PLN-5101-001

DMS-100 Family

DMS SuperNode Signaling Transfer Point
Technical Specification

BCS32 and up   Standard 01.01   September 1991

northern telecom

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Signaling Transfer Point
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About this document

This document contains technical specifications describing the DMS signaling transfer point (DMS-STP). This document is a reference document and is not meant to be used as a guide to daily tasks.

When to use this document

Northern Telecom (NT) software releases are referred to as batch change supplements (BCS) and are identified by a number, for example, BCS29. This document is written for DMS-100 Family offices that have BCS32 and up.

More than one version of this document may exist. The version and issue are indicated throughout the document, for example, 01.01. The first two digits increase by one each time the document content is changed to support new BCS-related developments. For example, the first release of a document is 01.01, and the next release of the document in a subsequent BCS is 02.01. The second two digits increase by one each time a document is revised and rereleased for the same BCS.

To determine which version of this document applies to the BCS in your office, check the release information in *DMS-100 Family Guide to Northern Telecom Publications*, 297-1001-001.

How to identify the software in your office

The *Office Feature Record (D190)* lists your current BCS and the NT feature packages in it. You can view similar information on a MAP (maintenance and administration position) terminal by typing

>PATCHER;INFORM LIST;LEAVE

and pressing the Enter key.

How DMS SuperNode Signaling Transfer Point documentation is organized

This document is part of DMS SuperNode Signaling Transfer Point documentation that supports the Northern Telecom line of DMS SuperNode Signaling Transfer Point products. DMS SuperNode Signaling Transfer Point documentation is a subset of the DMS-100 Family library.

The DMS-100 Family library is structured in numbered layers, and each layer is associated with an NT product. To understand DMS SuperNode Signaling Transfer Point products, you need documents from the following layers:

- DMS-100 Family basic documents in the 297-1001 layer
- DMS SuperNode Signaling Transfer Point documents in the 297-5101 layer
- DMS SuperNode documents in the 297-5001 layer

DMS SuperNode Signaling Transfer Point documents and other documents that contain related information are listed in “Finding CCS7 information” in *Common Channel Signaling 7 Product Guide*, 297-5151-010.

References in this document

The following documents are referred to in this document.

Number	**Title**
297-1001-110	*DMS-100 Family Maintenance and Administration Position (MAP)*
297-1001-139	*Multi-Protocol Controller (MPC) General Description*
297-1001-156	*Power Distribution and Grounding Systems*
297-5101-101	*DMS SuperNode Signaling Transfer Point Planning and Engineering Guide*
297-5101-301	*DMS SuperNode Signaling Transfer Point Administration Guide*
297-5101-543	*DMS SuperNode Signaling Transfer Point Alarm Clearing and Performance Monitoring Procedures*
297-5101-544	*DMS SuperNode Signaling Transfer Point Trouble Locating and Clearing Procedures*
297-5101-545	*DMS SuperNode Signaling Transfer Point Recovery Procedures*
297-5101-546	*DMS SuperNode Signaling Transfer Point Routine Maintenance Procedures*
297-5101-547	*DMS SuperNode Signaling Transfer Point Card Replacement Procedures*

Signaling transfer point

The Common Channel Signaling 7 (CCS7) network consists of message switches called signaling nodes. The signaling transfer point (STP) is one type of signaling node used in a CCS7 network. It provides routing for CCS7 messages between network nodes. Unlike other nodes in a CCS7 network, the STP does not act as source or ultimate destination for CCS7 messages. Instead, STPs provide an efficient conduit for routing traffic between other nodes in the CCS7 network.

This chapter describes the configurations in which an STP can be used. Descriptions include how the STP is configured, as well as how the STP fits into the overall CCS7 network.

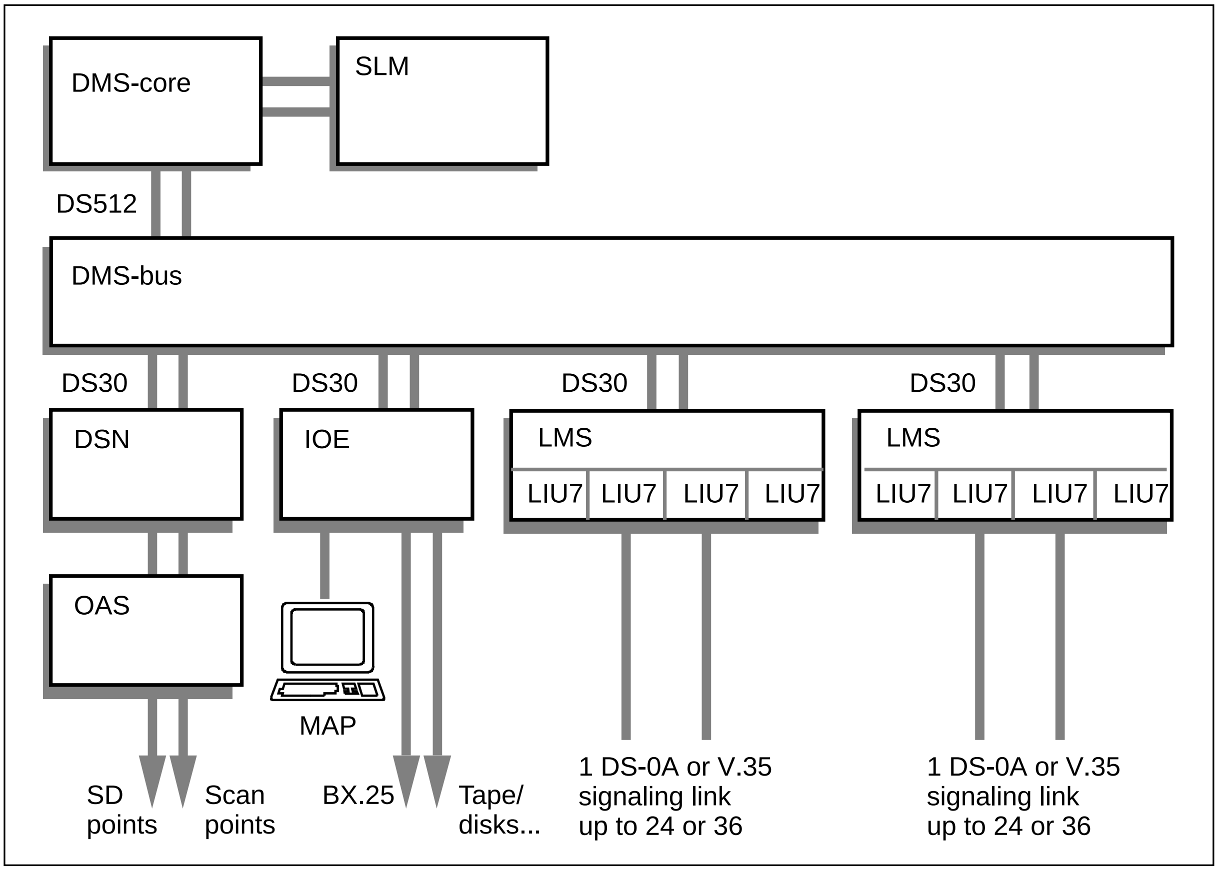
Components of the STP

The STP is built around the DMS-core and the DMS-bus, central DMS SuperNode elements, as well as the link peripheral processor (LPP) (illustrated in Figure 1-1). Basic DMS-100 Family equipment used in the STP consists of the input/output equipment and the office alarm system.

The input/output equipment (IOE) supports all peripheral magnetic tape units, disk drive units, and the administration and maintenance systems required to provide OAM interface to the STP. In a minimum configuration, one IOE frame is provided for each STP node.

The office alarm system consists of a trunk module equipment (TME) frame and a double shelf network equipment (DSNE) frame. Two office alarm system shelves, which contain a full complement of control and alarm circuit packs, are provided.

Figure 1-1xxx
STP components



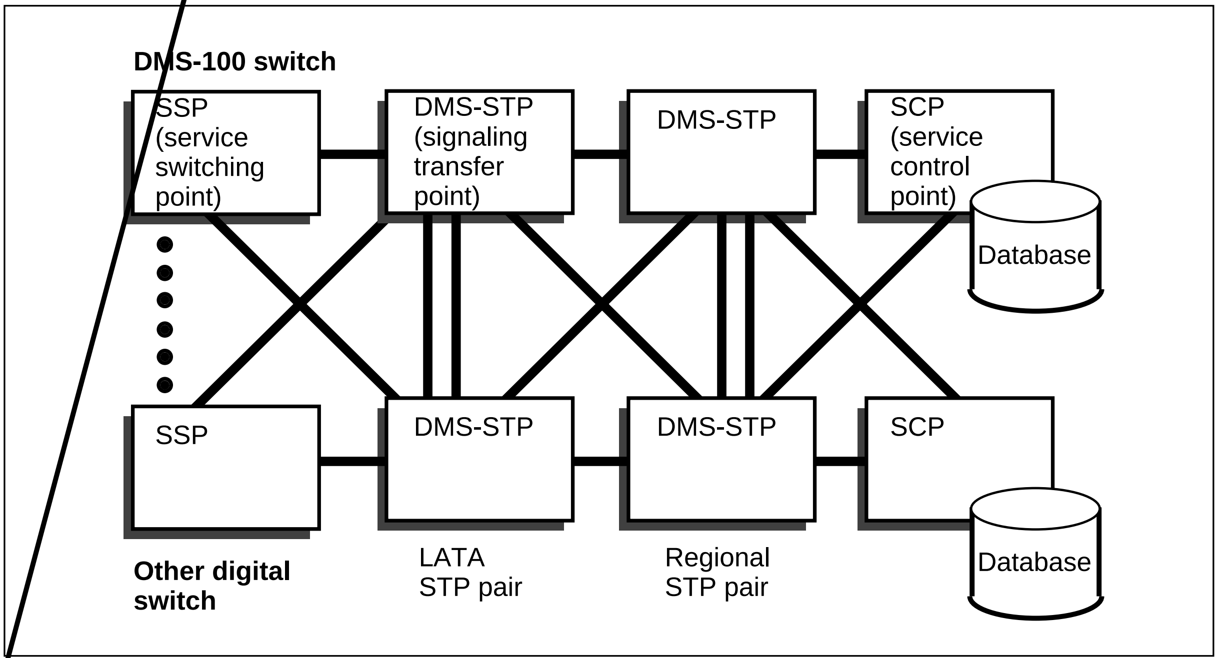
For further information on the components of the STP, see the chapter titled “Hardware,” or refer to *DMS SuperNode Signaling Transfer Point Planning and Engineering Guide*, 297-5101-101.

STP as part of the CCS7 network

In the CCS7 network the STP acts as a transfer point for routing CCS7 messages. In addition to its routing functions, the STP performs message discrimination, manages network signaling links, and supports translation of CCS7 application addresses, called global title translation (GTT), to specific point codes.

Figure 1-2 illustrates how the STP is positioned within a typical CCS7 network.

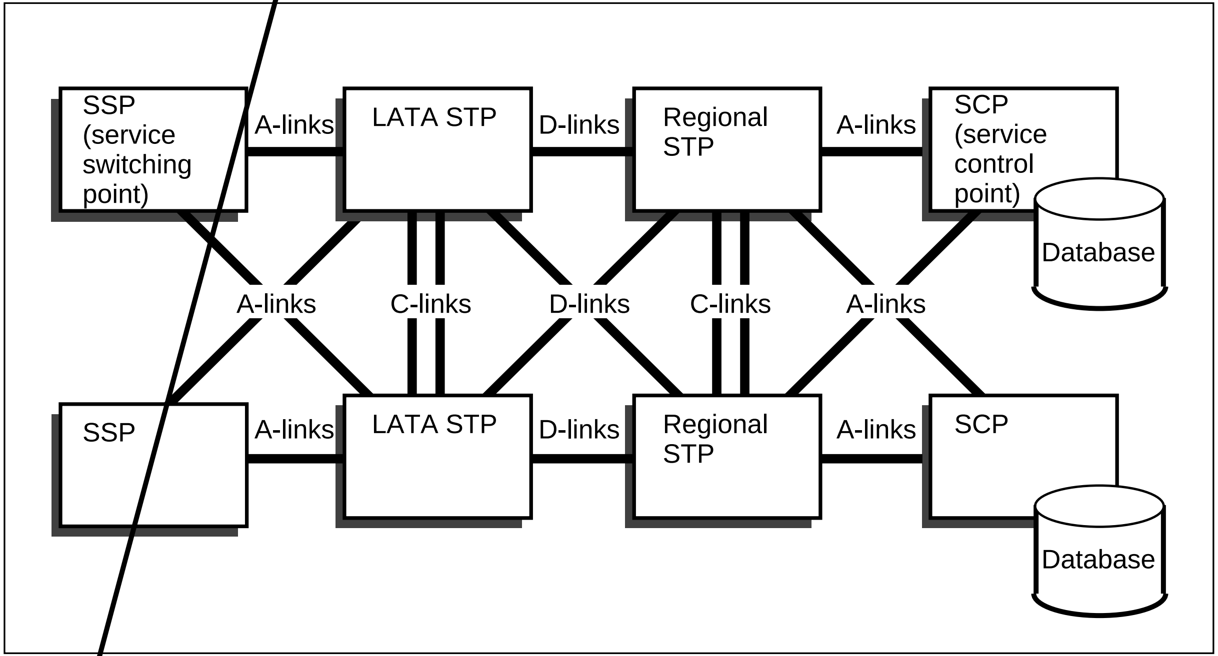
Figure 1-2xxx
STP in a CCS7 network



The STPs are configured in mated pairs to increase reliability. Each STP is connected to the CCS7 network using signaling links (SDL). These SDLs are also provisioned in duplicated pairs for reliability. Figure 1-3 illustrates how SDLs are used with the STP.

A-links are the signaling links which connect STPs to the signal switching points (SSP), and service control points (SCP). C-links are the signaling links which connect the mates of an STP pair. B- and D-links connect an STP to another STP in the CCS7 network.

Figure 1-3xxx
Network signaling data links to an STP



For further information regarding CCS7 and STP as part of the network, refer to *DMS SuperNode Signaling Transfer Point Planning and Engineering Guide*, 297-5101-101.

Hardware

DMS-STP design is based on the modular technology of the DMS SuperNode. The basic STP hardware configuration consists of a SuperNode frame, link peripheral processor frame(s), double shelf network equipment (DSNE) frame, trunk module equipment (TME) frame, and IOE frame(s).

Figure 2-1 illustrates the basic equipment frame lineup. Figure 2-2 illustrates the architecture behind the STP hardware.

Figure 2-1xxx
Typical STP equipment lineup

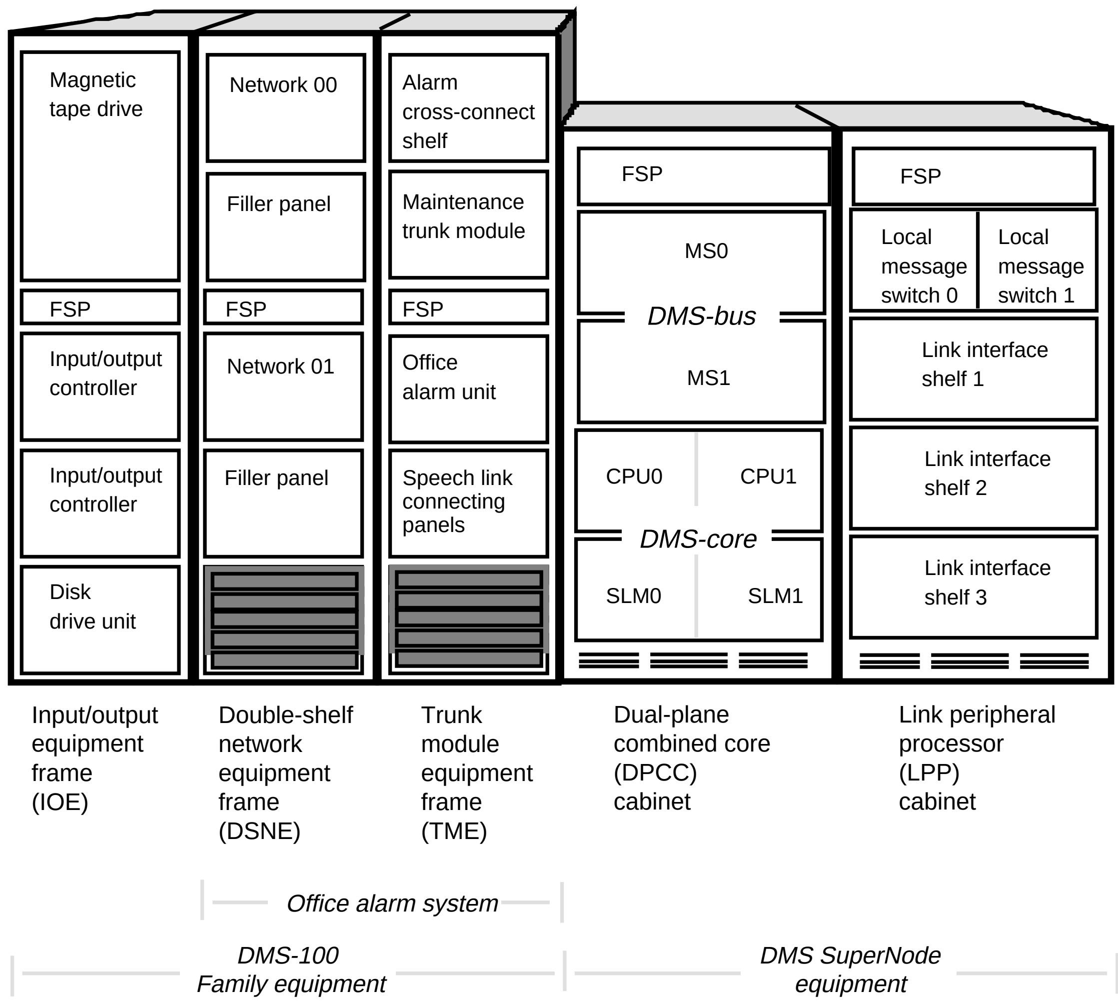
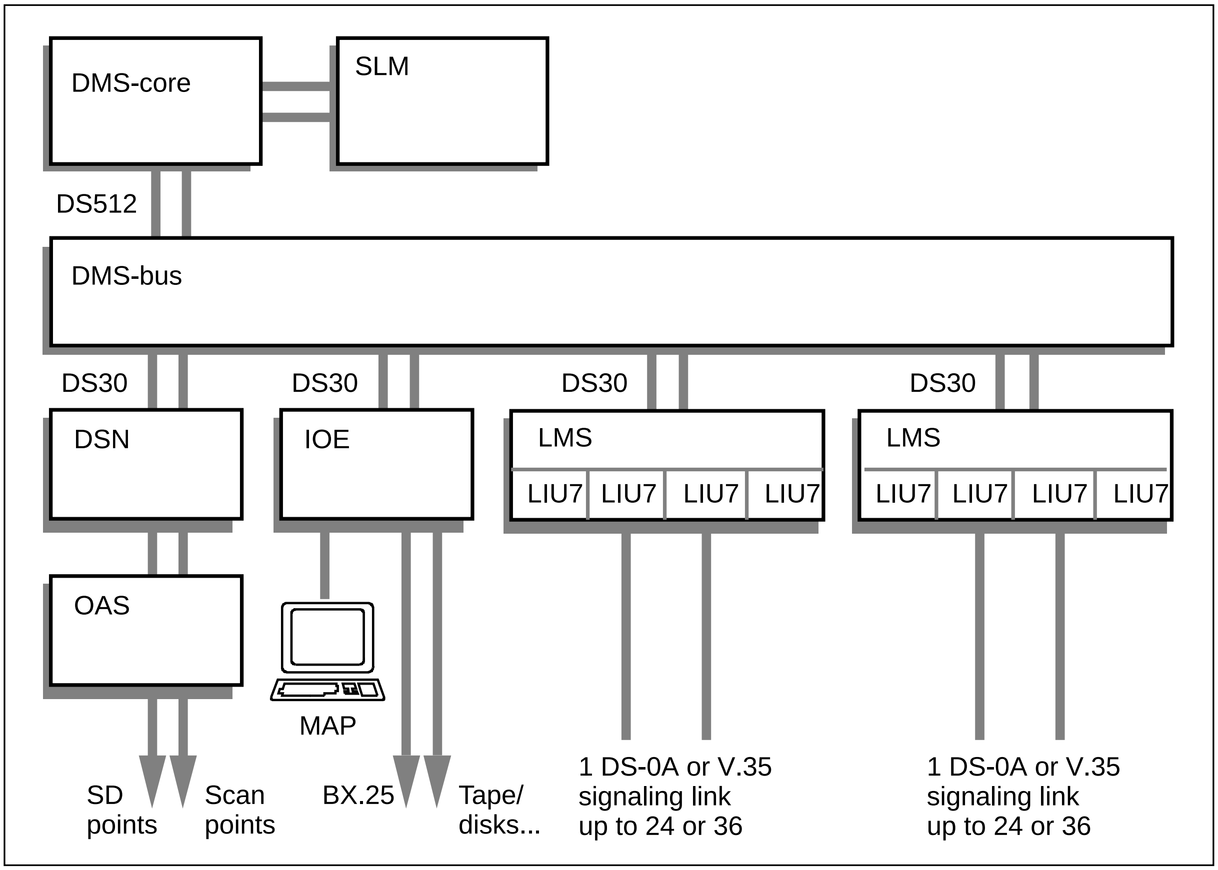


Figure 2-2xxx
STP hardware architecture



Power distribution center

Primary power distribution for the STP equipment conforms to the standard for all DMS-100 Family products in North America. Power for the STP is provided through the power distribution center (PDC).

Primary 240 Vac power is provided to a centralized power plant located within one floor of the equipment lineup. Conversion to a nominal potential of -48 Vdc is done before power is distributed to the equipment. Two isolated and fused -48 Vdc feeds (A and B) power the lineup through EMI filters ensuring power redundancy and effective shielding against electromagnetic influences.

For information on power requirements, refer to the power and grounding requirements section of this document.

Link peripheral processor

The link peripheral processor (LPP) cabinet provides the interface to network signaling links (SDL). It contains a fully duplicated local message switch (LMS) and three link interface shelves (LIS).

Each LIS can be equipped with up to 12 application-specific units (ASU); in the STP these are either CCS7 link interface units (LIU7) or Ethernet interface units (EIU). This is a total of 36 ASUs per NT9X70BA LPP cabinet, or 24 ASUs per NT9X70AA LPP cabinet.

Each LIU7 provides the interface between the STP and one signaling link. The EIUs provide connectivity between the STP and an Ethernet LAN.

There are two types of LPP frame: one houses only two-slot application-specific units (ASU), and the other can house both two- and three-slot ASUs.

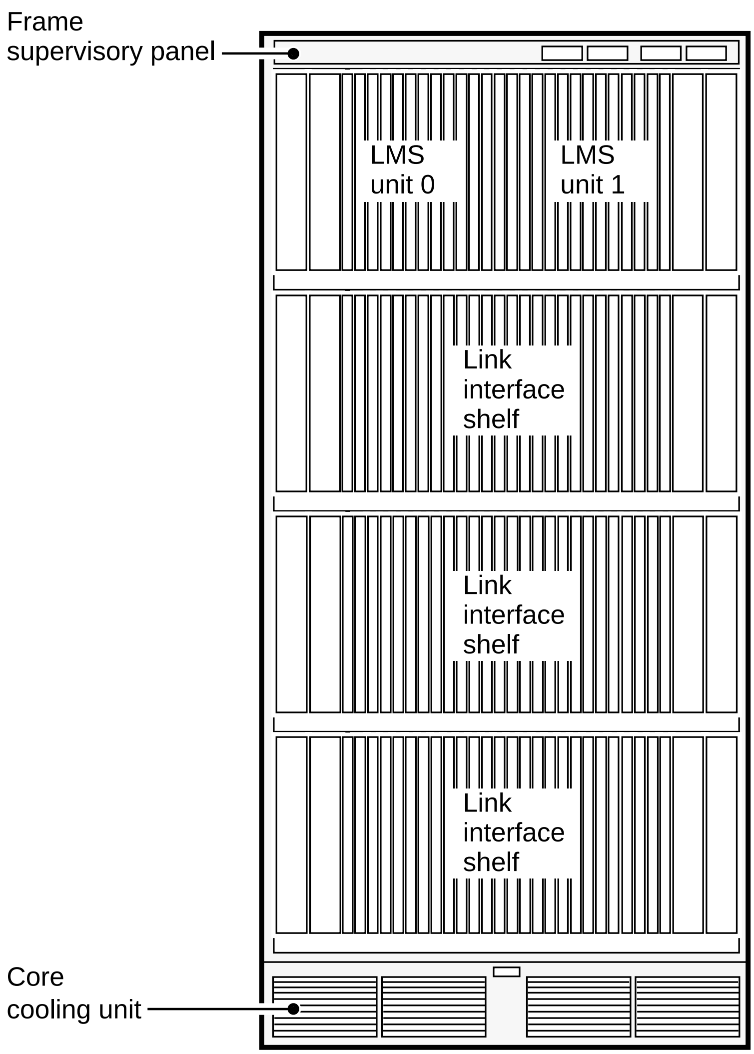
An STP can support up to ten LPPs.

Figure 2-3 shows the LPP equipment frame layout.

Each LPP includes a duplex LMS shelf as well as three fully wired link interface shelves. The LPP includes the following equipment:

- CPU card
- memory card
- mapper card
- MS four-port card
- DS30 four-port paddle board
- remote terminal interface paddle board
- MS P-bus terminator card
- T-bus access card
- MS clock card
- F-bus rate adapter card
- F-bus repeater card
- F-bus extender and terminator paddle board
- frame supervisory panel
- application-specific units (ASU), such as the LIU7s described below

Figure 2-3xxx
LPP equipment frame layout



Frame supervisory panel

The frame supervisory panel on the LPP provides

- alarm monitoring for power converters
- alarm circuits and alarm indicators

Local message switch

The local message switch (LMS) performs two simultaneous functions. It exchanges messages between the LIU7s in its cabinet while also providing access to the DMS-bus (which transports messages to and from other LPPs). The LIU7s perform MTP, SCCP, GTT, and STP Gateway Screening at the link level. At the same time the LMS is exchanging messages with the DMS-bus. The ability of the LPPs to perform these two transactions at once allows a high message throughput rate.

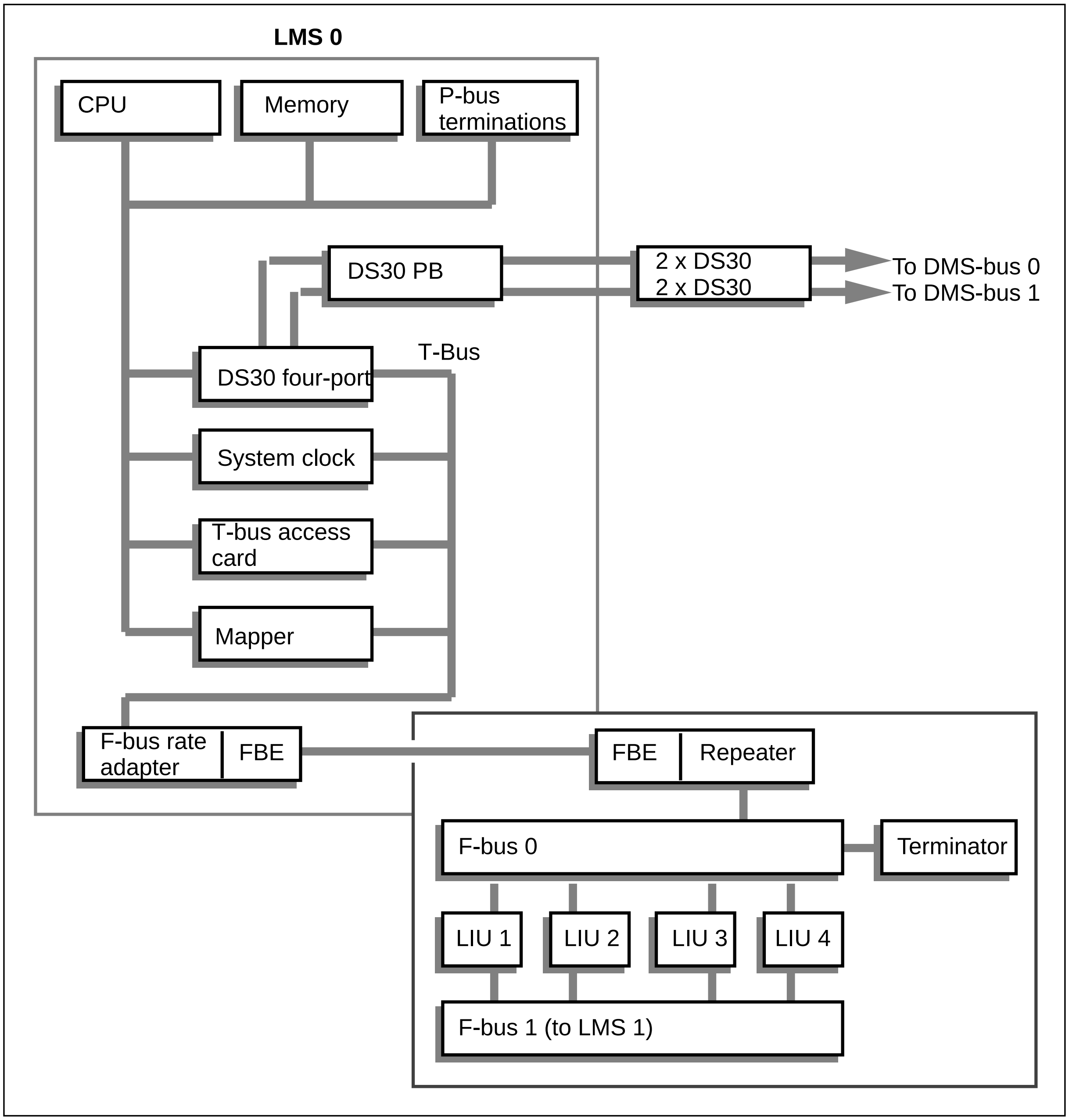
The LMS performs the same function for the LPP that the DMS-bus performs for the STP. A full complement of duplicated circuit packs are provided on the LMS shelf. The LMS pair normally operate in a load sharing mode; however, each one has the capacity to carry the full message load of the LPP. Either LMS can communicate with any LIU7 in the LPP by way of the F-bus. Communication with the DMS-bus is accomplished by way of four DS30 links.

Figure 2-4 illustrates the functional structure of the LMS.

Link interface shelf

Three fully wired link interface shelves (LIS) are equipped in an LPP. Each LIS serves up to 12 LIU7s, for a total of 36 LIU7s per LPP. The LIS connects to each LMS in the LPP by two independent F-buses, providing access from any LIU7 to either LMS.

Figure 2-4xxx
LMS functional structure



CCS7 link interface unit

The LIU7 is the interface between the STP and CCS7 signaling links. These LIU7s are responsible for the processing that allows CCS7 messages to rapidly enter and leave the STP. By processing both the message transfer part (MTP) and the signaling connection control part (SCCP) of the CCS7 protocol, as well as performing GTT and Gateway Screening functions, the LIU7 frees the DMS-core to efficiently manage the STP system. Each LIU7 in the STP can handle a traffic load of 0.8 erlangs while simultaneously performing GTT on all messages.

The LIU7 is available in two configurations: three-slot and two-slot. The three-slot configuration requires three slots on the LIS. The two-slot configuration requires only two slots on the LIS.

The three-slot LIU7 includes the following:

- link general processor card (NT9X13CA)
- P-bus to F-bus interface card (NT9X75)
- STP signaling terminal card (NT9X76)
- DS-0A terminator paddle board (NT9X78AA or NT9X78BA) or V.35 interface paddle board (NT9X77AA)

The two-slot LIU7 includes the following:

- integrated CPU and F-bus interface card (NTEX22AA or NTEX22BA)
- STP signaling terminal card (NT9X76)
- DS-0A terminator paddle board (NT9X78AA or NT9X78BA) or V.35 interface paddle board (NT9X77AA)

Figures 2-5 and 2-6 illustrate the functional configuration of the two-slot and three-slot LIU7s.

Figure 2-5xxx
Two-slot LIU7 functional configuration

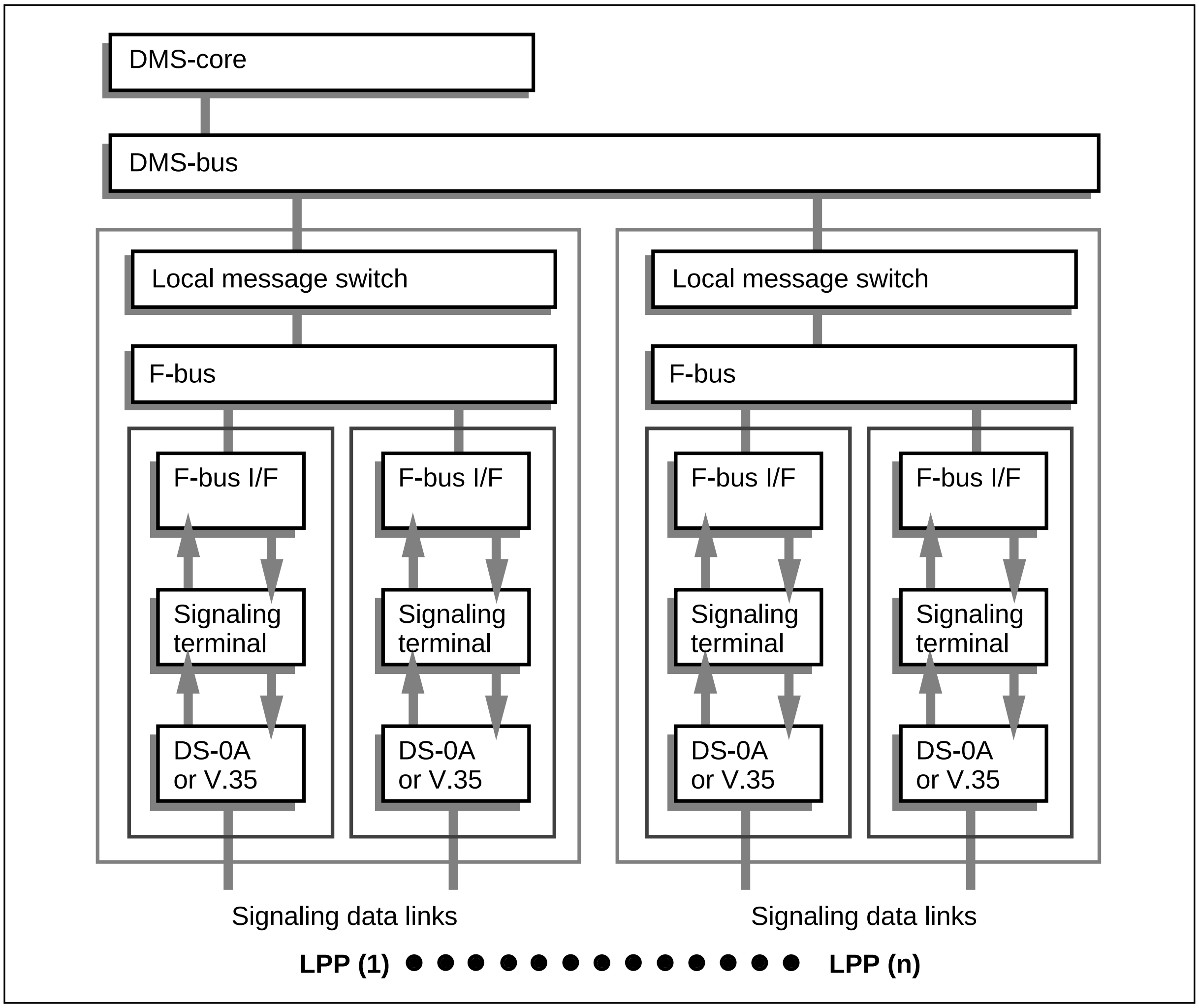
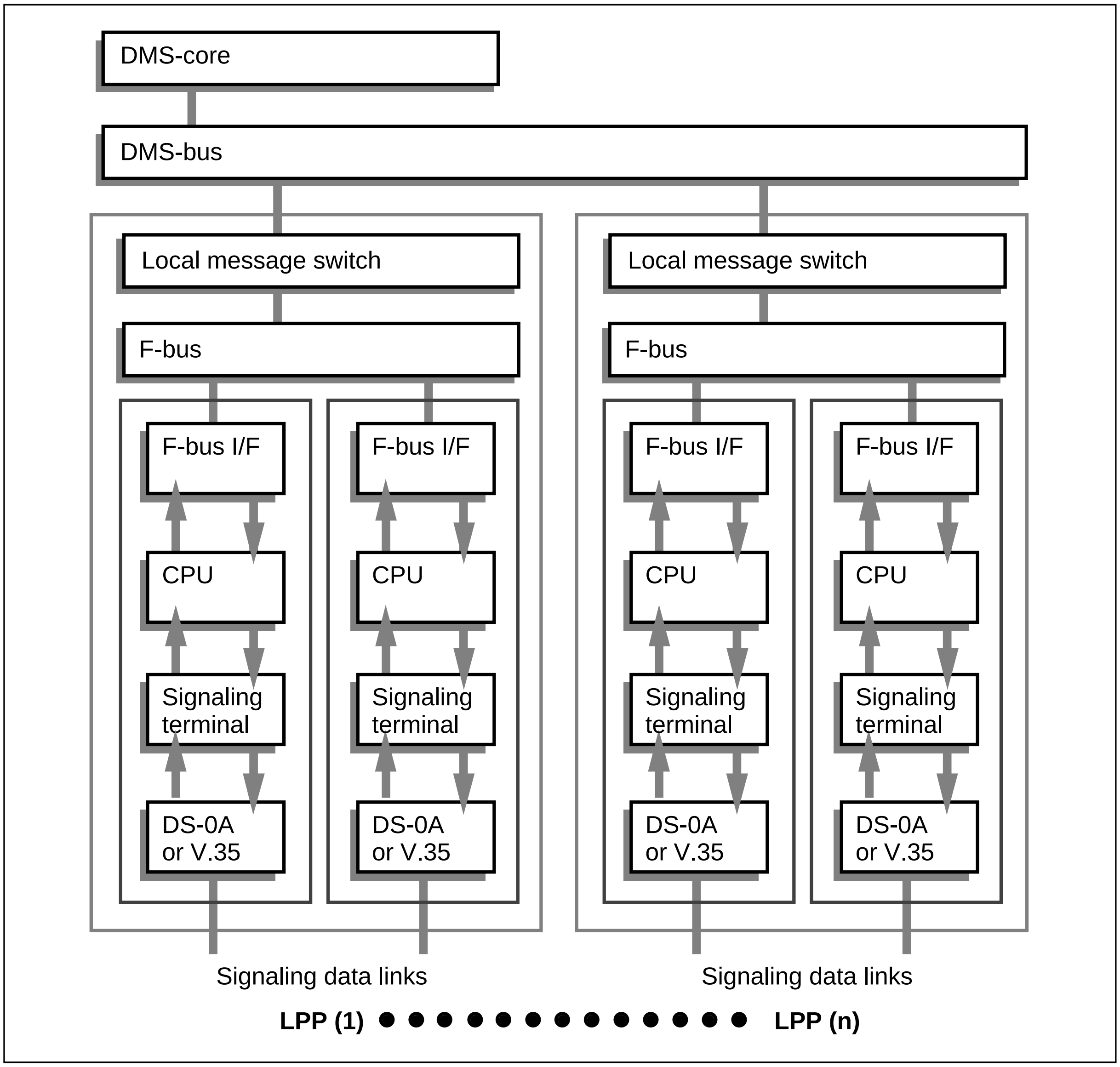


Figure 2-6xxx
Three-slot LIU7 functional configuration



Ethernet interface unit

The Ethernet interface unit (EIU) serves as the interface between the STP and an Ethernet local area network (LAN). EIUs support the MDR7 feature which allows CCS7 message tracing. With MDR7, two EIUs are equipped. One operates in an active mode, the other stands by in case of failure.

MDR7 maximum throughput is 12 kilobytes per second.

The EIU includes the following:

- integrated processor and F-bus interface card (NTEX22AA or NTEX22BA)
- Ethernet interface card (NT9X84AA)
- Ethernet access unit interface paddle board (NT9X85AA)

Composite clock

The DS-0A interface is timed by way of external composite-clock signals, which are supplied to the STP at the LMS. To ensure reliability, one clock signal is fed to each LMS, providing each LIU7 with two sources for its composite-clock signal.

The STP system conforms to the building integrated timing supply (BITS) design concept, which advocates a single master timing supply for each building. The telephone operating company must provide a timing signal generator and the necessary clock distribution equipment.

LPP hardware product engineering codes

Table 2-1 contains a list of LPP hardware and product engineering codes (PEC).

Table 2-1xxx
LPP hardware PECs

Hardware	PEC
Link interface module cabinet (holds 36 shrink LIU7s)	NT9X70BA
Link interface module cabinet (holds 24 LIU7s)	NT9X70AA
Common cabinet equipment	NT9X0101
Local message switch shelf assembly	NT9X7101
Link interface unit shelf assembly (24 LIU7s)	NT9X7201
Link interface unit shelf assembly (36 LIU7s)	NT9X7204
Local message switch shelf common circuit packet	NT9X71AB
LMS-F-bus rate adaptor circuit packet (24 LIU7s)	NT9X73AA

-continued-

Table 2-1xxx
LPP hardware PECs (continued)

Hardware	PEC
LMS-F-bus rate adaptor circuit packet (36 LIU7s)	NT9X73BA
CPU 16-MHz circuit pack	NT9X13DB or DA
Link interface unit shelf common circuit pack (24 LIU7s)	NT9X72AD
LIU7/DCP shelf common circuit pack (36 LIU7s)	NT9X72BA
F-bus repeater circuit pack (24 LIU7s)	NT9X74BA
F-bus repeater circuit pack (36 LIU7s)	NT9X74CA
F-bus extender paddle board (top shelf)	NT9X79AA
F-bus extender paddle board (shelf shelf)	NT9X79BA
Intra F-bus B termination paddle board	NTEX20BA
Intra F-bus A termination paddle board	NTEX20AA
Link general processor circuit pack	NT9X13CA
CCS7 signaling terminal circuit pack	NT9X76AA
Integrated processor and F-bus I/F	NTEX22AA
DS-0A interface paddle board	NT9X78AA
Enhanced DS-0A interface paddle board	NT9X76BA
V35 interface paddle board	NT9X77AA
F-bus interface circuit pack	NT9X75AA
Filler faceplate	NT9X19AA
Paddle board filler faceplate	NT9X19BA
Circuit pack filler faceplate	NT9X19AA
Ethernet interface card	NT9X84AA
Ethernet AUI paddle board	NT9X85AA

End

DMS-100 Family equipment

Input/output equipment

The input/output equipment (IOE) frame supports all peripheral magnetic tape units, administrative and maintenance systems, and disk drive units (DDU) required to provide an operations, administration, and maintenance interface to the STP. These components store software and office configuration data for the STP and compile, store, and output operational measurements and alarm data.

In cases where power redundancy is desired, two IOE frames can be used in tandem to house the input/output equipment.

Figure 2-7 illustrates the typical layout for an IOE frame.

Disk drive units

In a single-frame offices, one 14-inch Winchester DDU and a power converter card are installed.

If a second frame is added to a single-frame office, the final configuration is two 14-inch Winchester DDUs.

In a two-frame office, two 8-inch or two 5.25-inch Winchester DDUs and two power converters are installed.

Magnetic tape units

The IOE may be equipped with one magnetic tape drive. The tape used in this tape drive is nine-track, and 16000 bits per inch.

Input/output controllers

Input/output controllers (IOC) are required for DDUs and magnetic tape drives. These reside on two IOC shelves in the IOE frame, along with two DS30 interface controllers (NT1X62CA).

Multi-protocol controller

A multi-protocol controller (MPC) is available for systems that require frequent administrative communications with the STP. The MPC (NT1X89AA) also provides the required interface to the Signaling, Engineering, and Administration System (SEAS) that is used to administer the network from a central location. For more information on the MPC, refer to *Multi-Protocol Controller (MPC) General Description*, 297-1001-139.

Frame supervisory panel

The IOE frame supervisory panel provides

- alarm monitoring for power converters
- alarm circuits and alarm indicators

Video display units and printers

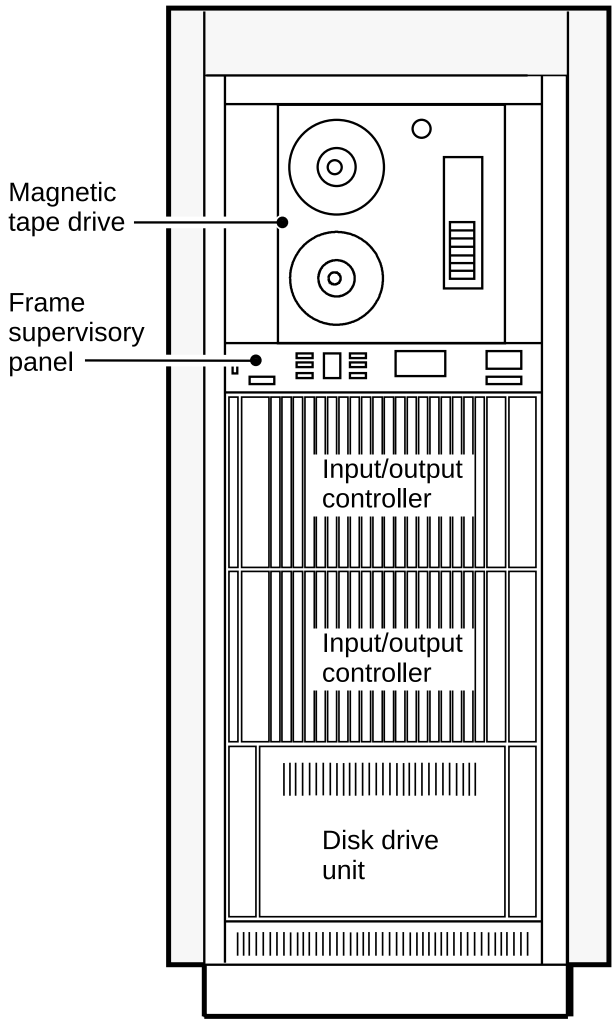
Video display units (VDUs) and printers may also be required, and connect to the STP by way of Terminal Controller cards in the IOE frame.

Maintenance and administration position

The maintenance and administration position (MAP) provides the user interface to the administration and maintenance of the STP. The MAP consists of the following three basic components:

- a visual display unit (VDU) with keyboard
- a voice communications module with system test interfaces
- position furniture

Figure 2-7xxx
Typical input/output equipment frame layout



IOE hardware product engineering codes

Table 2-2 contains a list of IOE hardware and product engineering codes (PEC).

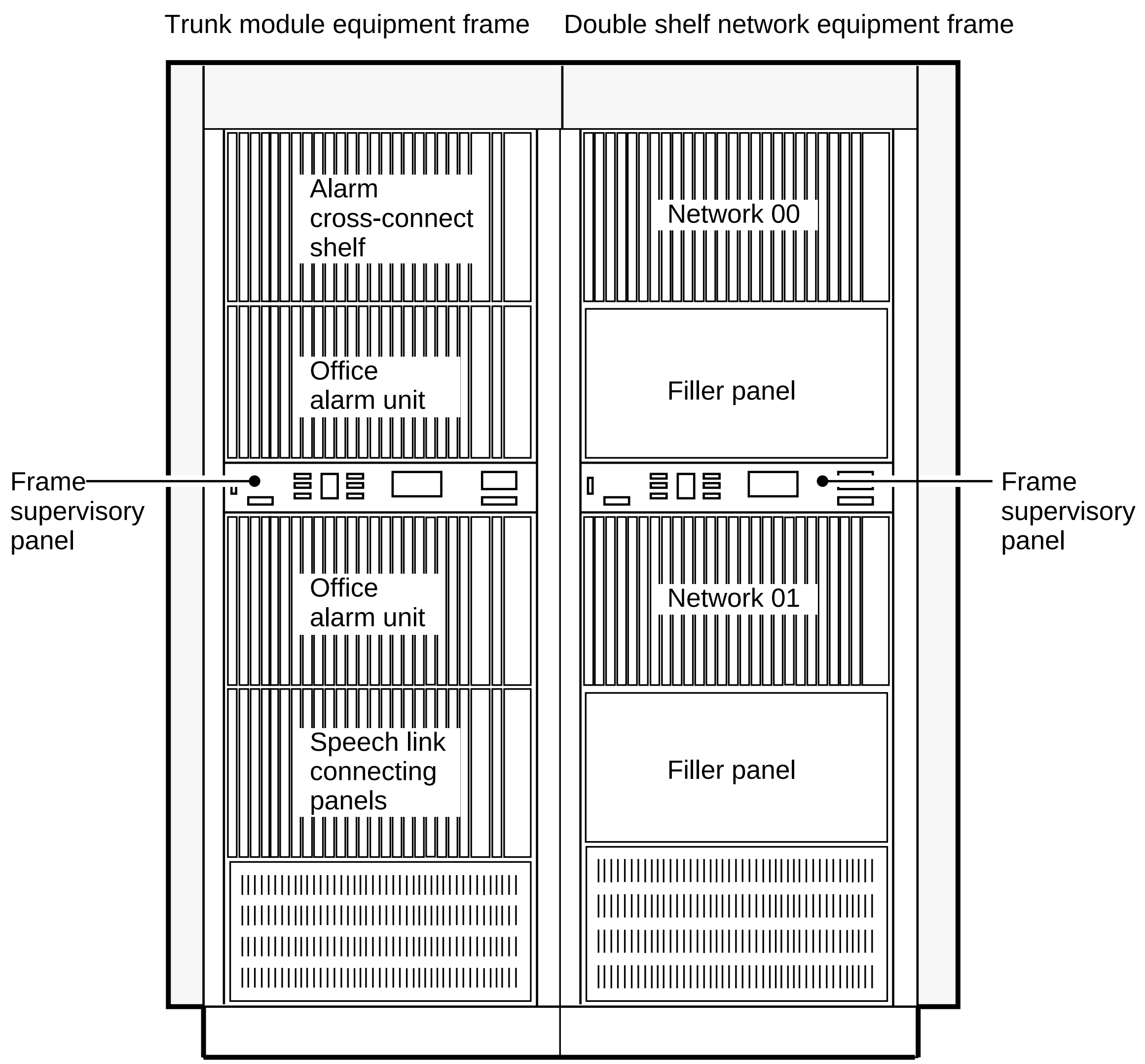
Table 2-2xxx
Input/output equipment hardware PECs

Hardware	PEC
Input/output equipment frame	NT0X43AD
Common framework	NT0X25AA
Power control and alarm circuit pack	NT0X36AB
MTG hardware and cook magnetic tape drive	NT0X44AD
Disk drive controller	NT1X55AB
IOC common pack fill	NT1X61AC
IOC shelf	NT1X61AD
DS30 interface controller circuit pack	NT1X62CA
Terminal controller card	NT1X67BD
Nine-track tape control card	NT1X68AC
Disk drive unit shelf	NT4X00AC
Multi-protocol control circuit pack	NT1X89AA

Office alarm system

The office alarm system (OAS) consists of a trunk module equipment frame (TME) and a double-shelf network equipment (DSNE) frame, both of which are standard DMS-100 equipment. Two office alarm system shelves are provided, containing a full complement of control and alarm circuit packs. Cross-connect panels maximize the flexibility of the OAS.

Figure 2-8xxx
Typical office alarm subsystem equipment configuration



Trunk module equipment frame

The trunk module equipment (TME) frame is equipped with an alarm cross-connect shelf, a frame supervisory panel, and two maintenance trunk modules (MTM) that provide alarm functions for the STP. It is also connected with a maintenance and administration position by way of the IOE frame. Figure 2-8 illustrates the typical frame layout for a trunk module equipment frame.

Alarm cross-connect panel

This panel interconnects the office alarm unit and the alarm display panel.

Maintenance trunk module office alarm system

The office alarm unit in the TME frame

- provides alarm functions for the STP
- collects alarms and reports them to the alarm reporting subsystem

It consists of two MTMs, one primary and one secondary. Each MTM consists of an OAU dead system alarm circuit pack and an alarm control and display panel. In addition, the primary MTM must be equipped with a miscellaneous scan point card (NT0X10AA) and a signal distribution card (NT2X57AA). If the remote alarm transfer feature is required, a remote alarm transfer circuit pack (NT3X83AA) must be equipped.

A transmission test trunk (TTT), consisting of a PCM test signal generator and a PCM level meter, allows in-service testing of the MTMs.

Frame supervisory panel

The TME frame supervisory panel provides

- alarm monitoring for power converters
- alarm circuits and alarm indicators

TME hardware product engineering codes

Table 2-3 contains a list of TME hardware and product engineering codes (PEC).

Table 2-3xxx
TME hardware PECs

Hardware	PEC
Trunk module equipment frame	NT0X46AB
Office alarm cross-connect field	NT3X83AA
Maintenance trunk module	NT2X58CA

-continued-

Table 2-3xxx
TME hardware PECs (continued)

Hardware	PEC
OAU dead system alarm with unique audible card	NT3X82AA or AB
Remote alarm transfer card	NT3X83AA
Miscellaneous scan point card	NT0X10AA
Signal distribution card	NT2X57AA
Alarm control/display panel	NT0X63AC
PCM signal test generator	NT1X90AA
PCM level meter	NT2X96AA
Network speech link connector panel	NT0X56BB
Peripheral speech link connector panel	NT0X56BC
Alarm audible panel	NT0X66AA
End	

Double-shelf network frame

The double-shelf network equipment (DSNE) frame is equipped with a duplicated network (one network module for each plane) to interface the MTM shelves to the dual-plane combined core (DPCC). Figure 2-8 illustrates the typical frame layout for a DSNE frame.

Network unit

The network unit interfaces the MTM shelves to the DPCC. There is one network unit for each plane.

Each network consists of one network clock circuit pack (NT3X76AC) and one network central processor circuit pack (NT3X74BB).

Frame supervisory panel

The DSNE frame supervisory panel provides

- alarm monitoring for power converters
- alarm circuits and alarm indicators

DSNE hardware product engineering codes

Table 2-4 contains a list of DSNE hardware and product engineering codes (PEC).

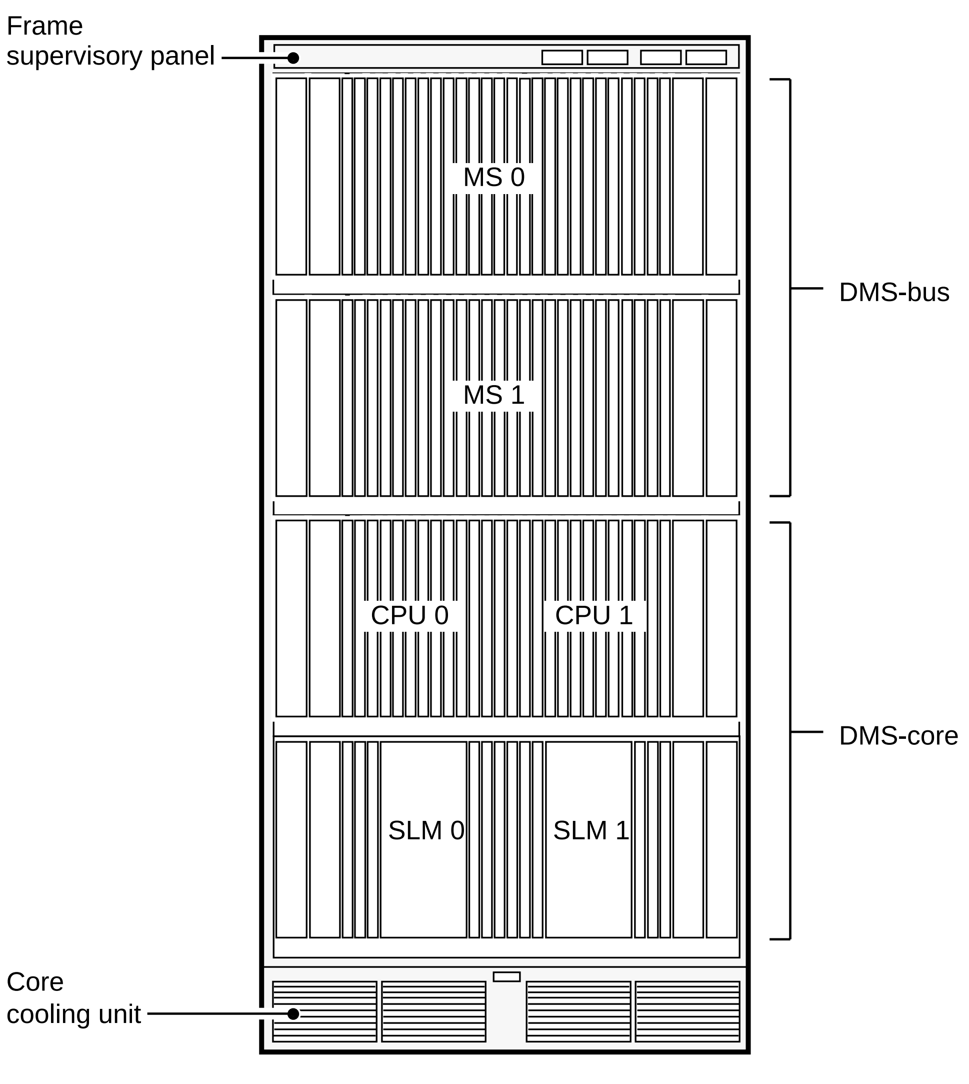
Table 2-4xxx
DSNE hardware PECs

Hardware	PEC
Double shelf network equipment frame	NT8X10AA
Network common circuit packs	NT8X11AC
DC fan cooling unit	NT3X90AC
Network control processor card	NT3X74BB
Network P-side message processor card	NT3X75BA
Network clock circuit pack	NT3X76AC

DMS SuperNode equipment (dual-plane combined core)

The DMS SuperNode equipment that is used in conjunction with the STP is housed in the standard dual-plane combined core (DPCC) cabinet. This cabinet contains the DMS-core and the DMS-bus. The DMS-core controls the operation, administration and maintenance functions of the STP. The DMS-bus distributes signaling messages and STP control messages. Figure 2-9 illustrates a typical DPCC frame layout.

Figure 2-9xxx
Typical dual-plane combined core frame layout



DMS-core

The DMS-core, the high-performance system-control vehicle for the STP, consists of a pair of duplicated Motorola microprocessors and their associated memory, running in a synchronous mode of operation. Each processor in the DMS-core has a high-speed, fiber-optic interface to both DMS-bus planes to ensure fast, reliable system communication.

The DMS-core performs the following functions for the STP:

- system start-up and reloading
- downloading and internal software distribution
- CCS7 network management
- maintenance operations and facility management
- collection, storage, and output of operational information
- alarm and statistical compilation
- update of global title translations and routing information

A high-speed system load module is used for loading and backing up the system memory for the DMS-core. Each system load module consists of a 140-megabyte, 5.25-inch Winchester disk drive and a 75-megabyte high-speed streaming cartridge tape drive. This can load the DMS-core, all LMSs, and all LIU7s in less than four minutes, no matter how large the STP configuration.

DMS-bus

The DMS-bus is the 32-bit wide, 128-Mbps message bus that interconnects all LPPs within an STP. The DMS-bus distributes both STP internal control messages and CCS7 messages.

Using the dual-plane architecture of the DMS SuperNode system, the DMS-bus is fully duplicated and normally operates in a load-sharing mode. This duplication ensures reliability by allowing either plane to carry the full message load without loss of messages or service.

DS30 links pass STP messages to the LPPs. Each plane of the DMS-bus currently accommodates 68 DS30 links. Each LPP requires eight links allowing the DMS-bus to support message transfers from up to ten LPPs.

The distributed-processor design of the STP allows message processing to occur within the LPP. This frees the DMS-core to administer the system as a whole and allows messages to enter and leave the DMS-bus with the greatest possible speed.

All CCS7 messages are routed from the source port to their destinations as complete messages.

This ability to process messages without hierarchical intervention and as complete units makes possible the high message throughput and the low delay characteristics of the DMS-STP.

Frame supervisory panel

The DPCC frame supervisory panel provides

- alarm monitoring for power converters
- alarm circuits and alarm indicators

DPCC cooling unit

The DPCC cooling unit provides forced air ventilation for equipment housed in the cabinet.

DPCC hardware product engineering codes

Table 2-5 shows DPCC hardware product engineering codes (PEC).

Table 2-5xxx
DPCC hardware PECs

Hardware	PEC
Dual-plane combined core cabinet	NT9X01BA
Computing module processor shelf common circuit board	NT9X06AA
Message switch processor shelf common paddle board	NT9X04AB
6-Mb memory circuit pack	NT9X14BB
MS four-port circuit pack	NT9X17AA
Four-port DS30 paddle board	NT9X23AA or BA
CM SLM common circuit pack fill	NT9X07AA
System load module I	NT9X44AA
CM bus extender paddle board	NT9X27AA

Physical specifications

Equipment frame sizes

The STP uses the following types of equipment frames:

- DMS SuperNode equipment frames
- DMS-100 Family equipment frames

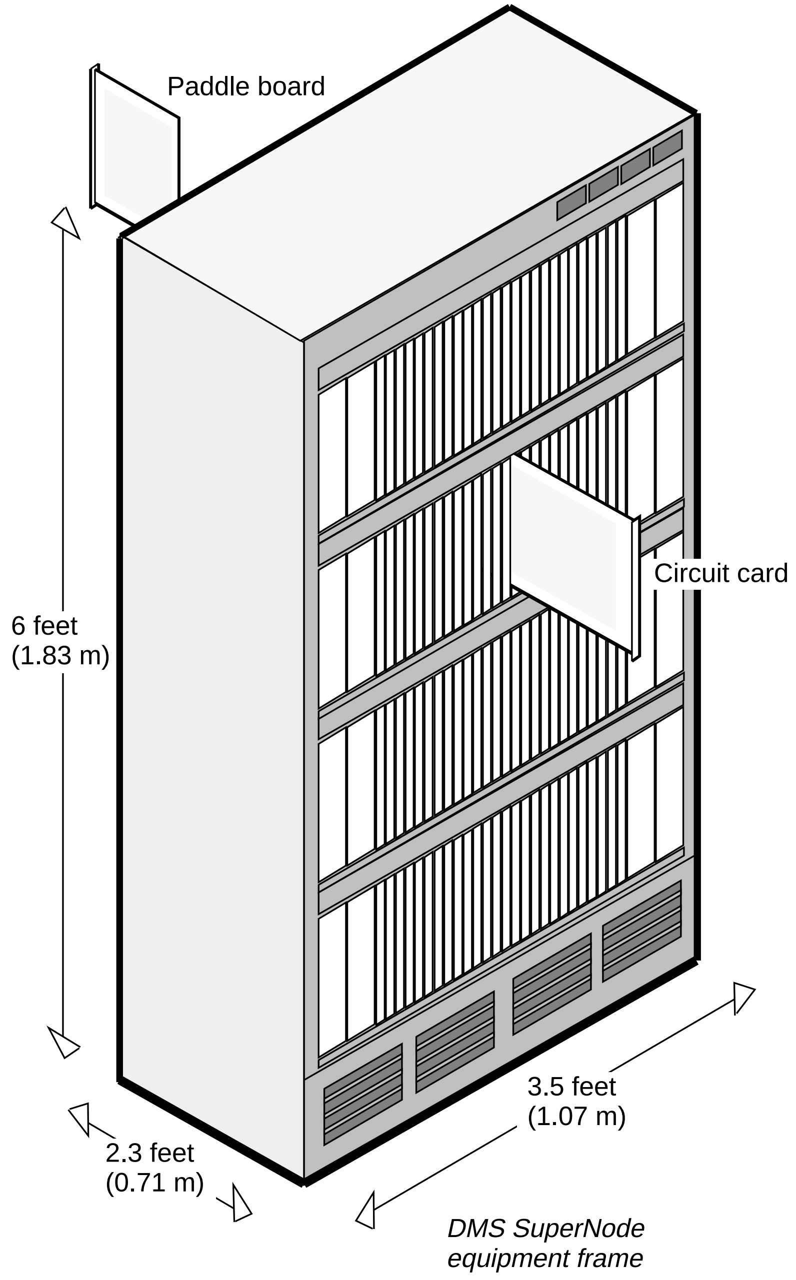
DMS SuperNode equipment frames

The following STP subsystems use DMS SuperNode equipment frames:

- dual-plane combined core
- link peripheral processor

Figure 2-10 illustrates the standard DMS SuperNode equipment frame.

Figure 2-10xxx
DMS SuperNode equipment frame



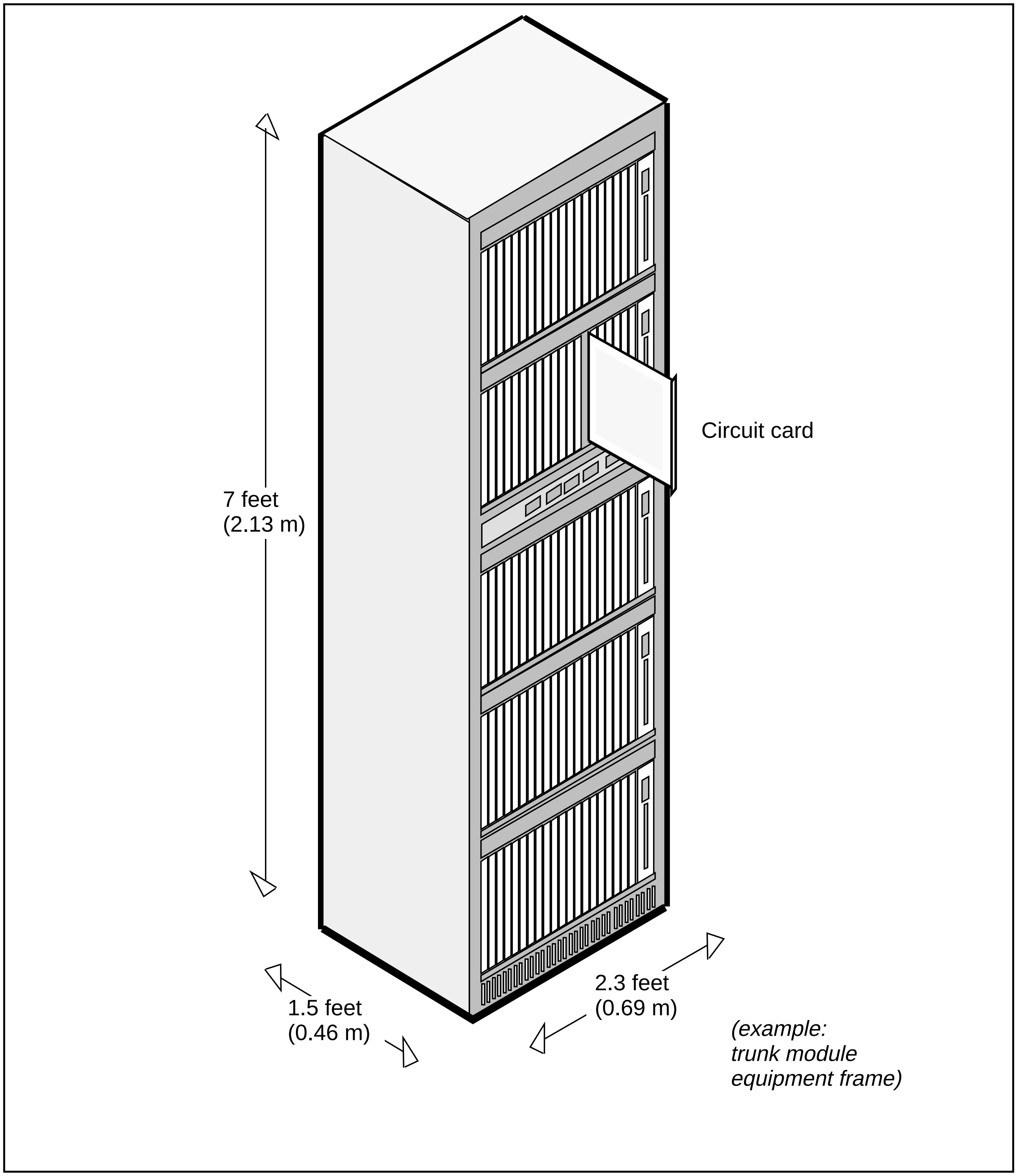
DMS-100 Family equipment frames

The following STP subsystems use DMS-100 Family equipment frames:

- trunk module equipment
- double shelf network equipment
- input/output equipment

Figure 2-11 illustrates the standard DMS-100 Family equipment frame.

Figure 2-11xxx
DMS-100 Family equipment frame



Typical STP equipment frame layouts

Table 2-6 lists representative floor space requirements for four typical STP office configurations.

Table 2-6xxx
Typical STP floor space requirements

Number of CCS7 links Two-slot LIU7s	Three-slot LIU7s	Number of LPPs	Equipment footprint	Minimum required floor space
36	24	1	26.45 sq ft 2.48 sq m	163.2 sq f 15.16 sq m
72	48	2	34.50 sq ft 3.24 sq m	199.4 sq ft 18.52 sq m
180	120	5	58.65 sq ft 5.52 sq m	308.0 sq, ft 28.61 sq m
324	216	9	98.90 sq ft 9.32 sq m	431.0 sq ft 40.04 sq m

The start-up footprint for common equipment frames is approximately 21 square feet. Each link peripheral processor (LPP) adds approximately eight square feet.

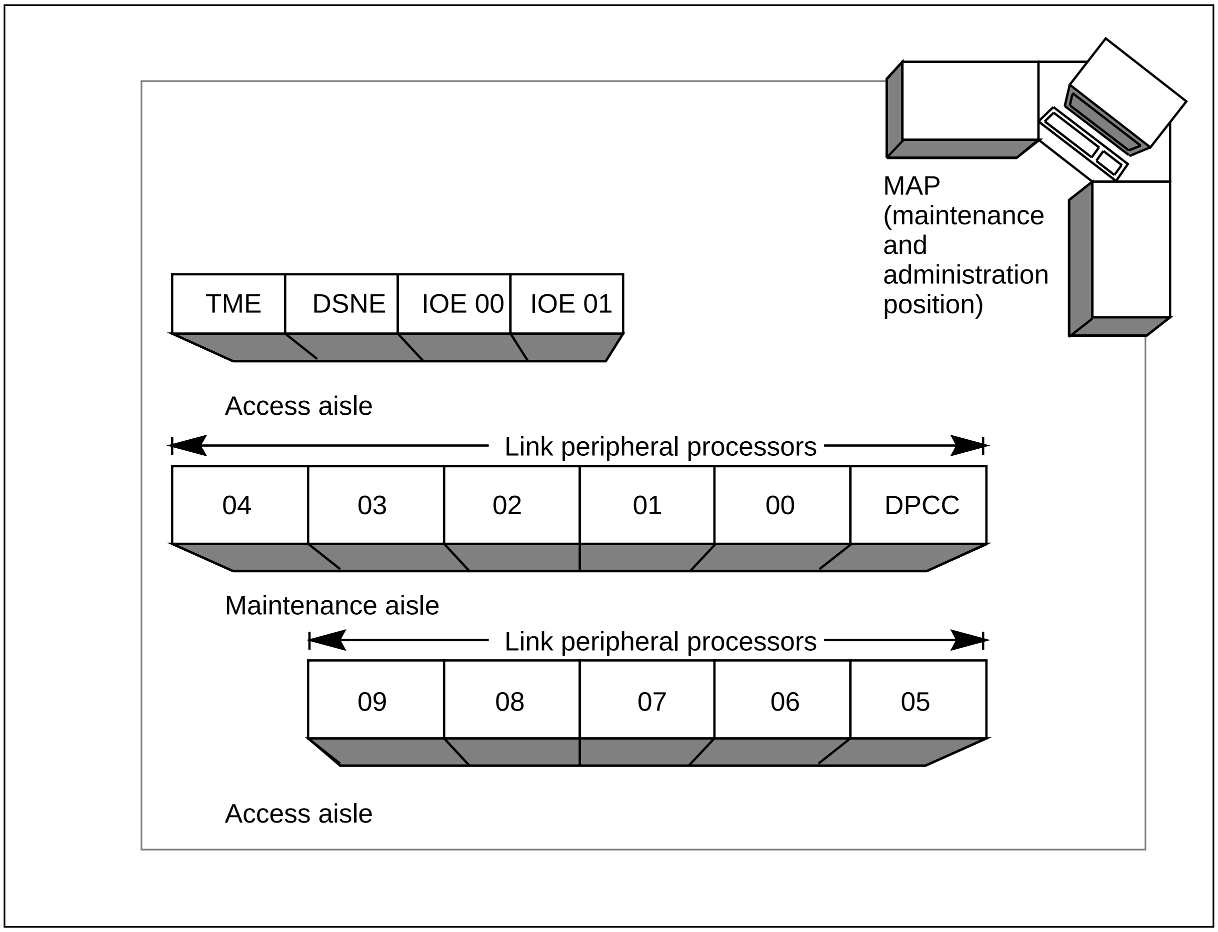
When planning the layout of STP equipment frames, use the aisle specifications provided in Table 2-7.

Table 2-7xxx
Aisle widths

Item	Size
Clearance between equipment frames and walls	3 ft (0.92 m) minimum
Width of access aisles	4 ft 6 in (1.38 m) minimum
Width of maintenance aisles	3 ft (0.92 m) minimum

Figure 2-12 illustrates a typical STP equipment frame layout. Although not indicated, it is assumed that cabinets for spares are available elsewhere on site.

Figure 2-12xxx
Typical STP equipment frame layout for ten LPPs



Floor loading specifications

Table 2-8 lists the equipment loads that must be taken into account when considering floor loading.

Table 2-8xxx
Equipment loads

Item	Load value
Fully equipped frames plus cabling	115 lbs/sq.ft. (561.5 kg/sq.m)
Battery equipment	300 lbs/sq.ft. (1,464.8 kg/sq.m)
Ceiling supported cabling on the floor below	10 lbs/sq.ft. (48.8 kg/sq.m)

Floor deviation

Floor deviation must not exceed one inch from the specified floor elevation. The maximum difference between high and low points in any 20 square feet (1.86 square meters) of floor area must not exceed 0.75 inches (1.9 cm).

Ceiling clearances

The recommended clear ceiling height is 132 inches (11 feet), while the minimum clear ceiling height is 120 inches (10 feet).

Entrance clearances

Equipment frames must remain crated until they are moved into the building in which they are being installed. Crated frames are 7 feet, 5 inches high, and 5 feet, 6 inches wide. To accommodate the crates and hoisting equipment, the building entrance must be 10 feet by 5 feet To move uncrated frames into the equipment room in an upright position, the entrance to the room should be 8 feet by 3 feet.

System grounding requirements

The resistance of the building principal ground for the central office building should be as low as possible and must never exceed the limits set by the local electric utility.

STP frames comply with UL, NEC, CEC and OSHA standards. For further information, refer to the end of this section of the document.

For further information regarding system grounding requirements, refer to *Power Distribution and Grounding Systems*, 297-1001-156, and contact your local electric utility for regulations in your region.

Environmental operating requirements

The environmental operating requirements for the STP are the same as those for all other DMS-100 Family equipment. Table 2-9 lists the environmental operating requirements for the STP. Short-term (as used in the table) is defined as 72 continuous hours and 15 days maximum per year.

Operation in temperature range from 40°F to 100°F (5°C to 38°C), is permissible provided the monthly average for the upper range does not exceed 86°F (30°C). All performance and reliability parameters are met in this temperature range.

Table 2-9xxx
Environmental operating requirements

Parameter	Operating conditions Normal	Short-term
Ambient temperature	50° to 86°F 10° to 30°C	40° to 120°F 5° to 49°C
Relative humidity (non-condensing)	29% to 50%	20% to 80%
Atmospheric pressure	586 mm Hg (78.8 KPa) corresponding to 10,000 ft (3,049m) altitude	Not applicable

Temperature and humidity are measured at a point 5 feet (1.254 m) above floor level, and mid-aisle or 15 inches (381 mm) in front of the equipment, whichever is smaller.

The rate of change should not exceed 12°F (6.7°C) per hour.

Environmental storage requirements

STP equipment can be stored in a sheltered environment under the environmental conditions listed in Table 2-10.

Table 2-10xxx
Environmental storage requirements

Parameter	Storage conditions
Ambient temperature	-58° F to 160°F -50° C to 71°C
Humidity	10% to 95% (maximum water vapor pressure not to exceed 25 mm Hg)
Atmospheric pressure	not to exceed 25 mm Hg (3.36 KPa) corresponding to 5,000 ft (1,524 m)

Standards compliance

The STP frames are listed by Underwriters Laboratories (UL). Recent variations to STP equipment have been submitted to UL for listing. Accessory equipment used on the STP, consisting of lighting fixtures and end guards, are UL Listed Accessory Equipment.

The customer will be notified of delivery of any components which do not comply with UL standards.

Communication utilities are exempt from National Electrical Code (NEC), Canadian Electrical Code (CEC), and Occupational Safety Hazard Association (OSHA) standards. Customers installing STP equipment in a location where they are not the telephone utility should contact Northern Telecom regarding possible noncompliance.

Contact Northern Telecom for compliance of a specific installation with electrostatic discharge (ESD) and earthquake protection standards.

Frame are available with comply with Federal Communications Commission (FCC) Part 15 (limiting levels of electromagnetic emission). Contact Northern Telecom for further information.

STP capacity and performance

The STP is a signaling transfer point in the CCS7 network. As a transfer point, it typically does not initiate or terminate any CCS7 messages. Because of this, the major capacity issue of the STP is its traffic-handling capacity. This chapter describes the traffic handling capacities of the STP as well as the physical capacities (that is, how many links and LIU7s can be physically connected to a STP).

A major advantage of the STP is the speed with which it processes CCS7 messages. The STP achieves its exceptional throughput capacity in part by processing CCS7 message transfers at the level of the link interface unit (LIU). By the time a message reaches the local message switch, all essential translations have already been accomplished, thus freeing the LMS and the DMS-Bus to distribute messages in the most efficient manner.

The STP has more than enough capacity to handle all of the messages that can be generated from 255 LIU7s, even in the worst possible scenario: when all signaling data links are operating at 56 Kbps, all links are loaded to 0.8 erlang, and all messages require global title translation (GTT) and Gateway Screening.

Capacity of an STP

The capacity of an STP can be expressed as the total message throughput the switch can sustain. The STP's message-handling performance is determined by the number of available links and the bandwidth of those links.

Throughput limitations

The various components of the STP have individual throughput limitations which are discussed below.

The DMS-core is not discussed, as it is not directly involved in CCS7 message transport across the STP. DMS-core performance does not affect STP CCS7 traffic-handling capacity.

DMS-bus capacity

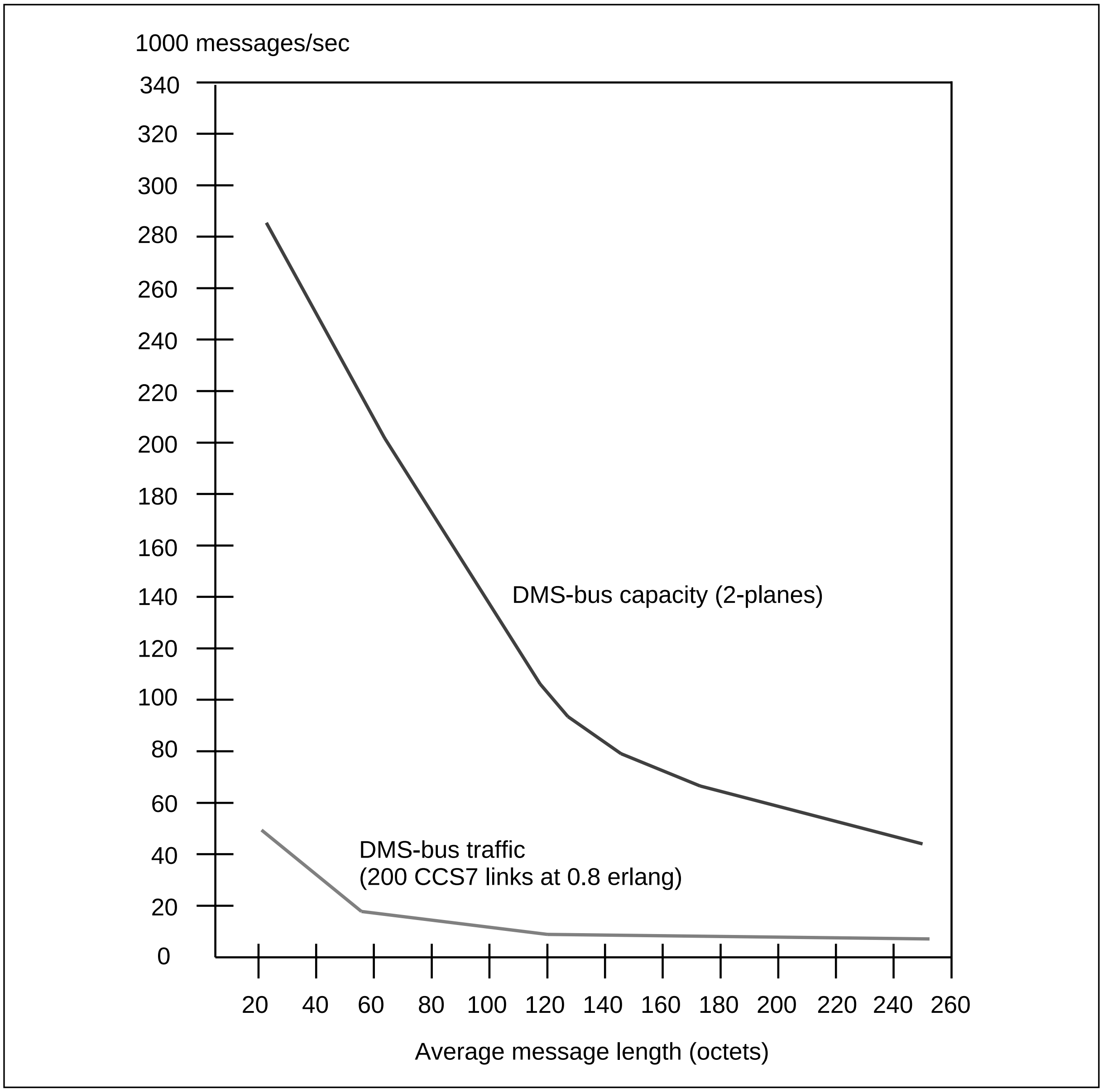
The DMS-bus places limits on the maximum throughput of the entire STP; however, DMS-bus capacity is not a limiting factor in overall STP performance.

DMS-bus occupancy for 255 link interface units (LIU7s) running at 0.8 erlang (with 25-octet long messages) is about 24%, in the worst-case situation where all message traffic is being routed between LPPs.

The capacity of the DMS-bus to carry CCS7 message traffic within the STP can be expressed as a function of message length.

Figure 3-1 illustrates the relationship between the STP's internal throughput and message length. Message length changes with different types of message traffic. This graph shows throughput against signaling link message length. It assumes a worst case of all traffic being inter-LPP. The DMS-bus capacity is shared over both MS planes.

Figure 3-1xxx
STP message switch throughput



Note: This figure shows the DMS-bus capacity for message traffic. The DMS-bus traffic line does not reflect non-CCS7 traffic.

F-bus throughput

The F-bus places limits on the maximum throughput of the particular LPP; however, F-bus capacity is not a limiting factor in overall STP performance. The F-bus can support the maximum number of LIU7s (36 LIU7s in an LPP) at 0.8 erlang.

LMS throughput

The local message switch (LMS) places limits on the maximum throughput of the particular LPP; however, LMS capacity is not a limiting factor in overall STP performance. The LMS can support the maximum number of LIU7s (36 LIU7s in an LPP) at 0.8 erlang.

DS30 throughput

The DS30 links place limits on the maximum throughput of the particular LPP; however, DS30 capacity is not a limiting factor in overall STP performance. When all DS30 links are available, all LIUs in the LPP can support 0.8 erlang.

LIU7 throughput

Normally, CCS7 signaling links are engineered for a 0.4 erlang load. The LIU7 is capable of handling all the traffic a properly engineered CCS7 link can supply (even at 0.8 erlang load, which may occur if the mate STP or signaling links experience failure).

LIU7 throughput is not a limiting factor in STP performance.

The throughput of an LIU7 depends on the nature of the message traffic (that is, the average message length). Table 3-1 lists LIU7 message throughput rates for various typical message lengths.

Table 3-1xxx
Signaling link message throughput

Average message length (octets)	LIU7 throughput at 0.4 erlang (messages/sec)	LIU7 throughput at 0.8 erlang (messages/sec)
25 (typical for ISUP messaging)	112	224
50	56	112
85 (typical for TCAP messaging)	33	66
200	14	28

Note: These throughput values remain valid when global title translation (GTT) is used.

CCS7 link bandwidth

Each CCS7 signaling link is engineered for 0.4 erlang load under normal conditions, and for 0.8 erlang load in the case of a link or node failure. CCS7 link bandwidth is typically 56 Kbps. (The maximum bandwidth is 64 Kbps.)

The CCS7 bandwidth limits the message-carrying performance of the LIU7s. The effective message throughput of a CCS7 signaling link is reflected in Table 3-1 above.

MDR7 throughput

The MDR7 bandwidth is 12 kilobytes per second for the EIU pair. When message rates are kept below this, the only likely message loss occurs on the Ethernet LAN, and is recovered by transmission control protocol/Internet protocol (TCP/IP).

Link limitations

The link limitations shown here apply in BCS32.

Number of LIU7s in the STP

The number of link interface units (LIU7) places limits on the maximum throughput of the entire STP. The STP has been fully verified and deployed with up to 255 CCS7 LIU7s, in BCS32.

This is the critical engineering consideration with regards to traffic throughput. The STP is link limited-traffic throughput is determined by the number of available signaling links.

Number of LIU7s in each LPP

The number of LIU7s in an LPP places limits on the maximum throughput of the particular LPP. An LPP can house a maximum of 24 three-slot LIU7s, or 36 two-slot LIU7s.

Number of LPPs

The number of link peripheral processors (LPP) places limits on the maximum throughput of the entire STP, depending on the configuration (that is, the total number of LIU7s housed). A maximum of ten LPPs can be equipped on the STP in BCS32.

Total throughput

The maximum throughput of an STP is a function of the number of signaling links which are available to it. With 25-octet CCS7 messages at 0.8 erlang, 255 signaling links yield 57,120 messages per second.

Each signaling link contributes an available throughput of 112 25-octet CCS7 messages per second, under normal (0.4 erlang) conditions.

STP cross-delay

With the STP architecture, processor handling time is made up of message processing time (within each LIU7), plus the queuing and transmission delays associated with the shared transmission resources of the LIU7s.

Global title translation (GTT) is performed by the LIU7. GTT does not impose processing load on the computing module (CM). Each LIU7 processor can handle GTT on all messages received on a signaling link. The STP distributed-processor architecture allows GTT to be applied without significant impact on STP cross-delay, beyond that associated with the message length alone.

When all components of the STP are kept within their engineered limits, the STP meets the Bellcore Cross Office delay requirements. Processor handling time at mean and 95 percentile points is significantly less than the Bellcore allowances.

STP cross-delay is shown in Table 3-2 on page 3-7.

Table 3-2
STP cross-delay

Minimum	Mean	95%
40% of messages requiring GTT 30% of messages requiring full gateway screening		
20 octets		
Normal	13.0	15.0
Failure	20.0	28.0
279 octets		
Normal	53.8	55.0
Failure	53.2	54.4
100% of messages requiring GTT 30% of messages requiring full gateway screening		
20 octets		
Normal	16.0	18.0
Failure	23.0	31.0
279 octets		
Normal	56.8	58.0
Failure	56.2	57.4

Performance standards

Accuracy

The STP conforms to the following standards of accuracy:

- undetected errors-not more than 1 in 10^{10} messages sent will be delivered with an undetected error
- loss of message-not more than 1 in 10^{7}
- messages out of sequence-not more than 1 in 10^{10}, including duplicated messages

Reliability

The DMS-STP’s DMS-core operates in a matched synchronized mode. Only one plane is online at any given time, while the other is in hot-standby, ready to switch activity automatically if a failure is detected-no messages are lost in this process. In addition, while the unit pairs of both the DMS-bus and the local message switch normally operate on a loadsharing mode, each unit has the capacity to carry the full signaling load if the other fails. The reliability figures assume

- fault detection coverage is 99% for the LMS and LIU7 and 99.9% for the DMS-core and DMS-bus
- mean-time-to-repair is 0.5 hours for an attended office and three hours for an unattended office
- error correction is employed with repair only when a fault cannot be corrected (error correction is logged to allow preventative maintenance prior to failure)

Projected link downtimes for STP hardware are

- 9.4 minutes per year at an attended office
- 56.2 minutes per year at an unattended office

The downtime allowance is partitioned among hardware, software and procedural failures. The exact partitioning is a function of system architecture and the interdependency-from a failure standpoint-of individual hardware and software components. An allowance of 75 minutes of the total allowable downtime of 155 minutes has been allocated to hardware failure.

STP features

The STP system provides all features and adheres to all requirements in Bellcore's technical reference document TR-TSY-000082. This chapter describes the major features that are available with the STP.

Gateway Screening

Gateway Screening is the STP security feature which allows the operating company to control access to the CCS7 network. When placed on an STP at the entrance of the CCS7 network, this feature allows the operating company to offer revenue-generating intelligent network services without risking proprietary information.

Key applications include

- verification of out-of-region credit cards
- implementation of CLASS in metropolitan areas served by more than one operating company
- Gateway Screening for ISDN applications

By monitoring selected data from CCS7 protocol labels, the Gateway Screening feature stops unauthorized access to CCS7 network databases and prevents use of unleased facilities and services.

Traffic from unstable CCS7 networks can also be blocked quickly when signs of messaging difficulties appear.

The optional CCS7 Message Detail Recording (MDR7) feature allows operating companies to bill private networks or other operating companies for CCS7 services on a usage-sensitive basis.

The Gateway Screening feature uses the LIU7s routinely provisioned with every STP. STP architecture provides a microprocessor at each LIU7, allowing Gateway Screening capabilities to be added to base STP functions with only minimal impact on CCS7 message throughput. In addition, Gateway Screening provides the following benefits:

- flexible screening that allows a different set of screening instructions for each STP CCS7 linkset

- the ability to use elements of both the CCS7 message transfer part (MTP) and/or signaling connection control part (SCCP) to screen messages
- interface to SEAS, which allows Gateway Screening to be monitored and controlled from a centralized operations support facility

The optional Gateway Screening validation feature enables screening rules to be verified before they are implemented.

Signaling, Engineering, and Administration System (SEAS)

The Signaling, Engineering, and Administration System (SEAS) and the Signaling, Engineering, and Administration Center (SEAC) that directs it provide a single administrative center that uses STPs to monitor and coordinate the elements of the CCS7 network.

The SEAC consists of a mainframe computer provisioned with the SEAS software developed by Bellcore. Using BX.25 links, a regional SEAC interfaces with SEAS software to compile traffic, routing, and performance data into the comprehensive view needed to efficiently manage and direct the CCS7 network.

SEAS assists the operating company in the following two key areas:

- comprehensive network surveillance and planning
- provisioning of STP nodes and signaling data links (SDL)

The STP SEAS interface provides the following functions, as specified in Bellcore document TA-TSY-000310:

- collection of engineering data to aid in sizing STP traffic-sensitive components by comparing service objectives to data collected from the SEAS network
- service surveillance to provide continuous monitoring of STP performance from the SEAC, allowing the operating company to collect the advance planning information necessary to determine the long-range CCS7 maintenance priorities
- recent change and verification capabilities to allow the SEAC to provision the STP with current tables whenever customer translation data is updated and to audit STP tables by requesting that data on a specific item or an entire table be forwarded for analysis
- SEAS for Gateway Screening to allow the SEAC to monitor the data generated by the STP Gateway Screening feature

SEAS (release 2.0)

The optional SEAS (release 2.0) feature extends STP capabilities by supporting Bellcore’s SEAS TA-TSY-000310, release 2.0. This release provides the following enhancements to the SEAS interface:

- new test message to support lab-to-lab and on-site testing of SEAS interface
- new recent change and verification capabilities
- enhanced reporting of system status

Global title translation

Global title translation (GTT) translates an application-specific address, such as a dialed 800 number, into the CCS7 network address, usually that of the appropriate SCP, where this number is translated into the telephone numbering plan address needed to complete the call.

The STP can perform global title translation at each LIU7. Since a processor and memory reside in each LIU7, GTT does not impose any processing load on the DMS-core. Messages requiring GTT are processed with no significant impact on cross-STP delay beyond that associated with the message length alone.

Enhanced maintenance

The optional enhanced maintenance feature reduces maintenance costs and improves the operating company’s ability to test datalink transmission facilities to the far end by providing the following maintenance capabilities for the STP:

- DS-0A loopback
- bit error rate test (C7BERT)

The DS-0A loopback feature allows an enhanced version of the DMS-STP’s LIU7 paddle board to recognize a loopback code from the DS-0A network. This capability allows test patterns to be extended beyond outside plant facilities into the STP LIU7, permitting more comprehensive and economical testing of operating company networks.

C7BERT allows operating company personnel to use a MAP-level command to evaluate the performance of a CCS7 signaling link before putting it into service. The BERT capability can also help isolate hardware faults that are affecting the performance of signaling links already in the network.

V.35 subrate interface

The optional V.35 subrate interface feature, working in conjunction with the V.35 paddle board, protects the operating company’s investment in existing facilities and increases provisioning flexibility by allowing equipment operating at less than the standard 56 Kbps to interface with the STP. The

V.35 subrate interface lets the V.35 paddle board of the LIU7 to administer the DMS-STP's link rates at 56 Kbps, 19.2 Kbps, 9.6 Kbps, 4.8 Kbps, or 2.4 Kbps on a per-LIU7 basis.

No external rate-adaption equipment is needed when this feature is provisioned, which further reduces operating company costs.

MTP preventive cyclic retransmission

The preventive cyclic retransmission (PCR) feature provides cost-effective error recovery for signaling links which have high propagation delays. This feature is designed for facilities with a one-way delay of 15 milliseconds or more.

Under ordinary error recovery procedures, a signaling point must receive a negative acknowledgement from the far end before it retransmits a message that was received incorrectly at its destination. Such methods introduce unacceptable delays in error recovery for messages delivered over long distances.

Preventive cyclic retransmission prevents this delay by continuously retransmitting a message until a positive acknowledgement is received from its destination point.

CCS7 Message Detail Recording

The delivery of advanced network services often requires the interaction of multiple CCS7 networks and the use of resources owned by several operating companies and/or their customers.

The CCS7 Message Detail Recording (MDR7) feature provides a tool that allows the operating company to measure the use of its CCS7 facilities by other CCS7 networks.

Hardware provisioning

This chapter provides guidelines that should be followed when provisioning the STP system hardware. For more detailed provisioning information, refer to the chapter titled “Provisioning the DMS-STP,” in *DMS SuperNode Signaling Transfer Point Planning and Engineering Guide*, 297-5101-101. For component product engineering (PEC) codes refer to the chapter titled “Hardware,” in this document.

Determining the number of signaling links required

An STP can have five different types of link connections in the CCS7 network. For a description of the CCS7 network, refer to the chapter titled “Understanding the DMS-STP,” in *DMS SuperNode Signaling Transfer Point Planning and Engineering Guide*, 297-5101-101.

The total traffic capacity between two nodes in the CCS7 network depends on the number of links installed

A-links

The number of A-links needed to connect a particular SSP or SCP to STPs relates to the service requirements of the SSP or STP. It does not relate to the service requirements of the STP. For more information, refer to *DMS SuperNode Signaling Point/Service Switching Point Planning and Engineering Guide*, 297-5121-101 or to *DMS SuperNode Service Control Point Planning and Engineering Guide*, 297-5131-101.

B- and D-links

To determine the number of B- and D-links needed at the STP site, examine the levels of signaling traffic expected over those links, given the network configuration in which they are to be used.

Procedure 5-1 is the procedure used to calculate the required number of B- and D-links needed at the STP.

Procedure 5-1xxx
Signaling link provisioning calculations

Step	Action
1	Determine the forecasted busy hour traffic load between the two STPs.
2	Calculate the number of links using $$\text{Number of links} = \frac{\text{maximum traffic load in either direction (octets/sec)}}{2{,}800}$$
	Note: It is possible that the traffic load going in one direction between two nodes will not be the same as the traffic load going in the opposite direction. In this calculation, use the maximum traffic load for whichever direction has the highest peak traffic.
3	You have completed this procedure.

C-links

One C-link must be connected to each link peripheral processor (LPP) in an STP. A minimum of two C-links must be connected to each STP. The number of C-links required is greater than or equal to the number of links in the largest linkset in the STP.

E-links

The number of E-links needed to connect a particular SSP or SCP to a particular STP relates to the service requirements of the SSP or SCP. It does not relate to the service requirements of the STP. For more information, refer to *DMS SuperNode Signaling Point/Service Switching Point Planning and Engineering Guide*, 297-5121-101 or to *DMS SuperNode Service Control Point Planning and Engineering Guide*, 297-5131-101.

MDR7

The MDR7 option consists of Ethernet interface unit hardware and application software. For more information on MDR7, refer to *DMS SuperNode Signaling Transfer Point Planning and Engineering Guide*, 297-5101-101.

The MDR7 uses two Ethernet interface units (EIU) which are installed in an LPP on the STP. One EIU operates as an active transceiver while the other stands by in case of a failure.

The maximum number of links allowed for an STP (255) includes EIU links.

Determining the required number of LPPs

The determination of how many LPPs a particular STP installation requires is simply a matter of determining how many signaling data links are required.

Each LPP can house up to 36 LIU7s. To determine the required number of LPPs for a particular STP, divide the total number of signaling links to be equipped by 36, and round up.

> ***Note:*** If three-slot LIU7s are being used instead of two-slot LIU7s, only 24 links can be accommodated in an LPP. In this case, divide the total number of required links by 24 and round up. Where a mix of two- and three-slot link interface units are going to be used, the number of LPPs required depends on the placement of the two- and three-slot interface units.

Common equipment

Dual-plane combined core cabinet

The DMS-core is not provisionable. Provisionable items within the DPCC cabinet are

- DS30 interface cards (NT9X17AA):
  two per LPP, one for the DSNE, one for the IOE
- MS four-port paddle boards (NT9X23BA):
  two per LPP, one for the DSNE, one for the IOE
- filler faceplates (NT9X19AA):
  34 minus 2 per LPP
- filler paddle boards (NT9X19BA):
  34 minus 2 per LPP
- system load module (NT9X07) shelf:
  one per STP

Input/output equipment frame

Provisionable items within the IOE cabinet are

- backup Winchester disk drive unit and a power converter card (if required)
- multi-protocol controller (MPC) for systems that require frequent administrative communications with the STP or require interface to the Signaling, Engineering, and Administration System (SEAS) (a minimum of two MPCs is recommended for the SEAS application-one MPC should be provisioned in each of the two IOC shelves of the IOE frame)

A second IOE cabinet is provisionable. Provision a second IOE cabinet if power redundancy is required.

Disk drive units

In a single-frame offices one 14-inch Winchester DDU and a power converter card are installed. If a second frame is added to a single-frame office then the final configuration is two 14-inch Winchester DDUs. In a two-frame office, two 8-inch or two 5.25-inch Winchester DDUs and two power converters can be installed.

Magnetic tape units

The IOE may be equipped with one magnetic tape drive. The tape used in this tape drive is nine-track and 16000 bits per inch.

Input/output controllers

Input/output controllers (IOC) are required for DDUs and magnetic tape drives. These reside on two IOC shelves in the IOE frame, along with two I/O MSG controller circuit packs (NT1X62CA).

Video display units and printers

Video display units (VDU) and printers may also be required, and connect to the STP by way of IOC cards in the IOE frame.

Link peripheral processor

Link peripheral processors are provisionable. The number of LPPs is limited by the number of port connections that are available to the DMS-bus. Each plane of the DMS-bus can accommodate 68 DS30 ports to support the DS30 links from the local message switches of the LPP. Each LPP requires eight links, thus allowing the DMS-bus to support message transfers from up to ten LPPs.

Number of signaling data links supported

Each LPP can support up to 24 three-slot LIU7s, or 36 two-slot LIU7s. One LIU7 is required for each signaling data link.

Required floor space

Each link peripheral processor requires approximately eight square feet of floor space.

Equipment load

Each link peripheral processor adds approximately 920 pounds to the floor load.

CCS7 link interface units

Each three-slot LIU7 consists of the following set of cards and paddle boards that are provisioned in one of the link interface shelves of an LPP:

- one link general processor card (NT9X13CA)
- one P-bus to F-bus interface card (NT9X75)
- one STP signaling terminal card (NT9X76)
- one DS-0A interface paddle board (NT9X78AA or NT9X78BA)
  or
  one V.35 interface paddle board (NT9X77AA)

Each two-slot LIU7 consists of the following set of cards and paddle boards that are provisioned in one of the link interface shelves of an LPP:

- one integrated processor and F-bus interface card (NTEX22AA)
- one STP signaling terminal card (NT9X76)
- one DS-0A interface paddle board (NT9X78AA or NT9X78BA)
  or
  one V.35 interface paddle board (NT9X77AA)

Provisioning tools

NT8620 questionnaire

The DMS-100 Family engineering questionnaire, NT8620, is the basic provisioning tool for the STP and its components. This questionnaire, when filled out properly, provides the appropriate amount and types of equipment needed by the operating company to properly provision an STP.

NT Access provisioning tool

NT Access is the automated tool that is used for provisioning the components of the DMS-100 Family of switches. The DMS-100 Family Order Capture Document (NT8630) is the primary document used with this system to provision a STP.

Software

This chapter contains information on provisioning the STP system software. For more detailed software information, refer to the chapter titled "DMS-STP software" in *DMS SuperNode Signaling Transfer Point Planning and Engineering Guide*, 297-5101-101.

Software for the STP can be broken into the following two groups:

- software required for basic capabilities and operation
- software available to support enhanced STP capabilities

Required software

The following software is required for the STP:

- base software (shown in Table 6-1)
- support software (shown in Table 6-2)
- software for two-slot LIU7 applications (where two-slot LIU7s are used)

Table 6-1xxx
Base software

PEC	Package name and description	Includes
NTX832AB	STP Base (master package) (provides CCS7 capabilities)	NT000AA Bilge NT001AA Common Basic NT041AB CCS7-MTP/SCCP NT210AA No.2 SCC Interface NT270AA New Peripheral Maintenance Package
NTX960AC	DMS SuperNode Series 20 Processor (master package) (provides DMS SuperNode front-end capabilities)	NT000AA Bilge NT001AA Common Basic NTF70AA SuperNode SN-20 NT940AA Control Module Bilge NT941AA Control Module Common NT942AA DMS SuperNode System Load Module (SLM) NT950AA MS Bilge NT951AB MS Common

Table 6-2xxx
Support software

PEC	Package name and description	Includes
NTX833AA	STP Operations	Provides STP configuration software, including 18-digit global title translation (GTT) capabilities, link peripheral processor (LPP) maintenance support, and support software for DS-0A interfaces to the signaling links. One required for each LPP.
NTX048AA	Synchronization	Operates and maintains synchronous stratum clocks used by the STP. Includes synchronization on STP to the rest of the CCS7 network.
NTX056AA	Enhanced Administration	Allows office data to be modified through the table editor or the service order and query system (SERVORD).
NTX074AA	Disk Data Storage System	Controls the operations of disk drive units and the manipulation of files on disks.
NTX445AB	OM Selective Output	Allows monitoring of selective operational measurement (OM) groups which require special attention. Reduces print time of scheduled OM reports. Permits totals to be generated for registers across all the tuples.

Software to support enhanced STP capabilities

Software which is available to support additional STP capabilities is shown in Table 6-3.

Table 6-3xxx
Additional software

PEC	Package name and description	Includes
NTX835AA	DMS-STP SEAS Interface (1.1)	Supports STP interface to the Signaling, Engineering, and Administration System (SEAS). Requires NTX273AA.
NTX836AA	LPP - V.35 Subrate Links	Enabled the V.35 version of the LIU7 paddle board to administer CCS7 links at subrates of 2.4 Kbps through 19.2 Kbps. This is required only with the V.35 interface paddle board (NT9X77AA).

-continued-

Table 6-3xxx
Additional software (continued)

PEC	Package name and description	Includes
NTX839AB	LIU7 Enhanced Maintenance	Provides DS-0A loopback recognition and bit error rate testing (BERT) capabilities. Required only with the enhanced DS-0A paddle board (NT9X78BA).
NTX840AA	DMS-STP Gateway Screening	Provides the ability to control access to CCS7 networks and databases by other CCS7 networks. Access control information is provided through datafill.
NTXE55AB	DMS-STP SEAS Interface (2.0)	Extends STP SEAS interface capabilities. Needs NTX835AA
NTXE32AA	MTP-Preventative Cyclic Transmission	Provides error recovery for CCS7 signaling links that have high propagation delays.
NTX292AB/BA	Enhanced Security Package	Allows control of user access to STP through datafill.

End

Provisioning tools

NT8620 questionnaire

The DMS-100 Family Engineering questionnaire, NT8620, is the basic provisioning tool for the STP and its components. This questionnaire, when filled out properly, provides the appropriate amount and types of equipment needed by the operating company to properly provision an STP.

NT Access provisioning tool

NT Access is the automated tool that is used for provisioning the components of the DMS-100 family of switches. The DMS-100 Family Order Capture Document (NT8630) is the primary document used with this system to provision a STP.

STP maintenance

Maintenance and administration functions for the STP are performed through the maintenance and administration position (MAP). The MAP can be located locally with the STP or remotely. It can operate as a single entity for small applications, or as a large-system interface where a number of MAP units operate concurrently. For a detailed description of the MAP refer to *DMS-100 Family Maintenance and Administration Position*, 297-1001-110.

The STP is strategically placed, as a CCS7 network hub, to serve as a central position from which to loop test messages to the various nodes in a CCS7 network.

For detailed step-by-step maintenance procedures refer to the following documents:

- *DMS SuperNode Signaling Transfer Point Alarm Clearing and Performance Monitoring Procedures*, 297-5101-543
- *DMS SuperNode Signaling Transfer Point Trouble Locating and Clearing Procedures*, 297-5101-544
- *DMS SuperNode Signaling Transfer Point Recovery Procedures*, 297-5101-545
- *DMS SuperNode Signaling Transfer Point Routine Maintenance Procedures*, 297-5101-546
- *DMS SuperNode Signaling Transfer Point Card Replacement Procedures*, 297-5101-547

For detailed step-by-step administration procedures refer to *DMS SuperNode Signaling Transfer Point Administration Guide*, 297-5101-301.

Overview of maintenance actions

The MAP is the focal point of the STP maintenance. The MAP provides a continuous, dynamically updated status display to serve as the focal point of the STP maintenance system. In most cases, trouble or faults within the system are automatically detected by internal facilities and an appropriate report filed in the LOG system. Audible alarms are generated if appropriate. The log messages associated with the alarms have a priority-of-action flag, consistent with the urgency of the alarm. Major alarm messages indicate trouble conditions which require the attention of operating company personnel.

The MAP maintenance mode provides a number of displays or levels. Each level presents detail, in increasing depth, on certain hardware, and offers a menu of commands. Access to each level is arranged in the same hierarchy as the system hardware. When the level of the fault is reached, maintenance personnel are alerted by a series of status displays. Diagnostics may then be run to pinpoint the failure, and corrective action taken.

MAP components

The basic components of the MAP include a visual display unit (VDU) with keyboard, a voice communications module, with system test interfaces, and optional position furniture. Other devices, such as printers, are used in conjunction with the VDU, depending on operating company procedures. Figure 7-1 illustrates the maintenance and administration position.

Modems are required for remote MAPs located at distances greater than 1200 feet. A 300-, 1200-, 2400-, or 4800-baud modem can also be configured to permit dialing into the STP from remote MAPs.

Voice communications module

The voice communications module provides communication with other maintenance personnel in the same or in distant offices, including the monitoring of trunks and lines, and the testing of peripherals.

Communications trunks

Two communication trunks, used to originate calls, are associated with every MAP used for trunk testing.

Figure 7-1xxx
Typical MAP position

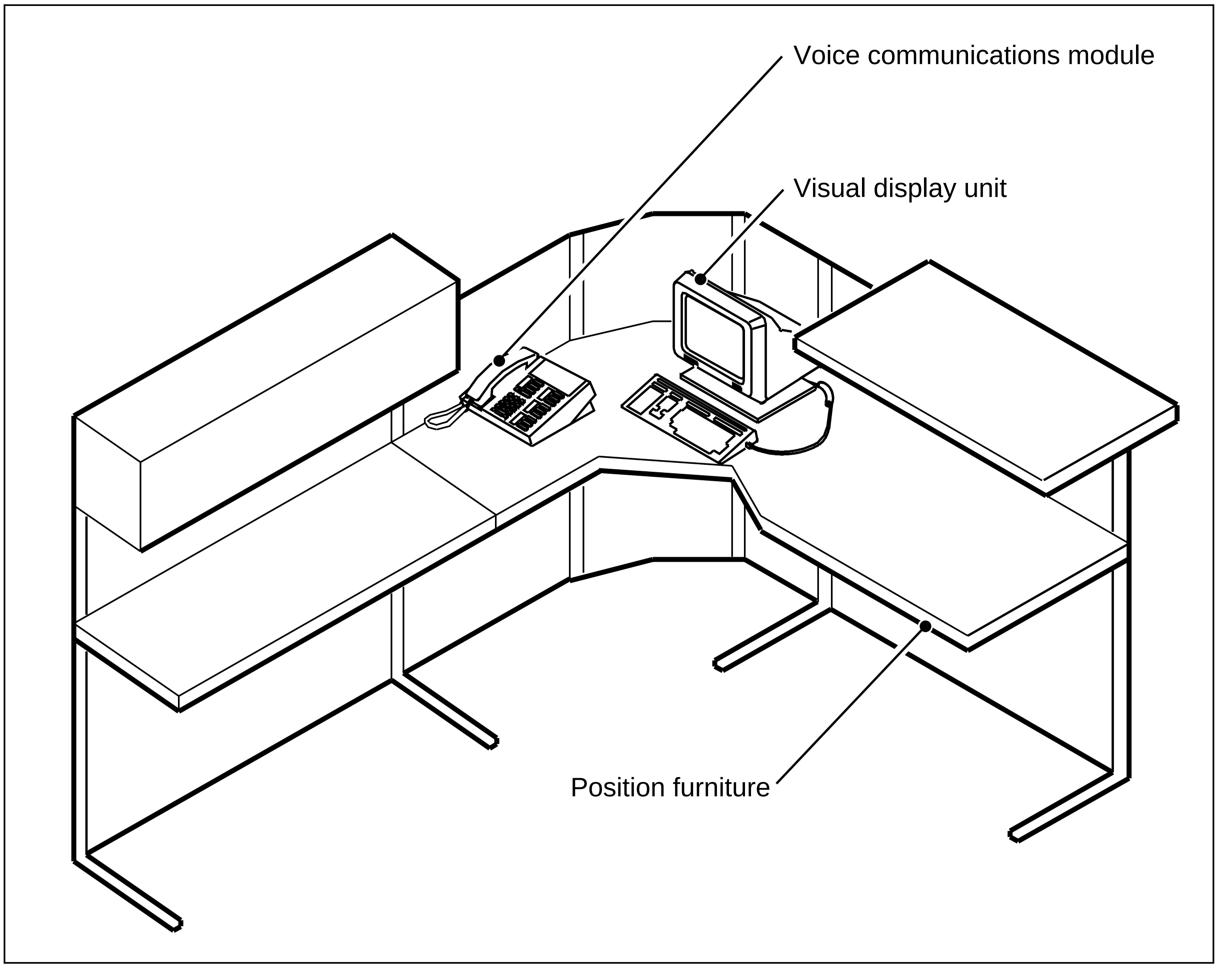
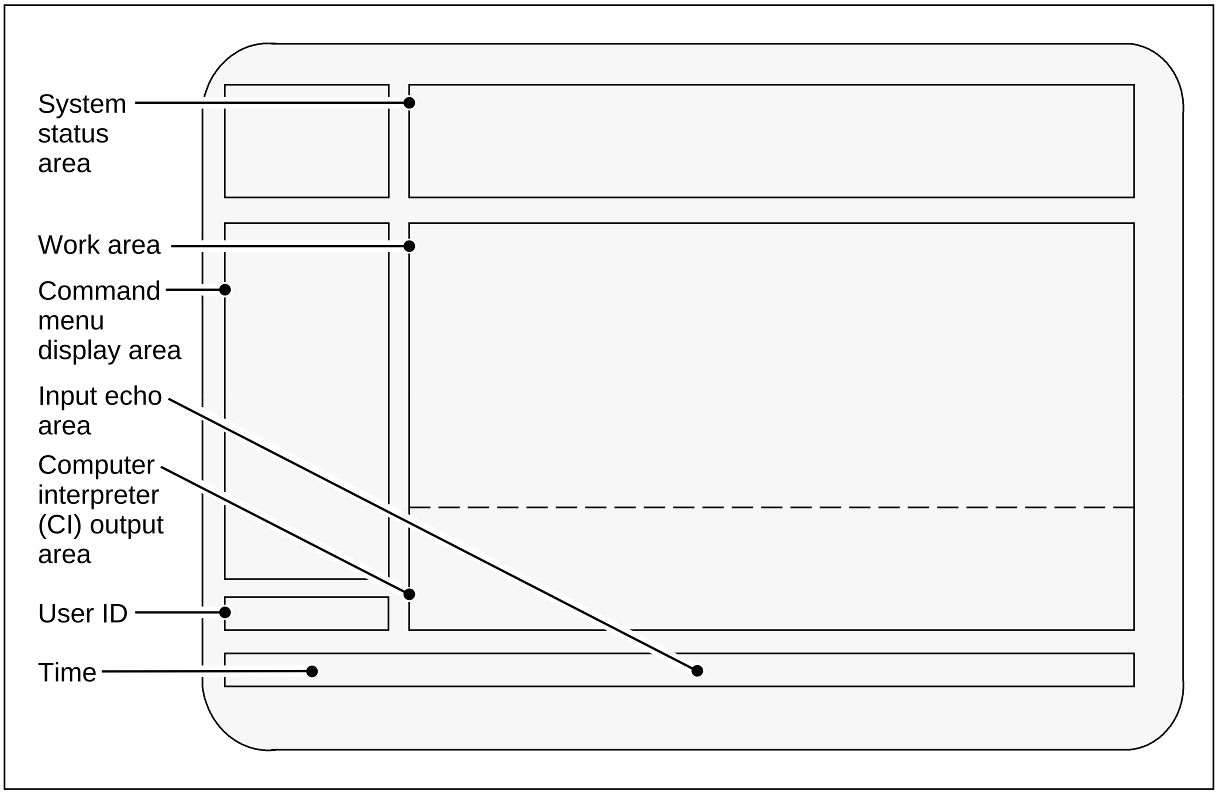


Figure 7-2 illustrates the VDU screen layout.

Figure 7-2xxx
Typical MAP screen layout



MAP operation

To gain access to the STP, the user inputs a series of commands on the VDU keyboard. The commands and associated responses are displayed on the VDU screen. These responses can be requests for further information from the user or contain the information requested by the user. The user logs onto the system by typing in a user ID and a password.

MAP security

The STP can provide automatic answer and dial-back. With this arrangement the user dials and then logs in with the prescribed user ID, password, and terminal number. This number is an automatic dial-back ID which may be a valid telephone number of up to ten digits, or a predefined index number.

The STP equipment offers command screening, password control, access control, audit trail, and automatic logout of dial-up lines on an optional basis.

Command screening

The command screening feature allows extensive screening of user commands before execution. Command screening can be applied to any user or terminal, or to both. DMS-100 equipment users and terminals are assigned single or multiple privilege command classes from 0 to 31, that is, up to 32, depending on the functions of the user or terminal.

Password control

The optional password control feature disables all current automatic logon procedures for the STP equipment to secure the system against unauthorized users. Users and passwords must be identified to the system before logging on. Password expiration warnings and a predesignated number of logon attempts before permanent lockout from the system is part of this feature.

Access control

This feature allows control of user access to the STP by controlling login access to consoles. Consoles may selectively enable or disable logins.

Offices can generate log reports when users modify or attempt to modify the customer data tables. An enhancement to the security table allows the telephone operating company to monitor both the user and the tables being accessed. All completed or aborted attempts to access a table are recorded in a log report.

Audit trail

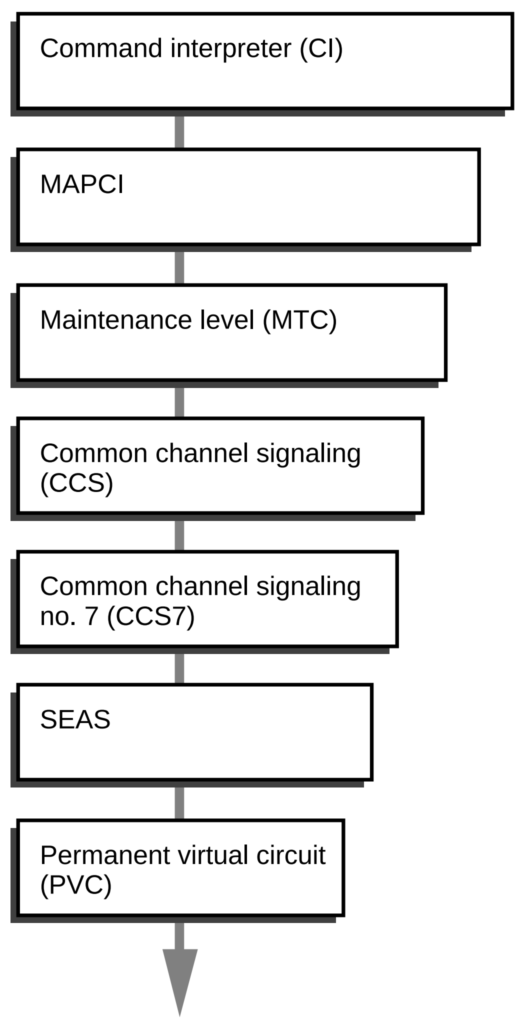
This feature provides control of user access and traces illegal entry attempts through the creation of an audit file of user entries.

MAP software support

The MAP provides access to SEAS functions through two levels reached through the CCS7 MAP level. The first level gives access to the operating state of SEAS through the SEAS overview screen. The second level displays the current operating state of the individual BX.25 circuits that link the STP to the SEAC.

The SEAS and permanent virtual circuit (PVC) levels are accessed through a telescoping series of menu commands. Figure 7-3 illustrates the location of the SEAS and PVC levels in the MAP hierarchy.

Figure 7-3xxx
SEAS and PVC levels in the MAP hierarchy



SEAS MAP level

The SEAS MAP level displays the current state of SEAS at the STP and makes available a series of commands that can be used to change that state.

PVC MAP level

As shown in Figure 7-4, the MAP display provides the operating state of each individual PVC.

Figure 7-4xxx
PVC MAP display

```
        CM     MS     IOD    Net    PM     CCS                   Ext
        ●      ●      ●      ●      ●      ●                     ●
 ____________________________________________________________________
0. Quit            |   SEAS
2. Post            |   InSv
3.                 |
4.                 |
5.                 |
6.                 |   PVCs   Offl   ManB   RMS    SysB   InSv   INI
7. Bay_            |   8      0      0      0      0      8      0
8. RTS_            |
9. Offl_           |  PVC  STATE      MPC    LINK   LC   PVCTYPE   PVCUSAGE
10.                |   0    InSv       2      2      2      C      all
11. Next           |   1    InSv       3      2      5      N      CMDs
12.                |   2    InSv       1      2      1      N      all
13.                |   3    InSv       0      2      3      C      CMDs
14. QueryFlt       |
15.                |
16.                |
17.                |
18.                |
                   |   >
```

STP enhanced maintenance

The enhanced maintenance feature provides DS-0A loopback and BERT testing capabilities for the STP.

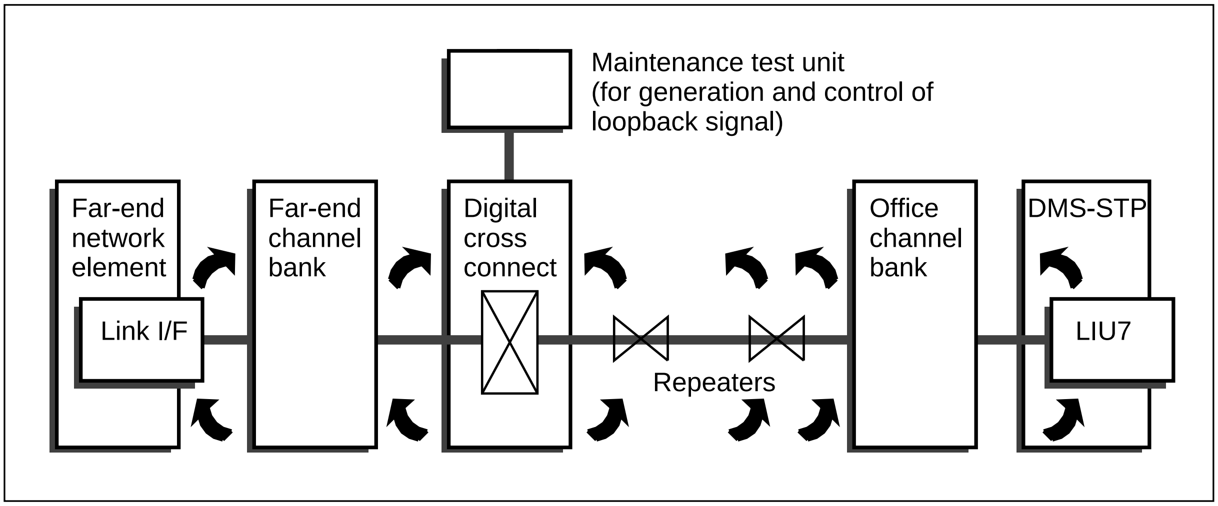
DS-0A loopback

Loopback testing is a method of testing that allows maintenance personnel to efficiently pinpoint the source of a problem in a network. This is done by looping test signals through various elements of the network.

The STP DS-0A loopback feature allows the STP to recognize a DS-0A loopback code, thus enabling a remote site to set up a test path between the STP and other CCS7 network elements. The bit error rate test feature provides a test pattern that can be looped back through a previously established test path to measure the quality of a link.

Figure 7-5 illustrates the typical DS-0A loopback paths used in loopback testing.

Figure 7-5xxx
Sample DS-0A loopback paths



Each LIU7 can also be manually placed into the loopback mode through a command from the LIU7 level at the MAP.

The STP can implement loopback testing through two modes: remote and local board. Remote loopback enables end-to-end testing of a DS-0A circuit Local board loopback enables internal STP testing of the signal terminal and the DS-0A paddle board by allowing the signal terminal to loopback data at the line side of the paddle board.

Bit error rate test

Bit error rate testing (BERT) measures the quality of a CCS7 signaling link. The C7BERT test on the STP repeatedly transmits a 2047-bit pseudo random pattern which complies with CCITT 0.152 specifications. It subsequently checks the pattern to verify that no bit errors have occurred.

> ***Note:*** Bit error rate test boxes should also comply with the 2047-bit CCITT 0.152 specification.

C7BERT allows testing of the link termination paddle board and the associated transmission facility.

This feature compares the bit pattern as it was transmitted against the pattern as it is received after being looped through a specified DS-0A circuit. A discrepancy between the two patterns reveals a problem in one or more of the facilities that make up the transmission path through the CCS7 network. Progressive looping back of the C7BERT signal through the various network elements can be used to isolate the problem’s source.

When the test originates at the STP, the the test pattern is generated by the LIU7 that interfaces the DS-0A circuit under test. Control of the C7BERT feature is integrated into the STP MAP. An auxiliary test box is not required to implement BERT testing from the STP.

If BERT testing is originated at another CCS7 node, the DMS-STP’s DS-0A loopback feature automatically cycles the BERT pattern through the STP and back to its originating node.

MAP commands can be used to initiate and control the following BERT operations:

- start a BERT test on a specified link
- stop BERT testing on a specified link
- query C7BERT for a snapshot of BERT statistics on a link currently under test

For more detailed information on loopback testing refer to *DMS SuperNode Signaling Transfer Point Trouble Locating and Clearing Procedures*, 297-5101-544.

Enhanced maintenance software requirements

The enhanced maintenance software package requires the following prerequisite software packages:

- STP Basic (NTX832AA)
- STP Operations (NTX833AA)
- Bilge (NTX000AA)
- Common Basic (NTX001AA)
- Synchronization (NTX048AA)
- Enhanced Administration (NTX056AA)
- Disk Data Storage System (NTX074AA)
- OM Selective Output (NTX445AA)

Enhanced maintenance hardware requirements

The enhanced maintenance feature requires one enhanced version of the DS-0A paddle board (NT9X78BA) for each SDL that interfaces the STP.

STP signaling and interface

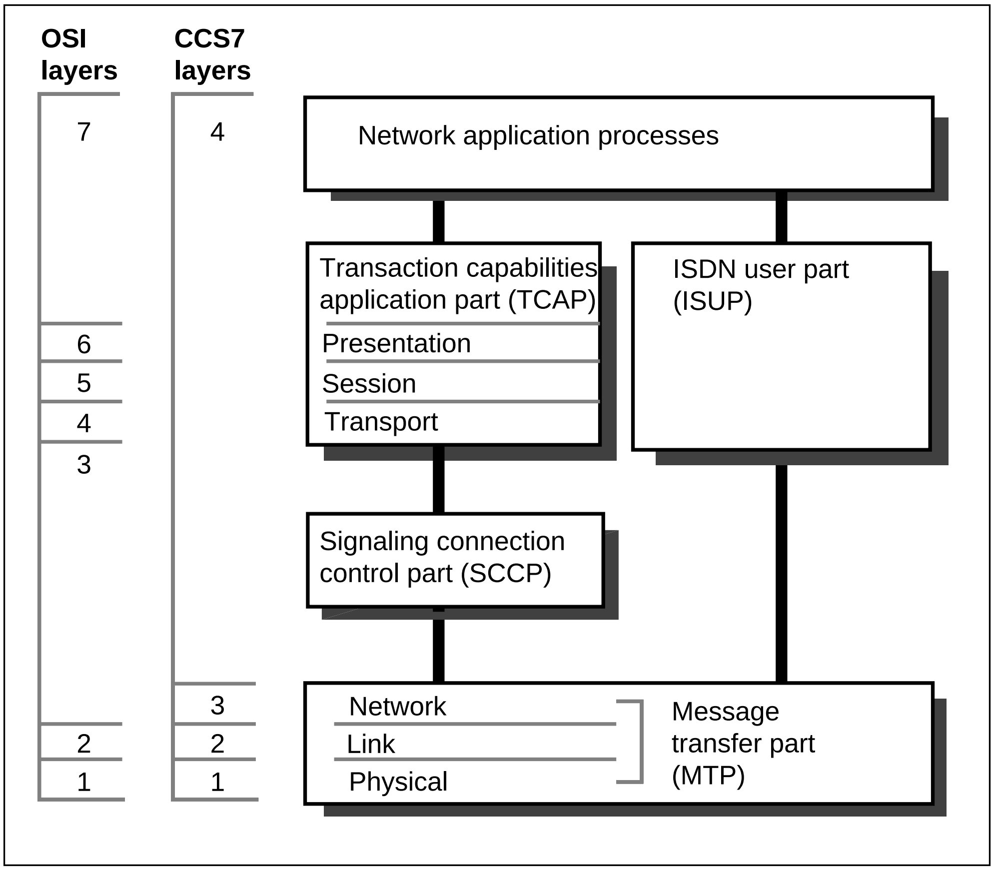
The STP is a key component of the CCS7 signaling network. CCS7 networks provide out-of-band signaling by using a separate high-speed data link for call set-up and routing. The STP provides the message routing capabilities between CCS7 nodes.

CCS7 signaling protocol

The DMS-100 system implementation of CCS7 uses a four-level structure which relates to the open system interconnection (OSI) as shown in Figure 8-1. Levels 1, 2, and 3 together are called the message transfer part (MTP). The overall function of the MTP is to serve as a connectionless transport system providing transfer of signaling messages between the locations of the communicating user or applications functions. OSI layers 1 and 2 directly correspond with levels 1 and 2; layer 3 of the OSI is subdivided into two layers which correspond to levels 3 and 4 respectively. Layer 4 is constructed to allow sublayering which provides functional partitioning for uses such as the signaling connection control part (SCCP) and the transaction capabilities application part (TCAP).

The CCS7 signaling network has two modes of operation. The first is the associated mode which refers to the connection of signaling links directly from one switching office to another. The second is the quasi-associated mode, which refers to the connection of signaling links directly to the signal transfer point.

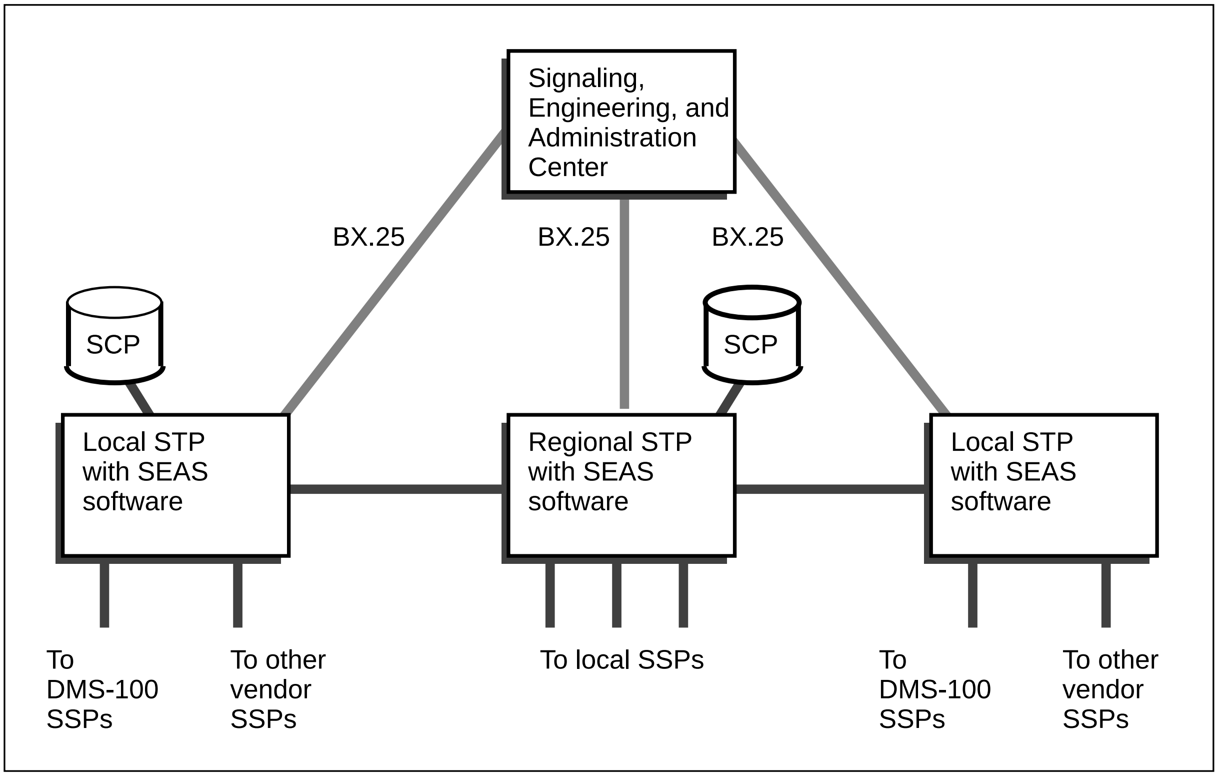
Figure 8-1xxx
Comparison of CCS7 levels with the OSI model



SEAS interface

The Signaling, Engineering, and Administration System (SEAS) provides a single administrative center that uses network signal transfer points to monitor and coordinate the elements of the CCS7 network. This center, the Signaling, Engineering, and Administration Center (SEAC), consists of a mainframe computer provisioned with SEAS software developed by Bellcore. Using BX.25 links, a regional SEAC interfaces with SEAS software in the signal transfer points connected to it. This interface enables the SEAC to compile traffic, routing, and performance data into the comprehensive view needed to efficiently manage and direct the CCS7 network. Figure 8-2 illustrates the SEAS interface to the CCS7 network.

Figure 8-2xxx
SEAS interface to the CCS7 network



SEAS aids operating company personnel in two ways: comprehensive network surveillance and planning, and provisioning of STP nodes and signaling data links (SDL).

The data that the STP and other signal transfer points deliver through the SEAS interface provides essential information needed to produce an overall plan that can ensure that proper capacity is strategically positioned in the various nodes of the network. The administration and engineering functions allow the operating company to process, store, and report traffic and performance data on a network-wide basis. This data, in turn, can be used to evaluate network performance, to balance loads between signal transfer point nodes, and to perform other network management tasks.

Once a network plan is in place, SEAS also functions to bring SDLs into service as needed and to assign and implement the translation data that the STP uses to route CCS7 messages through the network.

STP SEAS provides the following functions, as specified in Bellcore's document TA-TSY-000310:

- collection of engineering data to aid in sizing STP traffic-sensitive components, such as SDLs and linksets, by comparing service objectives to data collected from the SEAS network
- service surveillance to provide continuous monitoring of STP performance from the SEAC, allowing the operating company to collect the advance-planning information necessary to determine long-range CCS7 maintenance properties
- recent change and verification capabilities to allow the SEAC to provision the STP with current tables whenever customer translation data is updated, and to audit STP tables by requesting that data on a specific item or an entire table be forwarded for analysis
- SEAS for Gateway Screening to allow the SEAC to monitor the data generated by the STP Gateway Screening feature

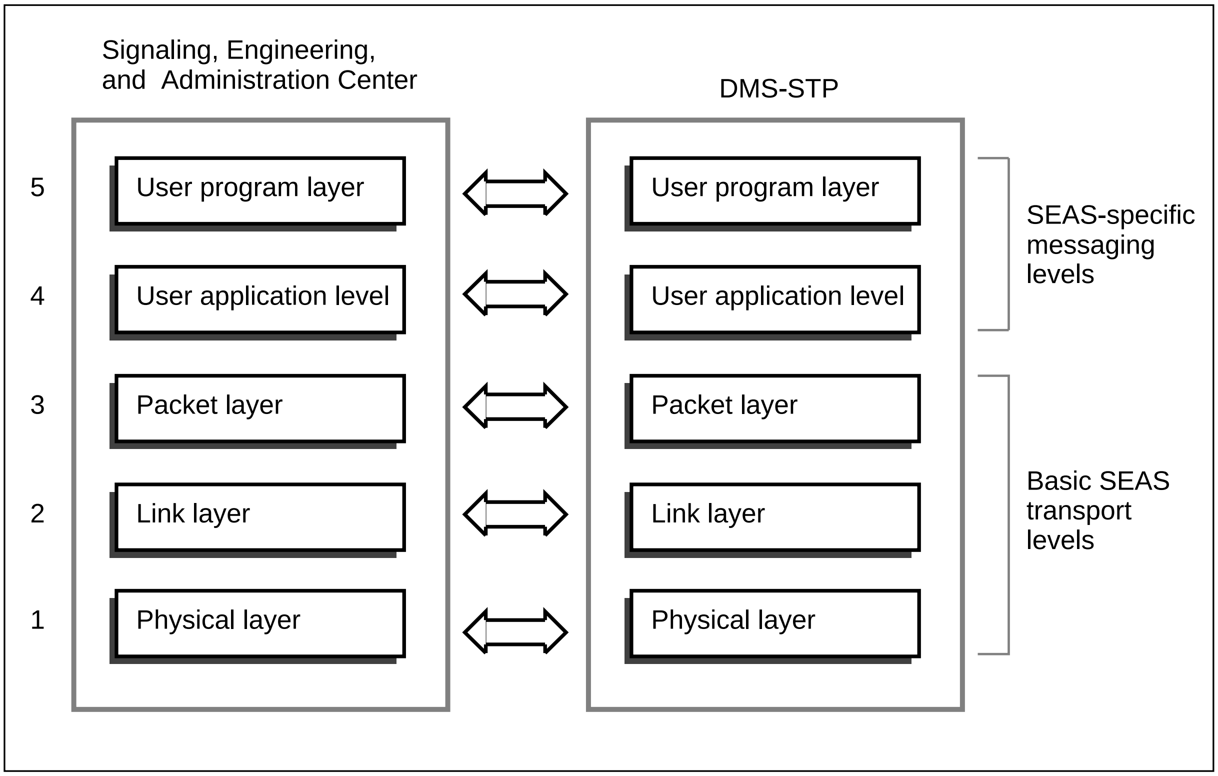
STP SEAS protocol

The SEAC communicates with the SEAS software in the STP through the five-layer protocol as shown in Figure 8-3.

The first three layers make up the basic transport service for SEAS. This transport system is based on the first three layers of the BX.25 packet switching standard, a modified X.25 protocol that supports data terminal equipment (DTE)-to-DTE messaging, as well as communications between DTE and data circuit-terminating equipment (DCE), such as modems. This flexibility allows either dedicated high-speed data links or packet-switched data networks to be used for transmitting STP/SEAC messaging.

The upper two levels supply the SEAS-specific messaging functions.

Figure 8-3xxx
SEAS/STP messaging protocol



STP SEAS hardware

The STP uses the following DMS-100 hardware to provide SEAS interface capabilities:

- input/output and multi-protocol controllers
- STP disk drive units

I/O and multi-protocol equipment

The STP input/output controller (IOC) supports the necessary connections for BX.25 links from the SEAC. The multi-protocol controller is a general purpose data-communications unit that serves as the physical interface between the STP input/output controller and the SEAS network. For more information, refer to the chapter titled “Hardware,” in this document.

Disk drive unit

The STP buffers SEAS messages in the Winchester 154-Mbyte disk drive unit (DDU). One DDU shelf and one disk drive controller are required to support the DDU.

Because of the potentially large size of SEAS messages, which can require up to 396K of memory, it is recommended that 64 megabytes of DDU storage be reserved for SEAS applications.

STP SEAS interface software

The standard SEAS interface software package (NTX835AA) supports all relevant specifications for Bellcore’s 1.1 SEAS release.

The optional SEAS software package (NTXE55AB) extends the STP capabilities by supporting Bellcore’s SEAS TA-TSY-000310, Release 2.0. This feature provides the following enhancements to the SEAS interface:

- new test message to support lab-to-lab and on-site testing of SEAS interface
- new recent change and verification capabilities
- enhanced reporting of system status

STP power and grounding requirements

Power requirements

Power for the STP is provided through the power distribution center (PDC). For further information regarding the power distribution center refer to the chapter titled “Hardware,” in this document.

Voltage requirements

Electrical power in the STP is distributed at a nominal potential of -48 Vdc. Measured at the frame load, and taking the voltage drop limitation into consideration, under normal conditions the operating voltage can range from -48 Vdc (maximum voltage drop) to -53.5 Vdc (battery float condition).

Under extreme conditions, the operating voltage can range from -44.75 Vdc to -55.8 Vdc.

> ***Note:*** Extreme conditions occur during commercial power failure (low end) and battery equalization charging (high end). Interface equipment may require modification of these limits when sharing a power plant with other equipment.

The actual operating voltages are measured at the input to the power distribution center (PDC), and include the loop voltage drops between the office battery terminals and the PDC. Except for line current and some relay equipment, all input power in the DMS-100 Family system is further processed by converters and inverters to obtain different dc and ac voltages.

Current requirements

Each fully populated link interface shelf (LIS) draws 18.7 amps from the -48 Vdc power supply.

The local message switch (LMS) shelf draws 7.8 amps from the -48 Vdc power supply.

Each of the four cabinet cooling fans draws 1.5 amps from the -48 Vdc power supply.

Table 9-1 describes the current drain at the -48 Vdc supply for fully equipped frames.

Table 9-1xxx
Typical current drain of fully loaded STP cabinets measured at -48 Vdc

PEC	Cabinet	Current drain
NT0X24AA	Link peripheral processor	65.0 amps
NT9X01BA	Dual plane combined core	80.0 amps
NT0X46AB	Trunk module equipment	13.2 amps
NT8X10AA	Double shelf network equipment	14.0 amps
NT0X43AD	Input/output equipment	20.5 amps

Electrical power requirements

Table 9-2 indicates the power and heat dissipation that can be expected from typical STP offices.

Table 9-2xxx
Power requirements and heat dissipation for typical DMS-STP offices

Number of LPPs	Amperes @ 48 Vdc	Watts	BTUs
1	192.7	9,249.6	31,568.9
2	257.7	12,369.6	42,217.4
5	452.7	21,729.6	74,163.1
10	777.7	37,329.6	127,405.9

Grounding requirements

STP uses single point grounding (SPG). Single point grounding consists of the interconnection of all backplane logic returns within a module by one or more copper busbars and straps. This connection may be made externally to each module, but it must be made at only one point.

All shelf backplanes and interconnecting busbars are electrically isolated from the module framework. The framework and logic return planes are internal to the DMS-100 switch and are not for external use.

Non-isolated system grounding (non-ISG) framework and logic return arrangements are based on the same principles as systems with ISG. Specific individual installations may be customized to meet customer standards for particular situations.

Fusing requirements

The fusing requirements at the power distribution center are

- two 20A fuses for each shelf (LMS and LIS), making a total of eight
- one 5A fuse for each cooling fan, making a total of four

Compliance with safety standards

While STP equipment is listed with Underwriters Laboratory, some variant components may not yet be listed. Customers will be notified of any provisioned equipment which is not compliant with UL standards.

Communication utilities are exempt from National Electrical Code (NEC), Canadian Electrical Code (CEC) and Occupational Safety and Hazard Association (OSHA) standards. In order to maintain compliance with NEC or CEC standards in installations where the customer is not the telephone utility, the customer must familiarize themselves with the applicable codes. Contact the power utility servicing the STP site for further information.

List of terms

A-link

A-link is a signaling data link that connects signal switching points (SSP) and service control points (SCP) to signaling transfer points (STP). *See* signaling data link (SDL) and signaling transfer point (STP).

BERT

See bit error rate test (BERT).

BH

See busy hour (BH).

Bit error rate test (BERT)

Bit error rate test (BERT) is used to measure the transmission quality of a loop. The BERT transmits a known bit pattern over a line and compares the reflected signal with the transmitted signal.

Busy hour (BH)

(1) Busy hour (BH) is the uninterrupted period of 60 minutes-not necessarily a clock hour-for which the average intensity of traffic is at the maximum.

(2) Busy hour (BH) is the busiest hour of the busiest day of a normal week, excluding holidays, weekends, and special event days.

Capability code

Capability code allows a CCS7 node to identify itself by more than one point code. For example, each node of an STP pair is identified by the same capability code and by individual capability codes. *See* point code.

CCS7 link interface unit (LIU7)

CCS7 link interface unit is a peripheral module that processes messages entering and leaving a link peripheral processor (LPP) through an individual signaling data link. Each LIU7 consists of a set of cards and paddle boards that are provisioned in one of the link interface shelves of an LPP. *See* link peripheral processor (LPP).

Central processing unit (CPU)

Central processing unit (CPU) is the hardware unit of a computing system that contains the circuits that control and perform the execution of instructions.

C-link

C-link is a signaling data link that connects the mates of a signaling transfer point (STP) pair. *See* signaling data link (SDL) and signaling transfer point (STP).

CM

See computing module (CM).

Common channel signaling (CCS)

Common channel signaling (CCS) is a signaling system in which a multiplicity of labelled messages are transmitted over a single channel using time-division digital techniques.

Computing module (CM)

Computing module is the processor and memory complex of the dual-plane combined core (DPCC) used by a DMS SuperNode. Each computing module consists of a pair of CPUs with associated memory that operate in a synchronous matched mode on two separate planes. Only one plane is active and it maintains overall control of the system while the other plane is on standby.

Connectionless signaling

Connectionless signaling, also referred to as transaction services, is used to define CCS7 signaling that is not associated with setting up and taking down a call. For example, signaling that is used to access a database for 800 number translations and maintenance signaling messages between signaling points are considered to be connectionless signaling.

Connection-oriented signaling

Connection-oriented signaling, also referred to as trunk signaling, is used to set up, monitor, and take down a call.

Consultative Committee on International Telephony and Telegraphy (CCITT)

Consultative Committee on International Telephony and Telegraphy (CCITT) operates under the auspices of the United Nations and is the forum for international agreement on recommendations for international communication systems.

CPU

See central processing unit (CPU).

Data modification order (DMO)

Data modification order (DMO) is a request initiated by operating company personnel to change DMS-100 information. The request can be made through either the table editor or the service order and query system (SERVORD).

D-link

D-link is a signaling data link that connects a signaling transfer point (STP) to another STP in the network. *See* signaling data link (SDL) and signaling transfer point (STP).

DMO

See data modification order (DMO).

DMS-bus

DMS-bus is the messaging control component of a DMS SuperNode. The DMS-bus consists of a pair of message switches (MS). *See* DMS SuperNode and message switch (MS).

DMS-core

DMS-core is the call management and system control component of a DMS SuperNode. It consists of a computing module (CM) and a system load module (SLM). *See* computing module (CM) and system load module (SLM).

DMS SuperNode

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

DPCC

See dual-plane combined core (DPCC).

Dual-plane combined core (DPCC)

The dual-plane combined core (DPCC) is a standard DMS SuperNode equipment cabinet that houses the DMS-core and DMS-bus. *See* DMS-core and DMS-bus.

End office (EO)

End office (EO) is a switching office that is arranged for terminating subscriber lines, and is provided with trunks for establishing connections to and from other switching offices.

Erlang (E)

Erlang (E) is an international dimensionless unit of the average traffic intensity (occupancy) of a facility during a period of time, usually a busy hour. One erlang equals 3600 call seconds. *See* busy hour (BH).

F-bus

See frame transport bus (F-bus).

F-bus taps

F-bus taps provide access to an F-bus. For DMS-STP applications, the tap is either part of the F-bus rate adapter card that is used by the local message switch (LMS), or is part of the P-bus to F-bus interface card that is used by a CCS7 link interface unit (LIU7). *See* frame transport bus (F-bus).

Frame transport bus (F-bus)

Frame transport bus (F-bus) is an eight-bit bus that provides data communication between a local message switch and the link interface units that are provisioned in a link peripheral processor (LPP). To ensure reliability, two load-sharing F-buses are provided in an LPP. Each F-bus is dedicated to one of the two LMSs. *See* link interface module (LIM).

Global title (GT)

Global title (GT) is an application address. A global title does not contain the necessary information that would allow routing by the signaling connection control part (SCCP) and the message transfer part (MTP). The SCCP global title translation function only translates a global title into a valid network address.

Global title translation (GTT)

Global title translation (GTT) translates an application-specific address, such as a dialed 800 number, into the CCS7 network address where this number is translated into the numbering plan address that is required to complete the call. The network address is usually that of the appropriate service control point (SCP).

GT

See global title (GT).

GTT

See global title translation (GTT).

ILLP

See inter link-to-link protocol (ILLP).

Input/output controller (IOC)

Input/output controller (IOC) is an equipment shelf that provides an interface between up to 36 input/output devices and the DMS-bus. The IOC contains a peripheral processor that independently performs local tasks, thus relieving the load on the DMS-core. *See* DMS-bus and DMS-core.

Integrated services digital network (ISDN)

Integrated services digital network (ISDN) is a set of Consultative Committee on International Telephony and Telegraphy (CCITT) standards that establish compatibility between the telephone network and various data terminals and devices. ISDN provides a path for the transmission of voice, data, and images. *See* Consultative Committee on International Telephony and Telegraphy (CCITT).

Integrated services digital network user part (ISUP)

Integrated services digital network user part (ISUP) is a level of the Common Channel Signaling 7 (CCS7) layered protocol. The main functions of ISUP include the signaling functions required to provide switched services and user facilities for voice and non-voice applications in the integrated services digital network (ISDN). *See* Common Channel Signaling 7 (CCS7), and integrated services digital network (ISDN).

Inter link-to-link protocol (ILLP)

Inter link-to-link protocol is a level-two CCS7 protocol that is used to detect message losses between CCS7 link interface units (LIU7). *See* CCS7 link interface unit (LIU7).

IOC shelf

See input/output controller (IOC).

ISDN

See integrated services digital network (ISDN).

ISUP

See integrated services digital network user part (ISUP).

LIM

See link interface module (LIM).

Link

Link is a communication channel between two adjacent signaling points in a network.

Link interface module (LIM)

Link interface module (LIM) is a peripheral module that controls messaging between link interface units in a link peripheral processor (LPP). The LIM also controls messaging between the LPP and the DMS-bus. A link interface module consists of two local message switches (LMS) and two frame transport buses (F-bus). Each LMS normally operates in a load-sharing mode with the other LMS. This ensures LIM reliability in the event of an LMS failure because either LMS has adequate capacity to carry the full message load of an LPP. To communicate with the link interface units in the LPP, each LMS uses a dedicated F-bus.

Link peripheral processor (LPP)

Link peripheral processor (LPP) is a DMS SuperNode equipment frame for the DMS-STP that contains two types of peripheral modules-a link interface module (LIM), and link interface units. For DMS-STP applications, CCS7 link interface units (LIU7) are used in the LPP. *See* link interface module (LIM) and CCS7 link interface unit (LIU7).

Linkset

Linkset is a set of links that are used as a group to carry signaling traffic between two signaling points in a network.

LIU7

See CCS7 link interface unit (LIU7).

LMS

See local message switch (LMS).

Local message switch (LMS)

Local message switch (LMS) is a high-capacity communication hub that controls messaging between link interface units in a link peripheral processor (LPP). The LMS also controls messaging between the LPP and the DMS-bus. The link interface module (LIM) uses a pair of LMSs to provide dual-plane redundancy. *See* link peripheral processor (LPP) and DMS-bus.

LPP

See link peripheral processor (LPP).

Maintenance and administration position

See MAP (maintenance and administration position).

Maintenance trunk module (MTM)

Maintenance trunk module (MTM) is a peripheral module, located in the trunk module equipment (TME) frame, that is equipped with test and service circuit cards. The MTM contains special buses to accommodate test cards for maintenance purposes. The MTM provides the office alarm units for the DMS-STP.

MAP (maintenance and administration position)

MAP is a group of components that provide a user interface between operating company personnel and the DMS-100 Family systems. A MAP consists of a visual display unit and keyboard, a voice communications module, test facilities, and MAP furniture.

Message switch (MS)

Message switch (MS) is a high-capacity communication facility that functions as the messaging hub of the dual-plane combined core (DPCC) of a DMS SuperNode. The MS controls messaging between the DMS-bus by concentrating and distributing messages, and by allowing other DMS-STP components to communicate directly with each other. *See* DMS SuperNode and DMS-bus.

MPC

See multi-protocol controller (MPC).

MS

See message switch (MS).

Multi-protocol controller (MPC)

Multi-protocol controller (MPC) is a general purpose data communications card that interfaces DMS-100 Family equipment through an input/output controller (IOC) shelf. The MPC implements low-level data communications functions, thereby offloading the computing module (CM). Different protocols are served with different downloadable software, thus allowing use by various application feature packages.

Network operation protocol (NOP)

Network operation protocol (NOP) provides an interface between a DMS-100 Family switch and its remote systems.

Network operating system (NOS)

Network operating system (NOS) is a facility that provides the DMS-100 Family of switches with the capability of transferring data over communication links to a telephone network operating system.

Node

Node is the terminating point of a link. Node is a relative term. Its meaning depends entirely on the context in which it is used. For Common Channel Signaling 7 (CCS7) applications, a node can be a service switching point (SSP), a signaling transfer point (STP), or a service control point (SCP).

NOP

See network operation protocol (NOP).

NOS

See network operating services (NOS).

OAS

See office alarm system (OAS).

Octet

Octet is a small group of data bits that is handled as a unit. In most cases it is an eight-bit byte, thus octet is an alternative word for byte.

Office alarm system (OAS)

Office alarm system (OAS) is a system that reports trouble conditions to office personnel who are located either on-site or at a remote site. The severity of each problem is indicated according to its level of urgency, that is critical, major, or minor alarms.

OM

See operational measurements (OM).

Open systems interconnection (OSI) reference model

Open systems interconnection (OSI) reference model for CCITT applications provides a defined structure for modeling the interconnection and exchange of information between users in a communication system. *See* Consultative Committee on International Telephony and Telegraphy (CCITT).

Operational measurements (OM)

Operational measurements (OM) are the hardware and software resources of the DMS-100 Family systems that control the collection and display of measurements taken on an operating system. OMs organize the measurement of data and manages its transfer to displays and records on which maintenance, traffic, accounting, and provisioning decisions are based.

OSI

See open systems interconnection (OSI) reference model.

PEC

See product engineering code (PEC).

Per trunk signaling (PTS)

Per trunk signaling (PTS) is the conventional telephony method used for call processing that multiplexes the control signal of a call with voice and data over the same trunk.

Point code

Point code is the address of a signaling point.

Product engineering code (PEC)

Product engineering code (PEC) is an eight-character code that provides a unique identification for each marketable product manufactured by Northern Telecom.

PTS

See per trunk signaling (PTS).

Route

Route is a signaling path in the signaling network that accesses a destination.

Routeset

Routeset is a logical grouping of routes from a node that have the same destination.

SCCP

See signaling connection control part (SCCP).

SCP

See service control point(SCP).

SDL

See signaling data link (SDL).

SEAS

See Signaling, Engineering, and Administration System (SEAS).

Service control point (SCP)

A service control point (SCP) is a node in a Common Channel Signaling 7 (CCS7) signaling network that supports application databases. The function of an SCP is to accept a query for information, retrieve the requested information from one of its application databases, and send a response message to the originator of the request. *See* Common Channel Signaling 7 (CCS7).

Service order and query system (SERVORD)

Service order and query system (SERVORD) is a user interface that is used to change, add, or delete a subscriber line. Standard telephone industry command format is used.

Service switching point (SSP)

Service switching point (SSP) is a signaling point (SP) in a Common Channel Signaling 7 (CCS7) network that has the capability to generate query messages for application databases that are located at service control points (SCP). An SSP is usually collocated with a Class Four switching office (that is, a toll office). *See* Common Channel Signaling 7 (CCS7), signaling point (SP), and service control point (SCP).

SERVORD

See service order and query system (SERVORD).

Signaling, Engineering, and Administration System (SEAS)

Signaling, Engineering, and Administration System (SEAS) provides a single administrative center that uses network signaling transfer points (STP) to monitor and coordinate the elements of a CCS7 network. The administration and engineering functions of SEAS allow the operating company to process, store, and report traffic and performance data on a network-wide basis. This data can be used to evaluate network performance, to balance loads between STP nodes, and to perform other network management tasks.

Signaling connection control part (SCCP)

Signaling connection control part (SCCP) is a level of the Common Channel Signaling 7 (CCS7) layered protocol. The main functions of the SCCP include the transfer of signaling messages with or without the use of a logical signaling connection, and the provisioning of flexible global title translations for different applications. *See* Common Channel Signaling 7 (CCS7).

Signaling data link (SDL)

Signaling data link (SDL) is a bidirectional transmission path for signaling. It consists of two data channels that operate together in opposite directions at the same data rate. An SDL constitutes the lowest functional level (level one) of the Common Channel Signaling 7 (CCS7) protocol hierarchy.

Signaling link

Signaling link is the term used to describe the first two levels of the Common Channel Signaling 7 (CCS7) protocol-the physical level (one) and the link level (two). The level-two functions, combined with a level-one signaling data link, constitute a signaling link that is used for the reliable transfer of signaling messages between two signaling points.

Signaling point (SP)

Signaling point (SP) is a node in a Common Channel Signaling 7 (CCS7) signaling network that either originates, terminates, or transfers signaling messages from one signaling link to another. An SP is usually co-located with a Class Five switching office (that is, an end office). *See* Common Channel Signaling 7 (CCS7).

Signaling system 7 (SS7)

Signaling system 7 (SS7) is the American National Standard Specification (ANSI) version of international CCITT Signaling System No.7 (CCITT SS7).

Signaling transfer point (STP)

Signaling transfer point (STP) is a node in a Common Channel Signaling 7 (CCS7) network that routes messages between nodes. STPs transfer messages between incoming and outgoing signaling links, but-except for network management information-do not originate or terminate messages. An STP is a type of tandem office. See Common Channel Signaling 7 (CCS7).

SLM

See system load module (SLM).

SP

See signaling point (SP).

SSP

See service switching point (SSP).

STP

See signaling transfer point (STP).

System load module (SLM)

System load module (SLM) is a mass storage system in a DMS SuperNode that is used to store office images. From the system load module, new loads or stored images can be booted into the computing module. *See* computing module.

DMS-100 Family

DMS SuperNode Signaling Transfer Point

Technical Specification

Information is subject to change without notice. Northern Telecom reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.

This device complies with the Class “A” limits for radio interference as specified in the Canadian Department of Communications Radio Interference Regulations.

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