Critical Release Notice

Publication number: 297-5001-549
Publication release: Standard 07.04

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

Bookmarks used in this NTP highlight the changes between the baseline NTP and the current release. The bookmarks provided are color-coded to identify release-specific content changes. NTP volumes that do not contain bookmarks indicate that the baseline NTP remains unchanged and is valid for the current release.

Bookmark Color Legend

Black: Applies to new or modified content for the baseline NTP that is valid through the current release.

Red: Applies to new or modified content for NA017/ISN04 (TDM) that is valid through the current release.

Blue: Applies to new or modified content for NA018 (SN05 DMS)/ISN05 (TDM) that is valid through the current release.

Green: Applies to new or modified content for SN06 (DMS)/ISN06 (TDM) that is valid through the current release.

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

Publication History

March 2004

Standard release 07.04 for software release SN06 (DMS) and ISN06 (TDM).

Change of phone number from 1-800-684-2273 to 1-877-662-5669, Option 4 + 1.

297-5001-549

DMS-100 Family

DMS SuperNode and DMS SuperNode SE Message Switch

Maintenance Guide

BASE10 Standard 07.03 April 1999

NORTEL

NORTHERN TELECOM

DMS-100 Family

DMS SuperNode and DMS SuperNode SE Message Switch

Maintenance Guide

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BASE10 Standard 07.03

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- Removed BCSMON information and inserted DMSMON information. (chapter 7)

August 1996

BASE07 Standard 06.01

- Revised the ”IOAU112 and MS104 log descriptions” (Chapter 8) to include information associated with the Critical REx test disable feature.

- Revised the ”RExByp alarm clearing procedure” (Chapter 9) to include information associated with the Critical REx test disable feature.

April 1995

CSP04 Standard 05.01

Added feature information to the following chapters:

- “Cards and paddle boards”
- “User interface and commands”

January 1995

CSP03 Preliminary 04.01

Added feature information to the following chapters:

- “Preventive maintenance strategies”
- “Logs”
- “Troubleshooting charts”
- “Advanced troublshooting procedures”

March 1994

CSP02 Preliminary 03.01

CSP02 is a temporary name that identifies a preliminary release of post-BCS36 NTPs.

Added feature information to the following chapters:

- “Overview”
- “Cards”
- “Troubleshooting charts”
- “Advanced troubleshooting procedures”
    - — “Troubleshooting an MS clock major alarm” section

December 1993

BCS36 Standard 02.02

Completed the sections that are not complete for the Gate two release. Added the following sections based on designer review:

- “MS104 logs”
- “MSL100 logs”

- “Troubleshooting an MaxPt alarm”
- “Troubleshooting an MSpair alarm”
- “Troubleshooting T-bus routing alarms”
- “Troubleshooting resource info logs”
- “Troubleshooting MSP logs”

September 1993

BCS36 Preliminary 02.01

Added the following chapters:

- “Trouble isolation”
- “Troubleshooting chart”
- “Advanced Troubleshooting procedures”

Added information to all other chapters based on designer review and feature updates.

March 1993

BCS35 Preliminary 01.01 first release of document

Contents

About this document

This document provides advanced maintenance and troubleshooting information for the DMS SuperNode and DMS SuperNode SE message switch. The audience for this document is advanced maintenance personnel.

When to use this document

Numbers indicate the version and issue of the document. An example is 01.01.

The first two digits indicate the version. The version number increases each time the user updates the document to support a new software release. For example, the first release of a document is 01.01. In the following 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 user revises the document and releases the document in the *same* software release cycle. For example, the second release of a document in the same software release cycle is 01.02.

This document is written for all DMS-100 Family offices. More than one version of this document can exist. Determine if you have the current version of this document and how you must organize documentation for your product. Check the release information in *Product Documentation Directory*, 297-8991-001 to determine this information.

References in this document

This document refers to the following documents:

- *Alarm and Performance Monitoring Procedures*
- *Card Replacement Procedures*
- *Log Report Reference Manual*
- *Operational Measurements Reference Manual*
- *Routine Maintenance Procedures*
- *Translations Guide*
- *DMS-100 Family Commands Reference Manual*, 297-1001-822

Overview

This chapter provides an summary of the DMS SuperNode (SN) and the DMS SuperNode SE (SNSE) switches and the architecture of the message switch (MS).

This chapter contains the following sections:

- "DMS SuperNode and SuperNode SE system architecture" on page 1-1 describes SN and SNSE system architecture.
- "DMS SuperNode and SuperNode SE cabinet layouts" on page 1-4 illustrates the SN and SNSE cabinet layouts.
- "DMS SuperNode and SuperNode SE message switch architecture" on page 1-6 describes SN and SNSE MS architecture.
- "DMS SuperNode and SuperNode SE message switch configurations" on page 1-10 describes SN and SNSE MS configurations.

DMS SuperNode and SuperNode SE system architecture

The SN and SNSE systems are shown in figures 1-1 and 1-2. The SN and SNSE systems share the following common components:

- DMS-core
- DMS-bus
- DMS-link

The DMS-core provides computing and data storage resources. The DMS-core contains a duplexed computing module (CM) and two system load modules (SLM).

The DMS-bus processes and distributes messages to nodes in the SN and SNSE switches. The DMS-bus consists of two load-sharing MSs.

The DMS-link allows the DMS-core and DMS-bus to communicate with each other and with other nodes in the SN and SNSE switches.

The SuperNode switch can be configured with a 64K or a 128K enhanced network (ENET). The ENET provides voice and data signal switching for nodes in the SuperNode SE switch and provides message routes to the MS.

The SuperNode SE switch can be configured with a 16K or a 32K enhanced network (ENET) and CCS7 link interface units (LIU7). The LIU7 provides CCS7 message processing.

Figure 1-1
SN system architecture

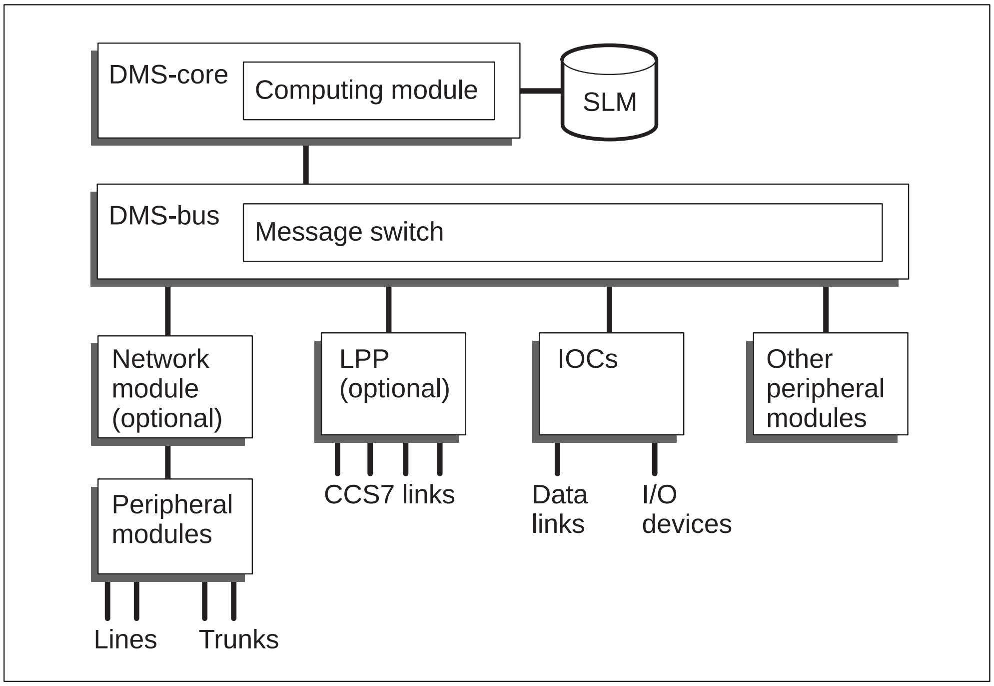
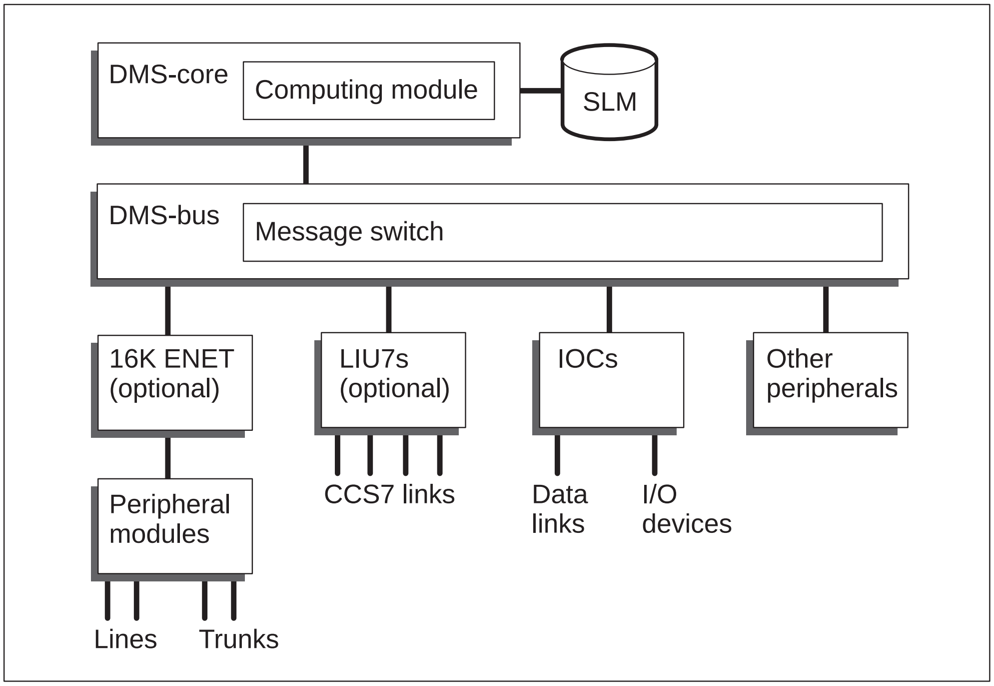


Figure 1-2
SNSE system architecture



DMS SuperNode and SuperNode SE cabinet layouts

In an SN cabinet, two shelves contain the MS. In an SNSE cabinet, a single shelf contains the MS. The SN cabinet is known as the dual plane combined core (DPCC) cabinet. The SNSE cabinet is called the SuperNode combined core (SCC) cabinet. Figures 1-3 and 1-4 illustrate SN and SNSE cabinet layouts.

Figure 1-3
SN DPCC cabinet layout

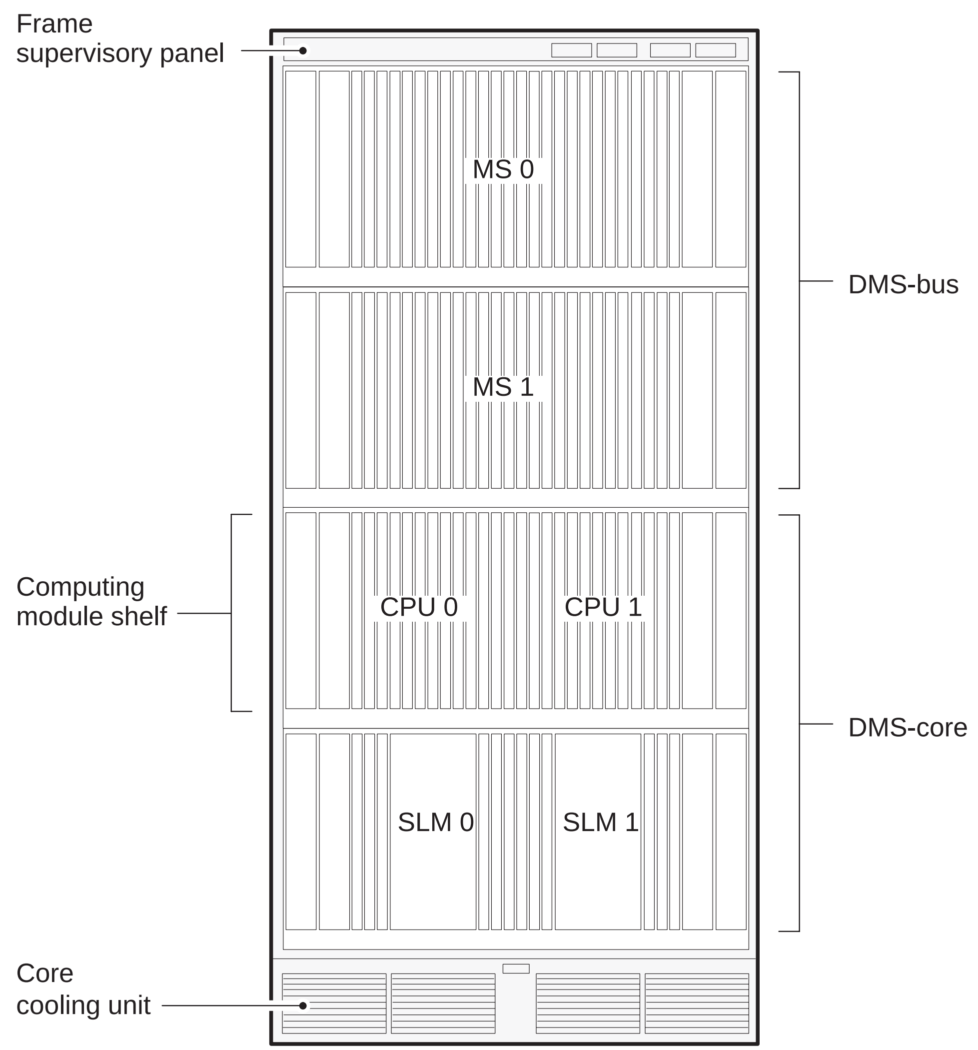
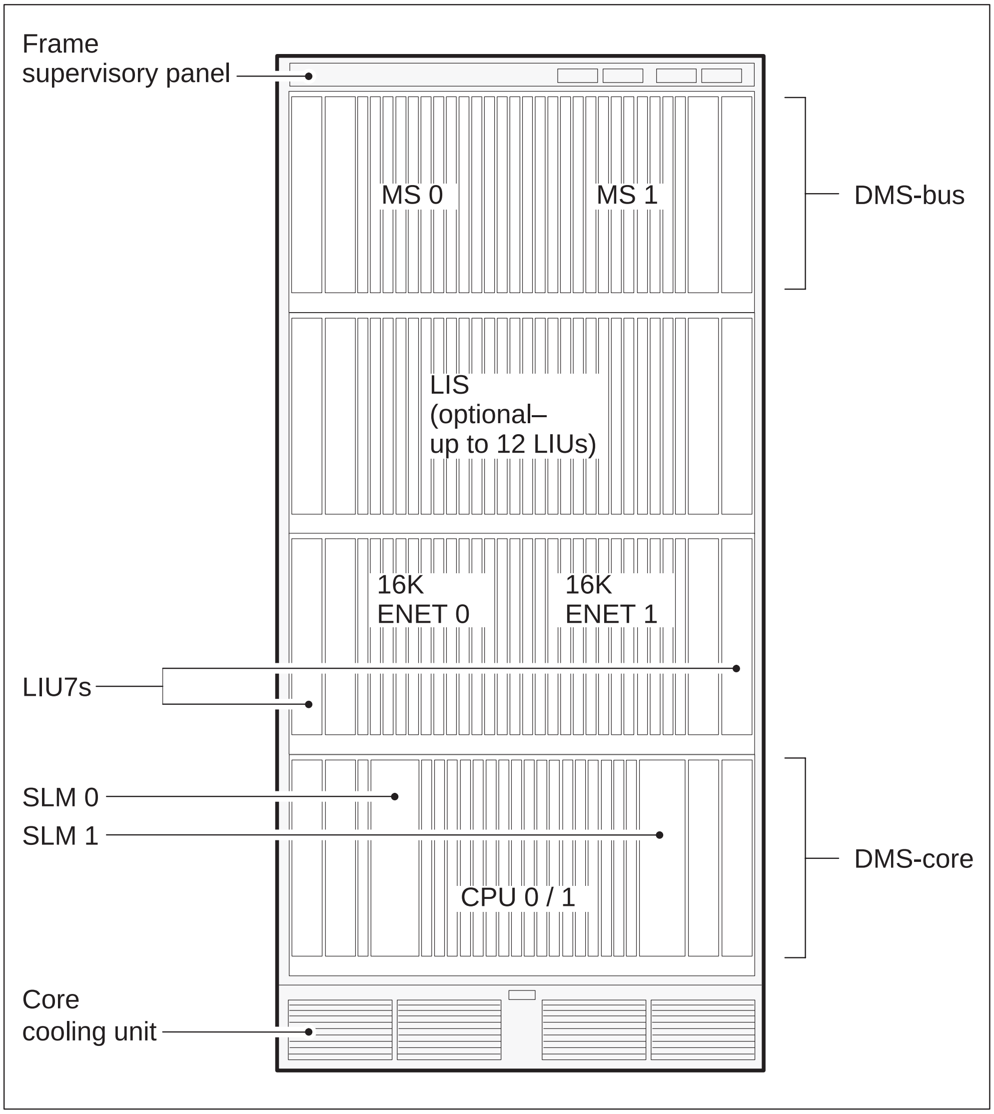


Figure 1-4
SNSE SCC cabinet layout

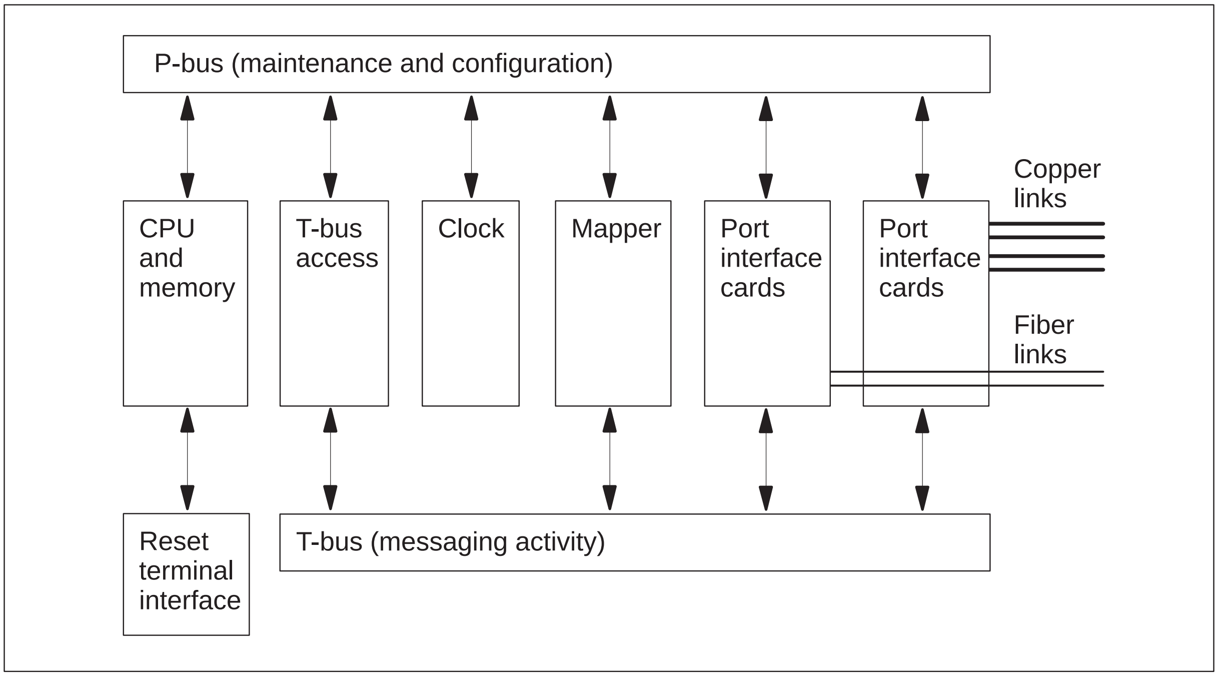


DMS SuperNode and SuperNode SE message switch architecture

The MS architecture is the same in the SN and SNSE switches. Figure 1-5 shows the MS. The MS contains the following subsystems:

- CPU and memory
- mapper
- port interfaces
- clock
- power

Figure 1-5
SN and SNSE MS subsystems



CPU and memory

The SN and SNSE MS processor card (NT9X13) processes software instructions. The CPU uses the asynchronous processor bus (P-bus) to communicate with other MS components for maintenance and control purposes. The CPU uses the transaction bus (T-bus) for port-to-port messaging.

The CPU uses the P-bus to perform the following functions:

- update mapper tables
- interact with the card maintenance units (CMU) on each port card for initialization, configuration, and maintenance
- interact with the CMU on the clock card to check system clock parameters
- read element-ID proms for inventory

The T-bus allows messages to access all ports in the MS.

The SN and SNSE MS memory provide two types of memory. The two types of memory are data store and program store. Data store memory provides temporary storage for data. Program store memory provides storage for the MS software. The SN and SNSE MS memory is normally configured on the processor card.

If the SN switch uses the NT9X13DD card, the switch configuration can also include an optional NT9X14 memory card. The processor or the collection of the processor and optional memory card is called the message switch processor (MSP). The MSP communicates with MS ports through the T-bus access card (9X52).

The NT9X26 card provides the reset terminal interface (RTIF) to the MSP. The NT9X26 card allows the MSP to receive reset signals directly from the CM.

The bus termination unit consists of two cards. The two cards are the NT9X52 and the NT9X49. The NT9X52 T-bus access card provides T-bus access and termination. The NT9X49 card provides P-bus termination. On SN switches, the cards are at opposite ends of the MS shelves. On SNSE switches, the NT9X52 cards in the two center slots of the MS shelf, and the NT9X49 cards are in the outer slots of the MS shelf.

Mapper

The SN and SNSE MS mapper (NT9X15) is a specialized memory card that converts logical port addresses to port addresses. The NT9X15 converts logical port addresses to port addresses for messages on the T-bus.

In real time, the mapper card looks at each message as the message is put on to the T-bus. The mapper card holds the T-bus cycle. The mapper card starts to translate the logical address to a physical address.

The mapper card takes the logical address from the message and translates the address into a card and port address. The mapper card uses information in the primary logical address table to perform the translation. If the logical route is available, and the card and the card's port are in service, the system allocates the route to the message. If the logical route is in use, or the card and port are not in service, the mapper chooses another route. The mapper chooses another route from the secondary logical address table. If the second logical route is in use or the card and port are not in service, the MS saves the message. The MS produces a log message that indicates this fault. The mapper also detects attempts to route messages before the system obtains routing information.

Port interfaces

The SN and SNSE MS port interfaces provide physical and protocol interfaces for both copper (DS30) and fiber (DS512 and SR128/256/512) links. All ports are independent.

The two specialized applications of port interfaces follow:

- inter-MS links
- CMIC links

Inter-MS links

Inter-MS links can reroute messages between MSs. You must provision Inter-MS links as a pair. Inter-MS links can use DS30 or DS512 links. The ports and paddle boards used must occupy the same slot positions on both MSs.

CMIC links

Computing module interface card (CMIC) links provide direct access from the CM to the MS. The CMIC links always use DS512 links.

Clock

The clock system in the SN and SNSE switches is fully redundant. Two clock systems, one in each MS, are present in the SN and the SNSE. One clock system is the master and the other is the slave. The two systems maintain frequency and phase synchronization. If a master clock system fails, the slave clock system automatically assumes the master role.

The NT9X53 clock cards produce signals at two frequencies. The system clock source is a nominal frequency of 10.24 MHz. The subsystem clock source is 16.384 MHz. Each frame pulses contains 8 KHz. The frame pulses are synchronous.

The JNET and the I/O controller (IOC) that use the DS512 links receive the system clock signal. The subsystem clock signal drives the MS T-bus. The CM, ENET, and application processors (AP) using the DS512 links receive the subsystem clock signal.

The NT9X54 provides the electrical interfaces for different clock signals. The types of clock signals include the following:

- analog external reference signals from atomic or loran-C clocks
- composite clock signals from a timing signal generator (TSG)
- DMS remote clock (Stratum 2 and 2.5)
- mate frame pulse

Stratum levels

A stratum level is a rating given to an oscillator to indicate the holdover accuracy of the oscillator. The highest level of accuracy is Stratum 1. The most accurate oscillators available, like atomic and loran, can receive this rating.

The following table shows the maximum acceptable drift for each stratum level. The numbers indicate how much of a complete cycle the oscillator drifts on every cycle. When the numbers are inverted, the numbers indicate the cycles required before the oscillator is out of synchronization by one full cycle.

Table 1-1
Drift accuracy for stratum ratings

	Stratum 1	Stratum 2	Stratum 2.5	Stratum 3
Amount of drift (per cycle)	1×10^{-11}	1.6×10^{-8}	6.2×10^{-8}	4.6×10^{-5}

Synchronization configurations

You can set up the MS clock systems in any of the following configurations.

- **Master internal** In a master internal office, the master clock is free running. The master clock is not synchronized to any external reference. Only signaling transfer points use this configuration.
- **Master external** In a master external office, the master clock synchronizes to an external reference clock by a phase lock loop (PLL). The system performs phase comparison between the master clock and the reference on the NT9X53 card. In this configuration, the clock source for the network is normally a Stratum 1.
- **Slave** In a slave office, the master clock synchronizes to an incoming T1 carrier (DS-1). The system performs phase comparison between the master clock and the reference at the peripheral module (PM).

Remote system clock function

This function improves the accuracy of the system clock. A remote oscillator shelf contains a Stratum 2 or 2.5 level oscillator on an NT3X16 card. The remote clock is not packaged in the SN or SNSE cabinet. The DMS continues to consider the remote clock internal.

With the NT9X53AA and AB clock cards, the system synchronizes the subsystem oscillator directly to the remote oscillator. If the link between the remote shelf and the NT9X53 breaks, the NT9X53 card loses the system oscillator.

With the NT9X53AC and AD clock cards, the system signal oscillator on the NT9X53 card maintains synchronization with the remote oscillator. If the link to the remote shelf breaks, the system oscillator on the NT9X53 can provide a stable reference to the subsystem oscillator.

Power

The SN and SNSE MS power converter cards provide +5 V dc (NT9X30) and –5 V dc (NT9X31) to the MS components.

DMS SuperNode and SuperNode SE message switch configuration

Figures 1-6 and 1-7 illustrate example SN and SNSE MS shelf layouts.

Figure 1-6
SN MS shelf layout

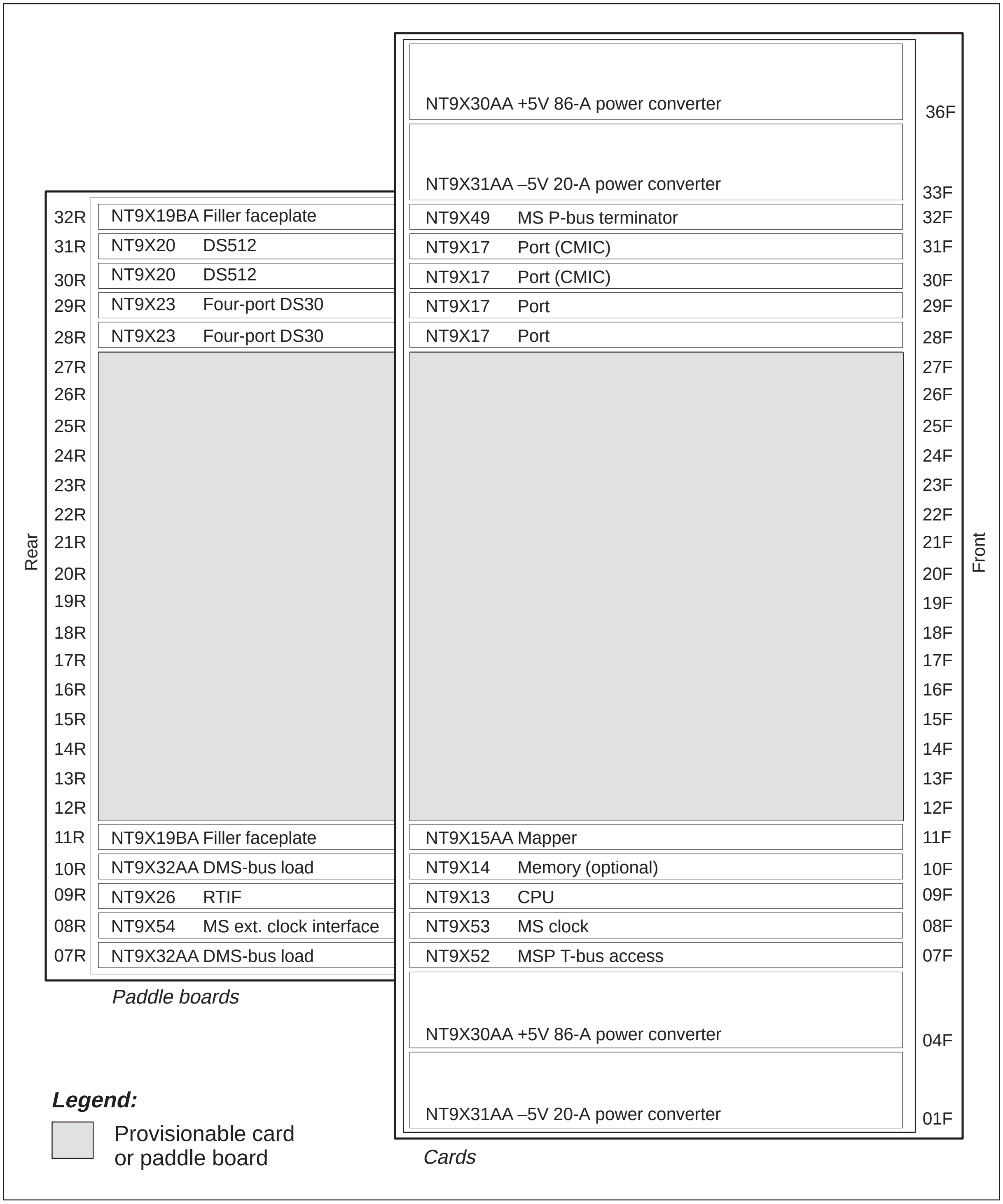
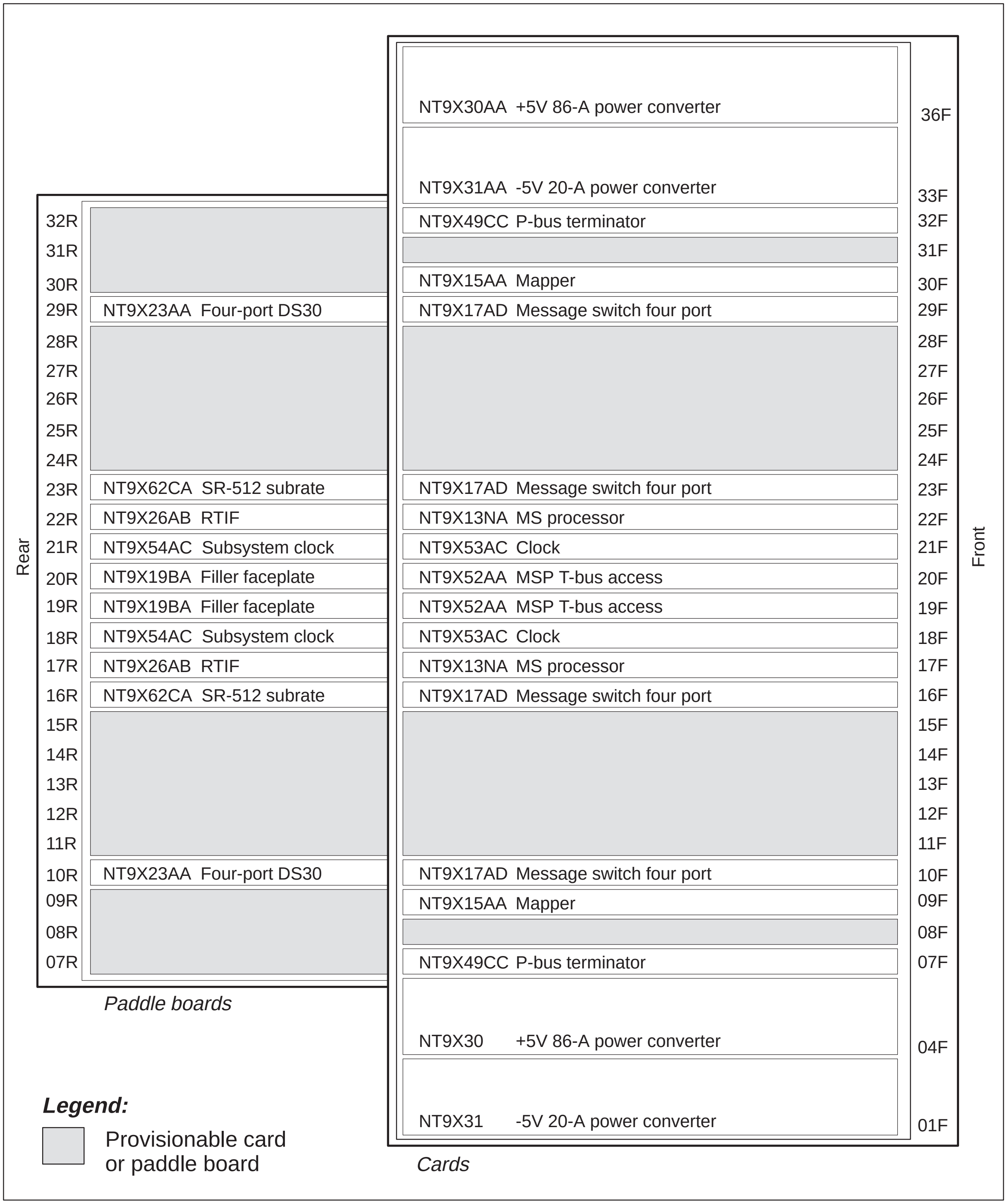


Figure 1-7
SNSE MS shelf layout



Preventive maintenance strategies

This chapter lists the preventive routine maintenance procedures performed by operating company personnel. This chapter describes the automatic maintenance activities of the DMS SuperNode (SN) and the DMS SuperNode SE (SNSE) message switch (MS).

This chapter contains the following sections:

- ”Routine maintenance procedures” lists the preventive maintenance procedures that apply to the SN and SNSE.
- ”Automatic maintenance” describes the system-run processes that detect, repair, and report problems.

Routine maintenance procedures

Routine procedures can prevent problems in the hardware and software of the switch if performed according to a schedule. The following procedures can affect switch operations.

The MS preventive maintenance procedures include the following:

- cleaning system load module (SLM) tape drive heads
- verifying and adjusting the time-of-day (TOD) clock
- testing wrist-strap grounding cords
- replacing cooling unit filters
- testing power converter voltages

For detailed instructions, refer to *Routine Maintenance Procedures*, 297-8xxx-546.

Automatic maintenance

The SN and SNSE switches continuously run diagnostic routines to make sure that no problems are present. The MS runs the following types of tests:

- routine exercise (REx) tests
- software audits

Routine exercise testing

The MS REx test performs a complete set of out-of-service tests on both MSs. The system REx (SREx) controller can initiate the MS REx test automatically. Operating compny personnel also can initiate the MS REx tests from the MS level MAP display. When the system executes a REx test the RExTst indicator appears under the MS header of the MTC level MAP display.

MS system routine exercise test

Datafill in table REXINTEN defines the schedule for automatic MS REx tests. The default schedule is a full REx test on each Tuesday and Wednesday on the slave MS. The system tests one plane (MS 0 or MS 1) on each day. On all other days, the system runs a base (partial) REx test. Alter the datafill in table REXINTEN to modify the schedule. Refer to the Customer Data Schema manual for your system for details on datafilling this table.

The SREx controller initiates an MS system REx test. A complete test executes the following activities:

- The MS REx test performs a stability check on the slave MS to make sure that the test can execute safely. If the stability requirements are not met, the REx test does not occur. The system raises the RExByp alarm. The system generates an MS104 REx bypassed log. The requirements for the stability check are as follows:
  - — a computing module (CM) or an MS dump is not in progress
  - — both MS nodes must be in service and stable. The MS nodes must not be returned to service from an out-of-service state recently
  - — all computing module interface card (CMIC) links are in service and stable
  - — when the MS node is taken out-of-service, the peripherals are not isolated
  - — a load operation of an MS card cannot be in progress
  - — an MS is not out of service because of a clock problem in the past 24 h
  - — did not execute any type of restart in the last 30 min
- The system queries the MS hardware to determine if there are any cards with release codes below the baseline. If the system finds a card with an invalid release code, the system generates an MS105 log. The test continues.
- The system performs the REx test on the slave MS. The REx test contains the following stages:

- out-of-band reset of the MS
- out-of-service clock test. If a clock test fails, or passes with in-service trouble, the system generates an MS248 log.
- out-of-band reset of the MS
- out-of-band (OOB) channel reset tests. If an OOB channel reset test fails, or passes with in-service trouble, the system generates an MS104 log. The MS104 log specifies the reason the test fails.
- REx tests. If a REx test fails, or passes with in-service trouble, the system generates an MS104 log. The system generates an MS104 log that specifies the failure reason.
- in-band channel reset tests. If an in-band channel reset test fails, or passes with in-service trouble, the system generates an MS104 log. The system generates an MS104 log that specifies the reason the test fails.

• The Master clock becomes the slave and the slave clock becomes the master. The MS REx test runs on the slave MS only. This switch makes sure that the system tests both MSs. The system generates two MS104 logs to indicate the switch: MS104 (MS acquired clock mastership) and MS104 (MS became slave). The switch does not occur if the system detects that the logs switched in the past 24 h because of non-REx activity. Text in the MS104 log can indicate this condition.

After the clocks switch, the system repeats the stability check, hardware query, and MS REx test on the other MS.

The REx test fails and the node remains system busy if:

- the test finds any system cards that have faults
- more than 30% of the interface cards fail
- 30% of the interface cards fail in a single stage of testing.

When the whole test is complete, the system generates another log to indicate the success or failure of the test. If the test passes, the system generates an MS104 REx passed log. If the test fails, the system generates an MS103 REx failure log and raises a RExFlt alarm.

MS manual routine exercise test

A manual REx test executes only the tests described in the MS REx test section for the MS system REx. The system performs the tests on the specified MS. The MS must be manual busy for the test to begin.

Software audits

The three types of MS maintenance audits are communication, data, and hardware. The MS maintenance software consists of local and central maintenance. Local maintenance is the maintenance activity that originates in the MS node. Central maintenance is the part of the CM software that maintains the MS node.

Communication audits

The communication audit processes check the integrity of the connection between the CM and the in-service MS nodes.

The sanity poll is the communication audit process that occurs most often. The sanity poll is also the highest priority communication audit process. The central MS uses addressing to route the messages over both CMIC links every second. The central MS waits for replies from the local MS. If the local MS fails to reply three consecutive times over a single link, the process initiates an in-service test. The in-service test diagnoses the reason for the failure. If the MS fails to reply three consecutive times on both links, the process takes the MS node out of service. The process generates an MS103 log report.

The communication audit process initiates an FTS-routed message exchange every 20 s. This FTS-routed message exchange checks that the MS node connects to the CM. The communication audit process expects a reply in 5 s. After the local MS sends ten messages without receiving a reply. The local MS audit process initiates an MS cold restart. An MS cold restart prompts the central MS maintenance to take the node out of service. The local MS generates an MS103 log report.

The I/O audit process initiates the central communication audit process. The I/O process is external to the MS maintenance system. The system initiates an FTS-routed message exchange one time each minute to check communication between the central and local MS maintenance systems. The I/O audit process expects a reply in 10 s. If the local MS fails two attempts to reply, the central audit process takes the MS node out of service. The process generates an MS103 log.

Table 2-1 lists the communication audit processes, together with some of the characteristics of the communication audit processes.

Table 2-1
Communication audit processes

Name	Frequency	Criteria for failure	Action on failure
Sanity poll	1 s (default, although the value can be datafilled)	Three consecutive attempts with no reply on both CMICs	Take MS node out of service
Local communication audit	20 s	Ten consecutive attempts with no reply within 15 s	Local MS restart
Central communication audit	1 min (approx.)	Two consecutive attempts with no reply within 10 s	Take MS node out of service

Data audits

When the MS node is out of service, the audit process attempts to return the MS to service. If the node does not return to service on the first attempt, the audit process attempts more severe actions. The most severe action attempted is a reload. To perform an automatic reload, the image table of contents (ITOC) for the primary autoload device must contain a correct load. When the system reloads the MS, the audit process returns the node to service.

When an MS node is in service, the central and local MSs exchange configuration and status data. This exchange of configuration and status data makes sure of the integrity of the MS databases. This information exchange occurs after every fifth central communication audit.

The system audits the databases in order from highest to lowest element. The system must complete audits of owner resources before the system can audit the dependent resources. An example of an owner resource is the node that owns its cards. Another example is the chain that owns its links of the chain. The system must complete audits of owner resources. If the audit discovers a mismatch and initiates a maintenance action, on an owner resource, the system does not audit the dependents of the owner. The system does not audit the dependents of the owner until the next audit cycle.

The system audits the elements in the order that follows:

- node data verification
- chain data verification
- chain card data verification
- channelized link data verification
- channelized port data verification
- stand alone card data verification
- unchannelized port data verification

The audit process performs the following functions for each element:

- returns system-busy elements to service
- tests in-service elements to find data mismatches
- tries to correct any data mismatches

One central MS audit process handles integrated link maintenance (ILM) maintained MS link and port resources. The process compares data from the central MS owner chain, the central MS link, and the ILM links. If a mismatch occurs, the process attempts to correct the problem. The process initiates a central MS link FSM to perform the required busy or return-to-service operation. Local ILM audit execution determines how often the system runs this audit.

Table 2-2 lists the data audit processes and some of the characteristics of the data audit processes.

Table 2-2
Data audit processes

Name	Frequency	Criteria for failure	Action on failure
Out-of-service MS node recovery	1 min (approx)	n/a	n/a
In-service MS data audit	5 min (approx)	Mismatched configuration or status data	Take element out of service
Central MS ILM link and port status audit	Defined by ILM	Mismatched status data	Take element out of service

Hardware audits

The three types of hardware audits are:

- background audit
- inventory audit
- local card audit

The background audit is a low priority process that runs every 25 ms. Every cycle, the system executes a memory march test on a part of MS memory, like processor cards, memory cards, and mapper cards. The system executes the memory march test to detect ECC errors. If the system finds an error, the memory parity error counter increases. The system reports the error to the correct local MS card transactor. Every audit cycle, the system tests a different area of memory. The complete memory test takes approximately 15 min.

Every 40 cycles, the system clears the memory parity error counters.

Every 2400 (40×60) cycles, the system compares the hardware mapper routing table on the MS mapper card to software in local MS memory. When the user updates the hardware table to match the software table, the system corrects mismatches. The system reports corrections are to the local MS mapper card transactor.

Every 36 000 (40×60×15) cycles, the system sends a message to each local MS card transactor to clear any hit counts that accumulate. The system clears any accumulated hit counts that are below threshold.

A local MS shelf inventory audit process runs every 10 ms to check access to ID PROM memory on all MS cards. A trap occurs if the process fails to read the ID PROM correctly. If the card is an interface card, the system takes the card out of service. If the card is a system card, the system takes the node out of service. Logs that associate with the node are MS103, MS153, and MS263.

The local card hardware audit runs on every tenth local MS communication audit. This audit performs a hardware check on all MS cards.

Local MS maintenance provides the following functions for use by local ILM link and port audits:

- Compares local MS and ILM configuration data for a port. Reports any mismatches to ILM.
- Fetches the local MS status data for the specified link or port, for comparison by ILM.

Table 2-3 lists the hardware audit processes and some of the characteristics of the hardware audit processes.

Table 2-3
Hardware audit processes

Name	Frequency	Criteria for failure	Action on failure
Local MS background audit			
—MS ECC memory check	25 ms	ECC error	Report error to local MS card transactor
—MS memory parity error counters reset	1 s	n/a	n/a
—MS mapper route table audit	1 min	Mismatch between software and hardware tables	Correct hardware and report error to local MS mapper card transactor
—MS hit counters reset	15 min	n/a	n/a
MS shelf inventory audit	10 ms	Failure to read ID PROM on a card	Report error to local MS card transactor, take card or node out of service
MS card hardware audit	3.5 min (approx)	Absent or defective card	Report error to local MS card transactor, take card out of service
Local MS ILM link or port configuration audit	Defined by ILM	Mismatch between ILM data and configuration of MS link or port	Report error to local ILM controller
Local MS ILM link or port resource status audit	Defined by ILM	n/a	n/a

Indications of automatic test results

The following indicators describe the results of automatic maintenance tests:

- alarms

- logs
- operational measurements (OM)

Operating company personnel can monitor these indicators for directions and patterns. Operating company personnel can monitor these indicators to detect and resolve minor problems before these problems become major problems.

For detailed information about how to clear alarms, refer to *Alarm and Performance Monitoring Procedures*, and the “Troubleshooting charts” chapter of this document. For more information about logs, refer to the *Log Report Reference Manual* and the “Logs” chapter of this document. For more information about the OMs, refer to the *Operational Measurements Reference Manual*, and the “Operational measurements chapter” of this document.

Logs

This chapter describes logs related to the DMS SuperNode (SN) and DMS SuperNode SE (SNSE) message switch (MS).

Logs are a primary source of information for monitoring the components of the MS. Some logs can isolate a problem to a single card. Other logs can help identify problems that do not relate to a single card.

DMS SuperNode and SuperNode SE MS-related logs

The following types of logs relate to the MS:

- input/output audit (IOAU)
- MS
- sync

The “Advanced troubleshooting procedures” chapter of this document provides detailed information on how to analyze the cause of difficult logs. For more information, refer to the *Log Report Reference Manual*.

Input/output audit logs

Input/output audit logs provide information related to I/O subsystem audits.

Table 3-1 lists the MS-related I/O audit logs and their triggers.

Table 3-1
SN and SNSE I/O audit logs

Name	Title	Trigger
IOAU112	INFO REX SCHEDULER NOTICE	A change to the system REx (SREX) controller schedule occurs. This log reports changes to the MS REx test schedule.

Message switch logs

The MS logs report information collected from the following sources:

- MS node
- MS cards
- chains
- channelized links
- ports
- channelized link ports
- inter-MS links
- inter-MS link ports

The system generates MS logs when any MS component changes state. These logs include:

- the reason for the state change
- notification of faults raised, cleared, or present
- the name of the resource that changed state
- an indication of the component the system connects to the other end of the resource.

Info logs report events that do not relate to state changes. For more information, refer to the “Advanced troubleshooting procedures” chapter of this document.

In addition to the logs listed in the following chart, the system also generates MS logs that relate to the F-bus (for SNSE only). The Common Channel Signaling 7 alarm clearing documents discuss these logs.

The following table lists the SN and SNSE MS logs and the triggers of the logs.

Table 3-2
SN and SNSE MS logs

Name	Title	Trigger
MS100	RTS NODE STATE CHANGE	An MS changed from manual busy or system busy to in service
MS101	MBSY NODE STATE CHANGE	An MS changed from in service to manual busy
MS102	MBSY NODE STATE CHANGE	An MS changed from system busy to manual busy
MS103	SYSB NODE STATE CHANGE	An MS changed from in service to system busy
MS104	INFO NODE	—MS REx test started, passed, passed with in-service trouble, failed, canceled, and bypassed —LOADMS operation started, completed, and failed —switch of MS clock mastership when slave clock acquired mastership and master clock becomes slave, or switch of mastership fails —recovery of an MS that is a computing module (CM) restart, audit action, or manual —DDM data sync of an MS failed during manual return to service, audit activity, or CM restart —audit recovery of a system-busy MS —patch mismatch between MS and CM —MS REx testing disabled by datafill in table REXSCHED

—continued—

Table 3-2
SN and SNSE MS logs (continued)

Name	Title	Trigger
MS105	INFO MS HW MONITOR	An MS card failed a release compatibility test
MS150	RTS CHAIN STATE CHANGE	A chain changed from manual busy or system busy to in service
MS151	MANB CHAIN STATE CHANGE	A chain changed from in service to manual busy
MS152	MANB CHAIN STATE CHANGE	A chain changed from system busy, C-side busy, or offline to manual busy
MS153	SYSB CHAIN STATE CHANGE	A chain changed from in service to system busy. All cards in the chain are system busy
MS154	SYSB CHAIN STATE CHANGE	A chain changed from C-side busy to system busy. All cards in the chain are system busy
MS155	CBSY CHAIN STATE CHANGE	A chain changed from system busy or manual busy to C-side busy
MS156	OFFL CHAIN STATE CHANGE	A chain changed from manual busy to offline. All cards in the chain are offline
MS157	INFO CHAIN	A soft fault on the chain raised or cleared
MS208	INFO FRNT CARD	A soft fault on the card raised or cleared
MS238	INFO BACK CARD	A soft fault on the paddle board raised or cleared.
MS248	INFO SYSTEM CARD	A soft fault on the card raises or clears.
MS260	RTS INTERFACE CARD STATE CHANGE	An interface card changed from manual busy or system busy to in service
MS261	MANB INTERFACE CARD STATE CHANGE	An interface card changed from in service to manual busy

—continued—

Table 3-2
SN and SNSE MS logs (continued)

Name	Title	Trigger
MS262	MANB INTERFACE CARD STATE CHANGE	An interface card changed from system busy, offline, or C-side busy to manual busy
MS263	SYSB INTERFACE CARD STATE CHANGE	An interface card changed from in service to system busy
MS264	SYSB INTERFACE CARD STATE CHANGE	An interface card changed from C-side busy to system busy
MS265	CBSY INTERFACE CARD STATE CHANGE	An interface card changed from system busy or manual busy to C-side busy
MS266	OFFL INTERFACE CARD STATE CHANGE	An interface card changed from manual busy to offline
MS267	INFO INTERFACE CARD	A soft fault on the card raised or cleared
MS277	INFO CHAIN CARD	A soft fault on the chain card raised or cleared
MS280	RTS CHNL LINK STATE CHANGE	A channelized link changes from manual busy or system busy to in service. When a channelized link changes to in service, the system attempts to return all the ports on the link to service
MS281	MANB CHNL LINK STATE CHANGE	A channelized link changes from in service to manual busy. When a channelized link changes to manual busy, all ports on the link change to manual busy
MS282	MANB CHNL LINK STATE CHANGE	A channelized link changes from system busy, C-side busy, or P-side busy to manual busy. When a channelized link changes to manual busy, all ports on the link change to manual busy

—continued—

Table 3-2
SN and SNSE MS logs (continued)

Name	Title	Trigger
MS283	SYSB CHNL LINK STATE CHANGE	A channelized link changes from in service to system busy. When a channelized link changes to system busy, all ports on the link change to system busy
MS284	SYSB CHNL LINK STATE CHANGE	A channelized link changed from either C-side busy or P-side busy to system busy. When a channelized link changes to system busy, all ports on the link change to system busy
MS285	CBSY CHNL LINK STATE CHANGE	A channelized link changed from either system busy or manual busy to C-side busy. The MS is out of service
MS286	PBSY CHNL LINK STATE CHANGE	A channelized link changed from system busy or manual busy to P-side busy
MS287	INFO CHNL LINK	A soft fault on the channelized link raised or cleared
MS300	RTS PORT STATE CHANGE	A port changed from system busy or manual busy to in service
MS301	MANB PORT STATE CHANGE	A port changed from in service to manual busy
MS302	MANB PORT STATE CHANGE	A port changed from system busy, C-side busy, or P-side busy to manual busy
MS303	SYSB PORT STATE CHANGE	A port changed from in service to system busy
MS304	SYSB PORT STATE CHANGE	A port changed from either P-side busy or C-side busy to system busy

—continued—

Table 3-2
SN and SNSE MS logs (continued)

Name	Title	Trigger
MS305	CBSY PORT STATE CHANGE	A port changed from system busy to C-side busy. Either the MS, an MS card, or both, are out of service
MS306	PBSY PORT STATE CHANGE	A port changed from system busy to P-side busy.
MS307	INFO PORT	A soft fault on the port raised or cleared
		A hard fault was detected on a P-side busy port
MS310	RTS CHNL LINK PORT STATE CHANGE	A channelized link changed from manual busy or system busy to in service
MS311	MANB CHNL LINK PORT STATE CHANGE	A port on a channelized link changed from in service to manual busy
MS312	MANB CHNL LINK PORT STATE CHANGE	A port on a channelized link changed from system busy, C-side busy, P-side busy, or L-side busy to manual busy
MS313	SYSB CHNL LINK PORT STATE CHANGE	A port on a channelized link changed from in service to system busy
MS314	SYSB CHNL LINK PORT STATE CHANGE	A port on a channelized link changed from either P-side busy or C-side busy to system busy
MS315	CBSY CHNL LINK PORT STATE CHANGE	A port on a channelized link changed from system busy or manual busy to C-side busy
MS316	PBSY CHNL LINK PORT STATE CHANGE	A port on a channelized link changed from system busy or manual busy to P-side busy
MS317	INFO CHNL LINK PORT	A soft fault on the link port raised or cleared

—continued—

Table 3-2
SN and SNSE MS logs (continued)

Name	Title	Trigger
MS318	LBSY CHNL LINK PORT STATE CHANGE	A port on a channelized link changed from manual busy to L-side busy
MS320	RTS IMSL PORT STATE CHANGE	An inter-MS link changed from system busy or manual busy to in service
MS321	MANB IMSL PORT STATE CHANGE	An inter-MS link changed from in service to manual busy
MS322	MANB IMSL PORT STATE CHANGE	An inter-MS link changed from system busy, C-side busy, or R-side busy to manual busy
MS323	SYSB IMSL PORT STATE CHANGE	An inter-MS link changed from in service to system busy
MS324	SYSB IMSL PORT STATE CHANGE	An inter-MS link changed from C-side busy or R-side busy to system busy
MS325	CBSY IMSL PORT STATE CHANGE	An inter-MS link changed from system busy or manual busy to C-side busy
MS326	RBSY IMSL PORT STATE CHANGE	An inter-MS link changed from system busy or manual busy to R-side busy
MS327	INFO IMSL PORT	A soft fault on the inter-MS link port raised or cleared

—end—

Sync logs

Synchronization logs contain information about MS clocks. The following table lists the synchronization logs and the triggers of the synchronization logs.

Table 3-3
SN and SNSE sync logs

Name	Title	Trigger
SYNC202	INFO	Change in clock state, timing link status, or an update to the tuning control
SYNC203	FLT	Timing link fault, clock fault, office dropped synchronization, or digital-to-analog converter (DAC) adjust failure
SYNC205	INFO	Change in clock state, timing link status, or an update to the tuning control for the system clock in a remote synchronization office configuration
SYNC206	FLT	Timing link fault, clock fault, office dropped synchronization, or DAC adjust failure for the system clock in a remote synchronization office configuration
SYNC208	INFO	A change in clock state, timing link status, or an update to the tuning control for the remote clock in a remote synchronization office configuration
SYNC209	FLT	Timing link fault, clock fault, office dropped synchronization, or the DAC adjust fails for the remote clock in a remote synchronization office configuration

Operational measurements

This chapter describes operation measurements (OM) related to DMS SuperNode (SN) and DMS SuperNode SE (SNSE) message switches (MS).

DMS SuperNode and SuperNode SE MS-related OMs

The OMs provide load and performance information. The OM system controls collection, display, and generation of OM data for the operating company.

The following OM groups are associated with the SN and SNSE MS:

- MS
- MSCHAIN
- MSCHNLK

For more information on OMs, refer to the *Operational Measurements Reference Manual*.

MS group

The MS registers provide information about the reliability and availability of the MS. Table 4-1 lists the registers in the MS group, and the peg reason or use description of the registers.

Table 4-1
MS group registers

Register name	Peg reason or use description
MSCDDIA	Diagnostic tests performed on MS interface cards
MSCDDIAF	Diagnostic test failures on MS interface cards
MSCDERR	Errors on MS interface cards
MSCDFLT	Faults on MS interface cards

—continued—

Table 4-1
MS group registers (continued)

Register name	Peg reason or use description
MSCDMBP	MS interface cards go manual busy
MSCDMBU	Amount of time MS interface cards are manual busy
MSCDSBU	Amount of time MS interface cards are system busy
MSDIA	Diagnostic tests performed on MS system cards
MSDIAF	Diagnostic test failures on MS system cards
MSERR	Errors on MS system cards
MSFLT	Faults on MS system cards
MSMBU	Amount of time MS system cards are manual busy
MSPTDIA	Diagnostic tests performed on MS ports
MSPTDIAF	Diagnostic test failures on MS ports
MSPTERR	Errors on MS ports
MSPTFLT	Faults on MS ports
MSPTMBP	Manual busy MS ports
MSPTMBU	Amount of time MS ports are manual busy
MSPTSBU	Amount of time MS ports are system busy
MSMBP	Manual busy MS
MSSBU	Amount of time the MS are system busy

—end—

MSCHAIN group

The MSCHAIN registers monitor MS chain performance and maintenance. The MS chains are interface cards connected by a bus. Table 4-2 lists the registers in the MSCHAIN group, and the peg reason or use description of the registers.

Table 4-2
MSCHAIN group registers

Register name	Peg reason or use description
MSCHDIA	Diagnostic tests performed on MS chains or chain cards
MSCHDIAF	Diagnostic test failures on MS chains or chain cards
MSCHERR	Errors on MS chains or chain cards
MSCHFLT	Faults on MS chains or chain cards
MSCHMBP	Manual busy MS chains or chain cards
MSCHMBU	Amount of time MS chains or chain cards are manual busy
MSCHSBU	Amount of time MS chains or chain cards are system busy

MSCHNLK group

The MSCHNLK registers monitor the performance and maintenance of MS channelized links. MS channelized links are fiber optic links that connect the MS chains to peripheral side (P-side) nodes. Table 4-3 lists the registers in the MSCHNLK group, and the peg reason or use description of the registers.

Table 4-3
MSCHNLK group registers

Register name	Peg reason or use description
MSCLDIA	Diagnostic tests performed on MS channelized links or ports
MSCLDIAF	Diagnostic test failures on MS channelized links or ports
MSCLERR	Errors on MS channelized links or ports
MSCLFLT	Faults on MS channelized links or ports
MSCLMBP	Manual busy MS channelized links or ports
MSCLMBU	Time MS channelized links or ports are manual busy
MSCLSBU	Time MS channelized links or ports are system busy

User interface and commands

This chapter describes the DMS SuperNode (SN) and DMS SuperNode SE (SNSE) message switch (MS) subsystem commands. This chapter provides examples of MAP displays. This chapter describes the status field indicators that appear in the MAP displays.

Enter the menu and non-menu commands contained in this chapter at any MAP terminal. Refer to the *DMS-100 Family Commands Reference Manual*, 297-1001-822 for more information. This manual includes information about these commands and the menu commands available at the MAP terminal.

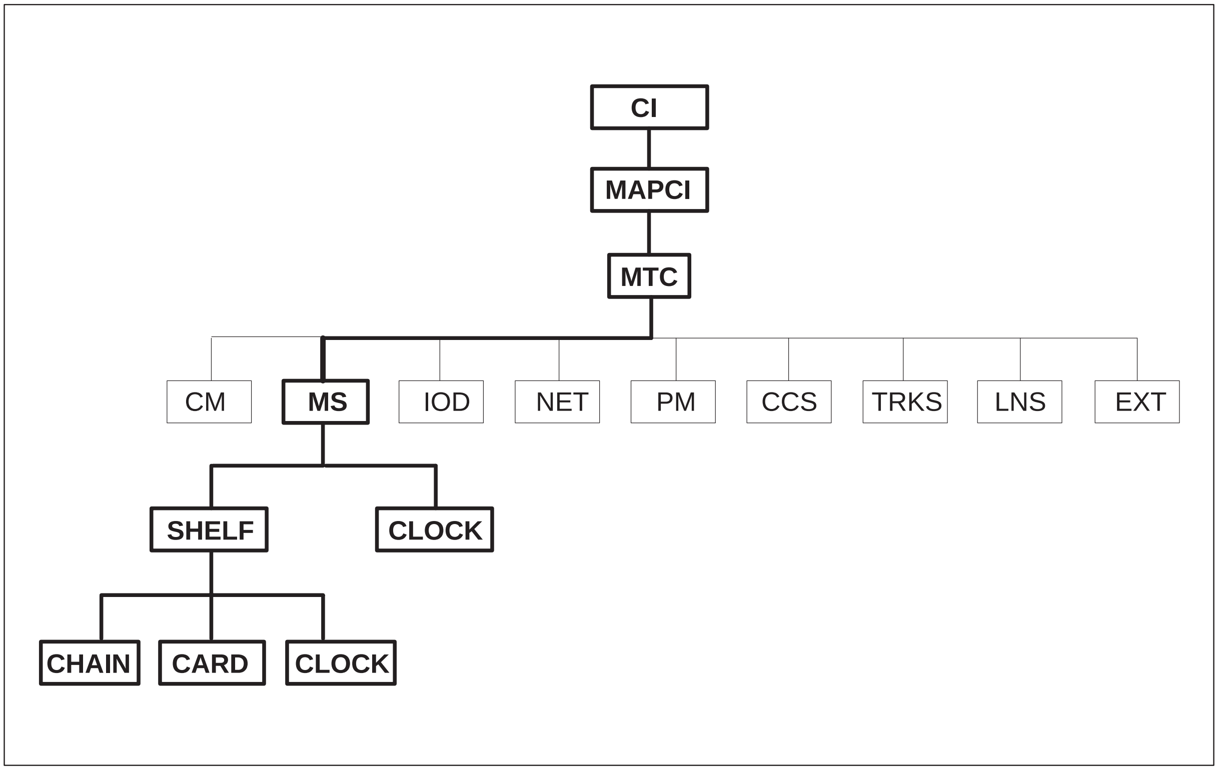
This chapter consists of the following sections:

- **MS level** describes the following:
  - the MS level menu commands
  - the MAP display
  - the MS level status field indicators in the display
- **Shelf level** describes the following:
  - the Shelf level menu commands
  - the MAP display
  - the Shelf level status field indicators in the display
- **Card level** describes the following:
  - the Card level menu commands
  - the MAP display
  - the Card level status field indicators in the display
- **Chain level** describes the following:
  - the Chain level MAP display
  - the Chain level status field indicators in the display

- **Clock level** describes the following:
  - — the Clock level menu commands
  - — the MAP display
  - — the Clock level status field indicators in the display

Figure 5-1 illustrates the MAP levels of the MS subsystem.

Figure 5-1
SN and SNSE MS subsystem MAP level hierarchy



MS level

This section covers the following:

- MS level MAP display
- listed menu commands at the MS level
- unlisted menu commands at the MS level
- MS subsystem state indicators

Example of an MS level MAP display

```
CM      MS     IOD     Net      PM     CCS     Lns     Trks    Ext     APPL
.        .      .       .        .      .       .        .      .        .
MS                 Message Switch   Clock   Shelf  0      Inter–MS Link 0 1
 0 Quit       MS 0       .          Slave          .                    . .
 2            MS 1       .          Master         .                    . .
 3
 4           MS:
 5
 6 Tst_
 7 Bsy_
 8 RTS_
 9
10 LoadMS_
11
12 SwMast
13 Shelf
14 QueryMS
15
16
17 InterMS_
18 Clock
  TEAM18
Time  11:02  >
```

MS level listed menu commands

The following table contains listed menu commands. You can enter these commands at the MS level of the MAP display.

Table 5-1
MS level listed menu commands

Command	Description
BSY	Busy the specified message switch node
CLOCK	Enter the clock level
INTERMS	Enter the card level for an inter-MS link
LOADMS	Place a new load in the specified MS
QUERYMS	Display general MS information
QUIT	Quit the MS level
RTS	Return the specified message switch node to service
SHELF	Enter the specified MS shelf level
SWMAST	Switch clock mastership to the mate MS
TST	Test the specified message switch node

MS level unlisted menu commands

The following table lists unlisted MS menu commands. You can enter these commands at the MS level of the MAP display.

Table 5-2
MS level unlisted menu commands

Command	Description
PSIDE	Display MS physical side node information
SCANMS	List MS cards in a particular state
SHOWBACKUP	Specify or query whether MS ports used for backup serial messaging are identified by the letter “B” in the MS card level MAP display

MS level system state indicators

The following table lists MS level subsystem state indicators.

Table 5-3
MS level status field indicators

Field	Indicator	Description
`Message Switch`	`.`	The MS is in service.
	`M`	The MS is manual busy.
	`S`	The MS is system busy.
	`T`	Maintenance action is in progress.
`Clock`	`Master`	The indicated MS is the master clock source.
	`M Flt`	The master clock is synchronized but has a fault.
	`M Free`	The master clock is free running.
	`S Flt`	The slave clock is synchronized but has a fault.
	`S Free`	The slave clock is free running, the MS is out of service.
	`Slave`	The indicated MS is the slave clock and is synchronized to the master.

—continued—

Table 5-3
MS level status field indicators (continued)

Field	Indicator	Description
	S OOS	The slave clock is out of service.
Shelf *n*	.	All cards on the MS shelf are in service.
	C	All cards on MS shelf are C-side busy.
	M	All cards on MS shelf are manual busy.
	S	All cards on MS shelf are system busy.
	F	Access the shelf level to determine the reason the MS is not completely in service.
	I	A card on the MS shelf is in-service trouble.
Link Connected to MS *n*	.	An inter-MS link is in service.
	–	An inter-MS link MS is not equipped.
	R	Remote end is busy (the other MS).
	C	C-side is busy.
	M	An inter-MS link is manual busy.
	S	An inter-MS link is system busy.

—end—

Shelf level

This section describes the following topics:

- Shelf level MAP display
- listed menu commands at the Shelf level
- unlisted menu commands at the Shelf level
- Shelf level card state indicators

Example of a Shelf level MAP display

```
CM      MS     IOD     Net      PM     CCS     Lns     Trks    Ext     APPL
.        .      .       .        .      .       .        .      .        .
Shelf              Message Switch   Clock   Shelf  0      Inter–MS Link 0 1
 0 Quit       MS 0       .          Slave          .                    . .
 2            MS 1       .          Master         .                    . .
 3
 4            Shelf 0                 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
 5            Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 6 Tst_       Chain           |       |
 7 Bsy_       MS 0  . . . . . . – – – . – – – – – – – – – . . . . . . .
 8 RTS_       MS 1  . . . . . . – – – . – – – – – – – – – . . . . . . .
 9 Offl_
10 LoadMS_   SHELF:
11 LoadCd_
12 Chain_
13 Card_
14 QueryMS
15 Trnsl_
16
17 InterMS_
18 Clock
  TEAM18
Time  11:02  >
```

Shelf level listed menu commands

The following table contains listed menu commands. You can enter them at the Shelf level of the MAP display.

Table 5-4
Shelf level listed menu commands

Command	Description
BSY	Busy the specified front and back card slot
CARD	Enter the MAP level for the specified card
CHAIN	Enter the MAP level for the specified chain
INTERMS	Enter the card level for the specified inter-MS link
LOADCD	Place a new firmware load in the specified card
LOADMS	Place a new load in the specified MS
OFFL	Offline the front and back slots for the specified card
QUERYMS	Display general MS information
RTS	Return to service the specified front and back card slot

—continued—

Table 5-4
Shelf level listed menu commands (continued)

Command	Description
TRNSL	Display P-side information for port(s), link(s), or tap(s).
TST	Test the specified front and back card slot
—end—	

Shelf level unlisted menu commands

The following table contains unlisted menu commands. You can enter them at the Shelf level of the MAP display.

Table 5-5
Shelf level unlisted menu commands

Command	Description
BSYCHN	Busy the specified chain
BSYMS	Busy the specified MS node
OFFLCHN	Offline the specified chain
QUERYCD	Query the firmware in the specified card or compare the firmware of two specified cards
RTSCHN	Return the specified chain to service
RTSMS	Return the specified MS node to service
SHWCHN	Show the MS chain configuration
TSTCHN	Test the specified chain
TSTMS	Test the specified MS node

SHELF level card state indicators

The Shelf level status field indicators appear in Table 5-6 .

Table 5-6
Shelf level status field indicators

Field	Indicator	Description
`Card` *n* `to` *nn*	`< >`	Indicates the extent of a chain.
	|	Indicates a single card chain.
	`.`	The card is in service.
	`–`	The card is not equipped.
	`C`	The card is C-side busy.
	`F`	Access the port level to determine the reason the card is not completely in service.
	`I`	The card is in-service trouble.
	`M`	The card is manual busy (interface cards only).
	`O`	The card is offline (interface cards only).
`Card` *n* `to` *nn*	`S`	The card is system busy (interface cards only).
	`T`	Maintenance action is in progress.

Card level

The Card level MAP display is different for each type of card accessed. This section describes the MAP displays and the status field indicators for system cards and interface. cards.

Example of a system card MAP display

```
 CM      MS      IOD      Net      PM      CCS      Lns      Trks     Ext      APPL
  .      .        .        .     2SysB   2 RSC      .       18 CC    1Crit     .
                                                             *C*      *C*
CARD                 Message Switch   Clock   Shelf  0       Inter–MS Link 0 1
 0 Quit      MS 0       .          M Free          .                      – –
 2           MS 1       .          Slave           .                      – –
 3
 4           Shelf 0                 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
 5           Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 6 Tst_      Chain
 7           MS 0  . . . . . – – – – – – – – – – – – – . . . . . . . . .
 8           MS 1  . . . . . – – – – – – – – – – – – – . . . . . . . . .
 9
10           Card 01 Front: T–bus Acc. Term. Back: T–bus Acc. Ext.
11           MS 0         .                           –
12           MS 1         .                           –
13 Card_
14 QueryMS
15
16
17
18
  TEAM15
Time  10:14  >
```

Card level listed menu commands

The following table contains listed menu commands. You can enter them at the Card level of the MAP display.

Table 5-7
Shelf level listed menu commands

Command	Description
QUERYMS	Display general MS information
QUIT	Quit the Card level
TST	Test the specified card

System card field indicators

The system card field indicators appear in Table 5-8.

Table 5-8
System card field indicators

Field	Indicator	Description
No entry		Clock card
Mapper Card		Mapper card
Memory Card		Memory card
Front: MS Processor Back: RTIF		Processor card Remote terminal interface card
Front: P–bus Terminator Back: P–bus Extension		P-bus terminator P-bus extension
Front: T–bus Acc. Term. Back: T–bus Acc. Ext.		T-bus access terminator T-bus access extension
	.	The card is in service.
	I	The card has soft faults.
	C	The card is C–side busy.

Example of an interface card MAP display

```
CM      MS     IOD     Net      PM     CCS     Lns     Trks    Ext     APPL
.        .      .       .        .      .       .        .       .       .
Card               Message Switch   Clock   Shelf  0      Inter–MS Link 0 1
 0 Quit       MS 0       .          Slave          .                    . .
 2            MS 1       .          Master         .                    . .
 3
 4            Shelf 0                  1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
 5            Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 6 Tst_       Chain           |       |
 7 Bsy_       MS 0  . . . . . . – – – . – – – – – – – – – . . . . . . .
 8 RTS_       MS 1  . . . . . . – – – . – – – – – – – – – . . . . . . .
 9 Offl_
10            Card 24 CMIC Interface Card        Port: 0
11 LoadCd_    MS 0         .                            .
12 QueryCd_   MS 1         .                            .
13 Card_
14 QueryMS   CARD:
15 Trnsl_
16
17 Next
18 Port_
  TEAM18
Time  11:04  >
```

Interface card status field indicators

The interface card field indicators appear in Table 5-9.

Table 5-9
Interface card field indicators

Field	Indicator	Description
CMIC interface card		Central message interface controller card
Protocol		Port card
DS30		The protocol is DS30.
DS512		The protocol is DS512.
Card nn	.	The card is in service.
	–	The card is unequipped.
	O	The card is offline.
	I	The card has a soft fault.
	M	The card is manual busy.
	T	Maintenance action is in progress.
	C	The card is C-side busy.
	S	The card is system busy.
Port n to nn	.	The port is in service.
	–	The port is unequipped.
	I	The port has a noncritical fault.
	M	The port is manual busy.
	C	The port is C-side busy.
	L	The associated link is busy.
	T	Maintenance action is in progress.
	P	The port is P-side busy.
	S	The port is system busy.

Chain level

This section covers the following:

- Chain level MAP display
- listed menu commands at the Chain level
- Chain level state indicators

Example of a Chain level MAP display

```
CM      MS      IOD      Net      PM      CCS      Lns      Trks     Ext      APPL
.        .       .        .        .       .        .        .        .        .
Chain              Message Switch   Clock   Shelf  0      Inter–MS Link 0 1
 0 Quit       MS 0       .          Slave          .                    . .
 2            MS 1       .          Master         .                    . .
 3
 4            Shelf 0                  1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
 5            Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 6 Tst_       Chain           |       |
 7 Bsy_       MS 0  . . . . . . – – – . – – – – – – – – – . . . . . . .
 8 RTS_       MS 1  . . . . . . – – – . – – – – – – – – – . . . . . . .
 9 Offl_
10            Chain 06  Range   Link   0
11            MS 0   I  06–06   DS512  .
12 Chain_     MS 1   I  06–06   DS512  .
13 Card_
14 QueryMS   CHAIN:
15 Trnsl_
16
17
18
  TEAM18
Time  11:06  >
```

Chain level listed menu commands

The following table contains the listed menu commands. You can enter these commands at the Chain level of the MAP display.

Table 5-10
Shelf level listed menu commands

Command	Description
BSY	Busy the specified chain or channelized link
CARD	Enter the MAP level for the specified card
CHAIN	Enter the MAP level for the specified chain
OFFL	Offline the specified chain
QUERYMS	Display general message switch information
RTS	Return the specified chain or channelized link to service

—continued—

Table 5-10
Shelf level listed menu commands (continued)

Command	Description
TRNSL	Display P-side information for the specified link(s)
TST	Test the specified chain, card on a chain, or link associated with a chain

—end—

Chain level state indicators

The Chain level state indicators appear in table 5-11.

Table 5-11
Chain level state indicators

Field	Indicator	Description
	.	
Chain *n*	.	The chain is in service.
	–	The chain is not equipped.
	I	The chain has a defect that is not critical.
	M	The chain is manual busy.
	O	The chain is offline.
	S	The chain is system busy.
	T	Maintenance action is in progress.
	C	The chain is C-side busy.
Range	xx–xx	Specifies the range of cards included in the chain.
Link	DS512	The chain uses DS512 links.
n to n	.	The port on the card associated with the chain is in service.
	T	Maintenance action is in progress.
	M	The port on the card associated with the chain is manual busy.

—continued—

Table 5-11
Chain level state indicators (continued)

Field	Indicator	Description
	S	The port on the card associated with the chain is system busy.
	–	The port on the card associated with the chain is not equipped.
	P	The port on the card associated with the chain is P-side busy.
	O	The port on the card associated with the chain is offline.
	—end—	

Clock level

This section covers the following:

- Clock level MAP display
- listed menu commands at the Clock level
- unlisted menu commands at the Clock level
- Clock level state indicators

Example of a Clock level MAP display

```
CM      MS      IOD     Net      PM      CCS     Lns     Trks    Ext     APPL
.        .       .       .        .       .       .        .      .       .
Clock              Message Switch   Clock   Shelf  0      Inter–MS Link 0 1
 0 Quit       MS 0       .          Slave          .                      . .
 2            MS 1       .          Master         .                      . .
 3
 4 SwCarr     Shelf 0                 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
 5            Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
 6 Tst_       Chain           |       |
 7            MS 0  . . . . . . – – – . – – – – – – – – – . . . . . . .
 8            MS 1  . . . . . . – – – . – – – – – – – – – . . . . . . .
 9
10 Sync       Card 02 Alm Stat %Adj Src | Car Stat Sp PM     CCT
11 DpSync     MS 0  .  .  Syn +06.7 Ms1 | Lk0 Lck   2 LTC 000 00
12 SwMast     MS 1  .  .  Syn –13.6 Lk0 | Lk1 Smp   3 LTC 001 00
13 Card_      Links Slipping:     5 out of    20
14 QueryMS   SHELF:
15           CLOCK:
16
17
18 Adjust_
  TEAM18
Time  11:07  >
```

Clock level listed menu commands

The following table contains the listed menu commands. You can enter these commands at the Clock level of the MAP display.

Table 5-12
Clock level listed menu commands

Command	Description
ADJUST	Adjust the frequency of the office clock
CARD	Enter the MAP level for the specified card
DPSYNC	Drop office synchronization
QUERYMS	Display general message switch information
SWCARR	Switch active and standby timing links
SWMAST	Display P-side information for the specified link(s)
SYNC	Synchronize the office

Clock level unlisted menu commands

The following table contains unlisted menu commands. You can enter these commands at the Clock level of the MAP display.

Table 5-13
Clock level unlisted menu commands

Command	Description
CLKALMFREE	Enable or suppress a clock alarm caused by the office free synchronization condition Use this command only if it is acceptable for synchronization warning to be suppressed from the MAP display. This warning occurs only if the office runs in a configuration that is not Master Internal and if the office is not synchronized to its timing reference.
DPSYNCLK	Drop synchronization on a specific clock
QUERYCD	Query the firmware in the specified card or compare the firmware of two specified cards
QUERYCK	Query the data and hardware state of the clock cards

—continued—

Table 5-13
Clock level unlisted menu commands (continued)

Command	Description
SYNCLK	Synchronize a specific clock to another clock
UPDAC	Read the DAC value in the clock

—end—

Clock level state indicators

The state fields that appear in the MAP display are different for each type of clock configuration. The procedure “Troubleshooting an MS clock major alarm” in this document includes a description of each state field in the procedure.

Cards and paddle boards

This chapter describes the DMS SuperNode (SN) and DMS SuperNode SE (SNSE) message switch (MS) cards and paddle boards.

This chapter includes the following sections:

- “The SN and SNSE-MS system cards and paddle boards” This section, on page 6-1, describes the SN and SNSE-MS system cards and paddle boards. The section describes the system cards and paddle boards in numeric order.
- “The SN and SNSE-MS interface cards and paddle boards”. This section, on page 6-9, describes the SN and SNSE-MS interface cards and paddle boards. The section describes the interface cards and paddle boards in numeric order.

SN and SNSE-MS system cards and paddle boards

The SN MS shelves and SNSE MS shelf are equipped with cards on the front and with paddle boards on the back. Both MSs on a switch have identical circuit cards, paddle boards, and associated hardware. On an SN switch, all cards and paddle boards appear in identical positions in both shelves. On an SNSE switch, all cards and paddle boards in MS 0 appear in mirror image in MS 1. The card numbers also appear in mirror image. The logical numbering of the cards is identical for both MSs. On the SN and SNSE switches, the cards share a common bus with the paddle boards.

Table 6-1 lists the SN and SNSE MS system cards and paddle boards.

Table 6-1
SN and SNSE MS system cards and paddle boards

PEC	Name	SN	SNSE
NT9X13DA	CPU 16-MHz card	√	
NT9X13DB	CPU 16-MHz card	√	

—continued—

Table 6-1
SN and SNSE MS system cards and paddle boards (continued)

PEC	Name	SN	SNSE
NT9X13DC	CPU 16-MHz card	√	
NT9X13DD	CPU 16-MHz card	√	
NT9X13NA	CPU 16-MHz card		√
NT9X14BB	6-Mbyte memory card	√	
NT9X14DB	24-Mbyte memory card	√	
NT9X15AA	Mapper card	√	√
NT9X26AA	Reset terminal interface paddle board	√	
NT9X26AB	Reset terminal interface paddle board	√	√
NT9X30AA	+5V 86-A power converter	√	√
NT9X31AA	–5V 20-A power converter	√	√
NT9X32AA	DMS-bus load paddle board	√	
NT9X49CA	MS P-bus terminator card	√	
NT9X49CB	MS P-bus terminator card	√	
NT9X49CC	MS P-bus terminator card		√
NT9X52AA	MSP T-bus access card	√	√
NT9X53AA	MS system clock card	√	
NT9X53AB	MS system clock card	√	
NT9X53AC	MS system clock card	√	√
NT9X53AD	MS dual-frequency oscillator clock card	√	√
NT9X54AB	Clock interface paddle board	√	
NT9X54AC	Clock interface paddle board	√	√

—end—

NT9X13 processor card

The SN and SNSE-MS processor cards (NT9X13) are high-performance microcomputer boards. The microcomputer boards are based on the Motorola 68000 group of 32-bit microprocessors.

The NT9X13 card consists of operating blocks as follows:

- CPU
- memory
- bus interface

CPU section

The processor on the NT9X13 card is a Motorola MC68000 series chip.

Memory section

The NT9X13 CPU card contains a RAM (DRAM). The SN switch can use the NT9X13DD card with the optional NT9X14 memory card.

Bus interface section

The NT9X13 CPU card uses the asynchronous processor bus (P-bus) to communicate with the other MS cards for maintenance and control purposes.

The MS uses the following NT9X13 processor cards:

- The NT9X13DA card is based on the Motorola 68020 processor. The SN applications use this card.
- The NT9X13DB card is like the NT9X13DA card. The NT9X13DB card has different firmware, which supports memory parity. The SN applications use this card.
- The NT9X13DC card is like the NT9X13DB card. The NT9X13DC card has 4 Mbyte of DRAM and different firmware. The SN applications use this card.
- The NT9X13DD card is like the NT9X13DC card. The NT9X13DD has 16 Mbyte of DRAM and different firmware. The SN applications use this card.
- The NT9X13NA card is like the NT9X13Dx-series cards used for SN applications. The NT9X13NA card has 16 Mbyte of DRAM. The SN applications use this card.

NT9X14 memory card

The NT9X14 memory card is an optional card available for SN switches only. The MS uses the following NT9X14 memory cards:

- The NT9X14BB 6-Mbyte memory card is configured as three 2-Mbyte modules.
- The NT9X14DB 24-Mbyte memory card is configured as three 8-Mbyte modules.

NT9X15 mapper card

The NT9X15 mapper card is a specialized memory card. The NT9X15 translates logical addresses that occurs in message headers to addresses that the MS transaction-bus (T-bus) can process. The system can map from a possible 64000 logical address routes. Each node in the system has two or more physical routes. The deeper in the system hierarchy the node is from the MS, the more possible routes are available to reach a node.

The mapper card operates as a large look-up table. The system accesses the mapper card in the following ways:

- the MS processor-bus (P-bus) interface for first configuration of contents and the maintenance that follows
- the MS T-bus interface for normal address translation (read only)
- internal method to search for secondary routes. Use this method if the primary route is closed (read only).

The NT9X15 card has the following operational blocks:

- logical address register
- physical address register
- refresh
- address select
- mapping memory
- maintenance
- control state machine
- P-bus interface

SN and SNSE applications use the NT9X15AA card.

NT9X26 reset terminal interface paddle board

The NT9X26 reset terminal interface (RTIF) paddle board provides an interface between the reset control subsystem and the message switch processor (MSP). The NT9X26 RTIF paddle board reads resets received from out-of-band (OOB) messages on computing module interface card (CMIC) links. The NT9X26, NT9X20, and NT9X23 paddle boards work together to receive OOB resets from the computing module (CM). The paddle boards send the resets to the MSP.

The MS uses the following NT9X26 RTIF paddle boards:

- The SN applications uses the NT9X26AA RTIF paddle board. The NT9X26AA RTIF paddle board has the following operational blocks or user inputs:
  - local video display terminal (VDT)
  - remote VDT
  - 9X13 serial interface
  - OOB links
- The NT9X26AB RTIF paddle board performs the same functions as the NT9X26AA. The SN and SNSE applications use the NT9X26AB RTIF paddleboard.

NT9X30 +5V power converter card

The NT9X30 card provides +5 V dc at up to 86 A to the components on the MS shelf.

The SN and SNSE applications use the NT9X30AA card. The NT9X30AA card includes the following working blocks:

- input filter
- auxiliary power supply
- pulse width modulation (PWM) module
- output stage, which includes transformer, rectifier, and filter
- input control
- monitor circuit

NT9X31 –5V power converter card

The NT9X31AA card provides –5V dc at up to 20 A to the components on the MS shelf.

The SN and SNSE applications use the NT9X31AA card. The NT9X31AA card includes of the following operational blocks:

- input filter
- auxiliary power supply
- PWM module
- output stage (transformer, rectifier, and filter)
- input control
- monitor circuit
- relay

NT9X32 bus-load paddle board

The NT9X32 paddle board reduces the noise on the P-bus in the MS. The P-bus runs the complete length of the MS shelf. Noise can occur on the bus. The NT9X32 provides enough load or impedance on the P-bus to reduce the noise. The system can use NT9X32 paddle boards instead of NT9X19 paddle boards in port interface paddle board slots if port interface paddle boards are not present.

SN applications use the NT9X32AA paddleboard.

NT9X49 P-bus terminator card

The P-bus gains resistive termination from the NT9X49 card.

The MS uses the following NT9X49 P-bus terminator cards:

- SN applications use the NT9X49CA card. The NT9X49CA card performs the following functions:
  - P-bus termination
  - lock of power converters on an in-service MS
  - access to the ID PROMs on the power converters
  - signal to clear the T-bus when timeouts occur
- The NT9X49CB card for SN applications performs the functions of the NT9X49CA card. The NT9X49CB card performs the following functions:
  - T-bus to P-bus interface which provides T-bus activity information to the MSP
  - logic analyzer to trace T-bus messages configurable by the MSP
  - T-bus activity monitor with programmable threshold detection
- SNSE applications can use the NT9X49CC card.

NT9X52 MSP T-bus access card

The NT9X52 card provides the interface between the P-bus and the T-bus. The MS processor card sends messages to the CM. To send messages, the MS processor card puts the messages on the P-bus to the NT9X52 card. The NT9X52 puts the messages on the T-bus. On the T-bus, the system selects a port card to transmit the messages. The reverse process occurs when the system receives messages from the DMS-core component.

The NT9X52 is interrupt driven. The NT9X13 issues an interrupt to the NT9X52 to verify if the NT9X52 can handle a message. If the NT9X52 is available, the interrupt returns and the MSP transmits the message over the P-bus. The MSP sends data to the NT9X52 in byte form. The NT9X52 converts the bytes to longwords. This conversion allows the bus access controller (BAC) to transmit the data over the T-bus.

After the T-bus receives MSP data in longword format, the MSP receives notification from an interrupt that a message waits. The MSP extracts the message off the P-bus in 1 byte segments.

The NT9X52 card provides the NT9X13 with access to the T-bus. The NT9X52 card also provides the following functions:

- generation and check of cyclic redundancy check (CRC) codes for T-bus messages that the NT9X13 card sent and received
- locks power converter on an in-service MS
- access to the ID PROM on the NT9X24, NT9X30, and NT9X31 cards
- a loopback register used during diagnostics
- termination of T-bus backplane signals
- buffer of clock signals generated by NT9X53.

The SN and SNSE applications use the NT9X52AA card.

NT9X53 system clock card

The NT9X53 card is a Stratum 3 clock that provides clock timing to all nodes in an office directly or indirectly. The NT9X53 works with the NT9X54 clock interface paddle board. The paddle board is behind the NT9X53 card.

The NT9X53 card accommodates two transmission frequencies: 10.24 MHz and 16.38 MHz. The system clock operates at 10.24 MHz and provides timing reference for PMs coupled to the MS with DS30 links. The subsystem clock operates at 16.38 MHz and provides timing references for the T-bus and all nodes connected to the MS with DS512 fiber links. The NT9X53 card contains a microprocessor that functions as the maintenance unit of the card.

The system uses the phase error to adjust NT9X53 clocks. A phase comparator measures the phase difference between the two clock references. The two clock references are the external oscillators and the on-board oscillators. The phase difference controls the DAC value.

The DAC sends a voltage, calculated from the phase difference, to a voltage controlled oscillator. The oscillator adjusts the output frequency based on the input voltage.

The MS uses the following NT9X53 system clock cards:

- The SN applications use the NT9X53AA card.
- The SN applications use the NT9X53AB card. The NT9X53AB card is like the NT9X53AA card. The NT9X53AB card supports the following external clock inputs:
  - — cesium/loran-C analog signals
  - — 64/8 kbit/s composite clock
- The NT9X53AC card is like the NT9X53AB card. The NT9X53AC card supports 32 kbyte of firmware that the system can download. The SN and SNSE applications use the NT9X53AC card.
- The NT9X53AD card uses a dual-frequency oscillator to generate both the system and subsystem clock signals. The memory type is SRAM instead of EEPROM. The SCRAM memory allows the card to perform parity operations. The memory supports 64 kbyte of firmware that the system can download.

NT9X54 clock interface paddle board

The NT9X54 paddle board provides cable connections for incoming external clock signals. The NT9X54 provides cable connection for the outgoing reference signal to the mate clock in the other MS. The NT9X54 converts the external clock reference signals to internal frequencies.

The MS software designates the NT9X53/NT9X54 pair in one MS as the master clock. The MS software designates the NT9X53/NT9X54 pair in the other MS as the slave clock.

The MS uses the following NT9X54 subsystem clock interface paddle boards:

- The SN applications use the NT9X54AB paddle board.
- The SN and SNSE applications use the NT9X54AC paddle board. The NT9X54AC is like the NT9X54AB card. The NT9X54AC supports system ISG compliance and the following clock interfaces:
  - — cesium/loran-C analog signals
  - — 64/8 kbit/s composite clock

SN and SNSE-MS interface cards and paddle boards

The MS interface cards and paddle boards connect the SN and SNSE MS and the other nodes in the SN and SNSE systems. Table 6-2 lists the MS interface cards and paddle boards.

Table 6-2
The SN and SNSE MS interface cards and paddle boards

PEC	Name	SN	SNSE
NT9X17AA	Message switch four-port card	√	√
NT9X17AD	Message switch four-port card	√	√
NT9X17BB	DMS-bus 32-port card	√	√
NT9X17CA	DMS-bus 128-port card	√	√
NT9X17DA	DMS-bus 64-port card	√	√
NT9X20AA	DS512 interface CM-MS paddle board	√	
NT9X20BB	DS512 interface EN-MS paddle board	√	
NT9X23AA	Four-port DS30 paddle board	√	√
NT9X23BA	Four-port DS30 paddle board	√	
NT9X25AA	MS port expander paddle board	√	
NT9X25BA	MS port terminator paddle board	√	
NT9X62BA	Four-port subrate DS512 paddle board	√	√
NT9X62CA	SR-512 subrate paddle board		√
NT9X62CB	SR-512 subrate paddle board	√	√
NT9X69BA	DMS-bus 16-link DS30 paddle board	√	√
NT9X73BA	LMS F-bus rate adapter card		√

NT9X17 port card

The NT9X17 card is the main MS message transaction mechanism. The NT9X17 card functions with an NT9X20, NT9X23, NT9X62, or NT9X69 paddle board located in the slot behind it. The NT9X17 card supports DS512 and DS30 links.

Each NT9X17 card includes the following:

- The BAC that control temporary message storage until the T-bus becomes available
- Link handlers (LH) that provide an interface between links and the MS. The LH's handle and generate level 2 protocols required for links.
- A card maintenance unit (CMU) that monitors and reports error conditions to the MSP. The CMU performs maintenance, which relieves the MSP and preserves CPU real time. When the CMU detects a port fault or a card fault the CMU sends a message to the MSP. This message

indicates the type of error.

At least one NT9X17 card connects the MS to an I/O controller (IOC).

The MS uses the following NT9X17 port cards:

- The SN and SNSE applications use the NT9X17AA four-port card. The functionality of the NT9X17AA card is like that of the MSP T-bus access card with the following exceptions:
  - the NT9X17AA card is compatible with NT9X20AA and NT9X23 paddle boards
  - the port interface is the link handler gate array instead of the P-bus interface
  - the NT9X17AA card has four link handlers, each one with a BAC
  - each port has private buffer space not shared with any other port
  - an allocator circuit controls time sharing of internal buses
  - the NT9X17AA card has internal regulation between ports
  - the link handler performs CRC generation and checking
  - loop-back register does not apply
  - the CMU controls and supervises all gate arrays
  - the P-bus interface provides decoding and buffering to access the paddle board. These functions reduce P-bus loading.
- The NT9X17AD four-port card is like the NT9X17AA card. The firmware on the NT9X17AD card increased from 8kbyte to 32kbyte to support SR128, SR256, SR512 links. In order, the SR128, SR256, and SR512 links are four, two, and one port. The NT9X17AD card is backward compatible with the NT9X17AA card. The SN and SNSE applications use the NT9X17AD card. This card is compatible with NT9X20AA, NT9X20BB, NT9X23, and NT9X62 paddle boards.
- The NT9X17BB 32-port card is based on multiport link handlers (MPLH) and multiport bus access controllers (MPBAC) that control 32 ports. The card runs multiport firmware and is compatible with NT9X20BB, NT9X62, and NT9X69 paddle boards. The SNSE applications use the card.
- The NT9X17CA 128-port card is functionally equivalent to the NT9X17BB, with the following exceptions:
  - the NT9X17CA 128-port has enough memory to support 8 kbyte of memory for each port in each direction
  - the card has two additional MPBACs and MPLHs

  - the EEPROM code expands from 64 kbyte to 128 kbyte
  - the SN and SNSE applications use this card

- The NT9X17DA 64-port card is functionally equivalent to the NT9X17BB. The NT9X17DA 64-port card provides 64 ports. The SN and SNSE applications use it. This card is compatible with NT9X20BB, NT9X62, and NT9X69 paddle boards.

NT9X19 filler card and paddle board

Use NT9X19 cards and paddle boards to occupy empty slots. Filler cards and paddle boards cool equipment and provide electromagnetic interference (EMI) protection.

The MS use the following NT9X19 filler cards:

- The NT9X19AA card can occupy empty card slots in SN and SNSE applications.
- The NT9X19BA paddle board can occupy empty paddle board slots in SN and SNSE applications.

NT9X20 DS512 interface paddle board

The in SN switches only use the NT9X20 DS512 interface paddle board. The NT9X20 and the NT9X17 card work together to exchange input and output signals over the S-bus.

The NT9X20 converts incoming fiber link light pulses to parallel electrical messages, and sends the messages to the NT9X17 through the S-bus. To transmit messages from the MS on a fiber link, the NT9X20 converts parallel messages from the NT9X17 to serial form, and changes electrical signals to light pulses for transmission over the DS512 link.

The MS uses the following NT9X20 DS512 interface paddle boards:

- Each NT9X20AA provides an interface between one DS512 CM link and one NT9X17A series card.
- The NT9X20BB paddle board provides messaging links between the MS and the enhanced network (ENET). The paddle board connects to the S-bus on the backplane. The paddle board is like the NT9X20AA. The NT9X20BB has a different fiber module from the NT9X20AA for the ENET connection. The optical interface includes a transmitter, a receiver, and clock recovery. In the transmit direction, the interface takes serial information from the fiber link interface chip (FLIC) and converts the information to an optical signal. In the receive direction, the interface converts an incoming optical signal to a logic signal at the output of the receiver. The interface sends this converted signal to clock recovery. The clock recovery extracts clock information from an incoming serial stream and uses the clock to sample the data again. The interface sends the new generated data and clock to the FLIC.

NT9X23 4-port DS30 paddle board

The NT9X23 paddle board provides the interface between an NT9X17A series card and DS30 links. Each NT9X23 can terminate up to four DS30 links. The NT9X23 provides maintenance and control functions and parallel-serial data conversion.

Use the following NT9X23 4-port DS30 paddle boards in the MS:

- The SN and SNSE switches use the NT9X23AA .
- The NT9X23BA paddle board is like the NT9X23AA paddle board, except that NT9X23BA supports out-of-band resets. The SN application use the NT9X23BA paddleboard.

NT9X25 port expander or terminator paddle board

The NT9X25 paddle board connects both sides of chained bus.

The MS uses the following NT9X25 port expander or terminator:

- Use the NT9X25AA port expander paddle board between an NT9X20BB board and an NT9X25BA board in the S-bus daisy chain. The NT9X25AA connects the S-bus of slot *n* to the S-bus of slot *n*+1, while the NT9X25BA terminates the chain.
- The NT9X25BA paddle board terminates the S-bus daisy chain.

NT9X62 SR512 paddle board

The NT9X62 paddle board provides an interface. This interface is between one NT9X17AD, NT9X17BB, NT9X17CA, or NT9X17DA card and two or four fiber optic links. The interface functions on receive and transmit paths. On the path for receiving, the NT9X62 performs the following functions:

- conversion of optical data to electrical data
- conversion of serial data to parallel data
- the frame pulse (FP) and alarm code reception
- the OOB reset reception

On the transmit path, the NT9X62 performs the following functions:

- conversion of parallel data to serial data
- conversion of electrical data to optical data
- transmission of the FP and alarm codes
- generation of logical transfer buffer (LTBUFF) overflow signaling
- generation of OOB reset signaling

The MS uses the following NT9X62 SR512 paddle boards:

- The NT9X62BA paddle board supports four links. The SN and SNSE applications use this paddle board.
- The NT9X62CA paddle board is like the NT9X62BA paddle board. The NT9X62CA supports two fiber links and provides dual OOB reset capability on the links. The SN and SNSE applications use the NT0X62BA.
- The NT9X62CB paddle board is like the NT9X62CA board. The NT9X62CB is the only type of paddle board used in conjunction with the fiber LIM. The SN and SNSE applications use this paddle board .

NT9X69 16-link DS30 interface paddle board

The SNSE applications use the NT9X69 paddle board to provide an interface. This interface is to the DS30 links between the MS and LIM and the DS30-based junctor networks (JNET). This interface extends to the IOC. This card provides one asynchronous CMIC link with OOB message reception. This card supports the following features:

- 16 DS30 links mapped to all 512 channels on the S-bus
- two loopbacks (one internal to R41, the other on DS30 links)
- power-up register accessible through P-bus
- ID PROM accessible through P-bus
- compatible with NT9X17BB/DA cards
- OOB reset transmission
- OOB reset reception (on link 0)
- ESD/EMI compliant

The SN and SNSE applications use the NT9X69AB 16-link DS30 interface paddle board.

NT9X73 rate adapter card

The SNSE switches use the NT9X73BA card to provide an interface. This interface is between the T-bus, the 8-bit frame bus (F-bus), and the CCS7 link interface units (LIU7).

Trouble isolation tools

This chapter describes the resident tools used to troubleshoot fault conditions. The fault conditions occcur on the Digital Multiplex System (DMS) SuperNode (SN) and DMS SuperNode SE (SNSE) message switch (MS). For information on tools other than resident tools, refer to the Technical Assistance Manuals.

Diagnostic tools

This chapter describes the following diagnostic tools:

- alarms
- the DMS monitoring (DMSMON) tool
- log reports
- the Maintenance Manager’s Morning Report (AMREPORT)
- the OM log-alarm cross reference charts
- operational measurements (OM)
- Sherlock
- Switch Performance Monitoring System (SPMS)

Alarms

Alarms are the primary indicators of problems with the system. Alarms provide information about the following types of problems:

- equipment failure
- equipment that operates at a degraded level
- equipment reached operating company defined capacity level
- loss of synchronization
- full or partly full system sanity
- software errors
- not complete automatic recovery attempt
- reboot that is not authorized

- auto transfer to standby
- cannot transfer from faulty to standby
- loss of communication between entities or subsystems
- loss of ability to store operational information (data exceeds threshold)
- inter-node transmission failure
- loss of communication with operation support systems
- power distribution failure
- security problems
- fire and trespass

The alarms are divided in three levels of seriousness: minor, major, and critical.

A minor alarm indicates that a problem is present that does not cause visible loss of service. Examples of minor alarm conditions include the following:

- conditions that can cause a major alarm if conditions are not corrected
- one busy piece of a pool of equipment
- service degradation that drops below a threshold defined by the operating company

A major alarm indicates that one-half of a duplicated system is out of service. This event can cause a visible loss of service. Backup is not available if another fault occurs on the active system. The system generates a major alarm when service degrades below a threshold defined by the operating company.

A critical alarm indicates that a problem is present that causes a visible loss of service. The following are examples of critical alarm conditions:

- loss of call processing capability (dead system)
- part or full loss of system sanity
- service degradation below a threshold defined by the operating company

A log accompanies each alarm. The logs provide detailed information about conditions in the switch.

The MS system alarm codes appear under the MS header of the MTC level MAP display. See the chapter “Troubleshooting charts” for a list of all MS alarm codes and the possible causes of alarms. The chapter indicates where to find information to clear each alarm.

DMSMON

The DMSMON monitors the changes in operation when operating company personnel change a release load. The DMSMON formats this information to a report. Generation of the report can be manual or automatic. The type of information in the report includes the following:

- counts of internal events like warm and cold restarts and down time information
- system trap information
- counts of different log occurrences
- configuration information like hardware counts

For additional information about the DMSMON tool, refer to the *DMS-100 Family Commands Reference Manual*, 297-1001-822.

Log reports

Log reports are a primary source of information about the components of the MS. Logs can isolate a problem to a single card. Logs help to detect problems that the system cannot attribute to a single card.

Log reports include the following information:

- seriousness of the logs, indicated by the number of asterisks
- type of log
- time and date
- suspected problem
- list of suspected cards

For information about the MS-related logs, see the “Logs” chapter of this document.

AMREPORT

The AMREPORT provides a 24 h summary of performance, administrative, and maintenance information. This information helps operating company personnel correct and prevent maintenance programs. The system produces AMREPORT as a log that includes the following information:

- switch performance information
  - — the SPMS indicators
  - — call processing performance
  - — the central processing unit (CPU) occupancy
  - — network accuracy
  - — peripheral module (PM) switch of activity (SWACT) information
  - — software performance like trap and SWERR counts
  - — footprint (FP) and OM log counts
  - — extended multiprocessor system (XMS) based peripheral module (XPM) SWACT information
- scheduled test results
  - — automatic line test (ALT)
  - — automatic trunk test (ATT)
- switch operations
  - — image dump results
  - — patch summary
  - — outage indicators
  - — table data integrity check
  - — not scheduled XPM REx test

For additional information on AMREPORT, refer to the *Digital Switching Systems DMS-100 Family Maintenance Managers Morning Report*, 297-1001-535.

The OM log alarm cross-reference charts

The “Troubleshooting charts” chapter of this document contains a set of three charts on OMs, logs, and alarms. Each chart uses one of the indicators as the key. This condition allows operating company personnel to locate all associated information based on any indicator presented by the switch.

Operational measurements

OMs provide load and performance information. The OM system controls collection, display, and generation of OM data for the operating company.

For information about OMs associated with the MS, see the “Operational measurements” chapter of this document.

Sherlock

Sherlock is a data collection tool. Operating company personnel can use this tool after a service outage. Sherlock automatically collects the data required to analyze the cause of the failure. Only one user at a time can use Sherlock.

Sherlock initiates a set of parallel processes that collect all the data available for the specified type of service failure. The system sends the data to a series of temporary files. To access or manipulate these temporary files, you must stop the Sherlock process before data collection completes.

When data collection completes, the system creates a data file and a console file on the specified storage device. This action detects the temporary files. The system names the data file SHRKyymmddhhmmss(Z) and contains the data. The Z indicates that the system compressed the file. The system names the console file SHERLOCK$OUT. The console file contains all the messages and responses sent to your terminal. The console file can contain additional messages, like time stamps.

For additional information on how to use Sherlock, refer to the *DMS-100 Family Commands Reference Manual*, 297-1001-822.

Switch Performance Monitoring System

The SPMS monitors all areas of switch operation and produces routine reports on performance from several different points of view. The system provides a medium-term review with reports that include detailed and summary level data.

The reports collect a wide range of index values computed from OMs that the switch generates. The time period covered in each report ranges from 30 min to 1 month. This range allows you to monitor day-to-day events and provides a longer-term view of switch performance.

The operating company personnel use SPMS results in switch performance index plans for administrative purposes. The operating company can use the general office performance index, a section of the lower-level indexes, or both indexes.

The SPMS consists of three sections:

- the service section
- the maintenance performance section
- the provisionable resources section

For more information on SPMS, refer to the *Switch Performance Monitoring System Application Guide*, 297-1001-330.

TRAPINFO

The TRAPINFO tool displays information on new software traps at a MAP terminal. The tool extracts information from the log utility and displays the information in a number of formats.

For more information about the TRAPINFO tool, refer to the *DMS-100 Family Commands Reference Manual*, 297-1001-822. For more information on traps, see the procedure “Troubleshooting an MS104 log”. This procedure is in the “Advanced troubleshooting procedures” chapter of this document.

Troubleshooting charts

This chapter contains four charts to assist operating company personnel. The charts assist personnel to find information to clear alarmed and nonalarmed trouble conditions in the message switch (MS).

MS alarm and trouble condition procedures

Table 8-1 lists MS-related alarms and nonalarmed conditions and gives a short description of the causes. Table 8-1 provides the location of the correct alarm clearing or trouble locating procedure for each alarm or condition.

Table 8-1
Message switch alarms and trouble conditions

Condition	Possible cause	Action
Critical alarms		
MSpair	Both MSs system busy	1 See the “Advanced troubleshooting procedures” chapter in this document.
Major alarms		
CLOCK	Measurement problems	1 See the “Advanced troubleshooting procedures” chapter in this document.
DDM	Datasync problem	1 See the DDM major alarm clearing procedure in the correct application specific document.
ManB	Message switch manually removed from service	1 See the “ManB major alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.

—continued—

Table 8-1
Message switch alarms and trouble conditions (continued)

Condition	Possible cause	Action
Major alarms (continued)		
NOIMSL	All inter-MS links out of service	1 See the ”NOIMSL major alarm clearing procedure” in *Alarm and Performance Monitoring Procedure*.
SysB	The system removes the MS from service for one of the following reasons: • self-diagnostics run • load problem • critical card fault that isolates the MS from the CM • system card inserted or removed when MS was in service	1 See the “SysB major alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*
TROOS	T-bus routing threshold exceeded	1 See the “Advanced troubleshooting procedures” chapter in this document.
Minor alarms		
CMIC	The CMIC link out of service because of one of the following conditions: • port in MS or CM has faults • port card in MS or CM has faults • damaged link between MS and CM	1 See the “CMIC minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.
IMSL	Out-of-service inter-MS link	1 Refer to the “IMSL minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.

—continued—

Table 8-1
Message switch alarms and trouble conditions (continued)

Condition	Possible cause	Action
Minor alarms (continued)		
Istb	An MS card is in-service trouble for one of the following reasons: • wrong or missing NT9X32 load paddle board • PEC mismatch between hardware and datafill	1 Refer to the “Istb minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.
MAXPT	More ports datafilled than allowable	1 See the “Advanced troubleshooting procedures” chapter in this document.
MBCD	Port card manually removed from service	1 Refer to the MBCD minor alarm clearing procedure in *Alarm and Performance Monitoring Procedures*.
MBCH	Port chain manually removed from service	1 Refer to the “MBCH minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.
MBCL	Channelized link manually removed from service	1 Refer to the “MBCL minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.
MBPT	Port manually removed from service	1 Refer to the “MBPT minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.
REx	MS under REx test	1 Refer to the “REx minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.
RExByp	The system did not perform the MS REx test because the system identified a condition that would result in service degradation. The system uses the information in table REXSCHED to disable MS Rex tests.	1 Refer to the “RExByp minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*. 2 See the “Advanced troubleshooting procedures chapter” in this document.

—continued—

Table 8-1
Message switch alarms and trouble conditions (continued)

Condition	Possible cause	Action
Minor alarms (continued)		
RExFlt	The MS REx test failed for one of the following reasons: • critical card fault • critical fault on the MS node	1 Refer to the “RExFlt minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*. 2 See the “Advanced troubleshooting procedures” chapter in this document.
SBCD	The system removed the port card from service for one of the following reasons: • hardware fault • load problem • card inserted or removed while MS was in service	1 Refer to the “SBCD minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.
SBCH	The system removed the port chain from service for the following reason: • card that has faults	1 Refer to the “SBCH minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.
SBCL	The system removed the channelized link from service for one of the following reasons: • card that has faults • fault on node to which the port links • link between port and node has faults	1 Refer to the “SBCL minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.

—continued—

Table 8-1
Message switch alarms and trouble conditions (continued)

Condition	Possible cause	Action
SBPT	The system removed a port removed from service for one of the following reasons: • card that has faults • fault on node to which the port links • link between port and node has faults An SBPT alarm also appears when the MS detects a persistently babbling device.	1 See the “SBPT minor alarm clearing procedure” *Alarm and Performance Monitoring Procedures*.
SPAN	One of the two timing links appears to not sample for one of the following reasons: • carrier is out of service • timing samples are bad	1 Refer to the “SPAN minor alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*. 2 See the “Advanced troubleshooting procedures chapter in this document.
TRIstb	T-bus routing threshold exceeded	1 See the “Advanced troubleshooting procedures” chapter in this document.
Nonalarmed trouble conditions		
MS104 logs	Several triggers	1 See the the “Advanced troubleshooting procedures” chapter in this document.
MS105 logs	Invalid card installed	1 See the “Correcting release mismatch problems procedure” in *Trouble Locating and Clearing Procedures*.

—continued—

Table 8-1
Message switch alarms and trouble conditions (continued)

Condition	Possible cause	Action
Nonalarmed trouble conditions (continued)		
MS resource info logs (MS157, MS208, MS238, MS248, MS267, MS277, 287, MS307, MS317, MS327)	Different triggers	1 See the “Advanced troubleshooting procedures” chapter in this document.
Cooling fan failure		1 See one of the following procedures in *Trouble Locating and Clearing Procedures*: — “Replacing a cooling unit assembly” — “Replacing a cooling unit electronic module” — “Replacing a cooling unit fan” — “Replacing an NT9X95 card in a cooling unit”

—end—

OM-log-alarm cross reference charts

Tables 8-2, 8-3, and 8-4 list MS-related logs, OMs, and alarms. Each table keys on one of the three indicators and provides cross-references to the other two indicators.

The following table groups registers, associated logs, and associated alarms by MS-related OMs.

Table 8-2
OM-log-alarm cross reference chart

OM group	Register	Associated logs	Associated alarms
MS	MSCDDIA	none	none
	MSCDDIAF	none	SBCD
	MSCDERR	MS263	SBCD
	MSCDFLT	MS263	SBCD
	MSCDMBP	MS261, MS262	MBCD
	MSCDMBU	none	MBCD
	MSCDSBU	none	SBCD
	MSDIA	none	none
	MSDIAF	none	SysB
	MSERR	MS103	SysB
	MSFLT	MS103	SysB
	MSMBU	none	ManB
	MSPTDIA	none	none
	MSPTDIAF	none	SBPT
	MSPTERR	MS303	SBPT
	MSPTFLT	MS303	SBPT
	MSPTMBP	MS301, MS302	MBPT
	MSPTMBU	none	MBPT
	MSPTSBU	none	SBPT
	MSMBP	MS101, MS102	ManB
	MSSBU	none	SysB
MSCHAIN	MSCHDIA	MS150	none
	MSCHDIAF	MS153	SBCH
	MSCHERR	MS150, MS153, MS154, MS157, MS277	SBCH
	MSCHFLT	MS153	SBCH

—continued—

Table 8-2
OM-log-alarm cross reference chart (continued)

OM group	Register	Associated logs	Associated alarms
	MSCHMBP	MS151, MS152	MBCH
	MSCHMBU	none	MBCH
	MSCHSBU	none	SBCH
MSCHNLK	MSCLDIA	MS310, MS280	none
	MSCLDIAF	MS283, MS313	SBCL
	MSCLERR	MS280, MS283, MS284, MS310, MS313, MS314, MS317	SBCL
	MSCLFLT	MS283, MS313	SBCL
	MSCLMBP	MS281, MS282, MS311, MS312	MBCL
	MSCLMBU	none	MBCL
	MSCLSBU	none	SBCL

—end—

The following table groups OMs and alarms by MS-related logs.

Table 8-3
Log-OM-alarm cross reference chart

Log	Associated OMs	Associated alarms
MS100	none	none
MS101	MSMBU, MSMBP	ManB
MS102	none	ManB
MS103	MSSBU, MSDIAF, MSERR, MSFLT	SysB
MS104	none	REx, RExByp, RExFlt
MS105	none	none
MS150	none	none
MS151	MSCHMBP, MSCHMPU	MBCH

—continued—

Table 8-3
Log-OM-alarm cross reference chart (continued)

Log	Associated OMs	Associated alarms
MS153	MSCHERR, MSCHDIAF, MSCHFLT, MSCHSBU	SBCH
MS154	none	SBCH
MS155	none	none
MS156	none	none
MS157	none	none
MS208	none	none
MS238	none	none
MS248	none	none
MS249	none	none
MS260	none	SBCD
MS261	MSCDMBP, MSCDMBU	MBCD
MS262	none	MBCD
MS263	MSCDSBU, MSCDDIAF, MSCDERR, MSCDFLT	SBCD
MS264	none	SBCD
MS265	none	MBCD
MS266	none	none
MS267	none	none
MS277	none	none
MS280	none	none
MS281	MSCLMBP, MSCLMBU	MBCL
MS282	none	MBCL
MS283	MSCLSBU, MSCLDIAF, MSCLERR, MSCLFLT	SBCL
MS284	none	SBCL
MS285	none	none
MS286	none	none
MS287	none	none

—continued—

Table 8-3
Log-OM-alarm cross reference chart (continued)

Log	Associated OMs	Associated alarms
MS300	none	none
MS301	MSPTMBP, MSPTMBU	SBPT
MS302	none	MBPT
MS303	MSPTSBU, MSPTDIAF, MSPTERR, MSPTFLT	SBPT
MS304	none	SBPT
MS305	none	none
MS306	none	none
MS307	none	SBPT
MS310	none	none
MS311	none	MBPT
MS312	none	MBPT
MS313	none	SBPT
MS314	none	SBPT
MS315	none	none
MS316	none	none
MS317	none	SBPT
MS318	none	none
MS320	none	none
MS321	none	IMSL
MS322	none	IMSL
MS323	none	IMSL
MS324	none	IMSL
MS325	none	IMSL
MS326	none	IMSL
MS327	none	IMSL
SYNC101	none	CLOCK
SYNC102	none	CLOCK

—continued—

Table 8-3
Log-OM-alarm cross reference chart (continued)

Log	Associated OMs	Associated alarms
SYNC103	none	CLOCK
SYNC104	none	CLOCK
SYNC105	none	CLOCK
—end—		

The following table groups logs and OMs by MS-related alarms.

Table 8-4
Alarm-log-OM cross reference chart

Alarms	Associated logs	Associated OMs
CLOCK	MS248, SYNC logs	none
CMIC	none	none
DDM	none	none
Istb	none	none
IMSL	MS321, MS322, MS323, MS324, MS325, MS326	none
ManB	MS101, MS102	MSMBP, MSMBU
MAXPT	none	none
MBCD	MS261, MS262, MS265	MSCDMBU, MSCDMBP
MBCH	MS151, MS152	MSCHMBU, MSCHMBP
MBCL	MS281, MS282	MSCLMBU, MSCLMBP
MBPT	MS301, MS302, MS311, MS312	MSPTMBU, MSPTMBP
MSpair	none	none
NOIMSL	none	none
REx	MS104	none
RExByp	MS104	none
RExFlt	MS104	none
—continued—		

Table 8-4
Alarm-log-OM cross reference chart (continued)

Alarms	Associated logs	Associated OMs
SBCD	MS260, MS263, MS264	MSCDDIAF, MSCDERR, MSCDFLT, MSCDSBU
SBCH	MS153, MS154	MSCHDIAF, MSCHERR, MSCHFLT, MSCHSBU
SBCL	MS283, MS284	MSCLDIAF, MSCLERR, MSCLFLT, MSCLSBU
SBPT	MS303, MS404, MS313, MS314	MSPTDIAF, MSPTERR, MSPTFLT, MSPTSBU
SPAN	none	none
SysB	MS103, MS104	MSSBU, MSFLT, MSERR, MSDIAF
TRIstb	none	none
TROOS	none	none

—end—

Advanced troubleshooting procedures

Task list

The names of all the procedures in this chapter appear in the following list. The names of the procedures are in alphabetical order. To find the correct procedure, look for the name of the procedure in the left column of the table. When you find the name of the procedure, go to the page number listed in the right column. If more than one entry appears under a procedure name, look for the context of the task.

Changing MS timing links

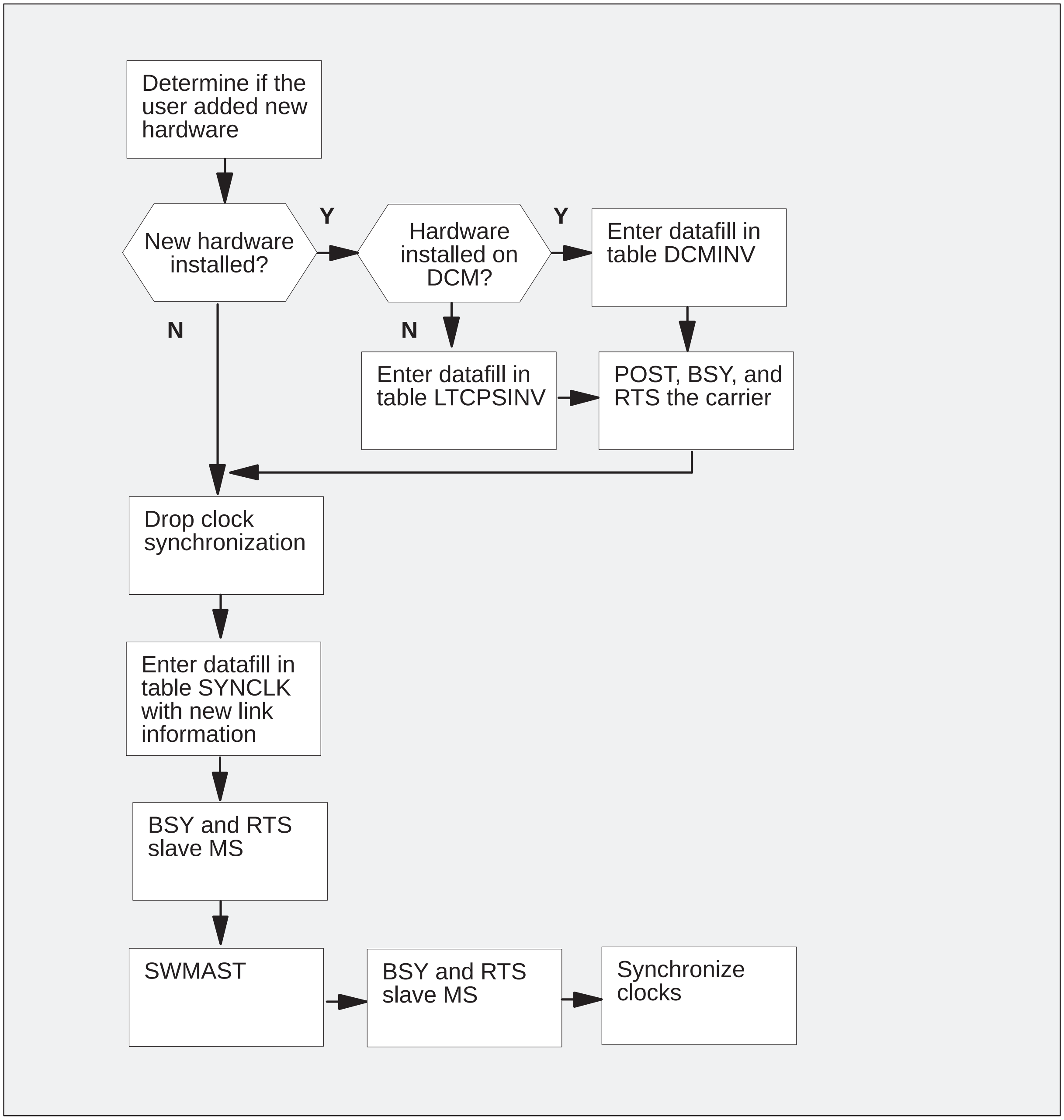
Application

Use this procedure when changing the datafill to determine which links provide the external clocking signal. You can assign timing links to different circuits or P-side links on peripheral modules (PM). The type of PM determines which circuits you can use. On digital carrier modules (DCMs), you can use circuits 0 to 4 as timing links. On digital trunk controllers (DTCs), line trunk controllers (LTCs), pulse code modulation-30 (PCM-30) digital trunk controllers (PDTCs), Austrian digital trunk controllers (ADTCs), or international digital trunk controllers (IDTCs), you can use only circuits 0 and 2 for timing links.

The flowchart on the next page shows the steps required to change the links.

Changing MS timing links (end)

Summary of changing MS timing links



MS104 logs

Application

This module provides information about MS104 logs. The module helps you understand the value of logs and helps you decide the correct action. The module does not provide detailed instructions for solving the problems that caused the system to generate logs. Analysis of the log data determines the problems that caused the system to generate logs.

The system generates MS104 node information logs when a maintenance action occurs and the node state did not change. The maintenance actions that produce these logs include the following:

- MS REx test
- MS load operations (manual or automatic)
- switch of MS clock mastership
- MS distributed data manager (DDM) datasync
- patcher audit detects a patch mismatch between the CM and the MS
- failure of the MS node audit to recover a system busy MS

The first line of the log report shows:

- the number of the log
- the date and time the system generated the log.
- the title of the log report.

The second line of the log report contains the reason the log system generated the log. For example, *MS REx Test Bypassed by System REx Controller.* The remaining lines contain more information. The reason that the system generated the log determines this information.

REx test

An MS REx test produces an MS104 log when the test starts, passes, passes with in-service trouble, fails, cancels, or is bypassed. The fourth line of the log report indicates the reason for the report. When the MS REx test passes with in-service trouble, the system generates a card list. The card list shows cards that operating company personnel must manually test. When the MS REx test fails, the system displays the failure reason. The system generates a card list.

MS104 logs (continued)

The following example shows the MS104 log generated when the system REx controller bypasses the test:

```
MS104 OCT01 02:54:25 1300 INFO        NODE
   STATE: RTS  BY REX TEST           CODE REF: 0: REASON: 0000 MS: 0
   FLT MAP: 0000 0000 0000
   MS REx Test Bypassed by System REx Controller.
```

MS load operations

The MS load operation uses MS104 logs to indicate when the operation starts, completes, or fails. When the MS load operation fails, the system displays the failure reason. The log report indicates if operating company personnel initiated the load operation or the system automatically initiated the operation.

The following example shows the MS104 log generated when the system automatically initiates the MS load operation.

```
MS104 JAN01 13:24:24 2400  INFO          NODE
   STATE: SYSB BY LOAD ACTION    CODE REF:6: REASON: 0000 MS: 1
   FLT MAP: 0000 0000 0080
   Auto loading started
```

Switch of clock mastership

The system generates MS104 logs when the MS clocks switch mastership. One log indicates that a new clock acquired mastership. A second log indicates that the master clock has become the slave. When the switch of clock mastership fails, the system generates another MS104 log that indicates the failure reason.

The following example shows an MS104 log that the system generates when the MS clocks switch mastership:

```
MS104 OCT01 09:51:10 9700 INFO     NODE
            STATE: RTS  BY MANUAL ACTION  CODE REF: 0: REASON: 0000 MS: 1
            FLT MAP: 0000 0000 0000
            MS acquired clock mastership
```

Recovering a message switch

Several MS104 logs are associated with failures during MS recovery. An MS data synchronization problem requires manual recovery action. The system initiates automatic recovery actions when an MS fails to return to

MS104 logs (end)

service during a CM restart. The system also initiates automatic recovery actions when an MS fails a system audit.

All failures associated with MS data synchronization generate MS104 logs. These logs indicate why the DDM download failed. When the data synchronization failure occurs during a manual return to service, the node remains manual busy. Operating company personnel must collect all DDM logs for analysis.

When the data synchronization failure occurs during a CM restart or system audit, the node returns to service. The system raises the DDM alarm under the MS header of the MTC level MAP display. To clear this alarm, refer to the “MS DDM alarm clearing procedure” in *Alarm and Performance Monitoring Procedures*.

If an MS fails to recover after a CM restart, the system generates an MS104 log. The MS104 log indicates the reason the MS failed to recover. The MS remains system busy. The system initiates a node audit to recover the MS.

The MS node audit performs a series of operations to recover the node. As each operation executes, the results are reported in an MS104 log.

The following example shows an MS104 log generated when a system audit initiated return to service fails:

```
MS104 JAN01 13:14:28 5500 INFO     NODE
    STATE: SYSB BY AUDIT ACTION   CODE REF: 1: REASON: 0000 MS: 1
    FLT MAP: 0000 0000 0020
    RTS failed: RST node – mtc open mc link failed
```

Application

A SPAN alarm occurs when the inactive timing link is not sampling. A standby link is not available to take over if a problem develops on the active timing link.

This alarm clears when the alarm associated with the resource clears. These alarms appear under the TRKS and peripheral module (PM) headers of the magnetic tape center (MTC) level MAP display. Refer to *Alarm and Performance Monitoring Procedures* to clear these alarms.

Troubleshooting a MaxPt alarm (end)

Application

A MS MaxPt alarm occurs when the number of ports datafilled for an application or node type exceeds the number allowed for the device. The system automatically generates the alarm on system audits or on a routine exercise (REx) test. The system can also generate an alarm if operating company personnel executes a QUERYMS command. This command accounts for all allocated series I and II peripheral module (PM) ports.

This alarm is not always a maintenance problem. This alarm must be addressed with the provisioning group for the operating company.

Application

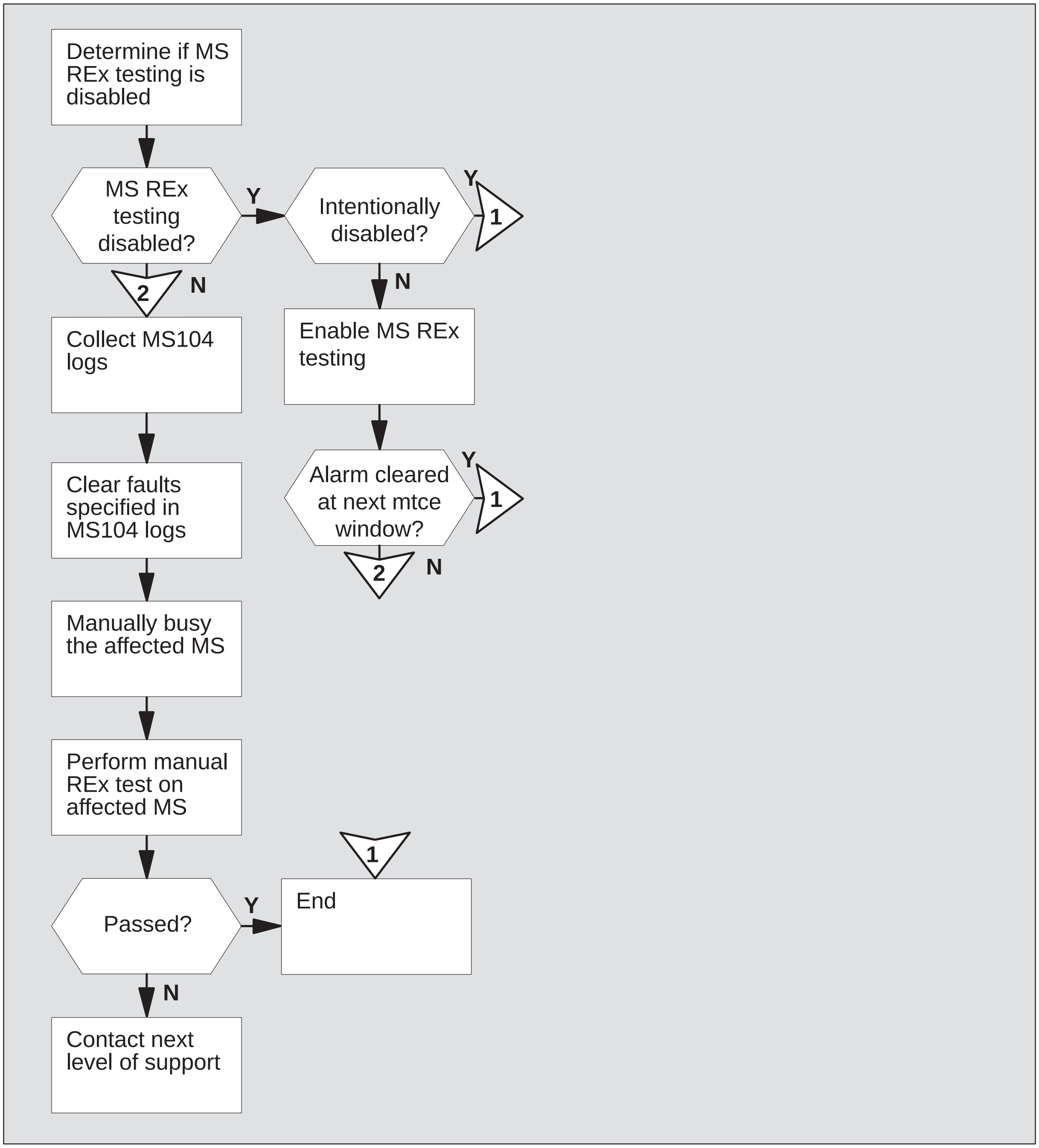
A RExByp alarm occurs for the following reasons:

- The daily automatic REx test has been bypassed. Before the message system (MS) performs a (routine exercise) REx test, the MS performs a stability check. The stability check makes sure that the MS can be taken out of service without causing a disruption. When the stability check fails or the node is not stable, the REx test is bypassed. The system raises the RExByp alarm and generates an MS104 log. The log specifies the reason that the test was bypassed.
- The user used datafill in table REXSCHED to disable automatic MS REX testing.

The steps to take to clear this alarm appear in the flowchart on the following page.

Troubleshooting a RExByp alarm (end)

Summary of troubleshooting a RExByp alarm



Troubleshooting a RExFlt alarm

Application

A RExFlt alarm occurs when the automatic REx test finds a fault. The system generates a series of logs.

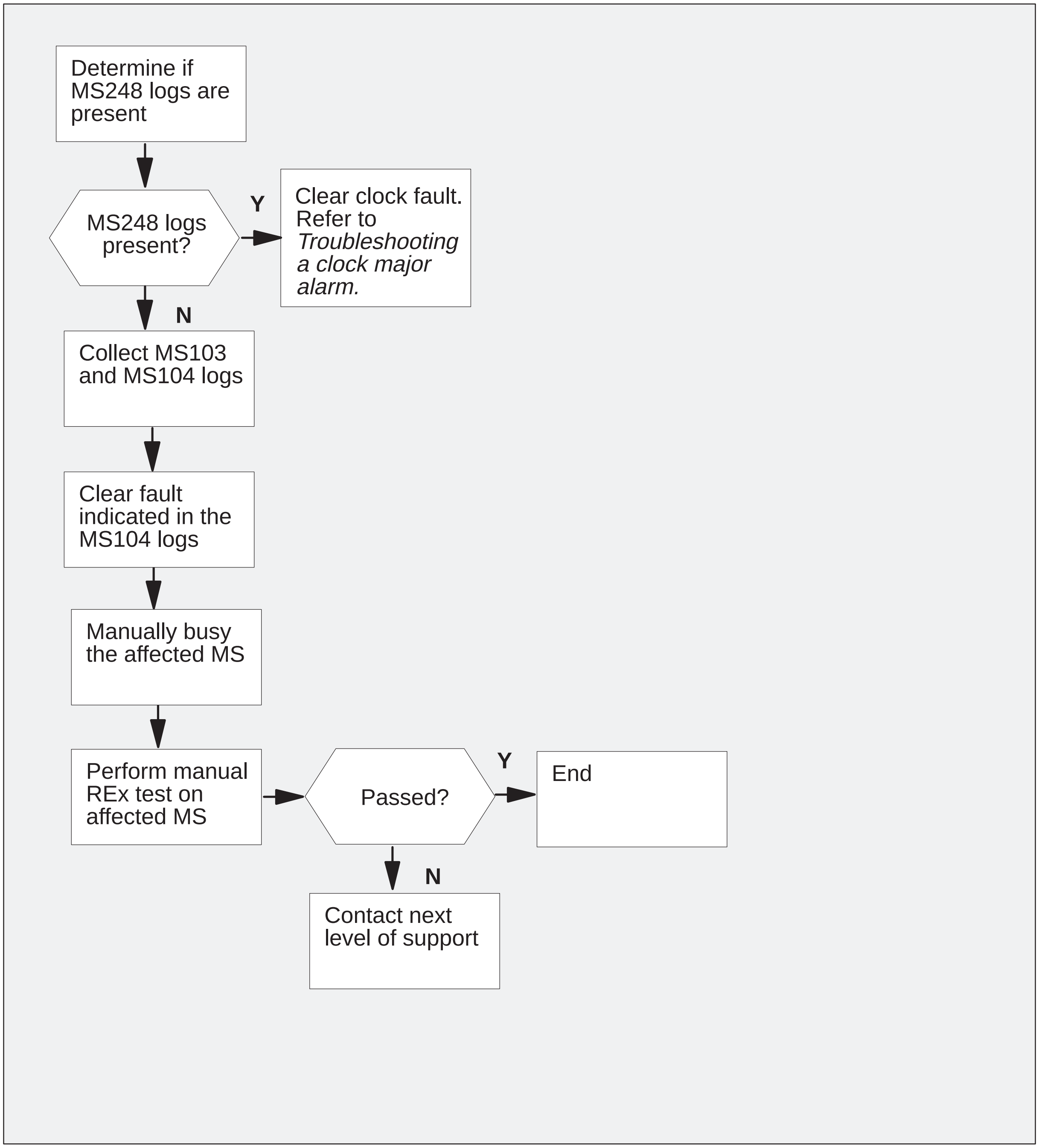
When the clock test stage of the message system (MS) REx test fails, the system generates MS248 and MS104 logs. When any other test stage fails, the system generates an MS104 log. The MS104 log specifies the fault. This log includes a list of cards that have faults.

The system generates another log to indicate the completion or failure of the REx test. An MS104 REx pass log indicates the REx test passed. An MS103 log indicates the REx test failed.

The steps to clear this alarm appear in the flowchart on the next page.

Troubleshooting a RExFlt alarm (end)

Summary of troubleshooting a RExFlT alarm



Troubleshooting an MSpair alarm (end)

Application

An MSpair critical alarm occurs when both MSs are out of service. The computing module (CM) performs a warm restart.

Contact the next level of support.

Troubleshooting an MS clock major alarm

Application

The MS CLOCK major alarm indicates one of several fault conditions. The MS header of the MTC level MAP display indicates a clock major alarm when the system detects a discrete clock fault.

You must access the Clock level of the MAP display to determine the type of clock alarm. The clocking configuration determines which one of four MAP displays is present. The ALM header of the MAP display indicates the exact clock alarm.

The MAP display provides the following information:

- the status of the internal clocks and remote clocks, if applicable
- the deviation values from the normal center frequency for the internal clocks and remote clocks in percentages, if applicable
- the timing sources for internal clocks and remote clocks, if applicable

The Clock level MAP displays for the main five clocking configurations appear in Figures 9-1 to 9-4.

Troubleshooting an MS clock major alarm (continued)

Figure 9-1
Clock level MAP display—master external remote sync

```
      CM     MS    IOD   Net    PM     CCS    Lns     Trks   Ext    APPL
       .      .     .     .      .      .      .       .      .      .
CLOCK           Message Switch  Clock  Shelf 0      Inter–MS Link 0 1
0 Quit      MS 0        .        Master       .                     . .
2           MS 1        .        Slave        .                     . .
3
4           Shelf 0                1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
5           Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
6 Tst_      Chain          :         :             : :
7           MS 0  . . . . . . – – – – . – – – – . . . . . . . . . . .
8           MS 1  . . . . . . – – – – . – – – – . . . . . . . . . . .
9
10 Sync     Card 02 Alm Int  %Adj Src  Rem %Adj  Src
11 DpSync   MS 0  .  .  Syn +00.7 Ex0  Syn +03.1 Ex0
12 SwMast   MS 1  .  .  Syn +01.3 In0  Syn –02.7 In0
13 Card_    Links Slipping:    4 out of 10276
14 QueryMS_
15
16
17
18 Adjust_
    TEAM2
Time  08:00
```

Troubleshooting an MS clock major alarm (continued)

Figure 9-2
Clock level MAP display—master external base and master internal

```
      CM     MS    IOD   Net    PM     CCS    Lns     Trks   Ext    APPL
      .       .     .     .      .      .      .       .      .       .
CLOCK             Message Switch  Clock  Shelf 0      Inter–MS Link 0 1
0 Quit      MS 0        .         Master       .                    . .
2           MS 1        .         Slave        .                    . .
3
4           Shelf 0                 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
5           Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
6 Tst_      Chain          :         :             : :
7           MS 0  . . . . . . – – – – . – – – – . . . . . . . . . . .
8           MS 1  . . . . . . – – – – . – – – – . . . . . . . . . . .
9
10 Sync     Card 02 Alm  Stat %Adj Src
11 DpSync   MS 0  .  .   Syn +00.7 Ex0
12 SwMast   MS 1  .  .   Syn +01.3 Ms0
13 Card_    Links Slipping:    4 out of 10276
14 QueryMS_
15
16
17
18 Adjust_
    TEAM2
Time  08:00
```

Troubleshooting an MS clock major alarm (continued)

Figure 9-3
Clock level MAP display—slave base

```
      CM     MS     IOD    Net     PM      CCS     Lns      Trks    Ext     APPL
      .       .      .      .      .       .       .        .       .       .
CLOCK             Message Switch  Clock  Shelf 0      Inter–MS Link 0 1
0  Quit     MS 0        .         Master       .                       . .
2           MS 1        .         Slave        .                       . .
3
4 SwCarr    Shelf 0                 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
5           Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
6 Tst_      Chain          :         :             : :
7           MS 0  . . . . . . – – – – . – – – – . . . . . . . . . . .
8           MS 1  . . . . . . – – – – . – – – – . . . . . . . . . . .
9
10 Sync     Card 02 Alm Stat %Adj Src : Car Stat Sp PM      CCT
11 DpSync   MS 0  .  .  Syn +00.7 Lk0 : Lk0 Lck   0 DTC 002  02
12 SwMast   MS 1  .  .  Syn +01.3 Ms0 : Lk1 Smp   0 DTC 001  02
13 Card_    Links Slipping:    4 out of 10276
14 QueryMS_
15
16
17
18 Adjust_
    TEAM2
Time  08:00
```

Troubleshooting an MS clock major alarm (continued)

Figure 9-4
Clock level MAP display—slave remote sync

```
      CM     MS    IOD   Net    PM     CCS    Lns     Trks   Ext    APPL
      .       .     .     .      .      .      .       .      .      .
CLOCK             Message Switch  Clock  Shelf 0      Inter–MS Link 0 1
0 Quit      MS 0        .         Master       .                    . .
2           MS 1        .         Slave        .                    . .
3
4 SwCarr    Shelf 0                 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2
5           Card  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
6 Tst_      Chain           :         :             : :
7           MS 0  . . . . . . – – – – . – – – – . . . . . . . . . . .
8           MS 1  . . . . . . – – – – . – – – – . . . . . . . . . . .
9
10 Sync     Card 02 Alm Int %Adj  Src Rem  %Adj Src:Car Stat Sp PM     CCT
11 DpSync   MS 0  .  .  Syn +00.7 Rm0 Syn +03.1 Lk0:Lk0 Lck   0 DTC 002 02
12 SwMast   MS 1  .  .  Syn +01.3 In0 Syn –02.7 In0:Lk1 Smp   0 DTC 001 02
13 Card_    Links Slipping:    4 out of 10276
14 QueryMS_
15
16
17
18 Adjust_
    TEAM2
Time  08:00
```

To determine the discrete fault that caused the alarm, check the error messages on the MS logs, or query the fault condition. To perform this action, type:

>QUERYMS ms_no 2 FLT

The type of alarm indicated and the error message displayed determine the steps required to clear the fault.

Table 9-1 lists all clock alarm indications and error messages. This table also lists the correct MS clock troubleshooting procedure to stop the alarm. Troubleshooting procedures 1 to 20 follow the table, beginning on page 9-19.

Troubleshooting an MS clock major alarm (continued)

Table 9-1
Troubleshooting MS clock alarms reference table

Alarm indication	Error message	Troubleshooting procedure
Alm0	Clock back card stratum1 office alarm0	15
Alm1	Clock back card stratum1 office alarm1	15
Ext	External clock failure	14
	Phase comparator C clock failure	14
	Phase comparator C frame pulse failure	14
CMU	Clock card CMU failure	2
Htr	Stratum2/Stratum2p5 remote clock heater failure	9
	Stratum 3 Clock oscillator heater failure	2
Mat	Mate Clock frame pulse failure	3
	Mate Clock frame pulse noisy	3
	Mate Communication Protocol Error	22
MM	Clock back card termination select incorrect	11
	Clock card and database configuration parameters are incompatible	11
	Clock card and database masterships are incompatible	12
	Clock card and database office types are incompatible	11
	Clock card and database remote SYNC configuration are incompatible	11
	Clock firmware load mismatch	13
	Clock types mismatch-clock type used is Strat2	11
	Clock types mismatch-clock type used is Strat2p5	11
	Clock types mismatch-clock type used is Strat3	11
	Invalid clock parameters for the clock card	13
	Invalid IP/IQ tracking level for the clock card	13
	Invalid IP/IQ values for the clock card	13
	No clock firmware resident in software	12
MSP	Clock card cannot be accessed	5

—continued—

Troubleshooting an MS clock major alarm (continued)

Table 9-1
Troubleshooting MS clock alarms reference table (continued)

Alarm indication	Error message	Troubleshooting procedure
MSP	Clock card experienced an error while accessing the P-bus	5
	Clock card number corrupted in data	12
	Clock card trapped	5
	Clock front or back card not inserted	5
	System processor bus reports a parity error for the clock card	13
Pwr	Clock onboard power converter failure	2
	Remote clock power converter failure	8
Rem	Off board clock failure	7
	Phase comparator D clock failure	7
	Phase comparator D frame pulse failure	7
	Phase comparator D phase latch failure	20
	Remote clock communication error	6
	Remote clock DAC compare fault	8
	Remote clock EPROM error	8
	Remote clock latch error	8
	Remote clock RAM error	8
	Stratum2/Strat2p5 remote clock sanity failure	10
Sub	Phase comparator B clock failure	2
	Phase comparator B frame pulse failure	2
	Phase comparator B phase latch failure	17
	Subsystem Clock DAC 50% value notification	21
	Subsystem Clock DAC 70% limit reached	19
	Subsystem Clock firmware PLL error	19
	Subsystem clock frame pulse failure	2
	Subsystem clock frame pulse noisy	2
	Subsystem Clock frame pulse on backplane failure	2

—continued—

Troubleshooting an MS clock major alarm (continued)

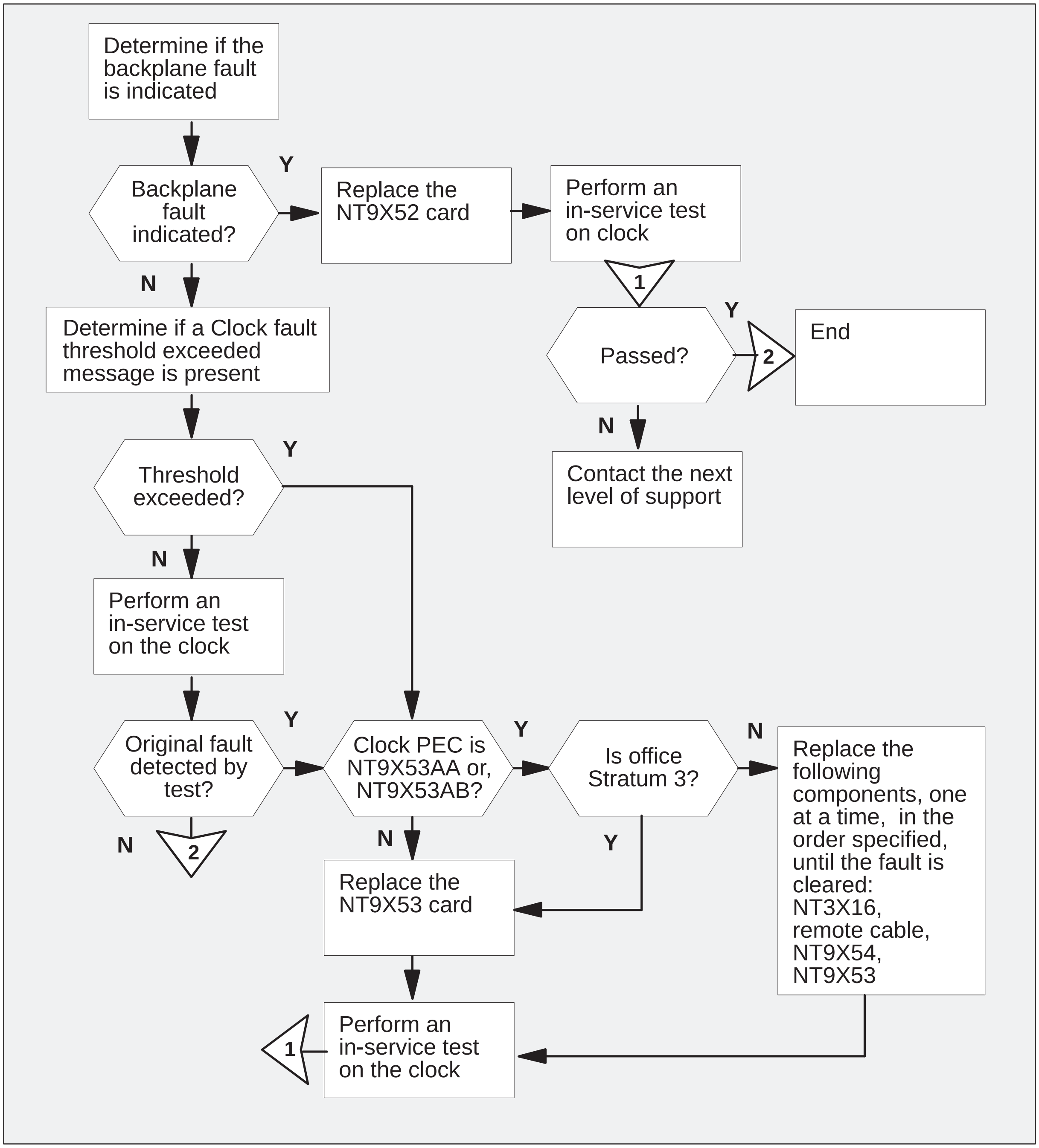
Table 9-1
Troubleshooting MS clock alarms reference table (continued)

Alarm indication	Error message	Troubleshooting procedure
Sub (cont)	Subsystem Clock oscillator failure	2
	Subsystem Clock signal failure	2
	Subsystem Clock signal noisy	2
	Subsystem Clock signal on backplane failure	2
Sys	Clock CMU has entered WAIT state	18
	Data RAM parity error	2
	Phase comparator A clock failure	2
	Phase comparator A frame pulse failure	2
	Phase comparator A phase latch failure	16
	Stratum 3 oscillator DAC delta error	12
	Stratum 3 oscillator DAC failure	2
	System clock firmware PLL error	18
	System clock firmware PLL stopped	18
	System Clock frame pulse failure	1
	System Clock frame pulse noisy	2
	System Clock frame pulse on backplane failure	1
	System Clock oscillator failure	1
	System Clock signal failure	1
	System Clock signal noisy	2
	System Clock signal on backplane failure	1
	System/Subsystem frame pulses out of SYNC	2
TMt	Frame pulse to mate clock has failed	4
	Mate communications transmit fault	23
Tun	Clock DAC value notification	21
	System DAC 70 percent limit reached	18

—end—

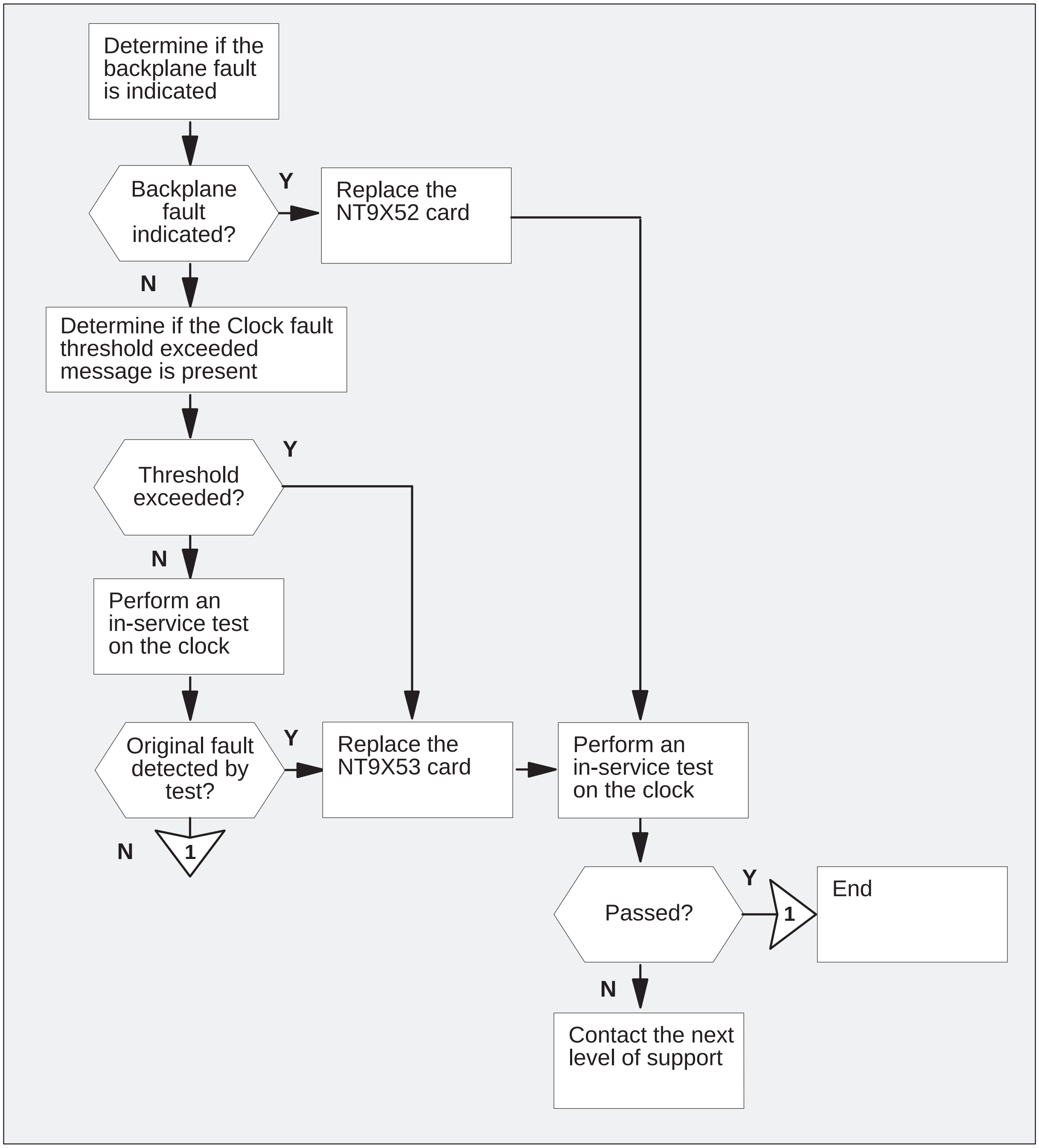
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 1



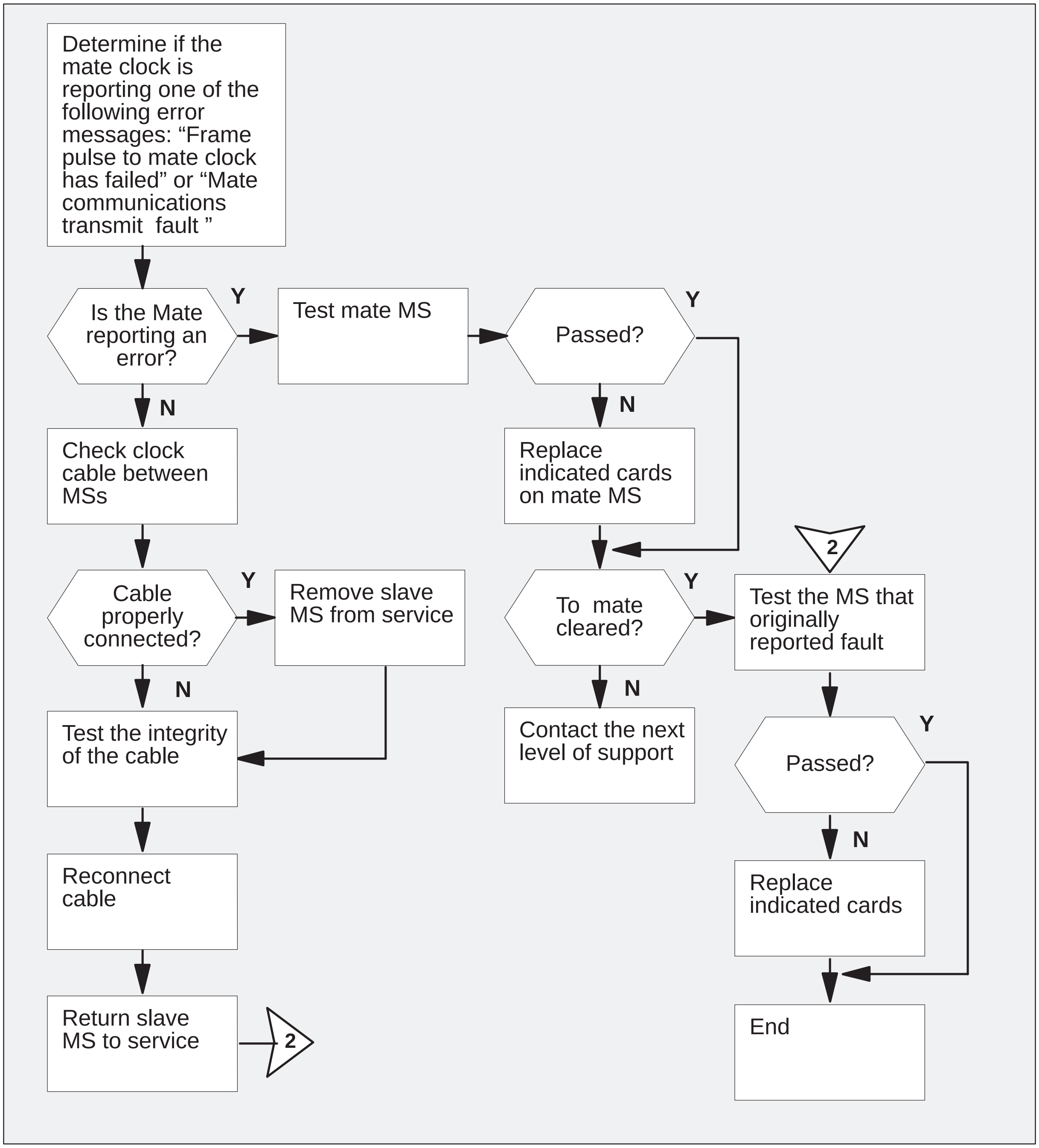
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 2



Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 3



Use procedure 3 to clear faults that indicate loss of synchronization between the two MS clocks. One of the following problems can cause the failure:

- a damaged or disconnected clock cable between the two MSs
- a fault on the mate MS clock

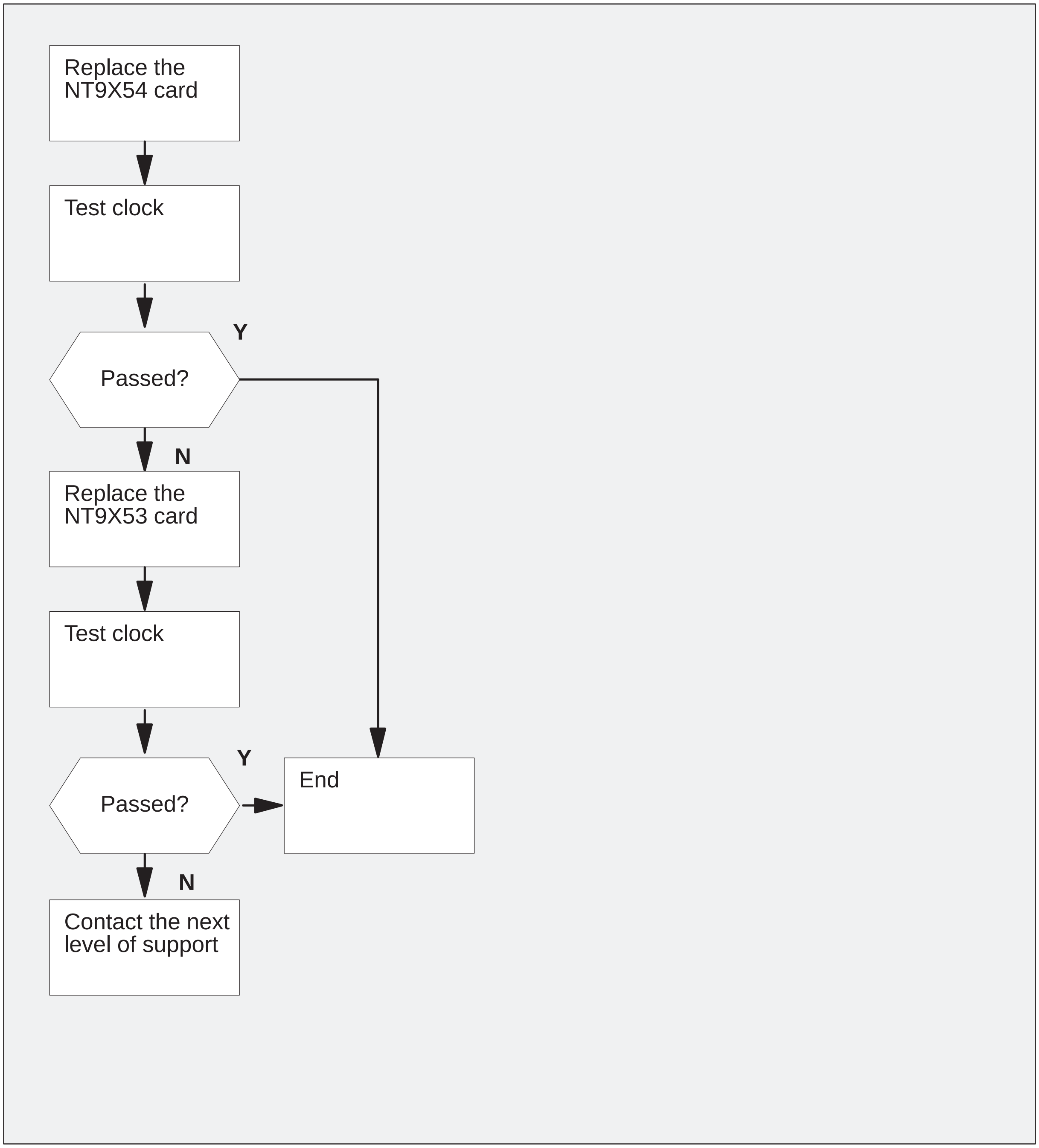
Troubleshooting an MS clock major alarm (continued)

- a fault on the clock of the MS that reported the error

The mate alarm indicates that the clock that reports the fault cannot receive signals from the mate clock. The to-mate alarm indicates that the clock that reports the fault cannot send signals to the mate clock. The master clock cannot become the slave clock if the master clock uses a mate alarm.

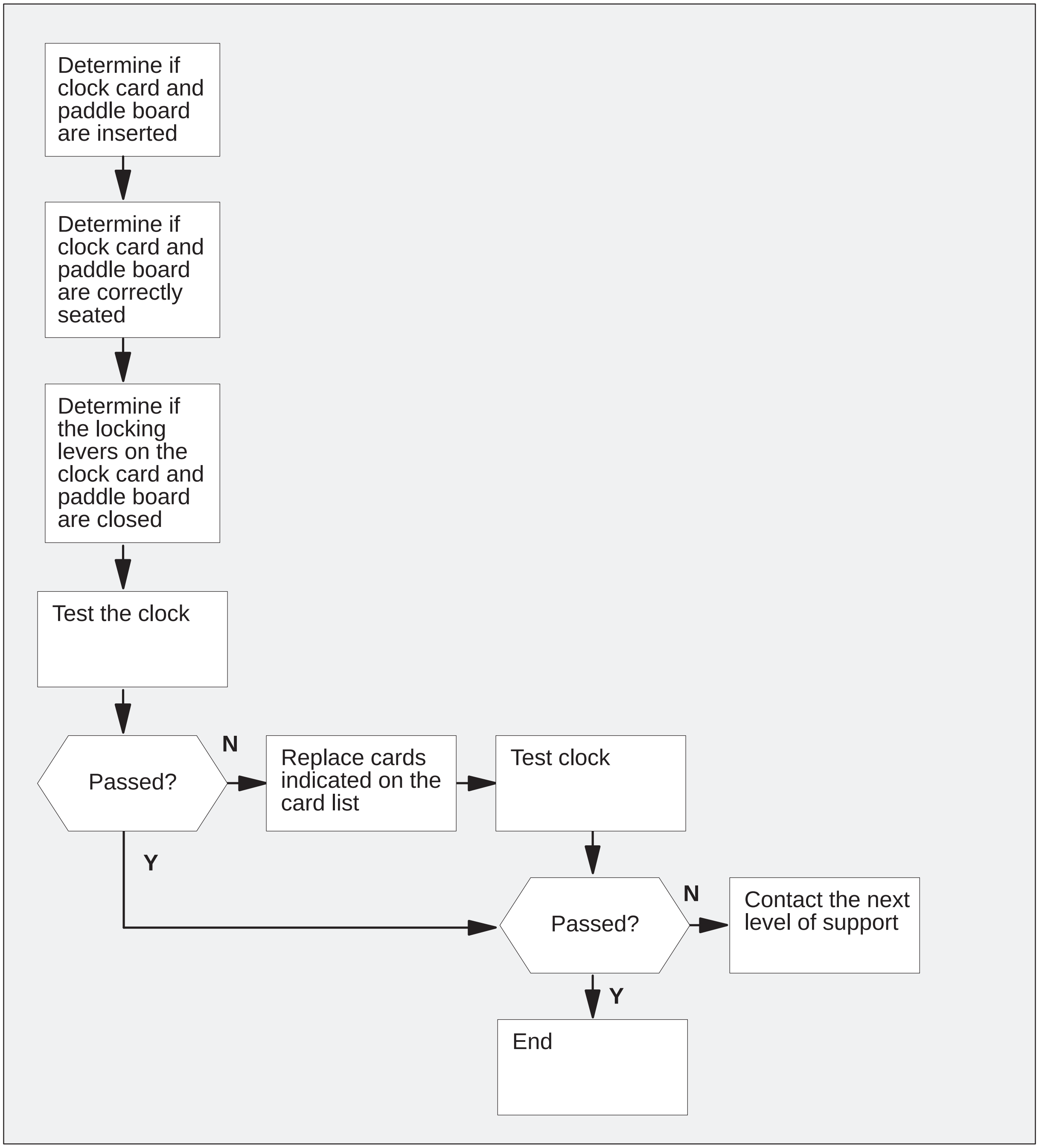
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 4



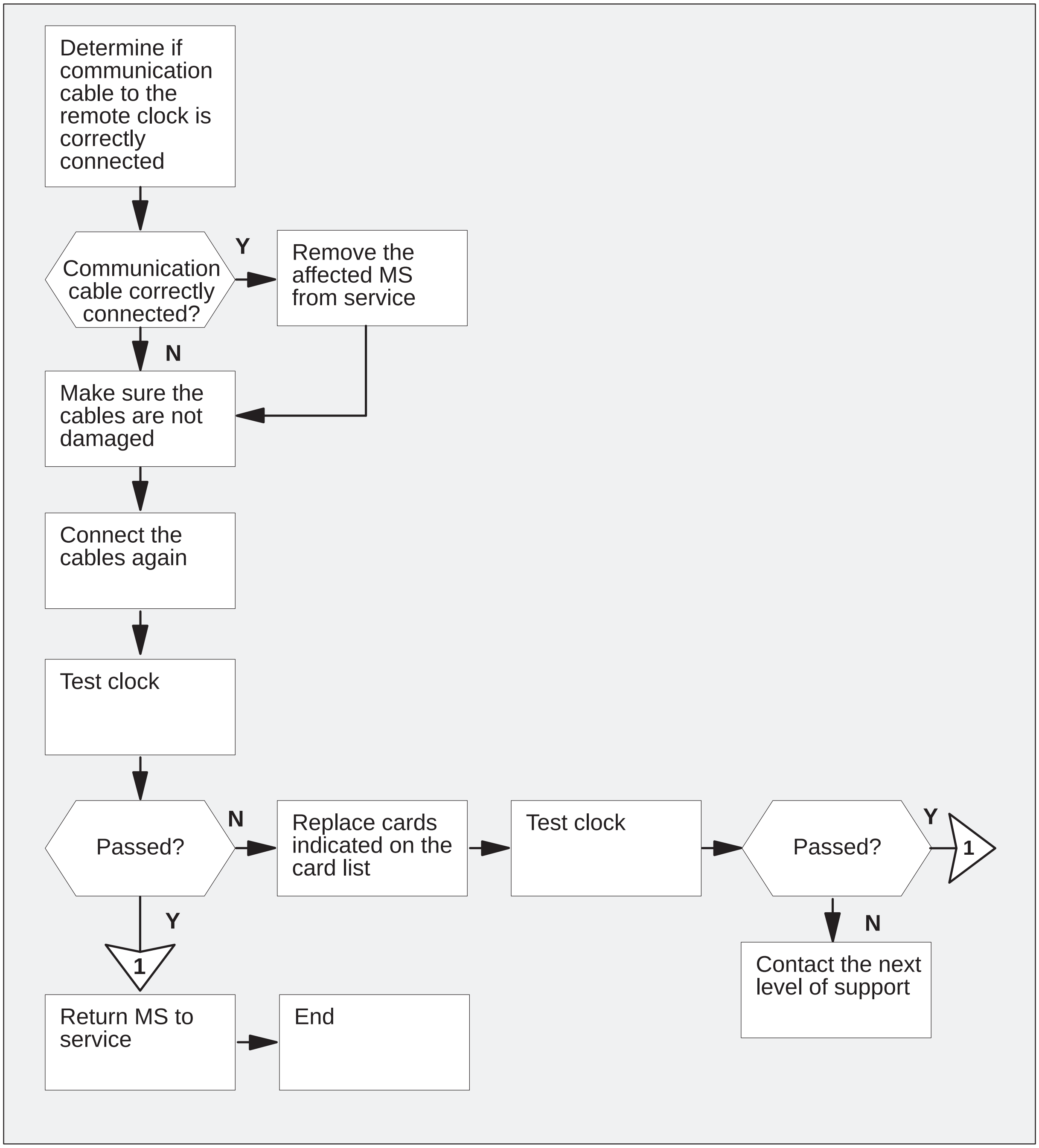
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 5



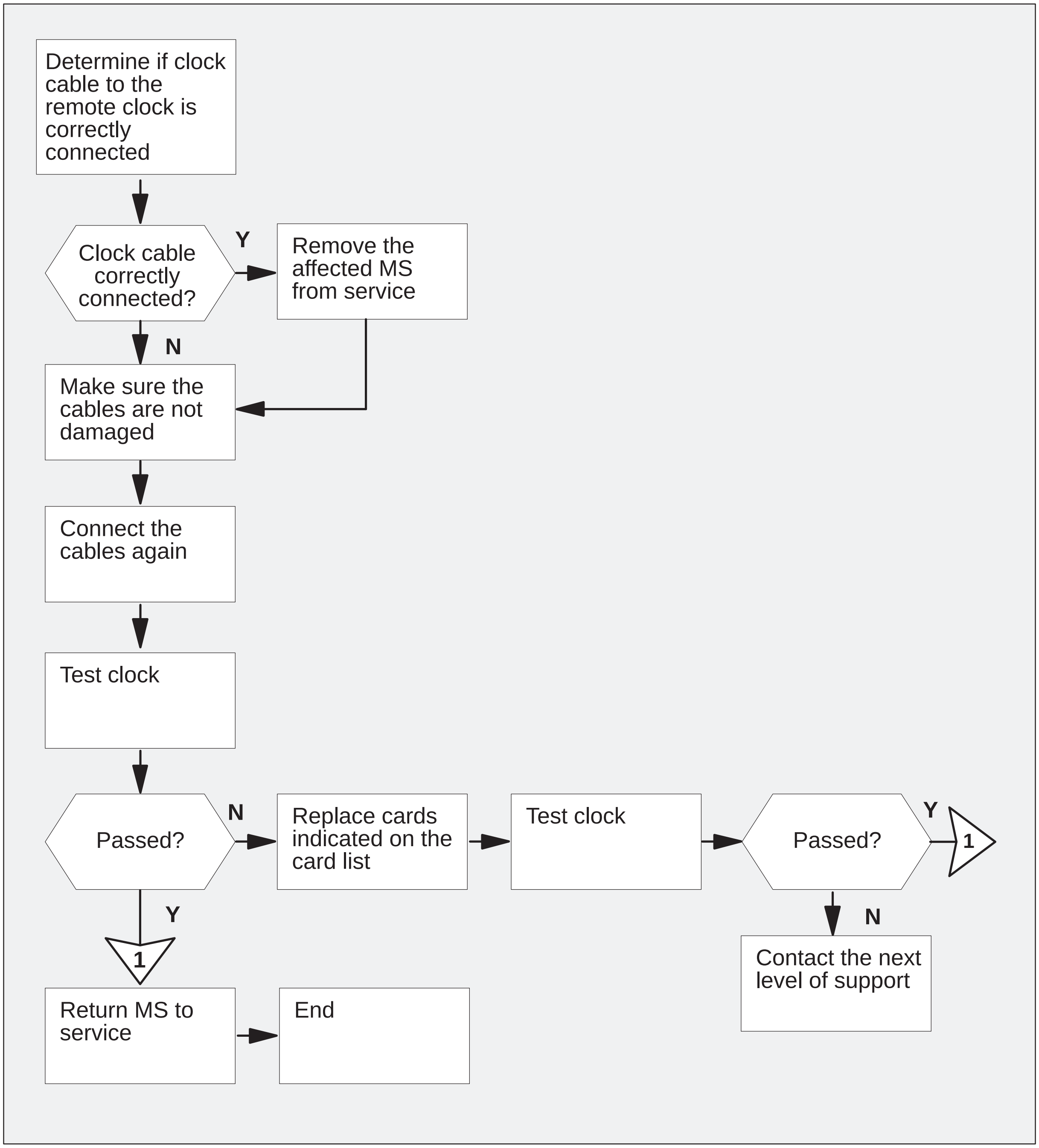
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 6



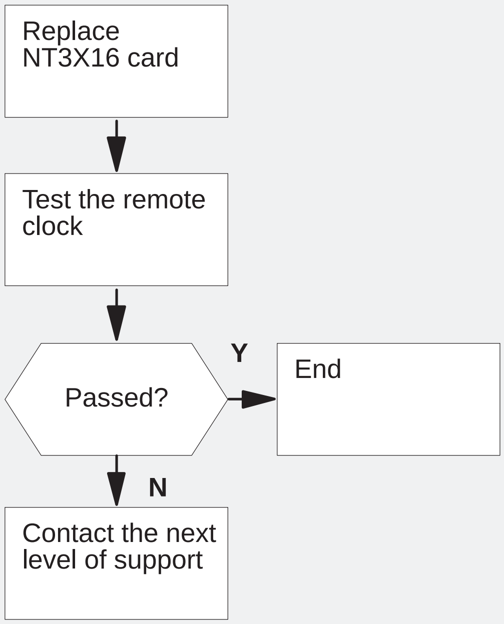
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 7



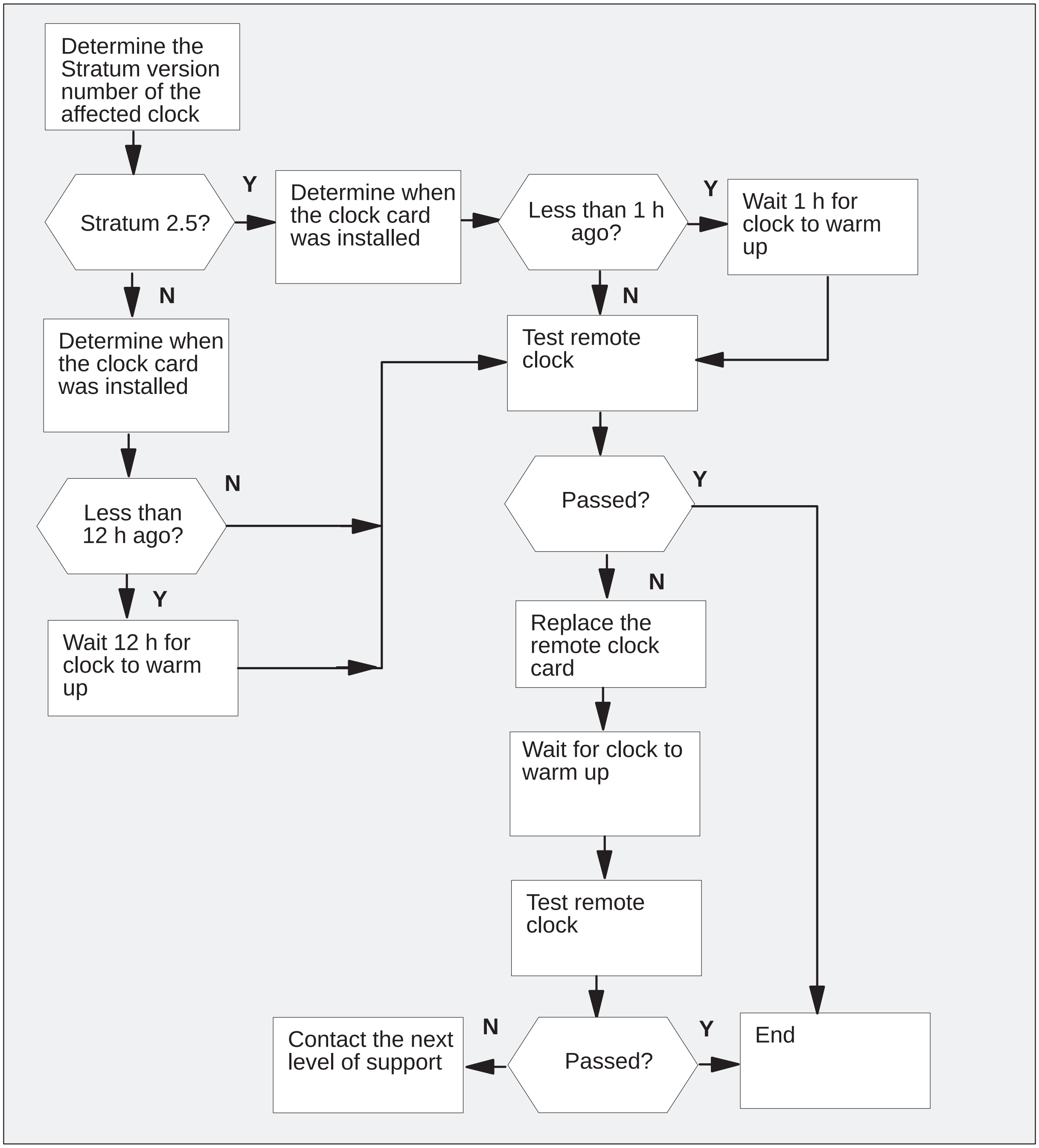
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 8



Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 9



Troubleshooting an MS clock major alarm (continued)

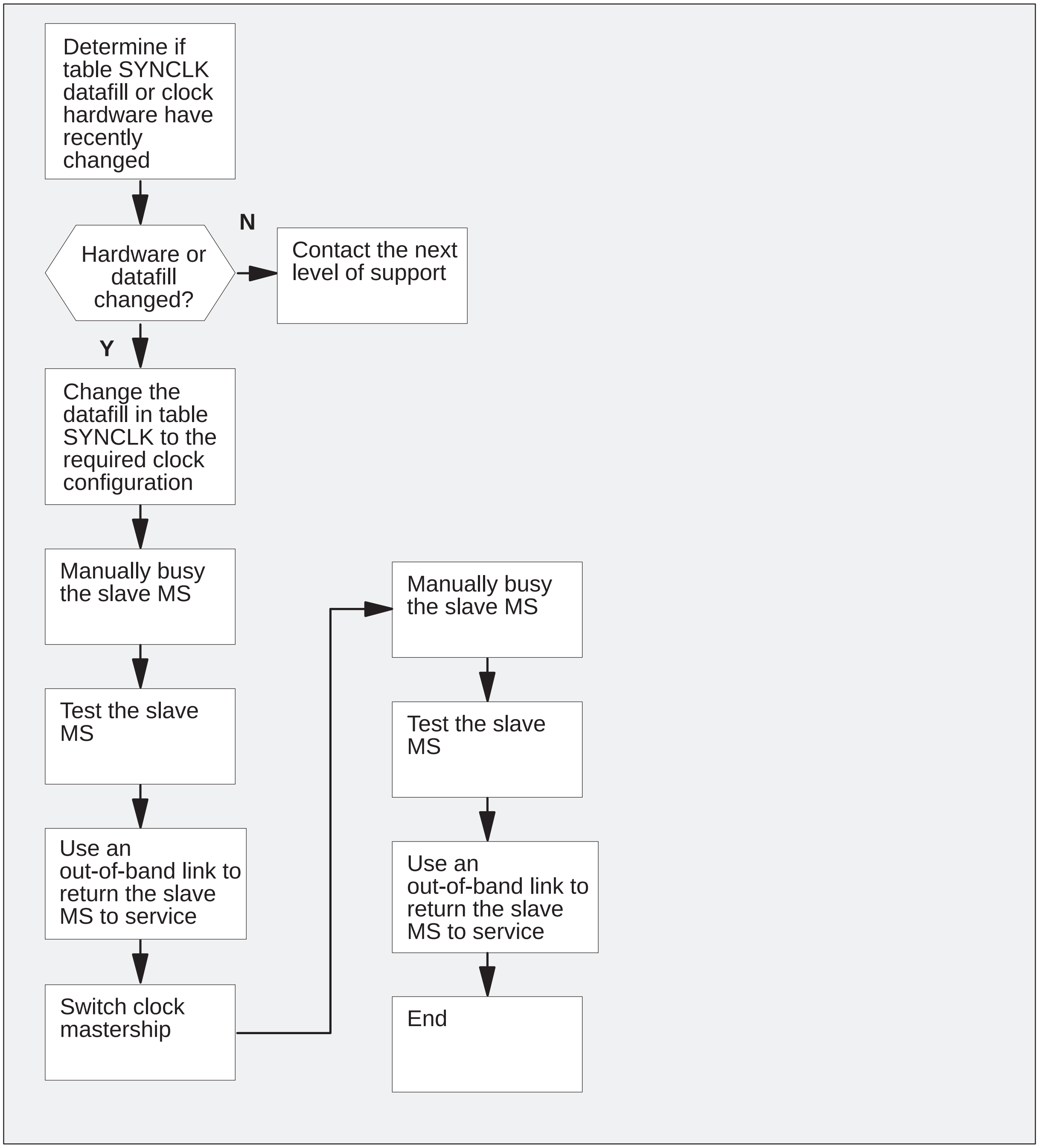
Use procedure 9 to clear faults that can occur when the user installs the remote clock card in the remote shelf. The temperature of the remote clock card determines the time required to clear this fault. The fault can require 1 h to clear after installing card for a stratum 2.5 clock. The fault can require a maximum of 12 h to clear for a stratum 2 clock. If the remote card is not replaced, or the problem continues, replace the remote clock card.

MS clock troubleshooting procedure 10

This fault is generated in association with other remote faults. To clear this fault, clear the remote fault reported with this fault. If this fault is generated with no remote fault, contact the next level of support.

Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 11

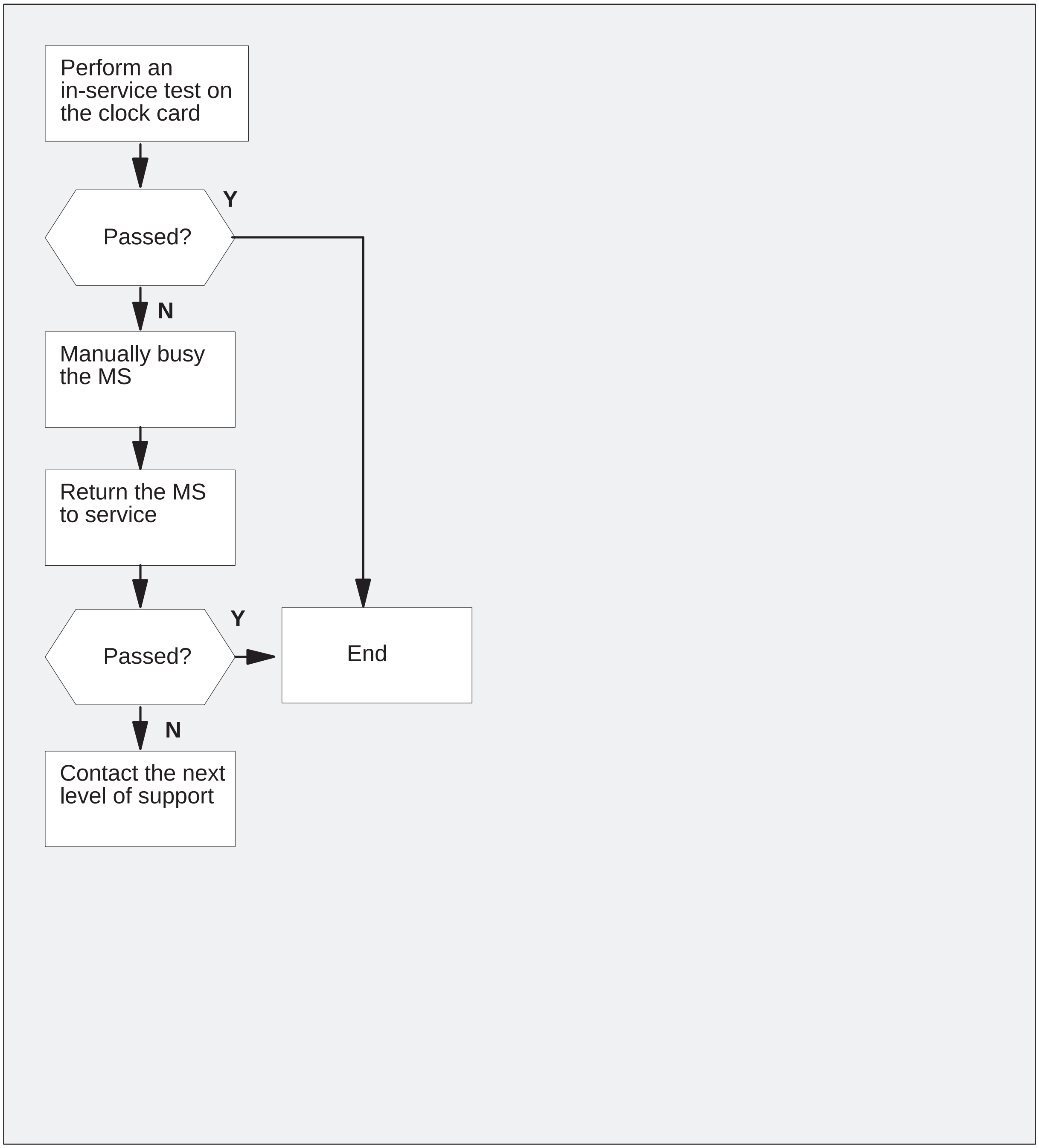


Troubleshooting an MS clock major alarm (continued)

Troubleshooting MS clock procedure 12

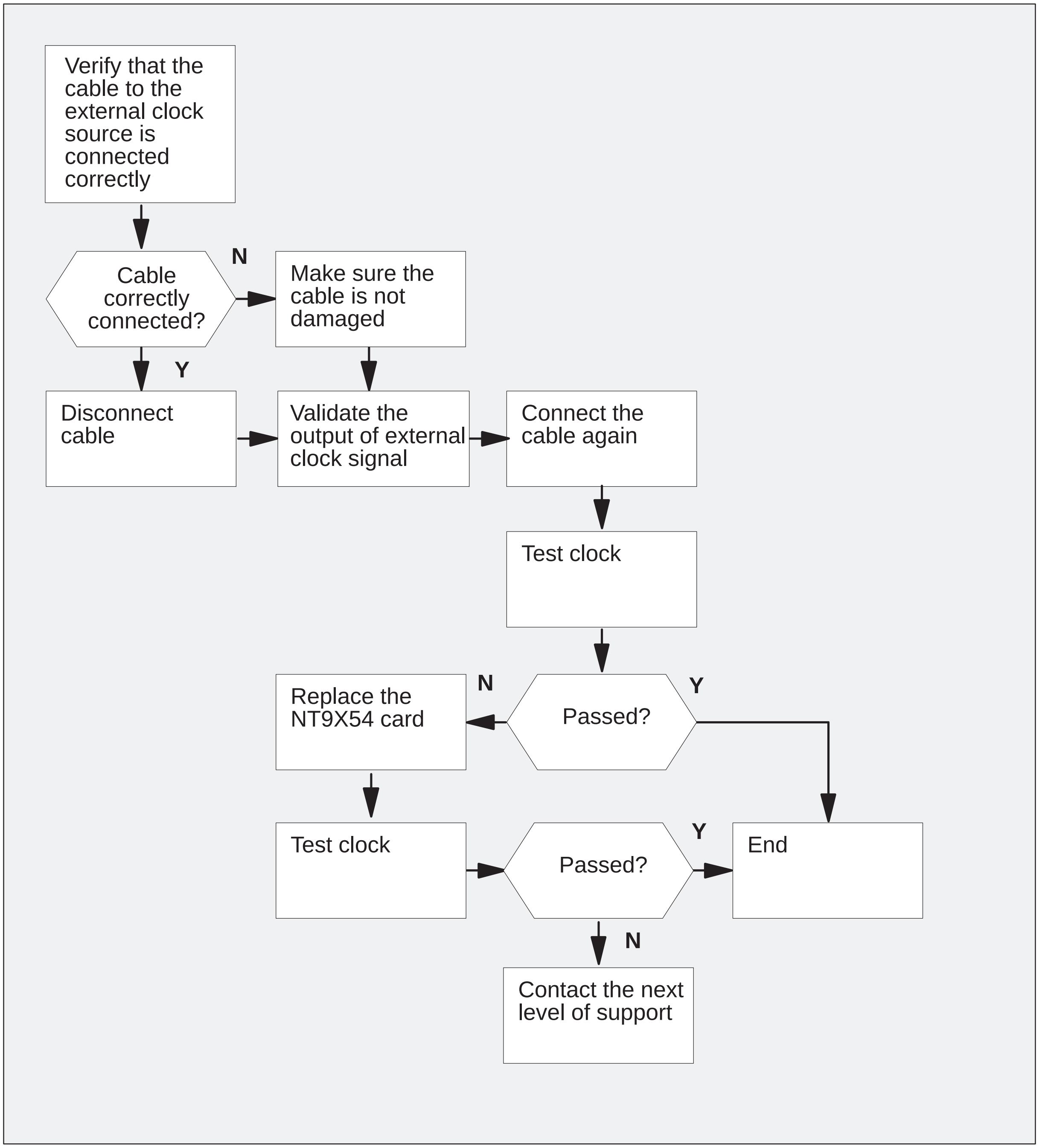
Contact the next level of support.

Summary of troubleshooting MS clock procedure 13



Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 14



Troubleshooting an MS clock major alarm (continued)

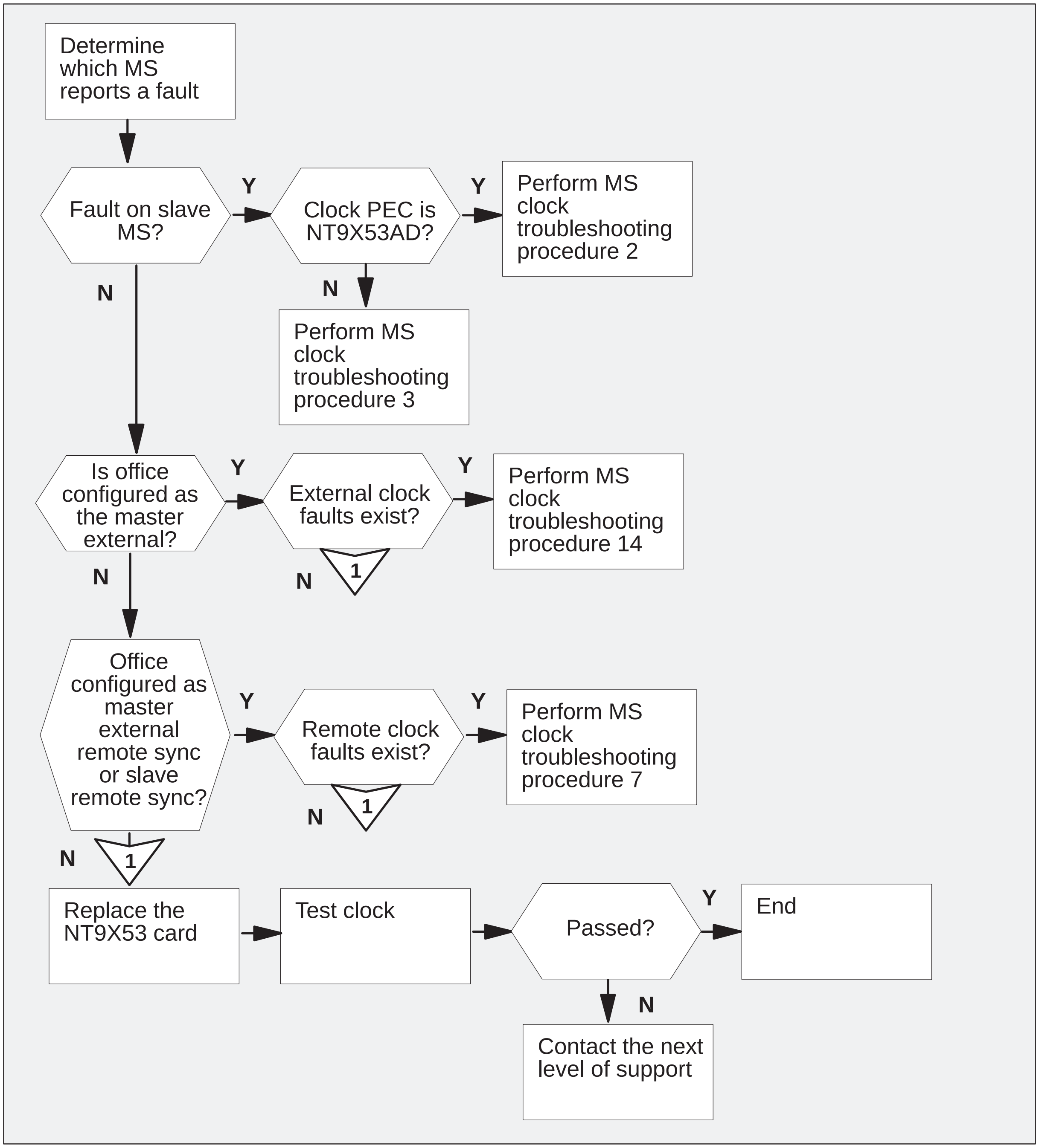
Troubleshooting MS clock procedure 15

The customer defines these faults. The faults indicate a problem with the Stratum 1 clock source.

Contact the next level of support to determine how the operating company defines this fault.

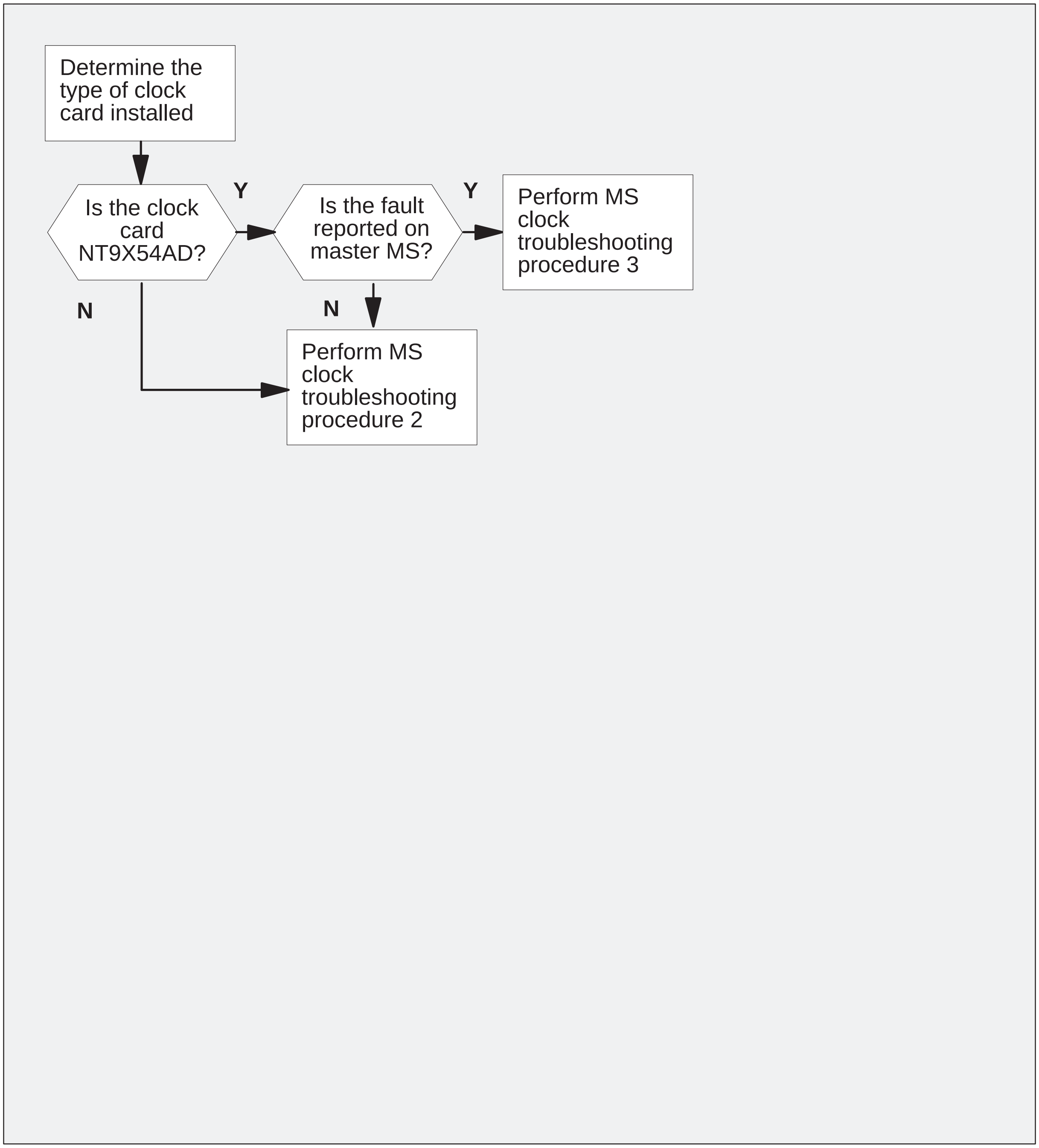
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 16



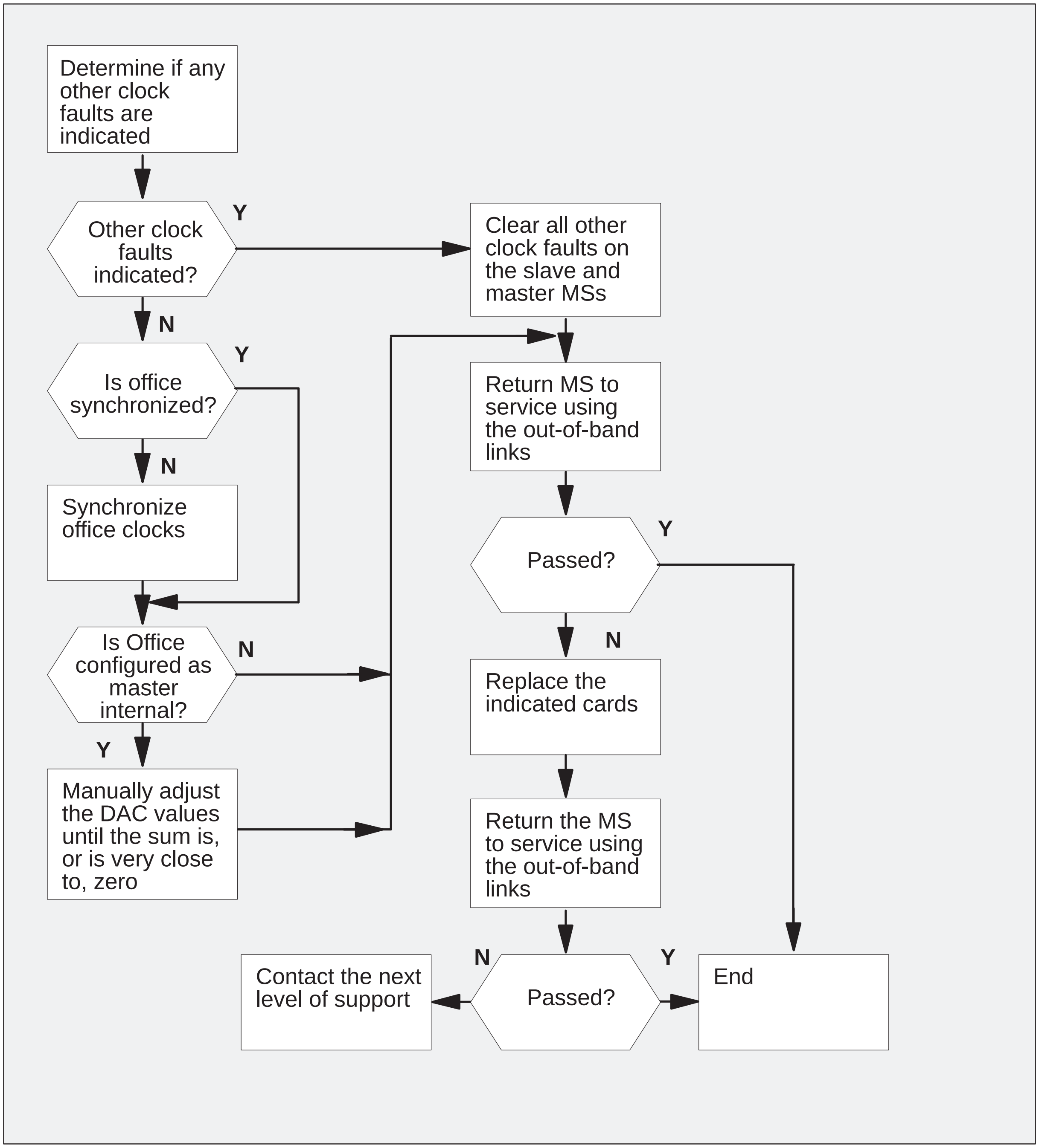
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 17



Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 18 and 19



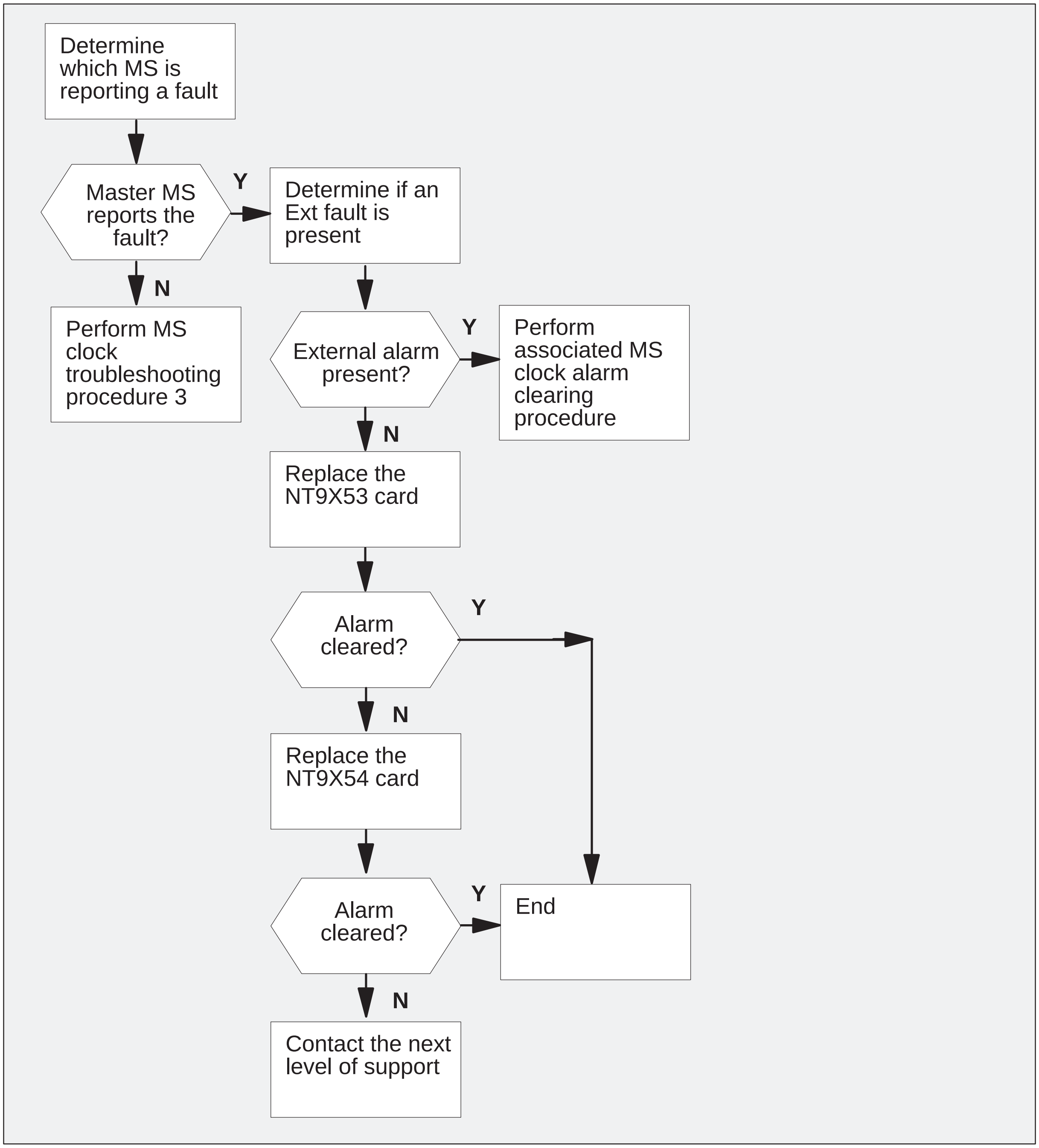
Troubleshooting an MS clock major alarm (continued)

Use procedures 18 and 19 to clear the following faults:

- the system clock on the slave MS cannot synchronize to the system clock on the master MS
- the subsystem clock cannot synchronize to the system clock

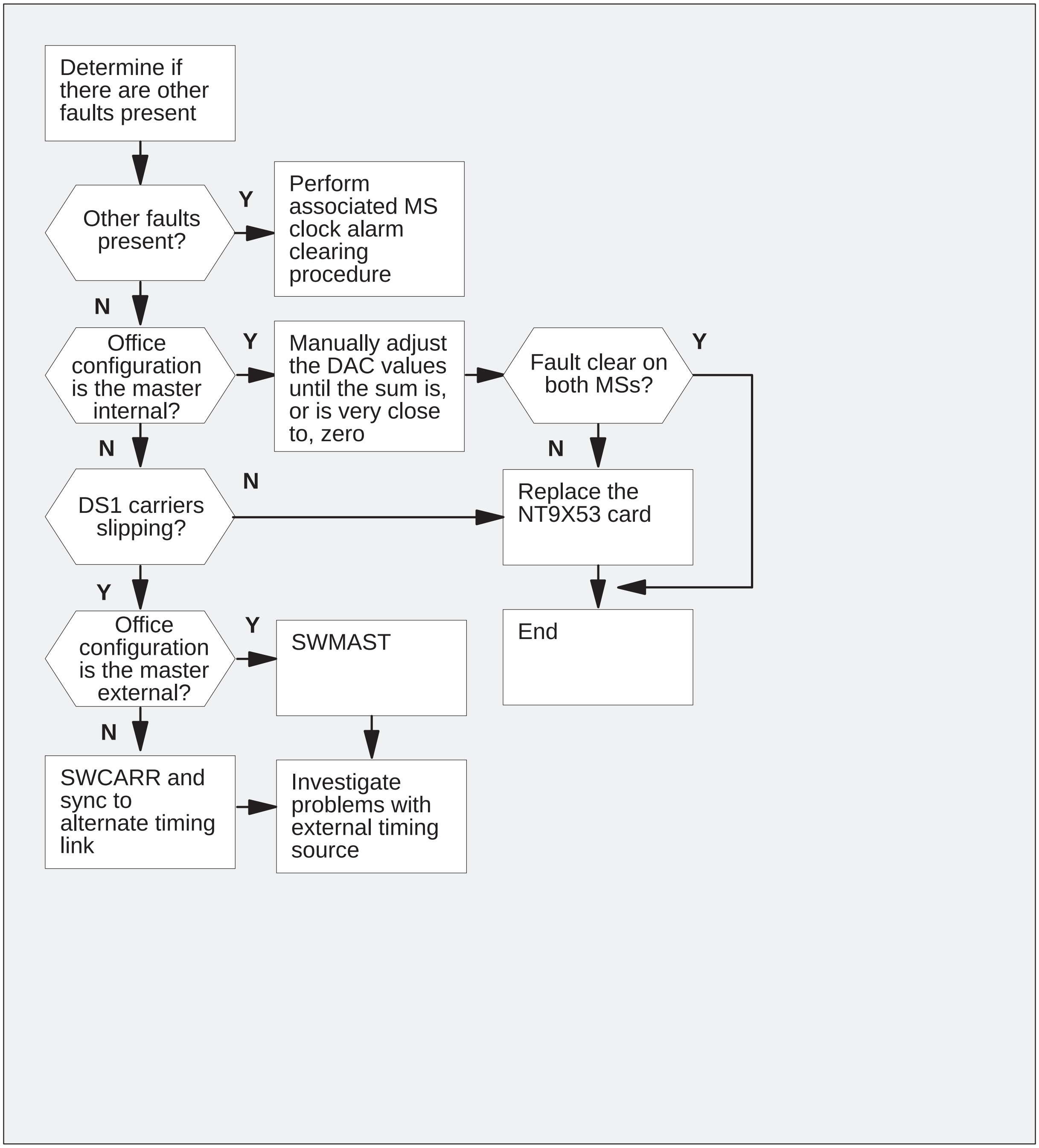
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 20



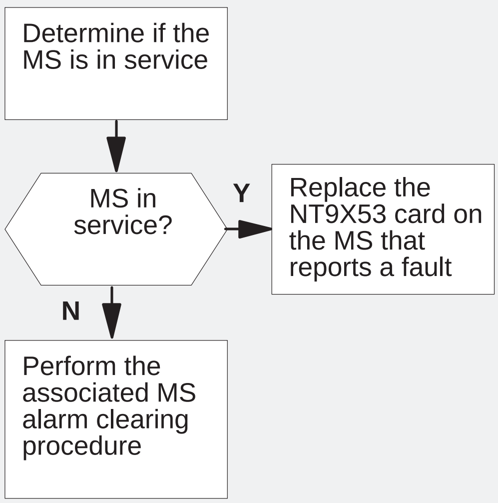
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 21



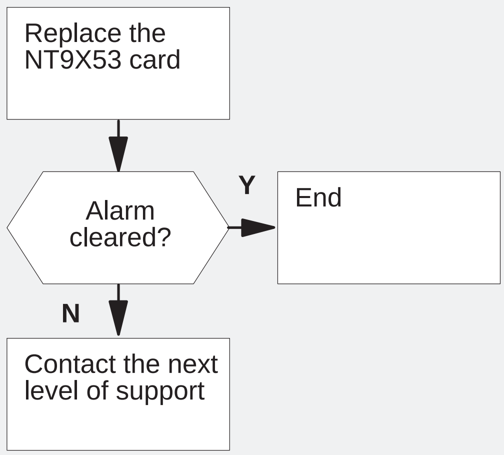
Troubleshooting an MS clock major alarm (continued)

Summary of troubleshooting MS clock procedure 22



Troubleshooting an MS clock major alarm (end)

Summary of troubleshooting MS clock procedure 23



Application

The message switch (MS) resource information logs include the logs that follow:

- MS157 INFO CHAIN
- MS208 INFO FRNT CARD
- MS238 INFO BACK CARD
- MS248 INFO SYSTEM CARD
- MS267 INFO INTERFACE CARD
- MS277 INFO CHAIN CARD
- MS287 INFO CHNL LINK
- MS307 INFO PORT
- MS317 INFO CHNL LINK PORT
- MS327 INFO IMSL PORT

The system generates these logs when a soft fault:

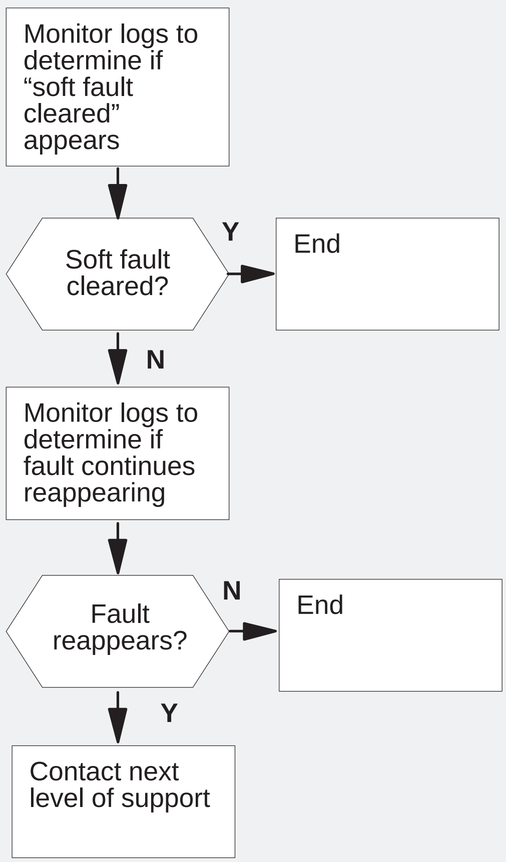
- occurs
- clears
- threshold is reached

The fault did not cause a state change in the component. Refer to *Log Report Reference Manual* for details on each information field in these log reports.

The steps to clear this type of fault appear in the flowchart on the next page.

Troubleshooting MS resource info logs (end)

Summary of troubleshooting MS resource info logs



Troubleshooting T-bus routing alarms

Application

T-bus routing alarms occur in the message switch (MS) subsystem. The alarms are TROOS major and TRIstb minor. The MS raises the alarms when mapper-unable-to-map (MUMP) thresholds are exceeded.

The MUMP faults are normally software related. The mapper card translates logical addresses in message headers to hardware addresses. When the mapper card cannot make this translation, the mapper card raises a MUMP interrupt and the message is lost.

When the minor alarm occurs, the subtending node or port does not always recognize the loss of messaging traffic. When the operating company personnel manually takes the node out of service and returns the node to service again, the software initializes again. These actions clear the alarm. Report all occurrences of this alarm to the next level of support. The next level of support will analyze the root cause of the fault.

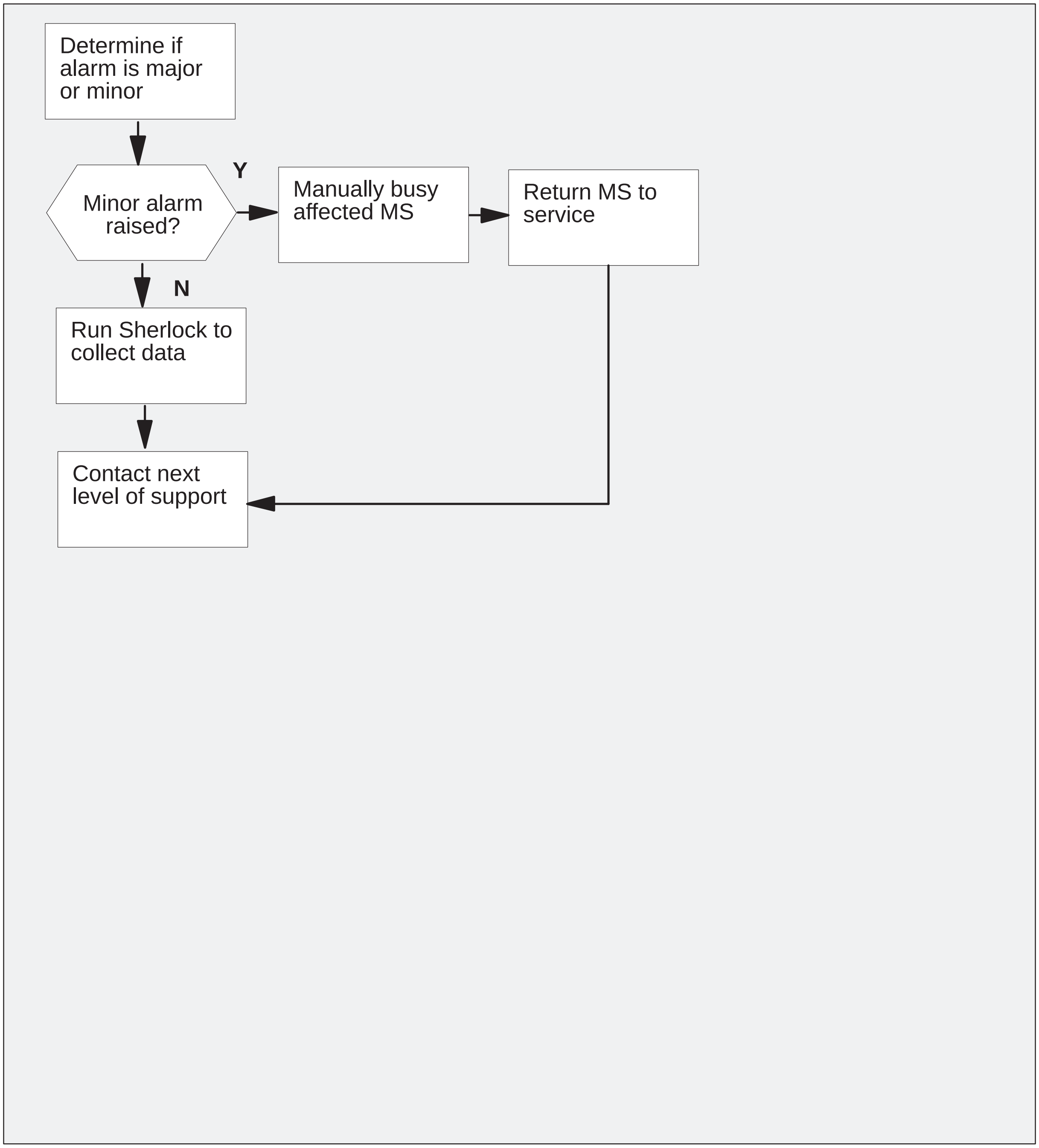
When the major alarm occurs, the system audit tries to recover the node. The system audit takes the node out of service and performs a restart. When this event occurs, the SysB alarm over-writes the major alarm. When the other MS is already out of service, the operating company personnel cannot take the node out of service. When the operating company personnel cannot take the node out of service for any reason, the alarm stands.

Report all occurrences of this alarm to the next level of support immediately. Address all port and PM-related faults at the next level of support. After the next level of service resolves these problems, the MS takes up to 10 min to stabilize and clear the alarm.

The flowchart on the next page summarizes the steps to clear these problems.

Troubleshooting T-bus routing alarms (end)

Flowchart for troubleshooting T–bus routing alarms



List of terms

alarm

A visual or audio indication of a fault condition in the digital multiplex system (DMS).

bus

An electrical connection that connects two or more wires or lines.

bus termination unit

The logical grouping of the bus termination cards on the message switch (MS) shelf.

card

A plug-in circuit pack that contains components. In a DMS switch, the correct term for a printed circuit pack or a printed circuit board is card.

CCITT

This term is from the French for International Telegraph and Telephone Consultative Committee (Comité Consultatif International Télégraphique et Téléphonique). Until March 1993, the CCITT was one of four permanent groups in the International Telecommunication Union (ITU). The CCITT studied technical issues in telecommunication on an international basis. The CCITT issued recommendations to improve standards and performance within the industry. The work of the CCITT continues in the ITU Telecommunication Standardization Sector (ITU-T).

CCS

Refer to common channel signaling (CCS).

CCS7

Refer to Common Channel Signaling 7 (CCS7).

central side (C-side)

In DMS SuperNode, the side of a node that faces away from the peripheral modules (PM) and toward the message switch (MS). *See also* peripheral side.

clock subsystem

One of the message switch (MS) subsystems. The clock subsystem provides timing for all nodes in the DMS SuperNode and SuperNode SE systems.

CM

Refer to computing module (CM).

CMIC

Refer to computing-module interface card (CMIC).

CMIC link

The fiber optic link that connects the MSs and the CM.

common channel signaling (CCS)

A signaling method in which information transmits over a single channel using time-division multiplex (TDM) digital techniques. This information relates to a large number of labeled messages.

Common Channel Signaling 7 (CCS7)

A signaling standard defined by the CCITT for a digital message–based network. The CCS7 separates call signaling information from voice channels. The CCS7 uses a separate signaling link to exchange interoffice signaling.

computing module (CM)

The processor and memory that the DMS SuperNode and DMS SuperNode SE use. Each CM consists of a pair of central processing units (CPUs) with associated memory. The CPUs operate in a synchronous matched mode on two separate planes. Only one plane is active. The active plane maintains control of the system. The other plane is on standby.

computing-module interface card (CMIC)

The card that the message switch uses to act as an interface with the computing module. The CMIC uses fiber optic transmission links.

C-side

See central side (C-side).

data store (DS)

One of the two elements of a DMS-100 memory. The DS contains transient information for each call. The DS also contains customer data and office parameters. The other main element of a DMS-100 memory is program store. *See also* program store (PS).

digital phase locked loop (DPLL)

A digital circuit that controls an oscillator. The DPLL maintains a constant phase angle in relation to a reference signal source.

DMS-bus

The messaging control system of the DMS SuperNode and DMS SuperNode SE. The DMS-bus consists of a pair of message switches (MS).

DMS-core

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

DMS-link

The networking software of the DMS SuperNode and DMS SuperNode SE. The DMS-link software consists of open and standard protocols. These protocols allow the DMS SuperNode and DMS SuperNode SE to function in a multivendor environment.

DMS SuperNode (SN)

A central control complex (CCC) for the DMS-100 switch. The two major components of DMS SuperNode are the computing module (CM) and the message switch (MS). Both components are compatible with the network module (NM), the input/output controller (IOC), and XMS-based peripheral modules (XPM).

DMS SuperNode SE (SNSE)

A compact version of the DMS SuperNode. DMS SuperNode SE provides the same functions as the DMS SuperNode, but DMS SuperNode SE smaller and has a smaller capacity than the SuperNode.

DPCC

See dual-plane combined core (DPCC) cabinet.

DPLL

See digital phase locked loop (DPLL).

DS

See data store (DS).

DS30

- A 10-bit 32-channel 2.048-Mbit/s speech-signaling and message-signaling link used in the DMS-100 Family switches.
- The protocol by which DS30 links communicate.

DS512 fiber link

The fiber optic transmission link implemented in the DMS SuperNode and DMS SuperNode SE. Use the DS512 to connect the computing module to the message switch. One DS512 fiber link is the equivalent of 16 DS30 links.

dual-plane combined core (DPCC) cabinet

One of the three cabinet models for the DMS SuperNode. The DPCC contains two message switch shelves, a computing module shelf, and a system load module shelf.

ENET

See Enhanced Network (ENET).

Enhanced Network (ENET)

A channel-matrixed time switch that provides pulse code modulated voice and data connections between peripheral modules (PM). ENET also provides message paths to the DMS-bus components.

F-bus

See frame transport bus (F-bus).

frame supervisory panel (FSP)

A facility that accepts the frame battery feed and ground return from the power distribution center (PDC). The FSP distributes the battery feed to the shelves of the frame or bay that contains the FSP. The FSP distributes the battery feed through axiliary fuses and feeds. The FSP also contains alarm circuits.

frame transport bus (F-bus)

An 8-bit bus that allows the link interface units (LIU) and a message switch to communicate data. To ensure readability, two load-sharing F-buses are present. Each message switch has a dedicated f-bus.

FSP

See frame supervisory panel (FSP).

HMI

See human-machine interface (HMI).

human-machine interface (HMI)

A series of commands and responses. Operating company personnel use these commands and responses to communicate with the DMS-100 Family switches. The MAP (maintenance and administration position) terminal and other input/output devices (IOD) allow HMI. A previous name for HMI is man-machine interface.

ID PROM

An element on each card or paddle board, which software reads to identify the component.

IMSL

See inter-MS link (IMSL).

input-output controller (IOC)

An equipment shelf that provides an interface between up to 36 I/O devices and the CM.

inter-MS link (IMSL)

A DS512 fiber link that provides a communication path between the message switches.

IOC

See input-output controller (IOC).

JNET

See junctored network (JNET).

junctored network (JNET)

A time-division multiplexed system. The JNET allows switching of 1920 channels for each network pair (completely duplicated). External junctors, internal junctors, and a digital network interconnecting (DNI) frame establish additional channels. Then the system can route channels directly, or use junctors, or DNI frame, and software control. The capacity for a DMS-100 switch is 32 network pairs or 61 440 channels (1920 channels × 32 network pairs).

LIM

See link interface module (LIM).

link

In a DMS switch, a connection between any two nodes.

link interface module (LIM)

A peripheral module (PM) that controls messaging between link interface units (LIU) in a link peripheral processor (LPP). The LIM also controls messages between the LPP and the DMS-bus component. An LIM consists of two local message switches (LMS) and two frame transport buses (F-bus). One LMS operates in a load sharing mode with the other LMS. This activity makes sure the LIM is reliable in the event of an LMS failure. The LIM is reliable because each LMS has the capacity to carry the full message load of an LPP. Each LMS uses a dedicated F-bus to communicate with the LIUs in the LPP. *See also* frame transport bus, link peripheral processor.

link interface shelf (LIS)

An optional shelf in the DMS SuperNode SE. This shelf controls messaging between link interface units (LIU). Each LIS uses a dedicated F-bus to communicate with the LIUs.

link interface unit (LIU)

A peripheral module (PM) that processes messages that enter and leave a link peripheral processor (LPP) through an individual signaling-data link. *See also* link interface unit for CCS7.

link interface unit for CCS7 (LIU7)

A peripheral module (PM) that processes messages that enter and leave a link peripheral processor (LPP) through an individual signaling-data link. Each LIU7 consists of a set of cards and a paddle board provisioned in one of the link interface shelves. *See also* link interface unit, link peripheral processor.

link peripheral processor (LPP)

The DMS SuperNode equipment cabinet for DMS-STP. The equipment cabinet contains two types of peripheral modules (PM). The types are a link interface module (LIM) and a link interface unit (LIU). For DMS-STP applications, link interface units for CCS7 (LIU7) are used in the LPP. *See also* link interface module, link interface unit for CCS7.

LIS

See link interface shelf (LIS).

LIU

See link interface unit (LIU).

LIU7

See link interface unit for CCS7 (LIU7).

LMS

See local message switch (LMS).

local message switch (LMS)

A high-capacity communications hub that controls messaging between link interface units (LIU) in a link peripheral processor (LPP). An LMS also controls messaging between the LPP and the DMS-bus component. The link interface module (LIM) uses a pair of LMSs to provide dual-plane redundancy.

log

A message sent from the DMS switch. The DMS switch sends the message when an important event occurs in the switch or one of the peripherals of the switch. A log report include sreports on state, activity, hardware and software faults, and test results. A log report can also include other events or conditions that affect the performance of the switch. The system can generate a log report in response to a system or manual action.

LPP

See link peripheral processor (LPP).

maintenance and administration position (MAP)

See MAP.

MAP

Maintenance and administration position. A group of components that provides a user interface between operating company personnel and the DMS-100 family switches. The interface consists of a visual display unit (VDU) and keyboard, a voice communications module, test facilities, and special furniture.

mapper

A card used in routing messages in the DMS SuperNode and DMS SuperNode SE message switch (MS).

master external

A clock configuration used in the MS where the master clock source is external to the DMS switch.

master internal

A clock configuration used in the MS where the master clock source is the oscillator on the internal clock card.

MC

See message controller (MC).

memory sparing

The process where the system disables a memory module that has faults. A memory module, called a spare, is configured in the place of the memory module that has faults. The spare has not been used and does not have faults. Another name for memory sparing is sparing.

message controller (MC)

A logical group of the hardware and software components. This group forms the serial message links between the computing module (CM) and the message switch (MS).

message switch (MS)

A high-capacity communications facility that functions as the messaging hub of the DMS SuperNode and DMS SuperNode SE. The MS concentrates and distributes messages to control messaging. The MS allows other nodes to communicate directly with each other.

message switch processor (MSP)

The logical group of the message switch processor card and the optional memory card.

MS

See message switch (MS).

MSP

See message switch processor (MSP).

network module (NM)

The basic building block of the DMS-100 Family switches. The NM accepts incoming calls and uses connection instructions from the CM to connect the incoming calls to the correct outgoing channels.

NM

See network module (NM).

node

The end point of a link. The meaning of node depends on the environment in which the term is used. For example, a circuit can be a node in relation to another circuit in a module. The module can be a node in relation to another component of the network. Some common applications are:

- in network topology, a terminal of a branch of a network or a terminal common to two or more branches of a network
- in a switched communications network, the switching points, including patching and control facilities
- in a data network, the location of a data station that connects data transmission lines
- a unit of intelligence within a system; in a DMS switch, the node includes the CPU, network module (NM) and peripheral modules (PM)

OM

See operational measurements (OM).

OOB signaling

See out-of-band (OOB) signaling.

operational measurements (OM)

The hardware and software resources of the DMS-100 Family switches. The OMs control the collection and display of measurements of an operating system. The OM subsystem organizes the measurement data and manages the transfer of measurement data to displays and records. Use the OM data for maintenance, traffic, accounting, and provisioning decisions.

out-of-band (OOB) signaling

Analog-generated signaling that uses the same path as a voice-frequency transmission. The signaling frequencies are lower or higher than those used for voice frequency.

paddle board

A short circuit pack based on the standard circuit pack. The paddle board carries the cable interfaces and local service functions. Examples of cable interfaces and local service functions are local clock sources and bus terminations. Cable interfaces and local service functions are located on the back of a DMS SuperNode or DMS SuperNode SE shelf.

P-bus

See processor bus (P-bus).

PDC

See power distribution center (PDC).

PEC

See product engineering code (PEC).

peripheral module (PM)

All hardware modules in the DMS-100 Family switches that provide interfaces with external line, trunk, or service facilities. A PM contains peripheral processors (PP). The PPs perform local routines that relieve the load on the CPU.

peripheral side (P-side)

The side of a node facing away from the MS and toward the peripheral modules (PM). *See also* central side.

PM

See peripheral module (PM).

power distribution center (PDC)

The frame that contains the components for distributing office battery feeds to equipment frames of the DMS-100 Family switches. The PDC accepts A cables and B cables from the office battery. The PDC provides auxiliary feeds that are protected to each frame or shelf. The PDC contains noise suppression and alarm circuits. The PDC provides a dedicated feed for the alarm battery supply.

processor bus (P-bus)

The bus in DMS SuperNode and DMS SuperNode SE modules for processor communications.

product engineering code (PEC)

An eight-character identifier for each hardware item manufactured by Nortel for marketing.

program store (PS)

In a DMS switch, programmed instructions for the procedures to process, administer, and maintain. The PS is one of the two different elements of a DMS-100 memory. The other main element is data store. *See also* data store (DS).

protocol

Set of rules, procedures, or standards that relate to format and timing of data transmission between two devices.

PS

See program store (PS).

P-side

See peripheral side (P-side).

remote oscillator

An oscillator located external to the DMS. Use the remote oscillator as a higher accuracy clock reference signal.

remote oscillator shelf (ROS)

A shelf external to the DMS that houses the remote oscillator.

reset terminal

See reset terminal interface (RTIF).

reset terminal interface (RTIF)

In DMS SuperNode, a terminal to reboot and monitor the status of the system. The RTIF can be a local terminal or a remote terminal connected through a modem. Another name for RTIF is remote terminal interface.

restart

The process to establish again the execution a routine after a program or data error. A restart normally requires a return to checkpoints placed at appropriate intervals. When a failure occurs, a restart allows a job to start again. The job does not have to start at the beginning of the run. A restart has a severity that reflects the importance of the resources being reset.

REx

See routine exercise (REx) test.

ROS

See remote oscillator shelf (ROS).

routine exercise (REx) test

An automatic test that internal software performs at normal intervals on DMS equipment.

RTIF

See reset terminal interface.

SCC

See SuperNode combined core (SCC) cabinet.

signaling transfer point (STP)

A node in a Common Channel Signaling 7 (CCS7) network. An STP routes messages between nodes. Signaling transfer points transfer messages between incoming and outgoing signaling links. The STPs do not originate or terminate messages, except network management (NWM) information. Signaling transfer points are deployed in pairs. When one STP fails, the mate takes over. The mate takes over so that service continues without interruption.

slave

The clock in the MS that is synchronized to the master. The clock is ready to assume mastership when a fault occurs on the master clock.

SLM

See system load module (SLM).

SN

See DMS SuperNode (SN).

SNSE

See DMS SuperNode SE (SNSE).

stratum level

A rating given to an oscillator that indicates the level of accuracy of an oscillator.

STP

See signaling transfer point (STP).

SuperNode combined core (SCC) cabinet

The DMS SuperNode SE cabinet. The SCC contains two message switches, a computing module, and system load module.

SWACT

See switch of activity (SWACT).

switch of activity (SWACT)

In a DMS fault-tolerant system, a switch that changes the states of two identical devices for the same function. A SWACT makes an active device inactive and an inactive device active.

system load module (SLM)

A mass storage system in a DMS SuperNode or DMS SuperNode SE that stores office images. From the SLM, new loads or stored images can be booted into the computing module (CM).

T-bus

See transaction bus (T-bus).

transaction bus (T-bus)

The bus used in DMS SuperNode and DMS SuperNode SE systems for messaging.

trap

- An unprogrammed conditional jump to a specified address. Hardware automatically activates a trap. The system makes a record of the location from which the jump occurred.
- An error condition detected by the firmware, software, or hardware detects which causes a trap interrupt.

trap interrupt

An interrupt that occurs because of a software or hardware error.

DMS-100 Family

DMS SuperNode and DMS SuperNode SE Message Switch

Maintenance Guide

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