links connected to the faulty NTMX81, as recorded in step 11, by typing

>BSY LINK link_no

and pressing the Enter key.

where

link_no
is the number of the link connected to the faulty NTMX81 card

A confirmation prompt for the BSY command is displayed at the MAP terminal

Example of a MAP response:

```
bsy link 0
Any active call may be lost
Please confirm (“Yes”, “Y”, “No”, or “N”):
```

If	Do
cannot continue at this time	step 24
can continue at this time	step 31

NTMX81
in an SMA2 (continued)

24 Reject the prompt to BSY the link by typing

>NO

and pressing the Enter key.

The system discontinues the BSY command.

25 Determine if the link is a message link

If the link has a CAP of	Do
MS	step 26
S	step 48

26 Post the IDT associated with the link by typing

>POST IDT idt_no

and pressing the Enter key.

where

idt_no
is the number of the IDT being posted

Example of a MAP response:

```
IDT      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0    1     0     2    13
    IDT   0     0    0     0     1     7

IDT 2 ISTb  Links_OOS:1
```

27 Display information about the state of the channels between the IDT and the RDT by typing

>PPS QUERY

and pressing the Enter key

Example of a MAP response:

```
TMC1: SMA2 7  7 24; OOS;Standby;Enable
EOC1: SMA2 7  7 12; 00S;Active ;Enable
TMC2: SMA2 7  8 24;InSv;Standby;Enable
EOC2: SMA2 7  8 12;InSv;Standby;Enable
```

28 Determine if there are any TMC, CSC, or EOC message channels for the link to be returned to service.

If TMC, CSC, or EOC channels are	Do
all in-service	step 48
out-of-service (OOS)	step 29

NTMX81
in an SMA2 (continued)

29 Return to service the message channels which were taken out of service in step 19 by typing

>RTS path

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

30 Determine if there are additional TMC, CSC, or EOC message channels to be returned to service.

If there are	Do
more channels to be returned to service	step 29
no more channels to be returned to service	step 48

31 Confirm the system prompt by typing

>YES

and pressing the Enter key.

Go to step 32.

32 Determine if there are additional links on the NTMX81 to be taken out of service.

Note: Remember that there two links connected to each NTMX81 card.

If	Do
there is another link to be taken out of service with a CAP of S	step 23
there is another link to be taken out of service with a CAP of MS and the associated IDT message channel has not been taken out of service	step 14
all links have been taken out of service	step 33
there is another link to be taken out of service with a CAP of MS and the associated IDT message channel has been taken out of service	step 23

NTMX81
in an SMA2 (continued)

33

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Remove the NTMX81 card as described in the following steps:

a Locate the packlet to be removed on the appropriate NTMX87 card slot.

b Open the locking lever on the packlet to be replaced and gently pull the card toward you until it clears the shelf.

c Ensure the replacement card has the same PEC, including suffix, as the card you just removed.

d Go to step 34.

34 Ensure the switches on the replacement card are set to the same settings as those on the card you have just removed.

Refer to the following table for information on correct DS-1 switch settings.

Distance to cross connect				
Feet	**Meters**	**S3/6**	**S2/5**	**S1/4**
0-133	0-41	On	Off	Off
133-266	41-81	Off	On	On
266-399	81-122	Off	On	Off
399-533	122-163	Off	Off	On
533-655	163-200	Off	Off	Off

Note: S indicates switch number(s). On S1 dip switch (6 position): S1-S3 belong to even port, and S4-S6 belong to odd port.

35 Open the locking lever on the replacement packlet.

a Align the packlet with the slots in the shelf.

b Gently slide the packlet into the card slot in the NTMX87 card.

36 Seat and lock the packlet.

a Using your fingers or thumbs, push on the upper and lower edges of the faceplate of the packlet to ensure the packlet is fully seated in the slot.

b Close the locking lever.

c Go to step 38.

At the MAP terminal

37 Post the SMA2 identified in step 4 by typing

>POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response:

```
SMA2     SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0    1     0     2    13
    SMA2  0     0    0     0     1     7

SMA2 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact ISTb
```

38 Return to service the P-side links by typing

>RTS LINK link_no

and pressing the Enter key.

where

link_no
is the number of the link connected to the NTMX81 card

Note: To RTS the other links associated with the SMA2, execute this step for each link until all links are returned to service.

If RTS	Do
passed	step 39
failed	step 48

39 Determine if the link that was returned to service is a messaging link.

If the link has a CAP of	Do
MS, as identified in step 11	step 41
S, as identified in step 11	step 40

NTMX81
in an SMA2 (continued)

40 Determine if additional links are to be returned to service

If	Do
an additional link must be returned to service	step 38
no more links are to be returned to service	step 46

41 Post the IDT associated with the DS-1 link that has been returned to service by typing

>POST IDT idt_no

and pressing the Enter key.

where

idt_no
is the number of the IDT being posted

Example of a MAP response:

```
IDT      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0    1     0     2    13
    IDT   0     0    0     0     1     7

IDT 1 SysB  Links_OOS:0
```

42 Display information about the state of the channels between the IDT and the RDT by typing

>PPS QUERY

and pressing the Enter key

Example of a MAP response:

```
TMC1: SMA2 7  7 24; OOS;Standby;Enable
EOC1: SMA2 7  7 12;InSv;Active;Enable
TMC2: SMA2 7  8 24; OOS;Standby;Enable
EOC2: SMA2 7  8 12; OOS;Standby;Enable
```

43 Return to service the message channels which were taken out of service in step 19 by typing

>RTS path

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

NTMX81
in an SMA2 (end)

44 Determine if there are additional TMC, CSC, or EOC message channels to be returned to service.

If there are	Do
more channels to be returned to service	step 43
no more channels to be returned to service	step 45

45 Determine if there are additional links on the NTMX81 to be returned service.

If	Do
there is another link to be returned to service	step 37
all links have been returned to service	step 46

At the equipment frame

46 Remove the sign from the active SMA2 unit.

47 Go to the common returning a card procedure in this document.

Go to step 49.

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

49 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTMX87
in an SMA2

Common procedures

The following procedures are referenced in this procedure:

- “Locating a faulty card in an SMA2"
- returning a card

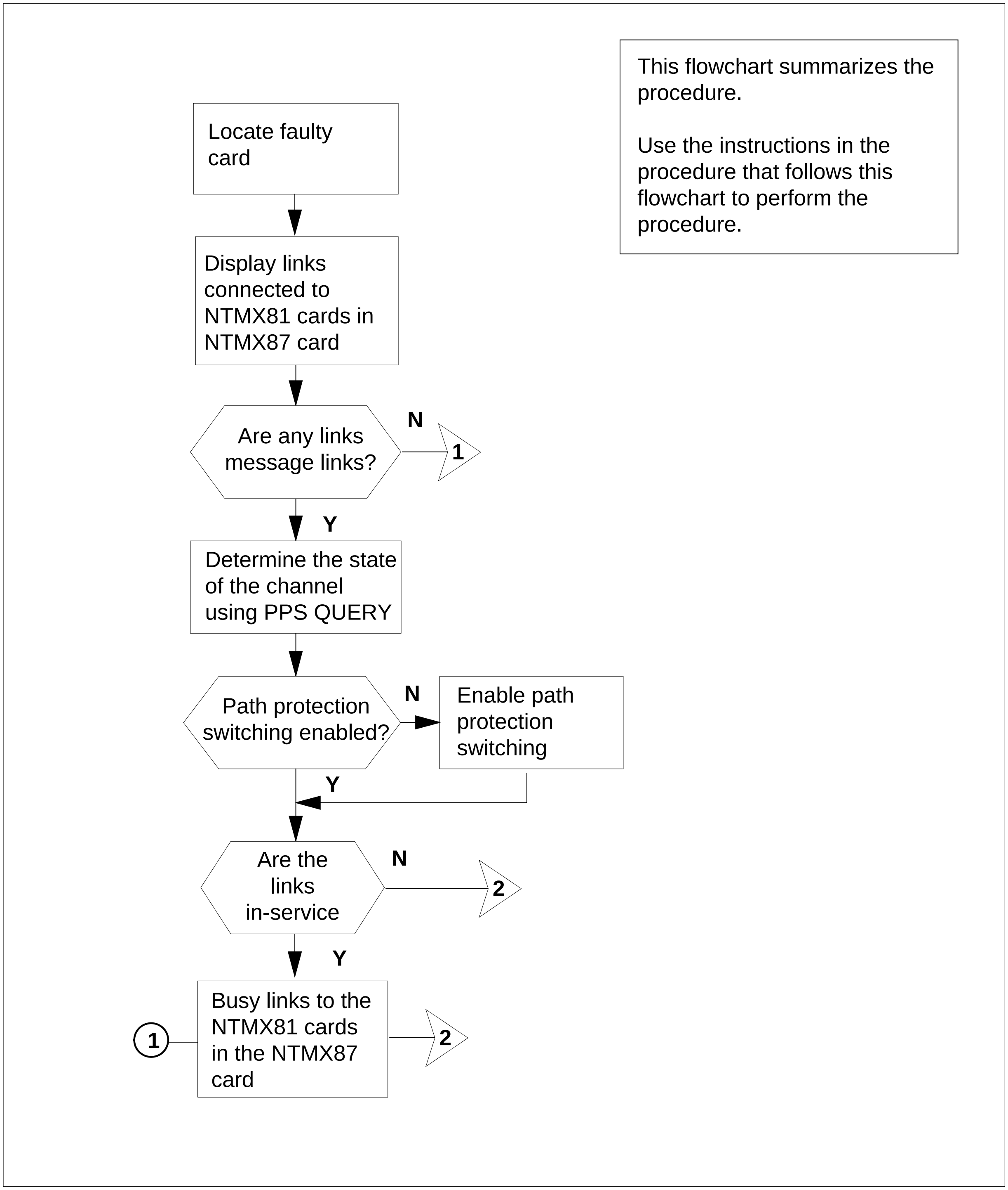
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

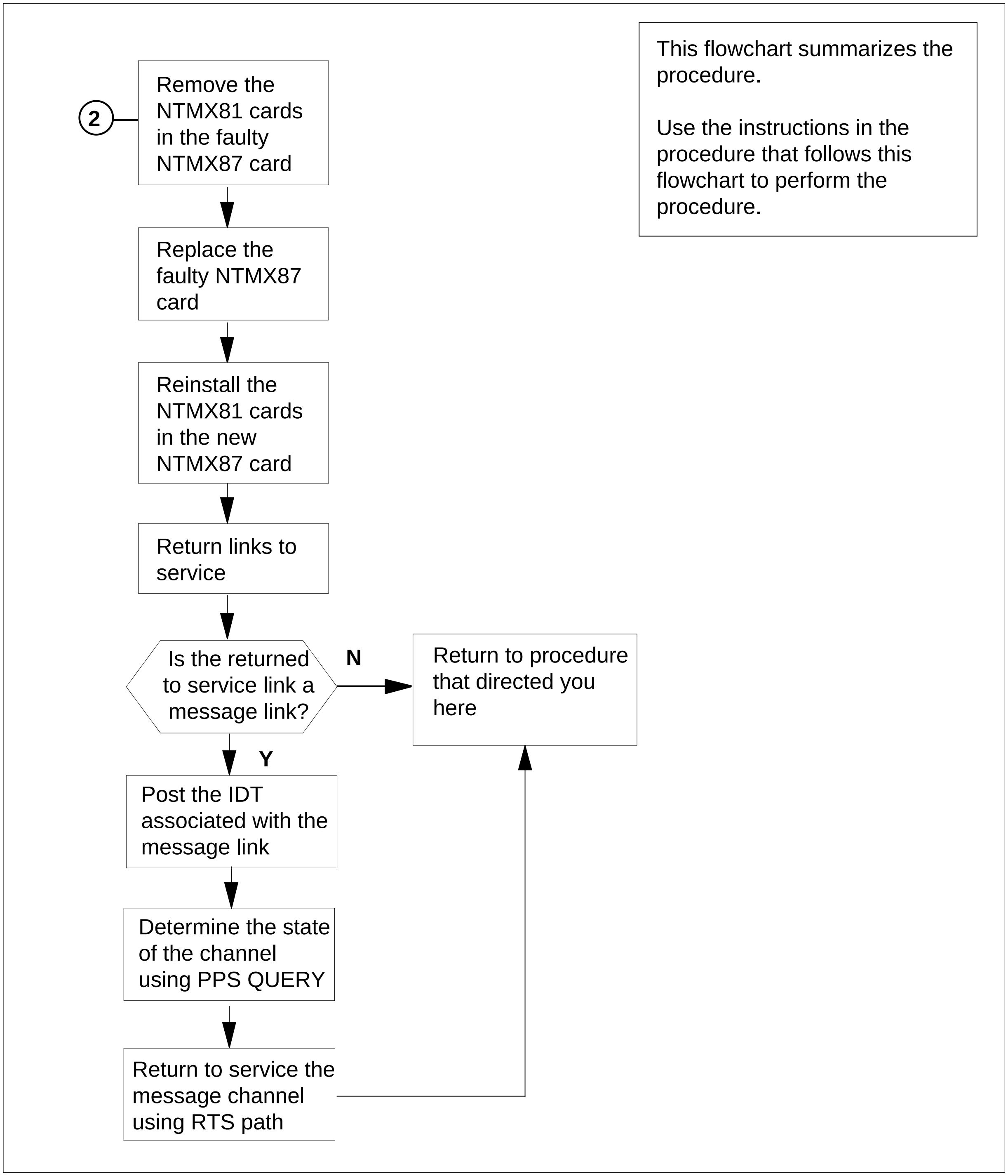
NTMX87
in an SMA2 (continued)

Summary of card replacement procedure for an NTMX87 card in an SMA2



NTMX87
in an SMA2 (continued)

Summary of card replacement procedure for an NTMX87 card in an SMA2 (continued)



NTMX87
in an SMA2 (continued)

Replacing an NTMX87 card in an SMA2

> **CAUTION**
> **Service disruption: calls may be dropped!**
> Perform this card replacment activity only during a period of low traffic. All calls being handled by the links connected to the DS-1 interface cards housed in the NTMX87 card being replaced will be dropped.

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Ensure you know the physical location of the faulty card. If card location is known continue to step 3, if card location is unknown refer to “Locating a faulty card in an SMA2".

3

> **CAUTION**
> **Loss of service**
> Ensure that you replace the card in the inactive unit and verify the mate unit is active.

Obtain an NTMX87 replacement card. Ensure the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the MAP terminal

4 Ensure the PM level of the MAP display is currently displayed by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 with the faulty card

Example of a MAP display:

NTMX87 in an SMA2 (continued)

```
SMA2      SysB     ManB     OffL     CBsy     ISTb      InSv
    PM       3        0        1        0        2       13
    SMA2    0        0        0        0        1       7

SMA2   0 ISTb  Links_OOS:  CSide  0, PSide   0
Unit0:   Act   InSv
Unit1:   InAct IsTb
```

5 Observe the MAP display and determine if the faulty card is in the active or the inactive unit.

If the faulty card is in the	Do
active unit	step 6
inactive unit	step 10

6 SWACT the units by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal.

If SWACT	Do
cannot continue at this time	step 7
can continue at this time	step 8

7 Reject the prompt to SWACT the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT. Go to step 47.

8 Confirm the system prompt by typing

>YES

and pressing the Enter key.

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

> ***Note:*** A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 10

NTMX87
in an SMA2 (continued)

If the message is	Do
`SWACT failed Reason: XPM SWACTback`	step 9
`SWACT refused by SWACT Controller`	step 9

9 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 47.

At the equipment frame

10 Hang a sign on the active unit bearing the words: *Active unit—Do not touch*. This sign should not be attached by magnets or tape.

At the MAP terminal

11 Display and record the P-side link status of the posted SMA2 associated with the faulty NTMX87 quad carrier card by typing

>TRNSL P

and pressing the Enter key.

Example of a MAP response

```
LINK1:  IDT 1   3;CAP: MS;  STATUS:OK; MSGCOND OPN
LINK2:  IDT 1   4;CAP: MS;  STATUS:OK; MSGCOND OPN
LINK3:  IDT 1   Carrier of CLASS – Trunk;Status:OK
LINK4:  IDT 1   Carrier of CLASS – Trunk;Status:SysB
```

The first line indicates that DS-1 link 1 is connected to IDT1 at C-side link 0.

Record the link numbers, IDT number, and capability (CAP) of the links connected to the NTMX81 cards housed in the NTMX87 card to be replaced.

> ***Note:*** Each NTMX81 card has two links associated with it. Therefore, each link must be manually busied. Possible link number pairs are as follows: 0,1; 2,3; 4,5; 6,7; and so forth.

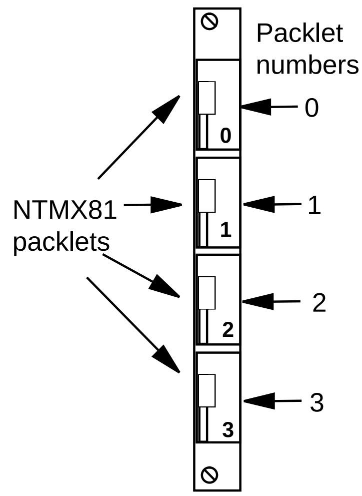
12 After identifying the links connected to NTMX81s in the faulty NTMX87, use the following figure to determine which NTMX81s are to be removed in the main or extension shelf. Match the link number with the slot number and the packlet number to the left of the table. Each NTMX81 packlet is connected to two DS-1 links.

NTMX87
in an SMA2 (continued)

Main shelf, P-side

	Slot 12	Slot 14	Slot 16
0	0 1	16 17	8 9
1	2 3	18 19	10 11
2	4 5	20 21	12 13
3	6 7	22 23	14 15

NTMX81 packlet slot number in the NTMX87 card located in the specified card slots.



NTMX87 card

Extension shelf (Note 2)

Left side P-side

	Slot 4	Slot 6	Slot 8
0	24 25	32 33	
1	26 27	34 35	
2	28 29	36 37	
3	30 31	38 39	

Right side P-side

	Slot 19	Slot 21	Slot 23
0		32 33	24 25
1		34 35	26 27
2		36 37	28 29
3		38 39	30 31

NTMX81 packlet slot number in the NTMX87 card located in the specified card slots.

Note 1: Slots 8 and 19 are recommended for EDCH circuit cards only.

Note 2: The extension shelf is available in the CMVI and MVIE frame only. The MVDD frame does not contain an extension shelf.

13 If any NTMX81s in an NTMX87 to be replaced are connected to IDT message links, then the appropriate message channels (TMC or CSC and EOC) must be busied.

If the link has a CAP of	Do
MS, as identified in step 11	step 14
S, as identified in step 11	step 22

NTMX87
in an SMA2 (continued)

14 Post the IDT associated with the DS-1 link to be taken out of service, as recorded in step 11, by typing

>POST IDT idt_no

and pressing the Enter key.

where

idt_no
is the number of the IDT being posted

Example of a MAP response:

```
IDT      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0     1     0     2    13
    IDT   0     0     0     0     1     7

IDT 2 ISTb  Links_OOS:1
```

15 Display information about the state of the channels between the IDT and the RDT by typing

>PPS QUERY

and pressing the Enter key

Example of a MAP response:

```
TMC1: SMA2 7  7 24; OOS;Standby;Enable
EOC1: SMA2 7  7 12; OOS;Standby ;Enable
TMC2: SMA2 7  8 24;InSv;Active;Enable
EOC2: SMA2 7  8 12;InSv;Active;Enable
```

Determine if path protection is enabled for all channels.

If one or both TMC, CSC, or EOC channels are	Do
inhibited	step 16
enabled	step 18

16 Enable path protection on an inhibited TMC, CSC, or EOC message channel by typing

>PPS ENA path

and pressing the Enter key.

where

path
is the inhibited TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

NTMX87
in an SMA2 (continued)

17 Determine if path protection switching must be enabled on additional TMC, CSC, or EOC message channels.

If	Do
additional channels must be enabled	step 16
all channels are enabled	step 18

18 Determine if the TMC, CSC, or EOC message channels for the link to be taken out of service are in-service.

If TMC, CSC, or EOC channels are	Do
in-service	step 19
out-of-service (OOS)	step 21

19 Busy the TMC, CSC, or EOC message channel associated with the link to be taken out of service by typing

>BSY path

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

20 Determine if there are additional TMC,CSC, or EOC message channels to be taken out of service.

If	Do
more channels must be taken out of service	step 19
no more channels are to be taken out of service	step 21

21 Determine if an additional link, as recorded in step 11, must be taken out of service associated with the NTMX81 to be replaced.

If	Do
an additional link must be taken out of service	step 13
no more links are to be taken out of service	step 22

NTMX87
in an SMA2 (continued)

22 Post the SMA2 identified in step 4 by typing

>POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response:

```
SMA2     SysB  ManB  Offl  CBsy  ISTb  InSv
    PM     3     0     1     0     2    13
    SMA2   0     0     0     0     1     7

SMA2 7 ISTb  Links_OOS:  CSide 0, PSide 1
Unit0:  Act   InSv
Unit1:  Inact InSv
```

23

CAUTION
Service disruption: calls may be dropped!
If you are prompted to confirm a BSY LINK command, perform this activity only during a period of low traffic. All calls being handled by the busied link will be dropped.

Busy one of the links connected to the faulty NTMX81, as recorded in step 11, by typing

>BSY LINK link_no

and pressing the Enter key.

where

link_no
is the number of the link connected to the faulty NTMX81 card

A confirmation prompt for the BSY command is displayed at the MAP terminal

Example of a MAP response:

```
bsy link 0
Any active call may be lost
Please confirm (“Yes”, “Y”, “No”, or “N”):
```

If	Do
cannot continue at this time	step 24
can continue at this time	step 31

NTMX87
in an SMA2 (continued)

24 Reject the prompt to BSY the link by typing

>NO

and pressing the Enter key.

The system discontinues the BSY command.

25 Determine if the link is a message link

If the link has a CAP of	Do
MS	step 26
S	step 47

26 Post the IDT associated with the link by typing

>POST IDT idt_no

and pressing the Enter key.

where

idt_no
is the number of the IDT being posted

Example of a MAP response:

```
IDT      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0     1     0     2    13
    IDT   0     0     0     0     1     7

IDT 2 ISTb  Links_OOS:1
```

27 Display information about the state of the channels between the IDT and the RDT by typing

>PPS QUERY

and pressing the Enter key

Example of a MAP response:

```
TMC1: SMA2 7  7 24; OOS;Standby;Enable
EOC1: SMA2 7  7 12; 00S;Active ;Enable
TMC2: SMA2 7  8 24;InSv;Standby;Enable
EOC2: SMA2 7  8 12;InSv;Standby;Enable
```

28 Determine if there are any TMC, CSC, or EOC message channels for the link to be returned to service.

If TMC, CSC, or EOC channels are	Do
all in-service	step 47

NTMX87
in an SMA2 (continued)

If TMC, CSC, or EOC channels are	Do
out-of-service (OOS)	step 29

29 Return to service the message channels which were taken out of service in step 19 by typing

`>RTS path`

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

30 Determine if there are additional TMC, CSC, or EOC message channels to be returned to service.

If there are	Do
more channels to be returned to service	step 29
no more channels to be returned to service	step 47

31 Confirm the system prompt by typing

>YES

and pressing the Enter key.

Go to step 32.

32 Determine if there are additional links on the NTMX81 to be taken out of service.

Note: Remember, all eight links on the NTMX87 need to be made manually busy.

If	Do
there is another link to be taken out of service with a CAP of S	step 23
there is another link to be taken out of service with a CAP of MS and the associated IDT message channel has not been taken out of service	step 14
all links have been taken out of service	step 33

NTMX87 in an SMA2 (continued)

If	Do
there is another link to be taken out of service with a CAP of MS and the associated IDT message channel has been taken out of service	step 23

At the frame or cabinet

33

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Remove the NTMX81 packlets from the NTMX87 quad frame carrier card as described in the following steps:

a Locate the packlets to be removed on the appropriate NTMX87 card slot.

b Open the locking lever on the packlet to be replaced and gently pull the card toward you until it clears the shelf.

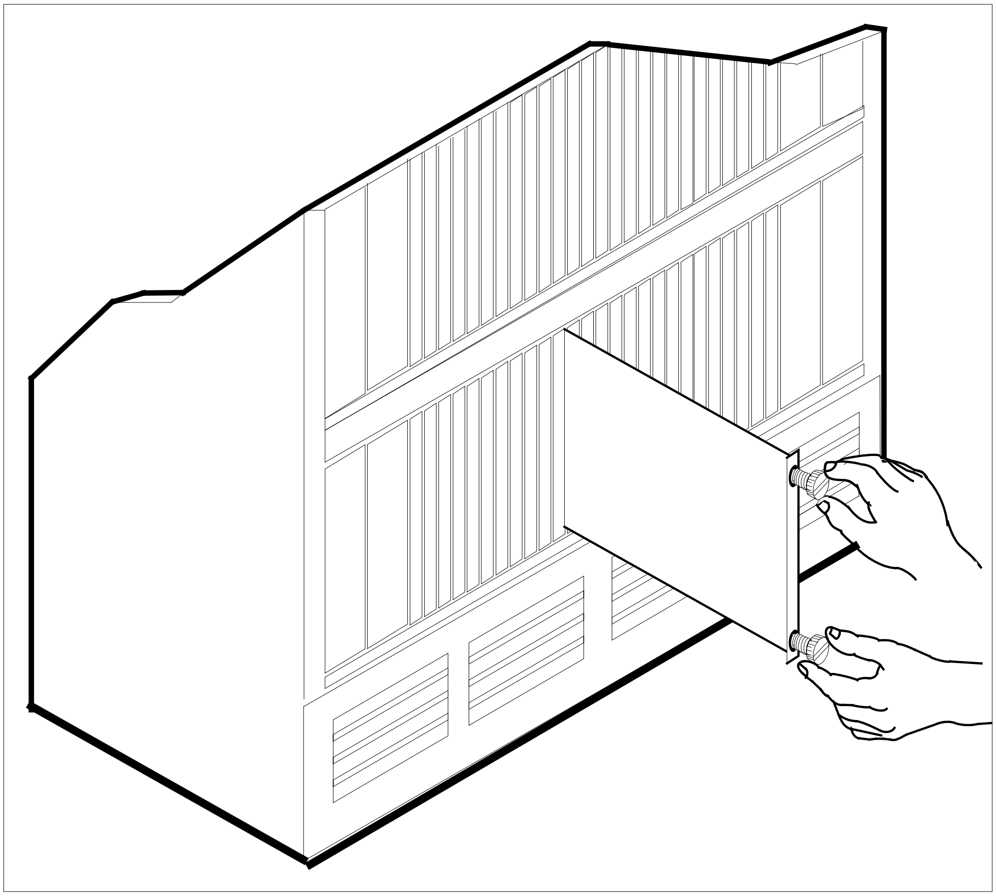
c Ensure the replacement card has the same PEC, including suffix, as the card you just removed.

d Repeat these steps for all four NTMX81 packlets.

e Go to step 34.

34 Using the T9908 wrist grounding strap and a T1324 screwdriver, remove the NTMX87 quad frame carrier circuit card. Insert the new quad frame carrier card and secure.

NTMX87
in an SMA2 (continued)



35 Replace the NTMX81 packlets removed in step 33 using the following steps:

a Open the locking lever on the NTMX81 packlets to be inserted in the new NTMX87 card.

b Align the packlet with the slots in the new NTMX87 card installed in step 34.

c Gently slide the packlet into the card slot in the new NTMX87 card.

d Using your fingers or thumbs, push on the upper and lower edges of the faceplate of the packlet to ensure the packlet is fully seated in the slot.

e Close the locking lever.

f Repeat these steps for all four NTMX81 packlets.

NTMX87
in an SMA2 (continued)

At the MAP terminal

36 Post the SMA2 identified in step 4 by typing

>POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 being posted

Example of a MAP response:

```
SMA2    SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0    1     0     2    13
    SMA2  0     0    0     0     1     7

SMA2 0 ISTb  Links_OOS:  CSide 0, PSide 0
Unit0:  Act   InSv
Unit1:  Inact ISTb
```

37 Return to service the P-side links by typing

>RTS LINK link_no

and pressing the Enter key.

where

link_no
is the number of the link connected to the NTMX81 card

Note: To RTS the other links associated with the SMA2, execute this step for each link until all links are returned to service.

If RTS	Do
passed	step 38
failed	step 47

38 Determine if the link that was returned to service is a messaging link.

If the link has a CAP of	Do
MS, as identified in step	step 40
S, as identified in step	step 39

39 Determine if additional links are to be returned to service

If	Do
an additional link must be returned to service	step 37

NTMX87
in an SMA2 (continued)

If	Do
no more links are to be returned to service	step 45

40 Post the IDT associated with the DS-1 link that has been returned to service by typing

>POST IDT idt_no

and pressing the Enter key.

where

idt_no
is the number of the IDT being posted

Example of a MAP response:

```
IDT      SysB  ManB  Offl  CBsy  ISTb  InSv
    PM    3     0    1     0     2    13
    IDT   0     0    0     0     1     7

IDT 1 SysB  Links_OOS:0
```

41 Display information about the state of the channels between the IDT and the RDT by typing

>PPS QUERY

and pressing the Enter key

Example of a MAP response:

```
TMC1: SMA2 7  7 24; OOS;Standby;Enable
EOC1: SMA2 7  7 12;InSv;Active ;Enable
TMC2: SMA2 7  8 24; OOS;Standby;Enable
EOC2: SMA2 7  8 12; OOS;Standby;Enable
```

42 Return to service the message channels which were taken out of service in step 19 by typing

>RTS path

where

path
is TMC1, TMC2, CSC1, CSC2, EOC1, or EOC2

43 Determine if there are additional TMC, CSC, or EOC message channels to be returned to service.

If there are	Do
more channels to be returned to service	step 42

NTMX87
in an SMA2 (end)

If there are	Do
no more channels to be returned to service	step 44

44 Determine if there are additional links on the NTMX81 to be returned service.

Note: Remember, all eight links on the NTMX87 need to returned to service.

If	Do
there is another link to be returned to service	step 36
all links have been returned to service	step 45

At the equipment frame

45 Remove the sign from the active SMA2 unit.

46 Go to the common returning a card procedure in this document.

Go to step 48.

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

48 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTRX41
in an SMA2 MSP

Application

Use this procedure to replace an NTRX41 card in a modular supervisory panel (MSP) located in a:

- cabinetized multi-vendor interface (CMVI)
- multi-vendor interface equipment frame (MVIE)
- multi-vendor double density frame (MVDD)

PEC	Suffixes	Name
NTRX41	AA	Alarm Module

Common procedures

The common returning a card procedure is referenced in this procedure.

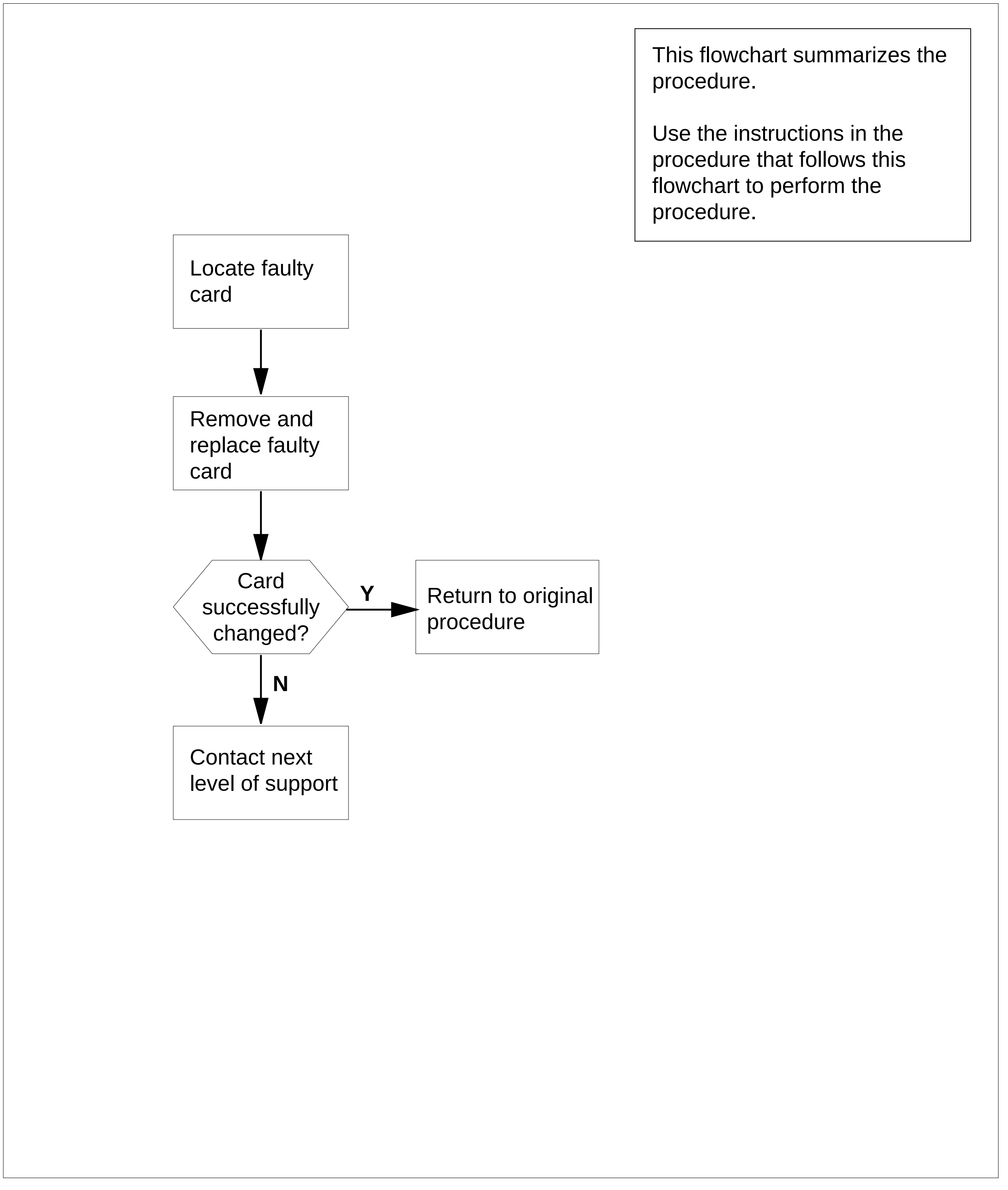
Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

NTRX41
in an SMA2 MSP (continued)

Summary of card replacement procedure for an NTRX41 card in an SMA2 MSP



NTRX41
in an SMA2 MSP (continued)

Replacing an NTRX41 card in an SMA2 MSP

At your current location

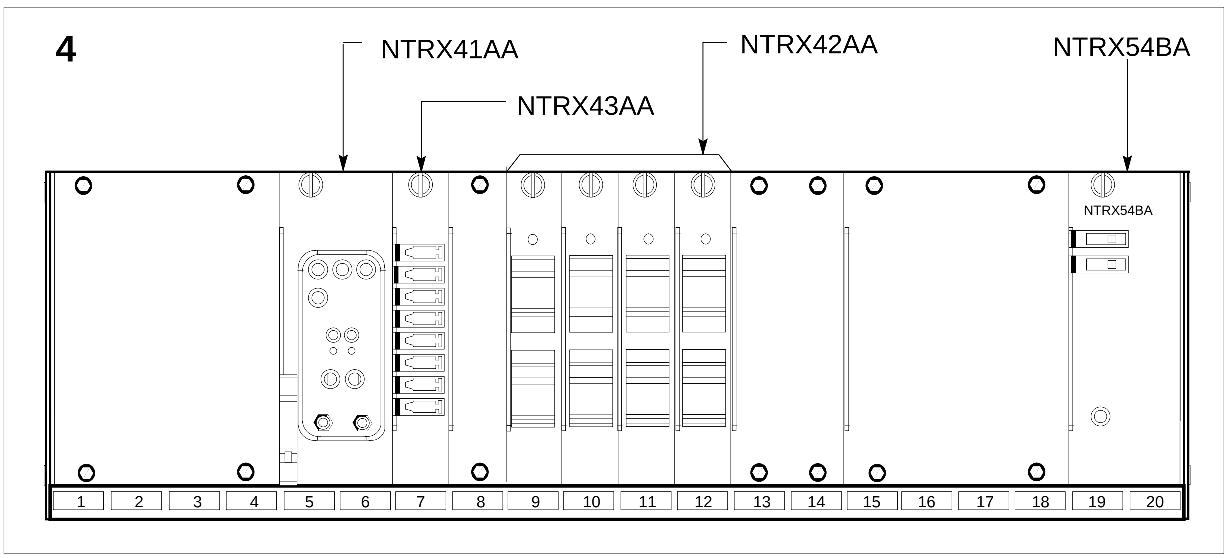
1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Obtain a replacement card. Ensure the replacement card has the same product equipment code (PEC), including suffix, as the card to be removed.

At the front panel of the cabinet or frame

3 Open the front cover of the MSP. Release the two cover latches and swing the cover down to the open position.

MSP



4

DANGER
Risk of injury from high energy levels, static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

NTRX41
in an SMA2 MSP (continued)

DANGER
Risk of injury from high energy levels, equipment damage
Take these precautions when removing or inserting a card:

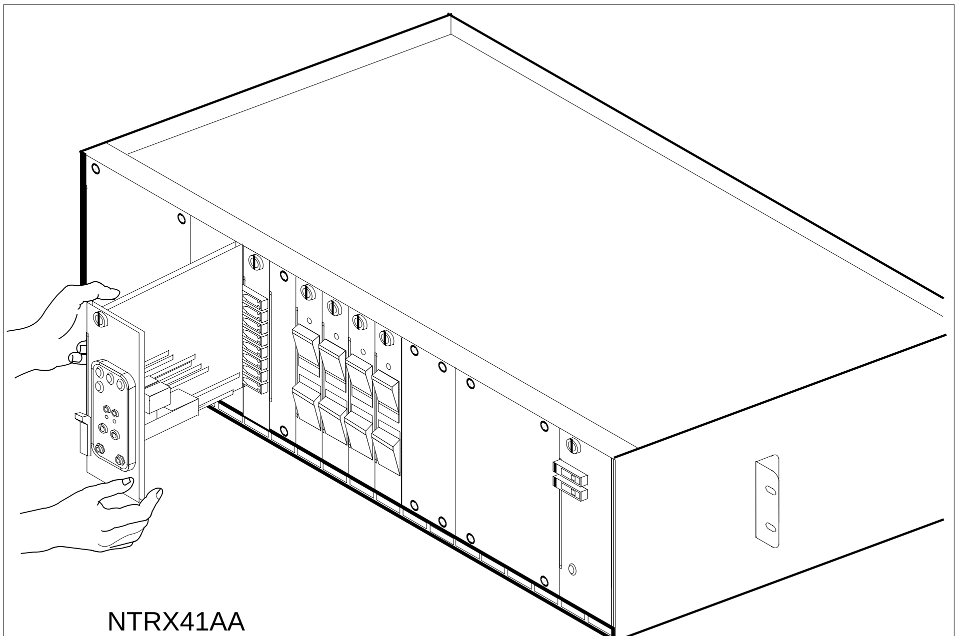
1. Do not apply direct pressure to the components.

2. Do not force the cards into the slots.

Put on a wrist strap.

5 Remove the NTRX41 circuit card as shown in the following figure.

a Open the front doors of the cabinet and locate the circuit card, it will be in slots 05 and 06.



NTRX41AA

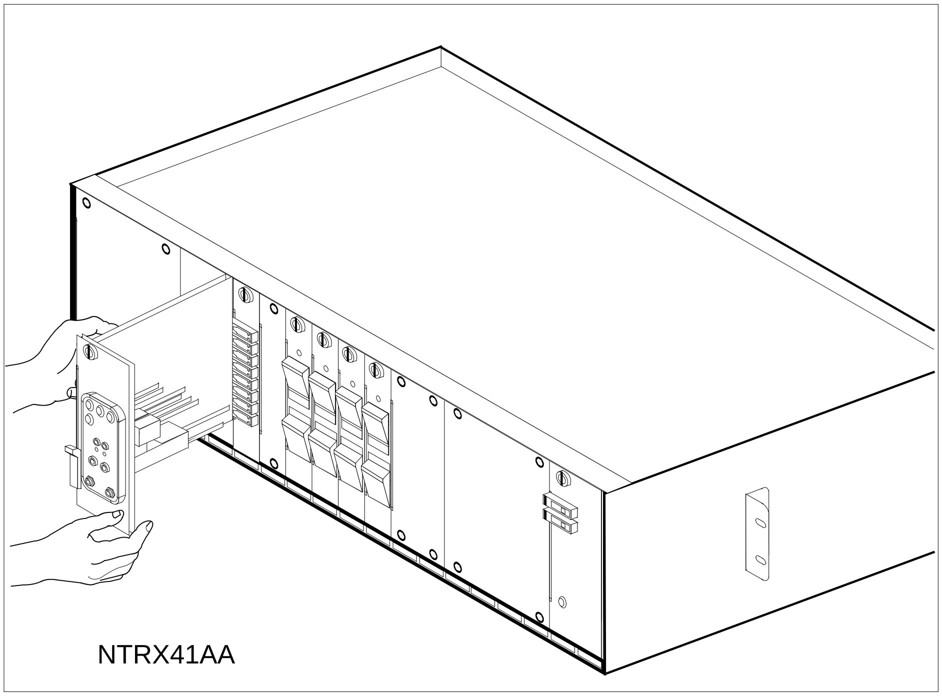
b At the front of the MSP, disengage the knurled thumbscrew at the top of the circuit card.

c Pull out the lever on the lower left side of the alarm module.

d Gently pull the circuit card toward you until it clears the shelf.

6 Ensure the replacement circuit card has the same PEC, including suffix, as the circuit card just removed.

NTRX41
in an SMA2 MSP (end)



- **a** Align the circuit card with the slots in the shelf and gently slide the circuit card into the shelf.
- **b** Gently but firmly seat the circuit card.
- **c** Push in lever on the upper left side of alarm module.
- **d** Tighten the knurled thumbscrew at the top of the circuit card.

7 Proceed as shown in the following table.

If alarm lights	Do
remain off	step 8
light up	step 9

8 Go to the common returning a card procedure in this document.

Go to step 10.

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

10 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTRX42
in an SMA2 MSP

Application

Use this procedure to replace an NTRX42 card in a modular supervisory panel (MSP) located in a:

- cabinetized multi-vendor interface (CMVI)
- multi-vendor interface equipment frame (MVIE)
- multi-vendor double density frame (MVDD)

PEC	Suffixes	Name
NTRX42	AA	Circuit Breaker Module

Common procedures

The common returning a card procedure is referenced in this procedure.

Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

A connector removal tool is available to facilitate removal of the AMP Faston 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.). The shorter tool is used when access to the rear of the MSP is very limited. An example of limited access is, MSP modules located directly behind the cabinet bulkhead.

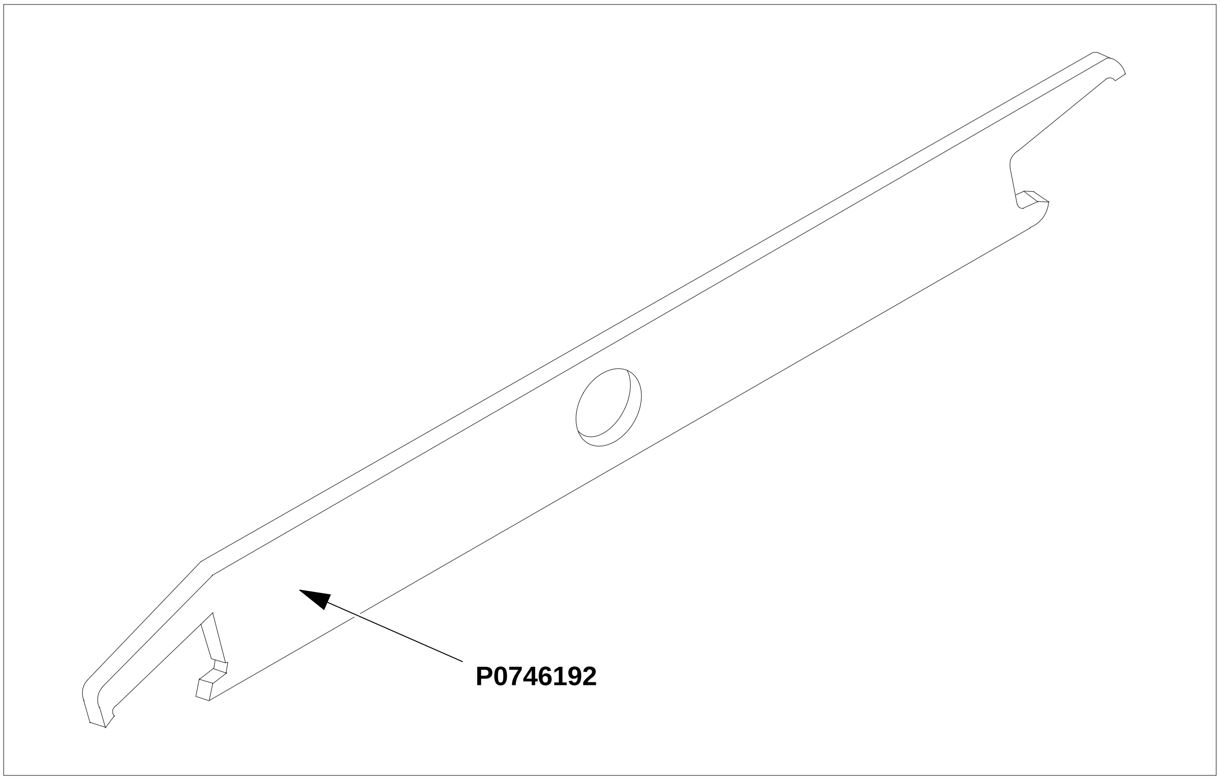
This tool is approximately 2 mm (.090 in.) thick and 17 mm (.65 in.) wide, with a jaw-like cut-out at each end. The cut-out profile conforms to the shape of the Faston receptacle. The shorter tip of each profile is used to position the receptacle in the tool.

The first meeting point of the tool serves as the pivot point. By rotating the tool around this pivot point, the longer tip of the profile which has a hook on its end, is engaged with the action-arm of the power connector. As the action-arm of the connector is depressed, the receptacle is disengaged from the connector tab. The receptacle is removed by pulling the tool with the receptacle trapped in its jaw, away from the connector. The tool is disengaged from the receptacle by rotating the tool's hook off the action-arm of the receptacle.

NTRX42
in an SMA2 MSP (continued)

Although the shape of the cut-out is the same on each end of the tool, the orientation of the profile is off by 15 degrees. This difference allows for the use of the tool at different angles, which may be required due to limited access to the connectors.

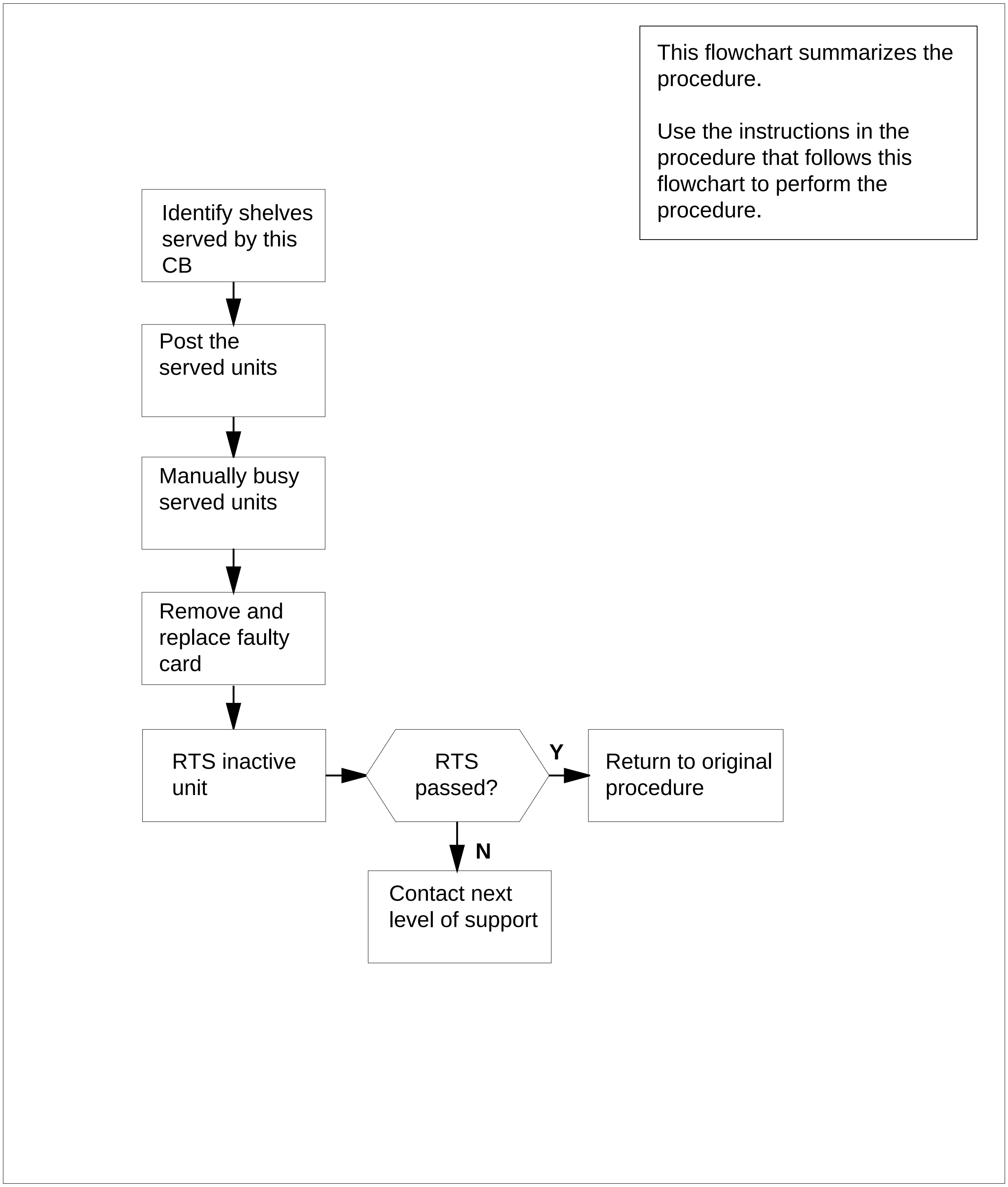
Connector removal tool



The following flowchart is a summary of this procedure. Use the instructions in the step-action table that follows the flowchart to perform the procedure.

NTRX42
in an SMA2 MSP (continued)

Summary of replacing an NTRX42 card in an SMA2 MSP



NTRX42
in an SMA2 MSP (continued)

Replacing an NTRX42 card in an SMA2 MSP

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

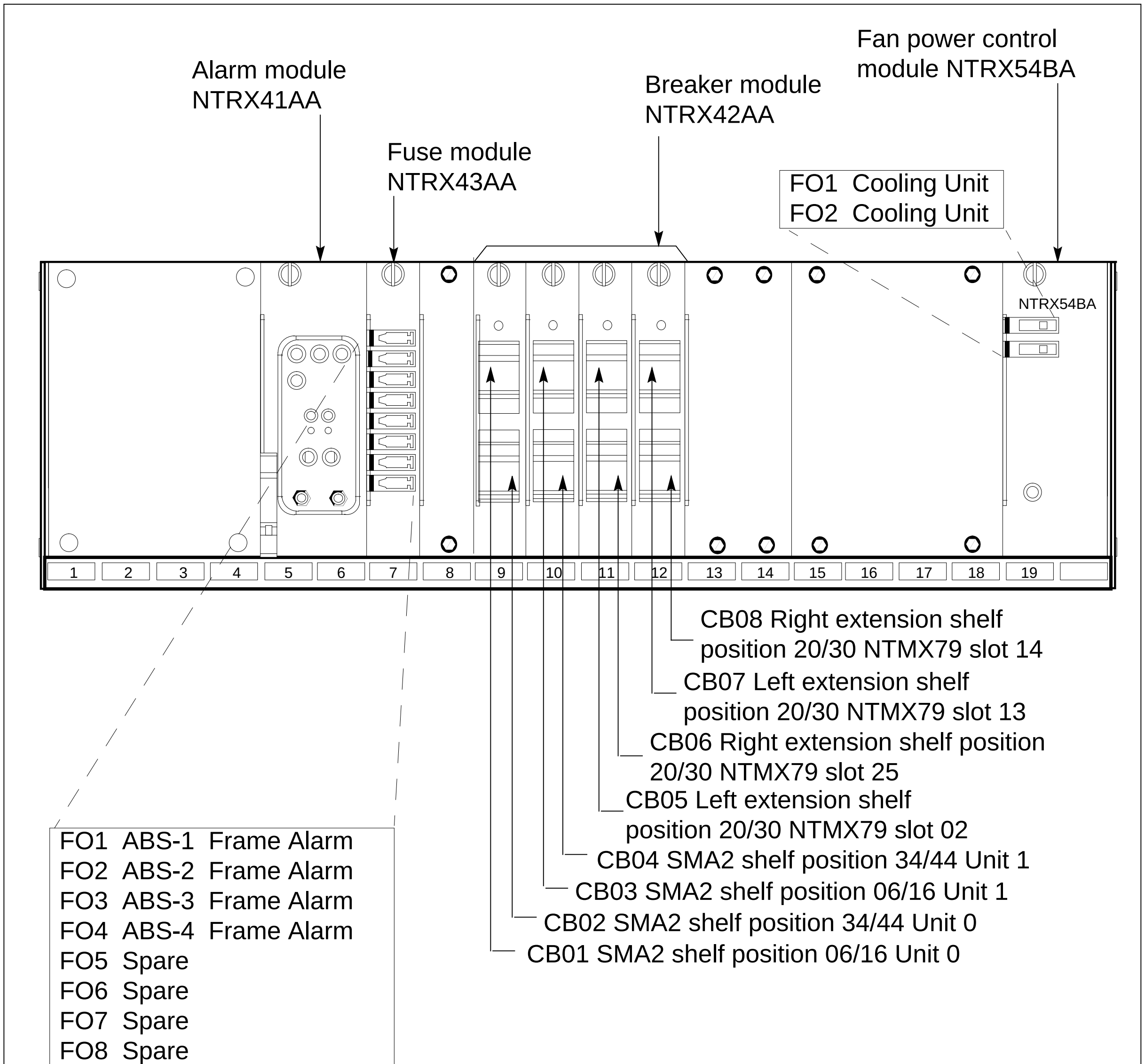
2 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the front panel of the frame or cabinet

3 Open the front cover of the MSP. Release the two cover latches and swing the cover down to the open position.

NTRX42 in an SMA2 MSP (continued)

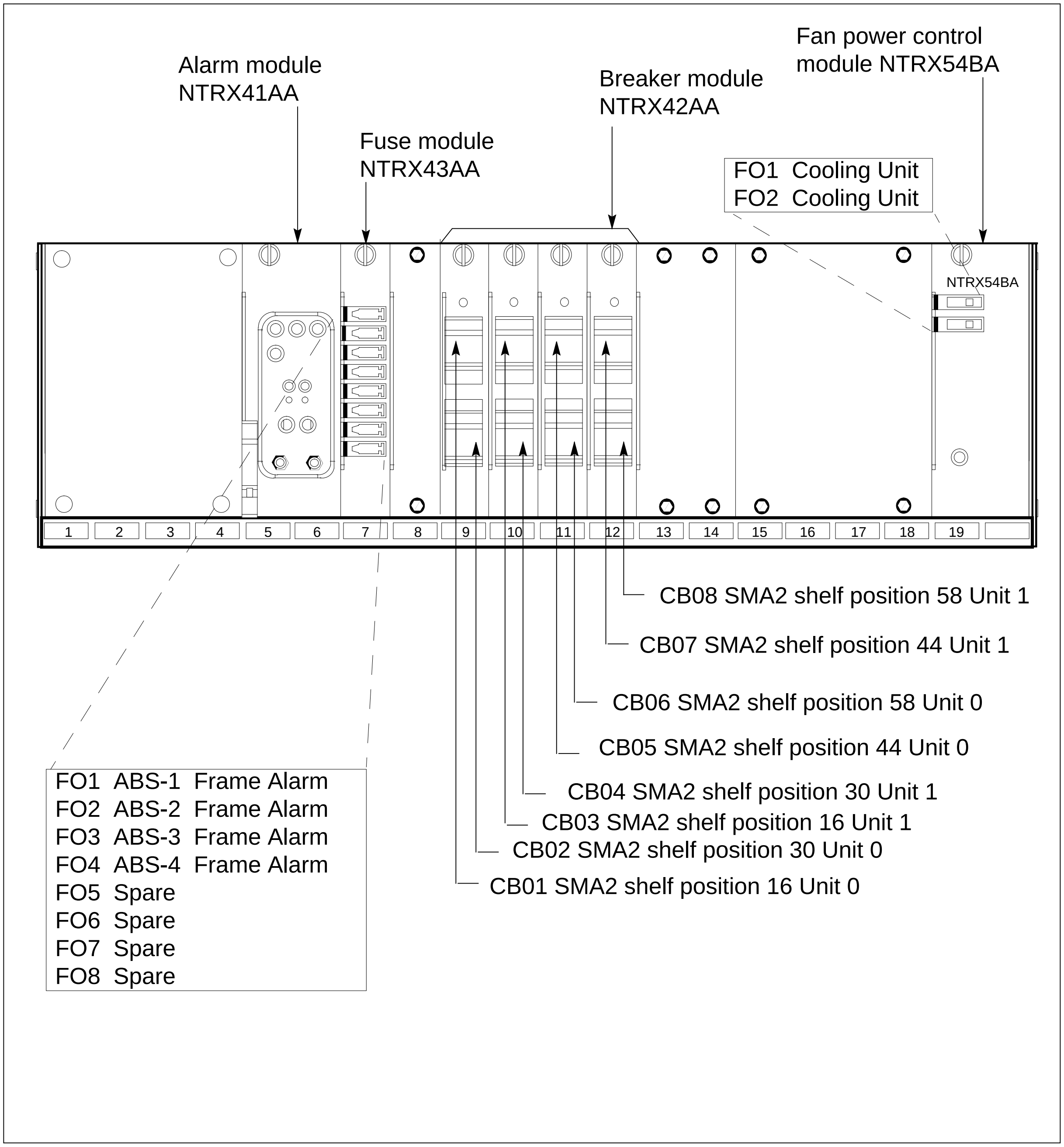
MSP in a CMVI cabinet or MVIE frame with an extention shelf



Note 1: The shelf position numbers identify the cabinet position numbers followed by the frame position numbering.

NTRX42
in an SMA2 MSP (continued)

MSP shelf for MVDD frame (without extension shelf)



4 Use the previous MSP figures and the breaker designation label to identify which cards are serviced by each circuit breaker (CB). Many RX42 modules service two separate devices (or units); both units must be powered down prior to removal of the associated RX42 circuit card.

NTRX42 in an SMA2 MSP (continued)

At the MAP terminal

5 Access the PM level and post the SMA2 by typing

>MAPCI;MTC;PM;POST sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 unit that will be busied.

Example of a MAP display

```
SMA2      SysB    ManB    OffL    CBsy    ISTb     InSv
    PM       3       0       1       0       2       13
    SMA2     0       0       0       0       1       7

SMA2   0 ISTb  Links_OOS:  CSide  0, PSide   0
Unit0:   Act   InSv
Unit1:   InAct IsTb
```

6 The NTRX42 you are replacing should be controlling the INACTIVE side of the SMA2.

If NTRX42 card is on the	Do
active unit	step 7
inactive unit	step 11

7 Switch the processing activity (SWACT) to the INACTIVE unit by typing

>SWACT

and pressing the Enter key.

A confirmation prompt for the SWACT command is displayed at the MAP terminal

If prompt indicates	Do
cannot continue at this time	step 8
can continue at this time	step 9

8 Reject the prompt to SWACT of the units by typing

>NO

and pressing the Enter key.

The system discontinues the SWACT.

9 Confirm the system prompt by typing

>YES

and pressing the Enter key.

NTRX42
in an SMA2 MSP (continued)

The system runs a pre-SWACT audit to determine the ability of the inactive unit to accept activity reliably.

Note: A maintenance flag appears when maintenance tasks are in progress. Wait until the flag disappears before proceeding with the next maintenance action.

If the message is	Do
`SWACT passed`	step 11
`SWACT failed Reason: XPM SWACTback`	step 10
`SWACT refused by SWACT Controller`	step 10

10 The inactive unit could not establish two-way communication with CC and has switched activity back to the originally active unit. You must clear all faults on the inactive unit before attempting to clear the alarm condition on the active unit.

Go to step 30.

After both units are in-service proceed to the next step.

At the frame or cabinet

11 Place a sign on the active unit bearing the words: *Active unit-Do not touch.* This sign should not be attached by magnets or tape.

At the MAP terminal

12 Busy the inactive PM unit by typing

> *bsy unit* unit_no

where

unit_no
is the number of the INACTIVE SMA2 unit to be busied.

Go to step 13.

At the front panel of the frame or cabinet

13 Verify and switch off associated power converter.

14 Determine faulty circuit breaker on MSP and switch both breakers on that circuit card to the OFF position. Safety tag the front of the circuit breaker.

15 An alarm may sound. If this occurs, silence the alarm by typing

>SIL

and pressing the Enter key.

16 Power down and safety tag the ABS fuse in the power room.

NTRX42
in an SMA2 MSP (continued)

At the rear panel of the frame or cabinet

17

DANGER
Risk of injury from high energy levels, static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

DANGER
Risk of injury from high energy levels, equipment damage
Take these precautions when removing or inserting a card:

1 Do not apply direct pressure to the components.

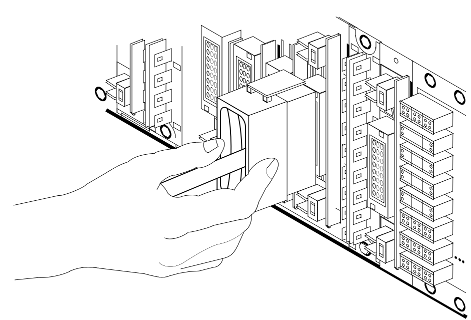
2. Do not force the cards into the slots.

3. Do not insert metallic objects into the black connectors. Voltage is present and equipment damage could result.

Put on a wrist strap.

18 Open the rear door and locate the NTRX42 circuit card. Verify the card location by checking the slot number stamped into the chassis.

a Note wire color and location to facilitate re-connection.



b Safety tag the front of the circuit breaker to indicate maintenance activity.

c Using the connector removal tool, manually disconnect the power connectors to the circuit card. Working 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.

NTRX42
in an SMA2 MSP (continued)

Manually disconnect and tag the large blue power connector. Disconnect and tag the smaller black power connectors located above the large blue power connector. Ensure you disconnect the black connectors *before* removing the circuit card.

d Although the connectors have voltage present on them, they are insulated. Secure the connectors to the power-connector bundle with a line-tie until it is time to reconnect them.

19 Disconnect and tag any jumper connectors and cables which may be present and set them aside for use on the replacement unit.

At the front panel of the frame or cabinet

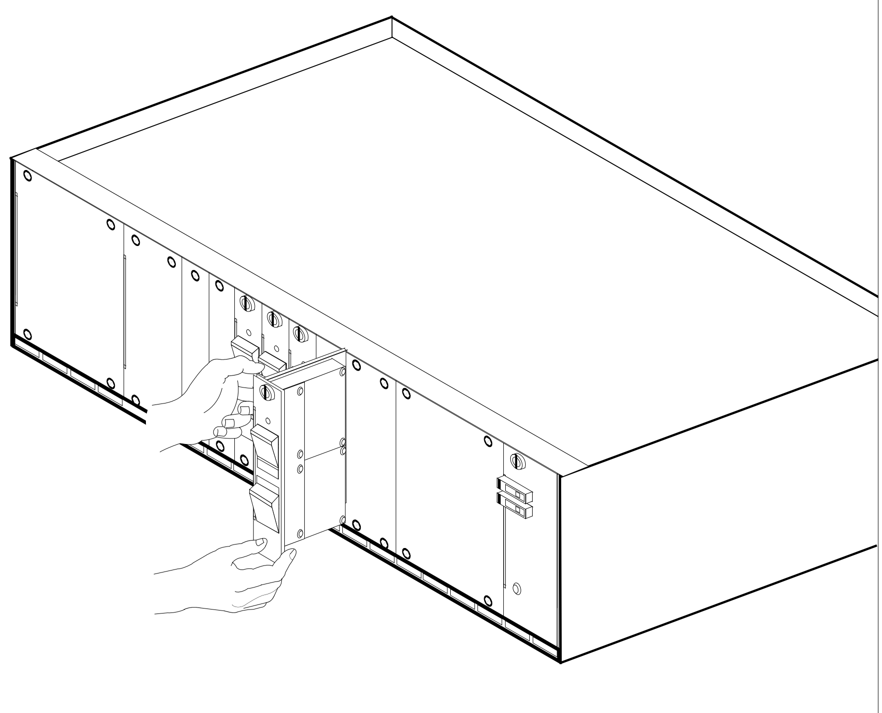
20 Remove the NTRX42 card.

a Disengage the spring-loaded captive screw at the top of the circuit card.

b Grasping the top and bottom of unit, gently pull the circuit card towards you until it clears the shelf.

c Replace the circuit card. Ensure the replacement circuit card has the same PEC, including suffix, as the circuit card being replaced.

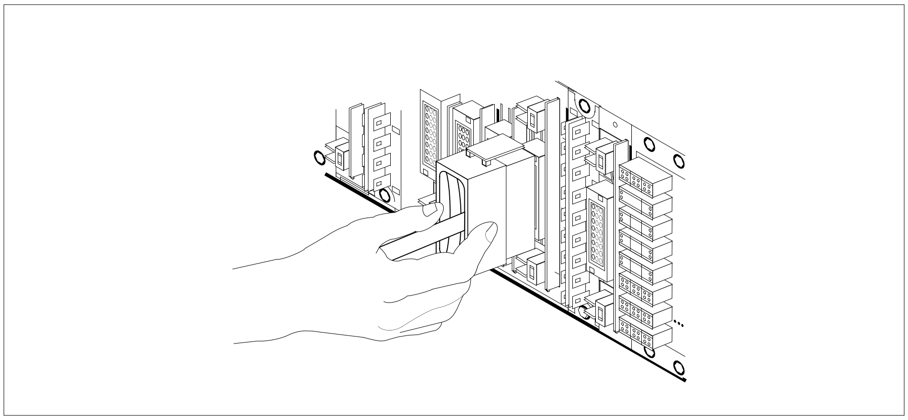
d Tighten the spring-loaded captive screw at the top of the circuit card.



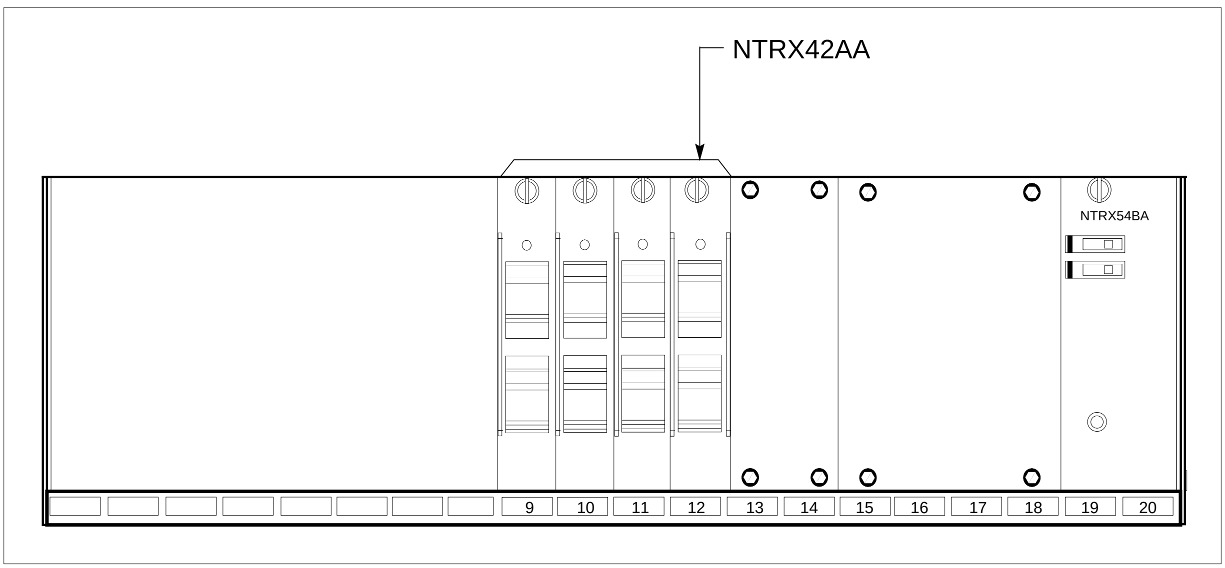
NTRX42AA

NTRX42
in an SMA2 MSP (continued)

21 Replace any jumper connectors and cables removed in step 19. Reinsert the power connectors at the rear of the circuit card.



22 Apply appropriate label from spare parts on replacement NTRX42 circuit card.



23 Power up the ABS fuse in the power room, remove safety tag from ABS fuse.

24 Switch on associated power converter.

25 Reset the circuit breakers to ON (upward). If any card controlled by this breaker includes a reset switch, hold the RESET button downward while setting the circuit breaker to the ON position.

26 Remove safety tag from front of circuit breaker.

27 Close the front cover of the MSP. Swing the cover up to the closed position and lock the two cover latches.

NTRX42
in an SMA2 MSP (end)

28 Return the SMA2 unit to service by typing

***>RTS UNIT* sma2_unit_no**

and pressing the Enter key.

where

sma2_unit_no
is the number of the SMA2 unit busied in step 12

If RTS	Do
passed	step 29
failed	step 30

29 Go to the common returning a card procedure in this document.

Go to step 31.

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

31 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTRX43
in an SMA2 MSP

Application

Use this procedure to replace a NTRX43 card in a modular supervisory panel (MSP) located in a:

- cabinetized multi-vendor interface (CMVI)
- multi-vendor interface equipment frame (MVIE)
- multi-vendor double density frame (MVDD)

PEC	Suffixes	Name
NTRX43	AA	Fuse Module

Common procedures

The common returning a card procedure is referenced in this procedure.

Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

A connector removal tool is available to facilitate removal of the AMP Faston 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.). The shorter tool is used when access to the rear of the MSP is very limited. An example of limited access is, MSP modules located directly behind the cabinet bulkhead.

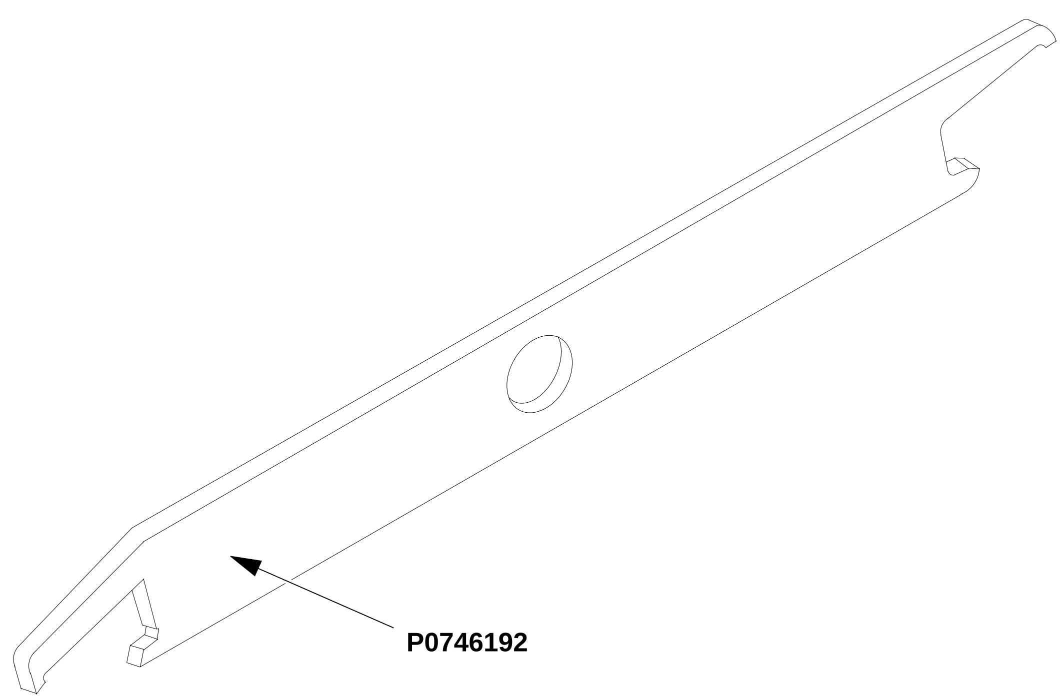
This tool is approximately 2 mm (.090 in.) thick and 17 mm (.65 in.) wide, with a jaw-like cut-out at each end. The cut-out profile conforms to the shape of the Faston receptacle. The shorter tip of each profile is used to position the receptacle in the tool.

The first meeting point of the tool serves as the pivot point. By rotating the tool around this pivot point, the longer tip of the profile which has a hook on its end, is engaged with the action-arm of the power connector. As the action-arm of the connector is pressed, the receptacle is disengaged from the connector tab. The receptacle is removed by pulling the tool with the receptacle trapped in its jaw, away from the connector. The tool is disengaged from the receptacle by rotating the tool's hook off the action-arm of the receptacle.

NTRX43
in an SMA2 MSP (continued)

Although the shape of the cut-out is the same on each end of the tool, the orientation of the profile is off by 15 degrees. This difference allows for the use of the tool at different angles, which may be required because of limited access to the connectors.

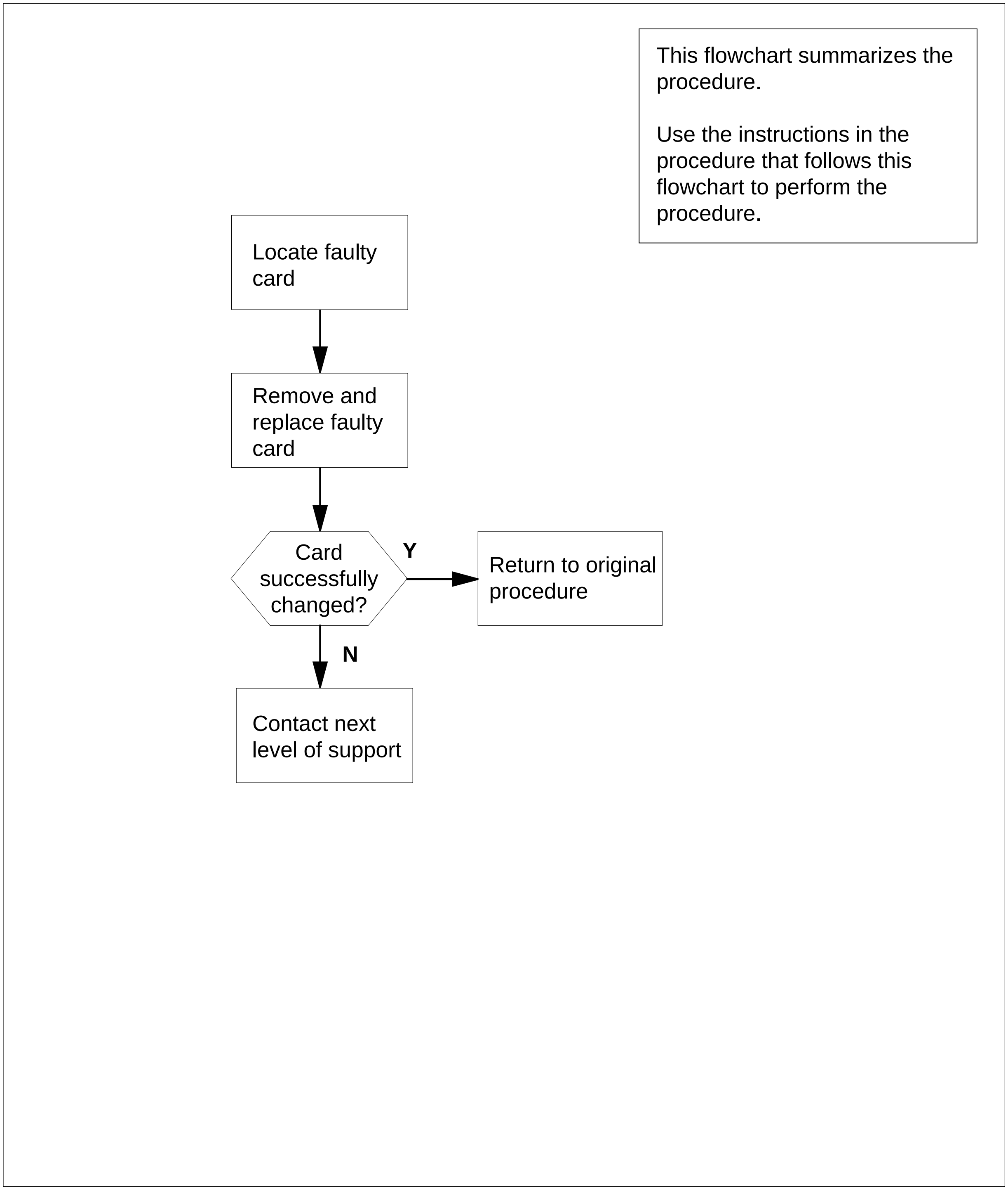
Connector removal tool



The following flowchart is a summary of this procedure. Use the instructions in the step-action table that follows the flowchart to perform the procedure.

NTRX43
in an SMA2 MSP (continued)

Summary of card replacement procedure for an NTRX43 card in an SMA2 MSP



NTRX43
in an SMA2 MSP (continued)

Replacing an NTRX43 card in an SMA2 MSP

At your current location

1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

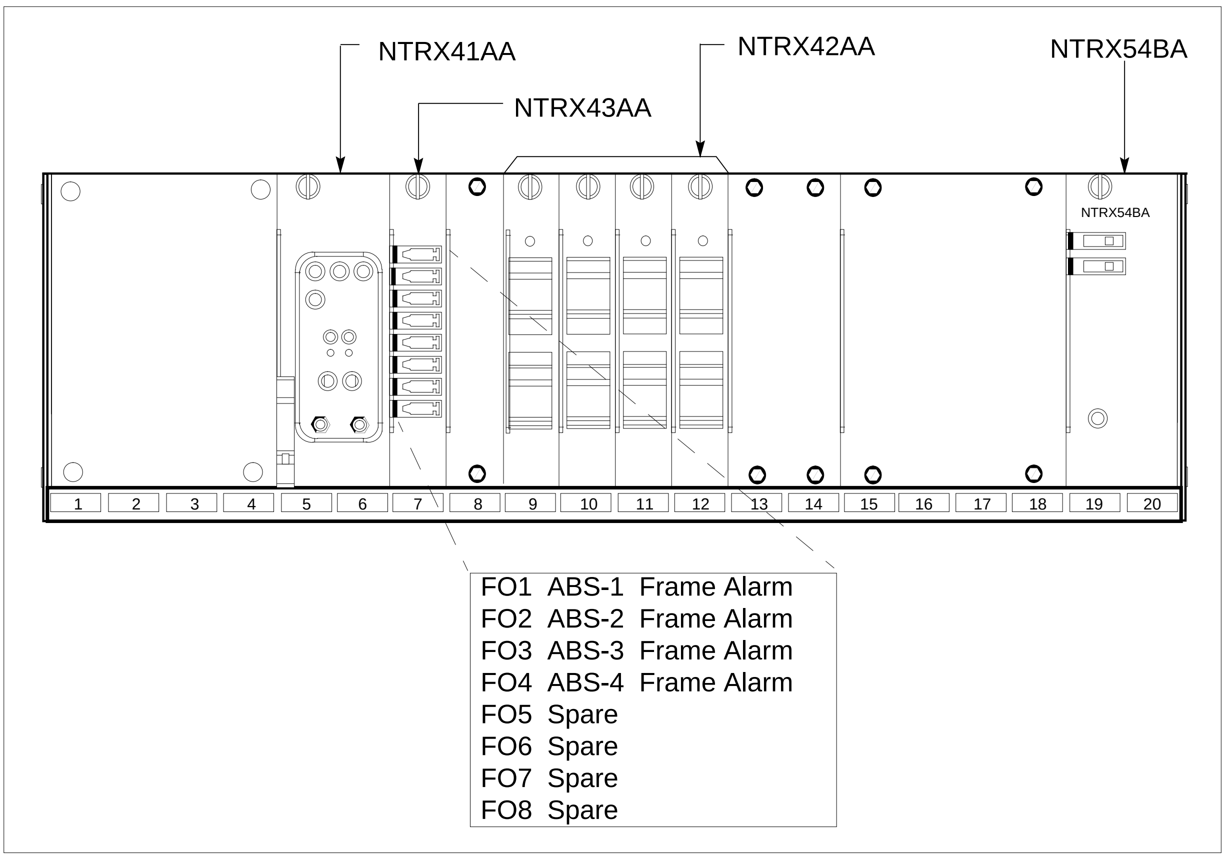
2 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the front panel of the frame or cabinet

3 Open the front cover of the MSP. Release the two cover latches and swing the cover down to the open position.

> ***Note:*** When servicing the fuse module, fans may shut down, alarms may sound, or there may be a loss of alarms. Use the following figure to identify fuse assignment.

MSP



NTRX43
in an SMA2 MSP (continued)

4

> **DANGER**
> **Risk of injury from high energy levels, static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

> **DANGER**
> **Risk of injury from high energy levels, equipment damage**
> Take these precautions when removing or inserting a card:
>
> 1. Do not apply direct pressure to the components.
>
> 2. Do not force the cards into the slots.

Put on a wrist strap.

5 Remove fuses from fuse module.

Note: Observe fuse colors, values, and positions before removing fuses from fuse module.

At the rear panel of the frame or cabinet

6

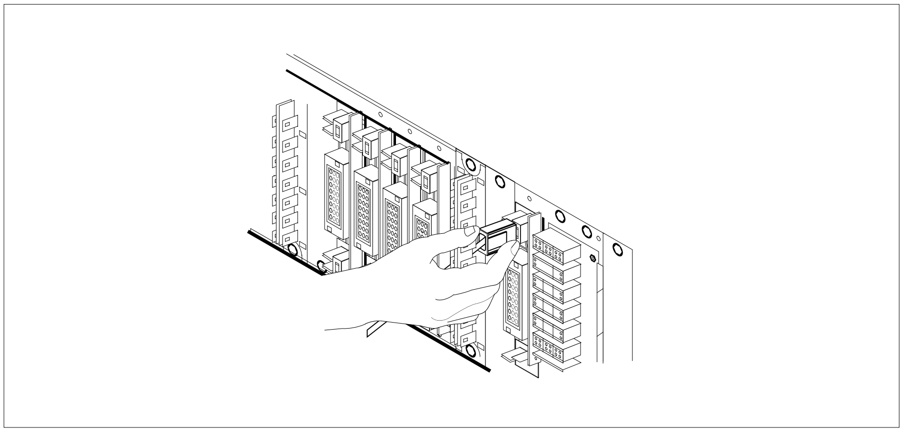
> **DANGER**
> **Risk of injury from high energy levels, voltage present**
> Do not insert metallic objects into the black connectors. Voltage is present and equipment damage could result.

Remove the NTRX43 circuit card as shown in the following figures.

a Open the rear doors of the cabinet and locate the back of the card to be replaced.

b Note wire color and location to facilitate re-connection.

NTRX43
in an SMA2 MSP (continued)



c Although the connectors have voltage present on them, they are insulated. Secure the connectors to the power-connector bundle with a line-tie until it is time to reconnect them.

d Using the connector removal tool, manually disconnect the power connectors to the circuit card. Working 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. Ensure you disconnect the black connectors *before* removing the circuit card.

e Remove and tag jumper connectors and cables, which may be present on the back of the circuit card and save for use on the replacement circuit card.

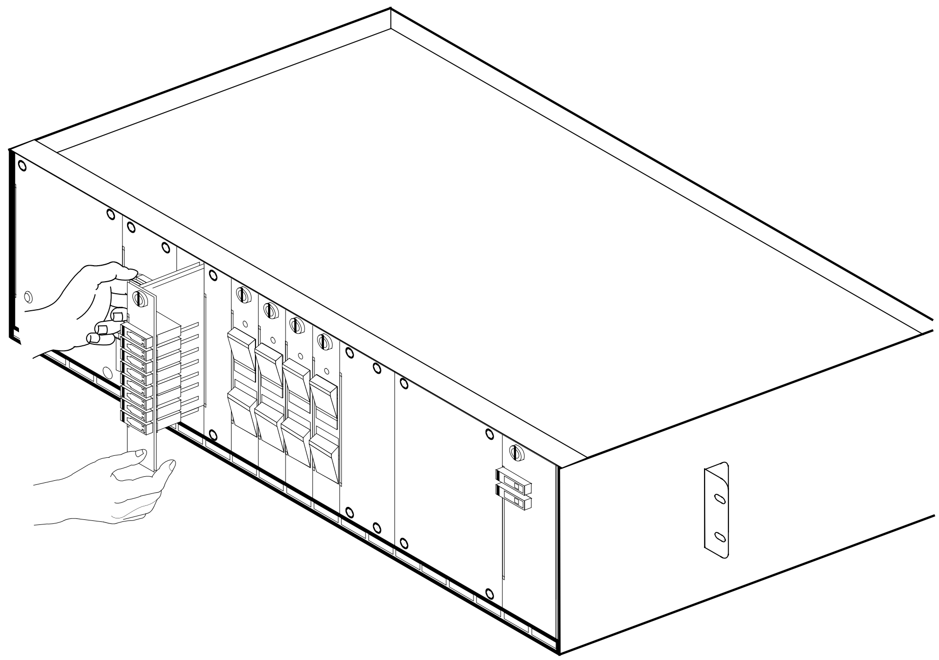
At the front panel of the frame or cabinet

7 Remove the NTRX43 card.

a Disengage the knurled thumbscrew at the top of the card.

b Gently pull the card towards you until it clears the shelf.

NTRX43
in an SMA2 MSP (continued)



NTRX43AA

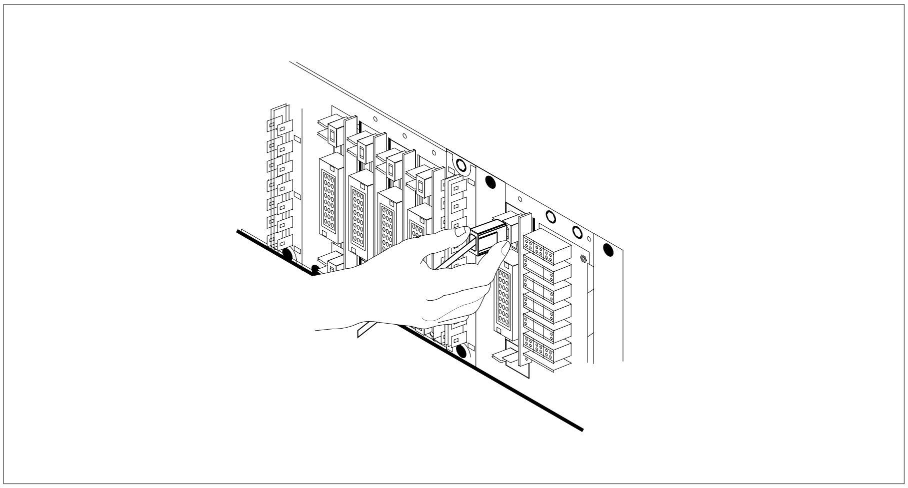
8 Ensure the replacement circuit card has the same PEC, including suffix, as the circuit card just removed.

- **a** Align the circuit card with the slots in the shelf and gently slide the circuit card into the shelf.
- **b** Gently but firmly seat the circuit card.
- **c** Tighten the knurled thumbscrew at the top of the circuit card.

At the rear panel of the frame or cabinet

9 Locate the replaced circuit card and re-attach the power connectors.

NTRX43
in an SMA2 MSP (end)



10 Install the jumper connectors and cables removed in step 6 onto the replacement circuit card.

At the front panel of the frame or cabinet

11 Replace fuses removed in step 5.

12 Power up circuit breaker supplying fuse module and remove safety tag.

If fuses	Do
do not blow	step 13
blow (protrude)	step 14

13 Go to the common returning a card procedure in this document.

Go to step 15.

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

15 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

NTRX54
in an SMA2 MSP

Application

Use this procedure to replace a NTRX54 card in a modular supervisory panel (MSP) located in a:

- cabinetized multi-vendor interface (CMVI)
- multi-vendor interface equipment frame (MVIE)
- multi-vendor double density frame (MVDD)

PEC	Suffixes	Name
NTRX54	BA	Fan Power Control Module

Common procedures

The common returning a card procedure is referenced in this procedure.

Do not go to a common procedure unless directed to do so in the step-action procedure.

Action

A connector removal tool is available to facilitate removal of the AMP Faston 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.). The shorter tool is used when access to the rear of the MSP is very limited. An example of limited access is, MSP modules located directly behind the cabinet bulkhead.

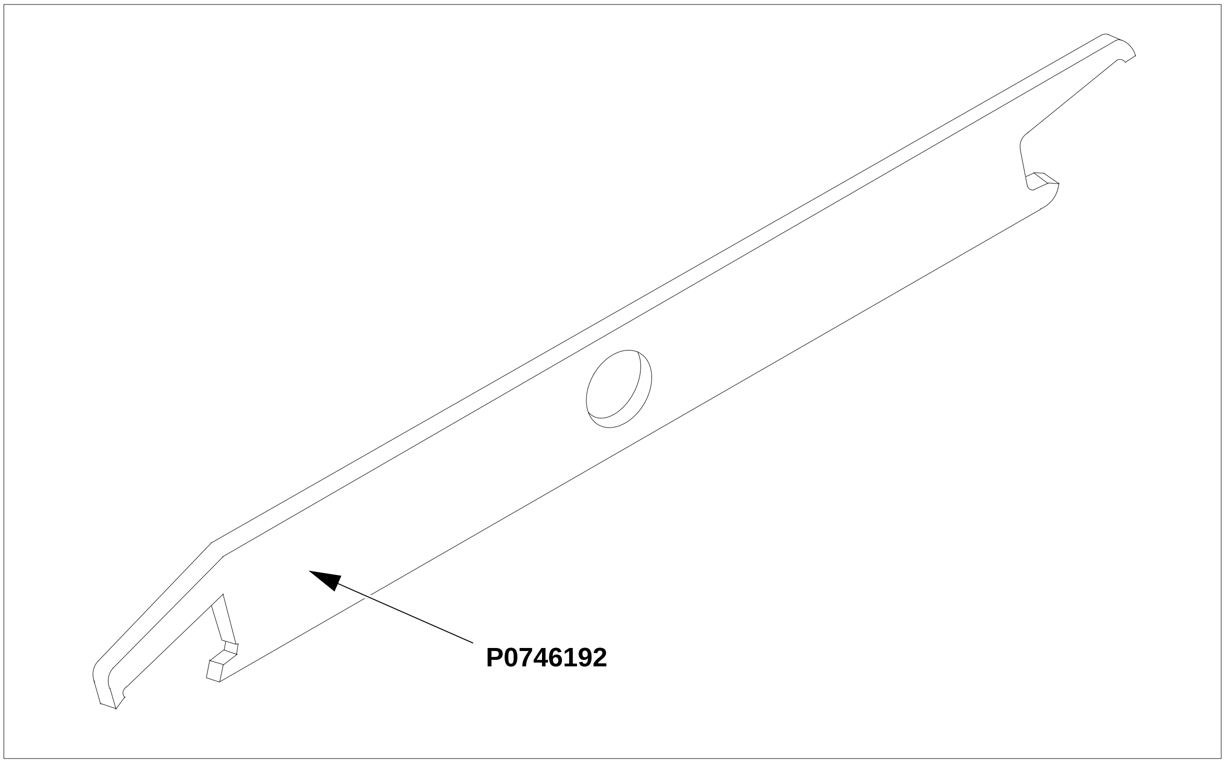
This tool is approximately 2 mm (.090 in.) thick and 17 mm (.65 in.) wide, with a jaw-like cut-out at each end. The cut-out profile conforms to the shape of the Faston receptacle. The shorter tip of each profile is used to position the receptacle in the tool.

The first meeting point of the tool serves as the pivot point. By rotating the tool around this pivot point, the longer tip of the profile which has a hook on its end, is engaged with the action-arm of the power connector. As the action-arm of the connector is depressed, the receptacle is disengaged from the connector tab. The receptacle is removed by pulling the tool with the receptacle trapped in its jaw, away from the connector. The tool is disengaged from the receptacle by rotating the tool's hook off the action-arm of the receptacle.

NTRX54
in an SMA2 MSP (continued)

Although the shape of the cut-out is the same on each end of the tool, the orientation of the profile is off by 15 degrees. This difference allows for the use of the tool at different angles, which may be required because of limited access to the connectors.

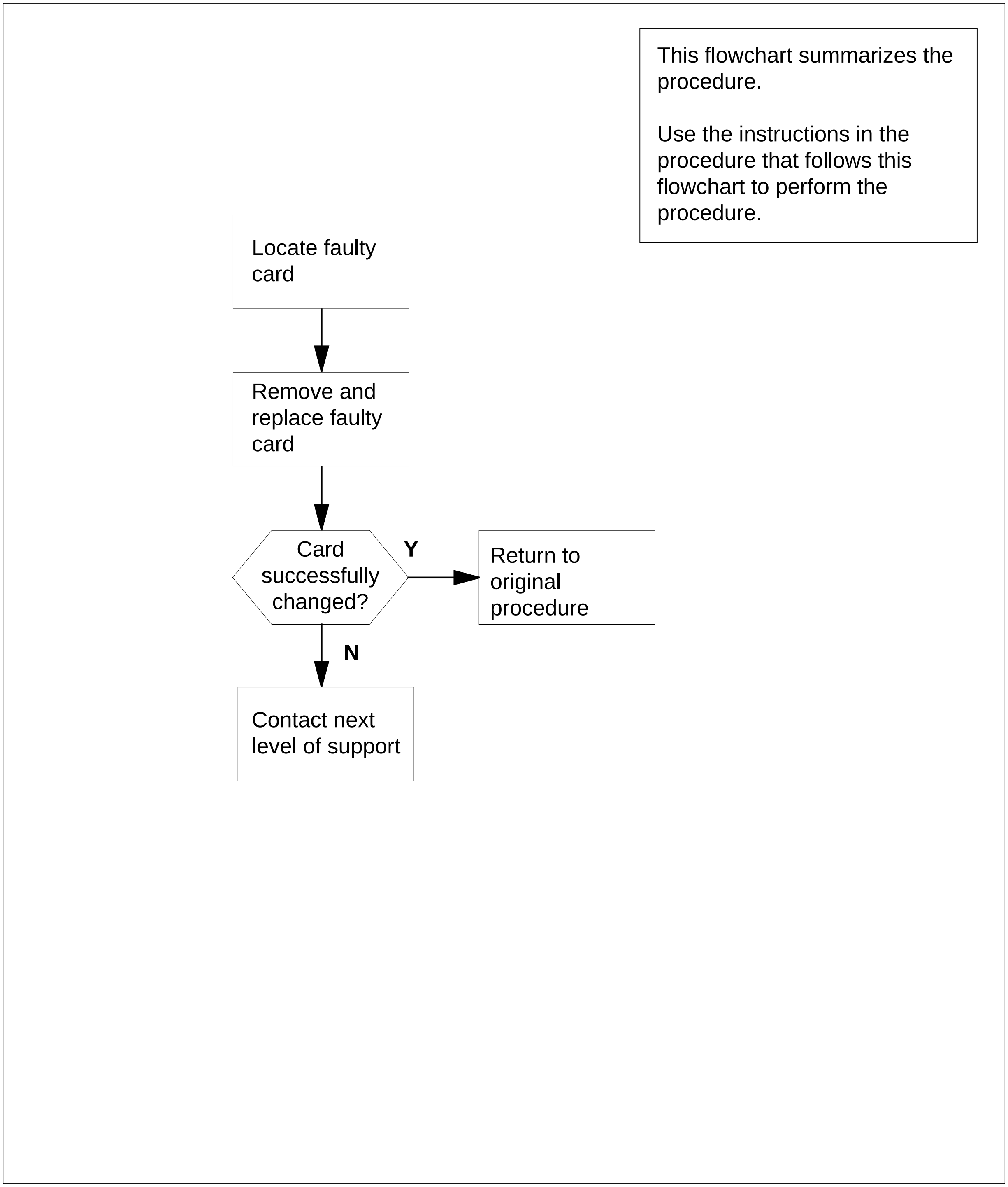
Connector removal tool



The following flowchart is a summary of this procedure. Use the instructions in the step-action table that follows the flowchart to perform the procedure.

NTRX54
in an SMA2 MSP (continued)

Summary of card replacement procedure for an NTRX54 card in an SMA2 MSP



NTRX54
in an SMA2 MSP (continued)

Replacing an NTRX54 card in an SMA2 MSP

At your current location

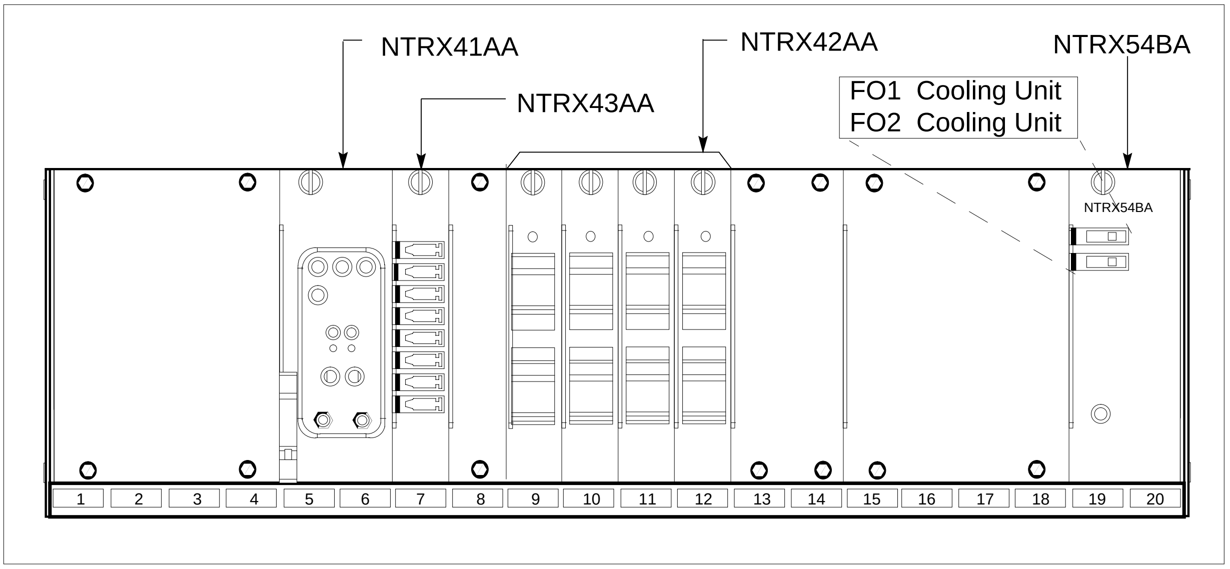
1 Proceed only if you have been directed to this card replacement procedure from a step in a maintenance procedure, are using the procedure for verifying or accepting cards, or have been directed to this procedure by your maintenance support group.

2 Obtain a replacement card. Ensure that the replacement card has the same product equipment code (PEC), including suffix, as the card that is to be removed.

At the front panel of the frame or 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

DANGER
Risk of injury from high energy levels, static electricity damage
Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

NTRX54
in an SMA2 MSP (continued)

DANGER
Risk of injury from high energy levels, equipment damage
Take these precautions when removing or inserting a card:

1. Do not apply direct pressure to the components.

2. Do not force the cards into the slots.

WARNING
Heat damage
Avoid leaving this card out of service for more than 30 minutes. Extensive damage to the entire cabinet may occur if cooling is lost for more than 30 minutes.

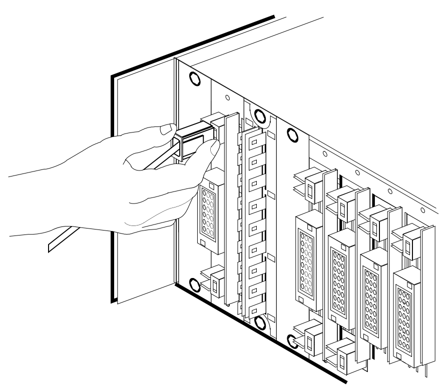
Put on a wrist strap.

5 Remove the two fuses in the fan power control module.

At the rear panel of the frame or cabinet

6 Remove the NTRX54 circuit card as shown in the following figures.

- **a** Open the rear doors of the cabinet and locate the circuit card, it will be in slots 19 and 20.
- **b** Note the wire color and location to facilitate re-connection.



- **c** Using the connector removal tool, manually disconnect the power connectors to the circuit card. Working 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

NTRX54
in an SMA2 MSP (continued)

power connectors located above the large blue power connector. Ensure you disconnect the black connectors *before* removing the circuit card.

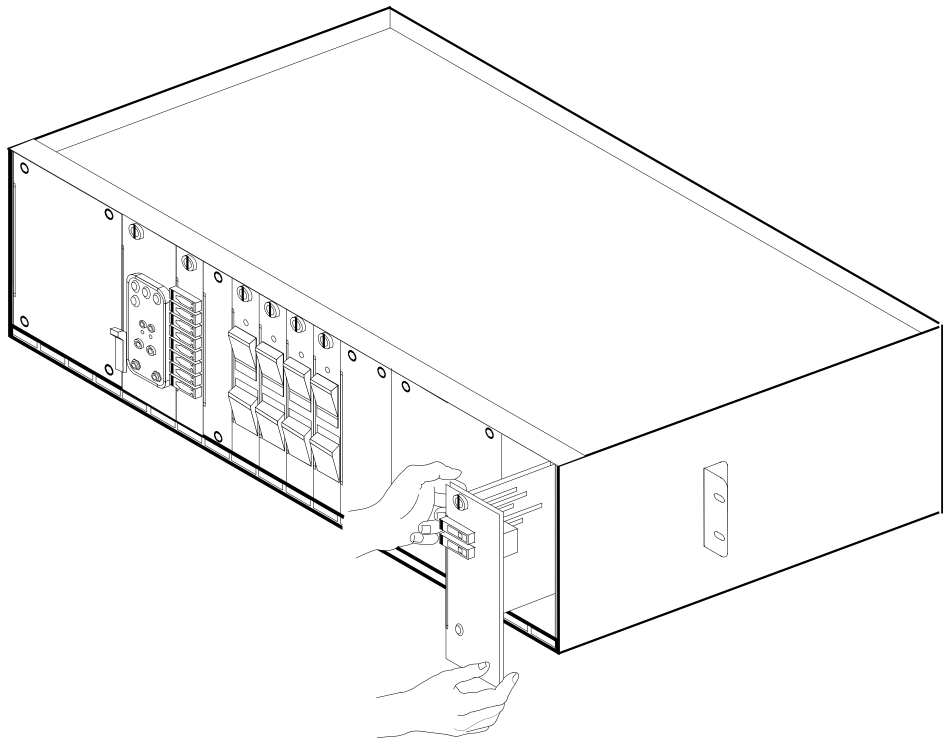
d Although the connectors have voltage present on them, they are insulated. Secure the connectors to the power-connector bundle with a line-tie until it is time to reconnect them.

At the front panel of the frame or cabinet

7 Remove the NTRX54 card.

a Disengage the knurled thumbscrew at the top of the card.

b Gently pull the card towards you until it clears the shelf.



NTRX54BA

8 Ensure the replacement circuit card has the same PEC, including suffix, as the circuit card just removed.

a Align the circuit card with the slots in the shelf and gently slide the circuit card into the shelf.

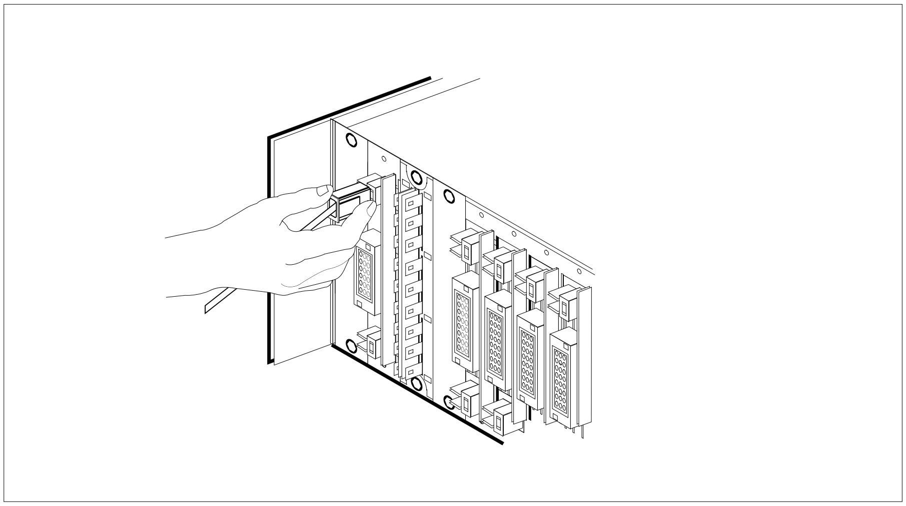
b Gently but firmly seat the circuit card.

c Tighten the knurled thumbscrew at the top of the circuit card.

NTRX54
in an SMA2 MSP (end)

At the rear panel of the frame or cabinet

9 Locate the replaced circuit card and re-attach the power connectors, as noted in step 6.



10 Replace the two fuses removed in step 5.

If fuses	Do
do not blow	step 11
blow (protrude)	step 12

11 Go to the common returning a card procedure in this document.

Go to step 13.

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

13 You have successfully completed this procedure. Return to the maintenance procedure that directed you to this card replacement procedure and continue as directed.

Returning a card for repair or replacement in an SMA2

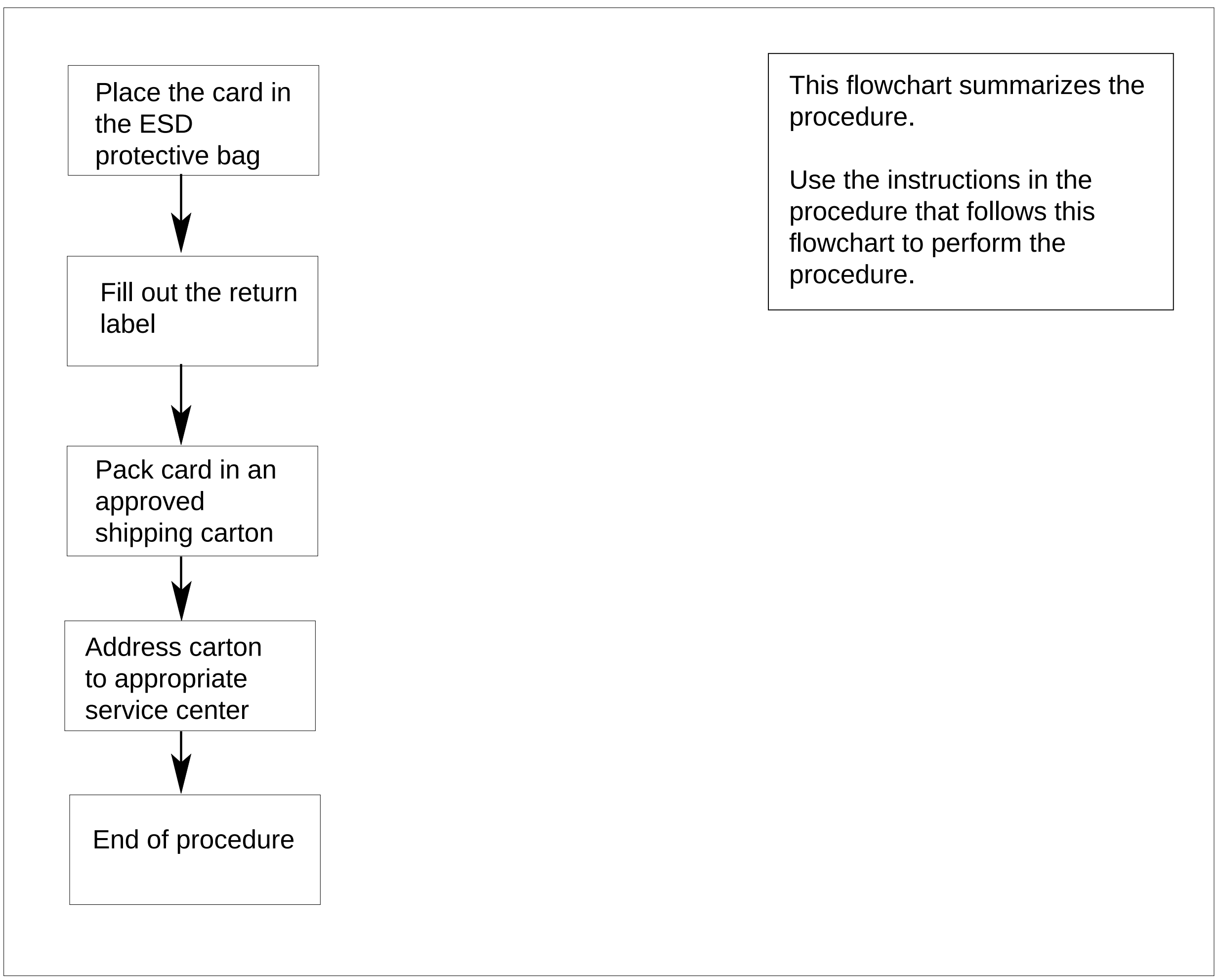
Application

Use this procedure to return a circuit card, such as a power converter, to Nortel (Northern Telecom) for repair or replacement. The documents you must fill out and the address where you must return the card depend on your location, Canada or the United States, and in some cases the company where you work.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

Summary of card replacement procedure for Returning a card for repair or replacement in an SMA2



Returning a card for repair or replacement in an SMA2 (continued)

Returning a card for repair or replacement in an SMA2 shelf

At your current location

1 Place the card in an electrostatic discharge (ESD) protective bag.

If your location is in	Do
Canada	step 6
the United States	step 2

2 Fill in a return label for each card you are returning. If you require assistance filling out the label, dial Nortel at 1-800-347-4850.

Be sure to include the following information:

- return authorization number from customer service
- NT product engineering code (PEC)
- serial number
- release number
- BCS release software being used at the time of replacement
- peripheral module load name
- description of the failure and action taken to repair
- fault code that best describes the fault (see the bottom of the tag)
- name of your company
- office identifier code
- your name
- site name

3 Pack the card or assembly in a Nortel card shipping carton and seal it.

If a Nortel shipping carton is not available, use another carton, but ensure that each card or assembly is

- enclosed in packing paper
- surrounded in bubble pack or foam
- secured tightly in the carton so that it cannot shift

4 Address and mail the carton to:

Nortel Customer Service Center
Spare Parts Center
4600 Emperor Blvd.
Morrisville, North Carolina 27560

5 Go to step 11.

6 Fill in one return tag (form 24-115) for each card or assembly you are returning.

Returning a card for repair or replacement in an SMA2 (end)

Be sure to include the following information:

- return authorization number from customer service
- NT product engineering code (PEC)
- serial number
- release number
- BCS release software being used at the time of replacement
- peripheral module load name
- description of the failure and action taken to repair
- fault code that best describes the fault (see the bottom of the tag)
- name of your company
- office identifier code
- your name
- site name

If you require help in filling out the tag, call 905-454-2808, or in the case of an emergency, 905-457-9555.

7 Attach one copy of the card tag to one of the card latches.

8 Keep the other copies of the tag for your records.

9 Pack the card or assembly in a Nortel shipping carton and seal it.

If a Nortel shipping carton is not available, use another carton, but ensure that each card or assembly is

- enclosed in packing paper
- surrounded in bubble pack or foam
- secured tightly in the carton to prevent any movement

10 Address and mail the carton to:

Nortel Customer Operations
c/o Wesbell Transport
1630 Trinity Road
Unit #3 Door #4
Mississauga, Ontario
L5T 1L6

11 You have successfully completed this common procedure. Return to the main procedure that sent you to this procedure and continue as directed.

Locating a faulty card in an SMA2

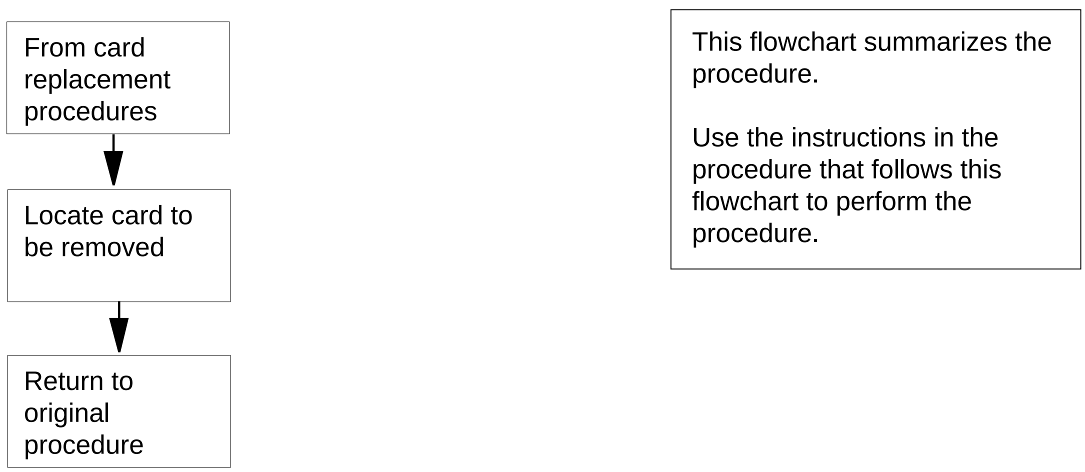
Application

Use this procedure to locate a card in an SMA2 shelf.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

Summary of card replacement procedure for Locating a faulty card in an SMA2



Locating a faulty card in an SMA2 (continued)

Locating a faulty card in an SMA2

At the MAP terminal

1 Post the SMA2 with the faulty card by typing

>MAPCI;MTC;PM;POST SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the SMA2 with the faulty card

2 Locate the building, frame, and shelf of the posted SMA2 module by typing

>QUERYPM

and pressing the Enter key.

Example of a MAP response:

```
Site  Flr   RPos   Bay–id     Shf
HOST  03    B12    CMVI 00    06
```

At the frame or cabinet

3 Locate the unit where the faulty card resides.

Unit 0 on the SMA2 (main) shelf contains circuit card 1-13. Unit 1 on the SMA2 (main) shelf contains circuit cards 14-27.

The extension shelf referred to below is only available on the CMVI and MVIE frame. The MVDD frame does not contain an extension shelf.

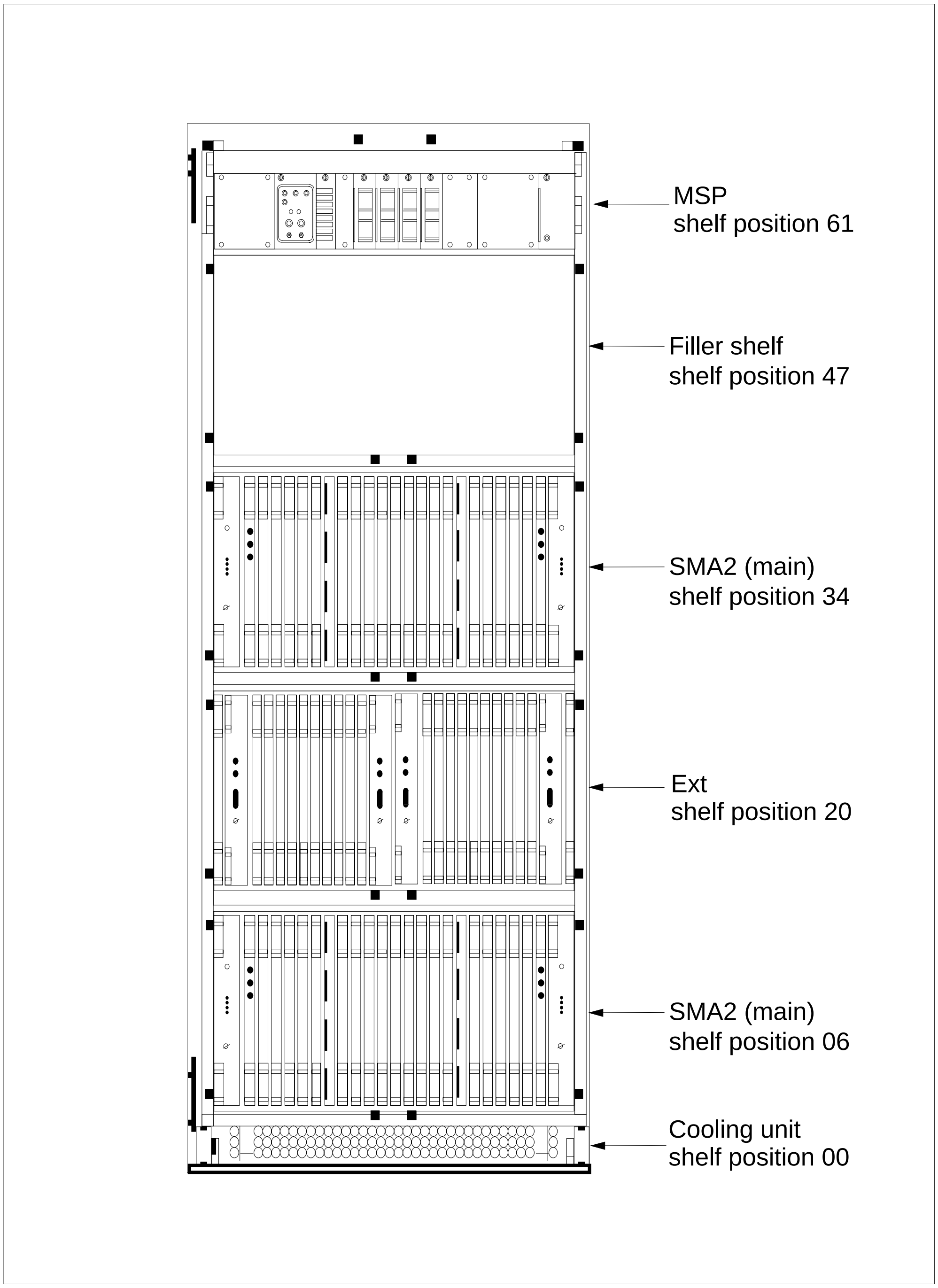
Unit 0 on the left side of the SMA2 extension shelf (first SMA2) contains circuit cards 2-7. Unit 1 on the left side of the SMA2 extension shelf (first SMA2) contains circuit cards 8-13.

Unit 0 on the right side of the SMA2 extension shelf (second SMA2) contains circuit cards 20-25. Unit 1 on the right side of the SMA2 extension shelf (second SMA2) contains circuit cards 14-19.

4 Use the following diagrams to locate the position of a SMA2 shelf within a cabinet or frame, and a SMA2 unit within a shelf.

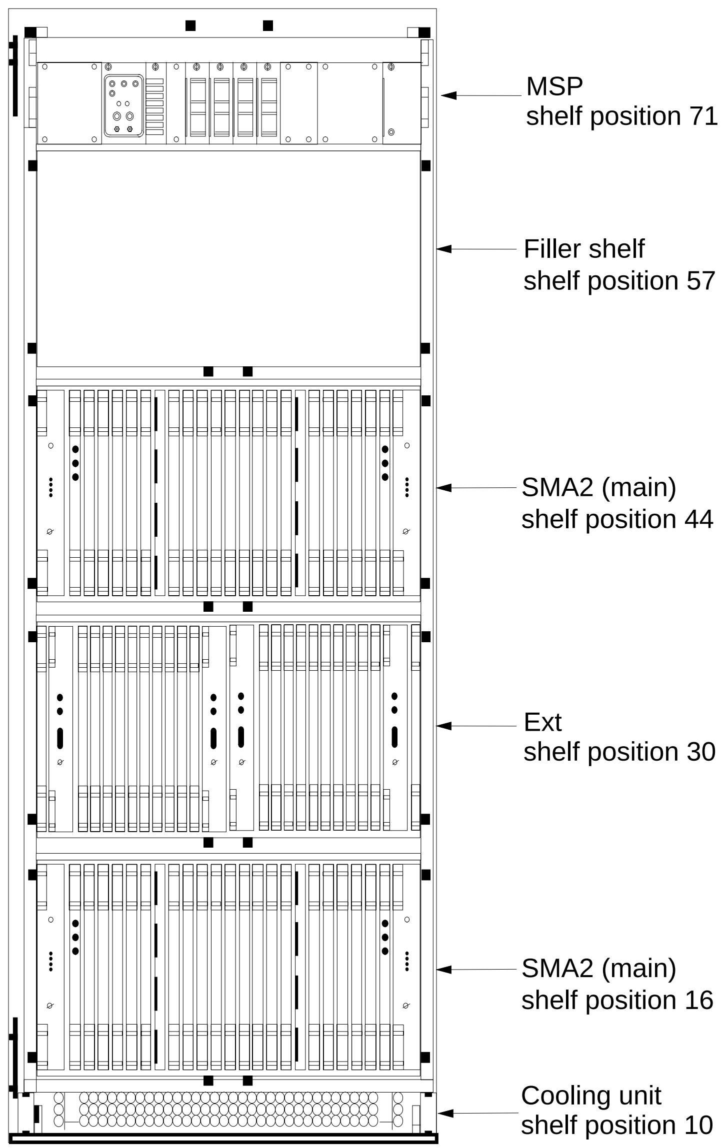
Locating a faulty card in an SMA2 (continued)

Cabinetized multi-vendor interface (CMVI)



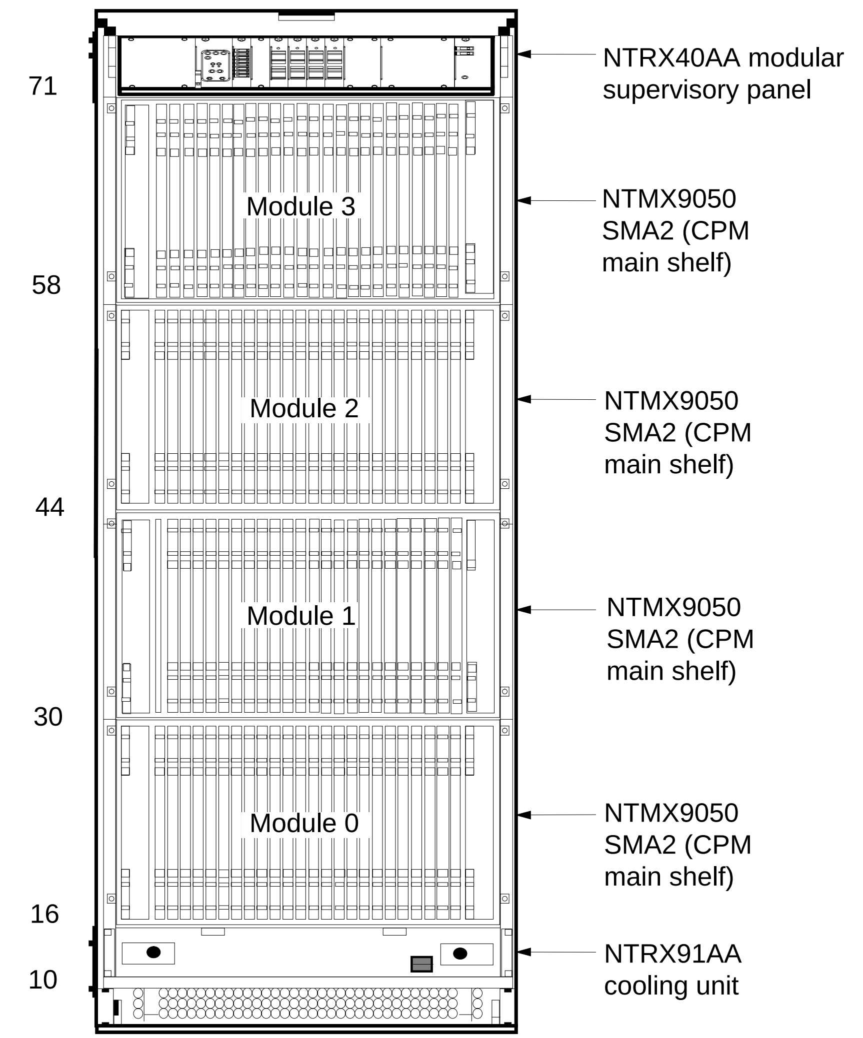
Locating a faulty card in an SMA2 (continued)

Multi-vendor interface equipment (MVIE)



Locating a faulty card in an SMA2 (continued)

Multi-vendor double density MVDD frame

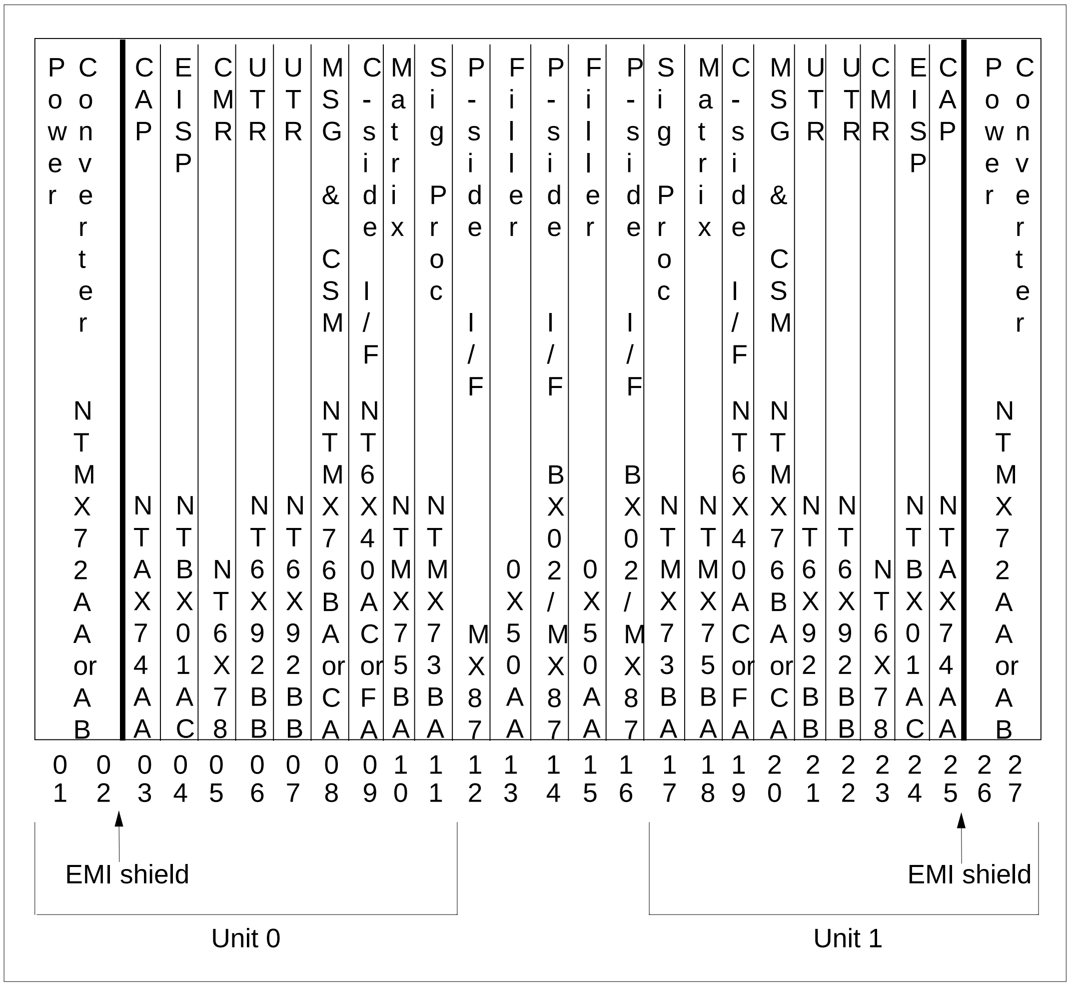


Shelf position numbers

5 Use the following figures to determine the slot assignments for the card in the main or extension shelf.

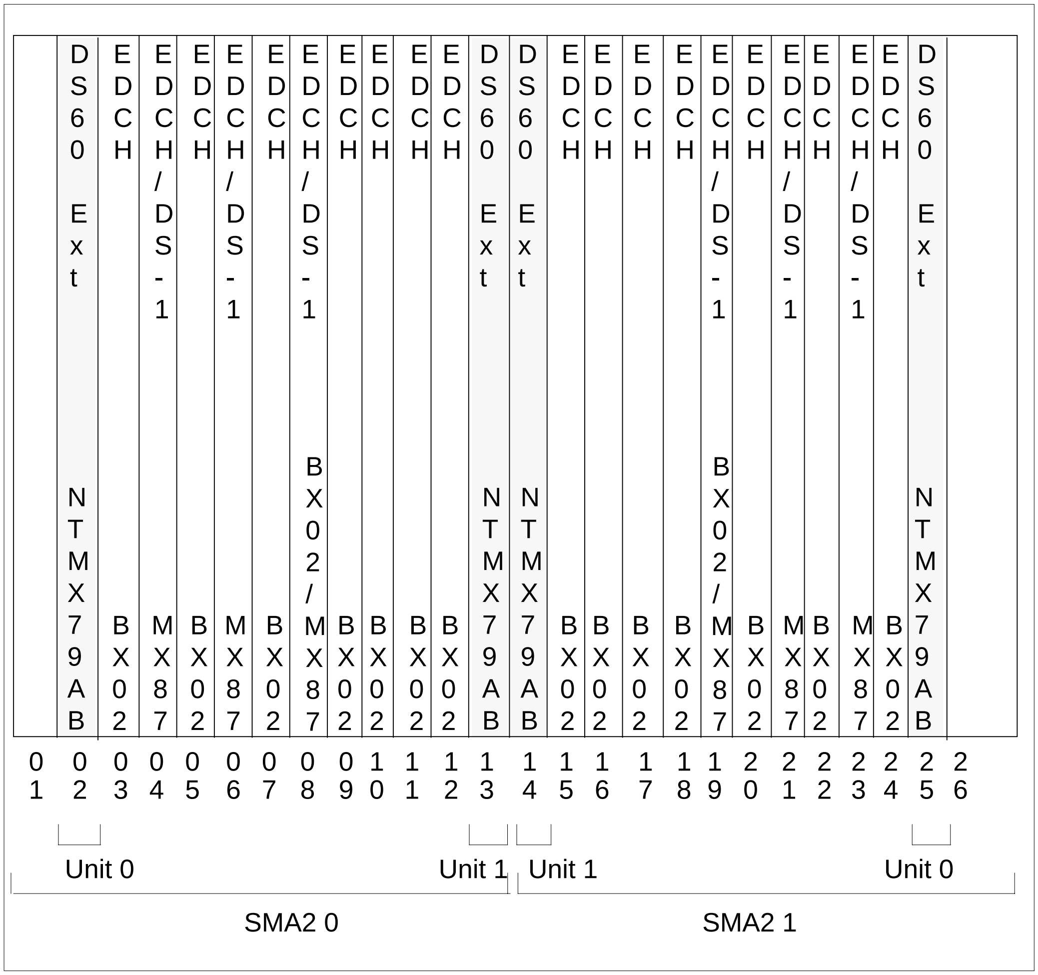
Locating a faulty card in an SMA2 (continued)

SMA2 main shelf configuration



Locating a faulty card in an SMA2 (continued)

SMA2 extension shelf configuration (CMVI and MVIE frame or cabinet)



6 Is the faulty card an NTMX87, NTMX81, or NTBX02?

If card is	Do
NTMX87 with NTMX81 packlets or NTBX02	step 7
other	step 13

Locating a faulty card in an SMA2 (continued)

At the MAP terminal

7 Access the line trunk controller P-side inventory (LTCPSINV) table from the CI level of the MAP display by typing

>TABLE LTCPSINV

and pressing the Enter key.

Example of a MAP response:

```
TABLE:  LTCPSINV
```

8 Display the tuple for the SMA2 module that contains the faulty card, for example, SMA2 0, SMA2 1, or SMA2 2, by typing

>HEADING;POS SMA2 sma2_no

and pressing the Enter key.

where

sma2_no
is the number of the posted SMA2

Example of a MAP response:

```
LTCNAME                                                 PSLNKTAB
------------------------------------------------------- SMA2  0
(0 DS1 DEFAULT N) (1 DS1 DEFAULT N) (2 DS1 DEFAULT N) (3 DS1 DEFAULT
N) (4 DS1 DEFAULT N) (5 DS1 DEFAULT N) (6 DS1 DEFAULT N) (7 DS1
DEFAULT N) (8 DS1 DEFAULT N) (9 DS1 DEFAULT N) (10 DS1 DEFAULT N) (11
NILTYPE ) (12 NILTYPE ) (13 NILTYPE ) (14 NILTYPE) (15 NILTYPE ) (16
NILTYPE ) (17 NILTYPE) (18 NILTYPE ) (19 NILTYPE ) (20 NILTYPE (21
NILTYPE) (22 NILTYPE) (23 NILTYPE) (24 DS1 DEFAULT N) (25 DS1 DEFAULT
N) (26 DS1 DEFAULT N) (27 DS1 DEFAULT N) (28 DS1 DEFAULT N) (29 DS1
DEFAULT N) (30 DS1 DEFAULT N) (31 DS1 DEFAULT N ) (32 NILTYPE ) (33
NILTYPE ) (34 NILTYPE) (35 NILTYPE ) (36 NILTYPE ) (37 NILTYPE) (38
NILTYPE ) (39 NILTYPE ) (40 DCH) (41 NILTYPE) (42 NILTYPE) (43
NILTYPE) (44 NILTYPE) (45 NILTYPE) (46 NILTYPE) (47 NILTYPE) (48
NILTYPE) (49 NILTYPE) (50 NILTYPE) (51 NILTYPE) (52 NILTYPE)
(53 NILTYPE) $
```

Each bracket identifies the link number and card type.

If card type is	Do
DCH	step 9
other	step 11

9 To find the DCH numbers of the DCH cards, access the DCHINV table from the CI level of the MAP by typing

>TABLE DCHINV

and pressing the Enter key.

Example of a MAP response :

Locating a faulty card in an SMA2 (continued)

```
TABLE:  DCHINV
```

10 List all DCH numbers, with headings, by typing

>LIST ALL

and pressing the Enter key.

Example of a MAP response

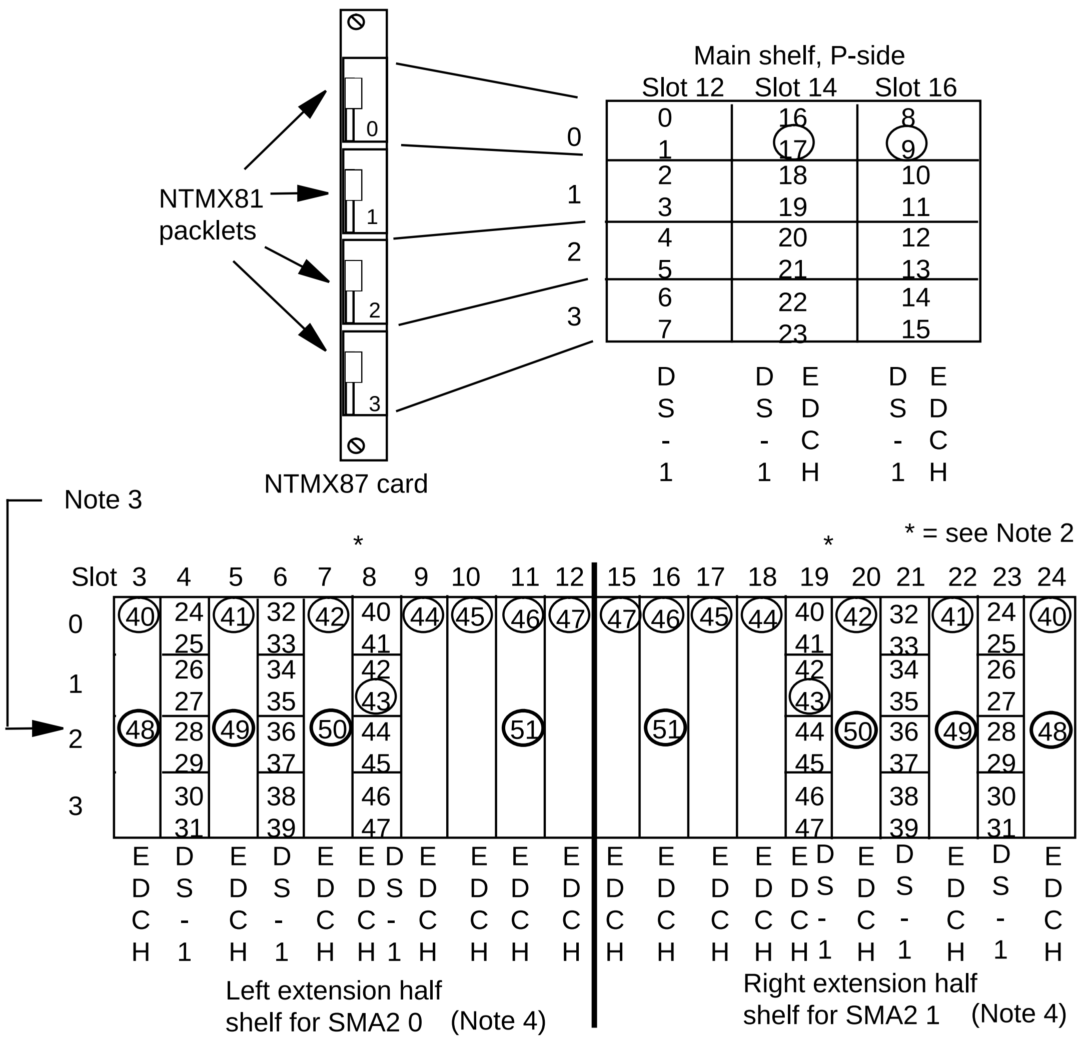
```
 DCHNO  PMTYPE  PMNO  DCHPEC      LOAD   PORT
 -------------------------------------------------
 0      SMU     0  BX02BA   EDH81AZ     17
 1      SMU     0  BX02BA   EDH81AZ     19
 2      SMA2    1  BX02BA   EDH81AZ     14
 5      SMU     0  BX02BA   EDH81AZ     13
 6      SMU     0  BX02BA   EDH81AZ     15
10      SMA2    0  BX02BA   EDH81AZ     14
```

11 Record each link and card name (and DCH number if applicable) associated with it.

12 Use the diagram below to determine the physical location of the slot of the faulty card and the peripheral-side (P-side) links that connect to it.

Locating a faulty card in an SMA2 (continued)

Card slot location and P-side link relationship



Note 1: Circled port numbers identify EDCH port numbers.

Note 2: When there is a special initial configuration requirement for 48 DS-1 ports, slot 8 in the left extension shelf and slot 19 in the right extension shelf are used to support DS-1 cards.

Note 3: When there is a special initial configuration requirement for 48 DS-1 ports and four EDCH cards, slots 3, 5, 7, and 11 in the left extension shelf and slots 24, 22, 20, and 16 in the right extension shelf are used to support EDCH cards. The bold circles identify port numbers used to support the special initial configuration of 48 DS-1s and four EDCH cards.

Note 4: The extension shelf is only available on the CMVI and MVIE frame. The MVDD frame does not contain an extension shelf. The P-side main shelf illustration applies to all models.

Locating a faulty card in an SMA2 (end)

13 You have successfully completed this common procedure. Return to the main procedure that sent you to this procedure and continue as directed.

Removing and inserting cards in an SMA2

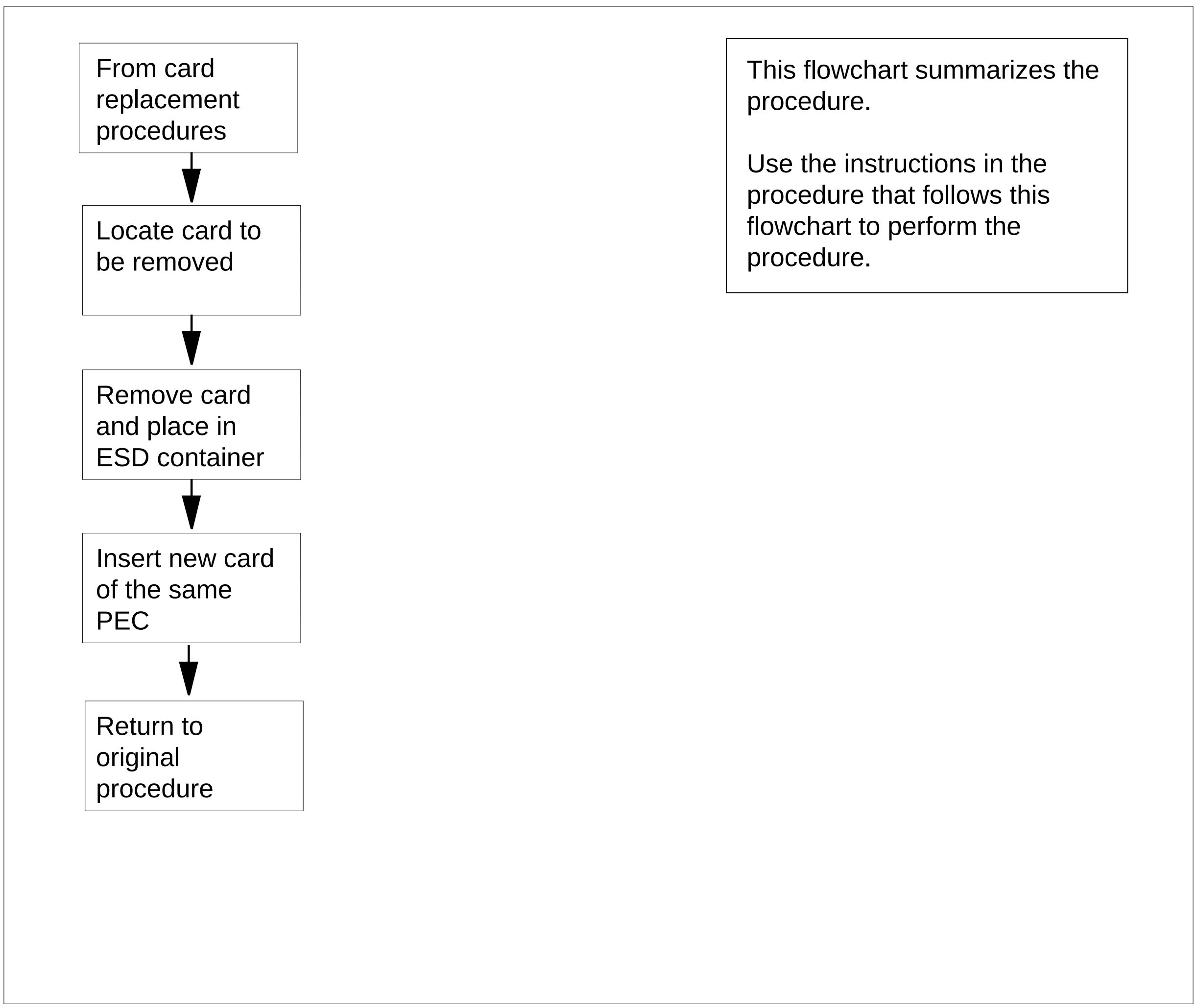
Application

Use this procedure when removing a card from an SMA2 shelf and inserting a replacement.

Action

The following flowchart is only a summary of the procedure. To replace the card, use the instructions in the step-action procedure that follows the flowchart.

Summary of card replacement procedure for Removing and inserting cards in an SMA2



Removing and inserting cards in an SMA2 (continued)

Removing and inserting cards in an SMA2

At the frame or cabinet

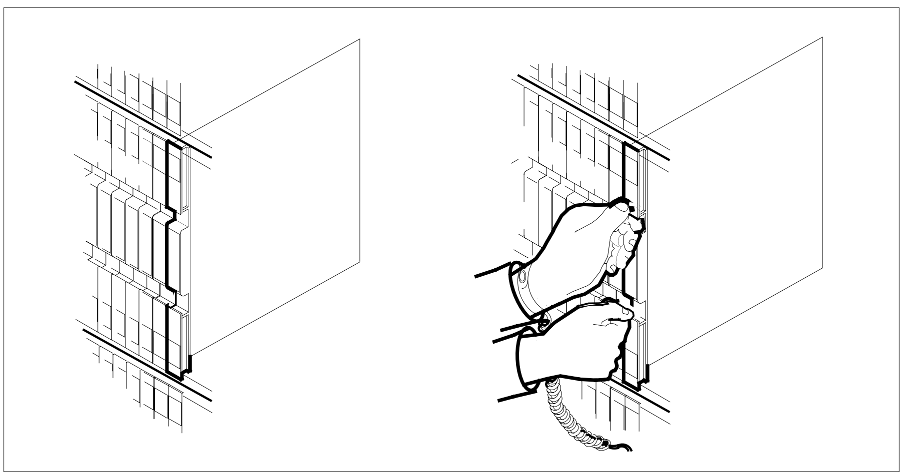
1

> **WARNING**
> **Equipment damage**
> Take the following precautions when removing or inserting a card:
> 1. Do not apply direct pressure to the components.
> 2. Do not force the cards into the slots.

> **WARNING**
> **Static electricity damage**
> Before removing any cards, put on a wrist strap and connect it to the wrist strap grounding point on the left side of the modular supervisory panel (MSP). This protects the equipment against damage caused by static electricity.

Put on a wrist strap.

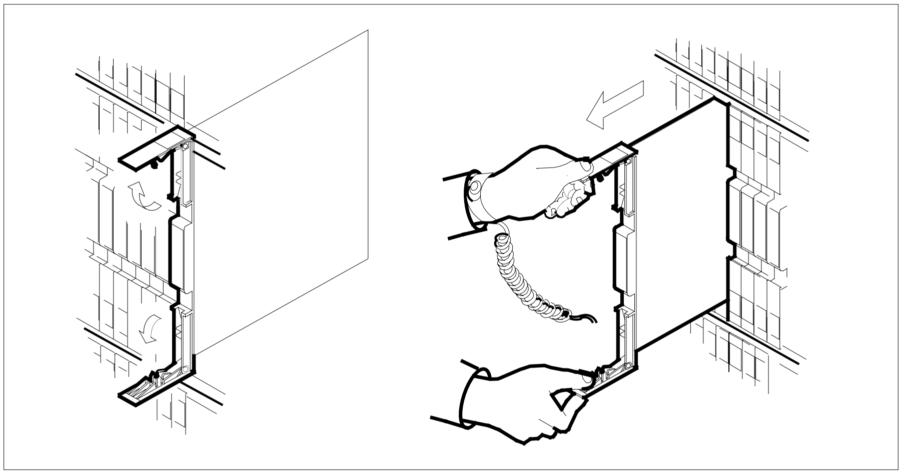
2 Locate the card to be removed on the appropriate shelf.



3 Open the locking levers on the faulty card. The top locking lever opens up and the bottom locking lever opens down.

Gently pull the card toward you until it clears the shelf.

Removing and inserting cards in an SMA2 (continued)



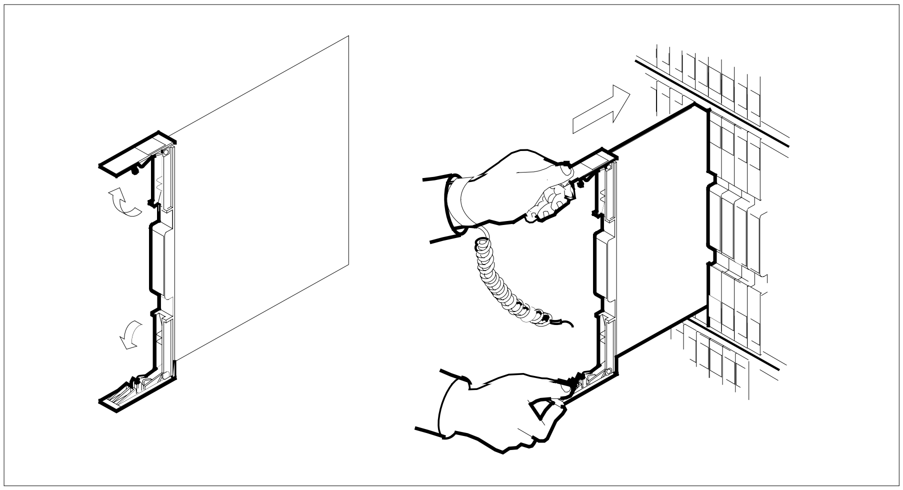
4 Place the card you have removed in an electrostatic discharge (ESD) protective container.

5 Ensure the replacement card has the same PEC, including suffix, as the card you just removed.

6 Visually inspect the replacement card for damage. If damage is found, return the card and obtain another replacement card. Send any damaged card for repair according to local procedure.

7 Ensure that all the DIP switch settings are the same as those on the card you just removed.

8 Open the locking levers on the replacement card. Align the card with the slots in the shelf and gently slide the card into the shelf.

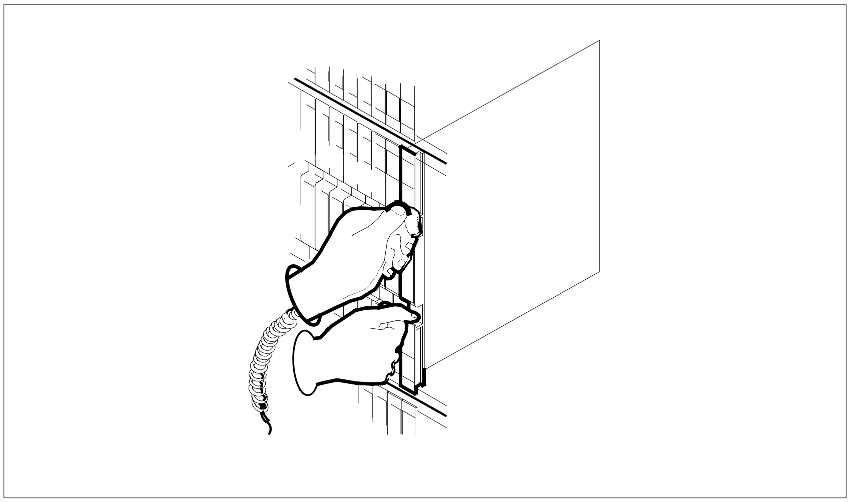


9 Seat and lock the card.

- **a** Using your fingers or thumbs, push on the upper and lower edges of the faceplate to ensure that the card is fully seated in the shelf.

Removing and inserting cards in an SMA2 (end)

b Close the locking levers.



10 You have successfully completed this common procedure. Return to the main procedure that sent you to this procedure and continue as directed.

Manually busying SMA2 C-side links

Application

Use this procedure to remove from service C-side links between an XPM and the network. This procedure is used for both junctored networks (JNET) and enhanced networks (ENET).

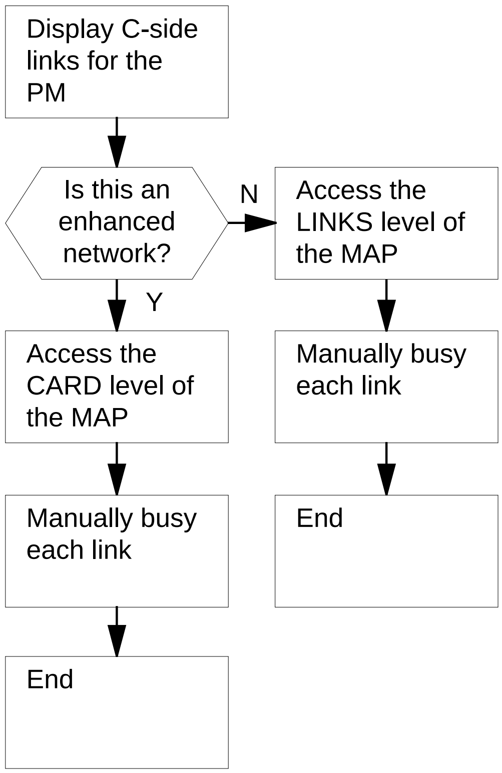
This procedure assumes that the PM is posted and available for query. Instructions in the main procedure direct you to re-post the PM after you have completed this common procedure.

Action

The following flowchart is only a summary of the procedure. To perform this procedure, use the instructions in the step-action procedure that follows the flowchart.

Manually busying SMA2 C-side links (continued)

Summary of Manually busying SMA2 C-side links



This flowchart summarizes the procedure.

Use the instructions in the procedure that follows this flowchart to perform the procedure.

Manually busying SMA2 C-side links (continued)

Manually busying SMA2 C-side links

CAUTION
Loss of service.
Proceed only if you have been directed here from a step in a maintenance procedure. This procedure removes from service C-side links between the Series II PM and the network. Calls may be dropped.

At the MAP terminal

1 Display a list of C-side links by typing

>TRNSL C

and pressing the Enter key.

Example #1 of a MAP response:

```
Link  0: NET 0  1 18;Cap MS;Status:OK   ;MsgCond:OPN,Unrestrict
Link  1: NET 1  1 18;Cap MS;Status:OK   ;MsgCond:OPN,Unrestrict
Link  2: NET 0  1 22;Cap  S;Status:OK
Link  3: NET 1  1 22;Cap  S;Status:OK
Link  4: NET 0  1 26;Cap MS;Status:OK   ;MsgCond:OPN,Restrict
Link  5: NET 1  1 26;Cap MS;Status:OK   ;MsgCond:OPN,Restrict
Link  6: NET 0  1 30;Cap  S;Status:OK
Link  7: NET 1  1 30;Cap  S;Status:OK
```

Example #2 of a MAP response:

```
Link  0: ENET 0  0 32 01  0;Cap MS;Status:OK   ;MsgCond:OPN,Restrict
Link  1: ENET 1  0 32 01  0;Cap MS;Status:OK   ;MsgCond:OPN,Restrict
Link  2: ENET 0  0 32 01  1;Cap  S;Status:OK
Link  3: ENET 1  0 32 01  1;Cap  S;Status:OK
Link  4: ENET 0  0 32 01  2;Cap MS;Status:OK   ;MsgCond:OPN,Unrestrict
Link  5: ENET 1  0 32 01  2;Cap MS;Status:OK   ;MsgCond:OPN,Unrestrict
Link  6: ENET 0  0 32 01  3;Cap  S;Status:OK
Link  7: ENET 1  0 32 01  3;Cap  S;Status:OK
```

If the network is a	Do
junctor network (JNET)	step 2
enhanced network (ENET)	step 7

2 Record the network plane, pair, and link for each C-side link for the XPM shelf associated with the card you are replacing.

Note 1: C-side links for network plane 0 are connected to the shelf for PM unit 0; C-side links for network plane 1 are connected to the shelf for PM unit 1. All C-side links interface to the active PM unit.

Note 2: The network plane, pair, and link are listed in columns 4, 5, and 6 of the response to a TRNSL command at the PM level, as shown in

Manually busying SMA2 C-side links (continued)

Example #1 of a MAP response: in step 1. For example, C-side link 7 is on network plane 1, pair 1, link 30.

3 Access the NET level of the MAP display by typing

>NET

and pressing the Enter key.

Example of a MAP display:

```
Net                    11111  11111  22222  22222  33
 Plane  01234  56789  01234  56789  01234  56789  01
   0    L..
   1    ...
```

4 Access the LINKS level of the MAP display by typing

>LINKS pair_no

and pressing the Enter key.

where

pair_no
is the number of the pair (0 to 31) to which the XPM C-side links areconnected

Example of a MAP display:

```
Net                    11111  11111  22222  22222  33
 Plane  01234  56789  01234  56789  01234  56789  01
   0    L..
   1    ...
Net   1  Links               11   1111   1111   2222   2222   2233
       Plane   0123   4567   8901   2345   6789   0123   4567   8901
         0     ....   ....   ..P.   ....   .P..   .P..   .P..   .P..
         1     ....   ....   ..P.   ....   .P..   .P..   .P..   .P..
         Links  3333   3333   4444   4444   4455   5555   5555   6666
        Plane   2345   6789   0123   4567   8901   2345   6789   0123
         0      .P..   .P..   .P..   .P..   ..P.   ..-.   ..-.   ..-.
         1      .P..   .P..   .P..   .P..   ..P.   ..-.   ..-.   ..-.
```

5 Busy one of the links you recorded in step 2 by typing

>BSY plane_no link_no

and pressing the Enter key.

where

plane_no
is the number of the plane for the link (0 or 1)

link_no
is the link number (0 to 63)

Example of a MAP response:

```
BSY 0 30
OK
```

Manually busying SMA2 C-side links (continued)

6 Repeat step 5 for all C-side links for the XPM unit you are working on.

Go to step 13.

7 Record the network plane, shelf, card, and link for the C-side links for the XPM shelf associated with the card you are replacing.

Note 1: C-side links for network plane 0 are connected to the shelf for PM unit 0; C-side links for network plane 1 are connected to the shelf for PM unit 1. All C-side links interface to the active PM unit.

Note 2: The network plane, shelf, card, and link are listed in columns 4, 5, 6, and 7 of the response to a TRNSL command at the PM level, as shown in *Example #2 of a MAP response:* in step 1. For example, C-side link 7 is on network plane 1, shelf 0, card 32, and link 1.

8 Access the NET level of the MAP display by typing

>NET

and pressing the Enter key.

Example of a MAP display:

```
ENET     System   Matrix  Shelf 0 1 2 3
 Plane 0 CSLink     .           F - - -
 Plane 1 CSLink     .           F - - -

ENET:
```

9 Access the SHELF level of the MAP display by typing

>SHELF shelf_no

and pressing the Enter key.

where

shelf_no
is the number of the shelf (0 to 7) to which the XPM C-side links areconnected

Example of a MAP display:

```
ENET     System   Matrix  Shelf 0 1 2 3
 Plane 0 CSLink     .           F - - -
 Plane 1 CSLink     .           F - - -

SHELF 00  Slot         1111111 11122222 22222333 333333
            123456 78 90123456 78901234 56789012 345678
Plane 0    .  .   IF  ...---- -------- ----.... .  .
Plane 1    .  .   IF  ...---- -------- ----.... .  .
```

10 Access the CARD level of the MAP display by typing

>CARD card_no

and pressing the Enter key.

where

card_no
is the number of the card (1 to 38) to which the XPM C-side links areconnected

Manually busying SMA2 C-side links (end)

Example of a MAP display:

```
ENET     System   Matrix  Shelf 0 1 2 3
 Plane 0 CSLink     .           F - - -
 Plane 1 CSLink     .           F - - -

SHELF 00  Slot         1111111 11122222 22222333 333333
            123456 78 90123456 78901234 56789012 345678
Plane 0    .  .   IF  ....---- -------- ----.... .  .
Plane 1    .  .   IF  ....---- -------- ----.... .  .

CARD 32   Front:     Back:   DS-512 Links
          Xpt        I/F    0 1 2 3
 Plane 0   .          .     . . . -
 Plane 1   .          .     . . . -
```

11 Busy the link you recorded in step 7 by typing

>BSY plane_no LINK link_no

and pressing the Enter key.

where

plane_no
is the number of the plane (0 or 1) for the link

link_no
is the link number (0 to 18 for DS512) or (0 to 15 for DS30)

Example of a MAP response:

```
Request to MAN BUSY ENET Plane:0 Shelf:00 Slot:32 Link:01 submitted.
Request to MAN BUSY ENET Plane:0 Shelf:00 Slot:32 Link:01 passed.
```

If	Do
the links are DS30s and you have not manually busied all links	step 12
the links are DS30s and you have manually busied all links	step 13
the link is a DS512	step 13

12 Repeat step 11 for each DS30 link recorded in step 7.

13 You have completed this procedure. Return to the main procedure that sent you to this procedure and continue as directed.

12 SMA2 routine maintenance procedures

This section contains routine maintenance procedures for the Subscriber Carrier Module-100 Access second version (SMA2). These procedures describe tasks maintenance engineering and field maintenance personnel must perform at normal intervals.

Inspecting cooling unit filters
SMA2

Application

Use this procedure to inspect cooling unit filters in a

- cabinetized multi-vendor interface (CMVI)
- multi-vendor interface equipment frame (MVIE)
- multi-vendor double density frame (MVDD)

Interval

Perform this procedure in two week intervals.

Common procedures

There are no common procedures.

Action

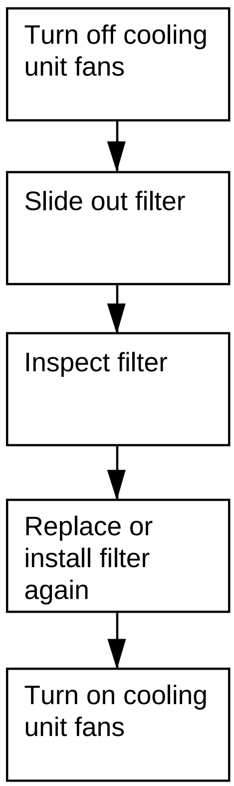
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedures. Follow the steps to perform the procedure.

Inspecting cooling unit filters
SMA2 (continued)

Summary of Inspecting cooling unit filters

This flowchart summarizes the procedure.

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

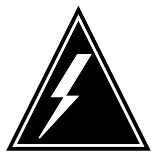


Inspecting cooling unit filters
SMA2 (continued)

Inspecting cooling unit filters

At the frame or cabinet

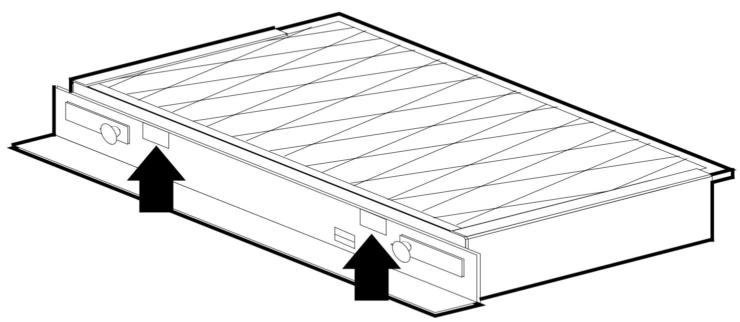
1



WARNING
To prevent overheating
Do not leave the cooling unit fans off for more than 30 min.

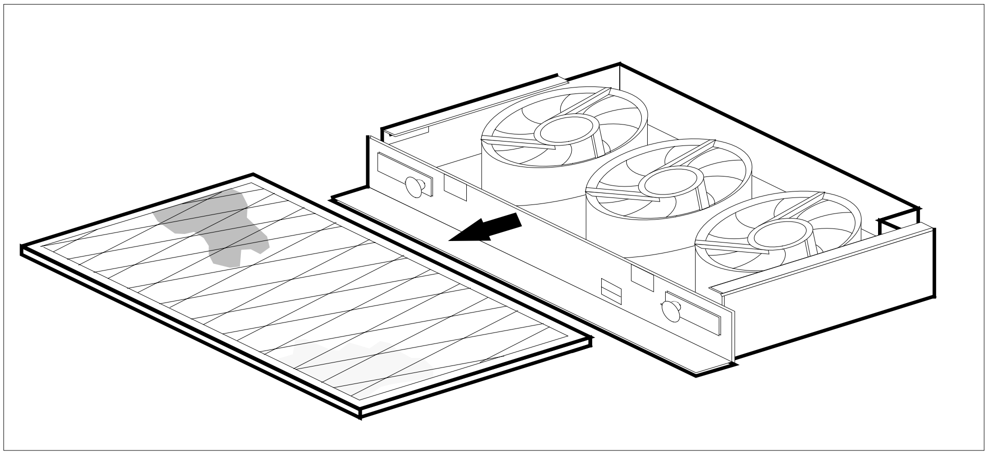
To make sure the cooling unit fans are off, place the power switch on the cooling unit in the off position.

2 Use the two filter access tabs to grip the filter.



3 Slide the filter from the cabinet.

Inspecting cooling unit filters
SMA2 (end)



If filter surfaces	Do
appear dirty	step 4
appear 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 SMA2

Application

Use this procedure to replace cooling unit filters in a

- cabinetized multi-vendor interface (CMVI)
- multi-vendor interface equipment frame (MVIE)
- multi-vendor double density frame (MVDD)

Interval

Perform this procedure at intervals of three months.

Common procedures

There are no common procedures.

Action

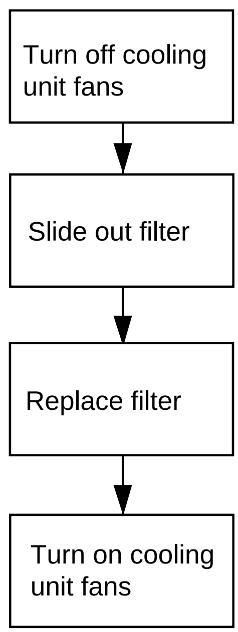
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Replacing cooling unit filters
SMA2 (continued)

Summary of Replacing cooling unit filters

This flowchart summarizes the procedure.

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

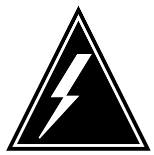


Replacing cooling unit filters
SMA2 (continued)

Replacing cooling unit filters

At the frame or cabinet

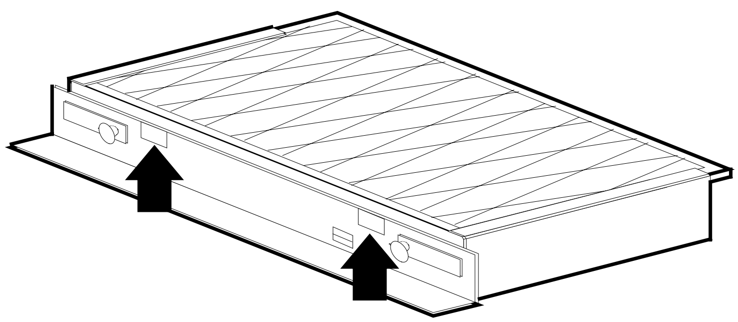
1



WARNING
To prevent overheating
Do not leave the cooling unit fans off for more than 30 min.

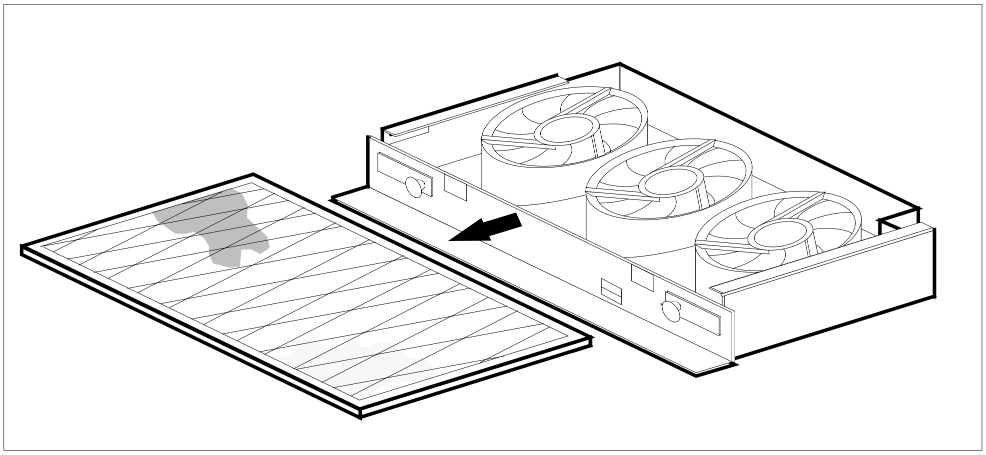
To make sure the cooling unit fans are OFF, place the power switch on the cooling unit in the off position.

2 Use the two filter access tabs to grip the filter.



3 Slide the filter out of the cabinet.

Replacing cooling unit filters
SMA2 (end)



If filter surfaces	Do
appear dirty	step 4
appear clean	step 5

4 Replace the filter with the same part number as the part number of the old unit.

5 Place the power switch on the cooling unit in the on position to power up the cooling unit.

6 The procedure is complete.

Cooling unit replacement
SMA2

Application

Use this procedure to replace a defective cooling unit (NTRX91AA) in the following:

- cabinetized multi-vendor interface (CMVI)
- multi-vendor interface equipment frame (MVIE)
- multi-vendor double density frame (MVDD)

Interval

Perform this procedure when a cooling unit fails to operate. An illuminated fan fail indicator on the front of the MSP indicates a defective cooling unit. Before you change the cooling unit, check for and correct any of the following:

- MSP fan card alarms
- blown fuses in the MSP card
- switch on the front of the cooling unit turned off
- damaged or disconnected fan power cable

Common procedures

There are no common procedures.

Action

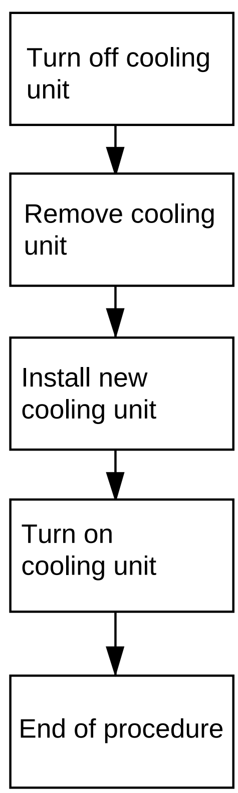
This procedure contains a summary flowchart and a list of steps. Use the flowchart to review the procedure. Follow the steps to perform the procedure.

Cooling unit replacement
SMA2 (continued)

Summary of cooling unit replacement

This flowchart summarizes the procedure.

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

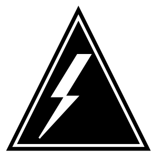


Cooling unit replacement
SMA2 (end)

Cooling unit replacement

At the frame or cabinet

1

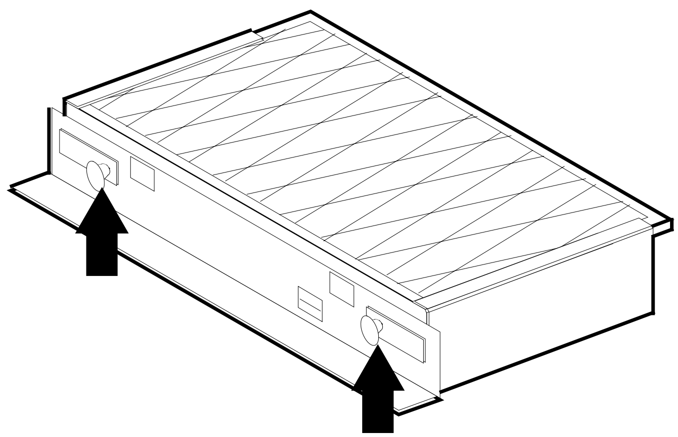


WARNING
To prevent overheating
Do not leave the cooling unit fans off for longer than 30 min.

Make sure to place the power switch on the cooling unit is in the OFF position to turn the cooling unit fans off.

2 Remove the trim panel mounting screws that hold the trim panels in place at the right and left of the frame. Remove the trim panels.

3 *Turn* the two knobs on the front panel of the cooling unit counterclockwise and slide the cooling unit out.



4 Replace with the same part number as the part number of the old unit. Slide in the new cooling unit until both sides lock into place.

5 Install the trim panels and trim panel mounting screws that you removed in step 2.

6 Place the power switch on the cooling unit in the ON position to power up the cooling unit.

7 This procedure is complete.

Power converter - testing power converter voltages SMA2

Application

Use this procedure to test power converter voltages for NTMX72AA power converters in a

- cabinetized multi-vendor interface (CMVI)
- multi-vendor interface equipment frame (MVIE)
- multi-vendor double density frame (MVDD)

Note: This procedure applies to the NTMX72AA power converter. The NTMX72AB does not have test points on the faceplate to support a test of power converter voltages.

Interval

Perform this procedure one time every 6 months.

Common procedures

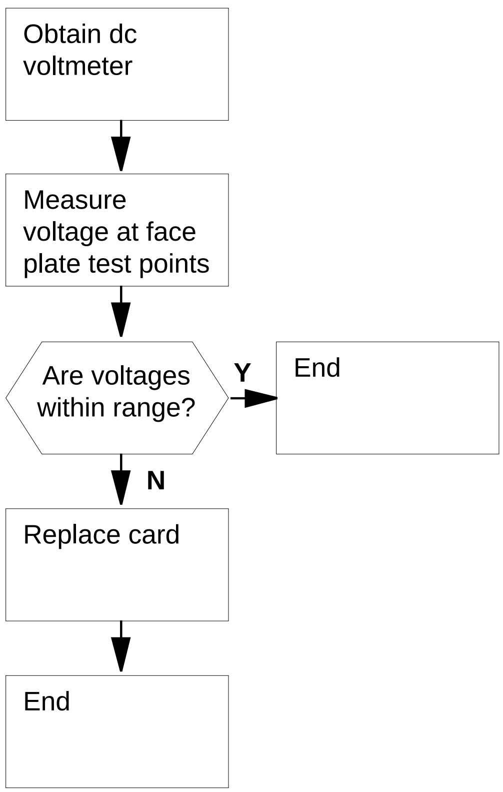
There are no common procedures.

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.

Power converter - testing power converter voltages
SMA2 (continued)

Summary of Power converter - testing power converter voltages



This flowchart summarizes the procedure.

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

Power converter - testing power converter voltages SMA2 (end)

Power converter - testing power converter voltages

At your current location

1 Obtain a dc voltmeter.

At the frame or cabinet

2 Use the voltmeter to measure the voltage at the test points on the faceplates. The faceplates refer to the faceplates of all NTMX72AA power converters in the cabinet or frame.

3 Compare the voltages measured in step 2 with the acceptable voltage ranges given in the following table (the voltage ranges are approximately 2% of the nominal values printed on the NTMX72AA faceplate).

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	Do
are within acceptable range	step 5
are not within acceptable range	step 4

4 Follow directions in *Card Replacement Procedures* to replace the NTMX72AA power converter. Return to this step.

5 This procedure is complete.

Wrist strap - Testing wrist strap grounding cords SMA2

Application

Use this procedure to test the level of resistance of the wrist strap grounding cords. The resistance of the wrist strap grounding cords must be low enough to allow static electricity to discharge from the body of the user. The resistance must be high enough to prevent electrocution of the user if a short circuit occurs in the equipment.

Interval

Perform this procedure one time each month.

Common procedures

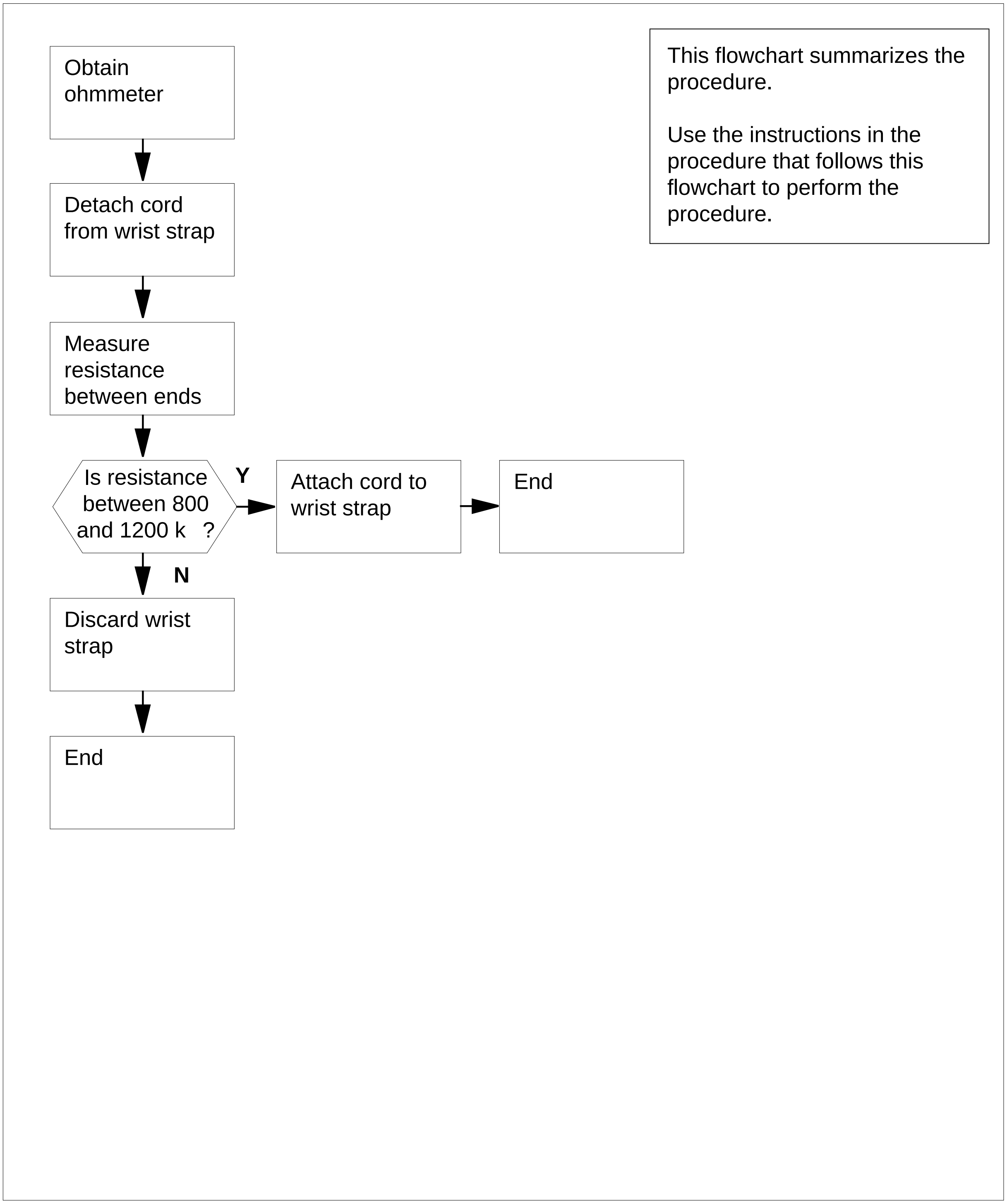
There are no common procedures.

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.

Wrist strap - Testing wrist strap grounding cords
SMA2 (continued)

Summary of Wrist strap - Testing wrist strap grounding cords



Wrist strap - Testing wrist strap grounding cords
SMA2 (end)

Wrist strap - Testing wrist strap grounding cords

At your current location

1 Obtain an ohmmeter.

2 Remove the grounding cord from the wrist strap.

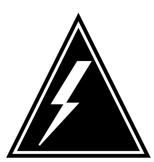
3 Use the ohmmeter to measure the resistance of the grounding cord. Refer to the instructions of the manufacturer for information on how to use this test equipment.

If resistance	Do
is between 800 kΩ ανδ 1200 κΩ	step 4
is not between 800 kΩ ανδ 1200 κΩ	step 5

4 The grounding cord and wrist strap assembly is safe to use. Assemble the wrist strap to the grounding cord. Go to Step 6.

5

DANGER
Risk of electric shock
The grounding cord is safe to use only if the level of resistance of the wrist strap measures higher than 800 kΩ. A lower resistance exposes the user to the risk of electrocution if equipment short-circuits while the user wears the wrist strap.



WARNING
Risk of equipment damage
A grounding cord that has a resistance higher than 1200 kΩ cannot conduct static charges to ground correctly. The cord does not protect sensitive electronic equipment against the buildup of static charges that damage this equipment.

Discard the whole assembly. *Do not attempt to use the assembly.*

6 This procedure is complete.

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DMS-100 Family

Expanded Subscriber Carrier Module-100 Access

Maintenance Manual

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NORTEL NETWORKS

How the world shares ideas.