Meridian Mail

Message Services Module
Planning and Engineering Guide

Publication history

August 1995

This manual is released as Standard 1.0 for Release 10.0 of the Meridian Mail Message Services Module (MSM). This version makes all previous versions obsolete.

December 1994

Standard 1.0 is the first release of this document for Meridian Mail product release 9.0.

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About this document

The *MSM Planning and Engineering Guide* provides information on assessing the hardware, software, and site requirements for your system. This document is intended for personnel involved in determining the engineering requirements for setting up Meridian Mail on the Message Services Module (MSM).

Who should use this manual

You should read this manual if you are involved in planning for the installation of the Meridian Mail MSM at your site.

How MSM documentation is organized

This document is part of the documentation set that supports the Northern Telecom (Nortel) line of Meridian Mail MSM products. Meridian Mail MSM documentation is a subset of the Meridian Mail library.

The Meridian Mail library contains the complete suite of MSM documents. These documents are

- *MSM Product Guide* (NTP 557-7001-010)
- *MSM Planning and Engineering Guide* (NTP 557-7001-100)
- *System Administration Guide for Multi-Customer Systems* (NTP 557-7001-300)
- *Customer Administration Guide for Multi-Customer Systems* (NTP 557-7001-301)
- *MSM System Administration Guide* (NTP 557-7001-302)
- *MSM System Administration Tools (NTP 557-7001-305)*
- *MSM Translations Guide* (NTP 557-7001-310)
- *Meridian Mail AdminPlus for the MSM* (NTP 557-7001-340)
- *MSM Routine Maintenance Procedures* (NTP 557-7001-501)
- *Card Replacement Procedures* (NTP 557-7001-502)
- *Trouble Locating and Alarm Clearing Procedures* (NTP 557-7001-503)
- *System Installation and Modification Guide* (NTP 557-7001-504)

In addition, the following are available:

- *OutCalling Application Guide* (NTP 555-7001-320)
- *OutCalling Application Guide for Multi-Customer Systems* (NTP 555-7001-321)
- *Networking Services Administration Guide* (NTP 555-7001-335)
- *Maintenance Messages (SEERS)* (NTP 555-7001-510)
- *MultiMedia Services Reference Manual (NT5R98AA)*, which contains the following:
  - — *Voice Forms Guide*
  - — *Voice Menus Guide*
  - — *Fax on Demand Application Guide*

Meridian Mail MSM documents and other documents that contain related information are listed in the "Finding MSM information" section in the *MSM Product Guide* (NTP 557-7001-010).

References in this document

The following documents are referred to in this document:

NTP number	Title
297-1001-156	*Power Distribution and Grounding Systems*
555-7001-216	*VoiceBridge Installation Procedures for AT&T Switches*
555-7001-217	*VoiceBridge Installation Procedures for ROLM Switches*
557-7001-219	*VoiceBridge Installation Procedures for Meridian 1 Switches*
557-7001-300	*System Administration Guide for Multi-Customer Systems*
557-7001-301	*Customer Administration Guide for Multi-Customer Systems*
557-7001-302	*System Administration Guide*
557-7001-504	*System Installation and Modification Guide*

Contents of this manual

This manual contains the following sections:

- Chapter 1, "Understanding the Meridian Mail MSM," describes the capabilities and operation of the Message Services Module (MSM), and its relationship to the public switching telephone network.
- Chapter 2, "Determining service requirements," provides formulas and examples for determining the system size for your site. The methods for determining service requirements are given feature by feature.

- Chapter 3, "Assessing site requirements," provides power and environmental guidelines that can be adjusted to meet the local conditions of your site.
- Chapter 4, "Planning MSM expansion," provides your engineers with some basic information that can be used to plan future expansion of your MSM system.
- Appendix A, "Meridian Mail MSM customer data form," provides a form that should be completed with information about your system. well before the installation is to take place. It should then be given to your Program Manager.

    Note: The "Customer data form" becomes the system data entry document and input audit trail for your system configuration.

- Appendix B, "Supported peripheral equipment," provides ordering information for modems, printers, terminals, tapes, and VoiceBridge units.
- The "List of terms" provides definitions for terms used throughout this manual.
- The "Index" provides another way to locate information in this manual.

What precautionary messages mean

Danger and caution messages in this document indicate potential risks. The significance of these messages is explained in the following chart.

Message	Significance
DANGER	Possibility of personal injury
CAUTION	Possibility of equipment damage, or service interruption or service degradation

Examples of the precautionary messages follow.

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

> **CAUTION**
> **Risk of loss of service**
> Subscriber service will be lost if you accidentally remove a card from the active unit of the peripheral module (PM). Before continuing, confirm that you are removing the card from the inactive unit of the PM.

Regulatory Notices

Notice for installations in Canada

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. In addition, the equipment must be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized maintenance facility designated by the supplier. Repairs or alterations made by the user, or *any* equipment malfunction, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure, for their own protection, that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

If you experience problems with your Nortel MSM equipment, contact your authorized distributor or service center in Canada for repair and warranty information. If you are unable to contact your distributor, call 1-800-NORTHERN.

Notice for Installations in the United States

The Nortel Message Services Module (MSM) system complies with Part 68 of the FCC rules. On the inside door of the cabinet is a label that shows a variety of information, including the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company.

The REN represents the electrical load that will be applied to your telephone line once an MSM modem port is connected to the network. The telephone line serving your premises will not operate properly if the total ringer load exceeds the capability of your telephone company's central office equipment. If you wish to know the total REN allowed for your line, call your telephone company. Normally, no MSM modem port should share the line with any other device.

If your Nortel MSM causes harm to the telephone network, the telephone company may disconnect your service temporarily. The telephone company may ask you to disconnect the equipment from the network until the problem has been corrected or may ask you to check for equipment malfunction. If possible, the telephone company will notify you in advance of an expected loss of service. If not, you will be notified as soon as possible. You will then be advised of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect proper operation of your equipment. To maintain uninterrupted service, you will be notified in advance of these changes.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device. To prevent overloading, the termination on a loop may consist of any combination of devices subject only to the requirement that the sum of the LNs of all the devices does not exceed 100.

If you experience problems with your Nortel MSM equipment, contact your authorized distributor or service center in the United States for repair and warranty information. If you are unable to contact your distributor, call 1-800-NORTHERN.

Chapter 1: Understanding the Meridian Mail MSM

Overview

This chapter describes the capabilities and operation of the Meridian Mail Message Services Module (MSM), and its relationship to the public switching telephone network.

The MSM is a large capacity voice processing hardware platform designed to provide call answering, voice messaging, and fax services to the private business, institutional customers, telephone companies, and service providers. Meridian Mail is the software which operates on the MSM to provide the voice processing functionality and fax services.

The MSM supports a variety of Northern Telecom (Nortel) and non-Nortel switches and PBXs. It is sold as customer premise equipment (CPE) and can be installed in one of the following situations:

- A private business maintains its own PBX or switch and MSM on site. In this situation, both the switch or PBX and the MSM are administered by the customer.
- A private business does not have its own PBX or switch but does have its own MSM on site. In this situation, the business is a carrier (Centrex) customer but maintains its own voice messaging system (that is, an MSM) on its premises. This is referred to as a CPE (Centrex) carrier.

System capacity

The maximum number of mailboxes on an MSM system is calculated by the total available hours of storage, divided by the average time taken by each user's messages and greetings. The average time per mailbox depends on the mailbox size limits and message deletion policy, both of which are set by the administrator.

The MSM is provisioned by selecting appropriate numbers of ports and hours of storage. Table 1-1 shows maximum mailbox capacities for systems with multiples of 24 ports. Table 1-2 presents a summary of detailed engineering parameters for a system with 192 ports.

Table 1-1

Maximum capacities (multiples of 24 ports)

Maximum voice ports	Maximum number of storage hours	Maximum number of mailboxes
48	150	5 291
	300	10 582
72 or 96	300	10 582
	600	21 164
120 or 144	450	15 873
	900	31 746
168 or 192	600	21 164
	1 200	42 328

Table 1-2

Maximum capacities (192 ports)

Feature	Engineering parameters
Voice services	• Languages on the system: 4 • Voice messaging channels: 192 • Customer groups per system: 2000 • Registered mailboxes per system: 42 328 • Levels per voice menu: 20
Messages	• Messages per mailbox: 999 • Recording time per message (minutes): 99
Storage	• Voice storage (hours): 1200 • Storage per mailbox (minutes): 360 • Storage for voice services (if they are on the system volume) and personal verifications (hours): 100 • Storage for voice services (if they are on the user volume): 100
Networking	• Networking nodes per system: 49 • Proprietary networking ports per system: 20
Greetings and personal verification	• System greeting (seconds): 25 • Personal verification (seconds): 12 • Internal and external greetings (minutes): 7
—continued—	

Table 1-2 (continued)
Maximum capacities (192 ports)

Feature	Engineering parameters
Distribution lists	• Personal distribution lists per mailbox: 9 • Entries per personal distribution list: 99 • Organizational directory entries per system: 50 000 • Entries per organization distribution list: 120
Fax	• Fax selections per Fax on Demand session: 25 • Pages per fax: 99
SMDI links	• Redundant ports: 8 • Non-redundant ports: 16
Administration	• System Administration Console: 1 • Multi-administration Terminals (MATs): 3 • Remote maintenance ports: 2 • Maintenance printers: 1
—end—	

Performance standards

Under normal conditions, response time for most voice messaging functions should be under one second 95% of the time and under four seconds 99.99% of the time.

Administration of Meridian Mail MSM VoiceMail

The administration and maintenance interface for an MSM can be monitored either locally or remotely by the administrator.

Up to four administrative positions can operate simultaneously from locally- or remotely-attached terminals. A typical administration configuration consists of one main system administration terminal and up to three multi-administration terminals (MATs). The secondary MATs have limited functionality. They provide access to user, voice service, and class of service administration features.

The MSM can be administered remotely via modem; however, it cannot be administered both locally and remotely at the same time. For security, remote administration access must be activated from the main system administration terminal.

In addition to the administration terminals, a dedicated system printer provides the system administrator with system events and error reports (SEERs). SEERs are generated by the system software to identify every significant event or error that occurs on the system.

MSM PBX/switch connectivity

The MSM is a large capacity voice processing system designed for customer premise installation. The MSM can operate in connection with several different PBXs/switches:

- Meridian SL-100 PBX (see Figure 1-1)
- Central office (carrier) Centrex switches such as the DMS-100, AT&T #1AESS, and AT&T #5ESS (see Figure 1-2)
- Other PBXs using Meridian Mail Connections
    - — AT&T (see Figure 1-3)
    - — ROLM (see Figure 1-4)
    - — Meridian 1 (see Figure 1-5)

Figure 1-1
MSM and the Meridian SL-100 PBX
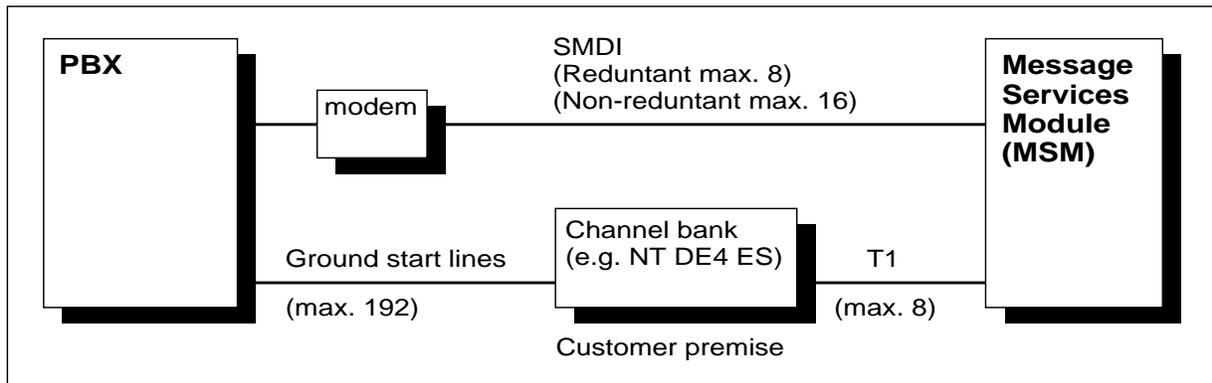
Figure 1-2
MSM and a CPE Centrex switch
(MSM connected to a central office [carrier] switch)
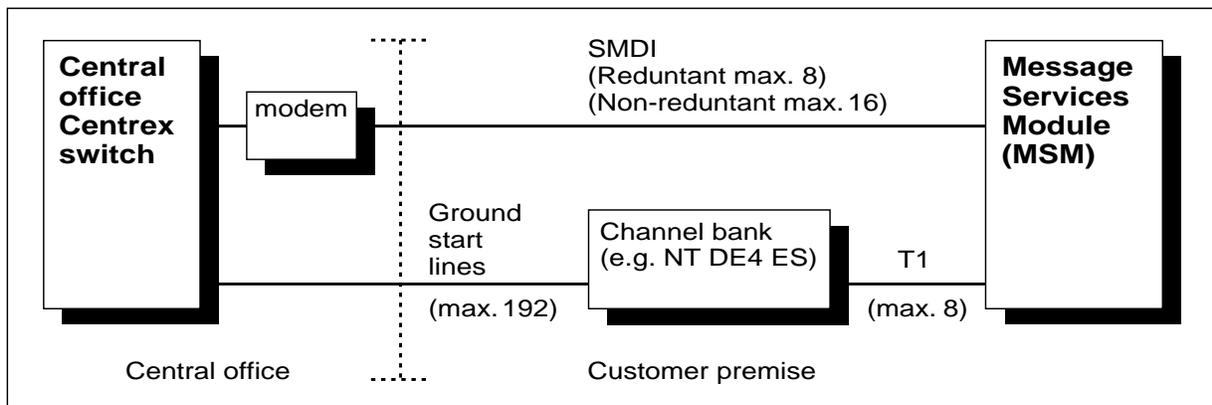
Connections and AT&T PBXs

Connections, using the VoiceBridge integration system, provides a link between AT&T PBXs and the MSM. The link to the MSM is achieved using the Simplified Message Desk Interface (SMDI) protocol to provide call presentation information and message waiting indication (MWI) control. This integration strategy allows an AT&T PBX to emulate a Centrex switch. Refer to the diagram in Figure 1-3.

The *VoiceBridge Installation Procedures for AT&T Switches* (NTP 555-7001-216) explains how to connect the MSM to an AT&T PBX by using one or more VoiceBridge units.

Figure 1-3
AT&T Connections on the MSM platform
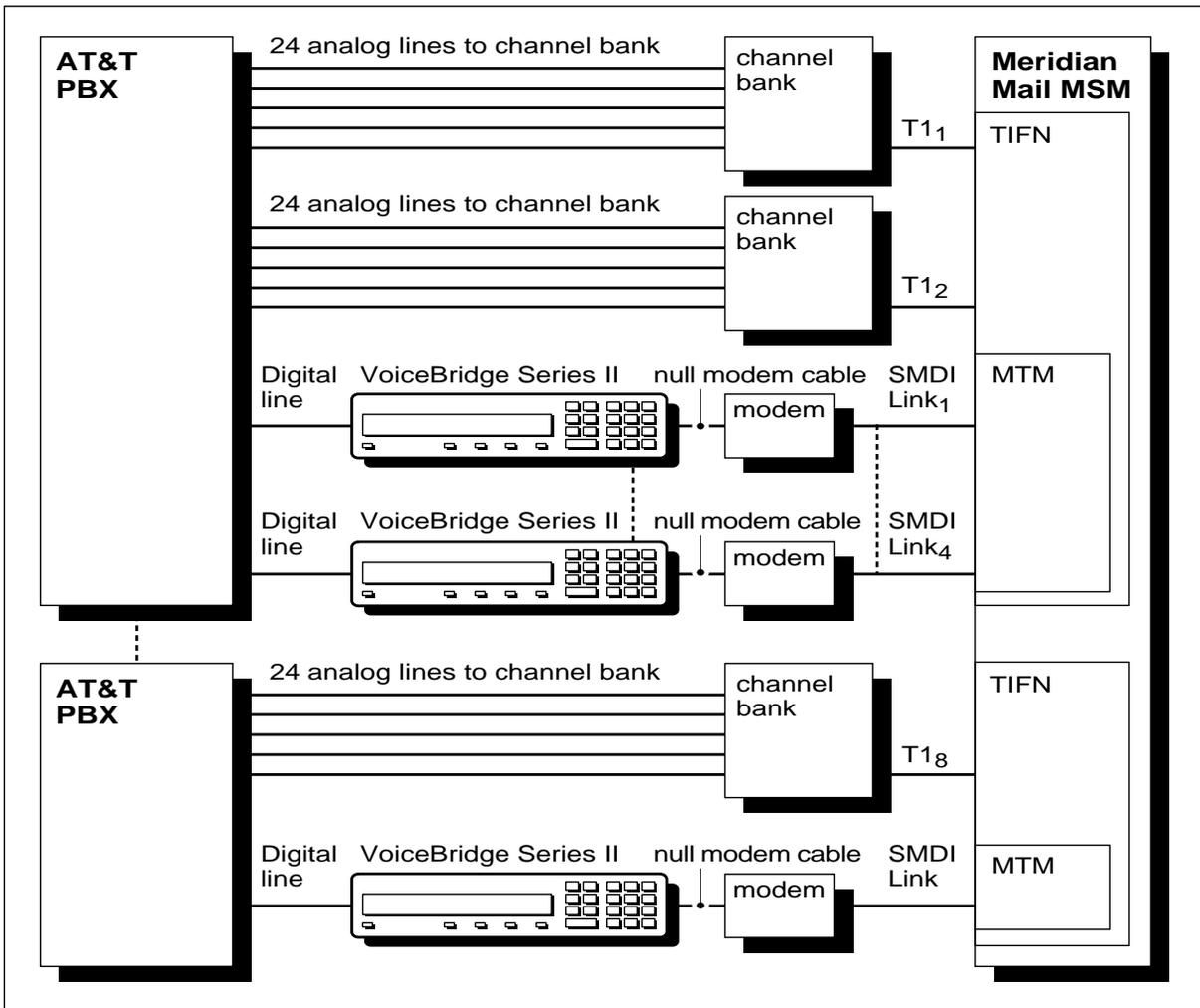
Connections and ROLM PBXs

Connections, using the VoiceBridge integration system, provides a link between ROLM PBXs and the MSM. The link to the MSM is achieved using the SMDI protocol to provide call presentation information and MWI control. This integration strategy allows a ROLM PBX to emulate a Centrex switch. See the illustration in Figure 1-4.

The *VoiceBridge Installation Procedures for ROLM Switches* (NTP 555-7001-217) explains how to connect the MSM to a ROLM PBX by using one or more VoiceBridge units.

Figure 1-4
ROLM Connections on the MSM platform
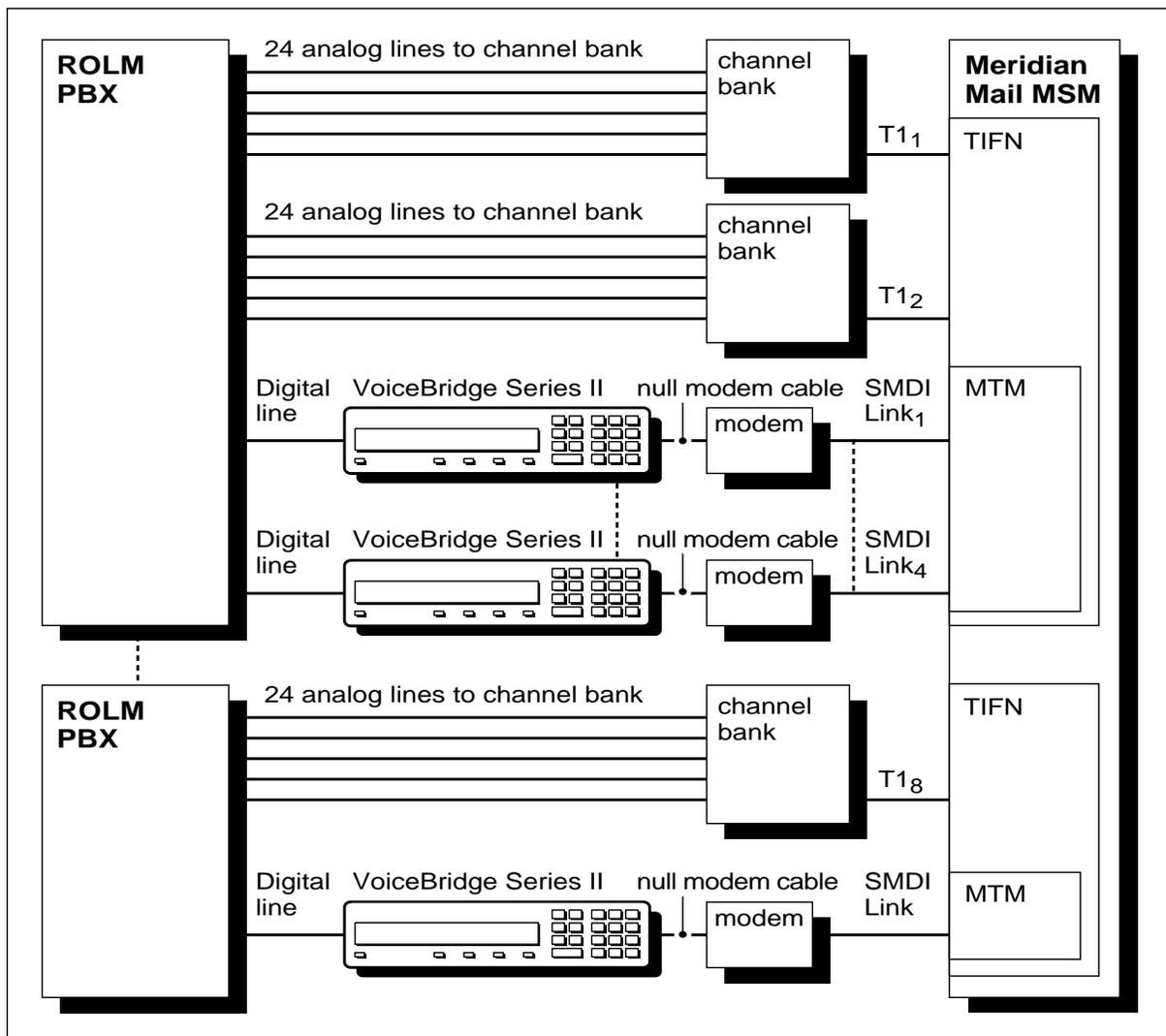
Connections and Meridian 1 PBXs

Connections, using the VoiceBridge integration system, provides a link between the Meridian 1 PBX and the MSM. The VoiceBridge emulates a 2616 digital station set, and the link is achieved by using the SMDI protocol to provide call presentation information and MWI control.

This integration strategy allows a Meridian 1 PBX to emulate a Centrex switch, and the PBX and the MSM to appear as one system to both outside callers and your subscribers.

Figure 1-5 shows how the Meridian 1 PBX, VoiceBridge, and MSM are connected. The NTP *VoiceBridge Installation Procedures for Meridian 1 Switches* (NTP 557-7001-219) explains how to connect the MSM to a Meridian 1 PBX by using one or more VoiceBridge units.

Figure 1-5
Meridian 1 Connections on the MSM platform
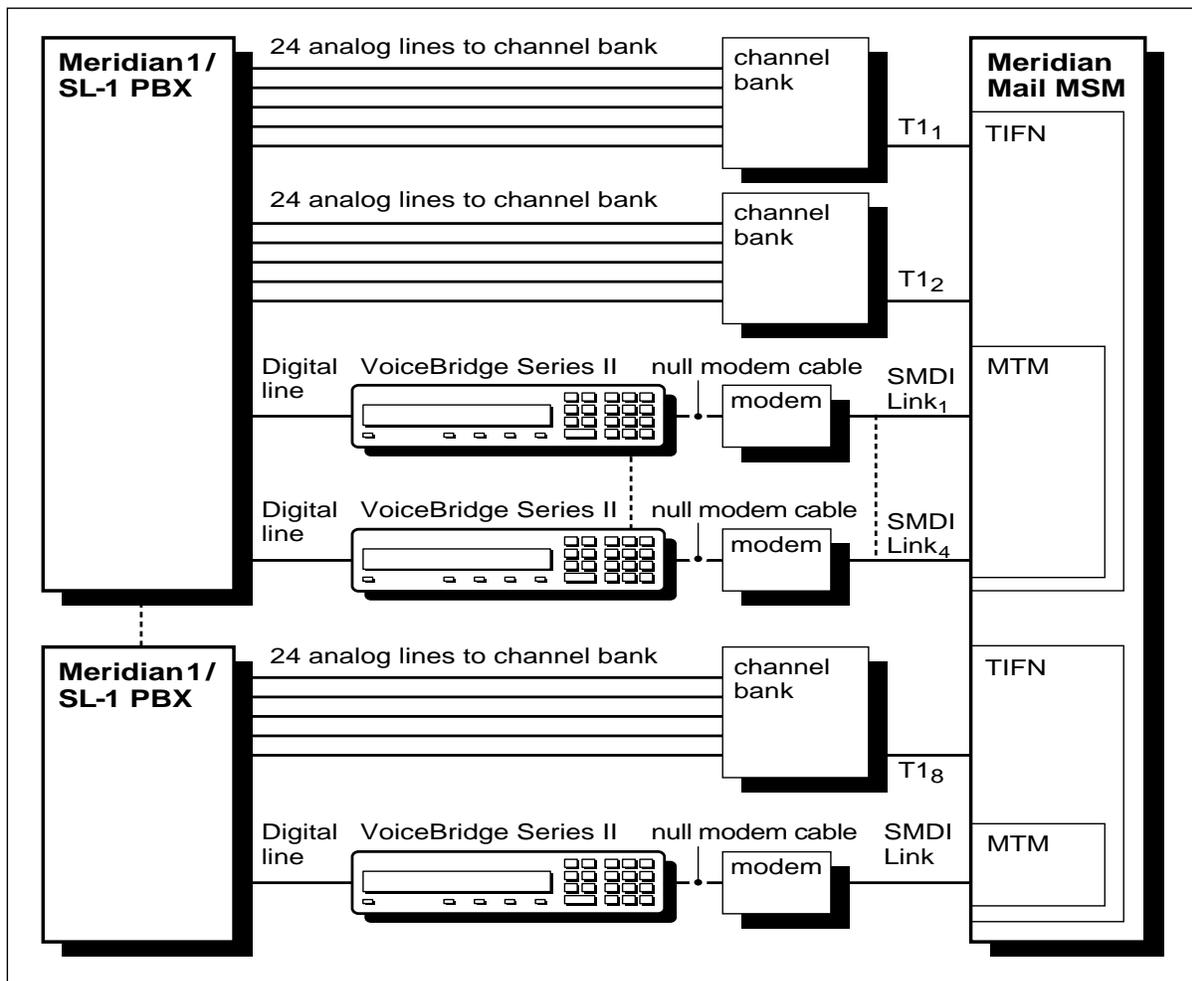
External hardware packaging

The MSM is housed in a SuperNode cabinet. The cabinet provides four shelves—two electrical and two disk shelves. Each half-shelf is powered by a pair of redundant power converters. The electronics interface from the system to the outside is carried out via four I/O panels, located on bulkheads at both electronics shelves.

Hardware components

The MSM consists of multiple processing nodes that are connected by an internal packet bus. For Meridian Mail MSM, the MSM contains two multi-server processors (MSPs), plus two or more signal processing nodes (SPNs), and a proportionate number of telephony interface nodes (TIFNs). A Meridian Mail bus (MM Bus) transports signals between the nodes. The MSM also contains storage modules (that is, disk drives and a tape drive), transition modules, and power supplies.

Table 1-3 lists the illustrations that show the logical architecture of the MSM based on the number of ports

Table 1-3
Location of illustrations showing logical architecture of the MSM
(based on the number of ports)

For	See
48 ports, primary electronics shelf	Figure 1-6
72 to 192 ports, primary electronics shelf	Figure 1-7
120 to 144 ports, secondary electronics shelf	Figure 1-8
168 to 192 ports, secondary electronics shelf	Figure 1-9
physical layout of a fully configured system	Figure 1-10

Figure 1-6
Logical architecture—Primary electronics shelf (48 ports)
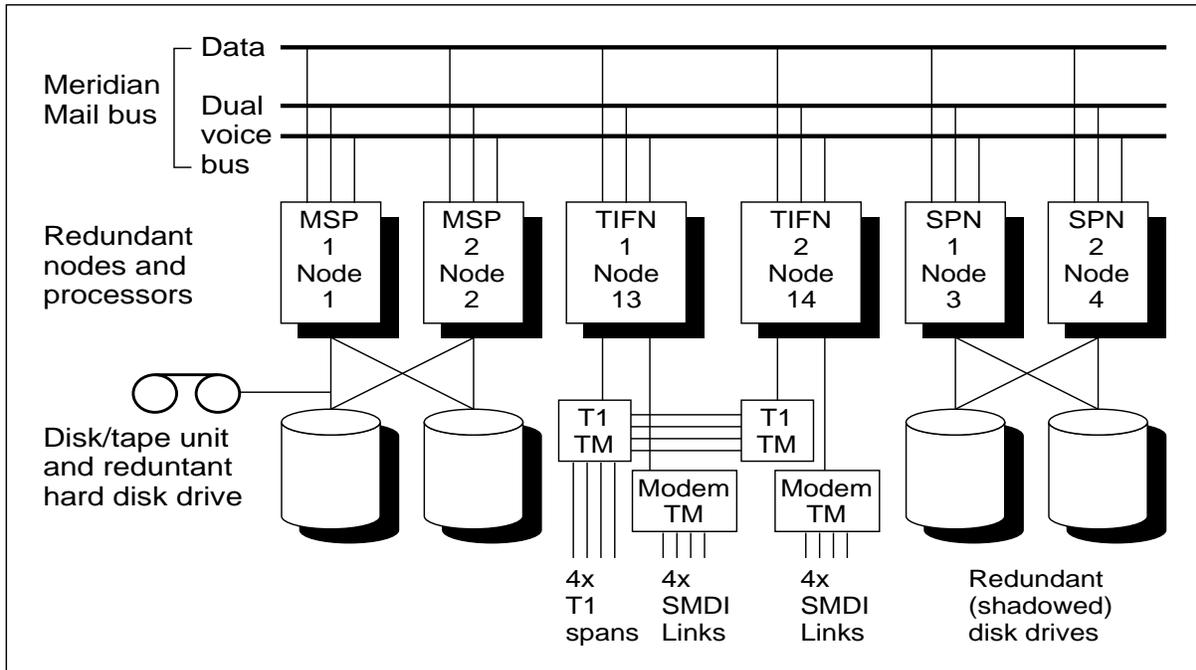
Figure 1-7
Logical architecture—Primary electronics shelf (72–192 ports)
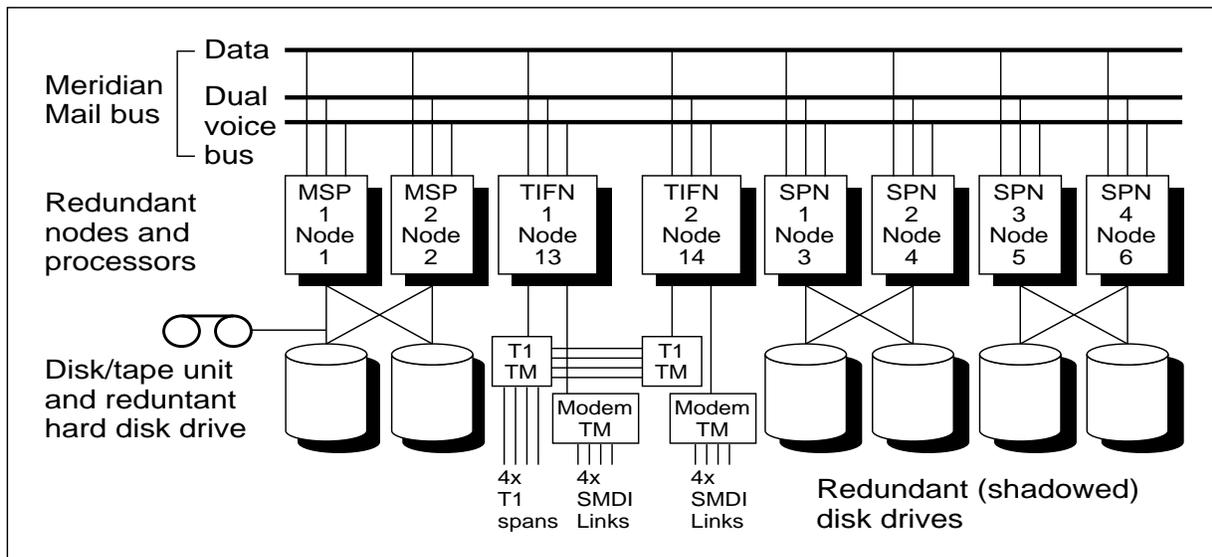
Figure 1-8
Logical architecture—Secondary electronics shelf (120–144 ports)
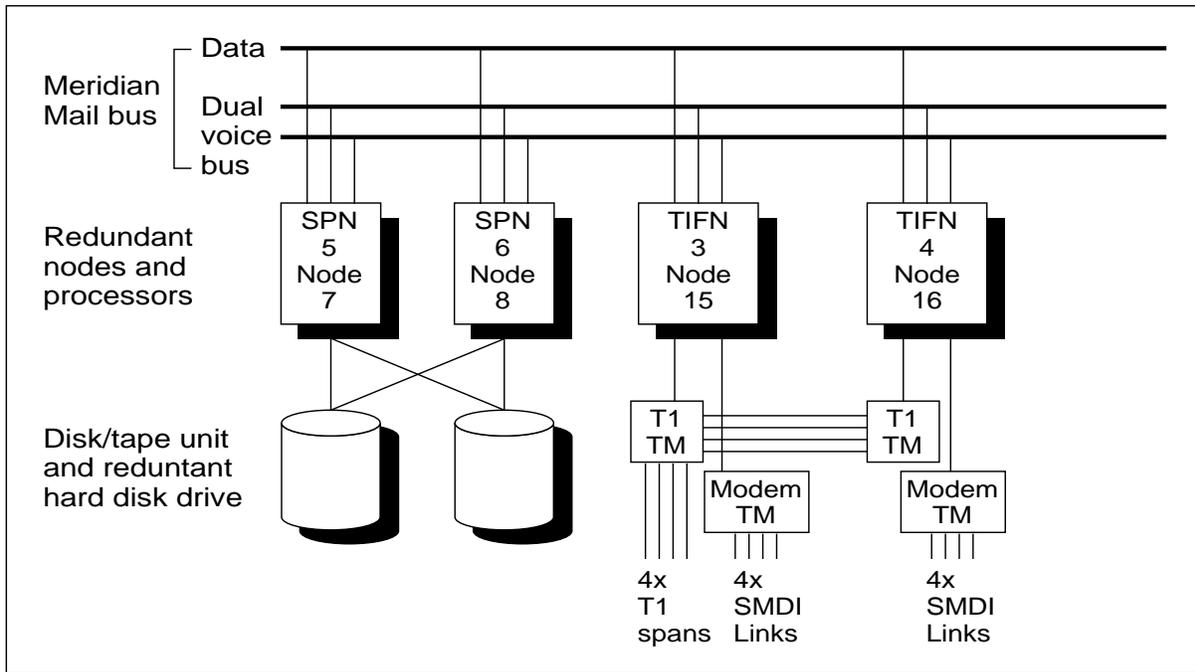
Figure 1-9
Logical architecture—Secondary electronics shelf (168–192 ports)
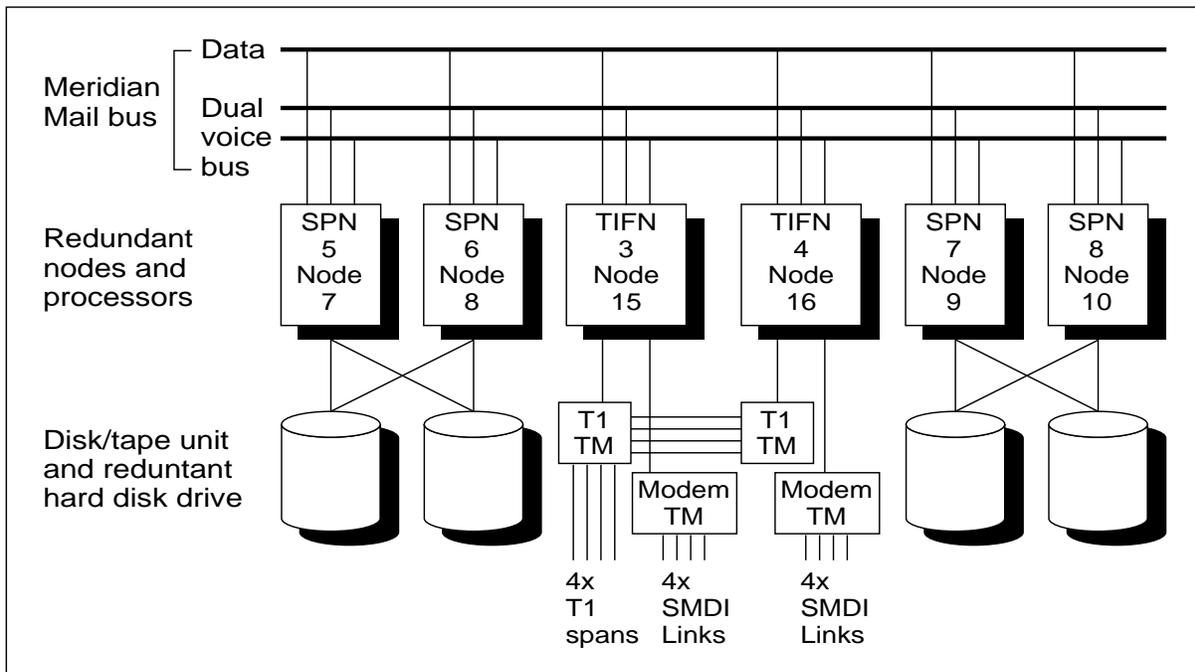
Figure 1-10
Layout of a fully configured MSM system
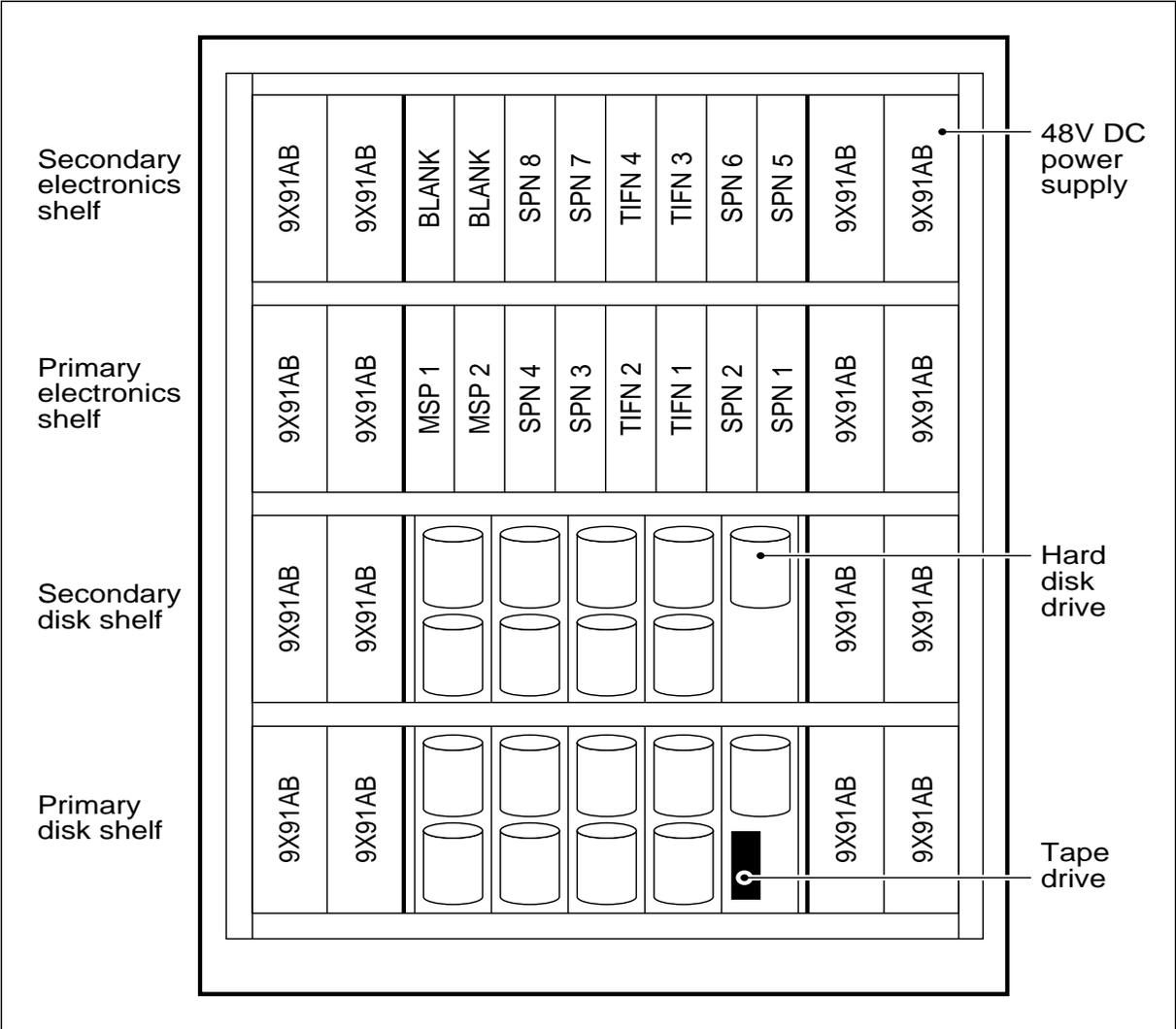
Note: The disk storage packs connected to the SPNs can be provisioned as single disk packs (NTGX14AA or NTGX14AB) providing 150 hours of storage per SPN node pair, or dual disk packs (NTGX14BA or NTGX14BB) providing 300 hours of storage per SPN node pair.

MSP

The MSP consists of two cards: the 68K processor card and the bus controller. The 68K card provides the processing environment for common system data such as the user directory and message transfer. The bus controller provides system clocks and acts as bus master. A storage module to hold system data is associated with each MSP pair.

SPN

The SPN has a 68K processor card, plus one or two VP12A cards (12 ports each). The SPNs handle all voice processing, up to a maximum capacity of 24 channels per SPN. Each SPN has a storage module to hold user data. SPNs are paired so that if one fails, the other can still access its user messages.

> *Note:* If you are converting your Meridian Mail system from Release 8.0 to Release 10.0 on the MSM, then you must replace the existing VP12 (NTGX12AA) voice processor card with the VP12A (NTGX12AB) voice processor card.

TIFN

The TIFN consists of a 68K processor card and a T1 card. The 68K card provides processing for the T1 environment. The T1 card terminates four T1 links. Incoming voice calls are transported from TIFNs to SPNs over two parallel voice buses.

MM Bus

The MM bus provides communication between the nodes. It has two components—an asynchronous packet bus for data transmission and a synchronous dual-voice bus for pulse-coded modulation (PCM) voice traffic. The dual-voice bus allows separation between the voice processing and telephony interface functions. This separation allows for flexible mapping of voice processing resources to incoming channels, facilitating development of advanced services such as fax and speech recognition.

Storage modules

Disk drives

A storage module consisting of one or two disk drives is associated with each MSP and SPN. Information is written to two disks at the same time; one is called the primary disk and the other is called the shadow disk. In case of a disk drive failure, either disk drive has a complete set of information which allows it to continue full service alone.

Table 1-4 identifies disk drives that have been discontinued. If your disk drive is listed in this table and it breaks down and needs to be replaced, you must order the replacement disk drive indicated.

Note: If you are converting from an earlier release of Meridian Mail on the MSM to Meridian Mail Release 10.0, you do not need to replace your current disk drives.

Table 1-4
Discontinued and replacement disk drives for the MSM

Discontinued disk drive		Replacement disk drive	
CPC code	Description	CPC code	Description
NTGX14AA	5 1/4" single 1400-Mbyte disk drive	NTGX14AB	3 1/2" single 1.4-Gbyte disk without a tape drive
NTGX14BA	5 1/4" dual 1400-Mbyte disk drive	NTGX14BB	3 1/2" dual 1.4-Gbyte disk without a tape drive
NTGX15AA	5 1/4" single disk with tape drive	NTGX15AB	3 1/2" dual 1.4-Gbyte disk with a 2.5-Gbyte Tandberg TDC4220 tape drive

Tape drive

A 2.5-Gbyte Tandberg tape drive is supplied with an MSP1 node and is used for program loading and backup/restore procedures. A partial backup involving system data, user profiles, and spoken names for a 192-port system takes approximately two hours and requires one 2.5-Gbyte tape.

Note: If you are converting from an earlier release of Meridian Mail on the MSM, you may continue to use the Archive 2150 tape drive. You are not required to upgrade the tape drive when converting to Meridian Mail Release 10.0.

Transition modules

All electronics cards are inserted into a backplane from the front of the cabinet. Most cards have a transition module connected to them from the rear of the cabinet. The module provides the connections for all system input and output except battery, grounding, and the frame supervisory panel.

68K Transition module

The 68K transition module provides external connections for three-current loop ports, one modem port, and interconnection to storage modules on the MSPs.

Bus controller transition module

The bus controller transition module provides relays for alarm signals.

T1 transition module

The T1 transition module provides external connections and termination for the four T1 lines.

RS-232 transition module

The RS-232 transition module provides four RS-232D connections and SCSI connections for the SPNs.

> *Note:* If you are converting from Release 8.0 to Release 10.0, you must replace the RS-232 transition modules.

Modem transition module

The modem transition module provides four SMDI ports for use with the TIFN.

Bus extension transition module

This transition module is used to extend the Meridian Mail bus from shelf to shelf.

Bus termination transition module

This transition module provides the electrical termination for the Meridian Mail bus.

System capacity

The MSM has a 192 voice channel capacity, expandable in 24-channel increments from the base 48-port system. The system has a storage capacity of 150 or 300 hours per SPN node pair, for a maximum system capacity of 1200 hours of shadowed message storage.

Power requirements

The MSM is powered from a 48 V DC supply. All shelves are powered by NT9X91AB power units in a redundant A/B configuration. The estimated power drain for a fully-configured MSM (that is, 192 ports/1200 hours) is 50 Amps.

Connectivity

Multiple SMDI links

Up to eight SMDI links can be supported for each TIFN pair. These links can be configured in redundant pairs so that in the event of a TIFN failure, the link is switched to the redundant TIFN. A total of eight redundant ports or 16 non-redundant ports can be provisioned on a 192-port MSM. A maximum of four redundant or eight non-redundant links are available in an MSM with 96 ports or less.

T1 links

Up to eight T1 links transmit digitized voice signals to the TIFN at the
MSM, with a maximum of four T1s per redundant TIFN pair. A channel
bank digitizes the signal arriving on the analog (ground-start or loop-start)
lines from the switch before transmitting the signal to the T1 link.

Hardware maintenance

All components can be taken out of service immediately or via
"courtesy-down," which allows calls-in-progress to end first. Diagnostics are
executed automatically on node or system power-up, or when a reset is
requested. Voice ports are enabled only if the diagnostics are successfully
passed. Cards are "hot-pluggable" in that the card can be inserted or
removed while under power without damage to the card or backplane, and
without affecting other system resources.

Physical provisioning information

Provisioning information for the MSM is detailed in Tables 1-5 to 1-8.

For descriptions of the various hardware components, refer to the "Hardware
components" section on page 1-8.

Table 1-5
Primary electronics shelf card layout with provisioning algorithm

Unit	Slot	Card (front)	PEC code	Trans. Module (rear)	PEC code	Ports						
						48	72	96	120	144	168	192
Power	1 2 3		NT9X91AB			X	X	X	X	X	X	X
Power	4 5 6		NT9X91AB			X	X	X	X	X	X	X
MSP1	7			BUS-X	NTGX04BA	X	X	X	X	X	X	X
	8	68K	NTGX05AA	68K TM	NTGX06AA	X	X	X	X	X	X	X
	9	BC	NTGX10AA	BC TM	NTGX11AA	X	X	X	X	X	X	X
MSP2	10	BC	NTGX10AA	BC TM	NTGX11AA	X	X	X	X	X	X	X
	11											
	12	68K	NTGX05AA	68K TM	NTGX06AA	X	X	X	X	X	X	X
	13											
SPN4	14	VP12A	NTGX12AB				X	X	X	X	X	X
	15	VP12A	NTGX12AB				X	X	X	X	X	X
	16	68K	NTGX05AA	RS-232 TM	NTGX06AB		X	X	X	X	X	X
SPN3	17	VP12A	NTGX12AB				X	X	X	X	X	X
	18	VP12A	NTGX12AB				X	X	X	X	X	X
	19	68K	NTGX05AA	RS-232 TM	NTGX06AB		X	X	X	X	X	X
TIFN2	20	68K	NTGX05AA	MODM	NTGX07AA	X	X	X	X	X	X	X
	21											
	22	T1	NTGX08AA	TI TM	NTGX09AA	X	X	X	X	X	X	X
TIFN1	23	T1	NTGX08AA	T1 TM	NTGX09AA	X	X	X	X	X	X	X
	24											
	25	68K	NTGX05AA	MODM	NTGX07AA	X	X	X	X	X	X	X
	26											
SPN2	27	VP12A	NTGX12AB			X	X	X	X	X	X	X
	28	VP12A	NTGX12AB			X	X	X	X	X	X	X
	29	68K	NTGX05AA	RS-232 TM	NTGX06AB	X	X	X	X	X	X	X
SPN1	30	68K	NTGX05AA	RS-232 TM	NTGX06AB	X	X	X	X	X	X	X
	31	VP12A	NTGX12AB			X	X	X	X	X	X	X
	32	VP12A	NTGX12AB	BUS-T	NTGX04AA	X	X	X	X	X	X	X
Power	33 34 35		NT9X91AB			X	X	X	X	X	X	X
Power	36 37 38		NT9X91AB			X	X	X	X	X	X	X

Table 1-6
Secondary (expansion) electronics shelf card layout with provisioning algorithm

Unit	Slot	Card (front)	PEC code	Trans. Module (rear)	PEC code	48	72	96	120	144	168	192
Power	1		NT9X91AB						X	X	X	X
	2											
	3											
Power	4		NT9X91AB						X	X	X	X
	5											
	6											
	7			BUS-X	NTGX04BA				X	X	X	X
	8											
	9											
	10											
	11											
	12											
SPN8	13	VP12A	NTGX12AB								X	X
	14	VP12A	NTGX12AB									X
	15	68K	NTGX05AA	RS-232 TM	NTGX06AB						X	X
	16											
SPN7	17	VP12A	NTGX12AB	RS-232 TM	NTGX06AB						X	X
	18	VP12A	NTGX12AB									X
	19	68K	NTGX05AA								X	X
TIFN4	20	68K	NTGX05AA	MODM	NTGX07AA				X	X	X	X
	21											
	22	T1	NTGX08AA	TI TM	NTGX09AA				X	X	X	X
TIFN3	23	T1	NTGX08AA	T1 TM	NTGX09AA				X	X	X	X
	24											
	25	68K	NTGX05AA	MODM	NTGX07AA				X	X	X	X
	26											
SPN6	27	VP12A	NTGX12AB						X	X	X	X
	28	VP12A	NTGX12AB							X	X	X
	29	68K	NTGX05AA	RS-232 TM	NTGX06AB				X	X	X	X
SPN5	30	68K	NTGX05AA	RS-232 TM	NTGX06AB				X	X	X	X
	31	VP12A	NTGX12AB						X	X	X	X
	32	VP12A	NTGX12AB	BUS-T	NTGX04AA					X	X	X
Power	33		NT9X91AB						X	X	X	X
	34											
	35											
Power	36		NT9X91AB						X	X	X	X
	37											
	38											

Table 1-7
Primary (lower) disk shelf card layout with provisioning algorithm

Unit	Slot	Card (front) PEC code	Transition Module (rear) PEC code	Ports						
				48	72	96	120	144	168	192
Power	1 2 3	NT9X91AB		X	X	X	X	X	X	X
Power	4 5 6	NT9X91AB		X	X	X	X	X	X	X
Disk 1	7 8 9 10 11	NTGX14AA/BA or NTGX14AB/BB NT9X19BC (Filler)		X X	X X	X X	X X	X X	X X	X X
Disk 2	12 13 14 15 16	NTGX14AA/BA or NTGX14AB/BB NT9X19BC (Filler)		X X	X X	X X	X X	X X	X X	X X
Disk 3	17 18 19 20 21	NTGX14AA/BA or NTGX14AB/BB NT9X19BC (Filler)		 X	X X	X X	X X	X X	X X	X X
Disk 4	22 23 24 25 26	NTGX14AA/BA or NTGX14AB/BB NT9X19BC (Filler)		 X	X X	X X	X X	X X	X X	X X
Disk/ Tape	27 28 29 30 31 32	NTGX15AA or NTGX15AB	 NT9X19BC (Filler) NT9X19BB (Filler)	X X X	X X X	X X X	X X X	X X X	X X X	X X X
Power	33 34 35	NT9X91AB		X	X	X	X	X	X	X
Power	36 37 38	NT9X91AB		X	X	X	X	X	X	X

Table 1-8
Secondary (upper) disk shelf card layout with provisioning algorithm

Unit	Slot	Card (front) PEC code	Transition Module (rear) PEC code	Ports						
				48	72	96	120	144	168	192
Power	1 2 3	NT9X91AB					X	X	X	X
Power	4 5 6	NT9X91AB					X	X	X	X
Disk 5	7 8 9 10	NTGX14AA/BA or NTGX14AB/BB					X	X	X	X
	11		NT9X19BC (Filler)	X	X	X	X	X	X	X
Disk 6	12 13 14 15	NTGX14AA/BA or NTGX14AB/BB					X	X	X	X
	16		NT9X19BC (Filler)							
Disk 7	17 18 19 20	NTGX14AA/BA or NTGX14AB/BB							X	X
	21		NT9X19BC (Filler)	X	X	X	X	X	X	X
Disk 8	22 23 24 25	NTGX14AA/BA or NTGX14AB/BB							X	X
	26		NT9X19BC (Filler)	X	X	X	X	X	X	X
Disk 9	27 28 29 30	NTGX14AA or NTGX14AB		X	X	X	X	X	X	X
	31		NT9X19BC (Filler)	X	X	X	X	X	X	X
	32	NT9X19AA (Filler)	NT9X19BB (Filler)	X	X	X	X	X	X	X
Power	33 34 35	NT9X91AB		X	X	X	X	X	X	X
Power	36 37 38	NT9X91AB		X	X	X	X	X	X	X

Hardware provisioning

Hardware product codes

Hardware product codes for the MSM are detailed in the following table.

Table 1-9
Hardware product codes

PEC	Title
NTGX01AB	Service Peripheral Module cabinet
NTGX04AA	Meridian Mail MSM bus terminator transition module (PB)
NTGX04BA	Meridian Mail MSM bus extender transition module (PB)
NTGX05AA	68K main circuit pack
NTGX06AA	68K transition module (PB) for MSP nodes
NTGX06AB	68K RS-232 TM (PB) for SPN nodes
NTGX07AA	Modem transition module (PB)
NTGX08AA	T1 main circuit pack
NTGX09AA	T1 transition module (PB)
NTGX10AA	Bus controller main circuit pack
NTGX11AA	Bus controller transition module (PB)
NTGX12AB	VP12A circuit pack
NTGX14AA*	1400-Mbyte disk module assembly
NTGX14AB **	1.4-Gbyte, 3 1/2" disk module assembly
NTGX14BA *	Dual 1400-Mbyte disk module assembly
NTGX14BB **	Dual 1.4-Gbyte, 3 1/2" disk module assembly
NTGX15AA *	Disk tape module assembly
NTGX15AB **	1.4-Gbyte, 3 1/2" disk tape (Tandberg TDC4220) module assembly
NTGX19BC	Disk shelf rear filler CP
NTGX19CA	Power converter filler pack assembly
NT9X91AB	+5 V, +12 V power converter circuit packs

Note 1: "PB" means *paddle board*. The transition module is a paddle board that provides the nodes in the MSM with interfaces to the external world.

Note 2: The disk module assemblies identified with "*" have been discontinued by the manufacturer. "**" identifies their replacements.

Disk storage options

The system's MSPs are provisioned with a disk/tape unit (NTGX15AB) and a single disk pack (NTGX14AB) to provide redundant storage. Two disk storage options are available for the SPN (see Figure 1-11):

- 150 hours of shadowed storage per pair of SPN nodes using the NTGX14AB disk packs
- 300 hours of shadowed storage per pair of SPN nodes using the NTGX14BB dual disk packs

Note: Table 1-4 identifies disk drives which have been discontinued. If your disk drive is one of these, and it breaks down and needs to be replaced, you must order the replacement disk drive indicated.

Both drives on the pair of SPN nodes must be the same type.

Figure 1-11
Disk storage configurations for shadowed systems
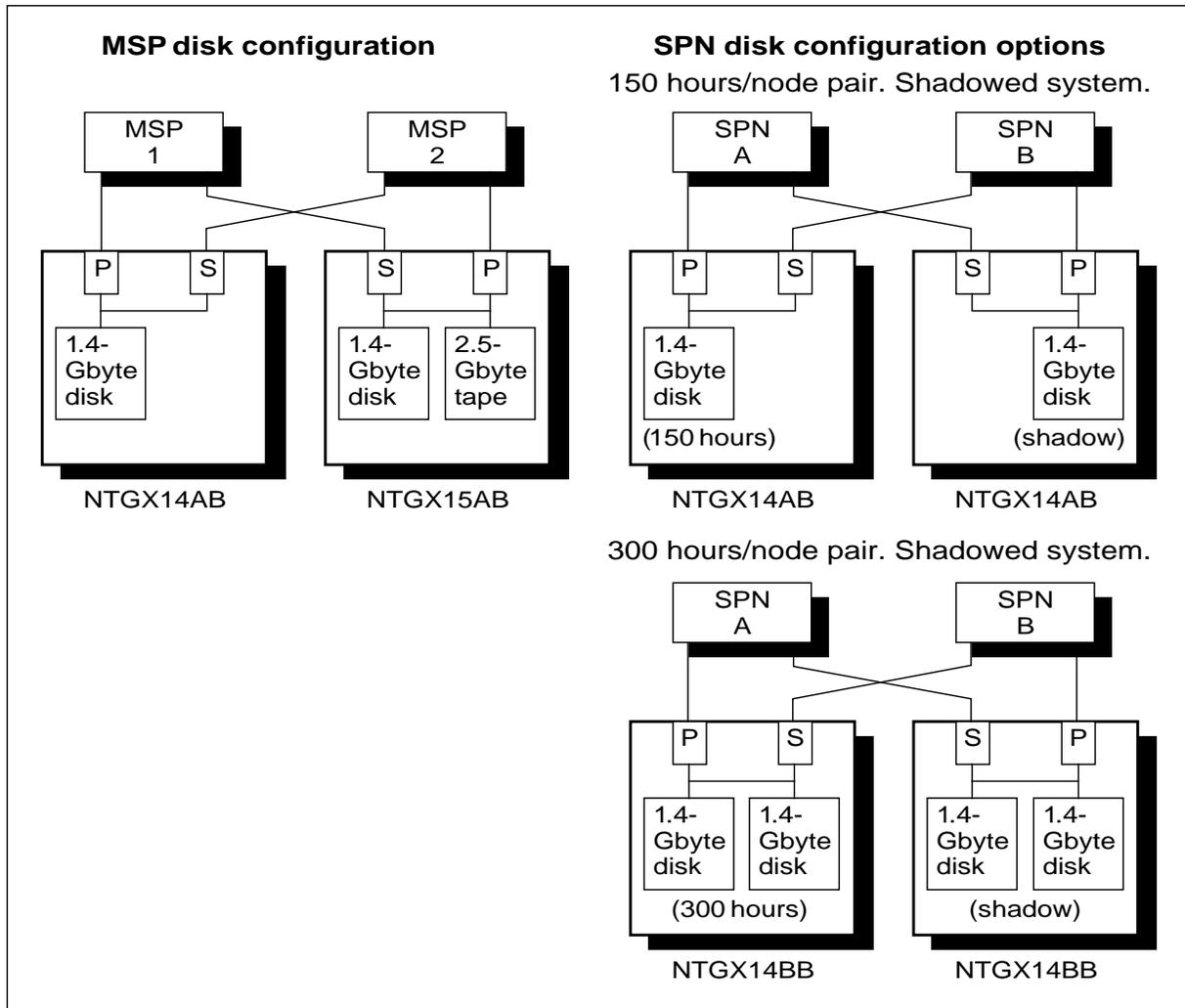
SPN capacities

Table 1-10 indicates the engineering capacities for the various numbers of SPNs that can be configured in an MSM.

Table 1-10
SPN capacities

Number of SPNs	Maximum voice ports	Maximum number of storage hours	Maximum number of mailboxes
2	48	150	5 291
		300	10 582
4	72 or 96	300	10 582
		600	21 164
6	120 or 144	450	15 873
		900	31 746
8	168 or 192	600	21 164
		1 200	42 328

Physical specifications

The physical specifications for the MSM are

Height	183 cm (72 in.)
Width	107 cm (42 in.)
Depth	71 cm (28 in.)
Maximum current drain	50 A
Power consumption	1200 watts for a 96-port system
	2400 watts for a 192-port system
Thermal profile	no more than 20° C (68° F) above ambient temperature

Earthquake information

The system is compliant with requirements for Zone 4.

Electromagnetic interference (EMI) information

The MSM conforms to the following EMI standards:

Conducted emissions	Met Bellcore 1089 requirements
Electrical fast transients	Met Bell 8465 requirements
Radiated immunity	Met Bell 8465 objectives/requirements to 1 GHz
	Met Bellcore 1089 objectives/requirements to 1 GHz
Conducted immunity	Met Bellcore 1089 requirements
	Met Bell 8465 requirements

Spares planning

Spares planning is derived from the size of the system and the mean time between failures (MTBF) figures for the main MSM components. The MTBF values are shown in Table 1-11. The three different spares kits are shown in Tables 1-12, 1-13, and 1-14.

Table 1-11
Mean time between failures of MSM system components

Component	MTBF in years
MSP	14.7
SPN	4.9
TIFN	10.8
MSM system	23.6

Table 1-12
Spares kit #1

PEC	Description	Spares
NT9X91AB	+5 V, +12 V Power converter CP	1
NTGX04AA	MMail Bus terminator transition module	1
NTGX04BA	MMail Bus extender transition module	1
NTGX05AA	68K main circuit pack	2
NTGX06AA	68K transition module PB for MSP	2
NTGX06AB	RS-232 transition module PB for SPN	2
NTGX07AA	Modem transition module	1
NTGX08AA	T1 main circuit pack	1
NTGX09AA	T1 transition module	1
NTGX10AA	Bus controller main CP	1
NTGX11AA	Bus controller transition module PB	1
NTGX12AB	VP12A circuit pack	1
NTGX14AA*	1400-Mbyte disk module assembly	1
NTGX14AB*	1.4-Gbyte, 3 1/2" disk module assembly	1
*For a system populated with dual disk packs		
• The NTGX14AA is replaced by the NTGX14BA.		
• The NTGX14AB is replaced by the NTGX14BB.		

Table 1-13
Spares kit #2

PEC	Description	Spares
NT9X91AB	+5 V, +12 V power converter CP	1
NTGX05AA	68K main CP	1
NTGX06AA	68K transition module PB for MSP	2
NTGX06AB	RS 232 transition module PB for SPN	2
NTGX08AA	T1 main circuit pack	1
NTGX10AA	Bus controller main CP	1
NTGX11AA	Bus controller transition module PB	1
NTGX12AB	VP12A circuit pack	1
NTGX14AA*	1400-Mbyte disk module assembly	1
NTGX14AB*	1.4-Gbyte, 3 1/2" disk module assembly	1
*For a system populated with dual disk packs		
• The NTGX14AA is replaced by the NTGX14BA.		
• The NTGX14AB is replaced by the NTGX14BB.		

Table 1-14
Spares kit #3

PEC	Description	Spares
NTGX05AA	68K main CP	1
NTGX06AA	68K transition module PB for MSP	2
NTGX06AB	RS-232 transition module PB for SPN	2
NTGX08AA	T1 main circuit pack	1
NTGX10AA	Bus controller main CP	1
NTGX11AA	Bus controller transition module PB	1

Fusing requirements

Table 1-15
Fusing requirements for the MSM

Shelf	Fuse (amps)
Shelf position 00 - A	20
Shelf position 00 - B	20
Shelf position 13 - A	20
Shelf position 13 - B	20
Shelf position 26 - A	30
Shelf position 26 - B	30
Shelf position 39 - A	30
Shelf position 39 - B	30
Blower - A	10
Blower - B	10

Software

Meridian Mail on the MSM offers a variety of voice mail services through the MSM basic software package and optional packages which provide enhanced services, including Fax on Demand.

Note: Please contact your Nortel Distributor/Sales Representative for further details.

Basic software requirement

This package represents the base voice messaging software required for the MSM. The base software package includes support for

- Meridian Mail User Interface (MMUI)
- Voice Messaging User Interface Forum (VMUIF)
- Voice Menus
- Multilingual support
- Dual language greeting support
- Mailbox Class of Service
- Outcalling
- Support for single SMDI

Optional software packages

- *Multi-SMDI support software* This package allows support for multiple SMDI links on the MSM. The MSM can support a maximum of eight redundant or 16 non-redundant SMDI Connections. The multi-SMDI feature allows a number of switches to be supported by one MSM or a single switch to interface with the MSM through multiple SMDI links for reasons of redundancy or capacity.

- *AMIS Networking* This package provides support for AMIS Networking on the MSM. This allows MSM users to compose and send messages to other users whose messaging systems support AMIS Networking.

- *Meridian Networking* This package provides support for Meridian Networking on the MSM. This allows Meridian Mail users to send and receive voice messages, to reply to voice messages, and to forward voice messages to users located at other Meridian Mail sites, using the same commands as they would for users on their own systems.

- *Voice Forms* This package provides support for voice forms on the MSM. The voice forms feature allows the MSM administrator to create applications to collect information from callers to the MSM.

- *Multi-Customer* This package provides support for multiple customer groups on the MSM. The MSM can support up to 2000 customer groups with this feature installed.

- *Access Enable* This package provides the ACCESS applications programming interface (API) functionality on the MSM. The Access Enable option is required on the MSM to run applications developed with Nortel's Meridian ACCESS product.

  Meridian ACCESS (Release 3) is a C-language API library that provides other Nortel development groups with a wide variety of functions to create customized voice processing applications. Meridian ACCESS is supported on a Meridian Applications Server (MAS)**.**

Note 1 : The Meridian Mail Access Enable option supports existing applications developed with ACCESS Releases 1 and 2 (including Meridian IVR Release 1, Customer Controlled Routing [CCR], and Visit Messenger Release 1). Modification to these applications is not required.

Note 2: Applications developed with ACCESS Release 3 are not supported on versions of Meridian Mail earlier than Release 10.0.

- *AdminPlus/Meridian Mail Reporter* Meridian Mail Reporter, a Windows-based application, replaces the DOS-based AdminPlus application on the PC. Meridian Mail Reporter provides file downloading capabilities through which billing records can be received from the Meridian Mail system by a PC. These records can be processed on the PC using any popular spreadsheet, reporting, or accounting program. This feature provides added flexibility for customers who require detailed accounting and billing for users of Meridian Mail.

  Meridian Mail Reporter includes enhanced reporting capabilities but does not provide access to the Meridian Mail console.

  If you are currently using AdminPlus and are converting to Meridian Mail Release 10.0, you must do the following:

  — Convert your AdminPlus application on the PC to Meridian Mail Reporter.
  — Do a feature expansion after conversion in order to enable AdminPlus and redefine the AdminPlus dataports. (Meridian Mail will drop the AdminPlus feature during conversion. The AdminPlus feature on Meridian Mail must be reenabled in order to use Meridian Mail Reporter.)

- *Meridian Mail Connections* This package provides support for connectivity to PBXs. VoiceBridge integration units are used to enable the PBX to emulate a Centrex switch using SMDI protocol to communicate with the MSM. Selected models of AT&T, ROLM, and Meridian 1 PBXs are supported.

Maintenance impact

Analysis of a switching system is based on a combination of maintenance and traffic indicators. These indicators denote the state of the system and assist in identifying actual or potential service problems.

To assist in an analysis of the grade of service provided and of Meridian Mail MSM performance, a set of operational measurements is provided by the system. Operational measurements associated with provisioning and administration can be used to determine if adequate software and hardware resources have been provided. For more information on these measurements, refer to one of the following documents:

- *MSM System Administration Guide for Multi-Customer Systems* (NTP 557-7001-300)
- *MSM System Administration Guide* (NTP 557-7001-302)

Chapter 2: Determining service requirements

This chapter provides formulas and examples for determining the system size for your site. The results are based on the number of users, how much the system will be used, and what level of service is required. Specifically, this chapter outlines how to estimate the number of ports, nodes, and hours of storage required, based on anticipated system usage.

The methods for determining service requirements are given feature by feature. You can ignore the steps for those features that you do not plan to have on your system.

> *Note:* The information contained in this chapter is very basic; if your system is complex, this chapter may not be enough to help you determine the service requirements. You may need to obtain assistance from a traffic engineer.

Product impact on network traffic

The Meridian Mail Message Services Module (MSM) will impact system traffic by increasing call completion rates on the local switch because of the call answering feature. It will also decrease holding times since subscribers are more likely to spend less time on the phone when talking to a voice mail product instead of another person.

Use of Simplified Message Desk Interface (SMDI), Message Waiting Indication (MWI), and Uniform Call Distribution (UCD) will increase the switch central processing unit (CPU) load.

Overload and flow controls

The Meridian Mail MSM is designed to run at full load with all ports busy. Because of this, overload and flow controls are not required to maintain system integrity during overload conditions.

Grade of service

To engineer the Meridian Mail MSM correctly, a grade of service must be selected. If a UCD queue is used, the system does not block, but rather delays the caller in a queue, listening to ringback until a port is available. The recommended grade of service for MSM systems using a UCD queue is P05. This means that there is a 5% probability of delay in queue exceeding six seconds (one ring cycle).

If another grade of service is required, then a traffic engineer will have to determine the traffic tables for that grade.

Basic-service, full-service, and multimedia ports

The following port configurations are available:

- Basic-service
- Full-service (voice and multimedia)

  Note 1: Basic-service multimedia ports are not available.

  Note 2: Northern Telecom (Nortel) no longer sells full-service multimedia ports. Instead, 1.5 full-service ports are used to configure one multimedia port.

  To determine how many ports are required for both multimedia and voice services, you will need to do the following (detailed instructions are provided later in this chapter):

- Determine how many ports are required for multimedia services.
- Determine how many full- and basic-service ports are required for voice services.
- Calculate the total number of ports as follows:

  (Multimedia x 1.5) + full- and basic-service = total ports

  Example

  If 8 multimedia ports and 36 full-service voice ports are required, purchase

  (8 x 1.5) + 36 = 48 full-service ports

    Note: The total should be evenly divided by 4 since ports are provided on voice processor cards in multiples of 4. If it cannot be divided evenly by 4, add more basic-service ports until it is.

- Reconfigure 12 full-service ports as 8 multimedia ports.

The port type (voice versus multimedia) and capability (basic versus full) determines the features that can be processed by that port. You can have a mixture of port types and capabilities on your system, depending on the requirements of your site. This flexibility allows your organization to minimize the purchase price of the system since basic ports are less expensive than full-service ports.

The Meridian Mail features are listed by port type in Table 2-1. Features that require a multimedia port are listed under "full-service ports" with and marked with an asterisk.

Table 2-1
MSM basic-service, full-service, and multimedia features

Port type	Features available	
Basic-service ports	ACC	Access Enable option *
	AS	Announcement service
	MS	Voice menu service
	PM	Prompt maintenance
	RA	Remote activation
	TD	Time-of-day service
	TS	Thru-dial service
	VS	Voice softkey
Full-service ports	VM	Voice messaging
	EM	Express messaging
	AN	AMIS networking agent
	DNU	Delivery to non-user
	RN	Remote notification
	VF	Voice forms service
	TR	Transcription service
	NW	Meridian networking
	FOC	Fax Outcalling
	Plus all basic-service features	
* ACCESS applications which intend to switch to Voice Messaging must be on full-service voice ports (for example, VISIT Messenger).		

Note: Fax Outcalling (FOC) consists of the following:

- same-call fax delivery (caller selects faxes from a voice menu and receives them during the same call)
- fax call-back (caller selects faxes from a voice menu and specifies a number to which the fax is to be sent)
- fax announcements (similar to voice announcements, except a fax is delivered instead of a voice message)

If you intend to have a mixture of port types and capabilities, you will need to determine how many of each port type and capability your system will require (that is, how many basic-service voice, full-service voice, and full-service multimedia ports are required).

Basic-service ports

To determine the number of basic-service ports required, decide what basic services you plan to use from Table 2-1. Then refer to the section "Determining the number of voice ports" for instruction on estimating traffic requirements for those applications. Follow only the procedures that refer to applications or features that you plan to process through basic-service ports. Then use those figures to obtain the number of basic-service voice ports that will be required.

Full-service ports

To determine the number of full-service voice ports required, decide which full-service voice applications you plan to use. The section "Determining the number of voice ports" will provide instruction on estimating the traffic requirements for those applications. Use the resulting figures to calculate the number of full-service voice ports required.

Multimedia ports

To calculate the number of multimedia ports required, refer to the section "Determining the number of multimedia ports" for instructions on estimating traffic requirements for fax-related features. Follow only the procedures that refer to applications or features (such as voice menus that have fax items) that you plan to process through multimedia ports. Then use those estimates to determine the number of multimedia ports required.

Refer to the section "Total number of voice and multimedia ports" to decide the system size that can provide the total number of voice and multimedia ports required.

Traffic considerations

The system should be engineered for average busy-season busy-hour traffic levels.

The following assumptions can be used to aid in calculating the engineering traffic requirements. These assumptions can be revised according to the conditions found at each particular site.

For business applications, during an eight-hour cycle, typical figures are

- 25% of the time is used for busy hour traffic (two hours)
- 5% of the time is used for greater-than-busy hour traffic
- 70% of the time is used for less-than-busy hour traffic

When estimating channel requirements, assume the following:

- No more than 20% of login calls use messaging features (send, reply, and forward).
  - Most logins are assumed to involve playing of incoming messages.
  - Typically, 90% of all messages are created by call answering.
  - Only 5% of login sessions use messaging features other than those needed to play and delete call answering features.
- The average number of recipients of a composed message is four.
- The average length of a composed message is 30 seconds.
- If networking is installed, 10% of recipients are at remote locations, and the network consists of three sites.

To calculate total traffic, first calculate the number of busy-hour centi [hundred] call seconds (CCS) per user.

$$CCS = \frac{number\ of\ call\ seconds}{100}$$

For call answering and voice messaging applications, typical values for per-user traffic are 0.45 CCS per user for Centrex customers and 0.20 CCS per user for residential or small business subscribers.

System sizing is dependent upon traffic estimation, with voice messages being the most significant element. Voice Menus, Voice Forms, and Thru-dial applications do not generate significant traffic compared to call answering and message retrieval, and can usually be ignored. However, if a system is set up mostly for these specific applications, then voice menus or voice forms traffic must be estimated and channel requirements determined, independent of the number of mailboxes.

Both storage hours and number of ports required must be considered.

Determining the number of voice ports

The number of ports on a system determines the maximum number of *simultaneous* users who can use the system and its features. For example, a 24-port system allows up to 24 users to use Meridian Mail at the same time. However it is unlikely that all users will try to access their mailboxes simultaneously; therefore, each port normally supports a large number of users.

Port requirements are determined using standard traffic engineering principles. These consider busy-hour traffic and desired grade of service. The busy hour is the highest traffic hour for the system. Busy-hour traffic is stated in busy hour CCS.

When calculating busy-hour traffic, keep in mind that, for a typical business, the busy hour usually occurs between 10:00 a.m. and 11:00 a.m., or 2:00 p.m. and 3:00 p.m. For individual businesses, the busy hour period may vary.

Furthermore, the busy hour or peak period may not occur each day. The peak period may occur only on certain days of the week or month, or only during certain months of the year (especially if the business is seasonal in nature). Consider these ideas when judging what hour in the day, week, month, or year is the busy hour. You must be aware of these factors to engineer a system that can truly handle peak traffic requirements.

The steps for determining the number of ports required for your organization are listed briefly below and then explained in more detail in the procedures that follow. Use the worksheet shown in Figure 2-1 to perform the required calculations.

The steps are

- Determine the busy hour voice messaging activity (connect time). For instructions, see Procedure 2-1.
- Determine the busy hour activity of all Meridian Mail applications used by your organization. For instructions, see Procedure 2-2.
- Determine the increase in busy hour activity that networking will cause. For instructions, see Procedure 2-3.

If networking is not included, skip this step.

- Estimate the increase in busy hour activity that outcalling will cause. For instructions, see Table 2-3.

  If outcalling is not included, skip this step.

- Calculate the number of ports required. For instructions, see Procedure 2-4.

Figure 2-1

Worksheet for calculating busy hour system activity and determining the ports required

Note: If these features will have dedicated ports, calculate their port requirements separately, and then insert the value in box 14 on the second page of this worksheet.

Busy hour system activity and ports required

	Basic-service voice activity (Call-seconds)	Full-service voice activity (Call-seconds)

1 Voice Messaging activity (see Procedure 2-1) → 1 [ ]

2 Activity of all applications (see Procedure 2-2)

Voice Menu activity → 2a [ ]   2b [ ]

Note: Voice menus with fax items for call-back delivery must be on full-service voice ports. Refer to the heading "Fax call-back activity". Other voice menus only require basic-service ports.

Announcements activity → 2c [ ]

Voice Forms activity → 2d [ ]

ACCESS applications activity → 2e [ ]   2f [ ]

Auto Attendant activity (if used during busy hour) → 2g [ ]

3 Networking activity on shared ports (if installed) (see Procedure 2-3) → 3 [ ]

4 Outcalling activity on non-dedicated ports (if installed) (see Table 2-3) → 4 [ ]

5 Add each column → 5a [ ]   5b [ ]

—continued—

Figure 2-1 (continued)
Worksheet for calculating busy hour system activity and determining the ports required

6 [Number of voice ports required (see Procedure 2-4)]

  a. Copy the basic-service total from box 5a on
     the previous page.   6 [_____]

  b. Divide the figure in box 6 by 100 to determine the
     total basic-service busy hour activity in CCS. 7 [_____]

  c. Look up the CCS (box 7) in Table 2-4 to determine
     the number of non-dedicated basic-service voice
     ports required.   8 [_____]

  d. Copy the full-service total from box 5b on the
     previous page.   9 [_____]

  e. Divide the figure in box 9 by 100 to determine the
     total full-service busy hour activity in CCS. 10 [_____]

  f. Look up the CCS (box 10) in Table 2-4 to determine the
     number of non-dedicated full-service voice ports required. 11 [_____]

  g. Number of ports dedicated to Meridian Networking
     (Obtain assistance from a traffic engineer.) 12 [_____]

  h. Number of ports dedicated to Outcalling
     (Obtain assistance from a traffic engineer.) 13 [_____]

  i. Number of ports dedicated to or required for other
     specialized services (see step 7 in Procedure 2-4) 14 [_____]

  j. Total number of voice ports required
     (add lines 8 and 11 through 14) 15 [_____]

7 To determine the minimum number of nodes required, look up the value
    from box 15 in Table 2-8 in the "Determining the number of nodes"
    section. If you are planning to have multimedia ports, wait until the multimedia
    port requirements have been calculated before determining the number of
    nodes required.

—**end**—

Voice messaging activity

The busy hour voice messaging activity (connect time) is the anticipated activity of Meridian Mail during the busy hour. To determine the busy hour voice messaging activity, use Procedure 2-1, then record the result in box 1 of Figure 2-1.

Procedure 2-1
Calculating the busy hour voice messaging activity

1   Estimate the average connection time per registered user during the busy hour.

    This includes both the time the user is logged on to Meridian Mail and the time callers use to leave messages for that user.

    The typical range is 30 to 60 seconds per user. A reasonable assumption is 40 seconds per Centrex user and 30 seconds per residential or small business user.

2   Determine the number of Meridian Mail users.

3   Multiply the result of step 1 by step 2.

4   Record the result in box 1 of Figure 2-1.

Activity of all applications

Meridian Mail applications include Voice Menus, Auto Attendants, Voice Forms, and Meridian ACCESS applications. It is important that you analyze your specific applications, since many applications vary widely in the number of calls requiring processing and the holding times of those calls.

To determine the total busy hour activity for each application, use Procedure 2-2 and record the result in the appropriate step 2 box in Figure 2-1. For an example, see Table 2-2.

Procedure 2-2
Calculating the busy hour activity of all applications

   Note: Voice menus with fax items for call-back delivery must be on full-service voice ports. Refer to the section "Fax call-back activity." Other voice menus only require basic-service ports.

1   Estimate the average length of the call.

    The average length is determined by the type of application. For an information-type menu, a reasonable assumption is 60 seconds per call. An automated attendant will have a smaller average call length.

2   Estimate the number of calls during the busy hour.

3   Multiply the result of step 1 by the result from step 2.

The result is the estimated busy hour activity for that particular application.

4   For voice menus, announcements, and voice forms only, repeat steps 1 to 3 for each item (that is, each voice menu, each announcement, etc.)

Add the items for each application together.

5   Record the result in the appropriate step 2 box of Figure 2-1.

6   Repeat steps 1 to 5 for each application.

Table 2-2
Busy hour voice applications activity calculation example

Voice service	Average length of call (seconds) X	Number of calls in busy hour =	Total call seconds for applications
Voice Menu 1	60	40	2400
Voice Menu 2	90	10	900
Voice Menu 3	30	10	300
Announcement 1	40	5	200
Announcement 2	30	10	300
Voice Form 1	200	16	3200
Voice Form 2	220	10	2200
Total			9500

Networking activity

Networking ports can be shared with other applications or dedicated. If the ports are shared, add this networking traffic estimate to the traffic estimates for other applications.

To determine the networking activity for shared ports, use Procedure 2-3. A typical assumption is that networking traffic will increase voice messaging activity by 5%.

Procedure 2-3
Calculating the networking activity-shared ports

Note: If you plan to dedicate ports to Meridian Networking, you will need to obtain assistance from a traffic engineer. The result is recorded in box 12 of Figure 2-1.

1   Multiply the result in box 1 of Figure 2-1 by .05.

2   Record the result in box 3.

Outcalling activity

Outcalling (which collectively refers to the *Remote notification and Delivery to non-users* features) can be used in a variety of ways by different organizations. Because of this, there are no formulas to follow when trying to determine port requirements. Instead, you must consider how your organization will use outcalling, especially during the busy hour.

Table 2-3
Deciding how your organization will use Outcalling

If	then
only a small number of users will be using Delivery to Non-Users and/or Remote Notification	the effect of these features on your overall system requirements will be small and can be ignored.
the Delivery to Non-Users feature will be restricted to low-traffic periods (for example, after hours)	the feature should have no impact on your system requirements.
a large number of users will be accessing Delivery to Non-Users and/or Remote Notification	estimate what the usage will be and record it in box 4 of Figure 2-1.
ports will be dedicated to the outcalling feature	you will need to obtain assistance from a traffic engineer to calculate the port requirements for outcalling. The result is recorded in box 13 of Figure 2-1.

Number of ports required

To determine the number of ports required, use Procedure 2-4 and record the results in the appropriate boxes in Figure 2-1.

Procedure 2-4
Calculating the number of ports required

1 Copy the figure from box 5a on the first page of Figure 2-1 into box 6 on the second page of Figure 2-1.

2 Divide box 6 by 100 to get the total busy hour system activity in CCS. Record the result in box 7.

3 Copy the figure from box 5b on the first page of Figure 2-1 into box 9 on the second page of Figure 2-1.

4 Divide box 9 by 100 to get the total busy hour system activity in CCS. Record the result in box 10.

5 For each of boxes 7 and 10, determine the number of ports required.

See Table 2-4. In the column labelled "Busy hour traffic," find the range within which the calculated total busy hour CCS falls. The corresponding value in the column labelled "Voice ports" is the number of ports required to accommodate the estimated total system activity.

6   Record the values from Table 2-4 in boxes 8 and 11 respectively.

7   If you are planning to have dedicated ports for specific services, calculate the port requirements for those specific services, and record it in box 14 of Figure 2-1.

8   Add boxes 8 and 11 through 14 together. Record the result in box 15.

Table 2-4 indicates the heaviest traffic for which the system should be engineered. It also indicates the number of users that can be accommodated (light use: 0.2 busy-hour CCS/user, and heavy use: 0.7 busy-hour CCS/user). For a better grade of service, additional ports should be allocated.

With the UCD queue used, the system does not block but rather delays the caller in a queue, listening to ringback, until a port is available. The recommended grade of service is 'P05', or 5% probability of delay in queue exceeding six seconds (one ring cycle).

Note: The use of broadcast messages or large distribution lists may result in a surge of login traffic. To minimize this effect, Meridian Mail MSM message delivery rates are limited. Otherwise, the ability of callers to leave messages could be affected by users suddenly logging in to get a broadcast message.

Table 2-4
UCD: non-blocking P05 delay > 1/6 hold time (one ring cycle)

Voice ports	Busy hour traffic (CCS)	Calls per hour (30 sec.)	Number of users	
			.2 CCS/user	.7 CCS/user
3	25.3	84	127	36
6	84.6	282	423	121
9	154.7	516	773	221
12	230.1	767	1150	329
15	308.9	1030	1544	441
18	390.0	1300	1950	557
21	472.9	1576	2364	676
24	557.1	1857	2786	796
27	642.4	2141	3212	918
30	728.6	2429	3643	1041
33	815.5	2718	4078	1165
36	903.1	3010	4515	1290
39	991.2	3304	4956	1416
42	1079.7	3599	5399	1542
—continued—				

Table 2-4 (continued)
UCD: non-blocking P05 delay > 1/6 hold time (one ring cycle)

Voice ports	Busy hour traffic (CCS)	Calls per hour (30 sec.)	Number of users	
			.2 CCS/user	.7 CCS/user
45	1168.7	3896	5844	1670
48	1258.1	4194	6290	1797
51	1347.8	4493	6739	1925
54	1437.8	4793	7189	2054
57	1528.1	5094	7640	2183
60	1618.6	5395	8093	2312
63	1 709.4	5 698	8 547	2 442
66	1 800.3	6 001	9 002	2 572
69	1 891.5	6 305	9 457	2 702
72	1 982.8	6 609	9 914	2 833
75	2 074.3	6 914	10 372	2 963
78	2 166.0	7 220	10 830	3 094
81	2 257.8	7 526	11 289	3 225
84	2 349.7	7 832	11 748	3 357
87	2 441.8	8 139	12 209	3 488
90	2 533.9	8 446	12 670	3 620
93	2 626.2	8 754	13 131	3 752
96	2 718.6	9 062	13 593	3 884
99	2 811.1	9 370	14 056	4 016
102	2 903.7	9 679	14 519	4 148
105	2 996.4	9 988	14 982	4 281
108	3 089.2	10 297	15 446	4 413
111	3 182.0	10 607	15 910	4 546
114	3 275.0	10 917	16 375	4 679
117	3 368.0	11 227	16 840	4 811
120	3 461.1	11 537	17 305	4 944
123	3 554.2	11 847	17 771	5 077
126	3 647.4	12 158	18 237	5 211
129	3 740.7	12 469	18 703	5 344
132	3 834.0	12 780	19 170	5 477
135	3 927.4	13 091	19 637	5 611
138	4 020.9	13 403	20 104	5 744
—continued—				

Table 2-4 (continued)
UCD: non-blocking P05 delay > 1/6 hold time (one ring cycle)

Voice ports	Busy hour traffic (CCS)	Calls per hour (30 sec.)	Number of users	
			.2 CCS/user	.7 CCS/user
141	4 114.4	13 615	20 572	5 878
144	4 207.9	14 026	21 040	6 011
147	4 301.5	14 338	21 508	6 145
150	4 395.2	14 651	21 976	6 279
153	4 488.9	14 963	22 444	6 413
156	4 582.6	15 275	22 913	6 547
159	4 676.4	15 588	23 382	6 681
168	4 958.0	16 527	24 790	7 083
162	4 770.3	15 901	23 815	6 815
165	4 864.1	16 214	24 321	6 949
171	5 052.0	16 840	25 260	7 217
174	5 146.0	17 153	25 730	7 351
177	5 240.0	17 467	26 200	7 486
180	5 334.1	17 780	26 670	7 620
183	5 428.2	18 094	27 141	7 755
186	5 522.3	18 408	27 611	7 889
189	5 616.4	18 721	28 082	8 023
192	5 710.6	19 035	28 553	8 158
—end—				

Determining the number of multimedia ports

If you are purchasing the Fax Outcalling or Fax on Demand features (voice menu with fax items, fax call-back delivery, fax announcements), your system will require multimedia ports. Multimedia applications require more processing than voice applications. As a result, three physical port locations are required to configure two multimedia ports, whereas only one physical port location is required to configure one voice port. Therefore, it is necessary to calculate the multimedia port requirements separately, and then convert this number to an equivalent number of voice ports. The overall system size is expressed in terms of physical port locations.

This section outlines the steps required to calculate the busy hour multimedia activity and port requirements. The steps are listed briefly below and then explained in more detail in the procedures that follow. Use the worksheet shown in Figure 2-2 to perform the required calculations.

The steps are

- Determine the busy hour activity for voice menus with fax items (same call delivery). For instructions, see Procedure 2-5.
- Determine the busy hour activity for fax call-back deliveries. For instructions, see Procedure 2-6.
- Determine the busy hour fax announcements activity. For instructions, see Procedure 2-7.
- Calculate the number of multimedia ports required based on fax activity in the busy hour. For instructions, see Procedure 2-8.

Figure 2-2

Worksheet for calculating the number of multimedia ports required

Multimedia busy hour activity and ports required

Activity
(Call-seconds)

1 Voice menus with fax items (same call delivery) (see Procedure 2-5)

1 [   ]

2 Fax call-back activity (see Procedure 2-6)

2 [   ]

3 Fax announcement activity (same call delivery) (see Procedure 2-7)

3 [   ]

4 Number of non-dedicated multimedia ports required (see Procedure 2-8)

Add lines 1 through 3.

4 [   ]

5 Divide the total by 100 to determine the total activity in CCS.

5 [   ]

6 Look up the CCS in Table 2-5 to determine the number of non-dedicated multimedia ports required.

6 [   ]

7 Number of dedicated multimedia ports required (see Procedure 2-9)

7 [   ]

8 Add 6 and 7 together.

8 [   ]

Voice menus with fax items (same call delivery)

With the Fax-on-Demand feature, you can set up voice menus that offer faxes as some of the menu items. These can be referred to as multimedia voice menus. A caller who reaches a multimedia voice menu can select faxes to be received. If the caller is calling from a phone line that is also connected to a fax machine, the fax can be delivered during the same call (same call delivery).

To estimate the call connect time (traffic) for multimedia voice menus during the busy hour, use Procedure 2-5.

Procedure 2-5
Estimating the call connect time for multimedia voice menus

1   Select a multimedia voice menu, and estimate the average duration of calls to this menu during the busy hour.

    When estimating this duration, include the following:

    • time to listen to the menu greeting

    • time to listen to the voice menu and select faxes

    • time to receive "same call" faxing instructions

    • time to send the selected faxes

        — about 12 seconds to establish protocol

        — 40 seconds per page in normal resolution; 80 seconds per page in fine resolution

        — about 10 seconds to complete the fax delivery (that is, end protocol, then disconnect)

2   Estimate the number of calls to this menu during the busy hour. This would depend on the specific function of the multimedia voice menu in your organization.

3   Multiply the result of step 1 by the result of step 2 to determine the estimated total activity generated from this multimedia voice menu during the busy hour.

4   Record the result on some note paper.

5   Repeat steps 1 to 4 for each multimedia voice menu.

6   Add the activity for each multimedia voice menu to get the total activity. Record the result in box 1 of Figure 2-2.

Fax call-back activity

A voice menu with fax items may give a caller the option to specify a different number to receive the selected faxes. If a caller chooses this option, Meridian Mail must "call back" the specified number.

In this scenario, the voice menu and fax selection part of the process could be supported by a full-service voice port (refer to box 2b in Figure 2-1). Traffic estimates for calls of this type, that do *not* involve a fax delivery during the same call, should be incorporated into the full-service voice port calculations. See "Determining the number of voice ports."

To estimate the total busy-hour connect time for the actual fax call-back deliveries, use Procedure 2-6.

Procedure 2-6
Estimating the total busy-hour connect time for fax call-back deliveries

> *Note:* If you want to dedicate ports to fax callback deliveries, see Procedure 2-9.

1   Estimate the average duration of fax call-back delivery calls during the busy hour. When estimating this duration, include the following:

- 10 seconds to set up the call
- 14 seconds to answer the call
- 12 seconds to establish the protocol
- 40 seconds per page in normal resolution; 80 seconds per page in fine resolution
- 10 seconds to complete the fax delivery (that is, end protocol then disconnect)

2   Estimate the number of fax call-back deliveries during the busy hour.

3   Multiply the result of step 1 by the result of step 2 to determine the estimated total connect time used by fax call-back deliveries in the busy hour.

4   Record the result in box 2 of Figure 2-2.

Fax announcement (stand-alone fax service) activity

A fax announcement service does not use a voice menu interface. Instead, when a caller dials the announcement service number, a fax is delivered. This is a same-call delivery, so the guidelines for estimating the connect time for these announcements is similar to that for voice menus with fax items. The steps are outlined in Procedure 2-7.

Procedure 2-7
Estimating the connect time for fax announcements with "same call" fax delivery

1   Select a fax announcement and estimate the average duration of calls to this fax announcement during the busy hour.

   When estimating the call duration, include the following:

   • time to listen to the announcement greeting

   • time to receive "same call" faxing instructions

   • time to transmit the fax:

      — 12 seconds to establish protocol

      — 40 seconds per page in normal resolution; 80 seconds per page in fine resolution

      — 10 seconds to complete the fax delivery (that is, end protocol then disconnect)

2   Estimate the number of calls to this fax announcement during the busy hour. This would depend on the specific function of this fax announcement in your organization.

3   Multiply the result of step 1 by the result of step 2 to determine the estimated total activity generated from this fax announcement during the busy hour.

4   Record the result on some note paper.

5   Repeat steps 1 to 4 for each fax announcement.

6   Add together the activity for each fax announcement to get the total activity. Record the result in box 3 in Figure 2-2.

Calculating the number of multimedia ports

To calculate the number of multimedia ports required, use

• Procedure 2-8 for non-dedicated ports

• Procedure 2-9 for dedicated ports

   Note: In a system where multimedia ports are dedicated to call-back delivery, 36 CCS can be supported by each dedicated port because the system can make continuous use of these ports.

Procedure 2-8
Calculating the number of non-dedicated multimedia ports required

1 Add lines 1 through 3 in Figure 2-2. Record the result in box 4.

2 Divide the result in box 4 by 100 to get the estimated busy hour multimedia activity in CCS, and record the result in box 5.

3 Determine the number of multimedia ports required based on the estimated busy hour system activity.

See Table 2-5. In the column labelled "Busy hour traffic," find the range within which the calculated total CCS falls. The corresponding value in the column labelled "Number of multimedia ports" is the number of ports required to accommodate the estimated total system activity.

4 Record the value in box 6 of Figure 2-2.

Procedure 2-9
Calculating the number of dedicated multimedia ports required

1 Use the following formula to determine how many dedicated ports you require:

$$\text{Number of multimedia ports} = \frac{\text{Total fax delivery call-seconds in busy hour}}{\text{Maximum wait-time for delivery in seconds}}$$

The maximum wait time should be less than 3600 seconds (one hour); otherwise, the system could become overloaded.

2 Record the result in box 7 of Figure 2-2.

Table 2-5
Multimedia port capacity
(based on 234-second sessions and 5% probability of busy-hour calls being queued for over one ring)

Number of multimedia ports	Busy hour traffic (in CCS)
2	10.4
4	43.1
6	84.7
8	131.1
10	180.5
12	232.2
14	285.4
16	340.0
18	395.6
20	452.1
22	509.4
24	567.4
—continued—	

Table 2-5 (continued)
Multimedia port capacity
(based on 234-second sessions and 5% probability of busy-hour
calls being queued for over one ring)

Number of multimedia ports	Busy hour traffic (in CCS)
26	625.9
28	684.9
30	744.4
32	804.3
34	864.5
36	925.1
38	986.0
40	1047.2
42	1108.7
44	1170.4
46	1232.3
48	1294.5
50	1356.9
52	1419.4
54	1482.1
56	1545.0
58	1608.1
60	1671.3
62	1734.6
64	1798.1
66	1861.8
68	1925.5
70	1989.4
72	2053.3
74	2117.4
76	2181.6
78	2245.9
80	2310.3
82	2374.8
84	2439.4
86	2504.0
88	2568.8
90	2633.6
92	2698.5
94	2763.4
—continued—	

Table 2-5 (continued)
Multimedia port capacity
(based on 234-second sessions and 5% probability of busy-hour
calls being queued for over one ring)

Number of multimedia ports	Busy hour traffic (in CCS)
96	2828.5
98	2893.6
100	2958.8
102	3024.1
104	3089.4
106	3154.8
108	3220.2
110	3285.7
112	3351.2
114	3416.9
116	3482.5
118	3548.2
120	3614.0
122	3679.8
124	3745.7
126	3811.6
128	3877.6
—end—	

Total number of voice and multimedia ports

Multimedia physical port requirements

Multimedia applications require more processing than voice applications. As a result, three physical port locations are required to configure two multimedia ports, while only one physical port location is required to configure one voice port. It follows then that a system with multimedia ports is larger than a system with the same number of voice ports.

For example, if you required a system with eight multimedia ports and 36 voice ports as per your calculations to this point, you would actually need a system with 48 physical port locations (12 ports to configure eight multimedia ports and 36 ports to configure 36 voice ports).

Note: If no multimedia ports are required (for example, you have not purchased Fax-on-Demand), then system size can be based solely on the number of voice ports. No conversion to physical ports is required since one voice port equals one physical port location.

Number of ports required

Follow the steps in Procedure 2-10 to calculate the total number of ports required to support voice and multimedia services. Use Figure 2-3 as your worksheet.

Figure 2-3
Worksheet for calculating the total number of ports required for voice and multimedia services

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Ports required for voice and multimedia services

1 Number of voice ports required for voice features
(including dedicated ports) from box 15 of Figure 2-1   1 [   ]

2 Number of multimedia ports required (must be an even
number, including dedicated ports) from box 8 of Figure 2-2   2 [   ]

3 Equivalent number of physical ports required to
support multimedia services (multiply line 2 by 1.5)   3 [   ]

4 Total number of physical ports required
(add lines 1 and 3)   4 [   ]

5 If the result in box 4 cannot be divided evenly
by 4, add more basic-service ports until the total
can be divided evenly by 4.   5 [   ]

Note: To determine the minimum number of nodes required, refer to "Determining the number of nodes" section.

Procedure 2-10

Calculating the total number of voice and multimedia ports

1   Copy the figure from box 15 in Figure 2-1 into box 1 of Figure 2-3.

2   Copy the figure from box 8 in Figure 2-2 into box 2 of Figure 2-3.

3   Multiply the figure in box 2 by 1.5. Record the result in box 3.

This value is the equivalent number of voice ports.

4   Add boxes 1 and 3 together. Record the result in box 4.

This total is the total number of physical ports (or voice port equivalents) required.

5   If required, add more ports until the total number of ports can be divided evenly by 4. (Ports are provided on voice processor cards in multiples of 4.) Record the new total in box 5.

6   Look up this total in the section "Determining the number of nodes (on page 2–30) to determine the number of nodes your system will require.

Disk storage

Determining storage hours required

The storage hours on a system, combined with the number of nodes, defines the system size. (Note that the number of storage hours referred to here excludes storage for the basic software and the voice prompts for one language).

The number of storage hours your system needs is dependant on the requirements for

- message storage, which includes stored messages, personal greetings, and responses to voice forms
- voice services, including voice menus, announcements, voice forms definitions, and faxes
- personal verifications

These sources of storage requirements are discussed in upcoming sections ("Message storage requirements," "Voice services storage requirements," and "Personal verifications storage requirements").

Message storage requirements

Message storage includes received messages or unsent composed messages stored in user mailboxes, personal greetings, and responses to voice forms.

Total message storage time required depends on the following things:

- number of users
- average storage per user (for messages and personal greetings)
- voice forms response times

The method for determining the required amount of message storage time, based on the items listed above, is divided into three procedures which are outlined as follows:

- Calculate the storage time required for messages and personal greetings. For instructions, see Procedure 2-11.
- Calculate the storage time required for voice forms responses. For instructions, see Procedure 2-12.
- Add the storage requirements together (see Procedure 2-13).

  Note: These are basic guidelines only. Other applications of Meridian Mail MSM may have different storage requirements.

Storage time required for users

The storage time per user is based on the average number of stored messages per user and the average length of each message, plus the length of the personal greeting. This varies with different organizations and applications.

The minimum storage time that should be allowed per user is one minute. Average message length is about 30 seconds. If each user is allocated ten minutes of storage time, then approximately twenty messages (including personal greetings) can be stored per user.

> *Note:* The foregoing storage requirements are for business/centrex users. The requirements are different for residential users.

When determining storage requirements for messages, consider the average storage time required per user. This is an estimate of the storage time that will actually be used. The maximum allocated time is the limit on message storage, not the amount that you expect will be used by each user.

There are a number of factors to consider when estimating message storage time requirements. They include

- user training to use the "delete messages" command
- maximum allocated time per user
- read message retention period (automatic deletion of read messages)
- whether sent messages are kept or automatically deleted after sending
- number of messages received per user per day

Procedure 2-11

Calculating the storage time required for users

1   Estimate the total number of users on the Meridian Mail system.
2   Estimate the average number of minutes of storage each user requires.
3   Multiply the result of step 1 by the result of step 2.
4   Multiply the result of step 3 by 1.2 (to add a 20% safety margin).
5   Divide by 60 to convert the storage time to hours.

> **Example:**
> If there are 1000 Meridian Mail users and average storage time per user is five minutes, the total storage time is 5000 minutes. With a 20% safety margin added, total storage time is 6000 minutes or 100 hours.

Storage time required for responses to voice forms

Voice forms allow subscribers to call the system using a Touch-Tone phone, and in response to prerecorded prompts, provide verbal information which is then recorded.

The average voice form contains ten fields. Responses to each prompt are usually 10 seconds in length. Thus a total of 100 seconds of response storage time is required for each call to most voice forms. A more precise estimate of the storage time requirement can be made if it is known what the voice forms are and the expected response times.

Procedure 2-12

Calculating the storage time required for voice forms responses

1 Determine the number of fields required for each form.

2 Multiply the number of fields by the expected response time for each field.

3 Estimate the number of calls to each voice form before the responses are transcribed and deleted.

4 For each form, multiply the number of calls by the expected total response time.

5 Divide by 60 to convert the storage time to hours.

Total hours of storage for all messages
Procedure 2-13
Calculating the total message storage requirements

Add up the storage times determined in Procedures 2-11 and 2-12.

Voice services storage requirements

Voice services includes voice menus and announcements, voice forms, and fax on demand.

The voice services storage time depends on

• voice menus and announcements storage requirements

• voice forms definitions requirements

• fax definitions requirements

Based on the foregoing items, the method for determining the required amount of voice services storage time is outlined as follows:

• Calculate the voice menus and announcements storage requirements. For instructions, see Procedure 2-14.

• Calculate the forms definitions storage requirements. For instructions, see Procedure 2-15.

• Calculate the fax storage requirements. For instructions, see Procedure 2-16.

• Add all the storage requirements together.

Voice menus and announcements storage requirements

Estimate the storage time required for voice menus and announcements (if you have purchased that option). This depends on the type of applications you wish to have. Information-type menus require more storage time than call-handling applications (automated attendants, for example). Follow Procedure 2-14 to determine the voice menus and announcements storage requirements. See the example in Table 2-6.

Procedure 2-14

Calculating the voice menus and announcements storage requirements

1   Estimate the number of voice menus and announcements required.

2   Determine the wording of each voice menu and announcement.

3   Once the wording of each menu and announcement is determined, estimate the time each will take for playback.

4   Add the playback times for all the voice menus and announcements.

5   Divide by 60 to convert the storage time to hours.

Table 2-6

Voice menus and announcements storage time calculation example

Voice menus and announcements	Estimated playback time (minutes)
Auto-attendant prompt	1
Auto-attendant choices	2
Announcement 1	1
Announcement 2	1
Thru-dial announcement	1
Voice menu 1 greeting	1
Voice menu 1 choices	2
Voice menu 1 announcement 1	1
Voice menu 1 announcement 2	1
Voice menu 1 announcement 3	1
Voice menu 2 greeting	1
Voice menu 2 choices	2
Voice menu 2 announcement 1	2
Voice menu 2 announcement 2	1
Total	**18 minutes or 0.3 hours**

Voice forms definitions storage requirements

Voice form definitions are similar to voice menus. Therefore, the procedure for calculating voice form definitions storage requirements is similar to the procedure for calculating voice menus storage requirements. See Procedure 2-15.

Procedure 2-15

Calculating the forms definitions storage requirements

1 Estimate the number of forms required.

2 Determine the wording of each form.

3 Based on the wording of each form, estimate the time each form will take for playback.

4 Add the playback times for all the forms.

5 Divide by 60 to convert the storage time to hours.

Fax storage requirements

The number of storage hours required for faxes depends on the number of fax pages and the resolution (quality).

- *Normal resolution* takes 0.3 minutes per page or prints 200 pages per hour.

- *Fine resolution* takes 0.6 minutes per page or prints 100 pages per hour.

Using these figures, estimate your fax storage requirements as outlined in Procedure 2-16.

Procedure 2-16

Calculating the fax storage requirements

1 Estimate the total number of normal resolution fax pages you plan to have on the system.

2 Multiply this number by 0.3 to get the total number of minutes of storage required.

3 Estimate the total number of fine resolution fax pages you plan to have on the system.

4 Multiply this number by 0.6 to get the total number of minutes of storage required.

5 Add the totals from steps 2 and 4 to get the total fax storage requirements in minutes.

6 Divide the result of step 5 by 60 to convert to hours of storage.

Total hours of storage for voice services
Procedure 2-17
Calculating the total voice services storage requirements

Add up the storage times determined in Procedures 2-14, 2-15, and 2-16.

Personal verifications storage requirements

Allow about seven seconds per personal verification. If there are 1500 subscribers, required storage time would be 1500 x 7 = 10 500 seconds.

See the example in Table 2-7.

If your system will not have any user mailboxes (that is, your system is strictly a voice menu system), then no personal verifications will be required. The storage requirement can be ignored.

Table 2-7
Personal verifications storage time calculation example

Number of users	x	Estimated average personal verification length (seconds)	Required storage time
1500		7	10 500 seconds/3600 = 2.92 hours

Configuration of voice services

The voice services can be configured, during installation, so that they use either volume VS1 or volume VS203. If the voice services are configured on VS1, then they can have a maximum of 100 hours. This includes three hours for the second language, if installed, as well as the storage time for personal verifications.

If the voice services are configured on VS203, then up to 150 hours can be stored. However, the voice services storage time will have to be added to the total message storage requirements (calculated in Procedure 2-13) to determine the system storage hours.

Determining the number of nodes

The number of nodes required for Meridian Mail MSM depends primarily on the number of ports required. Table 2-8 shows the number of ports possible with different numbers of Signal Processing Nodes (SPNs).

Table 2-8
SPN node configurations

SPN nodes	Ports	System storage hours NTGX14AB	System storage hours NTGX14BB
2	48	150	300
4	72	300	600
4	96	300	600
6	120	450	900
6	144	450	900
8	168	600	1200
8	192	600	1200

Note: To fulfill redundancy requirements, SPN nodes are configured in pairs. Consequently, 72, 120, and 168 port systems would have the last pair of SPN nodes with 12 ports each instead of 24. Thus for a 72-port system, the first two SPN nodes would be 24-port nodes, and the last two would be 12-port nodes giving a total of 72 ports.

Determining the number of SMDI links required

Under normal traffic conditions, a single SMDI link running at 2400 bps has sufficient capacity in both directions (incoming Present Call Information [PCI] and outgoing message waiting indication [MWI]) to support a fully configured 192-port Meridian Mail MSM system. However, if the available holding time falls below 24 seconds, a second SMDI link will be required.

Note: This assumes a 7-digit DN and a length of 30 characters per PCI message. Meridian Mail MSM can then accommodate eight incoming messages per second, or 480 messages per minute. With a 192-port system, 480 messages per 192 ports (2.5 messages per port), or 2.5 calls per minute per port (24 seconds per call) are possible.

For redundancy, Meridian Mail MSM has multiple SMDI links. This requires the Multiple SMDI Software package (NTZB21AA). Multiple SMDI links are also required if there are multiple host switch systems attached to the Meridian Mail MSM. The maximum traffic capacity will be the sum of the traffic configured for each switch.

Note: There will be a small decrease in the performance rating. For example, a 192-port system may have maximum busy-hour traffic of 5710.6 CCS. When this system is partitioned into two 96-port systems, each having separate SMDI links connecting to two host switches, the maximum busy-hour traffic would be 2718.6 CCS for each or 5437.2 CCS total (a 5% decrease in capacity).

When the Meridian Mail Connections feature is used on the MSM, a VoiceBridge unit is required for each SMDI link.

Determining the number of T1 links required

Meridian Mail MSM supports multiple T1 links. Each T1 link supports 24 channels. Each T1 node has four T1 spans. To determine the number of links required, see Table 2-9.

Table 2-9
Number of T1 links required

Number of ports	Number of T1 nodes	Number of T1 links
48	2	2
72	2	3
96	2	4
120	4	5
144	4	6
168	4	7
192	4	8

Number of VoiceBridges required for Meridian Mail Connections

Systems that are connected to one or more AT&T, ROLM, or Meridian 1 switches require the Connections feature of Meridian Mail. Systems using this feature require additional provisioning calculations to determine the number of VoiceBridge units required.

Due to the processing time of VoiceBridge transactions, the grade of service obtained with these switches will not normally match that obtained in a non-Connections Meridian Mail installation. However, once a call is connected, command response times will be equivalent to any Meridian Mail system.

The number of VoiceBridges for each port type (Basic Voice, Full-Service Voice, and Full-Service Multimedia) must be calculated independently. Separate VoiceBridges are required for each port type, and each VoiceBridge unit requires an SMDI link. (Up to 16 VoiceBridge units can be connected to an MSM system.)

Consideration should be given to both the traffic requirements for each VoiceBridge as well as the potential load and traffic implications for the switch. The Nortel Distributor should ensure that the necessary hardware requirements are met, and that the switch is able to handle the new traffic load.

Separate tables are provided in this section for AT&T switches, ROLM switches, and Meridian 1 PBXs. These tables identify the number of VoiceBridges required and the expected grade of service for 40-, 60-, and 234-second sessions. Table 2-10 will help you to locate the table you need.

Table 2-10
Locating grade of service tables for AT&T, ROLM, and Meridian 1 switches

Switch type	For voice services, see	For fax services, see
AT&T	Tables 2-11 and 2-12	Table 2-13
ROLM	Tables 2-14 and 2-15	Table 2-16
Meridian 1	Not available at time of printing. Please see your Product Release Bulletins for more information.	

AT&T PBXs

Digital set emulation is used. The AT&T PBX must have the Leave Word Calling (LWC) feature. One port on an AT&T digital line card is needed for each VoiceBridge unit. One analog line is needed per voice messaging port.

The VoiceBridge takes an average of 2.5 seconds to process each transaction. Since an incoming call may have to queue—first to be processed by the VoiceBridge, then to obtain a Meridian Mail port—the grade of service depends on both the number of ports and the number of VoiceBridge units. Longer session times will reduce the number of VoiceBridge units needed for a given number of Meridian Mail ports.

Table 2-11 shows only 120 ports. A 144-port system would require 17 VoiceBridges, which cannot be supported. MSM systems support 16 VoiceBridges maximum.

Table 2-11
Number of VoiceBridges for Connections with AT&T PBX using 40-second sessions

Number of ports	CCS for 40-second sessions	Number of VoiceBridges	Grade of service for delay time	
			6 seconds	12 seconds
4	54.3	1	9%	5%
8	157.6	1	17%	6%
12	273.8	2	8%	4%
16	396.2	2	10%	4%
20	522.5	2	14%	4%
24	651.6	3	9%	3%
28	782.6	3	10%	3%
32	915.0	4	9%	3%
36	1048.7	4	9%	3%
40	1183.4	5	9%	3%
44	1318.9	5	9%	3%
48	1455.1	6	9%	3%
52	1591.8	6	9%	3%
56	1729.1	7	9%	3%
60	1966.8	7	10%	3%
64	2004.9	7	10%	3%
72	2282.2	8	10%	3%
96	3120.0	11	10%	3%
120	3963.8	14	11%	2%

Table 2-12
Number of VoiceBridges for Connections with AT&T PBX using 60-second sessions

Number of ports	CCS for 60-second sessions	Number of VoiceBridges	Grade of service for Delay time	
			6 seconds	12 seconds
4	51.5	1	7%	4%
8	150.5	1	11%	5%
12	262.2	1	18%	6%
16	380.4	2	7%	4%
20	502.6	2	7%	4%
24	627.7	2	10%	4%
28	754.9	2	12%	4%
32	883.8	3	8%	3%
36	1014.0	3	8%	3%
40	1145.4	3	9%	3%
44	127.6	3	10%	3%
48	1410.7	4	8%	3%
52	1544.5	4	8%	3%
56	1678.9	4	8%	3%
60	1813.8	5	8%	3%
64	1949.2	5	8%	3%
72	2221.2	6	8%	3%
96	3045.0	8	8%	3%
120	3876.9	9	8%	2%
144	4714.1	11	9%	2%
168	5555.2	13	9%	2%
192	6399.3	15	9%	2%

Table 2-13
Number of VoiceBridges for Connections with AT&T PBX using 234-second sessions

Number of ports	CCS for 234-second sessions	Number of VoiceBridges	Grade of service for Delay time	
			6 seconds	12 seconds
4	48.5	1	6%	5%
8	142.2	1	6%	5%
12	248.3	1	7%	5%
16	360.8	1	8%	5%
20	477.3	1	10%	5%
24	596.8	1	11%	5%

Note: Due to the length of fax sessions, the VoiceBridge can monitor only 24 ports at one time.

ROLM PBXs

Digital set emulation is used. The PBX requires the Message Waiting feature as well as an option to allow the Music on Hold feature to be disabled. One digital line port on the PBX is required for each VoiceBridge unit, and one analog line is required per voice messaging port.

The VoiceBridge takes an average of 3.5 seconds to process each transaction. Since an incoming call may have to queue—first to be processed by the VoiceBridge, then to obtain a Meridian Mail port—the grade of service depends on both the number of ports and the number of VoiceBridge units. Longer session times will reduce the number of VoiceBridge units required for a given number of Meridian Mail ports.

Table 2-14
Number of VoiceBridges for Connections with ROLM PBX using 40-second sessions

Number of ports	CCS for 40-second sessions	Number of VoiceBridges	Grade of service for Delay time	
			6 seconds	12 seconds
4	54.3	1	14%	6%
8	157.6	2	9%	4%
12	273.8	2	14%	5%
16	396.2	3	10%	4%
20	522.5	3	14%	4%
24	651.6	4	11%	4%
28	782.6	4	13%	4%
32	915.0	5	11%	4%
36	1048.7	6	11%	4%
40	1183.4	6	12%	4%
44	1318.9	7	11%	4%
48	1455.1	8	11%	4%
52	1591.8	8	12%	4%
56	1729.1	9	12%	3%
60	1866.8	10	12%	3%
64	2004.9	10	12%	3%
72	2282.2	12	12%	3%
96	3120.0	16	13%	3%

Table 2-15
Number of VoiceBridges for Connections with ROLM PBX using 60-second sessions

Number of ports	CCS for 60-second sessions	Number of VoiceBridges	Grade of service for Delay time	
			6 seconds	12 seconds
4	51.5	1	10%	5%
8	150.5	2	7%	4%
12	262.2	2	9%	4%
16	380.4	2	12%	5%
20	502.6	2	17%	5%
24	627.7	3	10%	4%
28	754.9	3	12%	4%
32	883.8	3	15%	4%
36	1014.0	4	10%	4%
40	1145.4	4	10%	4%
44	1277.6	5	9%	4%
48	1410.7	5	10%	4%
52	1544.5	6	9%	3%
56	1678.9	6	9%	3%
60	1813.8	6	10%	3%
64	1949.2	7	9%	3%
72	2221.2	8	9%	3%
96	3045.0	10	10%	3%
120	3876.9	13	10%	3%
144	4714.1	16	11%	3%

Table 2-16
Number of VoiceBridges for Connections with ROLM PBX using 234-second sessions

> *Note 1:* Due to the length of fax sessions, the VoiceBridge can monitor
> only 12 ports at one time.

Number of ports	CCS for 234-second sessions	Number of VoiceBridges	Grade of service for Delay time	
			6 seconds	12 seconds
4	48.5	1	6%	5%
8	142.2	1	6%	5%
12	248.3	1	11%	6%

Meridian 1 PBXs

Digital set emulation is used. The Meridian 1 PBX must have Digit Display
Software (DDSP) and Message Waiting Center (MWC) installed. One port
on a Meridian 1 line card is required for each VoiceBridge unit, and one
analog line is required per voice messaging port.

> *Note :* At time of printing, engineering information was not available.
> Please refer to your Product Release Bulletins or your Nortel
> Distribution/Sales Representative for more information.

Dataports for MSM

The dataports are provided via the transition modules.

The NTGX06AA transition modules on MSP nodes provide three 20mA
four-wire serial current loop driver/receivers (port numbers 1, 3, and 4), and
one V.22 BIS serial modem port out to a telephony loop (port number 2).
The NTGX06AB transition modules on SPN nodes provide four RS232-C
serial ports. Ports 1 and 3 are asynchronous. Ports 2 and 4 can be
synchronous or asynchronous.

The TIFN nodes have four serial ports. They interface to the modem
transition module where the serial ports provide four redundant
transmit/receive pairs through a relay to on-board modems for SMDI links.

Table 2-17
Port configurations for the MSM

Node	Port	Port type	Con-sole	Re-mote Access	Net-work[a]	SMDI	Stand-by SMDI	MAT[b]	Printer	ACCESS	Admin-Plus
1	1	20 ma	√c								
(MSP 1)	2	Modem		√					√		
	3	20 ma									
	4	20 ma						√			
2	1	20 ma	√c								
(MSP 2)	2	20 ma		√							
	3	Modem									
	4	20 ma						√			
3	1	RS232-C			√					√	√
(SPN-1)	2				√					√	√
	3				√					√	√
	4				√			√		√	√
4	1	RS232-C			√					√	√
(SPN 2)	2				√					√	√
	3				√					√	√
	4				√					√	√
5	1	RS232-C			√					√	√
(SPN 3)	2				√					√	√
	3				√					√	√
	4				√					√	√
6	1	RS232-C			√					√	√
(SPN 4)	2				√					√	√
	3				√					√	√
	4				√					√	√
7	1	RS232-C			√					√	√
(SPN 5)	2				√					√	√
	3				√					√	√
	4				√					√	√
8	1	RS232-C			√					√	√
(SPN 6)	2				√					√	√
	3				√					√	√
	4				√					√	√
9	1	RS232-C			√					√	√
(SPN 7)	2				√					√	√
	3				√					√	√
	4				√					√	√

—**continued**—

Table 2-17 (continued)
Port configurations for the MSM

Node	Port	Port type	Console	Remote Access	Network$_a$	SMDI	Standby SMDI	MAT$_b$	Printer	ACCESS	Admin-Plus
10	1	RS232-C			√					√	√
(SPN 8)	2				√					√	√
	3				√					√	√
	4				√					√	√
13	1	Modem				√					
(TIFN 1)	2					√					
	3					√					
	4					√					
14	1	Modem				√	√				
(TIFN 2)	2					√	√				
	3					√	√				
	4					√	√				
15	1	Modem				√					
(TIFN 3)	2					√					
	3					√					
	4					√					
16	1	Modem				√	√				
(TIFN 4)	2					√	√				
	3					√	√				
	4					√	√				
—end—											

The following items refer to the subscript alpha characters in the header row of Table 2-17:

a. A maximum of 20 networking modem ports can be used on an MSM.

b. If the multi-admin feature is enabled, up to three multiple administration terminals (MATs) may be assigned. In the case of local terminals, it is recommended that

— MSP1 data port 4 be assigned to the first MAT

— MSP2 data port 4 be assigned to the second MAT

— SPN1 data port 4 be assigned to a third MAT

c. If MSP 1 fails, a relay on the I/O panel switches the terminal to MSP 2 port 1.

Meridian ACCESS links

Multiple ACCESS links are supported on a single node where more than one serial port is available. This means that, for example, AdminPlus and Meridian IVR can run on the same node.

The number of links that can be created on a single node depends on the type of node and its position in the system as shown in Table 2-18.

Table 2-18

Maximum number of links supported on the MSM

Number of SPN nodes	Number of links
2	4
4	8
6	8
8	8

Note 1: On the MSM, ACCESS links cannot be created on TIFN nodes.

Note 2: Only one link can be used for AdminPlus. Any one ACCESS link can be configured for AdminPlus.

Table 2-20 shows which data ports can be used for ACCESS links, and the maximum baud rate (in Kbps) that can be used on those ports. Table 2-19 lists both the minimum and maximum baud rates.

Table 2-19

Baud rate limitations for data links

For	Minimum baud rate	Maximum baud rate
TM–each port	2400 bps	9600 bps
TM–each node	——	9600 bps combined
Link–ACCESS	4800 bps	9600 bps
Link–AdminPlus	2400 bps	9600 bps

Table 2-20

Recommended configuration of dataports for ACCESS links

Note: The following table uses transition module ports 1 and 2 as examples for the recommended setup. ACCESS links *can be* configured on ports 1, 2, 3, and 4. The maximum baud rate for each node must not exceed 9.6 Kbps.

	System limits			Node 3 SPN 1		Node 4 SPN 2		Node 5 SPN 3		Node 6 SPN 4		N # 7 5	N # 8 6	N # 9 7	N # 10 8
# of SPN Nodes	Data links	Max. voice ports	Cumulative baud rate	TM # 1	TM # 2	TM # 1	TM # 2	TM # 1	TM # 2	TM # 1	TM # 2	TM # 1	TM # 1	TM # 1	TM # 1
2	0	48													
	1	48	9.6	9.6											
	2	48	19.2	9.6		9.6									
	3	48	19.2	4.8	4.8	9.6									
	4	48	19.2	4.8	4.8	4.8	4.8								
4	0	96													
	1	96	9.6	9.6											
	2	96	19.2	9.6		9.6									
	3	96	28.8	9.6		9.6		9.6							
	4	96	38.4	9.6		9.6		9.6		9.6					
	5	96	38.4	4.8	4.8	9.6		9.6		9.6					
	6	96	38.4	4.8	4.8	4.8	4.8	9.6		9.6					
	7	96	38.4	4.8	4.8	4.8	4.8	4.8	4.8	9.6					
	8	96	38.4	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8				
6	0	144													
	1	144	9.6	9.6											
	2	144	19.2	9.6		9.6									
	3	144	28.8	9.6		9.6		9.6							
	4	144	38.4	9.6		9.6		9.6		9.6					
	5	144	48.0	9.6		9.6		9.6		9.6		9.6			
	6	144	57.6	9.6		9.6		9.6		9.6		9.6	9.6		
	7	144	57.6	4.8	4.8	9.6		9.6		9.6		9.6	9.6		
	8	144	57.6	4.8	4.8	4.8	4.8	9.6		9.6		9.6	9.6		
—continued—															

Table 2-20 (continued)
Recommended configuration of dataports for ACCESS links

Note: The following table uses transition module ports 1 and 2 as examples for the recommended setup. ACCESS links *can be* configured on ports 1, 2, 3, and 4. The maximum baud rate for each node must not exceed 9.6 Kbps.

	System limits			Node 3 SPN 1		Node 4 SPN 2		Node 5 SPN 3		Node 6 SPN 4		N #7 5	N #8 6	N #9 7	N #10 8
# of SPN Nodes	Data links	Max. voice ports	Cumulative baud rate	TM #1	TM #2	TM #1	TM #2	TM #1	TM #2	TM #1	TM #2	TM #1	TM #1	TM #1	TM #1
8	0	192													
	1	192	9.6	9.6											
	2	192	19.2	9.6		9.6									
	3	192	28.8	9.6		9.6		9.6							
	4	192	38.4	9.6		9.6		9.6		9.6					
	5	192	48.0	9.6		9.6		9.6		9.6		9.6			
	6	192	57.6	9.6		9.6		9.6		9.6		9.6	9.6		
	7	192	67.2	9.6		9.6		9.6		9.6		9.6	9.6	9.6	
	8	192	76.8	9.6		9.6		9.6		9.6		9.6	9.6	9.6	9.6
—end—															

Chapter 3: Assessing site requirements

Physical requirements

This section provides guidelines that can be adjusted to meet the local conditions of the customer site.

Cabinet size

The Meridian Mail Message Services Module (MSM) is housed in a SuperNode C42 cabinet. The dimensions of the cabinet are

- 1.83 m high (72 in.)
- 1.07 m wide (42 in.)
- 0.71 m deep (28 in.)

Floor loading

The floor loading requirement for the MSM equipment is 488.3 kg/m^2 (100 lb/sq. ft.). The weight of an MSM will not exceed 680 kg (1500 lb), including the crate.

Equipment unloading

The MSM is packaged in a double-corrugated container inside a crate and must be kept in a vertical position. The crate is bolted to a skid and can be transported using a fork lift. To avoid damage, the MSM must be kept packed until it reaches its office floor location.

A crated MSM is 2.03 m (80 in.) high, 1.22 m (48 in.) wide, and 0.81m (32 in.) deep. To accommodate hoisting fixtures, the recommended size for the equipment doorway into the building should be at least 2.54 m (120 in.) high and 1.27 m (60 in.) wide.

A minimum 2-ton capacity hoisting beam, which can be extended 1.83 m (72 in.) from the building, is recommended. It should be installed above the loading doors for upper floor installations. The MSM cannot be hoisted using hooks.

An unloading area of approximately 13.5 m^2 (150 sq ft) should be provided inside the loading door to facilitate equipment delivery.

The uncrated MSM can be lifted and moved into its final position using the C42 positioning tool. This tool, however, increases the width of the MSM by 38.1 cm (15 in.) per side and increases the height of the MSM by 7.6 cm (3 in.). Therefore, within the building, the uncrated cabinets require an equipment entrance doorway at least 1.59 m (72 in.) wide and 1.91 m (75 in.) high.

Power and grounding requirements

The power distribution system supplies controlled and protected DC and AC power to the MSM system. The grounding system provides hazard protection for personnel and equipment; it also provides immunity, within accepted standards, from transient phenomena. For detailed information on power and grounding requirements and practices, refer to *Power Distribution and Grounding Systems* (NTP 297-1001-156).

Grounding requirements

All SuperNode-based equipment is organized in modules. The module size has been chosen to suit each functional area of the system regardless of physical size. For example, in an SL-100 or DMS-100, the central control complex and the trunk circuits (single shelf) are each treated as a single module.

The modular structure of SuperNode equipment is retained in the design of its grounding system. The design is based on the single point ground (SPG) concept applied to each module. Messaging between modules is independent of the ground plane. This independence allows the equipment to interface with a variety of installation configurations and with other types of switching systems without being redesigned.

> **DANGER**
> **Risk of electrocution**
> A distance of 2.39 m (7 ft) must separate the SuperNode equipment (that is MSM, SL-100) from other equipment that is not connected to the same ground. Otherwise, you could be electrocuted.

Again, refer to *Power Distribution and Grounding Systems* (NTP 297-1001-156) for design guidelines on power and grounding systems.

Power consumption

In Meridian Mail, a module represents half a shelf which is supported by a pair of redundant power converters (NT9X91AB). The power consumption of an MSM depends on the amount and type of circuit packs provisioned in the module. The power consumption of the MSM must be calculated to ensure that no module is over the maximum allowable power limit.

The power consumption rating of each MSM is based on its power converter supporting half a shelf. Power converters on the left side of the system support card slots 7 through 19, and converters on the right side support slots 20 through 32.

For the electronic shelf, Meridian Mail MSM supports a maximum allowable power consumption of 60 A at 5.1 V and 3 A at 12 V. For the disk shelf, a maximum allowable power consumption of 15 A at 5.1 V and 22 A at 12 V is supported. The maximum power output of the MSM half shelf is 350 W.

The power consumption for Meridian Mail MSM is listed below:

- For a fully configured 192-port system, the power consumption is 50 A at 48 V.

- For a base 48-port system, the power consumption is 20 A at 48 V.

Refer to Table 3-1 for power consumption of individual circuit packs.

Table 3-1

Power consumption of individual circuit packs

PEC	Description	Power consumption (amperes) nominal
NTGX04AA	Bus terminator TM	0.930
NTGX05AA	68K	4.55
NTGX06AA	68K TM at 12 V 68K TM at 5 V	0.061 0.530
NTGX06AB	68K RS-232 TM at 5 V	0.600
NTGX07AA	Modem transition module (PB)	0.200
NTGX08AA	T1	2.24
NTGX09AA	T1 transition module (PB)	0.699
NTGX10AA	Bus controller	2.00
NTGX11AA	Bus controller TM (PB)	0.166
NTGX06AB	68K RS-232TM at 5 V	1.8
NTGX12AB	VP12A card	5.95

The power consumptions of the various circuit packs were measured using an ideal voltage of 5.1 V DC per board. The 68K transition module was measured using a voltage of 12 V DC.

Battery feeds

The DC power plant supplies power to the power distribution center (PDC) at a nominal voltage of –48 V through separate battery feeders A and B. The power is returned from each PDC to the power plant through battery return conductors, which are the same size as the battery feeders. The power is then distributed from the fuse panels in the PDC to the individual shelves in the equipment frames through secondary battery feeders and returned to the PDC through return feeders of the same size. Required DC voltages, other than –48 V, are obtained from DC-DC converters, which are powered from –48 V and located within each equipment frame.

Environmental operating requirements

The recommended ambient temperature range is from 5° C through 38° C (40° F through 100° F) with the extreme limits at 2° C (35° F) and 49° C (120° F).

The recommended operating relative humidity range is from 20% through 55% with the extreme limits at 20% and 80%.

The extreme temperature and relative humidity conditions are based on a maximum duration of up to 72 continuous hours and up to 15 days per year. The maximum rate of temperature cycling should not exceed 8.33° C (15° F) per hour.

Air cleanliness should not be worse than class 100 000 (that is, 35.7 million particles 0.5 micron or larger per m^3 [100 000 particles 0.5 micron or larger per ft^3]).

The heat dissipation of the MSM is 2100 watts or 1244 watts per m^2 (112 watts per ft^2) This is less than the NEBS requirement of 1333 watts per m^2 (120 watts per ft^2) for cabinetized frames. This assumes that the frame is fully equipped and all equipment is operating at maximum capacity. The heat dissipated in the SL-100 systems is 444 watts per m^2 (40 watts per ft^2), averaged over the equipment room floor. This is for SL-100 switching equipment only. Heat dissipation requirements for other equipment in the room must be considered when calculating the overall heat to be dissipated.

Earthquake protection

Equipment installed in all earthquake zones must meet the earthquake floor response spectra criteria shown in Bellcore NEBS Issue 3. Equipment units located near each other are required to be joined together to prevent pounding. The MSM meets all Zone 4 requirements.

Equipment installed in zones other than Zone 4 Upper Floor may be designed to the earthquake floor response spectra criteria shown by the appropriate factor in Bellcore NEBS.

All equipment must be base-mounted to the floor without auxiliary support from walls or ceiling. Equipment installed on a raised floor must be attached to the structural floor below to withstand seismic forces. Ductwork and cabling are required to be supported so that they can withstand out-of-phase relative motion.

Transportation and storage requirements

The limits contained in the following paragraphs apply during transportation from Northern Telecom (Nortel) to the customer's site and transportation by the customer to its facilities.

The recommended ambient temperature range for transportation and storage is from –40°C through 60°C (–40°F through 140°F) . The MSM cannot be located near any heat source that exceeds the upper limit of this temperature range.

The recommended relative humidity range for transportation and storage is from 5 percent through 100 percent.

The MSM system can be stored in environments with vibration limits, as described below, without damage.

- Acceleration Density
    - 10 to 200 Hz: up to 1.0 m^2/s^3 (10.76 ft^2/s^3)
    - 200 to 2000 Hz: up to 0.3 m^2/s^3 (3.23 ft^2/s^3)
- Shock (depending on package weight)
    - 100 m/s^2 (328 ft/s^2) for 11 ms Type I spectrum
    - 300 m/s^2 (3229 ft/s^2) for 6 ms Type II spectrum
- Bump
    - 250 m/s^2 (820 ft/s^2) for 6 ms at 1 to 3 Hz repetition rate
- Drop/Topple
    - 100 mm (3.9 in.) from a 30-degree angle
- Free Fall:

Weight	Height
<20 kg (<44 lb)	1.2 m (4 ft)
20–100 kg (220 lb)	1.0 m (3.2 ft)
>100 kg (>220 lb)	0.25 m (0.82 ft)

Chapter 4: Planning MSM expansion

Overview of expansion

The customer's engineers do the planning for future expansion of the Meridian Mail Message Services Module (MSM) system. The plan is designed to anticipate the additional lines, trunks, and features that may be needed. Based on forecasted growth, the planning process starts two to three years after the system goes into service.

Operational measurements

After the Meridian Mail MSM is installed, it is necessary to track the impact of its call processing activity on system resources. Operational measurement data may be used to determine the system resources that are affected. For more information, refer to the "Operational Measurements" chapter in the *System Administration Guide for Multi-Customer Systems* (NTP 557-7001-300).

Expansion

Expansion actually refers to a number of different processes:

- *Node expansion (increasing the number of voice nodes)* Adding more nodes to the system includes adding more ports and/or disk space. Ports are added in increments of 24.

  However, to maintain redundancy in 72-, 120-, and 168-port systems, the last two nodes would be equipped with only one VP12A card each to provide 12-port nodes. The minimum system configuration is 48 ports. See Table 4-1 for more information. Refer to the chapter "Determining service requirements" for assistance in calculating the elements of the new configuration.

  Node expansion is performed through the hardware modification selection from the System Installation and Modification menu.

> **CAUTION**
> **Risk of data loss**
> Do not mix the NTGX14AB (single) and NTGX14BB
> (dual) disk drives in your system. Mixing these disk drives
> in a shadowed system may result in loss of data.

The following table lists the allowable configurations for an MSM system.

Table 4-1
SPN node configurations

SPN nodes	Ports	Disk size (hours) NTGX14AB	Disk size (hours) NTGX14BB
2	48	150	300
4	72	300	600
4	96	300	600
6	120	450	900
6	144	450	900
8	168	600	1200
8	192	600	1200

Note: To fulfill redundancy requirements, SPN nodes are configured in pairs. Consequently for the 72-, 120-, and 168-port systems, the last pair of SPN nodes have 12 ports each instead of 24. Thus, for a 72-port system, the first two SPN nodes would be 24-port nodes, and the last two would be 12-port nodes only, for a total of 72 ports.

- *Feature expansion (adding new features)* When a new feature is required, contact your Northern Telecom (Nortel) sales representative to arrange for a feature expansion.
- *Language expansion (adding more languages to the system)* When an additional language is required, contact your Nortel sales representative to arrange for a language expansion.

Appendix A: Meridian Mail customer data form

The customer data form must be completed and given to the installer before installation of the MSM can begin.

Please complete the following (fields are explained below):

End user: _____ Dist./Sales Rep. _____

Location: _____ End-user Rep. _____

Date: _____ VoiceMail Release: _____

Base #: _____ COEO #: _____

Field instructions

End user Record the name of the company or customer. If this sale is through a Northern Telecom distributor, the distributor's customer's name should be recorded here.

Dist./Sales Rep. Record the name of the contact person at the Northern Telecom (NorTel) distributor's site.

Location Record the physical location of the mail system. This can be a city name, or if there is more than one location, a street location may be recorded.

End-user Rep. Record the name of the contact person at the end-user location. This will usually be one of the customer's switch technicians.

Date Record the date on which this form is completed.

VoiceMail Release Record the Meridian Mail release being installed or upgraded at the site. If this is a feature expansion, then the existing Meridian Mail release number should be recorded.

Base # Record the base number of the site or switch.

COEO # Record the COEO number of the site or switch.

Installation Option

The only option which applies is CPE, which is already checked below.

CPE   ____√____

Optional features

Optional features which can be installed are shown below. Please record a check mark next to each feature sold to the customer.

> **Note 1:** Features will be activated from this form. Features marked with a check mark must match features sold.

> **Note 2:** VMUIF call answering is only available to multi-customer configurations.

> **Note 3:** Features identified with an asterisk (*) are automatically installed during system initialization.

AMIS (analog) Networking   _____

Meridian Networking   _____

Voice Menus   _____

Voice Forms   _____

ACCESS   _____

AdminPlus   _____

Multi-Customer support   _____

VMUIF Call Answering*   _____

MM Voice Messaging*   _____

Meridian Mail Connections   _____

Customer name

This data field identifies a name for this site's Meridian Mail. Record a unique name to be used for this specific site or specific Meridian Mail system.

Customer name   _____

Hardware configuration

Circle one of the following configurations. The selection must match the equipment ordered or current equipment.

48 ports (150 hours)	48 ports (300 hours)
72 ports (300 hours)	72 ports (600 hours)
96 ports (300 hours)	96 ports (600 hours)
120 ports (450 hours)	120 ports (900 hours)
144 ports (450 hours)	144 ports (900 hours)
168 ports (600 hours)	168 ports (1200 hours)
192 ports (600 hours)	192 ports (1200 hours)

Languages

The available languages are displayed by the system. Listed below is the standard language set supplied by the factory. This listing will normally be accepted as presented. Other tapes are available with additional languages.

The customer may have up to four different languages installed on their system. All languages are shipped on the tape.

Record a check mark next to the prompt languages to be installed.

Note: The number of installed languages must not exceed the number of languages actually sold to the customer. The customer may choose to install each language immediately, or at a later date.

American English   _____

Canadian French   _____

Latin-American Spanish   _____

Message Agent   _____

CPTD country index

The call progress tone detection (CPTD) country index number is required for all new installations. They are listed below.

Record a check mark next to the setting that should be used for CPTD.

Note: Generic settings are North American compliant and will work in either the United States or Canada.

1	Generic settings	_____
2	Australia	_____
3	Austria	_____
4	Belgium	_____
5	Canada	_____
6	Denmark	_____
7	Finland	_____
8	France	_____
9	Germany	_____
10	Hong Kong PROVISIONAL	_____
11	Ireland	_____
12	Italy	_____
13	Japan	_____
14	Netherlands	_____
15	New Zealand	_____
16	Norway	_____
17	Portugal	_____
18	Saudi Arabia	_____
19	Singapore	_____
20	Sweden	_____
21	Switzerland	_____
22	Taiwan	_____
23	Turkey	_____
24	United Kingdom	_____
25	United States	_____

DSP parameters

Default DSP parameters are indicated in the table below. Where prompts are mandatory, the required entry has been indicated in the column labelled "Value." Guidance on what to record is provided after the table.

Table 5-1
DSP parameter values

Parameter	Default	Range	Value
DSP encoding type	MuLaw		MuLaw
Disable silence compression	No	Yes/No	
Transmit level	0	−10 to +10 dBm	
Receive level	0	−10 to +10 dBm	
DTR reject level	−57	−60 to −30 (3dB incr.)	
DTR max. accept. level	1	−11 to +4	
Disable AGC	No	Yes/No	
AGC center	−20	−10 to −20	−20
Telescan ring time	1024	224 to 1024	
Telescan debounce	128	96 to 512	128
Hookflash pulse	320	304 to 1024	

Parameter instructions

DSP encoding type This parameter is available only as MuLaw.

Disable silence compression Record "No" if the customer wants to have silence compressed on disk. Record "Yes" if the customer wants silence periods recorded on disk. The default is No.

Transmit level Record the required transmit level. The default is 0 dBm.

Receive level Record the required receive level. The default is 0 dBm.

DTR reject level Record the required level at which tones will be rejected. The default is −57.

DTR max. accept level Record the required level at which tones will be accepted.

Disable AGC Record "No" if the customer chooses to maintain automatic gain control. Record "Yes" if the customer does not choose to have automatic gain control. The default is No.

AGC center Record the value −20.

AGC span Record the value 16.

Telescan ring time Record the minimum on time of a ring cycle. The default is 1024 ms.

Telescan debounce Record the value 128 ms.

Hookflash pulse Record the duration required for the system to recognize a hookflash signal. The setting for a #1AESS Centrex is 700 ms.

T1 span parameters (lines)

Default T1 span parameters are indicated in the table below. Where prompts are mandatory, the required entry has been indicated in the column labelled "Value." Guidance on what to record is provided after the table.

Table 5-2
T1 span parameter values

Parameter	Default	Range	Value
T1 span A (1-24)	InternalBC Timing	InternalBCTiming/ExternalT1Timing	
T1 span B (25-48)	InternalBC Timing	InternalBCTiming/ExternalT1Timing	
T1 span C (49-72)	InternalBC Timing	InternalBCTiming/ExternalT1Timing	
T1 span D (73-96)	InternalBC Timing	InternalBCTiming/ExternalT1Timing	
T1 span E (97-120)	InternalBC Timing	InternalBCTiming/ExternalT1Timing	
T1 span F (121-144)	InternalBC Timing	InternalBCTiming/ExternalT1Timing	
T1 span G (145-168)	InternalBC Timing	InternalBCTiming/ExternalT1Timing	
T1 span H (169-192)	InternalBC Timing	InternalBCTiming/ExternalT1Timing	
Line signalling	DTMF	DTMF DP (VMUIF only)	
Line interface type	FXOGrd Start	FXOGrd Start FXOLoopStart FXSGrdStart* FXSLoopStart* FourW_EnMType *reserved for future use	FXOGrdStart (connected to SL100 or Centrex) FXOLoopStart (when using Connections)
Start type	WinkStart	WinkStart ImmedStart DelayStart	WinkStart
Trunk type	NonDIDTrunk	DIDTrunk NonDIDTrunk ASPTrunk	DIDTrunk
Frame format	D4	D4, ESF	D4
Line code format	B8ZS	B8ZS, B7, Transparent	B8ZS
Line length	0-133	0-133 133-266 266-399 399-533 533-655	
T1 alarm	Bit_Two	Bit_Two, s_Bit (use with D4 frame type) Alternate Bit_2 (use with ESF frame type)	Bit_Two
T1 debounce	130	50-32 767	
T1 GuardTime	130	0-32 767	
—continued—			

Table 5-2 (continued)
T1 span parameter values

Parameter	Default	Range	Value
ESFD	0	0-253	
BCVR	0	0-253	
OOFD	0	0-253	
Ring pulse	130	0-32 767	
Hook flash pulse	320	0-32 767	320 (480 if using Connections)
—end—			

Parameter instructions

T1 span parameters Enter InternalBCTiming for each of the appropriate T1 spans as indicated if the T1 clocking is coming from the network itself. Enter ExternalBCTiming for each of the appropriate T1 spans as indicated if the T1 clocking is coming from an alternate switch or external clocking source.

Line signalling Enter DTMF if the customer will be using tones to signal Meridian Mail during login and for command entry. Enter DP only if the customer is using Dial Pulse signalling and is configured for VMUIF.

Line interface type Enter FXOGrdStart when connected to the SL100, or FXOLoopStart when using Connections.

Start type Enter the value WinkStart.

Trunk type Enter the value DIDTrunk.

Frame format Enter the value D4.

Line code format Enter the value B8ZS.

Line length   This is the length of the T1 circuit from the MSM to the channel bank. Enter the appropriate length in feet from the ranges indicated.

T1 alarm Enter the value Bit_Two.

T1 debounce Enter the appropriate value between 50 and 32 767. The default is set at 130.

T1 GuardTime Enter the appropriate value between 50 and 32 767. The default is set at 130.

ESFD Enter the appropriate value between 0 and 253. The default value is set at 0.

BCVR Enter the appropriate value between 0 and 253. The default value is set at 0.

OOFD Enter the appropriate value between 0 and 253. The default value is set at 0.

Ring pulse Enter the appropriate value between 0 and 32 767. The default is set at 130.

Hookflash pulse Enter the appropriate value between 0 and 32 767. The default is set at 320.

T1 channel information

The T1 channel information default values displayed by the system are normally correct. Enter new values only if required. Each group of channels requires definition if values other than the defaults are to be used.

This is the total number of voice ports which will be associated with the MSM. "First channel" relates to the first channel in the voice port array and is usually set at 1. "Last channel" refers to the last channel in the T1 grouping and will be a number greater than 1, since T1 circuits will have channels in complements of 24.

Table 5-3
T1 channel parameter values

Parameter	Default	Range	Value
First channel	1	1-192	
Last channel	1	1-192	

Channel range

From 48 to 192 channels can be configured. Enter the starting and ending channel numbers in each group in the Value column. This allows for non-contiguous blocks of channels and channels owned by different groups.

This allows the administration of distinct channels for different user groups. "First channel" relates to the first channel in the voice port array and is usually set at 1. "Last channel" refers to the last channel in the T1 grouping and will be a number greater than 1, since T1 circuits will have channels in complements of 24. The default for Last channel is 48 ports, because a 48-port system is the smallest MSM configuration available.

Table 5-4
Channel range parameter values

Parameter	Default	Range	Value
First channel	1	1-192	
Last channel	48	1-192	

Channel parameters

Default channel parameters are indicated in the table below. Where prompts are mandatory, the required entry has been indicated in the column labelled Value. Guidance on what to record is provided after the table.

Table 5-5
Channel parameter values

Parameter	Default	Range	Value
DN	2800	0 to 9 999 999	
Service ID	−1	Mandatory	−1
Class	−1	Mandatory	−1
Link type	SMDI	SMDI No link	
UCDDN	3650	0 to 9 999 999 (up to 7 digits)	
Login code	*85	Up to 19 alphanumeric characters	Blank out if Login is not supported.
Logout code	*84	Up to 19 alphanumeric characters	Blank out if Logout is not supported.
Agent ID	Same as UCDDN	Up to 12 digits	
NRDD code	blank	Up to 19 alphanumeric characters	Leave blank. Do not enter anything.
Message desk	63	1 to 63	
Message terminal	1	1 to 2047	
Link ID	1	Up to 19 alphanumeric characters	
Agent position ID	blank	Up to 19 alphanumeric characters	Leave blank. Do not enter anything.
Switch type	DMSCENTREX	*Without Connections* DMS100_CENTREX DMS100_POTS Meridian_SL100 AT&T_1A_ESS AT&T_5_ESS *With Connections* all the above plus Meridian_1 DMS_10 AT&T_PBX ROLM _*PBX*	

Parameter instructions

DN The DN specified for this channel is assigned on the switch side. DNs may be any length up to seven digits.

Service ID This is a mandatory field entry and is always set at –1.

Class This is a mandatory field entry and is always set at –1.

Link type This indicates the type of link that serves this channel. The default is SMDI; however, as in the case of outcalling-only channels, the value No Link may be chosen.

UCCDN This is the DN specified for Meridian Mail UCD as the main pilot number. DNs may be any length up to seven digits.

Login code Enter the login code for agents (Meridian Mail ports) to log into the UCD queue upon system startup. The code may be up to 19 alphanumeric characters. The code for SL-100 is *85.

Logout code Enter the logout code for agents (Meridian Mail ports) to log out of the UCD queue upon system shutdown. The code may be up to 19 alphanumeric characters. The code for SL-100 is *84.

Agent ID This code is the same as the UCDDN identified for the Meridian Mail system.

NRDD code This must remain blank. Do not place any entry here.

Message desk Enter the number of the message desk here. Message desk numbering begins at 63 and decrements by 1 for each subsequent SMDI link. The default is 63.

Message terminal Enter the number of the message terminal. The default is 1.

Link ID Enter the ID. This can be an alphanumeric entry up to eight characters. The default is 1.

Agent position ID This must remain blank. Do not place any entry here.

Switch type Identify the type of switch that is being connected to the MSM. The available types are

Without Connections	**With Connections**
• DMS100_CENTREX	• DMS100_CENTREX
• DMS100_POTS	• DMS100_POTS
• Meridian_SL100	• Meridian_SL100
• AT&T_1A_ESS	• AT&T_1A_ESS
• AT&T_5_ESS	• AT&T_5_ESS
	• Meridian_1
	• DMS_10
	• AT&T_PBX
	• ROLM _PBX

Dataport types

Dataport types are displayed based on the optional features selected during feature enabling.

Only a dataport defined as an SMDI link requires the baud rate to be set and the link ID to be entered. During software installation, you will be asked for the baud rate (1200 or 2400) and link ID for each SMDI link.

Other port types and rules follow. For more information, see Table 5-6.

- Node 1 port 1 and Node 2 port 1 = CONSOLE
- ACCESS port: The Access feature may only be installed on *Even* voice nodes and must have one or more ports for every 48 voice channels.
- MAT, MODEM, or PRINTER can be defined on any node and port combination.

Table 5-6
Dataport types

Feature	Ports
Access	1 port on node 1 1 port on node 3 (if 3 or more nodes)
Networking	2 (or more) modem ports 1 modem port
Multi-Admin	Up to 3 MAT terminals on a system Up to 1 MAT terminals on a node
Multi-SMDI	Up to 4 SMDI ports on a node Up to 8 redundant SMDI ports or 16 non-redundant SMDI ports on a system
All systems	0 or more printer ports 1 or more console ports

Range of channels

The range of channels, shown in Table 5-7, is the last part of the customer data form. It allows you to determine or fill out all of the necessary information for T1 channels before information is entered into the switch.

Completing the range of channels information, while optional, is encouraged since it speeds data entry and provides an audit trail of input information.

The information collected in the range of channels is used as follows:

Channel DN The channel DN is the directory number associated with the MSM port number.

UCD DN The uniform call distribution (UCD) directory number (DN) is the primary DN that is assigned to the UCD group by datafilling Table DNROUTE. If a multiline hunt group is used, this field can be used by the hunt group DN.

Agent Login Agent login is the digilator inde that is entered in Table BNXA as the ode or universal all distribution ativate CDA. Blank out this ield i Agent ogin is not supported by the swith.

Agent Logout Agent logout is the digilator index that is entered in Table IBNXLA as the code for universal call distribution deactivate (UCDD). Blank out this field if Agent Logout is not supported by the switch.

Agent ID Agent ID defaults to the UCD DN that is assigned through TABLE DNROUTE.

Message Desk Number Message desk number is the value (1-63) that is assigned to the UCD group on an SMDI datalink.

SMDI Link ID SMDI link ID is the unique terminal designation or device name that is assigned through either Table TERMDEV or Table SLLNKDEV respectively.

For further details about datafill requirements, refer to the *MSM Translations Guide* (NTP 557-7001-310).

Table 5-7
Channel range information

Port number	Channel DN	UCD DN	Agent Login	Agent Logout	Agent ID	Message desk number	SMDI Link ID
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
—continued—							

Table 5-7 (continued)
Channel range information

Port number	Channel DN	UCD DN	Agent Login	Agent Logout	Agent ID	Message desk number	SMDI Link ID
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
64							
—continued—							

Table 5-7 (continued)
Channel range information

Port number	Channel DN	UCD DN	Agent Login	Agent Logout	Agent ID	Message desk number	SMDI Link ID
65							
66							
67							
68							
69							
70							
71							
72							
73							
74							
75							
76							
77							
78							
79							
80							
81							
82							
83							
84							
85							
86							
87							
88							
89							
90							
91							
92							
93							
94							
95							
96							
—continued—							

Table 5-7 (continued)
Channel range information

Port number	Channel DN	UCD DN	Agent Login	Agent Logout	Agent ID	Message desk number	SMDI Link ID
97							
98							
99							
100							
101							
102							
103							
104							
105							
106							
107							
108							
109							
110							
111							
112							
113							
114							
115							
116							
117							
118							
119							
120							
121							
122							
123							
124							
125							
126							
127							
128							
—continued—							

Table 5-7 (continued)
Channel range information

Port number	Channel DN	UCD DN	Agent Login	Agent Logout	Agent ID	Message desk number	SMDI Link ID
129							
130							
131							
132							
133							
134							
135							
136							
137							
138							
139							
140							
141							
142							
143							
144							
145							
146							
147							
148							
149							
150							
151							
152							
153							
154							
155							
156							
157							
158							
159							
160							
—continued—							

Table 5-7 (continued)
Channel range information

Port number	Channel DN	UCD DN	Agent Login	Agent Logout	Agent ID	Message desk number	SMDI Link ID
161							
162							
163							
164							
165							
166							
167							
168							
169							
170							
171							
172							
173							
174							
175							
176							
177							
178							
179							
180							
181							
182							
183							
184							
185							
186							
187							
188							
189							
190							
191							
192							
—end—							

Appendix B: Supported peripheral equipment

Peripheral equipment for Meridian Mail MSM consists of channel banks, modems, printers, and terminals, plus their associated cables and adapters (if required). The following tables provide ordering information for these devices.

Channel banks

Ordering information for channel banks is shown in Table 6-1.

Table 6-1
Channel bank ordering information

Product description	CPC code	PEC code
Nortel DE4 shelving unit (1 for every 24 cards)	B0231510	NT4S42AA
2-wire FXO channel bank card	A0340535	QPP502D
Newbridge Model 3624	This channel bank can be used with the MSM but is not supplied by Northern Telecom (Nortel). Please contact your local supplier	

SMDI modems

Ordering information for SMDI modems is shown in Table 6-2.

Table 6-2
Modem ordering information

Product description	Product CPC code	PBX connection cable CPC code	MSM connection cable CPC code
Ven-Tel 2400 Plus II-NT, Firmware Rev. V4.68 Model # 9501-0342-23	A0384913	NT0X96EH	NT0X96JD
Ven-Tel EC2400-33 MNP/X.PC, Firmware Rev. V5.2 (for networking)	A0345963	as above	as above
UDS 2440 Rev. 3050-5C, -5F, -5G Stand-alone	A0360824	as above	as above
UDS 2440 Rev. 3050-5C, -5F, -5G Rack Mount	A0385557	as above	as above
Case Rixon DCM4222	A0351638	as above	as above
General Datacom DC224+C	A0605611	as above	as above

PBX Integration units

Ordering information for VoiceBridges is shown in Table 6-3.

Table 6-3
VoiceBridge ordering information

Product description	Product CPC code
VoiceBridge for AT&T PBXs	A0380908
VoiceBridge for ROLM PBXs	A0383524
VoiceBridge for Meridian1 PBXs	A0619640

Printers

Ordering information for printers is shown in Table 6-4.

Table 6-4
Printer ordering information

Product description	Product CPC code	Cable CPC code	Adapter CPC code
DEC LA75S-AA	A0382513	NT0X96FR	H8673-AA A0384282
DEC LA424	A0382784	NT0X96FR	H8673-AA A0384282

Terminals

Ordering information for terminals is shown in Table 6-5.

Table 6-5
Terminal ordering information

Product description	Product CPC code	MSP connections		SPN connections	
		Cable CPC code	Adapter CPC code	Cable CPC code	Null modem CPC code
DEC VT420-AA	A0383146	NT0X96FR	H8673-AA A0384282	NT0X96JD (plus null modem)	B0239500 A0376505
DEC VT420-BA	A0383147	NT0X96FR	H8673-AA A0384282	as above	as above
DEC VT420-CA	A0383150	NT0X96FR	H8673-AA A0384282	as above	as above
HP 700/44 C1007W	A0378381	NT0X96FR	N/A	as above	as above

Tapes

Ordering information for tapes is shown in Table 6-6.

Table 6-6
Tape ordering information

Product description	Tape drive type	Product CPC code
DC6250 tape	Archive Viper or Tandberg	A0368760
2.5 Gbyte 3M magnus tape (DC9200XL)	Tandberg	A0630697

List of terms

68K card

This is a card with a 12Mhz 68010 processor, SCSI interface, and the capability of addressing 8 MB of RAM.

ACCESS link

This is an asynchronous link between Meridian Mail and a host running a Meridian ACCESS application.

AdminPlus

This is a Meridian Mail feature which transfers Operational Measurements and Billing data to Meridian Mail Reporter running on a client PC over the AdminPlus link.

AdminPlus link

This is an asynchronous link between Meridian Mail and Meridian Mail Reporter.

AMA

See "Automatic Message Accounting."

AMIS (Analog) Networking

The AMIS Networking feature is enabled by this package. This is available only to Centrex customers. AMIS allows networking between other non-Meridian Mail networks. The MMUI interface is required.

Automatic Message Accounting (AMA)

This is an automatic recording system that documents all the necessary billing data of subscriber-dialed long distance calls.

Card

A card is a plug-in circuit pack containing components. In Meridian Mail, "card" is the preferred term for a printed circuit pack or printed circuit board.

CCS

See "Centi-call seconds."

Centi-call seconds (CCS)

Centi-call seconds (hundred-call seconds) are calculated by multiplying the average number of calls during the busy hour by the average holding time in seconds, then dividing the result by 100.

Centrex

This is a service that provides a business telephone subscriber with direct inward dialing to extensions on the same system and direct outward dialing from all extensions. Centrex switching equipment is normally located at the central office but may be located on the operating company client's premises.

Channel capacity

This is a measure of the maximum possible information rate through a channel, subject to specified constraints.

Circuit pack (CP)

In Meridian Mail-Supernode, a circuit pack consists of multi-layer printed circuit board (PCB), through-hole electronic components, a backplane connector, a faceplate, lock latches, and stiffeners. It is also referred to as a "printed circuit pack." *See also* "Card."

CP

See "Circuit pack."

CPE

See "Customer Premise Equipment."

CPI

Call progress information.

Customer Premise Equipment (CPE)

This refers to equipment, such as ISDN terminals, that is located on the customer's premises.

Data set

In data communication, this is an electronic device that provides an interface between a data processing machine and a telephone or telegraph line. It is also known as a *modem*.

Digilator index

This is a sequence of digits entered in Table IBNXLA to activate or deactivate universal call distribution (UCD).

Disk drive unit

A disk drive unit consists of a disk drive and a power-converter card, installed in an input/output equipment frame.

Directory number (DN)

A directory number is the full complement of digits required to designate a subscriber's station within one numbering plan area (NPA). The directory number is usually a three-digit central office code followed by a four-digit station number.

DN

See "Directory number."

DTMF

See "Dual-Tone Multi-Frequency."

Dual-Tone Multi-Frequency (DTMF)

This is a scheme to uniquely represent a key (0 – 9, *, #) on the telephone keypad. When a key is pressed, a tone (comprised of two frequencies) is generated on the voice path.

Fax on Demand (FOD)

This is a service that is used to send faxes upon request to callers.

FOD

See "Fax on Demand."

Ground start line

This is a line circuit arrangement in which dial-tone is sent in response to a ground signal on the ring conductor applied by the calling station or PBX. This differs from the more common loop start configuration in which seizure is accomplished by bridging the tip and ring conductors.

IBN

See "Integrated Business Network."

Integrated Business Network (IBN)

This term is now known as Meridian Digital Centrex. It is a special business services package that utilizes the data-handling capabilities of an SL-100 Family office to provide a centralized telephone exchange service. Many optional features are also available.

Integrated Services Digital Network (ISDN)

This is a set of standards proposed by the International Telegraph and Telephone Consultative Committee (CCITT) to establish compatibility between the telephone network and various data terminals and devices. ISDN provides a path for transmission of voice, data, and images.

Interactive Voice Response (IVR)

This is an application that allows callers to interact with a host computer via prerecorded messages and prompts.

ISDN

See "Integrated Services Digital Network."

IVR

See "Interactive Voice Response."

Line hunting

Line hunting is a procedure for searching a number of lines to find one that is idle. *See also* "Multi-line hunt."

Link

- In Meridian Mail, a link is a connection between any two nodes. *See also* "Node."

- A link is also a four-wire group of conductors providing transmit and receive paths for the serial speech or message data between components of SL-100 Family systems. Speech links connect peripheral modules to the network modules. Message links connect network message controllers or input/output controllers to the central message controller.

Link protocol

This is a set of rules for communication of data over a data link. Link protocols exist for transmission codes, transmission nodes, and for data control and recovery procedures.

Mean time between failures (MTBF)

This is the period of time in which the hardware component is expected to perform without breaking down. For example, the mean time between failure for an MSM system is about 23.6 years.

Meridian Mail

This is a Northern Telecom product that provides voice messaging and other voice and fax services.

Meridian Mail user interface (MMUI)

This is a proprietary telset interface into Meridian Mail based on DTMF tones.

Message Services Module (MSM)

The Message Services Module is a high capacity voice processing hardware platform designed to provide call answering, voice messaging, and fax services to the private business or institutional customer.

MMUI

See "Meridian Mail user interface."

Modem

The term "modem" is a contraction of the words *modulator* and *demodulator.* A modem is used to transmit and receive digitized information from one computer to another.

MPC

See "Multi-protocol controller."

MSM

See "Message Services Module."

MSP

See "Multi-server processor."

MTBF

See "Mean time between failures."

Multi-line hunt

This is a service-related telephony feature that permits calls to a busy line to be routed to other specified lines without assigning a directory number to each line. *See also* "Line hunting."

Multi-line hunt group

This is a procedure for searching a number of lines in a specified group to find one that is idle.

Multimedia

This term refers to Meridian Mail services or features that combine voice and fax capability. A voice menu that allows a caller to select a fax to receive is an example of a multimedia application.

Multi-protocol controller (MPC)

This is a general-purpose data communications card that allows data communications between an SL-100 Family switch and an external computer (for example, between a central office billing computer and an SL-100 Family switch). The MPC card resides on the input/output controller shelf. The MPC card's protocol software is downloaded from the SL-100 central processing unit and then supports software routines for data packet network communication.

Multi-server processor (MSP)

This is the main processor on the prime node of a Meridian Mail platform. On the MSM, the MSP can also be configured on the backup node to the prime node.

Network

A network is

- an organization of stations capable of intercommunication but not necessarily on the same channel
- two or more interrelated circuits
- a combination of terminals and circuits in which transmission facilities interconnect user stations directly
- a combination of circuits and terminals serviced by a single switching or processing center
- an interconnected group of computers or terminals

Node

A node is the terminating point of a link. Node is a relative term; its meaning depends entirely on the context within which it is used. For example, a circuit may be a node in the context of another circuit within a module; the module itself may be a node in the context of another component of the network, and so forth.

Northern Telecom Publication (NTP)

This is a document that contains descriptive information about Northern Telecom hardware and software modules, and performance oriented practices for testing and maintaining the system. NTPs are part of the standard documentation package provided to an organization purchasing Northern Telecom products.

NPA

See "Numbering Plan Area."

NT

This is an acronym for "Northern Telecom (Nortel)."

NTP

See "Northern Telecom Publication."

Numbering Plan Area (NPA)

This is the area code portion of a directory number.

Paddle board (PB)

This is a short circuit pack, based on the standard circuit pack. The PB carries the cable interfaces and/or local service functions such as local clock sources and bus terminations, located on the back of a Meridian Mail-SuperNode shelf. *See also* "Transition Module."

PB

See "Paddle board."

PBX

See "Private Branch Exchange."

PCI

See "Present call information."

PEC

See "Product engineering code."

Plain ordinary telephone system (POTS)

This is an acronym used in the telephone industry to denote basic, conventional telephone services.

Port

In the Meridian Mail MSM, a port is the point at which a speech or message link is connected to a peripheral module, network module, input/output controller, or central message controller.

POTS

See "Plain ordinary telephone system."

Power distribution center

A separate room that contains batteries that provide backup power to the MSM. The batteries continue to supply power to the MSM when there is a power failure.

Present call information (PCI)

This is a message from the switch to the message desk terminal. It contains the calling party identification, called party identification, and the reason the call is being forwarded (where applicable).

Private Branch Exchange (PBX)

This is a private telephone exchange, either automatic or attendant-operated, serving extensions in an organization and providing access to the public network.

Product engineering code (PEC)

> This is an eight-character code that provides a unique identification for each marketable product manufactured by Northern Telecom Ltd.

Remote Notification

> This is a voice messaging feature. Through setup of target DNs, this feature will call the target(s) to notify the owner(s) of the mailbox that a new message has been deposited. Based on call status (answered, not answered, busy), this feature may retry until successful call completion or until a retry limit has been reached.

Service order system (SERVORD)

> This is a user interface that is used to change, add, or delete a subscriber line. Standard telephone industry command format is used.

SERVORD

> See "Service order system."

Shelf

> This is a container on the MSM for drawers, cards, or both.

Signal processing node (SPN)

> This is a node that is used to process signals by means of attached voice processor cards.

Simplified message desk interface (SMDI)

> This is a Bellcore standard that can be used to interface Central Office switches to voice messaging systems. SMDI can be used to pass Present call information (PCI) and Message Waiting Indication (MWI) messages.
>
> SMDI provides the directory number of the called station, the calling station number (if available), and the reason for the call being forwarded to a message desk. In addition, it provides the message desk with the ability to activate or deactivate the message waiting indicator for any station able to forward calls to the desk.

SMDI

> See "Simplified message desk interface."

SPN

> See "Signal processing node."

T1

> This is the standard 24-channel, 1.544Mbyte/s pulse code modulation system as used in North America. This digital carrier carries a signal whose designation is DS1.

Telephony interface node (TIFN)

This is a node that interfaces between incoming telephony lines and places communications on the Meridian Mail bus of the MSM.

Terminal

A terminal is

- the point of origination or termination in a communications network
- any device capable of sending and/or receiving information over a communication channel

TIFN

See "Telephony interface node."

TM

See "Transition Module."

Transition Module (TM)

This is a board that is plugged into the back of the MSM. This board is used for connecting wiring to the cards on the shelf. *See also* "Paddle board."

Translations

This is the process that the SL-100 family of switches uses to determine the destination of a call based on the digits the caller dials and the capabilities available to the caller. It also allows the Meridian Mail MSM software to recognize the hardware components of the system.

Translations database

In order to perform translations, the SL-100 switch must access data which is stored in its memory. This area of memory is the translations database.

UCD

See "Uniform call distribution."

Uniform call distribution (UCD)

This is a Meridian Digital Centrex feature which allows calls to be evenly distributed to a number of predesignated stations known as UCD stations or UCD positions. This feature is used to queue incoming calls to the message desk.

Voice port

All Meridian Mail features, except for some Fax on Demand functions, use voice ports. A distinction is made between voice ports and multimedia ports, since multimedia ports require additional processing capabilities.

Voice services

Voice services include voice menus, announcements, Thru-Dial, time-of-day control, voice form definitions, and fax items.

VoiceBridge

This is a unit manufactured by Voice Technologies Group Inc. It provides a link between the Meridian Mail on the MSM platform and one or more of the following switches:

- AT&T PBX
- Meridian 1/SL-1 PBX
- ROLM CBX

VP12A

This is a twelve-port card that is used in the Message Services Module for voice processing.

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Reader's Response Form for:

Meridian Mail Message Services Module
Planning and Engineering Guide, 557-7001-100
August 1995

Tell us about yourself:

Name: _____ **Date:** _____

Company: _____

Address: _____

_____

Occupation: _____ **Phone:** _____

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1. What is your level of experience with this product?

   ❑ New user ❑ Intermediate ❑ Experienced ❑ Programmer

2. How do you use this book?

   ❑ Learning ❑ Procedural ❑ Problem solving ❑ Reference

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   ❑ Yes ❑ No

   If you answered **No** to this question, please answer the following questions.

4. What chapters, sections, or procedures did you find hard to understand?

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   _____
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Reader's Response Form

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Message Services Module

Planning and Engineering Guide

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