PLN-2291-001

DMS-100 Family

TOPS MPX
Technical Specification

IBMA001 and up   Standard 03.06   October 1998

nt northern telecom

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Contents

TOPS MPX features   6-1

TOPS MPX call processing   7-1

TOPS MPX maintenance 9-1

Regulatory and user considerations 10-1

List of terms 11-1

About this document

When to use this document

TOPS MPX Technical Specification describes operational and functional capabilities and features of the TOPS MPX AOSS system (IBM DA only). This document does not cover TOPS MPX NT DA AOSS or TOPS MPX-IWS. The TOPS MPX AOSS system provides directory assistance and intercept services. Additional services will be available in the near future through the TOPS MPX-IWS system, which will provide toll and assist capability.

How to check the version and issue of this document

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

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

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

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

References in this document

The following documents are referred to in this document:

- *Operational Measurements Reference Manual*
- *Log Report Manual*
- *TOPS MPX Power and Grounding Guide*, 297–2291–156

- *TOPS MPX Operator Guide*, 297–2291–300
- *TOPS MPX Force Management Guide*, 297–2291–310
- *Translations Guide*
- *Alarm and Performance Monitoring Procedures*
- *Trouble Locating and Clearing Procedures*
- *Recovery Procedures*
- *Card Replacement Procedures*

What precautionary messages mean

The types of precautionary messages used in NT documents include danger, warning, and caution messages. Danger, warning, and caution messages indicate possible risks.

Examples of the precautionary messages follow.

DANGER   Possibility of personal injury

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

WARNING   Possibility of equipment damage

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

CAUTION   Possibility of service interruption or degradation

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

How commands, parameters, and responses are represented

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

Input prompt (>)

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

>BSY

Commands and fixed parameters

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

>BSY CTRL

Variables

Variables are shown in lowercase letters:

>BSY CTRL ctrl_no

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

Responses

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

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

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

1 Manually busy the CTRL on the inactive plane by typing

>BSY CTRL ctrl_no
and pressing the Enter key.

where

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

Example of a MAP response:

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

Introduction to TOPS MPX

The Traffic Operator Position System MPX (TOPS MPX) is an extension of TOPS MP with the TOPS message switch (TMS) that provides directory assistance (DA) service. Using TOPS MPX, operators obtain information for directory assistance and intercept calls by accessing a directory assistance system (DAS) provided by IBM. An integrated access for directory assistance and toll and assist service is provided by the TOPS Intelligent Workstation System (TOPS MPX-IWS).

The development of TOPS MPX requires the cooperation of IBM as an outside equipment manufacturer (OEM). The operator positions for TOPS MPX are based on IBM's Personal System/2 (PS/2).

TOPS MPX uses the existing DMS-200 with TMS hardware and OEM equipment configured to provide the TOPS MPX vehicle. TOPS MPX development includes software residing in the DMS-200 central control (CC), an audio card that plugs into the operator position, and integration of the OEM equipment. Hardware aspects of the existing systems are covered in the respective product specifications for DMS-100 and TOPS. OEM equipment details are covered in referenced IBM documents.

TOPS MPX evolution

Since its introduction, the TOPS MPX workstation has supported directory assistance functions using the IBM DA system. That application communicates between workstation and switch using NT's Auxiliary Operator Services System (AOSS) protocol and between workstations on the local area network (LAN) using IBM's TPORT protocol.

Now TOPS MPX-IWS provides turnkey traditional operator services such as toll and assistance, directory assistance, and intercept, in addition to new services that can be custom-developed and defined by the operating company. The TOPS MPX-IWS workstation follows Bellcore's specifications for an Intelligent Workstation Subsystem (IWSS). With its open architecture and programmable interface for new applications, TOPS MPX-IWS is designed to suit evolving multiple-service and multiple-vendor operator centers.

The following figure identifies the applications and benefits of TOPS MPX with AOSS and shows the potential migration path from TOPS MPX with AOSS to TOPS MPX-IWS with open position protocol (OPP).

TOPS MPX evolution
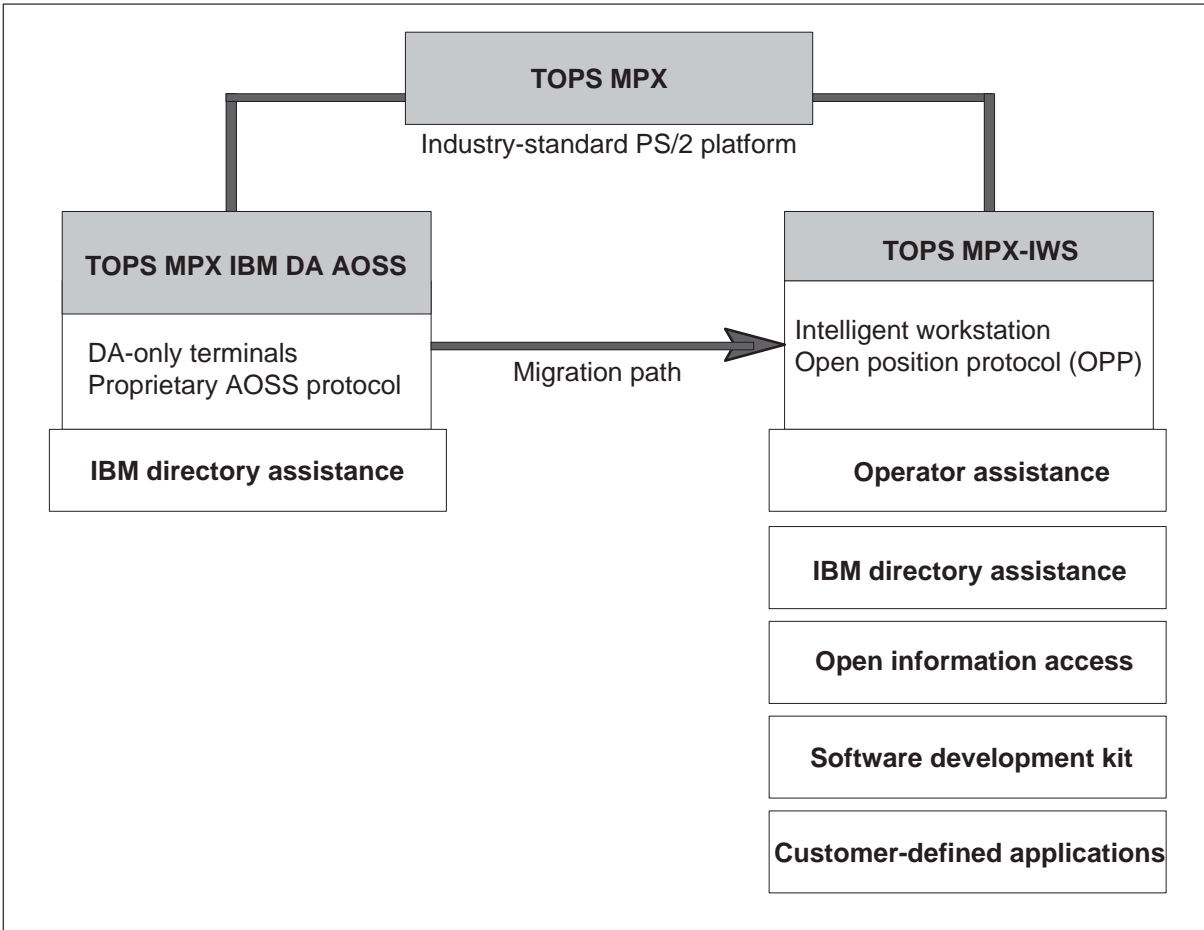
TOPS MPX software architecture

TOPS MPX uses a base of industry-standard commercial software packages. On top of that, application software is available from NT or from an OEM. The following figure shows the software structure of TOPS MPX in its AOSS version and in its IWS-OPP version.

TOPS MPX software architecture

**TOPS MPX software structure
(AOSS switch protocol)**

| IBM DA |
| External messaging:
DMS = AOSS
DAS = TPORT |
| IBM PC LAN |
| DOS 5.0 |

**TOPS MPX software structure
(OPP switch protocol)**

| Multiple service applications:
Toll and assistance
Directory assistance (multi-vendor)
Intercept
Customer name and address
Others... |
| Application programmers interface |
| OPP access, base utilities (NT) |
| X.25 app and mtce (NT) |
| External messaging (TCP/IP) |
| Microsoft Windows 3.1 |
| DOS 5.0 |

This document addresses TOPS MPX with the AOSS switch protocol.

TOPS MPX configurations

This chapter describes the system architecture of TOPS MPX and its possible configurations. It also describes token-ring architecture, installation requirements, and floor-plan considerations.

System architecture

The TOPS MPX system requires enabling software features residing in the DMS-100/200 or DMS-200 central control (CC) and in the TOPS MPX operator positions.

TOPS MPX software operates in a hardware environment that includes a DMS-100/200 or DMS-200 CC and TOPS MPX operator positions.

The following figure shows the TOPS MPX system architecture.

DAS architecture

For this specification, the IBM directory assistance system (DAS) is not regarded as part of the TOPS MPX system. For additional information on IBM DAS, refer to *IBM Programmable Operator Subsystem User Guide*, SC28-8168.

TOPS MPX system
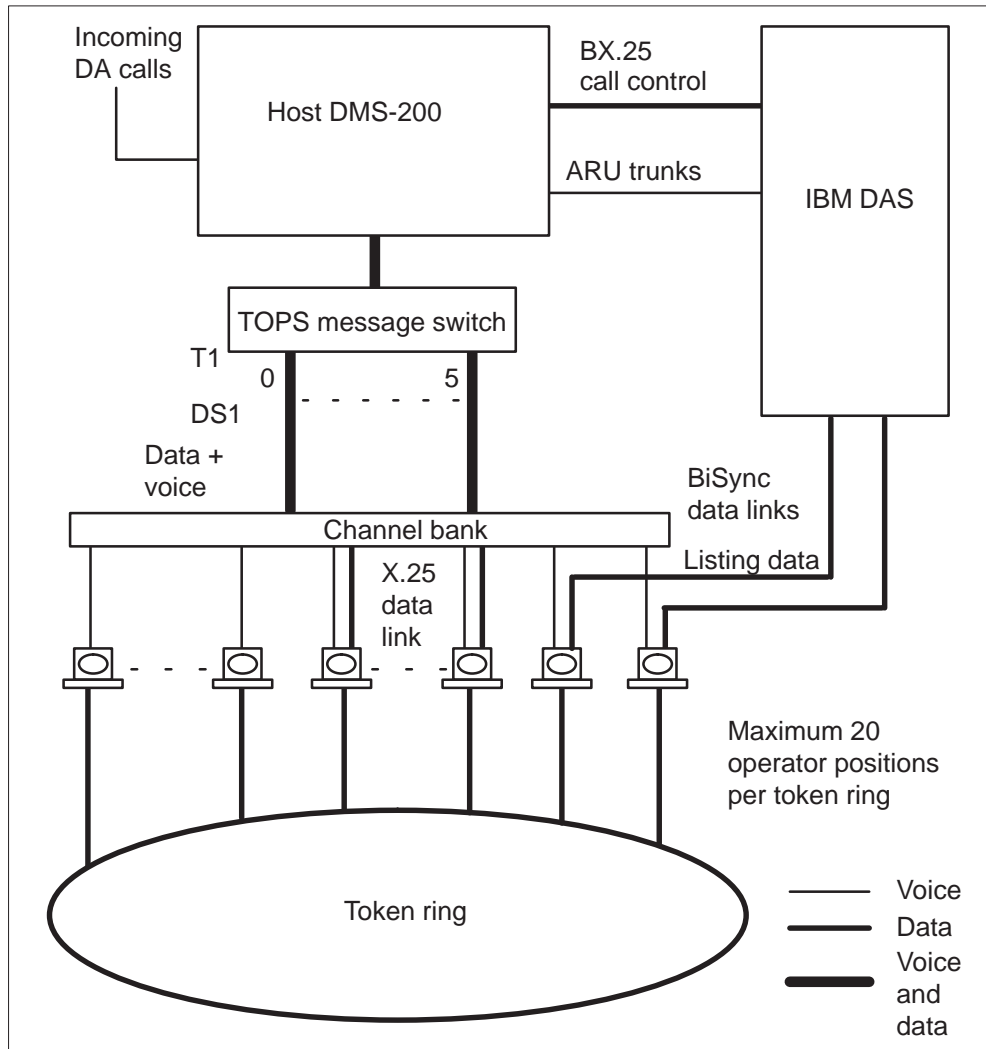
Note: IBM DAS Series 1 uses BiSync data links from the DAS to the positions. IBM DAS RS6000 uses X.25 data links.

Modularity

The modularity for system configurations is based on operator position groups and token rings. Position groups, also known as clusters, have a modularity of four positions, because that is the number of positions served by the virtual position controller (VPC) in the DMS gateway position (formerly known as the Type 2 position). (For more information, refer to the section "TOPS MPX DMS gateway position" later in this chapter.)

Token-ring local area networks (LANs) are supplied based on the total number of DA operator positions required, divided by the maximum number

of operators per token ring. The maximum number of positions per LAN is 16, but 20 can be used as the maximum at the operating company's discretion. Clusters should be balanced across token rings, with equal numbers of clusters on each token ring to the extent possible. For more information on configuration, refer to the *Operational Measurements Reference Manual*.

Data links between DMS gateway positions and the CC may be nonduplicated or duplicated for increased reliability. Duplication is strongly recommended. If duplicated, two DMS gateway positions are required in each cluster. If not duplicated, only one DMS gateway position is required. Clusters contain up to four positions.

Data links from the database gateway positions (formerly known as Type 1 positions) to the DAS are always duplicated; thus, two database gateway positions are always required on each token-ring local area network (LAN). The database gateway positions should be located in different clusters. This means that a token ring should have at least two clusters, with the first two clusters each containing a database gateway position.

Operator position serving limits

The following paragraphs explain the serving limits of operator positions.

Operators per TMS

The maximum number of operators is 96 per TMS (6 TMS DS-1 ports with 16 operator positions per DS-1 port).

Operators per token ring

Although the recommended maximum number of operator positions for each token ring is 16, up to 20 positions can be equipped on each token ring, at the operating company's discretion, provided cable-length restrictions are observed. If the recommended duplicated data links to the CC are not required, the minimum number of positions per token ring is three. Refer to the preceding section, "Modularity," for other restrictions on adding positions to the token ring.

TMSs per DMS

The maximum number of TMSs that can be served by a DMS-200 is physically limited by the number of network ports available in the DMS. However, DMS real-time capacity imposes a practical limit. The DMS call-processing capacity operator limits impose a practical limit on the number of TMSs per DMS switch. The following paragraphs describe these operator limits.

Operators per DMS

Up to 1023 operators can be datafilled per DMS, but overall operator serving limits are imposed by real-time considerations determined by the traffic mix.

> *Note:* In this specification, limitations imposed by the IBM DAS are not considered.

Estimates are provided in the "Operator serving limits" table of the "TOPS MPX equipment" chapter in this document for an NT40 and a DMS-SuperNode (68020 at 20 Mhz and 68030 at 33 Mhz) system in the standalone (SA), remote operator center (ROC) and host operator center (HOC) configurations.

Use caution in interpolating the operator capability of a considered SA, ROC, or HOC system. The call-processing times combine linearly; the operator capability does not.

SA configuration

For an SA system, shown in the following figure, the estimates given in the "Operator serving limits" table of the "TOPS MPX equipment" chapter in this document refer to the TOPS switch only, not to the intervening end office.

SA configuration
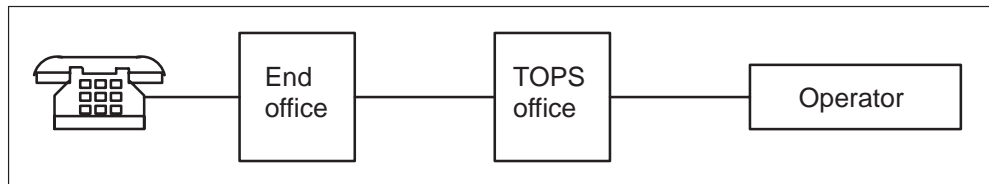
HOC/ROC configuration

For a HOC/ROC system, illustrated in the following figure, the estimates given in the "Operator serving limits" table of the "TOPS MPX equipment" chapter in this document refer to the TOPS switch only, not to the intervening end office.

HOC/ROC configuration
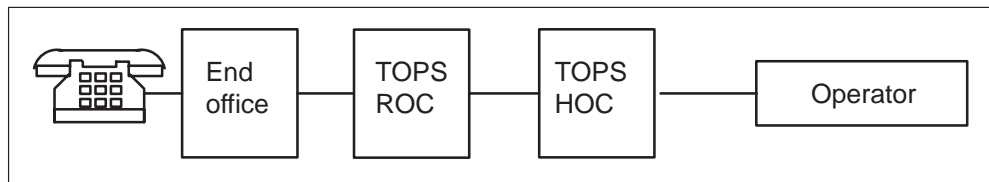
TOPS MPX configurations

A force administration system is made up of a DMS switch and all the positions it serves. Within that system, a traffic office is a group of related operator positions for which separate administrative data is provided.

An entire work force contained in one location constitutes a single-traffic office. A work force divided into geographically separate groups constitutes a multitraffic office. This section describes the equipment used in each type of office configuration.

Single-traffic office configuration

In a single-traffic office configuration, operators and force administration personnel are all located in the same group or office. Refer to the following figure for an illustration.

Other optional equipment may be found in a single-traffic office, depending on the services the office provides. For specific information on the kinds of equipment available, refer to the "Office equipment provisioning" table in the "TOPS MPX equipment" chapter.

The minimal equipment normally found in a single-traffic office in a TOPS ACD environment includes the following:

- in-charge (IC) position
- service assistance (SA) positions
- operator positions
- system administration data system teletypewriter (SADS TTY)

Sample single-traffic office configuration

Single-traffic office configuration

> **IC position, SADS**
> (IC manager with force
> management capabilities)
>
> (clerk). . . . . .(clerk)
>
> **SA positions**
>
> (Service assistants with delegated
> force management functions)
>
> **Operator positions**
> (operators)

Note 1: The number of clerks required depends on work load.

Note 2: Up to 126 SA/IC positions can be datafilled for the traffic office. (The system maximum is 126 SA/IC positions, so if 126 are datafilled for one traffic office, none can be datafilled for any other traffic office.)

Note 3: Up to 1023 operator positions can be datafilled in Table TOPSPOS, depending on how heavily the DMS is loaded.

Multitraffic office

In a multitraffic office configuration, the operator work force is divided administratively into different groups or offices, and these offices are generally located in different geographical areas. Each individual office is referred to as a "traffic office." The next figure illustrates a sample configuration for a multitraffic office.

The minimal equipment normally found in a multitraffic office in a TOPS ACD environment includes the following:

- force management cathode-ray tube (FMCRT)
- IC position
- SA positions
- operator positions
- force administration data system teletypewriter (FADS TTY)
- traffic administration data system teletypewriter (TADS TTY)

The FMCRT and the FADS TTY are located in the force management center (FMC).

> *Note:* TOPS MPX does not support a force management position. A TOPS 04 or TOPS MP position is used for the FMCRT position.

Other types of equipment may be located in the multitraffic office, such as the mechanized force administration data system (MFADS).

Sample configuration of a multitraffic office

> *Note:* A force management center can cover up to 30 traffic offices. In this example, operator positions 100 through 199 are accounted for in traffic offices 2 through 29. Up to 126 SA/IC positions can be datafilled for the traffic office. (The system maximum is 126 SA/IC positions, so if 126 are datafilled for one traffic office, none can be datafilled for any other traffic office.) The number of force clerks per traffic office depends on work load. Up to 1023 operator positions can be datafilled in Table TOPSPOS, depending on how heavily the DMS is loaded.

There are some functional differences between single-traffic and multitraffic offices, depending on the office configuration. For example, in a multitraffic office, the force supervisor must be able to poll each individual office; this capability is not required in a single-traffic office. In a multitraffic configuration, statistics must be attributed to a given traffic office. Such differences are indicated in this document where appropriate.

TOPS MPX operator positions

TOPS MPX positions are based on PS/2 personal computers with customized software, keyboards, and interface plug-in cards. There are three types of positions, defined by their system function. All three types provide the user interface to the operator, connections to the token-ring LAN and the operator headsets, and a voice interface to the DMS switch. The token-ring LAN connection and the voice interface to the DMS switch are provided by two plug-in cards.

The three types of positions are distinguished by data interfaces provided in a third plug-in card position and by different communication functionality:

- database gateway (formerly known as Type 1) – Contains the software functionality and interface card for one 56 kb/s, BiSync or X.25 link connecting the position to the IBM DAS.

- DMS gateway (formerly known as Type 2) – Contains the software functionality and interface card for one 56 kb/s, X.25 data link connecting the position to the TMS. This position is the VPC.

- general operator position (formerly known as Type 3) – Contains no additional functionality.

Regardless of their types, operator positions serve one of the three following functions:

- general operator position

- in-charge position

- assistance position

TOPS MPX data/voice connections

The following paragraphs describe interfaces in the TOPS MPX system and explain how the CC call control software functions, how listing services data is transferred, and how DA and intercept service vendors work.

Interfaces

The following interfaces are required in the TOPS MPX system:

- Call control between the host DMS-200 and the IBM DAS – A BX.25 9.6 kb/s or 19.2 kb/s link provides the physical interface for call control. The number of links provided is based on several factors including the amount of traffic in the DMS host switch.

- ARU trunks on T1 facilities between the DMS-200 and the IBM DAS – For automated DA and intercept call responses in the IBM DA system, TOPS MPX uses audio response units (ARU). These units are provisioned externally at the IBM information systems services node. The ARUs communicate with the calling subscriber through the DMS network and dedicated ARU trunks.

- Listing services data transfer between the IBM DAS and designated TOPS MPX database gateway positions – Redundant 56 kb/s binary synchronous data links connect two TOPS MPX database gateway positions on each token-ring LAN to the IBM DAS. The data links can also be X.25 (1984) when talking to an RSC/6000 IBM DAS. DA information is passed from the TOPS MPX database gateway positions to the token-ring LAN. From there it is available to all other TOPS MPX positions on the token-ring LAN.

- Digital voice links between the DMS-200 and each TOPS MPX position – These links provide the operator voice paths to the positions.

- Data links between the DMS-200 and the TOPS MPX – These links provide the CC-to-operator-position data communication for a group of four TOPS MPX positions. DMS gateway positions terminate the data links and pass the message traffic to and from the token-ring LAN.

- Token-ring LAN access for all TOPS MPX positions – This access is used for TOPS MPX position-to-position communications.

- User interface between the TOPS MPX and the operator – This interface includes screen displays, keyboard input, and the headset interface for the operator.

CC call control

In conjunction with the DAS and with TOPS MPX application software resident in the position, the TOPS MPX software resident in the CC provides the functions of DA and intercept call handling. Only station-paid and no-charge calls are handled. No alternate billing calls are currently handled at the TOPS MPX AOSS position.

The CC performs call processing and control. Directory assistance and intercept calls are processed by obtaining the necessary resources and communicating with the DAS database and TOPS MPX to control events that occur as calls progress. These communication messages define, for example, the type of call and details of the call, the status of operator position assignment, and the selection and status of ARUs.

The following stages occur in the progression of a DA or intercept call:

- initiating the DA or intercept call
- presenting the call to an operator
- handling the call while at the operator position
- providing a voice response
- handling recalls (reconnects)

The BX.25 link is used to communicate call-control messages between the CC and the DAS. Capacity depends on the speed of the multi-protocol controller (MPC) or enhanced multi-protocol controller (EMPC).

The CC communicates with a selected operator position through a TMS permanent virtual circuit (PVC) and a subtending TOPS MPX DMS gateway position. A call is assigned to an individual operator if manual intervention or supervision is required.

Listing services data transfer

The operator position communicates between the selected operator and the DAS databases through the token-ring LAN to a designated TOPS MPX database gateway position providing a data link to the DAS. The database gateway position/DAS data link uses the X.25 or BiSync protocol. The application-level protocol used for terminal to IBM DAS communication is proprietary to IBM.

This communication channel is used to send listing services data from the DAS to a particular operator. For protection against failure, the listing services data links are duplicated for each token-ring LAN.

TOPS message switch

TOPS MPX requires the TMS. The basic configuration of the TOPS MPX system with a TMS connection to the DMS switch is shown in the following figure. The TMS must be located in a host DMS central office, and the TMS cable connection to the DMS network must be within 228.7 m (750 ft). Since T1 transmission links are used, there is no practical limit on the distance between the TMS and the TOPS MPX system.

The TMS converts the messaging protocol of the DMS network to the X.25 protocol used between the TMS and all connected nodes. The TMS X.25 protocol complies with the CCITT 1984 (Yellow Book) specifications for PVCs over one or more 56 kb/s DS-0 channels.

As shown in the following figure, the voice and data links from the TOPS MPX system connect to a channel bank, which multiplexes DS-0 channels onto a DS-1 signal channel. The T1 link connects the channel bank to the TMS, which demultiplexes the DS0 channels from the DS-1 signal channel. Voice channels are nailed up through a TMS time switch to the DMS network.

TMS and TOPS MPX interface
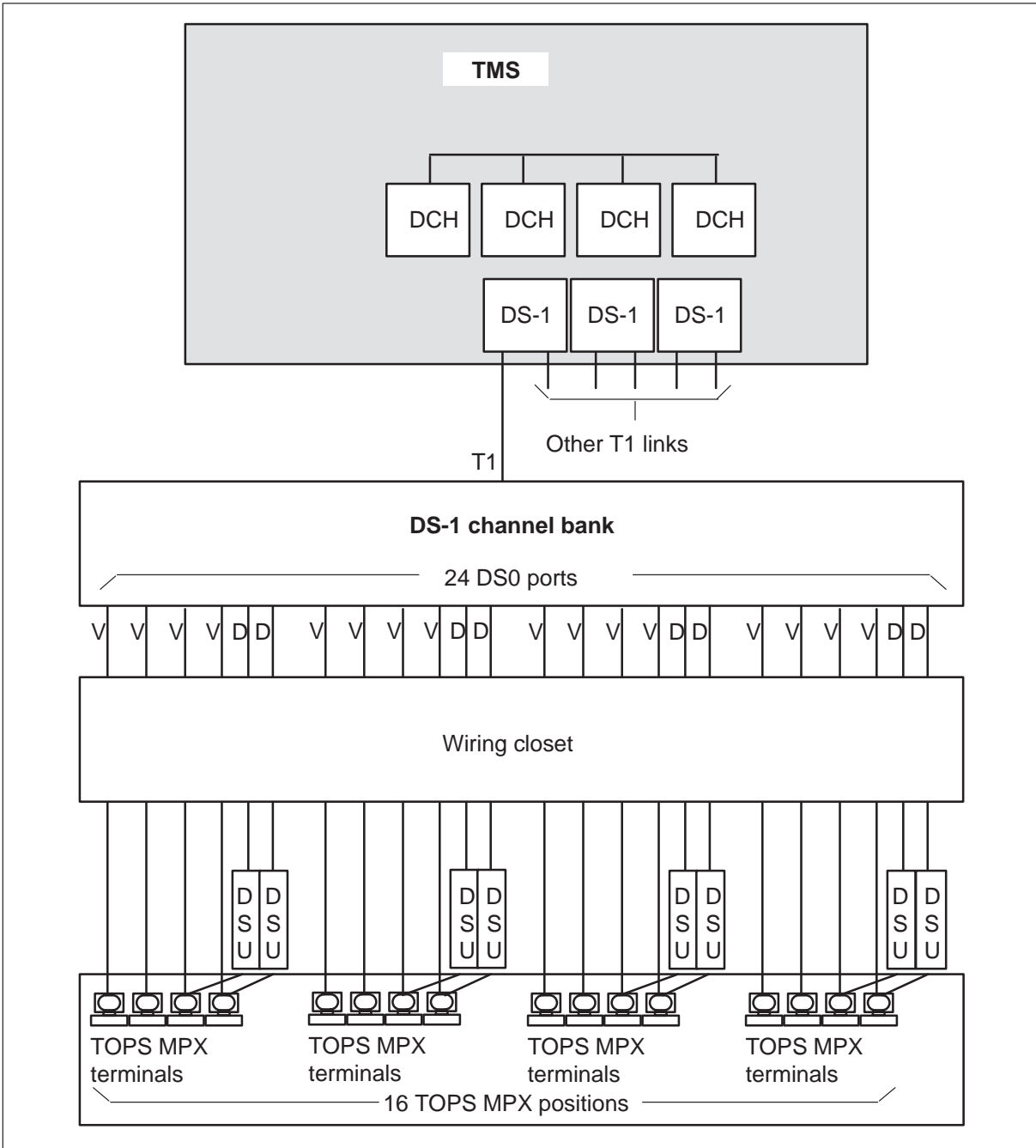
Token ring

Clusters are groups of positions associated with a virtual position controller (VPC), which is located in a DMS gateway position. The VPC provides the CC/TOPS MPX data-link connectivity for all positions within the cluster, including where the VPC itself resides. Clusters may have from one to four

positions. The data link should be duplicated for increased reliability. In that case, each cluster must contain an active and an inactive VPC (two DMS gateway positions), unless it has only a single position.

The database gateway position provides the TOPS MPX/DAS data-link connectivity for all positions on a token ring. This data link is always duplicated for increased reliability; therefore, exactly two database gateway positions are always required on each token ring. For reliability in an IBM DAS configuration, it is best to locate these positions in different clusters on different MAUs.

Allocation of positions to token rings is constrained by certain rules. Some are mandatory and others are recommended for reasons of economy or increased reliability. The rules must take into account two cases: duplicated and nonduplicated TOPS MPX/CC data links.

Mandatory rules

The following list describes mandatory rules for token rings:

- The maximum number of positions on a single token ring is 20

- The maximum number of positions in a cluster is 4.

- The maximum number of clusters on a token ring is 5.

- In an IBM DAS configuration, each token ring must have two database gateway positions.

- Each cluster must have one DMS gateway position for nonredundant TOPS MPX/CC data-link applications, or two DMS gateway positions for redundant TOPS MPX data-link applications. A single DMS gateway position is permitted in redundant data-link applications, if it is the only position in the cluster.

  Note: Although the system can be operated with non-redundant TOPS MPX/CC data links, the reliability provided by such a configuration is likely to be unacceptable. The redundant TOPS MPX/CC data-link configuration is strongly recommended, and all new installations should be so configured.

- All positions on a single token ring must be in the same building as the wiring closet frame.

Recommended rules

The following list describes the recommended rules for token rings:

- For most efficient transmission, the recommended maximum number of positions equipped on a single token ring is 16.

- For reasons of economy, the number of token rings in an OSC should be minimized by filling each token ring to 16 positions before starting a new one.

- For reasons of service availability, the number of positions on each token ring should be equally balanced to the extent possible.

- For reasons of economy, clusters should be filled to four positions before starting a new cluster. This minimizes the number of DMS gateway positions.

- Each token ring should have at least two clusters, so the TOPS MPX/DAS data links can be placed in different clusters.

- If there are two or more clusters, the first two clusters should each contain one database gateway position and two DMS gateway positions for redundant operations. These clusters may also contain general operator positions.

- Each additional cluster after the first two on a token ring may be filled out with general operator positions after the recommended two DMS gateway positions.

- Redundant TOPS MPX/CC datalinks are recommended for all applications.

Typical recommended token-ring configurations are shown in the following table, where digits represent position type as follows:

- 1 = database gateway position

- 2 = DMS gateway position

- 3 = general operator position

For example, "1122" represents four positions, of which two are database gateway and two are DMS gateway. The positions underlined are required in each cluster of four if the cluster is equipped. Other positions are equipped as needed. Blanks separate clusters.

Recommended token ring configuration

Fully equipped				Minimally equipped	
1223	1223	2233	2233	122	122

Installation requirements

Northern Telecom provides for the complete engineering and installation of TOPS MPX. TOPS MPX installation meets the following telephone operating company installation requirements:

- Installation kits containing instructions for miscellaneous parts are provided.

- Craft interface instruction cards are provided.

- A ground-isolation pad with bolting-pattern drill template is provided as required.

- System mounting/support and cabling for raised-floor applications can be engineered as required.

- Network Equipment Building requirements (NEBS) are met for bolting pattern/foot print.

For more information, refer to section 2019 of the IM-925.

TOPS MPX equipment

This chapter describes the hardware used in the TOPS MPX system.

Hardware units

For operator audio connection with subscribers, the patented digital telephony (DT) card, also known as the audio card, is a plug-in unit that interfaces the PS/2-based operator position to the DMS-200. On the operator side, it provides a four-wire analog voice interface for the operator headsets. On the DMS switch side, it provides a six-wire digital voice interface, terminating at channel banks and a time source generator (TSG).

A keyboard is developed to replace the PS/2 standard keyboard. The keyboard, essentially the same as the TOPS MP keyboard, is developed by IBM to BNR specifications.

Call control data links are handled by multi-protocol controllers (MPC) or enhanced multi-protocol controllers (EMPC) and run at 9.6 kb/s or 19.2 kb/s.

Note: The multi-protocol controller (MPC) has been manufacture discontinued and replaced by the EMPC. Both controllers continue to be supported; however, only EMPCs are available for new installations.

Integration of OEM equipment

Original equipment manufacturer (OEM) equipment and other TOPS MPX hardware and software is integrated into the DMS TOPS environment.

NT provides the following IBM equipment:

- Personal System/2 (PS/2) base
- keyboard
- color monitor
- token-ring local area network (LAN) connectivity — LAN adapter card
- real-time interface coprocessor (RTIC) card — X.25 interface coprocessor/2

The channel-bank and TSG equipment required by TOPS MPX is provided by the operating company.

Equipment diagrams

Depending on how software packages and circuit cards are provisioned, a workstation can become a database gateway (formerly known as a Type 1 position), a DMS gateway (formerly known as a Type 2 position), or a general operator position (formerly known as a Type 3 position).

The following figures show the workstation equipment.

TOPS MPX workstation

Monitor unit: 9524
(NTNX51LD, CPC A0614675)

Base unit: 486 PS/2
(NTNX51PB, CPC B0224644)

Keyboard unit
(NTNX51HA, CPC B0238254)

Headset jack assembly
[NTNX05309 for 3.05-m
(10-ft) cable]

DSU:
CPC A0602029, or
A0609602 for gateway positions

Power strip
(CPC A0384297 for twist-lock connector)
or
(CPC A0384296 for straight-blade connector)

Twist-lock or straight-blade connector

Note: Suitable headsets include Plantronics Starset II and Starset Supra, or UNEX Corp. Ventel Types I,II,V, and VB.

Monitor cable connection to base unit

Monitor unit

Monitor signal cable

Base unit

Slot 5: DT (audio) card
Slot 4: Token-ring card
Slot 3: (RTIC card for
database gateway and DMS
gateway positions)

Display signal
cable connector

Keyboard cable connection to base unit

Keyboard unit

Base unit

Keyboard
connector

Keyboard cable

Base unit circuit cards

Base unit

Slot 5: DT (audio) card
(NTNX51BD)

Slot 4: Token-ring network (adapter)
card (CPC A0602526)

Slot 3: RTIC card (CPC A0602526)
(for database gateway and DMS
gateway; not used for general
operator position)

FGND   HS1   HS2   DT

TR

RC

Workstation power

Base unit

DSU (used with database gateway and DMS gateway) (CPC A0602029 or A0609602)

Power strip
(CPC A0384297 for twist-lock connector)
or
(CPC A0384296 for straight-blade connector)

Twist-lock or straight-blade connector

Monitor unit

DT and TR card connections to equipment frame

Workstation base unit

Wiring closet TOPS MPX equipment frame

DT (audio) card (NTNX51BD)

DT

TR

Token-ring network card
(CPC A0602526)

Cables
NT0R82AB
(A0348376)
and
A0385644

Outlet

Voice
cable

Data
cable

BIX block (NTNX5103)

1 2 3 4 5 6

V1 – V20

Voice
Teladapts

MAU

1 – 8
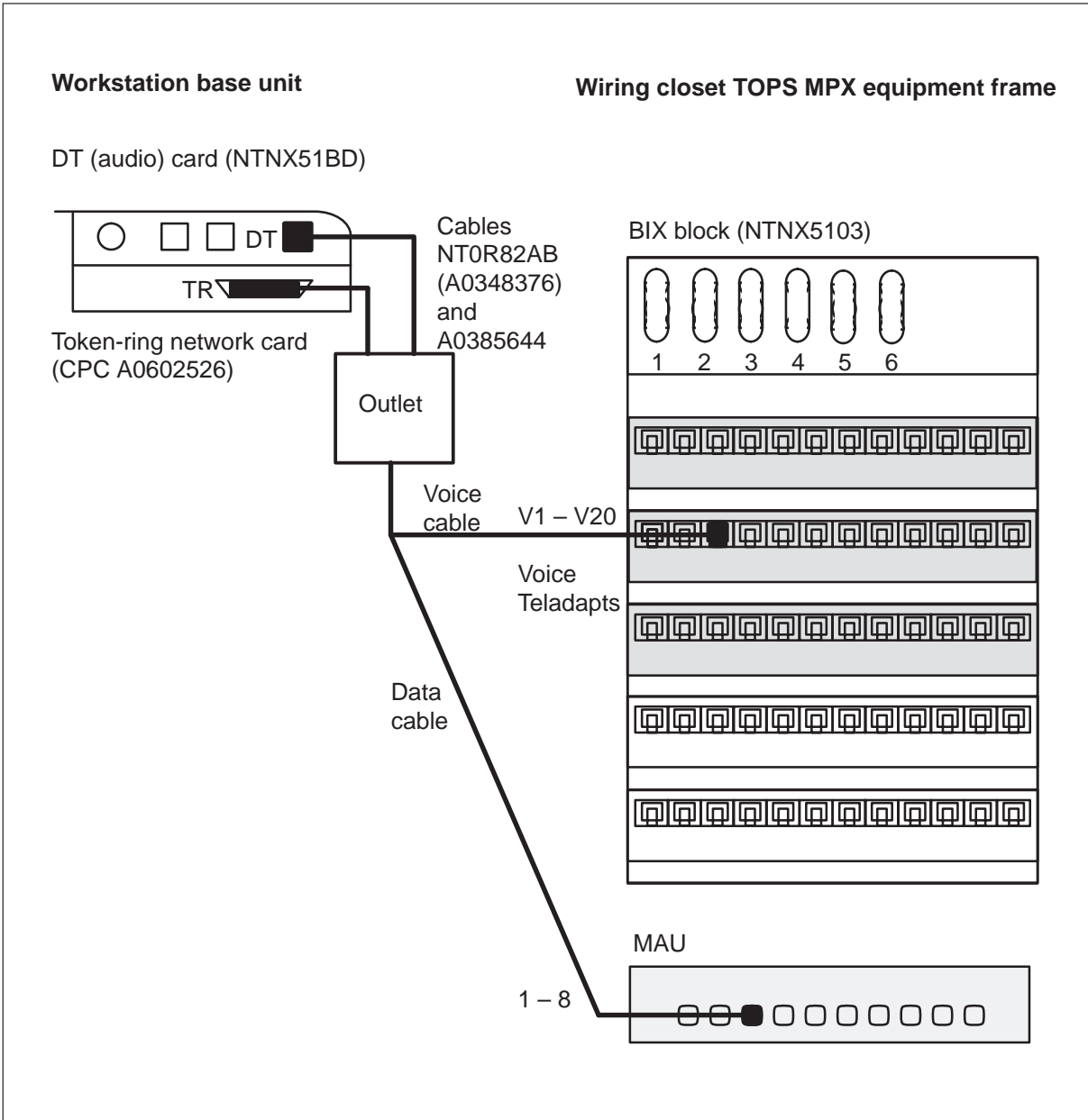
RTIC card and DSU connections to equipment frame

Workstation base unit

Wiring closet TOPS MPX equipment frame

RTIC card (used with database gateway and
DMS gateway) (CPC A0369273)

BIX block (NTNX5103)

RC

Cable
NTNX36DM

1   2   3   4   5   6

Data
Teladapts
D1 – D20

Cable
NTNX36DP

DDS

DTE

DSU (used with database gateway and DMS gateway)
(CPC A0602029 or A0609602)
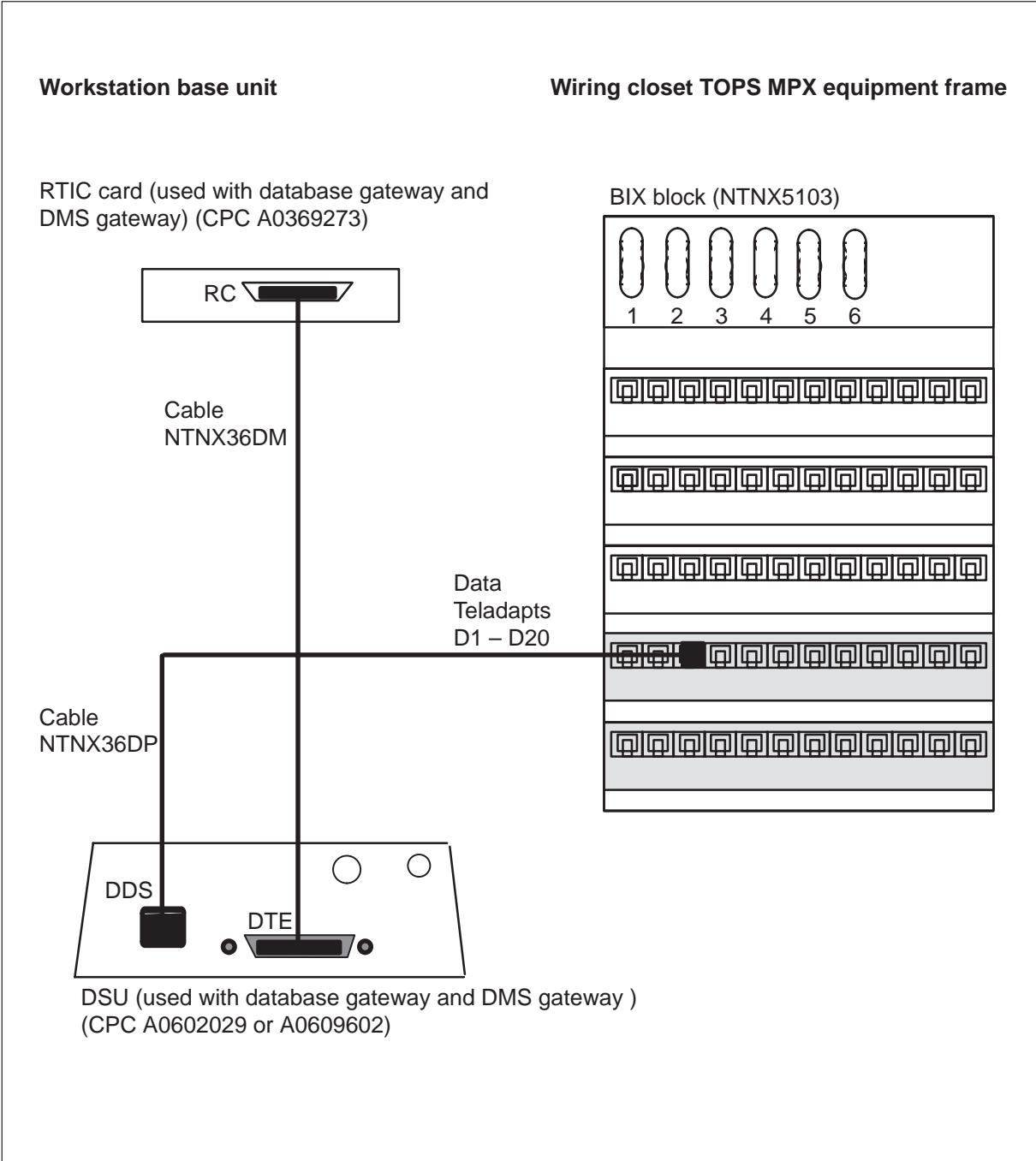
TOPS MPX equipment cables
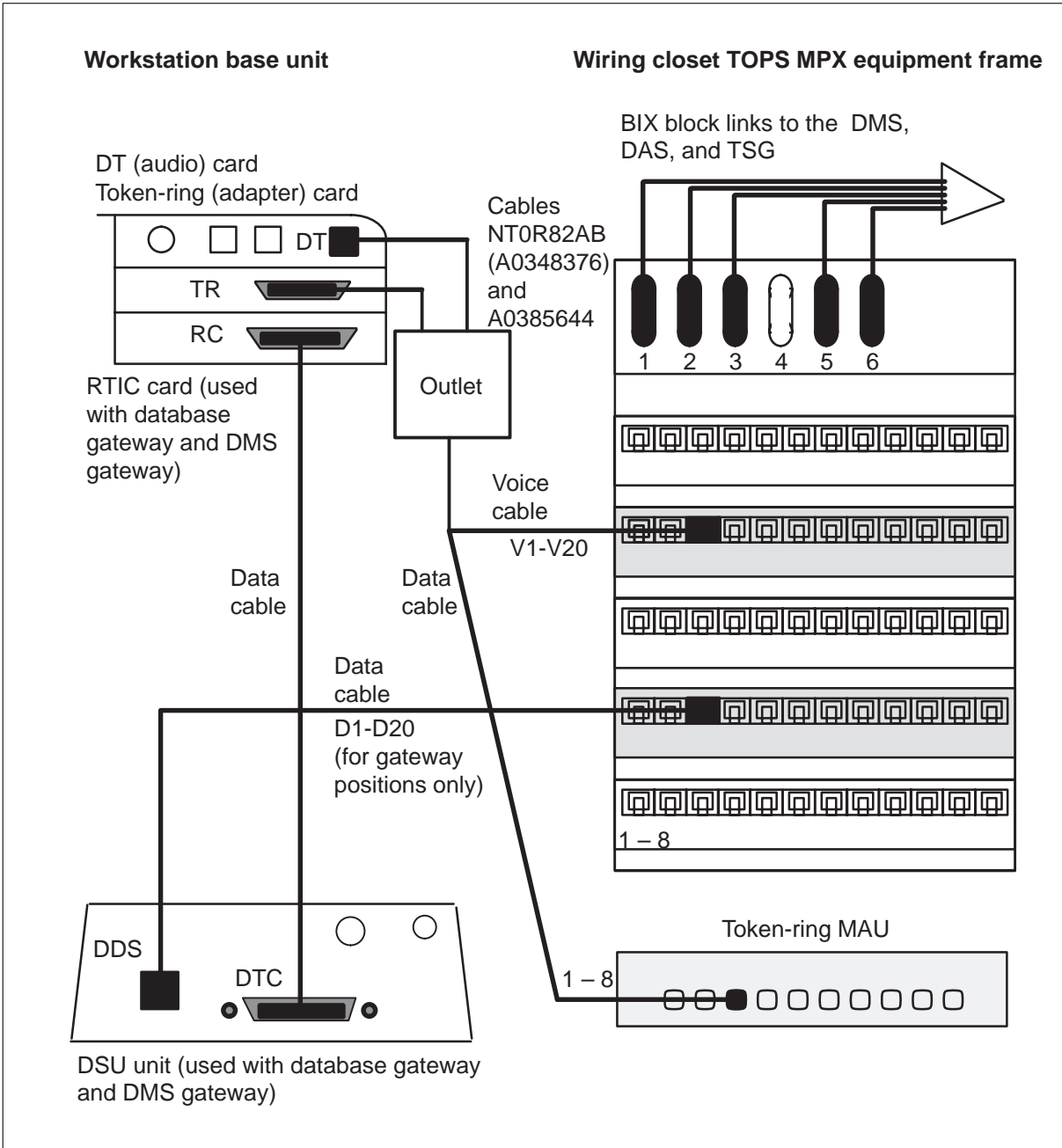
The TOPS MPX position

The TOPS MPX position is a custom IBM Personal System/2-based operator service workstation. It combines existing IBM hardware and software products with custom hardware and software jointly developed by IBM and NT.

TOPS MPX is designed to operate within the ambient temperature, relative humidity, and atmospheric pressure ranges listed in the following table.

Position equipment environmental considerations

	Normal	**Short Term**
Ambient temperature:	50°F–86°F	41°F–120°F
	10°C–30°C	5°C–49°C
Relative humidity: (noncondensing)	40%– 55%	40%– 55%
Atmospheric pressure	586 mmHg (78.8 KPa) corresponding to 2134 m (7000 ft.) of altitude	

The recommended ambient temperature range is 10°C–30°C (50°F–86°F) with the extreme limits at 5°C (41°F) and 49°C (120°F).

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

The extreme temperature and relative humidity conditions are based on a maximum duration of up to 72 continuous hours and up to 15 days per year. The maximum rate of temperature cycling should not exceed 6.7°C (12°F) per hour.

Air cleanliness should not be worse than class 100,000 (that is, 100,000 particles per cubic foot 0.5 micron or larger).

The heat dissipation of the TOPS MPX is 312 watts/position. This assumes that the frame is equipped fully and all equipment is operating at maximum capacity. This heat dissipation is for DMS-100 Family switching equipment only. Heat dissipation from other equipment must be considered when calculating the overall heat to be dissipated.

Position equipment packaging

Position equipment consists of the items listed in the following table. Note that the database gateway and DMS gateway PS/2 base units, as shipped, include the three plug-in cards listed: DT (audio) card, RTIC card, and

token-ring card. The general operator PS/2 base units include two plug-in cards: the DT (audio) card and the token-ring card. These plug-in cards are provisioned separately, but they are shipped together.

TOPS MPX position equipment

Description	Product Engineering Code (PEC) (See note 1)	Common Product Code (CPC)
PS/2 base	NTNX51PB	B0224644
Cable management bracket	NTNX5122	B0237579
Color monitor (9524)	NTNX51LD	B0240144
TOPS MPX keyboard, combined English	NTNX51HA	B0238254
TOPS MPX keytop designation labels	N/A	P0741755
Keyboard template (one per TOPS MPX position)	N/A	P0714192
DSU (56K modem for gateway positions) 110V only (GDC DT500N)	N/A	A0602029
UDS (56K modem for gateway positions) 110/220V	N/A	A0609602
Power strip, twist lock	N/A	A0384297
Power strip, straight blade (optional)	N/A	A0384296
Integrated headset jack assembly	NTNX5309	B0232113
Headset	N/A	(See note 2)
TOPS MPX DT (audio) card	NTNX51BD	B0232558
FC 6401 RTIC card (included in database gateway and DMS gateway base)	N/A	A0369273
FC 1133 token-ring card (included in database gateway, DMS gateway, and general operator position base)	N/A	A0602526

Note 1: Product engineering codes (PEC) are subject to change based on evolving enhancements.

Note 2: Suitable headsets include Plantronics Starset II and Starset Supra, or UNEX Corp. Ventel Types I,II,V, and VB.

Wiring closet equipment

Voice and data signals from the operator workstations are cabled to the TOPS MPX wiring closet equipment frame. The equipment frame contains cable connector hardware for links to the token-ring LAN, the DMS, and the DAS.

The wiring closet equipment includes one or more miscellaneous (MIS) equipment frames dedicated to TOPS MPX LAN equipment. MIS frames dedicated to TOPS MPX do not receive power and cannot house any equipment other than TOPS MPX LAN hardware. Throughout this document these MIS frames are referred to as TOPS MPX equipment frames.

Since power is not required at the TOPS MPX equipment frame, a frame supervisory panel is not provided. Also, TOPS MPX equipment frames do not have cable troughs; if required, cable racks are installed in accordance with site floor-plan drawings. Trim panels, doors, and lights are not to be installed on TOPS MPX equipment frames.

TOPS MPX equipment frames provide for mounting multiservice access units (MAUs) and building internal cross-connect (BIX) blocks. This equipment provides the token-ring and data-link connectivity and voice connections for all TOPS MPX positions in the operator service center (OSC). Each equipment frame provides connections for TOPS MPX on four token rings. The following figure shows the front and rear views of the frame: each side serves two token rings. Three MAUs are provided for each token ring. Six MAU connections are unused in the 16-position token ring configuration, and two MAU connections are unused in the 20-position configuration. These spare connections may be used in the future, for example, to add a bridge to connect the token-ring LAN to a wide area network, or to provide access for dial-up capability.

Six 50-pin connectors are provided in each BIX block for cable connections to the channel-bank units and the TSG. Currently, one of these connectors is unused.

TOPS MPX wiring closet equipment

1st token ring 00		3rd token ring 02

TR-00 MAU-00
TR-00 MAU-01
TR-00 MAU-02

TR-00 BIX block 1-20 | TR-01 BIX block 21-40

TR-01 MAU-03
TR-01 MAU-04
TR-01 MAU-05

2nd token ring 01

TR-02 MAU-06
TR-02 MAU-07
TR-02 MAU-08

TR-02 BIX block 41-60 | TR-03 BIX block 61-80

TR-03 MAU-09
TR-03 MAU-10
TR-03 MAU-11

4th token ring 03

Front   Rear

Note: Each MAU has eight ports.
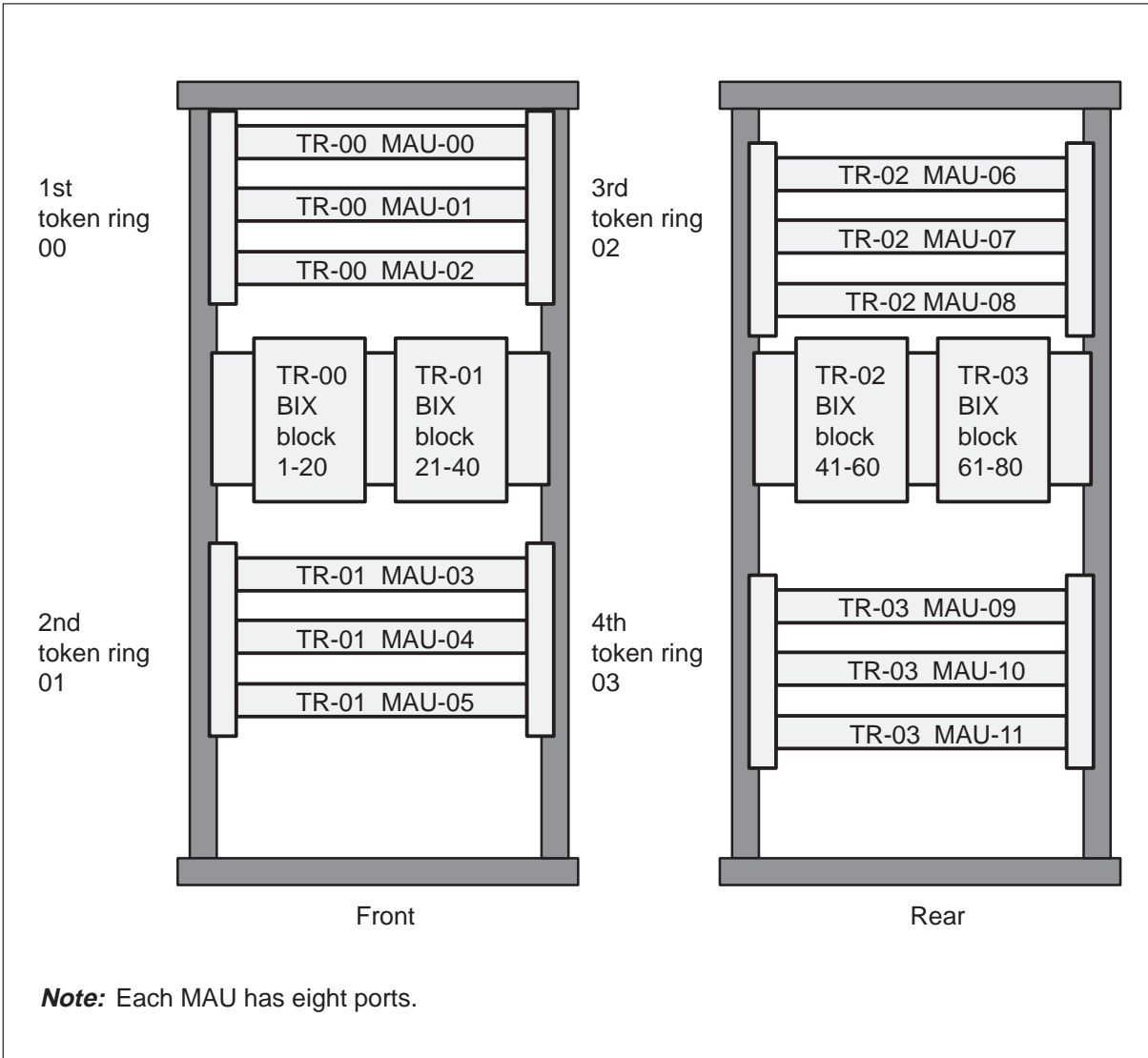
Multistation access unit (MAU)

The MAU is used to connect positions to the token ring. Three MAUs are always provided on each token ring, and each MAU provides connections for up to eight positions. Extenders are used to mount the MAUs in the TOPS MPX equipment frame. Two extenders are used for each set of three MAUs.

TOPS MPX MAU equipment

Description	Common product code (CPC)
MAU connector, A type	A0369138
MAU (8228)	A0368910
MAU mounting extender	P0709734

BIX block interface

The following figures shows the operator service center (OSC) TOPS MPX BIX block interface. Located in the wiring closet, it serves to terminate cable pairs from the TOPS MPX positions. Each BIX block is associated with the operator positions on a single token-ring LAN and can accommodate up to 20 positions. The BIX block is prewired with 20 voice and 20 data Teladapt connectors, used for position voice and data connections.

BIX block

Linked to DMS

Transmit data (voice)

Receive data (voice)

Clock ◄── Linked to TSG

(Not used)

Linked to DMS
or DAS

Transmit data

Receive data

50-pin connectors for links
to DMS, DAS, AND TSG

C1 C2 C3 C4 C5 C6

V1 V2   V3 V4   V5 V6   V7 V8

Voice Teladapts

V9 V10   V11 V12   V13 V14   V15 V16

V17 V18   V19 V20

D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12

Data Teladapts

D13 D14 D15 D16 D17 D18 D19 D20
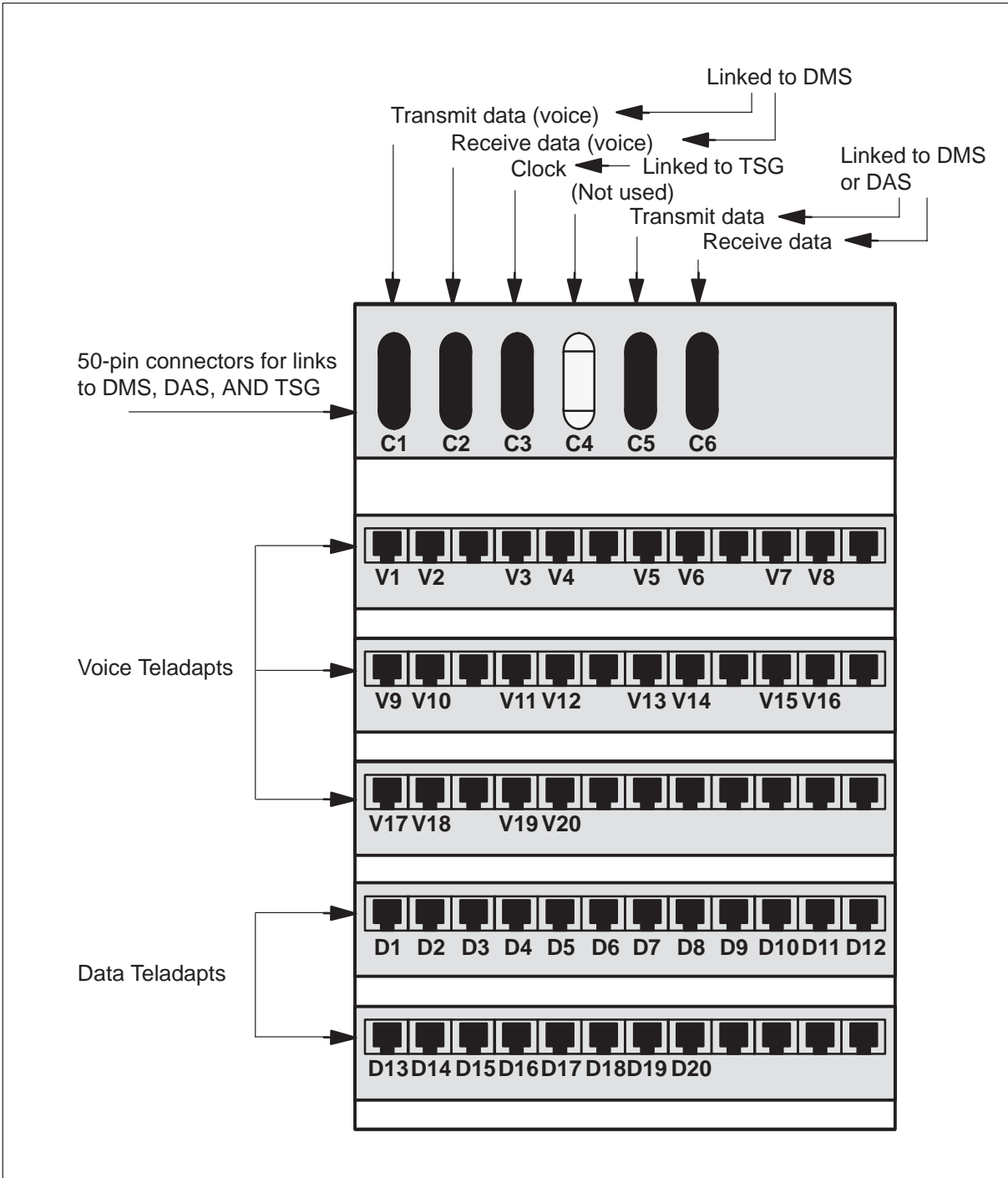
The BIX block is mounted in the TOPS MPX equipment frame using one mounting panel for two BIX blocks. These parts are identified in the following table.

TOPS MPX BIX block equipment

Description	Part number	Common product code (CPC)
BIX block assembly	NTNX5103	B0231179
Mounting panel	P0702320	P0702320

TOPS MPX equipment frame hardware kit

A TOPS MPX equipment frame hardware kit is required for each TOPS MPX equipment frame to mount MAUs, BIXs, and brackets in the TOPS MPX equipment frame. This kit for the TOPS MPX equipment frame is identified in the following table, labeled miscellaneous (MIS) frame hardware kit.

TOPS MPX frame hardware kit equipment

Description	Part number	Common product code (CPC)
MIS frame hardware kit	NTNX5109	B0231602

TOPS MPX cables

The operating company is responsible for integrating TOPS MPX with the furniture of its choice and for managing cable routing effectively. Cables are first run for each operator workstation and four position clusters. The routing of cables between operator workstations and the wiring closet TOPS MPX equipment frames is site specific. Cables must be properly secured to prevent interference with the raising and lowering of the operator's work surface.

The cable types required for TOPS MPX are as follows:

- position to outlet (NT0R82AB and A0385644)
- outlet to wiring closet (NTNX36QU)
- RTIC card to DSU (NTNX36DM)
- DSU to BIX block (NTNX36DP)
- MAU to MAU (NTNX36DK)

- CB to BIX block (NTNX36DN)

- TSG to BIX block (NTNX36DQ)

The following types of cables are used to connect an operator's workstation to a TOPS MPX equipment frame, and to connect the equipment frame to the DMS, DAS, and TSG.

Cables NT0R82AB (A0348376), A0385644, and NTNX36QU

Cables NT0R82AB and A0385644 connect the base unit of a workstation to cable NTNX36QU, which connects to a MAU shelf and BIX block in the TOPS MPX equipment frame. Cable NT0R82AB (A0348376) is a seven-foot voice cable. Cable A0385644 is a six-foot data cable. The following figure shows Cables NT0R82AB and A0385644 connecting the DT (audio) card and the token-ring network (adapter) card through Cable NTNX36QU to the equipment frame. This configuration is the standard recommendation of Northern Telecom.

Cable NTNX36DM

This cable connects the base unit of a TOPS MPX gateway position to a DSU. The following figure shows Cable NTNX36DM.

Cable NTNX36DP

This cable connects the DSU to a BIX block in the TOPS MPX equipment frame. It has an 8-pin Teladapt, which connects to the DSU, and a 6-pin Teladapt that connects to the BIX block. The following figure shows Cable NTNX36DP.

Workstation cables

**NT0R82AB (A0348376) and A0385644: cables between workstation
and TOPS MPX equipment frame**

Teladapt connector,
6 positions,
6 contacts (CPC A0369985)

Teladapt connector,
6 positions, 4 contacts
used (CPC A0369985)

DT (audio) card

NT0R82AB

Outlet

NTNX36QU

BIX block voice
Teladapt
(V1 – V20)

Token-ring
network card

A0385644

Token-ring
MAU (1 – 8)

365.76 m
maximum (1200 ft
maximum)

Male 9-pin D-sub connector (CPC
A0329608) with hood (CPC A0368855)

Connector (CPC
A0369138)
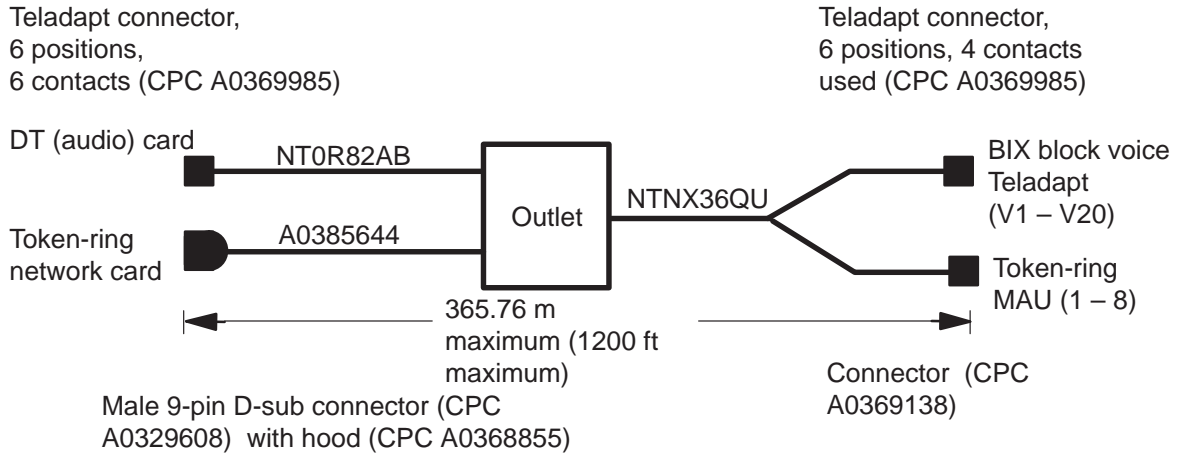
**NTNX36DM: cable between RTIC card and DSU (modem) (database
gateway and DMS gateway only)**

Non-filtered, female 37-pin D-sub connector
(CPC A0310833) with hood (CPC A0298767)

Filtered, male 25-pin D-sub, standard
RS-232C pinout connector (CPC
A0315352) with hood (CPC
A0323869)

RTIC card

1.22 m minimum; 2.74 m maximum
(4 ft minimum; 9 ft maximum)
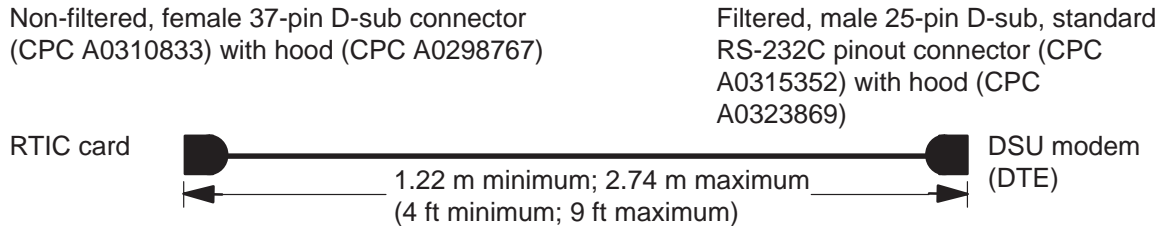
DSU modem
(DTE)

**NTNX36DP: cable between DSU (modem) and TOPS MPX equipment frame
(database gateway and DMS gateway only)**

Teladapt connector,
8 positions, 8 contacts
(CPC A0376318)

Teladapt connector,
6 positions, 4 contacts used
(CPC A0369985)

DSU (DDS)

365.76 m maximum
(1200 ft maximum)

BIX block
data Teladapt
(D1 - D20)
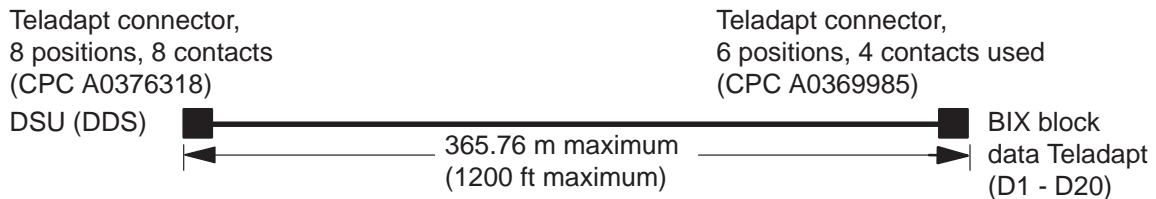
Cable NTNX36DK

Three NTNX36DK cables are used to interconnect the MAUs of a token ring. The following figure shows Cable NTNX36DK.

Cable NTNX36DN

Four NTNX36DN cables are used to connect a BIX block in the TOPS MPX equipment frame to a channel bank or distribution frame. The routing of these cables is site specific. The following figure shows Cable NTNX36DN.

Cable NTNX36DQ

This cable is used to connect a BIX block in the TOPS MPX equipment frame to the TSG. (The TSG is provided by the operating company.) The following figure shows Cable NTNX36DQ.

TOPS MPX equipment frame cables   .

NTNX36DK: MAU to MAU cable

Connector (CPC A0369138)   Connector (CPC A0369138)

MAU   MAU
(R0) ◼━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━◼ (R1)
        ◄────────── 1.22 ──────────►
                      m (4 ft)
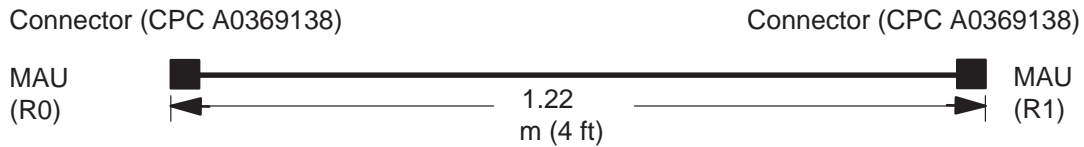
NTNX36DN: cabling from TOPS MPX equipment frame to distribution frame for links to the DMS and DAS

50-pin connector (CPC   Terminated at distribution frame for
A0291218) with hood (CPC   links to the DMS switch or DAS
A0288507)
                      25-pair 24-AWG cable (CPC R0113628)
BIX block ◖━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━
(C1, C2,   ◄──────── See note below. ────────►
C5, and C6)
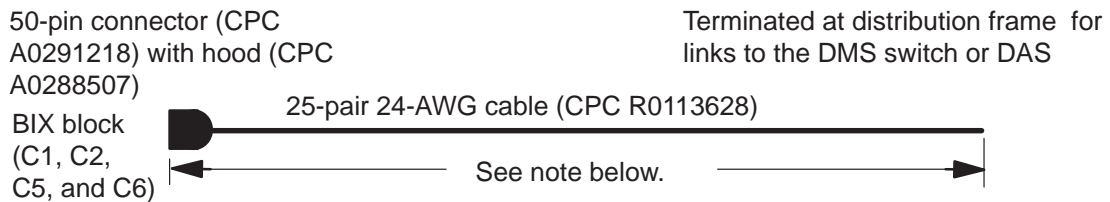
Note: The maximum cabling distance between a TOPS MPX workstation and the wiring closet equipment frame is 365.76 m (1200 feet).

NTNX36DQ: cabling from TOPS MPX equipment frame to TSG

50-PIN connector (CPC
A0291218) with hood (CPC   Terminated at the TSG
A0288507)
                    25-pair 24-AWG shielded cable (CPC R0114974)
BIX block ◖━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━
(C3)   ◄──────── See note below. ────────►
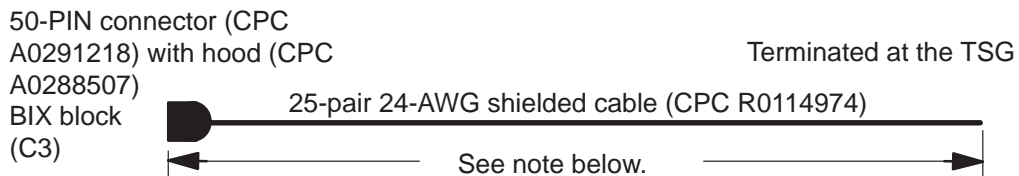
Note: The maximum cabling distance between a TOPS MPX workstation and a channel bank or a TSG is 457.20 m (1500 feet).

Alternative cable NTNX36DS

Cable NTNX36DS connects the base unit of a workstation to a MAU shelf and BIX block in the TOPS MPX equipment frame. It is a single cable with two connectors at each end. The end at the equipment frame has a 6-foot split between its two connectors. (A 6-foot split is a Y-split with three feet of cable on each side.) This cable provides an alternative to the recommended configuration of cables NT0R82AB, A0385644, and NTNX36QU. The following figure shows cable NTNX36DS.

Alternative workstation cable

NTNX36DS: cable between workstation and TOPS MPX equipment frame

Teladapt connector, 6 positions, 6 contacts (CPC A0369985)

Teladapt connector, 6 positions, 4 contacts used (CPC A0369985)

38 mm (1.5 in)

914 mm (3 ft)

Digital telephony card

BIX block Voice Teladapt (V1 – V20)

152 mm (6 in)

Token-ring network card

Token-ring MAU (1 – 8)

365.76 m maximum (1200 ft maximum)

Connector (CPC A0369138)

Male 9-pin D-sub connector (CPC A0329608) with hood (CPC A0368855)

Note: Cable NTNX36DS provides an alternative way to link the workstation and equipment frame. The standard recommendation of Northern Telecom, however, is the configuration of Cables NT0R82AB and A0385644 to Cable NTNX36QU, as shown in the earlier figure "Workstation cables."

The following table lists the TOPS MPX cable types.

TOPS MPX cable types

Cable	Description	Product engineering code (PEC)	Common product code (CPC)
Position to outlet box on NTNX36QU cable	Type 6 office cable 2.13 (7 ft) (See Note 1)	NT0R82AB	A0348376
Position to outlet box on NTNX36QU cable	Type 6 office cable 1.82 (6 ft) (See Note 1)	N/A	A0385644
Outlet to wiring closet	Type 2 plenum cable0–365.76 m (0–1200 ft) (See Note 1)	NTNX36QU	B0235273
DSU to BIX	2 pair, 24 AWG, NT plenum cable 0–365.76 m (0–1200 ft)	NTNX36DP	B0230904
MAU to MAU	Type 1 plenum cable 1.22 m (4 ft)	NTNX36DK	B0230860
RTIC card to DSU	12 pair, 24 AWG, NT non-plenum cable, 2 twist per inch Minimum 1.22 m (4 ft) Maximum 2.74 m (9 ft)	NTNX36DM	B0230859
CB to BIX block	25 pair, 24 AWG, NT non-plenum cable (See Note 2)	NTNX36DM	B0230862
—continued—			

TOPS MPX cable types (continued)

Cable	Description	Product engineering code (PEC)	Common product code (CPC)
TSG to BIX block	25 pair, 24 AWG, NT non-plenum cable (See Note 3)	NTN36DQ	B0231996

Note 1: The recommended configuration for position to wiring closet is cables NT0R82AB and A0385644 to the outlet box on NTNX36QU cable. An alternative configuration, not recommended, is cable NTNX36DS (CPC B0233915), a type 2 plenum cable 0–365.76m (0–1200 ft) long.

Note 2: The length of this cable is restricted so that all combined cable lengths from any position to channel banks do not exceed 457.20 m (1500 ft).

Note 3: The length of this cable is restricted so that all combined cable lengths from any position to the TSG do not exceed 457.20 m (1500 ft). The shield should be grounded at the TSG end.

—end—

Cable-management bracket

A cable-management bracket (NTNX5122, CPC B0237579) placed under the base unit relieves strain on cables attached to the TOPS MPX position. The TOPS MPX cables must be properly dressed and secured to the bracket separately with Tywrap.

Operating environment

The recommended equipment operating range is 4°C–38°C (39.2°F–100.4°F) with a relative humidity of 20%–50%; however, appropriate working conditions for personnel should prevail.

The area in which multiple clusters are arranged should employ a flooring material with a static factor of 3000 volts or less and a relative humidity of 35%–50%. These conditions ensure proper operation of the electronics in the TOPS console by minimizing static electricity.

The TOPS MPX cabling system components can operate within the following environmental limits listed in the following table.

Cabling system components operating environmental limits

Description	Temperature	Relative Humidity	Max. Wet Bulb
Wiring closet	10.0°C–40.6°C	8%–80%	27°C
Accessories	0.6°C–51.7°C	5%–95%	29.4°C
Cable	–40°C to 80°C	No limit	No limit

Transportation and storage requirements

All TOPS MPX equipment complies with shock and vibration requirements as specified in LATA Switching Systems Generic Requirements (LSSGR) Section 14.4.3, as well as Network Equipment-Building System (NEBS) Sections 4.4.1, 4.4.2, and 4.4.3. These requirements apply to equipment in non-operating condition during handling and transportation.

The database gateway and DMS gateway PS/2 base units, as shipped, include three plug-in cards: DT card, RTIC card, and token-ring card. The general operator position PS/2 base units include two plug-in cards: the DT card and the token-ring card. These plug-in cards should not be shipped loose.

The TOPS MPX cabling system components can be shipped and stored within the following environmental limits shown in the following table.

Cabling system components shipping and storage environmental limits

Description	Temperature	Relative humidity	Max. wet bulb
Accessories	–40°C to 60°C	5%–95%	29.4°C
Cable	–40°C to 80°C	No limit	No limit

Office configuration equipment

The following is a list of the minimum equipment found in the given office configuration beyond the operator position. The "Office equipment provisioning "table in the "Office Provisioning" section later in this chapter lists the possible equipment that can be located in the office.

- single-traffic office

— system administration data system (SADS) teletypewriter (TTY) – used by the in-charge manager to activate and deactivate force management features and to send information on various aspects of the system

— TOPS MPX in-charge (IC) position – a cathode-ray tube (CRT) and keyboard located in the traffic office, usually near the SADS TTY

— TOPS MPX service assistance (SA) position – a position, including a screen (CRT) and a keyboard, where a service assistant can be reached for help

- multitraffic office

— force management center (FMC) – a centralized location staffed with people who carry out administration tasks for the entire operator work force (not for individual traffic offices)

— force administration data system (FADS) TTY – a TTY located in the FMC and used to activate and deactivate force management features and to provide information on the system and the traffic offices

— traffic administration data system (TADS) TTY – a TTY used in individual traffic offices to activate and deactivate force management features and to output information on various aspects of the system for the given traffic office. There is one TADS TTY for each traffic office.

— TOPS MPX IC position – a position that displays office statistics and receives assistance requests, monitors, pages, places outgoing calls, and performs administrative searches

— TOPS MPX SA position – a position where a service assistant can be reached for help and can receive assistance requests, monitor, page, place outgoing calls, and perform administrative searches

— TOPS MPX force management position (FMCRT) – a position that displays statistics for the operator work force. The FMCRT uses a TOPS 04 or TOPS MP workstation to display FM statistics.

The keyboard-send-receive (KSR) SADS, TADS, and FADS TTYs are equipped with a standard QWERTY keyboard. They are used to enter commands or queries into the DMS switch, which uses the printer to confirm these inputs or to provide the requested information. The DMS switch transmits measurement statistics to the TTY at a rate of 300 baud to the switch and 1200 baud from the switch. The speed is assigned by the operating company in table TOPSDEV.

Determining the operator work force

Much of the provisioning for TOPS MPX depends on the size of the operator work force as determined by the operating company. Some provisioning, such as equipment for administrative positions, can be done without work-force considerations. Other equipment amounts are restricted to a specific range, and the exact amount is determined by the operating company.

The number of operators supported by a DAS is determined by the average work time (AWT) of the operator, the average processing time (APT) of the DMS switch for the predominant call type, and many other factors.

The following formulas show the operator call rate, the central controller (CC) capacity, and the maximum number of operators supported by the CC in a particular environment:

$$\text{oper call rate} \quad = \quad \frac{(\text{oper util}) \ (\text{seconds per hour})}{(\text{operator AWT})} \quad = \quad \text{calls per hour per oper}$$

$$\text{CC capacity} \quad = \quad \frac{(\text{CC CP OCC}) \ (\text{msecs per hour})}{(\text{CC APT})} \quad = \quad \text{calls per hour}$$

$$\text{max number of opers} \quad = \quad \frac{(\text{CC calls per hour})}{(\text{calls per hour per oper})}$$

> *Note:* These formulas apply only when TOPS MPX is used in a DMS-200 office, with all operators working on the same call function (DA or intercept). In other cases (such as a DMS-200 office), these calculations are not appropriate.

The following table, "Operator serving limits," estimates the maximum number of operators supported by an NT40 and a DMS SuperNode (68020 at 20 MHz and 68030 at 33 MHz) system in the standalone (SA), host operator centralization (HOC), and remote operator centralization (ROC) configurations.

Be careful when interpolating the operator capability of a projected SA, HOC, or ROC system. Note that the call-processing times combine linearly, whereas the operator capabilities do not.

The values in the following table are not actual measurements. They are based on theoretical estimates, which are based on DA call timings. Intercept calls are not included in the estimates. Including intercept calls

would reduce the CC capacity available for DA calls. Therefore, these values are maximum limits, assuming 100% DA calls.

The following assumptions apply to the calculations:

- operator utilization = 95%
- CC CP occupancy = 70%

The estimates in the following table refer only to the TOPS office, not to an intervening end office as shown in the "SA configuration" figure or the "HOC configuration" figure in the preceding chapter, "TOPS MPX configurations."

Operator serving limits

DMS host system	Configuration	AWT	Operator call rate (calls/ hour)	CC CP OCC (calls/hour) at 70% occ.	APT (ms)	Maximum operators at 95% util.
NT40	SA	20	171	34,239	73.6	190
	HOC	20	171	80,769	31.2	449
	ROC	20	171	33,780	74.6	188
SuperNode 68020/20	SA	20	171	68,478	36.8	380
	HOC	20	171	161,538	15.6	897
	ROC	20	171	67,560	37.3	375
SuperNode 68030/33	SA	20	171	102,857	24.5	571
	HOC	20	171	242,308	10.4	1022 (See Note)
	ROC	20	171	101,205	24.9	562

Note: An arbitrary maximum of 1023 DA calls may be processed simultaneously in the host DMS switch. The maximum is defined by software code. A pool of 1022 DA call IDs is allocated for DA services. This pool limits the maximum DA call volume to 174,700 calls per hour, at 95% efficiency.

Distribution and expansion of operator workstations

TOPS MPX workstations are arranged in groups or clusters of four positions each. The clusters are connected to multistation access units (MAUs) in the form of a token-ring LAN. Three functional types of TOPS MPX workstations are used within the LAN.

The database gateway position has a data path to the DAS, and the DMS gateway position has a data path to the DMS. This DAS and DMS information is shared with the other operator positions within the token ring.

Like the database gateway and the DMS gateway, the general operator position has voice paths to the DMS network.

When TOPS MPX is used with IBM DAS, Northern Telecom recommends that token rings be limited to 16 workstations (four clusters), that redundant DMS gateway stations be used in each cluster, and that expansion be based on a growth of clusters. The maximum technical limitation for a token ring is 20 workstations (five clusters).

Provisioning the operator positions

The database gateway and DMS gateway workstations use the same hardware, including the RTIC card. The general operator position workstation does not use the RTIC card. The same headsets used for TOPS MP are used with TOPS MPX. Examples of suitable headsets include the following:

- Plantronics Starset II and Starset Supra

- UNEX Corp. Ventel Types I, II,V, and VB.

Operator positions may be located on a different floor from the TOPS MPX equipment frame, provided the cabling length does not exceed 365.76 m (1200 ft) to the wiring closet equipment frame.

Force management functions for the TOPS MPX are implemented using TOPS 04 or TOPS MP equipment. Provide a TOPS 04 or TOPS MP force management position for each TOPS MPX host or standalone office.

TOPS MPX DMS database gateway position

When used with IBM DAS, the TOPS MPX database gateway position acts as an operator position and also provides a data link to the DAS. This is a 56 Kbps data link using the binary synchronous (BiSync) or X.25 protocol. The link is connected from the position to a local data service unit (DSU) and then to the DAS. Database gateway positions are always provided in pairs on each token ring to provide redundancy for the DAS data link.

The database gateway position is equipped with the following plug-in cards:

- DT (audio) card

- token-ring card

- X.25 RTIC card

The RTIC card has a V.35 physical interface.

TOPS MPX DMS gateway position (VPC)

The TOPS MPX DMS gateway position, also known as the virtual position controller (VPC), performs all of the common functions of the TOPS MPX position and in addition provides, for all position in the same cluster, a data link to the TMS for communication with the DMS-200 CC. This is a 56 Kbps data link using the X.25 protocol. The link is connected from the position to a local DSU, and then to the channel-bank equipment provided by the operating company.

It is recommended to provision DMS gateway positions in pairs for each set of four positions on a token ring to provide redundancy for the CC data link. In a redundant configuration, a single DMS gateway position is permitted if it is the only position in the cluster. For non-redundant configurations, each cluster must have one DMS gateway position; non-redundant configurations are not recommended.

The DMS gateway position is equipped with the following plug-in cards:

- DT (audio) card
- token-ring card
- X.25 RTIC card

The RTIC card is the same hardware version as that used in the database gateway position.

TOPS MPX general operator position

The TOPS MPX general operator position communicates with the CC through the token ring to one of the pair of DMS gateway positions in the same group of four. Communication with the DAS is carried through the token ring to one of the pair of database gateway positions.

The general operator position is equipped with the following plug-in cards:

- DT card
- token-ring card

Workstation sparing information

The three types of TOPS MPX workstations can be spared by a single station type, using the separately provisionable plug-in circuit cards in quantities determined by the user.

Digital telephony (audio) card

All three types of TOPS MPX workstations have a plug-in DT (audio) card, which provides a voice link between the operator position and the DMS host. This four-wire voice link is made through channel-bank equipment provided by the operating company and through a TMS peripheral of the

DMS switch. The DT (audio) card also has two operator headset ports (RJ-11 jacks with TOPS MP pin outs) and a grounding lug for the headsets. In addition, the DT (audio) card has a two-wire clock interface to receive clock signals from a TSG.

The DT (audio) card supports low-current headsets as specified in the Operator Service Systems General Requirements (OSSGR) document, as well as the TOPS headset assembly.

The following figure shows how the DT (audio) card connects to both the DMS switch and the operator headsets.

DT card links to DMS and headsets
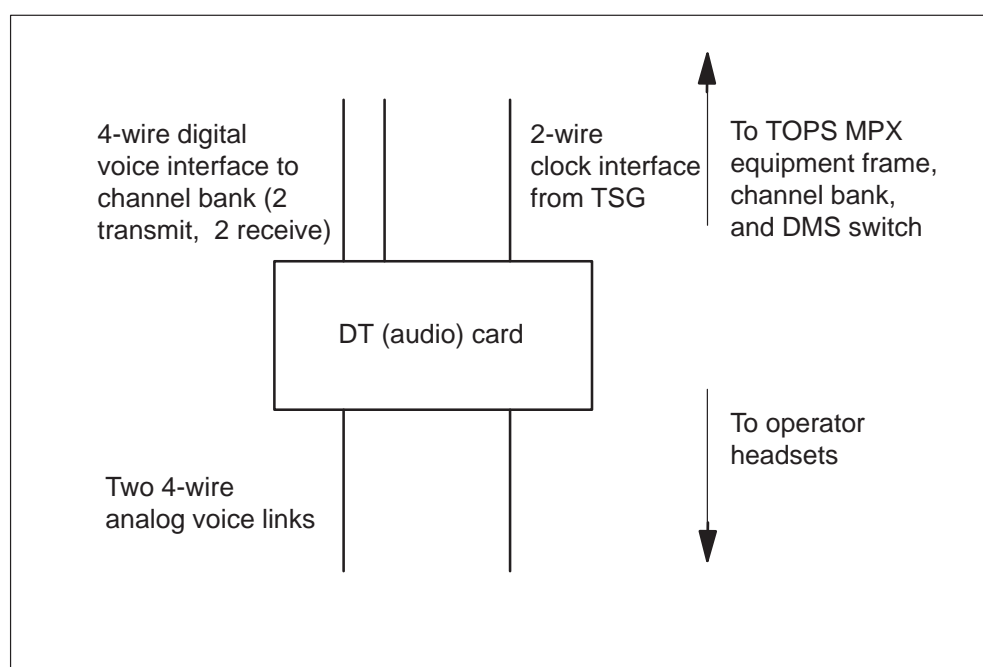
The following figure shows the headset cable connections to the DT (audio) card.

Headset cable connections to DT (audio) card

Headset jack assembly
(NTNX5309)

FGND   HS1   HS2   DT

DT (audio) card (NTNX51BD)

Note: Suitable headsets include Plantronics Starset II and Starset Supra, or UNEX Corp. Ventel Types I,II,V, and VB.
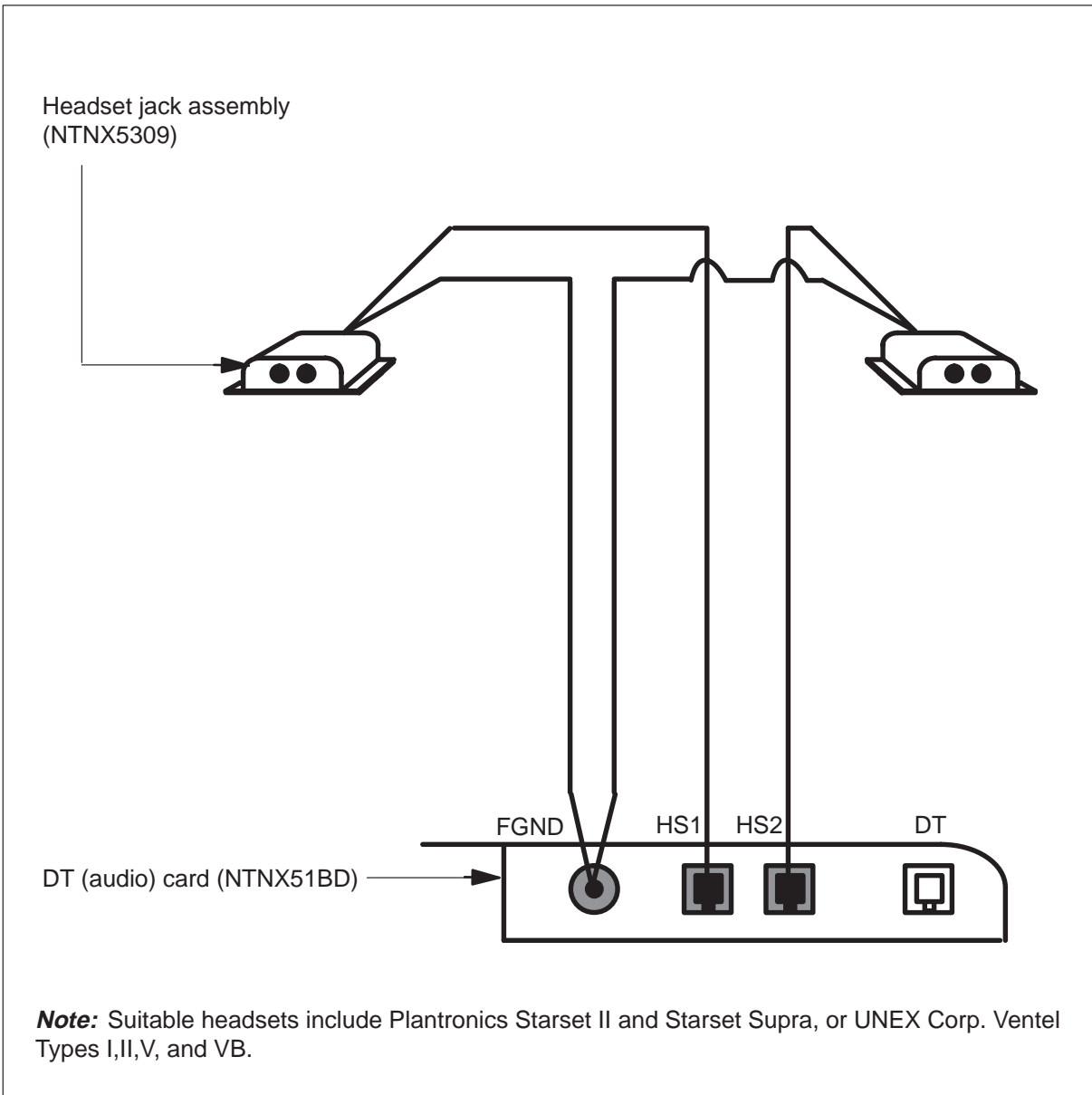
Keyboard

The TOPS MPX keyboard used with all position types is identical to a standard TOPS MP keyboard with one additional key (the **Word** key). Some keys, designated as user programmable, have clear plastic keycaps. Captions for these keys may be printed by the operating company according to its particular requirements. Permanent TOPS MPX captions are printed on the fixed function keys.

Power strip

Power strips are used to distribute ac power to TOPS MPX operator position equipment. The power cords of the power strips can have a straight-blade or twist-lock connector. Operator equipment connections are made to straight-blade power outlets on the power strips.

Data service unit

The recommended DSU for the TOPS MPX to the DMS switch and the TOPS MPX to the DAS data-link applications is a GDC DT500N DSU (A0602029) or a UDS 56K modem (A0609602).

Channel-bank units

Channel-bank equipment is provided by the operating company. The following Northern Telecom channel-bank units are recommended for a TOPS MPX application:

QPP-554B   DMS voice channels (one per TOPS MPX position) for database gateway, DMS gateway, and general operator position workstations

> *Note:* The QPP-554B channel-bank unit must have error correction turned off. In addition, zero code suppression (ZCS) should be turned off.

QPP-684A   DP56 data channels, one for each DMS gateway workstation
QPP-684A   DP56 data channels, one for each database gateway workstation

> *Note 1:* Database gateway positions require channel-bank access between the DAS and the DSU.

> *Note 2:* The QPP-553A card (DP56) has been manufacture discontinued.

The following two tables describe the switch setting for the QPP684A.

Switch settings on the QPP684A

Switch	Settings
SW1	0 (no error correction)
SW2	ZS = DIS (zero code suppression turned OFF)
	LLB = DIS (disable latching loopback option)
—continued—	

Switch settings on the QPP684A (continued)

Switch	Settings
P3	B (for DE-4E or DE1000 channel bank)
P4	B (for DE-4E or DE1000 channel bank)
P5	B (for DE-4E or DE1000 channel bank)
—end—	

Front panel switch settings on the QPP684A

Switch	Settings
SC	OUT (for 56K DDS interface application)
56	IN (for 56K DDS interface operation)
19.2	OUT
9.6	OUT
4.8	OUT
2.4	OUT

Note: For operating companies using the secondary channel (SC) for DDS maintenance support, the SC faceplate switch would be turned ON (IN).

Time source generator

A digital clock timing source supplied by the operating company is required for the DT (audio) card located in the TOPS MPX positions. A TSG manufactured by Telecom Solutions, or a TSG equivalent, is recommended to provide this function. With the optional cards recommended, the TSG provides internal redundancy, so that no single-point failure will cause loss of clock signals. Each timing output card (TOCA) provides ten ports, with each port serving one TOPS MPX position. One hot spare TOCA card is provided for redundancy of the output ports, and it is automatically switched in to replace a failed output port. Also, redundant clock input (CI) and Stratum 3 (ST3) clock cards are recommended.

The recommended TSG operates from two office battery power sources. The redundant –48 Vdc supply lines are fused on the shelf, then bussed to the rest of the cards in the shelf. Each card contains a dc-to-dc converter that provides dc supply voltages for its onboard electronics.

All alarm indications are bussed from each CI, ST3, TOCA, and matrix control adapter (MCA) card to the fuse and alarm (FA) card, which in turn produces major and minor audible and visual alarms and major and minor LED indications. The FA card monitors both its own performance and the power of alarm inputs from the other cards, and it provides the central office (CO) and an E2A telemetry-type system with an alarm and status output. The FA alarm outputs should be wired by the operating company to a distribution frame, where they are cross-connected to DMS scan points and picked up as office alarms.

The following table identifies the parts for the Telecom Solutions TSG.

Telecom Solutions TSG

Description	Quantity	Part Number
DCD-400 shelf assembly	1	990-40000-01
Fuse and alarm card (FA)	1	090-40014-01
Clock input card (CI)	2	090-40010-01
Stratum 3 clock (ST3)	2	090-40013-01
Timing output card (TOCA)	1 per 10 positions	090-40011-01
Hot spare TOCA	1	090-40011-01
Matrix control card (MCA)	1	090-40015-01

Equipment provisioning

The DMS-100/200 TOPS with TMS uses the provisioning guidelines of TOPS MPX.

Token ring

The token-ring ensemble is the hardware building block for TOPS MPX. This ensemble is made up of several TOPS MPX operator positions interconnected by a token ring. The operator positions are based on IBM PS/2 personal computers, equipped with different plug-in cards to perform three different functions. All positions have plug-in DT (audio) cards that connect to the TMS through channel-bank equipment provided by the operating company, and token-ring cards that interface the position to the token ring. The token ring is made up of MAUs and interconnecting cabling. The token-ring interface in each position is connected to a MAU. Each MAU terminates up to eight positions. Gateway positions have the RTIC card.

TOPS message switch

TOPS MPX requires the TOPS message switch (TMS). The number of TMSs needed is influenced by the number of workstations (operator positions). Site configurations of more than 96 workstations use more than one TMS. The TMS is repeated as necessary up to the limits of the CC (including other factors than the number of positions) in the DMS switch.

DMS conference circuits

Three port conference circuits are required in the host and remote (if present) DMS offices, according to the source of the DA/INT calls.

DMS audio response trunks

The audio response units (ARUs) are used for automated DA and intercept call responses. The ARUs are internal (NT supplied) and external (vendor supplied – IBM). The DMS identifies an appropriate ARU trunk and establishes a connection between the ARU and the calling party. The DAS sends the requested number over a dedicated ARU trunk on standard T1 facilities between the DMS and the DAS. Standby ARU trunks are provided over physically separate T1 facilities. Trunks to audio response units should be provisioned based on traffic, grade of service, and redundancy requirements.

Office provisioning

The following table lists the equipment that can be found in each office type.

Office equipment provisioning

Single-traffic	Multi-traffic	Equipment	Requirement
√	√	Operator position	0–1023 per TOPS MPX host (varies depending on real-time considerations)
√	√	SA position	0–125 per TOPS MPX host
√	√	IC position	0–1 per office (maximum 30 per TOPS MPX host)
√	√	Autoquote (AQ) TTY	1 per hotel, maximum of 512 per TOPS MPX host
√	√	Record (REC) TTY	2 (includes optional backup TTY)
—continued—			

Office equipment provisioning (continued)

Single-traffic	Multi-traffic	Equipment	Requirement
√	√	Voicequote (VQ) TTY	2 (includes optional backup TTY)
√	√	HADS TTY	1 per TOPS MPX host
	√	TADS TTY	1 per office, maximum of 30 per TOPS MPX host
	√	FADS TTY	1 per TOPS MPX host
√		SADS TTY	1 per TOPS MPX host
		FMCRT	1 per TOPS MPX host
√	√	MFADS	1 per TOPS MPX host
√	√	Network operation trunking information system (NOTIS)	1 per TOPS MPX host

—end—

Power and grounding requirements

Northern Telecom recommends that TOPS MPX operator position equipment be powered from a "protected" 120 V, 60-Hz power source supplied by the operating company. Also, the recommended method of installation is in the common bonding network. Power and grounding arrangements for the TOPS MPX must conform to the requirements specified in *TOPS MPX Power and Grounding Guide,* 297-2291-156.

Operating company support equipment

Support equipment, such as channel banks and the time source generator, is used to link the TOPS MPX to the DMS host and DAS. This equipment is external to the TOPS MPX wiring closet equipment and is provided by the operating company.

Voice and data links between any support equipment and the TOPS MPX are transformer coupled (or equivalently coupled) to ensure ground separation. Also, support equipment is usually dc powered.

Support equipment must meet the following requirements. If the channel-bank equipment and the TSG are located with the DMS equipment, they must be in the same isolated ground plane as the DMS switch.

- Each channel bank or TSG must be fused separately at its –48 V dc input.

- The frames housing this equipment must be insulated from the floor and from any incidental contact with metal raceways, cable racks, or other incidental grounds.

Installation environments

The TOPS MPX can be installed in areas with conventional floors, raised floors, or dropped ceilings as described in the *TOPS MPX Power and Grounding Guide*, 297-2291-156.

A raised-floor installation must meet all local codes and applicable national codes. Industry-recognized codes and guides such as NEC Article 645, CEC Section 10-406, ANSI/NFPA 75 and FIPS Pub 94 should be consulted.

Wiring placed in dropped ceilings or raised floors used as environmental air-handling spaces or ducts must meet the requirements for plenum cable as described in NEC Article 300-22 and CEC Sections 60-312 and 60-316.

TOPS MPX software

This chapter explains how TOPS MPX software is packaged and provisioned.

DMS switching evolution

DMS switching evolution (DMSE) has restructured and optimized software for the DMS switch family, resulting in a simplified way of ordering DMS software. The many hundreds of NTX software packages formerly available for each BCS load have now been replaced with a much smaller set of software options for easier provisioning.

DMS software is now available in product computing-module loads (PCL) instead of in batch change supplement (BCS) releases or universal software loads (USL). Each PCL contains all the generally available software for a particular switch application in a particular market. There is no need to reload software to deploy a generally available feature, because all features are already present in the switch.

Previously, Northern Telecom tested BCS Releases in their entirety and then delivered subsets of the BCS as custom load builds. With PCLs, the customer receives software in the exact configuration in which it is developed and then chooses which services are to be deployed.

The following figure illustrates this simplified restructuring.

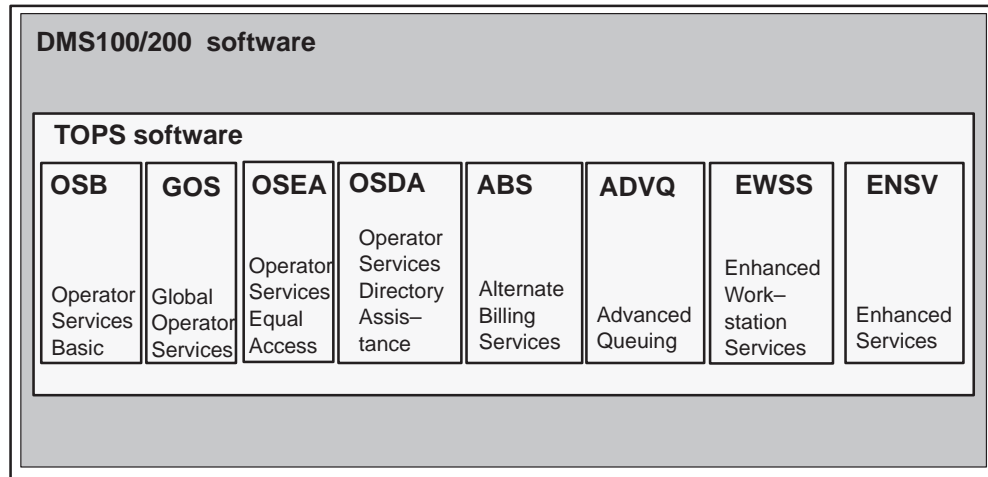**Simplification of software ordering with PCLs**
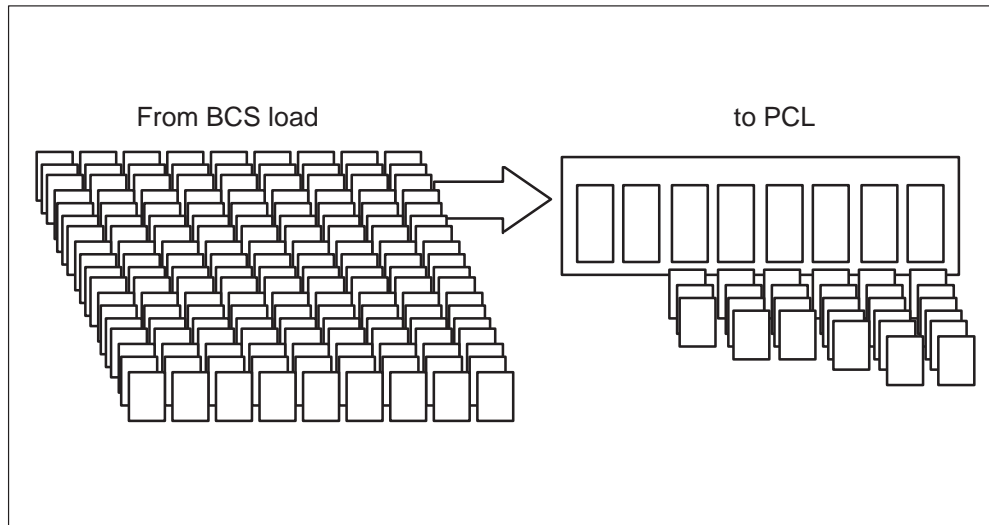
TOPS software for the DMS switch is provided in a TOPS load that includes all generally available TOPS software for DMS-100/200 and DMS-200 TOPS switches in North America. For example, a TOPS003 customer receives all the software in the DMS software platform as well as the TOPS component.

TOPS software is divided into two overall products: TOPS computing-module (CM) software and TOPS non-CM software. Each product is divided into functional groups such as Alternate Billing Services (ABS). Some functional groups contain optional functions. For example, Automated Alternate Billing Service (AABS) is an optional function within the ABS functional group.

The TOPS005 software includes the eight functional groups shown in the following figure.

TOPS application

DMS100/200 software

TOPS software

OSB	GOS	OSEA	OSDA	ABS	ADVQ	EWSS	ENSV
Operator Services Basic	Global Operator Services	Operator Services Equal Access	Operator Services Directory Assis–tance	Alternate Billing Services	Advanced Queuing	Enhanced Work–station Services	Enhanced Services

TOPS CM software

TOPS MPX-IWS application software interacts with base software in the DMS-100/200 CM, with existing software in the enhanced TOPS message switch (ETMS), and with the NT or IBM DAS, which is not part of the TOPS MPX-IWS product. DMS central controller (CC) software for TOPS MPX-IWS is included with the DMS load tape. The CC software can be installed in standalone (SA), host operator center (HOC), and remote operator center (ROC) configurations.

The following tables map the old package names to the new functional group and function names and codes. If a function code and name are listed, that function is optional. If no functions are listed in a functional group, then nothing is optional in that group.

Alternate Billing Services (ABS)

Functional group	Functional group name	Function	Function name	Package name
ABS00001	**Alternate Bill Serv**	——	——	ABS Ech Acc Alt Bill Cdn
		——	——	Ech Acc Alt Bill Serv
		——	——	Ex Clg Card Form SS7
—continued—				

Alternate Billing Services (ABS) (continued)

Functional group	Functional group name	Function	Function name	Package name
		——	——	Ex Clg Card Form SS7
		ABS00002	**Automated Alternate Billing Service (AABS)**	Automated Alternate Billing Service (AABS)
		ABS00003	**Operator Hand-off to AABS**	Operator Hand-off to AABS
		ABS00004	**Account Code Billing**	Account Code Billing
		ABS00005	**French/ English AABS**	FGB Carrier Code Expansion
		ABS00006	**ABS AABS Call Screening**	AABS Call Screening
		ABS00007	**TOPS DN Call Screening**	TOPS DN Call Screening
		ABS00008	**TOPS Commercial Credit Card Billing**	TOPS Commercial Credit Card Billing
		ABS00009	**Auto Room & Auth Numb**	Auto Room & Auth Numb
		ABS00010	**Calling Card Denial Reason**	Calling Card Denial Reason
		ABS00011	**AABS Enh Serv Acc**	AABS Enh Serv Acc
		ABS00013	**TOPS Auth Code Billing**	TOPS Auth Code Billing
—end—				

Advanced Queuing (ADVQ)

Functional group	Functional group name	Function	Function name	Package name
ADVQ0001	**Advanced Queuing**	**ADVQ0002**	**TOPS Close Down**	TOPS Close Down
		ADVQ0003	**Host Queue Mgmt System**	Host Queue Management System (QMS)
		ADVQ0004	**Remote Queue Mgmt Sys**	TOPS Remote Queue Management System
		ADVQ0005	**Host/ Remote Networking by Queue Type**	Host/Remote Networking by QueueType

Note: In TOPS005, ADVQ0006 is a prep feature that is unavailable for customers to order. This function, QMS Customer Service Enhancements, will be available in TOPS006.

Enhanced Services (ENSV)

Functional group	Functional group name	Function	Function name	Package name
ENSV0001	**Enhanced Services**	**ENSV0002**	**Automated Coin Toll Service (ACTS)**	Automatic Coin Toll Service (ACTS)
		ENSV0003	**TOPS Alternate Announce- ment**	TOPS Alternate Announcement
		ENSV0004	**Screened Service Routing**	Screened Serv Rout
		ENSV0005	**External Audio Response– Host & Rem**	External Audio Response–Host & Remote
		ENSV0006	**2-Digit ANI– TOPS Off**	2-Digit ANI– TOPS Off
		ENSV0007	**Pre-Paid Coin Overtime**	Pre-Paid Coin Overtime
			—continued—	

Enhanced Services (ENSV) (continued)

Functional group	Functional group name	Function	Function name	Package name
		ENSV0008	**Enh TOPS Oper Centra**	Enh TOPS Oper Centra
		ENSV0009	**External RTRS Intrfce**	External RTRS Intrfce
		ENSV0010	**Country Direct Billing Service**	Country Direct Billing Service
		ENSV0011	**Enh OC–Incr Rem Supt**	Enh OC–Incr Rem Supt
		ENSV0013	**MDS– Offer of Service Prompt**	MDS– Offer of Service Prompt
			—end—	

Enhanced Workstation Services Software (EWSS)

Functional group	Functional group name	Function	Function name	Package name
EWSS0001	**Enhanced W/S Software**	——	——	TOPS MP Interface
		——	——	Remote TOPS MP OC Datalink
		——	——	Host MP OC Datalink
		——	——	TOPS 2 Term DA/Int
		——	——	Auto OIA Sess Start
		EWSS0003	**TOPS DA Subten TMS**	TOPS DA Subten TMS
		EWSS0004	**TOPS Open Position Protocol**	TOPS Open Position Protocol
			—continued—	

Enhanced Workstation Services Software (EWSS) (continued)

Functional group	Functional group name	Function	Function name	Package name
		EWSS0005	**TOPS Increased Multiplexing**	TOPS Increased Multiplexing
		EWSS0006	**TMS Networking**	TMS Networking
		EWSS0007	**TMS Processor Upgrade**	TMS Processor Upgrade
		—end—		

Global Operator Services (GOS)

Functional group	Functional group name	Function	Function name	Package name
GOS00001	**Global Oper Service**	——	——	Manual Toll Break–In
		——	——	R2 on TOPS
		——	——	Global TOPS Call Proc
		——	——	TOPS BT7 Interwork
		——	——	Global TMS (PCM30)
		——	——	Global Operator Services Rating
		——	——	Operator Services Booked Call Database

Operator Services Basic (OSB)

Functional group	Functional group name	Function	Function name	Package name
OSB00001	**Oper Services Basic**	——	——	TOPS ACD Features
		——	——	TOPS Robustness
				TOPS IDDD 15 Dgt Expn
				TOPS NoRestart SWACT
				AMA Mods
		——	——	TOPS Call Processing Features
		——	——	TOPS Remote CAMA
		——	——	TOPS Inward Validation
		——	——	Host Operator Centralization (OC) Data Link Handling
		——	——	TOPS NOTIS Format
		——	——	Remote OC Data Link Handlng
		——	——	TOPS Dial-Up Autoquote
		——	——	TOPS City Zone Rating
		——	——	TOPS Bellcore AMA
		——	——	TOPS Service Billing
		——	——	TOPS AWT Enhancements
			—continued—	

Operator Services Basic (OSB) (continued)

Functional group	Functional group name	Function	Function name	Package name
		––	––	TOPS Op Password
		––	––	TOPS AMA Enhancements
		––	––	TOPS Extended Bellcore AMA Format (EBAF)
		––	––	TOPS E911
		––	––	Dir Assist/Toll Branding
		––	––	Improved Statspac
		––	––	TOPS Permanent Hold
		––	––	Enhanced MFADS
		––	––	TOPS Multi NPA Support
		—end—		

Operator Services Directory Assistance (OSDA)

Functional group	Functional group name	Function	Function name	Package name
OSDA0001	**Directory Assistance**	––	––	TOPS DA Call Proc
		––	––	Std Sw-DAS/C Prot
		––	––	IBM Sw-DAS/C Prot
		––	––	TOPS Supp Int Dram
		—continued—		

Operator Services Directory Assistance (OSDA) (continued)

Functional group	Functional group name	Function	Function name	Package name
		OSDA0002	**Automated Directory Assistance Call Completion (ADACC)**	Auto DACC w/Alt Bill
		OSDA0003	**Automated Intercept Call Completion (AINTCC)**	Automated Intercept Call Completion (AINTCC)
		OSDA0004	**ADAS**	Automated Directory Assistance Service (ADAS)
		OSDA0005	**Cellular/ IXC/LEC ADACC**	Cell/IXC/LEC ADACC
		OSDA0006	**ADAS Plus Interface**	ADAS Plus Interface
		OSDA0007	**ADAS HMI Enhance-ments**	ADAS HMI Enhancements
		OSDA0008	**LPP/APU Support**	LPP/APU Support
		—end—		

Operator Services Equal Access (OSEA)

Functional group	Functional group name	Function	Function name	Package name
OSEA0001	**Operator Services Equal Access**	——	——	Equal Access Carrier Code
		——	——	Base TOPS Equal Access
		—continued—		

Operator Services Equal Access (OSEA) (continued)

Functional group	Functional group name	Function	Function name	Package name
		——	——	FGB Carrier Code Expansion
		——	——	FGD Carrier Code Expansion
		OSDA0002	**TOPS InterLATA Carrier**	TOPS InterLATA Carr
		OSDA0003	**TOPS ExcAcc Op Svc Sig**	TOPS ExcAcc Op Svc Sig
		OSDA0004	**TOPS Incoming FGD Signaling**	TOPS Incoming FGD Signaling
		OSDA0005	**GR317/394 ISUP/TOPS**	GR314/394 ISUP/TOPS
		—end—		

TOPS non-CM software

The following tables identify the non-CM software related to TOPS. This software is delivered in non-CM load (NCL) packages.

Automated Directory Assistance Services (ADAS)

NCL package	NCL package name	Function	Function name	Package name
ADAS0001	**ADAS VPU/LPP/ Workstation Support**	**ADAS0002**	**ADAS VPU Software**	ADAS VPU Software
		ADAS0003	**ADAS Maintenance and Administration**	ADAS Maintenance and Administration
		ADAS0004	**ADAS LPP Support Utilities**	ADAS LPP Support Utilities
		—continued—		

Automated Directory Assistance Services (ADAS) (continued)

NCL package	NCL package name	Function	Function name	Package name
				ADAS APU Software
				ADAS OAM Position
				ADAS APU Maintenance
				ADAS UNIX Application Environment
				ADAS Enhanced Service Resource Management
				ADAS APU SOS, UNIX Base
—end—				

TOPS MPX: AOSS Platform

NCL package	NCL package name	Function	Function name	Package name
NTDA0001	**MPX-AOSS Platform**	**NTWS0001**	**MPX Base Operating Systems**	LAN Manager Module
				Task Manager Module
				Operating System Module
		NTWS0009	**MPX-AOSS Network Communica- tions**	MPX-AOSS Network Communica- tions
—continued—				

TOPS MPX: AOSS Platform (continued)

NCL package	NCL package name	Function	Function name	Package name
		NTWS0010	**MPX-AOSS Gateway Communica-tions**	MPX-AOSS Gateway Communica-tions
		MPXA0004	**MPX-AOSS NT-DA Terminal Application**	MPX-AOSS NT-DA Terminal Application
		MPXI0018	**LAN Access Module**	LAN Access Module
			—end—	

TOPS MPX: IBM DA AOSS Support

NCL package	NCL package name	Function	Function name	Package name
IBMA0001	**IBM DA AOSS Support**	**IBMA0004**	**IBM DA AOSS Support**	IBM DA AOSS Support

TOPS MPX: IWS Platform (for TOPS005 with IWSS005 Base)

NCL package	NCL package name	Function	Function name	Package name
IWSS005	**MPX-IWS Platform**	**NTWS0001**	**MPX-IWS Intelligent Workstation Platform**	LAN Manager Module
				Task Manager Module
				Operating System Module
			—continued—	

TOPS MPX: IWS Platform (for TOPS005 with IWSS005 Base)(continued)

NCL package	NCL package name	Function	Function name	Package name
		NTWS0009	**Network Communica-tion Module**	Network Communication Module 2
		NTWS0010	**Gateway Communica-tion Module**	Gateway Communication Module
		—end—		

TOPS MPX: IWS Applications (for TOPS005 with IWSS0041 Applications)

NCL package	NCL package name	Function	Function name	Package name
IWSS005	**MPXI IWS Applications**	MPXI0018	**LAN Access Module**	LAN Access Module
		MPXI0019	**IWS Base 16**	IWS Base 16
		MPXI0020	**IWS Base 04**	IWS Base 04
		MPXI0021	**MPX-IWS Open Information Access (OIA)**	MPX-IWS Open Information Access (OIA)
		MPXI0022	**MPX-IWS Operator Assistance Application**	MPX-IWS Operator Assistance Application
		MPXI0023	**MPX-IWS NT-DA Application**	MPX-IWS NT-DA Application
		MPXI0024	**MPX-IWS IBM DA Application (Initial)**	MPX-IWS IBM DA Application (Initial)
		MPXI0025	**MPX-IWS IBM DA Application (Upgrade)**	MPX-IWS IBM DA Application (Upgrade)
		MPXI0026	**Off–Ring RAMP**	Off–Ring RAMP

TOPS Position Controller (TPC)

NCL package	NCL package name	Function	Function name	Package name
TPC00001	**TPC TOPS MP Support**	**TPC00002**	**TPC TOPS MP Terminal Support**	TPC TOPS MP Support
		TPC00003	**TPC TOPS MP OIA Interface**	TPC TOPS MP Support— OIA Interface

Voice Services Node (VSN): Support

NCL package	NCL package name	Function	Function name	Package name
VSN00001	**Alternate Billing Services**	**ABS00001**	**ABS Software for VSN—Base Support**	AABS Software for VSN—Base Support
		ABS00002	**AABS Software for VSN— French Support**	AABS Software for VSN— French Support

Voice Services Node (VSN): Call Completion Enhancements

NCL package	NCL package name	Function	Function name	Package name
VSN00002	**Alternate Billing Services**	**ABS00003**	**VSN Call Completion Enhance- ments**	VSN Call Completion Enhance- ments

Integrated Release 7 (IR7)

In addition to the functional groups defined in the previous tables, there is an Integrated Release 7 (IR7) functional group, containing all the software for Directory Services Processors. Offerings include Digital Directory Assistance (DDA), the Operator Services 6/40FT Gateway, Directory One, LION, and support applications.

Provisioning position software

The IBM directory assistance (DA) application software is described in *IBM Programmable Operator Subsystem User Guide*.

Two diskettes are used to load the IBM PS/2 with TOPS MPX application software. Their use requires appropriate TOPS MPX hardware to be in place.

> *Note: IBM Getting Started with Disk Operating System* is used to install DOS on the hard drive of the PS/2.

The diskettes and their contents are listed below.

TOPS MPX Load Diskette #1 contains the following software packages:

- Installation process
- Programmable Operator Subsystem (POS) for digital telephony card interface
- IBM Disk Operating System (DOS), version 5.02 or higher
- LAN support program (version 1.1 or higher), which provides the interface between a TOPS MPX position and the token-ring LAN adaptor

TOPS MPX Load Diskette #2 contains the following software packages:

- Real-time interface co-processor support software for IBM DAS communications
- Real-time interface co-processor support software for AOSS X.25 communications
- binary synchronous (BiSync) protocol

Information from the hardware and system diskettes is also required. (The hardware diskette may be installed before shipment.)

The system diskette contains the following software packages:

- bootable DOS
- digital telephony card diagnostic

DMS control software

TOPS MPX application software interacts with base software in the DMS-100/200, with existing software in the TOPS message switch (TMS), and with the IBM DAS.

For this specification, the IBM directory assistance system (DAS) is not regarded as part of the TOPS MPX system. For additional information on IBM DAS, refer to *IBM Programmable Operator Subsystem User Guide.*

The DMS CC software for TOPS MPX is included with the DMS load tape. The CC software can be installed in standalone (SA), host operator center (HOC), and remote operator center (ROC) configurations.

Related DMS features

The CC software handles the DA and call-intercept functions of the DMS-100/200 or DMS-200 TOPS. Only station-paid and no-charge calls are handled; no alternate billing calls are currently handled by TOPS MPX AOSS operator positions.

TOPS MPX capacity and performance

The DMS-100 Family architecture provides distributed processing over three switching stages, of which the processor is the central control authority. The capacity of the central processing unit (CPU) is defined in terms of overhead and call-processing occupancies. The overhead occupancy accounts for nondeferrable priority processes, such as task assignment, scheduling, and system integrity, and deferrable functions, such as operation, administration, and maintenance (OA&M), and auditing routines. The call-processing occupancy includes the originating and incoming system call processes and related tasks, such as call-request interrupt.

With SuperNode processors SN20–SN40, the maximum call-processing occupancy would be 86%, with the overhead occupying 14% at a 20% grade of service. With NT40 processors, the maximum call-processing occupancy would be 83%, with the overhead occupying 17% at a 20% grade of service. This total maximum call-processing time does not take into account optional features, such as the CPU monitoring tool ACTIVITY. With the addition of optional features and maintenance considerations, total overhead occupancies increase above the minimum allocation, reducing CPU time for call processing. The following figure illustrates this concept. For actual calculation of maximum call-processing capacity, consult the REAL::TIME tool.

TOPS MPX capacity and performance

The following factors are important for TOPS MPX capacity and performance:

- DMS computing module (central processor)

  The central processor utilization affects the overall performance of TOPS MPX. If the central processor utilization is too high, calls can be denied. For additional information, refer to the "Operator serving limits" table in the "TOPS MPX equipment" chapter.

- Digital trunk controller (DTC) modules

  For DA and intercept call types, the signal processor is the limiting component in the DTC. The multifrequency (MF) wink call-origination

call timing is 50 ms, assuming universal tone receivers (UTRs) are used. The terminating audio response unit (ARU) call has a signaling processor (SP) call timing of 40 ms. SP available real time for call processing is 17 percent or 612,000 ms per hour.

- Multi-protocol controller (MPC) / enhanced multi-protocol controller (EMPC) messaging

  The total MPC/EMPC messages per second affects the overall performance of TOPS MPX. If the total messages per second is too high, the MPC discards messages, thus degrading TOPS MPX grade of service (GOS). For additional information, refer to the section "Call control links" later in this chapter.

- TOPS message switch (TMS) messaging

  TMS messaging affects the overall performance of TOPS MPX. If the SP real-time utilization is too high, call messages can be discarded or delayed, thus degrading GOS. Problems can occur if the DCHs in the TMS are overloaded. Refer to SEB 93-03-002.

CPU real-time availability for call processing
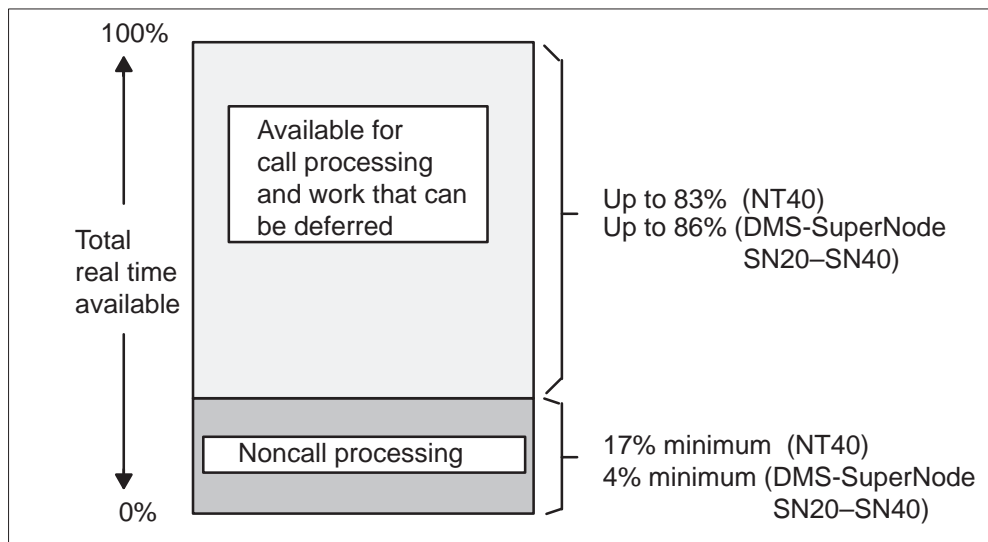
Reliability

This section addresses the reliability of the TOPS MPX system.

Downtime

Downtime for TOPS MPX caused by the DMS switch is less than 28 minutes per year. This meets the requirements of LATA Switching System General Requirements (LSSGR), Section 12.7.

TOPS MPX position reliability

Under normal operation, the system is used 40 hours a week and powered down after use. If system power is constantly on, the mean time between failure (MTBF) is reduced by two-thirds. Routinely powering down and maintaining the terminal prolongs its life expectancy significantly. The position keyboard is specified to withstand 15 million operations per key.

Voice communication

In the event of TOPS MPX failure, the system design ensures continuous availability of voice communication. Interruption of data communication between the virtual position controller (VPC) and the switch will not exceed 1 minute per occurrence. Mean time to repair (MTTR) in case of failure is 30 minutes or less per occurrence.

Voice transmission is digital throughout the DMS/TOPS MPX up to the digital telephony (audio) card in the TOPS MPX positions. No pads or level adjustments are provided or needed for the voice paths between TOPS MPX and the DMS switch. The voice transmission levels are therefore the same as zero transmission level point (TLP) for the DMS switch. The audio card provides headset levels as specified by the Operator Services Systems General Requirements (OSSGR), Section 21.4.3.

These requirements are as follows:

- The headset transmit TLP is +4 at 50 Ohms impedance.

- The headset receive TLP is –8 at 300 Ohms impedance.

The audio card provides +/–5 dB volume level adjustment for the headset receive path.

The amplitudes of various call-arrival tones are listed in the following table.

Call-arrival tones amplitude

Tone	Frequency (Hz)	Level/Frequency (dBm0)	Total level (dBm0)	Level at headset (dBm)
Ziptone	480	–17	–17	–25
Dialtone	350/440	–13	–10	–18
DTMF "D"	941/1633	–7	–4	–12

All LSSGR specifications are stated at a transmission level point (TLP) of 0, but the operator's headset is at a –8 TLP. Therefore, the actual level at the headset is 8 dB lower than the values obtained from the LSSGR tone tables.

Dual-frequency tones at the same level or frequency value as a single-frequency tone are approximately 3dB louder, because the dual tones add together. This is why the dialtone and the DTMF tone total-level values increase by 3dB and the ziptone does not increase. The duration of the ziptone is 100 ms.

Time source generator (TSG)

Time source generator (TSG) equipment must be supplied by the operating company; it is not supplied with TOPS MPX. Since the TSG is critical to the operation of the TOPS MPX voice interface, the recommended Telecom Solutions DCD-400 system reliability figures are given for information only. Refer to the following table.

Telecom Solutions calculates the DCD-400 system with full redundancy to have a downtime of about 4×10^{-12} minutes per year.

Telecom Solutions TSG

Item	Actual MTBF (10^{-5} hr/yr)
Shelf assembly	15.9210
Clock input	7.3584
Timing output card (TOCA)	28.0900
Stratum 3	15.2910
Fuse & alarm	14.0060
Matrix control	30.9600

Interfaces

Three types of interfaces are used: ARU trunks, service data links, and call control links.

ARU trunks

Standard T1 facilities are used for linking ARUs to the DMS-100/200 switch network.

Service data links

Service data from the IBM DAS is carried to the TOPS MPX database gateway position over a pair of redundant 56 Kbps data links for each token ring. The low-level protocol used for messages flowing between the DAS and the TOPS MPX database gateway position is the binary synchronous protocol.

Call control links

This section describes the performance, delay, and capacity of call-control links between the DMS MPCs and the DAS.

Performance

Call-control links between the DMS and the DAS can be equipped with either MPCs or EMPCs, depending on the system call-capacity requirements. On an MPC, these links always operate at 9600 baud. With EMPCs, these links can run at either 9600 or 19.2 Kbps. A maximum of 16 call-control data links, including spares, can be equipped per DMS system. The performance is summarized in the following table.

MPC and EMPC statistics

Protocol controller	Maximum throughput	Data rate
MPC	9000 calls per hour	9.6 Kbps
EMPC	19,000 calls per hour	9.6 Kbps
EMPC	24,000 calls per hour	19.2 Kbps

Both the MPC and the EMPC have two links or ports, but only one is used in this application. Modems are required to interface each data link to the DAS.

Delays

The influence on average work time (AWT) of the delay incurred in a 9.6 kbps call control link is insignificant. An AWT figure of 20 seconds is used throughout this specification for the purpose of performance estimation and provisioning calculations.

Capacity

The maximum aggregate capacity of the call control links is limited by the number of MPC/EMPCs that may be provisioned and the maximum throughput capacity of the MPC/EMPC units. Depending on call volume and redundancy requirements, EMPCs may be required.

TOPS MPX features

This chapter describes TOPS MPX screens and keyboards, and the messages that appear on the screens. It also introduces the major standard and optional features of TOPS MPX.

User interface

In addition to screens displayed at the terminal and input accepted at the keyboard, the user interface includes the operator headset interface and the Sonalert signal.

The TOPS MPX operator position screen

The TOPS MPX operator position screen is made up of 25 horizontal lines, each containing 80 characters. The screen is divided into 12 major areas for call handling. The following table identifies the names of each of these 12 areas, their positions on the screen, and their sizes in characters. Refer to the following figure for an illustration of the layout of the TOPS MPX screen.

Note: The positions of the fields on the TOPS MPX operator position screen shown in this document reflect the default positions. The operating company can customize the screen layout to suit its needs. To change the position of a field on the screen, refer to the *IBM Programmable Operator Subsystem User Guide*, SC28-8168.

The 12 fields of the TOPS MPX screen

Field name	Field size in characters	Field description
Listing area	1680	Displays the DA and intercept database search results.
Message/ command line	75	Displays messages from the database and allows entry of commands when the **Cmd** key is pressed (for example, command to enter the training mode).
—continued—		

The 12 fields of the TOPS MPX screen (continued)

Field name	Field size in characters	Field description
Book field	19	Displays the name of the current database book in use (think of it as a telephone directory).
Loc field (locality)	27	Displays the name of the locality that is currently being searched.
Strt field (street)	15	Allows the operator to enter a street name to target the database search.
Name field	29	Displays the name of the person, department, business, or other title for which the customer requests information. The operator must enter something in this field to initiate a database search (the only exception is on emergency number searches).
Type field	3	Displays information about the type of search currently in effect. The types of searches include the following: • BUS for business searches • GOV for government searches • RES for residential searches • EMR for emergency searches • INT for intercept searches • CNA for customer name and address • AUX for search of a special file
NPA field (numbering plan area)	6	Displays the current NPA for the book being searched or for the default book.
Oper field (operator name)	16	Displays the name of the operator currently logged on.
—continued—		

The 12 fields of the TOPS MPX screen (continued)

Field name	Field size in characters	Field description
Mode field (mode)	16	Usually blank except in cases where the operator is in training mode. Then, a message indicating that the operator is in training mode appears. Unlike the Name, Loc, Type, NPA, Oper, and Strt fields, a field label mode does not appear on the screen.
Date and time field	12	Displays the date.
Call control function area	64	Divided into four groups, this area displays the call-processing information. This document discusses all the messages that appear in these groups. The groups are referred to as group 1 through group 4.

—**end**—

Areas of the TOPS MPX screen
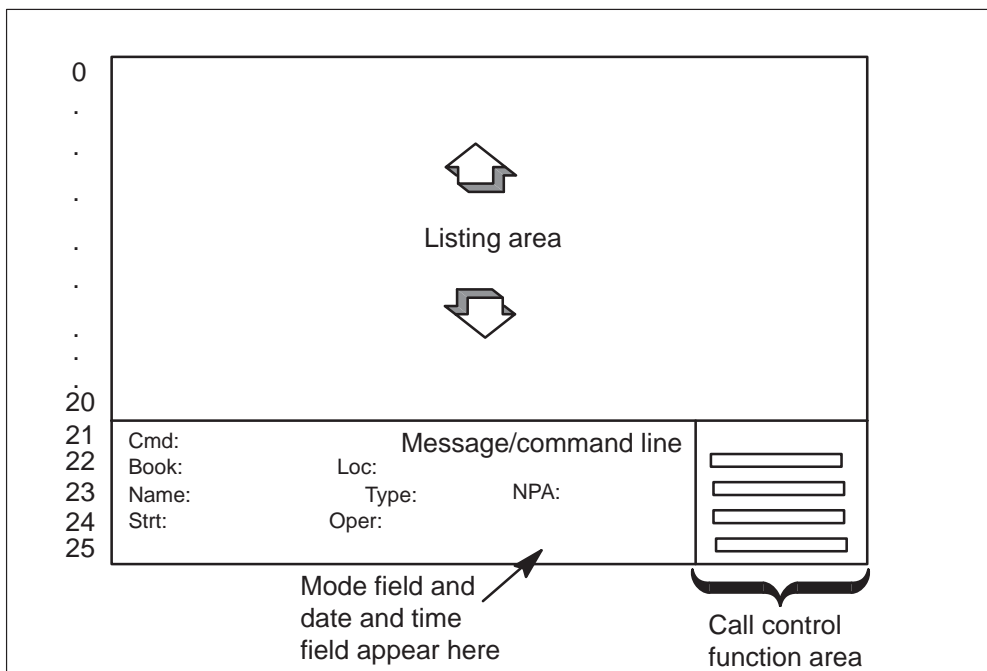
The TOPS MPX operator position keyboard

The TOPS MPX operator position keyboard is divided into the following five areas:

- standard keyboard (QWERTY) keys

- common finding home and numbering plan area (CFN/NPA) keys

- frequently referenced locality (FRL) keys

- database search keys

- call-processing keys

The following two figures show the TOPS MPX operator position keyboard.

TOPS MPX operator position keyboard
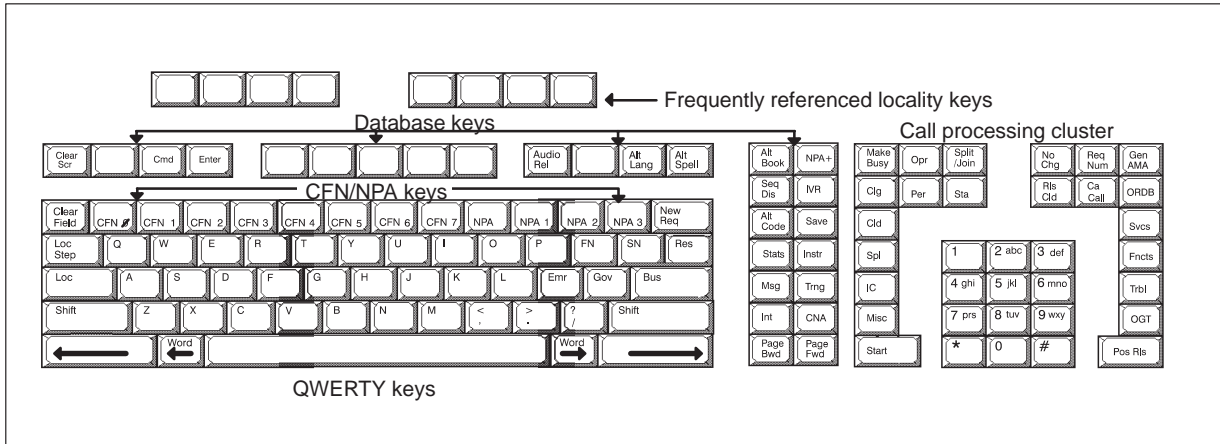
The QWERTY and CFN/NPA keys
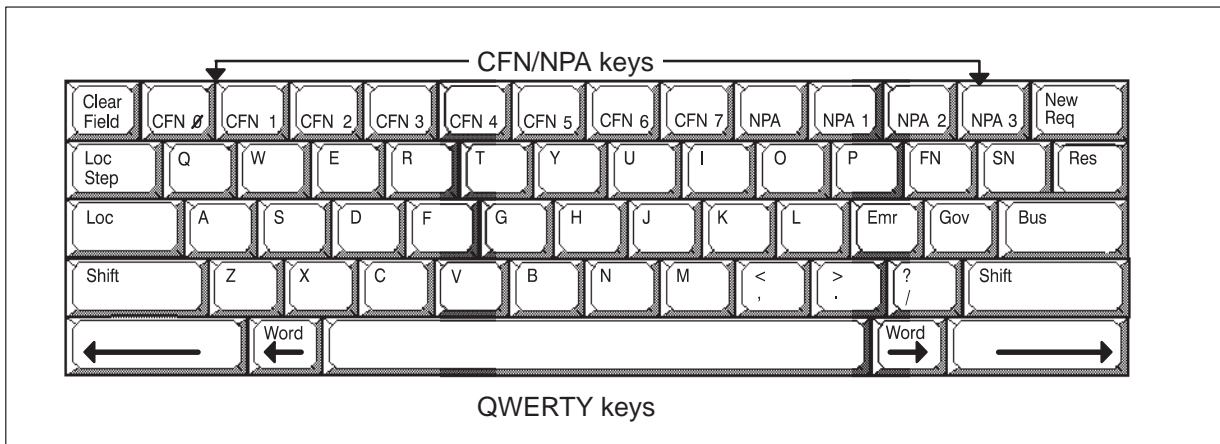
The following table lists and describes the functions of the QWERTY and CFN/NPA keys.

Description of QWERTY and CFN/NPA keys

Key	Description
Clear Field	Clears the field in which the cursor is currently displayed.
New Req	Used when processing multiple requests within a single call. When pressed, it clears the listing area, NAME, STRT, and TYPE fields.
Loc Step	Used when the default locality is not the requested locality and the FRL keys do not match the requested locality. This key allows the operator to page through the localities until the correct one displays on the screen.
FN	Finding name is used to position cursor in the NAME field. On call arrival, cursor will already be positioned in the NAME field.
SN	Street name is used to position the cursor in the STRT field. If the item being searched for is very common, identifying a street targets the search.
Res	Instructs the database to conduct a residential search. When this key is pressed, RES appears in the TYPE field.
Loc	Clears the LOC field and places the cursor in the first position of the LOC field. This key works in conjunction with the **Loc Step** key. After pressing the **Loc** key to position cursor in LOC field, the operator enters the locality information search criteria and presses the **Loc Step** key to find the required locality.
A through Z	The standard alphabetical letters used to enter search information.
Emr	Pressed to conduct an emergency search. When this key is pressed, EMR appears in the TYPE field.
Gov	Pressed to conduct government searches. When this key is pressed, GOV appears in the TYPE field.
Bus	Pressed to conduct business searches. When this key is pressed, BUS appears in the TYPE field.
Shift	Pressed to access the top row of the FRL keys.
<———————	Moves the cursor one character to the left.
Word <—	Moves the cursor one word to the left.
———————>	Moves the cursor one character to the right.
Word —>	Moves the cursor one word to the right.

—continued—

Description of QWERTY and CFN/NPA keys (continued)

Key	Description
Space bar	Enters a space or erases input in a field.
CFN/NPA keys	Common finding name and numbering plan area keys. These 12 keys are located at the top of the QWERTY keyboard and are coded to represent common search criteria that is often entered. The CFN/NPA keys allow operators to enter search criteria with one keystroke. For example, if the office handles more than one NPA, some of these keys can be defined as NPA keys. Pressing any of these 12 keys displays the NPA or CFN on the screen in the appropriate field.
	—end—

The frequently referenced locality keys

This section describes the frequently referenced locality (FRL) keys on the TOPS MPX operator position keyboard. The following figure illustrates the FRL keys.

FRL keys
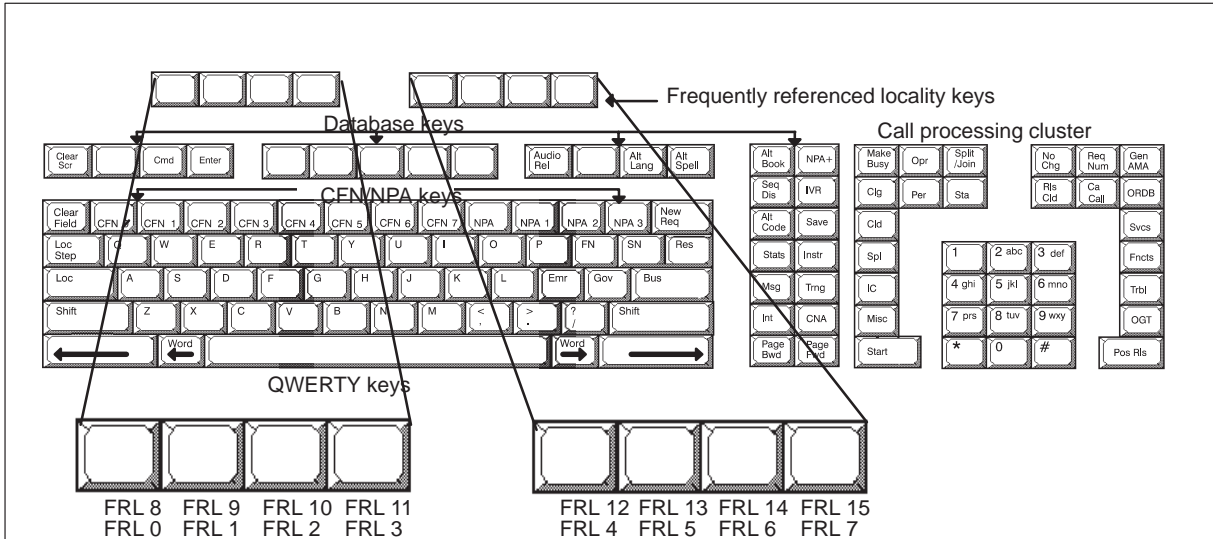
The FRL keys are the eight large unlabeled keys at the top left side of the keyboard. Using these keys, the operator can change the locality to be searched by pressing one key rather than typing in the entire locality name. Sixteen locations can be chosen as frequently referenced localities. FRL 0 through FRL 7 are called the primary localities and can be accessed by pressing the appropriate FRL key. This action chooses the locality corresponding to the appropriate FRL key pressed. FRL 8 through FRL 15

are the shifted localities. To change the default to the shifted locality, press one of these keys while pressing the **Shift** key.

The database keys

The following figure illustrates the database keys on the TOPS MPX operator position keyboard. The following table defines the functions of these keys.

Database keys
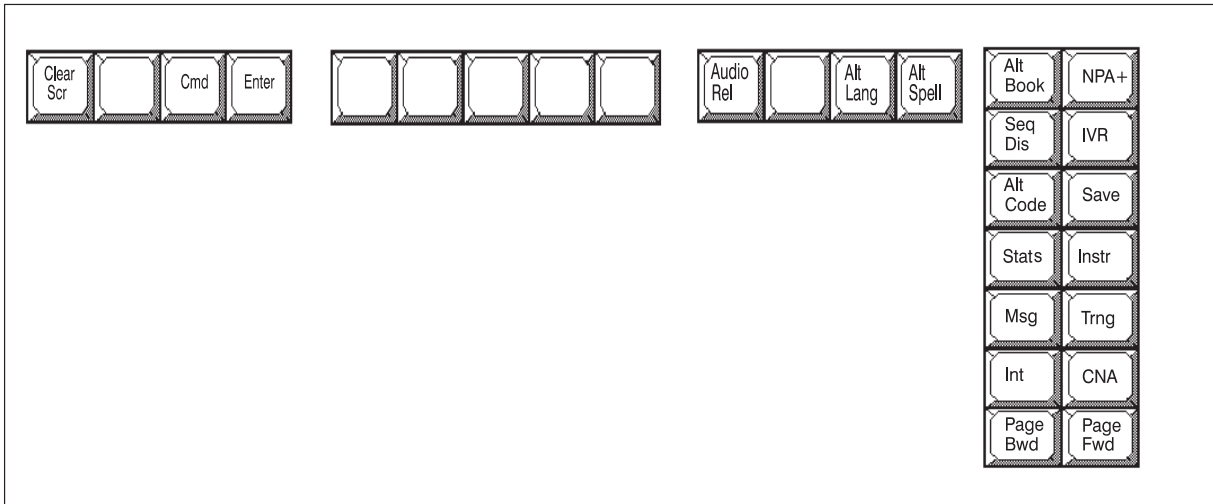
Description of the database keys

Key	Description
Clear Scr	Clears the NAME and STRT fields and the listing area.
Cmd	Positions the cursor at the beginning of the message/command line and allows entry of commands. These commands are defined by IBM and have access privileges associated with them. For complete details on these commands, refer to the appropriate IBM documentation.
Enter	Pressed to end the entry of a message on the message/command line.
Audio Rel	Pressed to send the call to recorded announcement for the requested number. Pressing this key causes the call to be released from the position, thereby allowing new calls to be attached to the position.
Alt Lang	Pressed to select an alternate language for the audio announcement. Also, this key must be pressed before the **Audio Rel** key.
Alt Spell	Returns a list of alternate spellings for the last name in the NAME field.
—continued—	

Description of the database keys (continued)

Key	Description
Alt Book	Changes the book in which searches are done.
NPA+	Allows the operator to position the cursor in the NPA field to enter an NPA that is not defined on one of the twelve CFN/NPA keys.
Seq Dis	Overrides the default values in cases of emergency or file verification.
IVR	Intercept verbal response allows the operator to recite an intercept number rather than sending the call to an audio announcement.
Alt Code	Similar to the **Shift** key. Pressing this key and any other key redefines the function of the key pressed.
Save	Allows the current screen display to be saved in a file.
Stats	Displays information about the operator work statistics.
Instr	Displays help information created by the supervisor.
Msg	Displays information from the supervisor.
Trng	Allows the operator to access a training database to learn search skills.
Int	Initiates an intercept database search and releases the call to an audio announcement automatically.
CNA	Initiates a search on a given telephone number to locate name and address information.
Page Fwd	Allows the operator to page forward in a screen of listings returned by the database as a result of a search.
Page Bwd	Allows the operator to page backwards in a screen of listings returned by the database as a result of a search.
—end—	

The call-processing keys

The call-processing keys, shown in the following figure, are used to enter numbers, report trouble, connect a subscriber to the service assistant, or process calls. Not all of the call-processing keys are functional with the current release of TOPS MPX. The following table describes the call-processing keys.

Call-processing keys

Note: Shaded keys indicate functions that are not applicable to the current release of TOPS MPX.

Description of call-processing keys

Key	Description
Make Busy	Makes the position unavailable to accept calls. Toggle action makes the position available to accept calls.
Opr	Pressed with the number keys and the **Start** key to sign on, request assistance, and transfer a call to another operator in the office.
Split/Join	Enables the operator to cut off and restore the subscriber voice connection, so the operator can speak with the service assistant/forward party without the subscriber's overhearing the conversation.
No Chg	Marks a call as being free of charge.
Req Num	Pressed with the number keys and the **Start** key to enter the requested number for billing.
Gen AMA	Pressed to generate an AMA billing record.
Clg	Pressed with the number keys and the **Start** key to enter the calling number for calls that arrive ONI or ANIF.
Per	Not available with current release of TOPS MPX.

—continued—

Description of call-processing keys (continued)

Key	Description
Sta	Not available with current release of TOPS MPX.
Rls Cld	Pressed to release the called or forward party.
Ca Call	Pressed in conjunction with the **Pos Rls** key to release a call when the calling party has not hung up.
ORDB	Not available with current release of TOPS MPX.
Cld	Pressed in conjunction with the number keys and the **Start** key to enter a called number and connect to that forward party.
Svcs	Not available with current release of TOPS MPX.
Spl	Not available with current release of TOPS MPX.
0 – 9	Pressed for digit entry.
Fncts	Not available with current release of TOPS MPX.
IC	Not available with current release of TOPS MPX.
Trbl	Pressed in conjunction with the number keys and the **Start** key to enter trouble codes.
Misc	Not available with current release of TOPS MPX.
OGT	Pressed in conjunction with one- or two-digit codes and the **Start** key to connect to a forward party.
Start	Pressed with other keys to terminate the entry of information.
* and #	Not available with current release of TOPS MPX.
Pos Rls	Pressed to release a call from the position.
—end—	

Messages that appear on the TOPS MPX screen

This section describes the messages that appear on the TOPS MPX operator position screen. The messages have been broken down into two main categories:

- those displayed by the Directory Assistance System (DAS)
- those displayed by the Digital Multiplex System (DMS).

This document deals mainly with the messages displayed by the DMS. For complete details on the messages displayed by the DAS, refer to the IBM document, *IBM Programmable Operator Subsystem User Guide*, SC28-8168.

Note: The messages described in this section apply to the automatic call distribution (ACD) system, when the Queue Management System (QMS) is not in use. For information about QMS-specific messages, refer to the section "Using the Queue Management System" later in this chapter.

The DMS displays information in the four groups in the call-control function area. The first figure in this chapter, "Illustration of areas of TOPS MPX screen," shows the position of the call-control function area on the TOPS MPX operator position screen.

Messages displayed in the message/command line

The DAS controls the messages displayed in the message/command line of the TOPS MPX operator screen. The following table lists some of the most common messages. For complete details on the messages that could appear in the message/command line, *IBM Programmable Operator Subsystem User Guide*, SC28-8168.

Note: The messages that appear on the operator screen can be defined by the operating company if they choose not to use the defaults provided. Refer to the *IBM Programmable Operator Subsystem User Guide*, SC28-8168, and the *IBM DAS TOPS MPX User Guide, Program Supplement,* SC23-4014, for details on changing the screen messages.

Common messages appearing in the message/command line

Message	Explanation
WORKING	A database search is in progress.
ADDITIONAL SURNAME DETAIL REQUIRED	On residential searches, the surname entered is very common. Therefore, additional information, such as initial of first name, is required to target the database search.
AUDIO NOT AVAILABLE	The operator attempts to release the call to audio announcement and the audio announcement is not available.
EXPAND OR DELETE: aaa	On a business search, the search criteria is too general. The characters aaa represent the word in question.
AWAITING AUDIO	Displayed after the operator has entered a listing selector and pressed **Audio Rel**.
—continued—	

Common messages appearing in the message/command line (continued)

Message	Explanation
LINE a SELECTED	Displayed on a recall indicating the line selector chosen for the initial call.
NO LISTINGS FOUND	Indicates that no listings matching the search criteria were found.
NO MATCH ON GIVEN/ STREET NAME	Displayed on a residential search when the database cannot find a match for the given name or street within that locality.
PLEASE REQUEST ADDITIONAL INFORMATION	Indicates that the search criteria are too general. Operator needs to enter more information to target the search.
POSITION READY FOR SIGN ON	Displayed when the position is not in use by an operator (that is, no operator logged on).
RECONNECT, LINE a SELECTED	Displayed when a call is reconnected to the operator for additional servicing. Calls will be connected to an operator when the call is released to audio and the subscriber does not hang up after the audio announcement is played. "a" indicates the listing selector that was chosen for the call on initial release from the operator position. Please note that the call does not necessarily reconnect to the same operator that handled it initially.
SIGN ON COMPLETE	Displayed after an operator successfully logs on to a position.
TOO MANY LISTINGS	Indicates that too many listings are found matching the search criteria. It is impossible to display them all. This situation results when the search criteria entered are too general. The operator must enter more specific information to target the search.

—end—

Messages displayed in the call-control function area

The call-control function area is divided into four groups. Each group is 16 characters long, and call-control information is displayed in these groups (see the following figure). The following sections provide illustrations of what appears in each group, followed by a brief explanation. Any displays enclosed in brackets (<>) indicate that the display appears in flashing mode. In addition, lowercase letters are used as place holders for numbers that are actually displayed. Certain displays overwrite one another. In these cases,

the illustration shows only one display; however, the explanation lists all displays and specifies their relative position in the group.

Illustration of groups in call-control function area
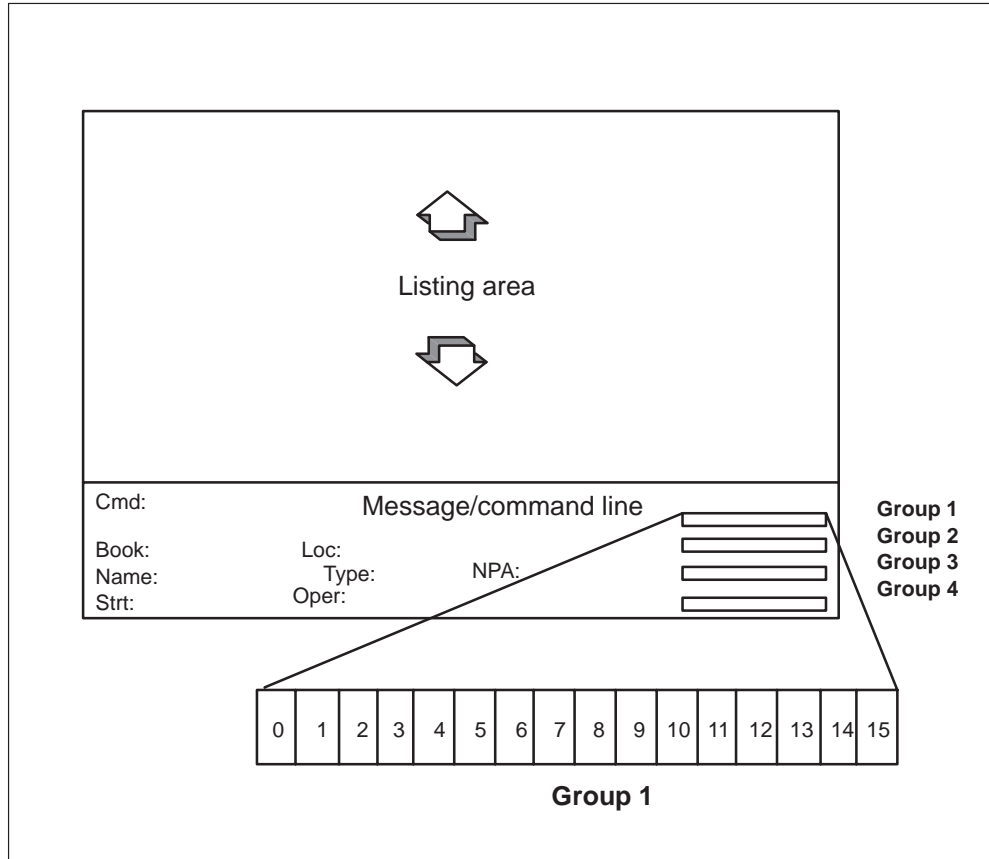
Call-control messages displayed in group 1

B	R	M	<P>			C	W		O	H	S	R		C	T
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Call-control messages displayed in group 1

Display	Column number	Explanation
B	0	Position is not available to accept incoming calls. The display is produced after the operator presses the **Make Busy** key.
R	1	The position is waiting for the external real-time rating system to complete a rating query related to a sent-paid hotel DA call. When the query is successful, the R is erased.
<R>	1	A rating query to the external real-time rating system has failed.
M	2	Position is being monitored by a service assistant or in-charge operator. The character M is displayed during monitoring only if the TOPS_DISPLAY_MON parameter is enabled.
<P>	3	The operator is being paged by the service assistant or in-charge operator. The operator goes into make-busy mode by pressing the **Make Busy** key to prevent another call from accessing the position. When the current call is complete, the number of the service assistant or in-charge position that paged the operator is displayed in group 2.
CW	6-7	Calls are waiting in the calls-waiting queue. Calls are placed in the calls-waiting queue when there are no operators currently available to handle a new call.
OH	9-10	The data link between the DMS and the DAS is not available, and the call must be handled manually by the operator (that is, the operator must enter any billing information, if necessary, and verbally quote the requested number).
VQ	9-10	There are no automatic recording units (ARU) available and the operator must verbally quote the requested number to the calling party.
—continued—		

Call-control messages displayed in group 1 (continued)

Display	Column number	Explanation
CT	14-15	The force manager has placed the operator in a controlled traffic situation. In controlled traffic, only the designated call types are brought to that position.
SR	11-12	The force manager has included the operator in the study register system. Refer to the *TOPS MPX Force Management Guide,* 297-2291-310, for details on the study register system.
—end—		

Call-control messages displayed in group 2

C	L	G	#	2	1	2	–	3	4	5	–	6	7	8	9
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Call-control messages displayed in group 2

Display	Column number	Explanation
OPR#xxxx	0-7	A valid operator number, xxxx, was keyed in at login and displays the number entered.
OPR#<xxxx>	0-7	An invalid operator number was keyed in at login and displays the number entered in the flashing mode.
OPR#xxxxx	0-8	The first digit shows that a valid operator function was keyed. The last four digits show the operator number and are optional depending on the function keyed.
OPR#<x>	0-4	An invalid operator function was keyed.
POS#xxxx	0-7	The position number of the service assistant or in-charge operator that paged the operator.
G	11	The operator logged on is a general operator and will receive calls from the general queue.
—continued—		

Call-control messages displayed in group 2 (continued)

Display	Column number	Explanation
X123	12-15	The operator at login learns the queues from which calls will be brought to the position. The display X123 means that the operator services all four queues (the general queue from above is included). If the display is X23, the operator services the general queue and queues 2 and 3.
CLG#	0-3	The call is ONI and the operator must enter the calling number.
<CLG#>	0-3	The call is ANIF and the operator must enter the calling number **Clg+** digits **+Start**.
CLG#xxx-xxx -xxxx	0-15	A valid calling number was entered.
CLG#<xxxxxx xxxxxx>	0-15	An invalid calling number was entered. A number could be invalid because of too many or too few digits entered or because it failed a validity check.
REQ#xxx-xxx -xxxx	0-15	A valid requested number has been entered. The number can be seven or ten digits.
REQ#<xxxxxx xxxxxx>	0-15	An invalid requested number has been entered.
CLD#xxx-xxx -xxxx	0-15	A valid forward number has been entered. If the operator keyed **OGT** + digits **+Start** and the outgoing trunk number corresponds to a billable directory number datafilled in Table OGTMPKEY, this billable number is displayed on the operator screen.
CLD#<xxxxxx xxxxxx>	0-15	An invalid forward number was entered. The invalid number is displayed.
—continued—		

Call-control messages displayed in group 2 (continued)

Display	Column number	Explanation
CLD#xx	0-9 0-5	A two-digit OGT code was entered. This code corresponds to a nonbillable number in Table OGTMPKEY. The OGT code is displayed on the operator screen, centered within the called number field.
CLD#<xx>	0-9 0-5	An invalid two-digit OGT code was entered for the called number.
		—end—

Call-control messages displayed in group 3

C	L	D	9	1	9		C	L	G			T	R	1	2
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Call-control messages displayed in group 3

Display	Column number	Explanation
RCL	0-2	The call is a recall and has previously been to the operator for service.
CUT	0-2	The call is an intercept cut-through.
SPL	0-2	The call is an intercept special call. Examples of intercept special calls include split referrals and intercept calls that arrive due to ARU failure.
CLD	0-2	A forward connection has been established and the forward party is on-hook. CLD is displayed in the steady mode while the line is ringing. When the called party answers, the CLD display disappears. If the called party goes back on-hook, CLD reappears.
		—continued—

Call-control messages displayed in group 3 (continued)

Display	Column number	Explanation
xxx	3-5	The serving NPA (SNPA) displays so that the operator can specify the SNPA if required by the DAS. The SNPA is displayed on calls when the NPA from the incoming number differs from the NPA in Table OPRTRANS. If the original number is not present (ONI), the DAS uses the NPA of the incoming trunk.
CLG	7-9	The calling party is on-hook or is disconnected. If the subscriber voice connection is still up, a trouble report should be generated. Otherwise, the operator presses **Pos RIs**.
<CLG>	7-9	The subscriber is on hold (the operator has pressed the **Split/Join** key). The operator must press **Split/Join** to reestablish the subscriber voice connection.
TRxx	12-15	A trouble report was keyed into the system. The two-digit trouble code is displayed.
TR<xx>	12-15	A trouble report failed the system validity check. The two-digit trouble code is displayed flashing.

—end—

Call-control messages displayed in group 4

X	1		C	A		N	C		A	M	A		4	1	1
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Call-control messages displayed in group 4

Display	Column number	Explanation
X1	0-1	The operator is receiving calls from the transfer 1 queue.
X2	0-1	The operator is receiving calls from the transfer 2 queue.
X3	0-1	The operator is receiving calls from the transfer 3 queue.
CA	3-4	The **Ca Call** key was pressed.
NC	6-7	The subscriber will not be charged for the requested number. This display appears when the **No Chg** key is pressed and on call arrival of nonchargeable calls.
AMA	9-11	Billing information has been forwarded to the automatic message accounting (AMA) tape, displayed approximately two seconds after the operator presses the **Gen AMA** key when handling multiple requests.
<AMA>	9-11	Billing is invalid or billing information is missing. The call cannot be released from the position until all billing information has been entered.
<ACS>	13-15	A forward connection is being established without a customer call at the position. To establish the forward connection, the operator keys **Opr** + 0 + digits + **Start**. This connection applies for calls to the service assistant only. Forward calls without a calling party attached are blocked.
HOM	13-15	A call from within the home NPA is attached to the position. The call would have been dialed 1+555+1212 or 1+NPA+1212. This display is flashing if the call arrives at the position with severe ANI failure.
FOR	13-15	A call from outside the NPA is attached to the position. The call would have been dialed 1+NPA+555+1212. This display is flashing if the call arrives with severe ANI failure.
—continued—		

Call-control messages displayed in group 4 (continued)

Display	Column number	Explanation
`555`	13-15	On arrival of a 555 call not defined as HOM or FOR, this display is flashing if the call arrives at the position with severe ANI failure.
`131`	13-15	On arrival of an inward directory assistance (DA) call (a call from another operator located at another TOPS MPX office).
`141`	13-15	On arrival of an inward 141 DA call.
`411`	13-15	On arrival of a local DA call. This display is flashing if the call arrives at the position with severe ANI failure.
`INT`	13-15	The arrival of an intercept (INT) call. This display is flashing if the call arrives at the position with severe ANI failure.
`***`	13-15	The arrival of an unspecified call type. This display is flashing if the call arrives at the position with severe ANI failure. **Note:** Three-character customized screen displays can be used out of Table TOPS.
—end—		

Note: Severe ANI failure refers to a call arriving on an originating trunk group.

In-charge position – force management displays

The in-charge position serves a dual purpose: it monitors and displays the system status, serving the same function as the FMCRT, and it also assists operators in handling calls.

The in-charge position screen displays the following force management information:

- current status of operator positions
- miscellaneous system information

The in-charge position also performs the following tasks:

- accepts assistance requests
- monitors an operator

- pages an operator

- connects a forward party

- performs administrative searches of the DAS

TOPS MPX in-charge position screen

In a TOPS MPX environment, the in-charge position has two types of displays. The first type is the same as that found on the general and assistance operator screens. The second type is the ten-second scan force management statistics.

The TOPS MPX in-charge position screen is divided into two major areas, as illustrated in the following figure, "TOPS MPX in-charge screen." The first 23 lines are used for DAS information services. The last line displays call-control functions, arranged in a stack at the bottom right of the screen, in four groups of sixteen characters.

The four groups contain statistics for four queues. For example, call-control group 1 contains statistics such as make busy and availability. Since TOPS has four queues and the TOPS MPX screen has only one line to display statistics, headings are eliminated and the queue statistics are displayed in call-control function area 1. Each four-character group is described in the following paragraphs.

Note: The messages described in this section apply to the automatic call distribution (ACD) system, when the Queue Management System (QMS) is not in use. For information about QMS-specific messages, refer to the section "Effects of QMS on TOPS MPX SA and IC screens" later in this chapter.

TOPS MPX in-charge screen

DAS
information
area

Call control function area

BOOK:
NAME:
STRT:
LOC:
OPER:
TYPE:
Date:
NPA:
Time:
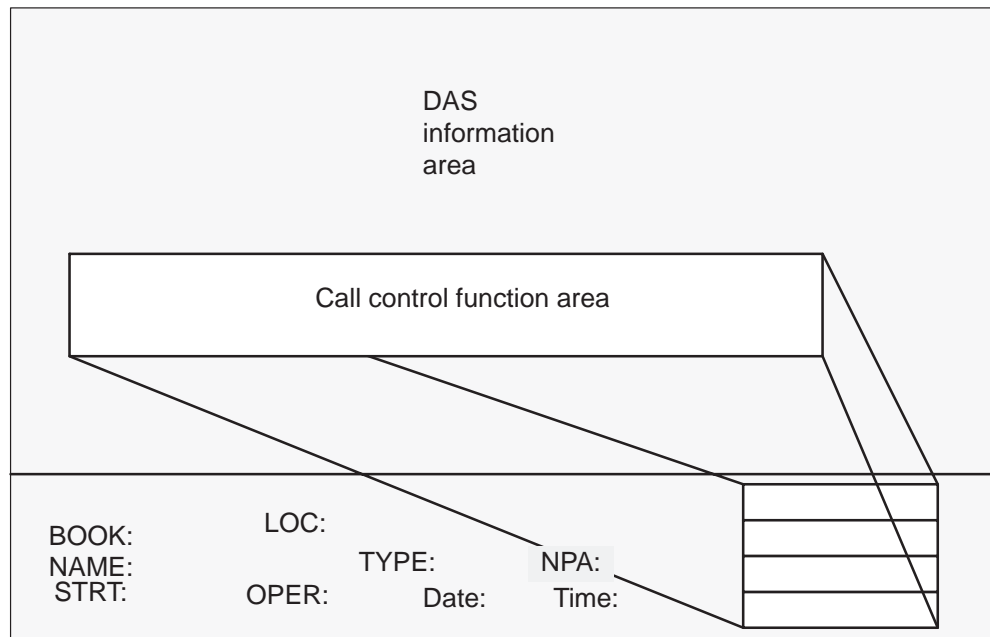
Group 1
The first group of 16 characters contains these items, as shown in the following figure:

- B: Indicates that the in-charge position is in the busy state. If the position is idle, the status displays are still present.

- D: Indicates that the in-charge position is accepting directed assistance requests only.

- <A> (flashing): Indicates that no assistance positions are available.

- M: Indicates that the in-charge position is monitoring a general operator; this item also displays when any other service assistance (SA) position is monitoring.

- P: Indicates that a general operator is being paged.

- OH: Signifies an operator-handled traffic condition. The voice response data links are down, and the operators are required to provide voice response on all queries. The Sonalert is sounded.

- ACWXX: Indicates assistance calls waiting; the Xs represent the number of assistance requests in queue for this team. Flashing numbers indicate a full queue.

- X0123: Signifies that calls are either waiting (steady) or being deflected (flashing), and is indicated by the number of the queue (0, 1, 2, or 3).

TOPS MPX in-charge screen – first group of characters
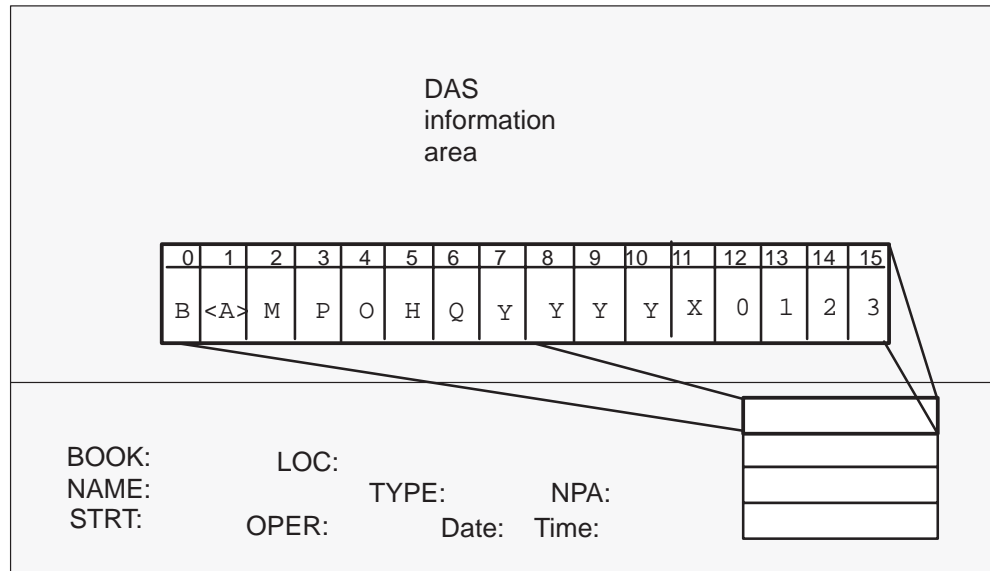
DAS
information
area

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	<A>	M	P	O	H	Q	Y	Y	Y	Y	X	0	1	2	3

BOOK: LOC:
NAME: TYPE: NPA:
STRT: OPER: Date: Time:

Group 2

The second group of 16 characters contains the following items, as shown in the following figure:

- xxx-xxx-xxxx: The first 12 characters indicate the forward number entered by the in-charge (IC) operator. This number may be a one- or two-digit outgoing trunk (OGT) code, a seven-digit local number, or a ten-digit number. Flashing indicates an invalid forward number.

- xx: Characters 4-5 indicate that a two-digit OGT code was entered by the IC manager.

- POS#xxxx: Characters 0-7 indicate the position number of the general operator requesting assistance and displays in this location for a general request arriving on loop 1. If flashing, loop 1 is on hold.

- REL BY: This display (columns 0-5) indicates that the general operator released the request to the request queue and dropped out of the call. This display replaces POS#xxxx (columns 0-7) when the general operator has released the call to queue.

- POS#xxxx: Characters 8-15 indicate the position number of the general or SA/IC operator requesting assistance and displays in this location for a directed request arriving on loop 2. If flashing, loop 2 is on hold.

- OPR#xxxx: Characters 0-7 indicate the operator number of the general or SA/IC operator requesting assistance. Displayed in this location for a directed request arriving on loop 2. Also displayed during SA logon and to indicate that paging of the operator number XXXX has been initiated.

- OPR#XXXX: Characters 8-15 indicate the operator number of the general operator requesting assistance. Displayed in this location for a general request arriving on loop 1.

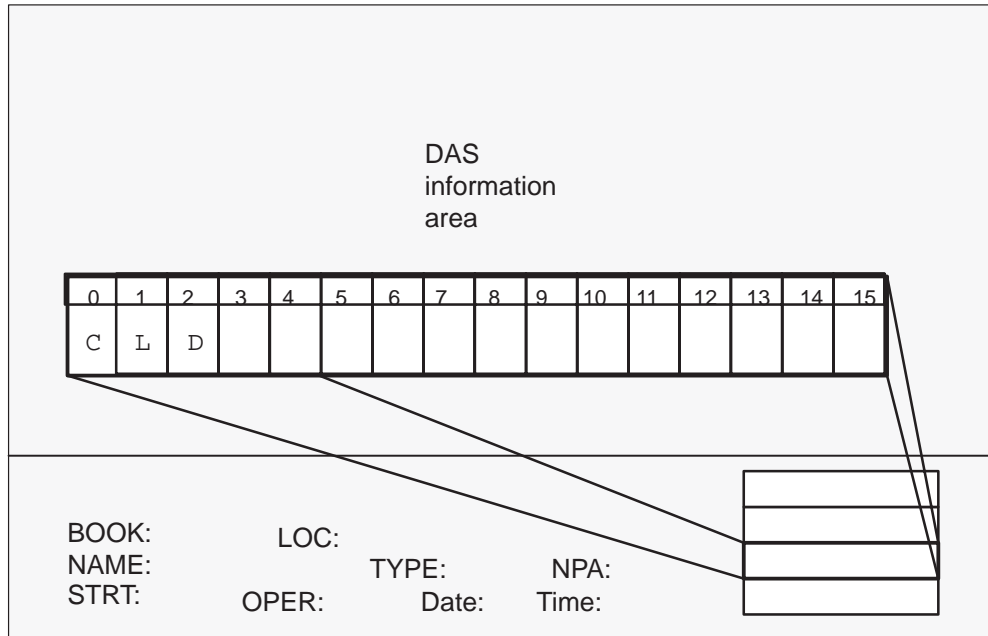- IMA: Displays in columns 8-10 at logon to indicate that this is an IC position (I), with service assistant (A), and monitoring capabilities (M).

- CLD: Displays in columns 13-15 and specifies called supervision.

TOPS MPX in-charge screen – second group of characters
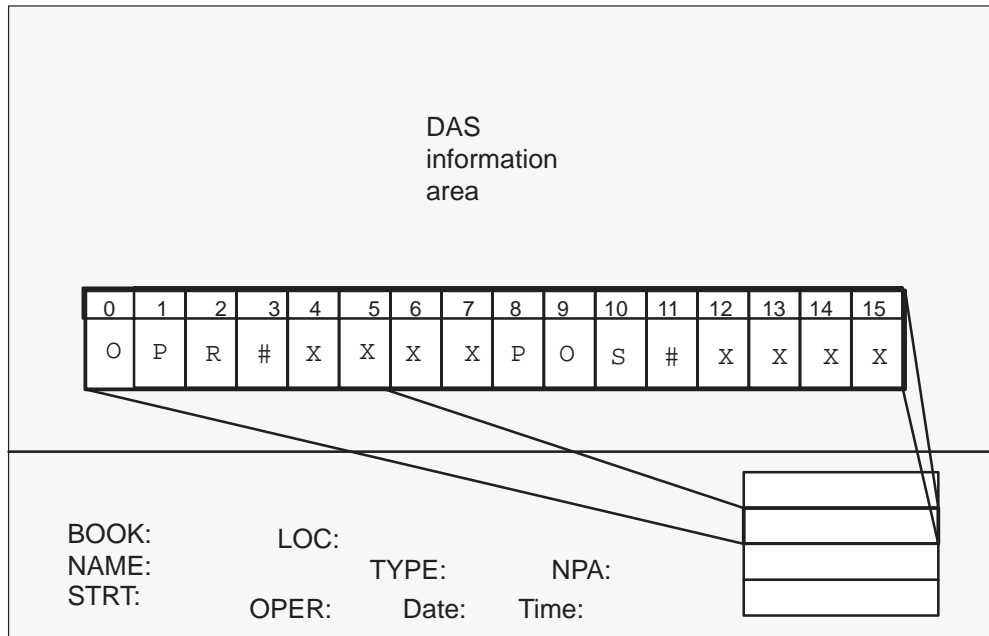
DAS
information
area

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
O	P	R	#	X	X	X	X	P	O	S	#	X	X	X	X

BOOK: LOC:
NAME: TYPE: NPA:
STRT: OPER: Date: Time:

Group 3

The third group of 16 characters contains the following items, as shown in the following figure.

- YYY: In columns 0-2, these numbers indicate the total number of general operator positions in the IC team currently occupied. If no positions are occupied, a zero flashes.

- YYY: In columns 3-5, these numbers indicate the number of positions in this IC team serving the XFR1 queue and currently occupied. If not, a zero flashes.

- YYY: In columns 6-8, these numbers indicate the number of positions in this IC team serving the XFR2 queue and currently occupied. If not, a zero flashes.

- YYY: In columns 9-11, these numbers indicate the number of positions in this IC team serving the XFR DA queue and currently occupied. If not, a zero flashes.

- UP: In columns 12-13, these letters represent that an unsupervised call is in progress at a position that is not logged on.

- UD: In columns 14-15, these letters represent that an unsupervised call has disconnected.

TOPS MPX in-charge screen – third group of characters
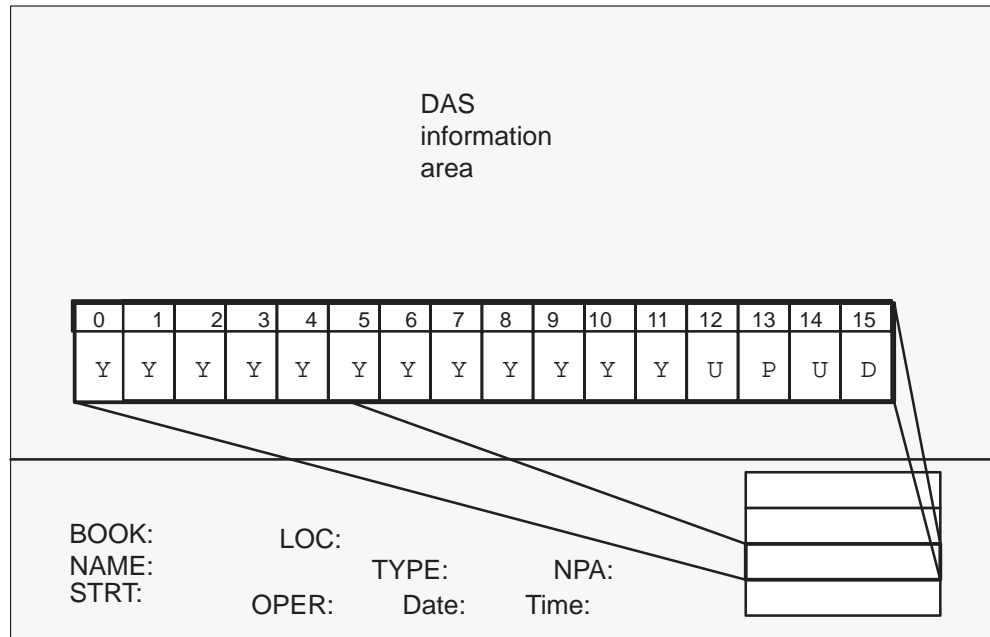
Group 4

The fourth group of 16 characters contains the following items, as shown in the following figure:

- zzz: In columns 0-2, these numbers indicate the total number of general operator positions in this IC team currently in a made busy state. If not, a zero displays.

- zzz: In columns 3-5, these numbers indicate the number of positions in this IC team serving the XFR1 queue and currently made busy. If not, a zero displays.

- zzz: In columns 6-8, these numbers indicate the number of positions in this IC team serving the XFR2 queue and currently made busy. If not, a zero displays.

- zzz: In columns 9-11, these numbers indicate the number of positions in this IC team serving the XFR DA queue and made busy. If not, a zero displays.

- A1 indicates that loop 1 has been accessed.

- A2 indicates that loop 2 has been accessed.

- `H1` indicates that loop 1 is on hold.

- `H2` indicates that loop 2 is on hold.

TOPS MPX in-charge screen – fourth group of characters
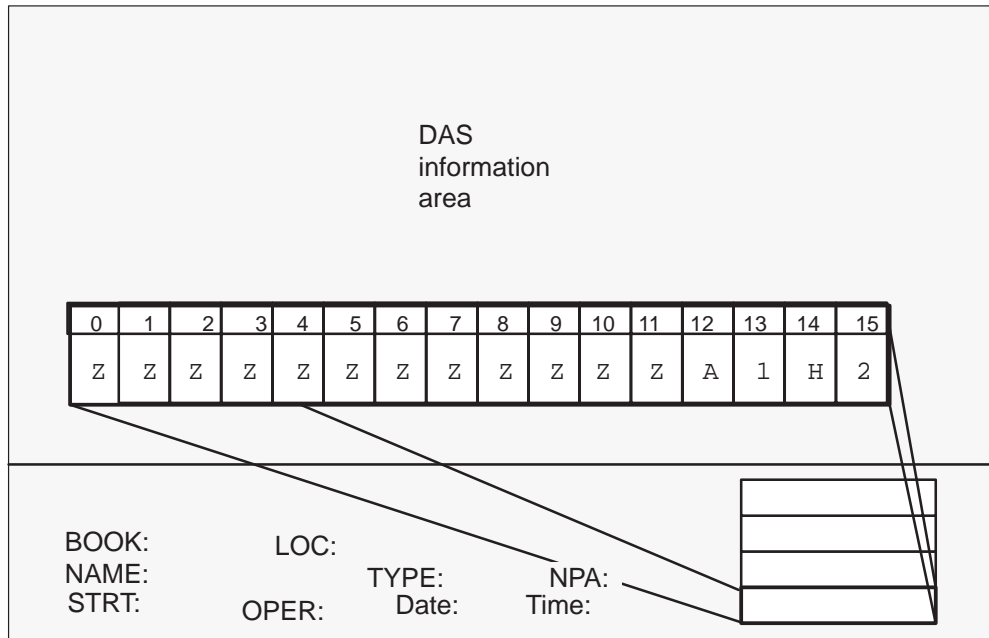
In-charge ten-second scan displays

The TOPS MPX in-charge screen display also provides a ten-second scan display for positions occupied and for positions made busy.

Positions occupied ten-second display

When the ten-second scan for occupied positions displays, the data are presented in character positions 0-11 of group 3.

Positions made busy ten-second display

When the ten-second scan for positions made busy displays, the data are presented in character positions 0-11 in group 4.

TOPS MPX in-charge position keyboard

The TOPS MPX keyboard is the same as the standard TOPS MP keyboard with one additional key (the **Word** key). All keys on the TOPS MPX keyboard are user-programmable. The keys have clear plastic keycaps to hold user-printed labels.

There are two functional variations on the keyboard: one for in-charge and service assistance positions and another for general operator positions. The

main keyboard cluster is the same for both. The key functions currently available for the call-processing cluster are shown in the following table.

TOPS MPX call-processing cluster key descriptions

Key	Description
Make Busy	Toggles the position busy or ready
Cld	Connects to a forward party when used in conjunction with digits entered (the called party directory number) and **START**
Opr	Used in conjunction with the digit keys and the **START** key to perform various functions: • operator logon • request assistance • paging and monitoring
ACS	Accesses loop 1 or loop 2 when used in conjunction with digits and **START**
Hold	Holds the connection on the active loop
Start	Used to send information to the DMS that was entered using other keys to update the screen
OGT	Used to access outgoing trunks
Pos Rls	Used to release the position, end operator handling of the call, and make the position available to receive new calls
Rls Cld	Releases the forward party

Note: Pressing the **Make Busy** key once makes the IC position available only to directed assistance requests; pressing it twice makes the IC position available to general assistance requests. Service assistants press the **Make Busy** key only once to be either available or not available.

The following figure illustrates the call-processing cluster on the in-charge and service assistance position keyboards.

TOPS MPX keyboard call-processing cluster – IC and SA positions

Note: The shaded keys indicate functions that are not applicable to the current release of TOPS MPX.
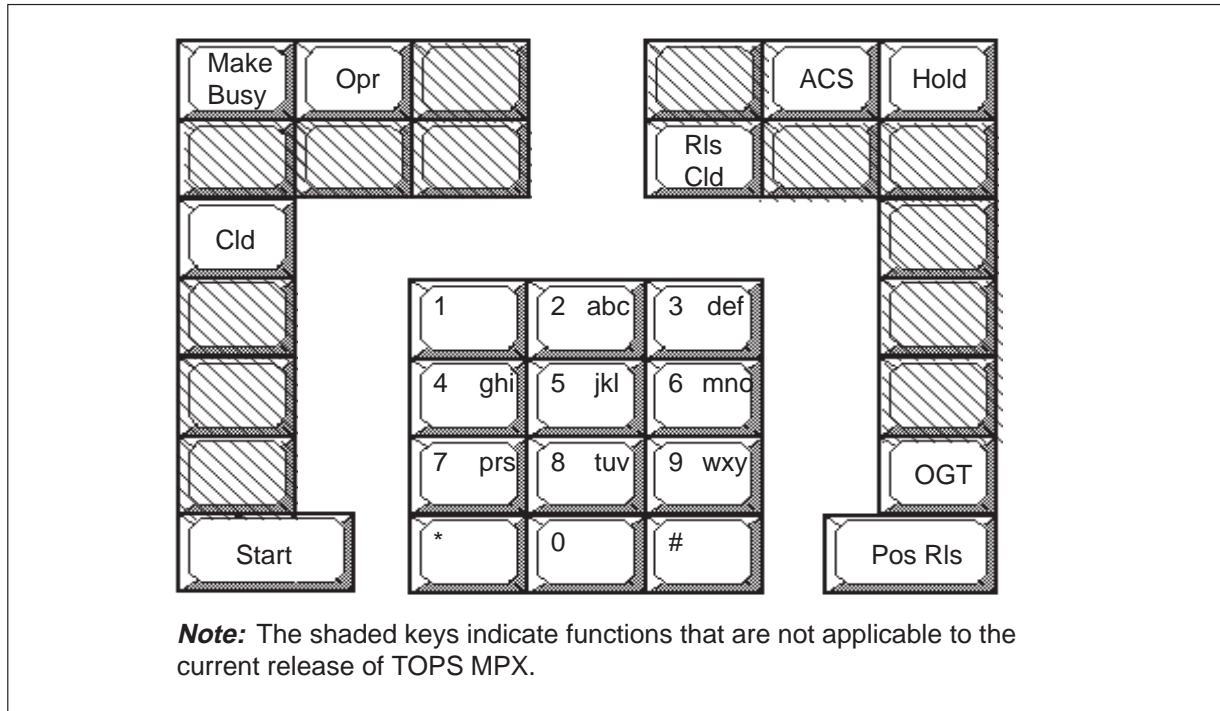
TOPS MPX service assistance position screen and keyboard

The TOPS MPX service assistance position uses the same type of screen and keyboard as the in-charge position. The major difference is in the data that appears in the four 16-character fields at the bottom of the screen.

Group 1

The first group of 16 characters contains the following items:

- B: In column 0, this display indicates that the position is busy, not accepting calls.

- <A>: In column 1, a flashing A indicates that no assistance positions are available.

- M: In column 2, the position is monitoring a general operator.

- P: In column 3, a P indicates that the position is paging a general operator.

- CW: In columns 11-12, these letters indicate that the number of calls waiting to be handled is greater than the threshold value.

- CD: In columns 14-15, the letters indicate that the number of calls deflected is greater than the threshold value.

Note: The messages described in this section apply to the automatic call distribution (ACD) system, when the Queue Management System (QMS) is not in use. For information about QMS-specific messages, refer to the section later in this chapter, "Effects of QMS on TOPS MPX SA and IC screens."

TOPS MPX service assistance position – first group of characters

DAS information area

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B	<A>	M	P								C	W		C	D

BOOK: LOC:
NAME: TYPE: NPA:
STRT: OPER: Date: Time:
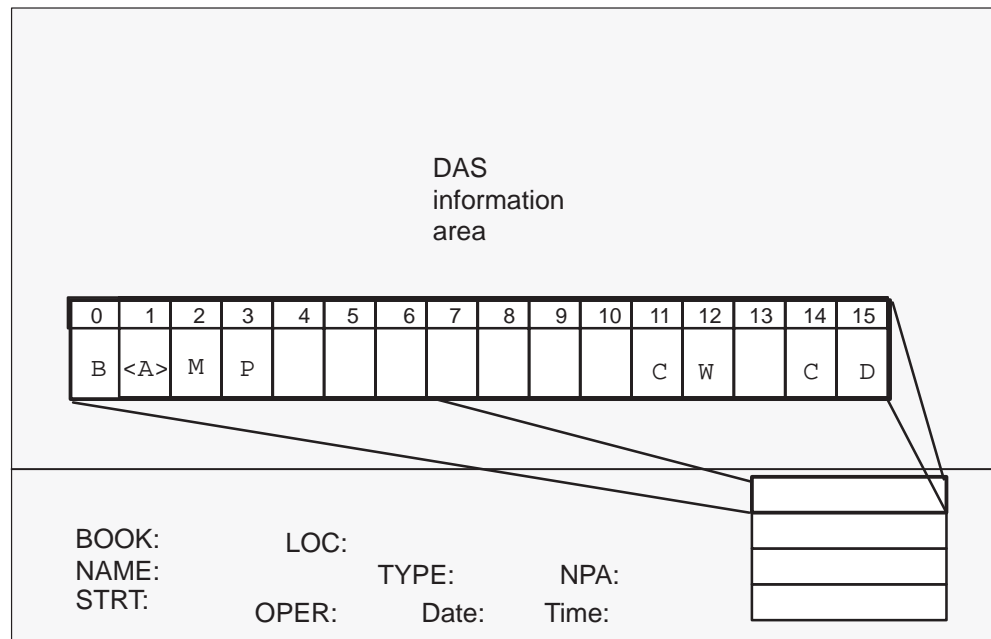
Group 2

The second group of 16 characters contains the following items:

- `CLD#XXX-XXX-XXXX`: In columns 0-15, these numbers indicate that the forward number entered by the SA. This number may be a one- to two-digit OGT code, a seven-digit local number, or a ten-digit number. If flashing, an invalid forward number has been entered.

- `CLD#   XX`: In columns 0-9, these numbers indicate that a two-digit OGT code has been entered by the SA.

- `OPR#XXXX`: In columns 0-7, these numbers indicate the operator number of the general or SA/IC operator requesting assistance. Displayed in this location for a directed request arriving on loop 2. Also displayed during SA logon and to indicate the paging of the operator number XXXX has been initiated.

- `OPR#XXXX`: Characters 8-15 indicate the operator number of the general operator requesting assistance. Displayed in this location for a general request arriving on loop 1.

- POS#XXXX: In columns 0-7, these numbers indicate the position number of the general operator requesting assistance on loop 1; if flashing, loop 1 is on hold.

- REL BY: This display (columns 0-5) indicates that the general operator released the request to the request queue and dropped out of the call. This display replaces POS#XXXX (columns 0-7) when the general operator has released the call to queue.

- POS#XXXX: In columns 8-15, these numbers indicate the position number of the general or SA/IC requesting assistance on loop 2; if flashing, the loop is on hold.

- MA: In column 9-10, these numbers indicate that the SA has monitoring abilities.

TOPS MPX service assistance screen – second group of characters
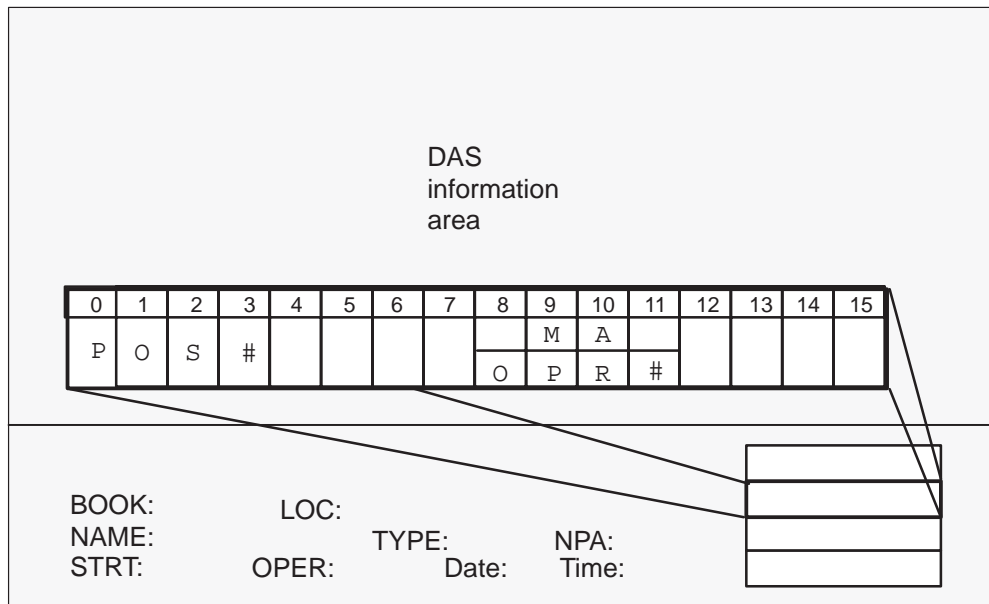
Group 3

The third group of 16 characters contains one item: CLD – called supervision. CLD displays when the forward (called) party is on-hook.

TOPS MPX service assistance screen – third group of characters

DAS
information
area

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
C	L	D													

BOOK: LOC:
NAME: TYPE: NPA:
STRT: OPER: Date: Time:

Group 4

The fourth group of 16 characters contains the following items:

- A1 indicates that loop 1 has been accessed
- H1 indicates that loop 1 is on hold
- A2 indicates that loop 2 has been accessed
- H2 indicates that loop 2 is on hold.

TOPS MPX service assistance screen – fourth group of characters
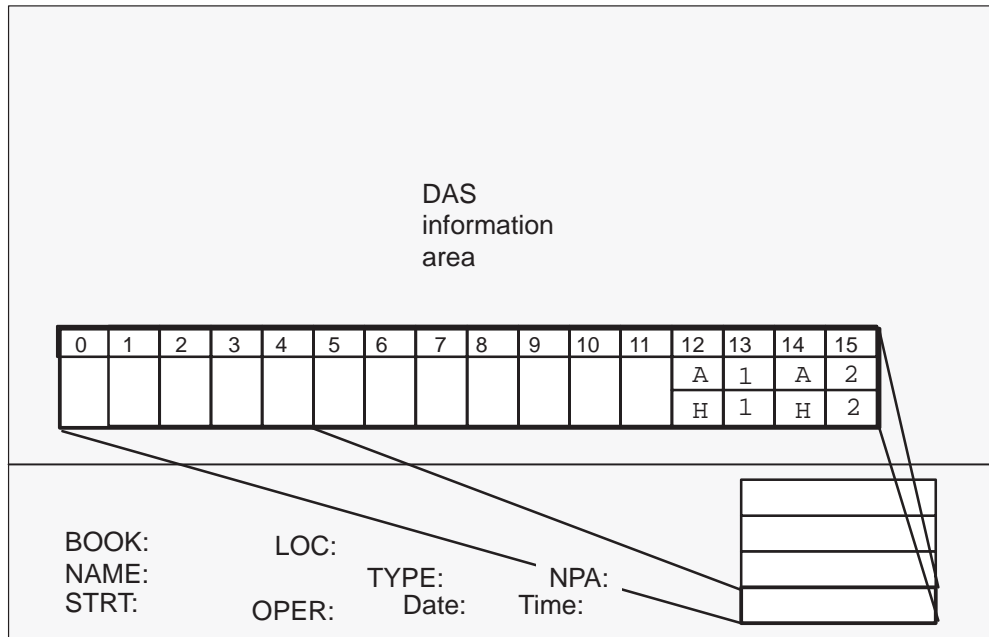
Interactions

TOPS MPX interacts with base software in the CC, with existing software in the TMS, and with the DAS.

TOPS MPX standard features

At present, TOPS MPX provides DA and INT services.

One-plus, zero-plus, and zero-minus calls

One-plus, zero-plus, and zero-minus calls are not currently supported by TOPS MPX.

NPA on zero-plus and 7-digit local calls

NPA on zero-plus and 7-digit local calls are not currently supported by TOPS MPX.

Emergency service feature

The operator can forward an emergency call to the appropriate party by using the outgoing trunk key.

Call identification and routing

Only DA and INT services are available on TOPS MPX.

Call distribution and queueing

The following paragraphs describe how calls are distributed to operators and queued.

Allocating an operator

A DA call always needs an operator. If digits and automatic intercept equipment are available, an INT call does not need an operator. To service DA or INT calls requiring an operator, a TOPS MPX position must be available. If an operator is not available, the call is placed in the call-waiting (CW) queue.

In brief outline, incoming calls are classified and assigned to one of four CW queues:

- general (GEN)

- transfer 1 (XFR1)

- transfer 2 (XFR2)

- DA

In TOPS MPX-IWS, these four queues are used for both DA and TA calls. In the TOPS MPX system, all four queues may be used for DA calls (even though only one of the queues is called the DA queue).

A second set of these four queues are used for recalls. Recalls are calls that, having been released to an ARU, remain off-hook and must be reconnected to an operator. The set of recall queues is a second set of four queues, similar to the first, but in which calls have a higher priority. Calls waiting in the recall queues are serviced before calls in the new call queues.

The queues ensure that only those operator positions assigned to perform transfer and DA tasks are allocated to service transfer and DA calls.

DA calls

If no operator is available to service a DA call, the call is placed in a queue. Calls are queued in the GEN, XFR1, XFR2, or DA CW queue. Ringing is then applied to the subscriber while the call remains in queue.

   Note: Ringing is not applied to recalls.

If different vendor equipment is used for intercept service, DA service must be datafilled as a separate service.

If there is already an excess of calls in the CW queues and the call is not a recall, the call is not queued but is deflected to treatment. DA calls are deflected to emergency treatment 5 (EMR5). If no queueing resources are available, the call cannot be placed in queue, but is sent to the queue

overflow treatment. When this treatment might be used to overflow to a trunk group to extend to another DA switch, the called digits cannot be sent forward. If the call requires no additional service after treatment, processing terminates it.

Intercept calls

If no operator is available to service the call, an intercept call is placed in a queue. Calls are queued in the GEN, XFR1, XFR2, or DA CW queue. Ringing is applied to the subscriber while the call remains in queue.

> *Note:* Ringing is not applied to recalls.

If different vendor equipment is used for DA service, intercept service must be datafilled as a separate service.

If there is already an excess of calls in the CW queues and the call is not a recall, the call is not queued but is deflected to treatment. Intercept calls are deflected to emergency treatment 6 (EMR6). If no queueing resources are available, the call cannot be placed in queue but is sent to the queue overflow treatment. When this treatment might be used to overflow to a trunk group to extend to another DA switch, the called digits cannot be sent forward. If the call requires no additional service after treatment, processing terminates it.

Three-port conference circuit allocation

When an appropriate operator becomes available, a three-port conference circuit is obtained from a pool of available conference circuits. If no three-port conference circuits are available, the position is released, and the call is queued to try again later. The call remains in queue until a conference circuit is obtained.

Connecting the subscriber and an operator

Once the three-port conference circuit is obtained, a voice path between the subscriber and the operator is established by connecting each through the network to the conference circuit. If either network connection is blocked, the position and the three-port conference circuit are released and the call is queued to try again later. If the connections are not successfully made after two attempts, the call receives network blocked treatment, and processing proceeds to terminate the call.

ARU allocation

Upon reception of the immediate transfer for a DA call or the referral message for an intercept call, TOPS MPX verifies the billing information (if required) then allocates an ARU for the call. Once the ARU is obtained, a network connection between the subscriber and the ARU is established. A message is sent to the DAS to inform it of the connection. If the call was

connected to a position, the three-port conference circuit and the
TOPS MPX position are released.

If an ARU cannot be obtained, a verbal quotation is imposed. If billing
information is missing or an ARU cannot be obtained, TOPS MPX sends a
message to the DAS indicating that the transfer was aborted; otherwise, it
sends a message to the DAS indicating that an ARU is connected.

If the network connections cannot be acquired, a second attempt is made by
allocating another ARU and again trying to accomplish the ARU subscriber
connection. If the connections cannot be accomplished for DA or intercept
calls, verbal quotation is indicated at the position, and a message is sent to
the DAS informing it of the failure.

For an automatic intercept call, a position must first be obtained before
verbal quotation can be indicated, so a message is sent to inform the DAS of
the connection failure. The DAS responds with a message indicating that a
position is required, and the DMS responds with a message identifying the
selected position.

Coin features

Coin calls are not currently supported by TOPS MPX.

Administrative searches and features

Administrative searches are searches in the DAS database for administrative
purposes, as opposed to normal DA searches.

DA operators

The DA operator can perform administrative searches whenever a call is not
at the position. The operator is not required to withhold calls when
performing administrative searches (there is no withhold-calls function). To
avoid being interrupted, the operator must first make the position busy. If
the position has not been made busy, administrative searches are terminated
by the arrival of a call.

In-charge and assistance operators

Service assistants can perform administrative searches when handling a DA
call referred to them by a general operator or when not handling a call,
provided that the position used by the service assistants can service DA
calls.

Statistics

Both the DMS and the DAS accumulate statistical data. Statistical data for
operator performance is accumulated by the TOPS MPX position software
in an active operator record (AOR). Performance data accumulation begins
when an operator signs on. The DMS TOPS switch informs the IBM DAS

of the status of operators and call progress. Data is accumulated until the operator signs off.

In the IBM DAS, accumulated AORs are sent every fifteen minutes to the statistics processor for storage and processing. This statistical information is available for retrieval. Refer to *IBM Directory Assistance System, Personal System/2, Programmable Operator Subsystem, Operation and Configuration Guide*.

Force management information is obtained by the host DMS as it is for TOPS MP systems. Refer to *TOPS MPX Force Management Guide*, 297-2291-310.

Operational measurements

TOPS MPX operational measurements (OMs) are the same as those provided for the TOPS MP positions.

Refer to the *Operational Measurements Reference Manual* for details regarding OMs.

Hotel/motel features

Hotel/motel services are not currently supported by TOPS MPX.

Billing features

Only station-paid and no-charge calls are handled by TOPS MPX. Billing is automated in DA where possible. The DMS makes the distinction as to whether a call is billable or not. On calls eligible for billing, the requested number is sent from the DAS to the DMS for billing purposes. This process allows billing for most DA calls to be transparent to the operator. If desired, a billing record can be generated on every call. This is determined by datafill in the DMS.

TOPS MPX optional features

Optional features for TOPS MPX are described in the following pages. Optional features such as operator centralization are available as separate feature packages. These features can operate with standard TOPS features. As enhancements to these features, they require additional translations.

TOPS Equal Access

TOPS Equal Access is not currently supported by TOPS MPX.

TOPS interLATA carrier service

TOPS interLATA carrier service is not currently supported by TOPS MPX.

Operator centralization

The operator centralization (OC) feature allows a host DMS-200 to extend operator service for 15 DMS-200 remote offices. These remote offices can directly access and control TOPS MPX positions on a demand basis. The remote office retains all existing trunking, translation, routing, and ticketing information. The host and the remote office provide an equal grade of service.

A new feature allows one switch to be a remote office for one queue and a host office for another queue.

Dial-up autoquote

Dial-up autoquote is not currently supported by TOPS MPX.

Closedown

Each OC host provides operator services 24 hours a day. During light traffic loads, usually midnight to 6 A.M., fewer operators are required. The closedown feature redirects the traffic load at each host switch and enhances OC by enabling the operating company to reconfigure the network between the host and the remote during closedown.

Billing features

TOPS MPX supports the following billing format.

TOPS expanded Bellcore AMA format (EBAF)

To provide adequate billing records for DA calls, it is recommended that the DMS features include phase one, or higher, of the TOPS expanded Bellcore AMA format (EBAF). Billing for call completion, when provided with integrated toll and assist capability in TOPS MPX-IWS, will require EBAF, phase two.

Alternate billing

Alternate billing calls are not currently supported by TOPS MPX.

Position sanity timer

During operator call processing, some situations can cause the calling or called parties to remain attached to an unoccupied position. Such a situation may occur if an operator logs out before the call is released from the position. This situation also occurs if a portion of the position data path not controlled by the DMS is lost. If the positions are connected by a local area network (LAN) and the LAN goes down, the calling and called parties will remain attached until the call is taken down.

A position sanity timer is activated when the DMS receives indication that all attached parties are onhook. If the timer expires, the DMS automatically takes the call down and generates a log. Therefore, resources are freed and

operating company personnel are alerted to the problem. The duration of the timer is datafillable.

Call completion

Automatic DA call completion (ADACC) is a DA enhancement. With ADACC, a subscriber may ask the operator to complete a call to the number provided by the DA search. An optional feature allows the operating company to restrict DA call completion.

Automatic intercept call completion (AINTCC) is an intercept enhancement. With AINTCC, subscribers who move may have calls to their old numbers automatically completed to the new number.

Personal Audio Response System (PARS)

The PARS feature provides custom announcements to a subscriber when a call is presented to a TOPS position. This feature requires multi-protocol (MPC) data links in stand-alone and host offices for messaging between the DMS and PARS.

The MPC is a general-purpose data communications card that interfaces the DMS-100 Family switch through an input/output controller (IOC) switch. The MPC implements low-level data communications functions, offloading the central control. Different protocols are served with different downloadable software, allowing use by various software applications. The MPC utility allows call processing and other applications to communicate with remote nodes. The term "data link" refers to an MPC connection between the DMS and a remote process.

Automated Directory Assistance Service (ADAS)

The Automated Directory Assistance Service (ADAS) reduces the average work time (AWT) of DA operators by automating the initial inquiry portion of DA call processing. As a voice processing service, ADAS is built on Northern Telecom's experience with the Automated Alternate Billing Service (AABS) and fits into a family of similar services, such as voice mail, message delivery, and interactive automatic call distribution (ACD).

ADAS is the first application developed for the voice processing platform (VPP), a software platform supporting enhanced voice and data service applications. ADAS is integrated with a DMS SuperNode switch.

With ADAS, the operator receives the information necessary to process the DA request as efficiently as possible. By automating the up-front greeting and inquiry process, ADAS saves two to four seconds on a typical call. ADAS does not require the operator to be on the call while the recorded greeting and prompts are played. Time is also saved by the high-quality responses of the caller.

The operating company can set and change many ADAS parameters, such as greetings, prompts, and help or error messages; maximum initial silence before and during recording; maximum recording time; maximum number of errors before going to operator; call arrival tones; sequence of prompts; deflection; and a skip digit option for expert users.

ADAS was designed for DMS-100/200/TOPS and DMS-200/TOPS DMS SuperNode switches, whether configured as host, remote, or standalone operator centers. Since the functionality is contained in the switch, ADAS can be used with any commercially available DA system.

ADAS uses the multicomputing capabilities of the DMS-200 SuperNode architecture, with the flexible, modular resources of the link peripheral processor (LPP). Processing units in the LPP perform voice-processing tasks such as silence thresholding, detection of dual-tone multifrequency (DTMF) signals, temporary storage of recorded audio, and playback of recorded audio. LPP processing units also provide interfaces to the switch network and Ethernet local area network (LAN).

ADAS also introduces a UNIX-based operations, administration, and maintenance (OA&M) workstation with a graphical user interface. This workstation is integrated with DMS SuperNode OAM. Several general-purpose tools are associated with the UNIX-based workstation service monitor. For example, MAP operations can be performed from the UNIX workstation through the DMS Passthru tool, and multiple MAP sessions can be opened at the same time.

To minimize demands on the switch, most ADAS processing is performed by the LPP. Since message interchange for ADAS voice processing takes place within the LPP, there is no traffic increase on the DMS bus.

Queue Management System (QMS)

The Queue Management System (QMS) is a group of software packages that provide enhanced capabilities for the management of call and agent queues.

Capabilities

QMS enhances queueing for TOPS in the following ways:

- Increases the maximum number of assignable call queues available in TOPS from 9 to 255.

- Integrates absolute priority queueing of operators with assignable grade of service (AGS), on an operator profile basis. This allows the operating company to introduce the concept of primary and secondary responsibilities for its operators.

- Provides support for basic periodic FM reports, which can be optionally activated and deactivated.

- Allows the the operating company to segregate traffic across the 255 queues by a wide range of criteria, including:
  — class of service

  — restricted

  — prefix dialing

  — inter-LATA carrier

  — called digits

  — time of day

  — originating area

  — language

  — automated service

- Furthermore, QMS is designed to allow for extending this set of criteria as new queueing capabilities are required.

- Is designed with switch capacity and real time as paramount concerns. The software supporting TOPS QMS behaves linearly under load, which provides a stable model for managing real-time efficiency.

In combination, these capabilities provide a new platform for the provision of existing services and for expeditious deployment of new services.

System configuration
QMS is a generic call, agent, and force management system that consists of three software components, as shown in the following figure.

QMS logical connectivity
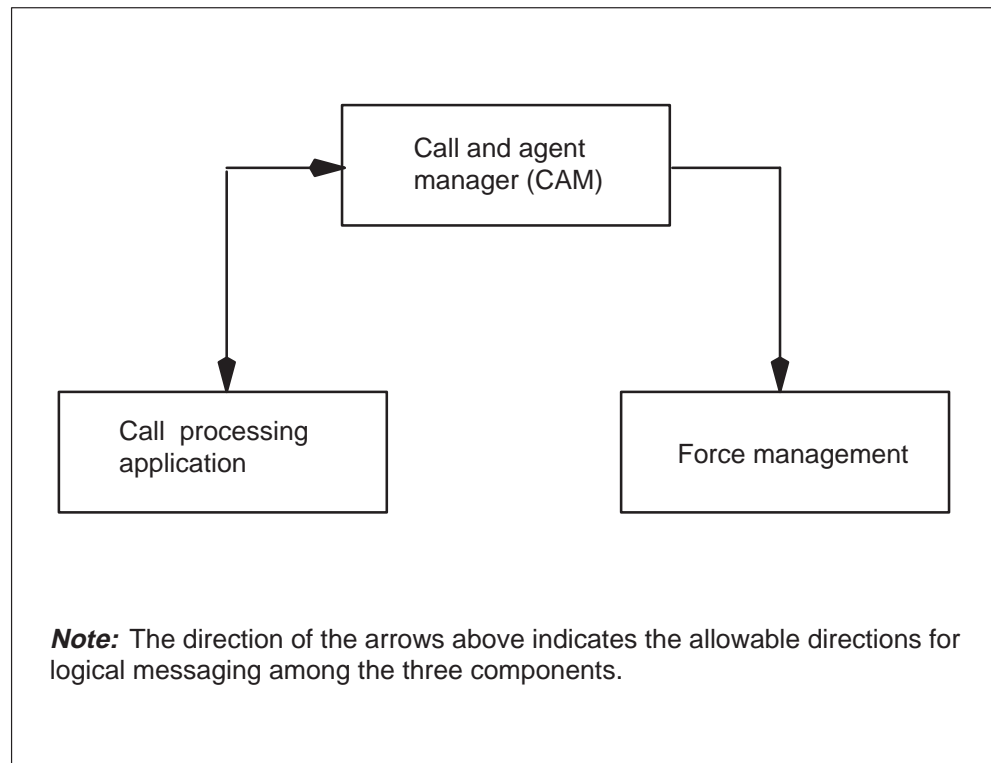
The three-part structure of QMS does not have a counterpart in traditional queueing systems (including DMS-TOPS). The following summary of the roles and relationships among these three components illustrates the capabilities of QMS.

Call and agent manager (CAM)
The QMS component shown in the center of the previous figure is the call and agent manager (CAM). The CAM allocates and manages the call and agent resources of QMS. It contains the physical store for the call and agent queues and the logic, which enforces the priorities associated with those queues. The call-processing application messages the CAM when calls are to be assigned to call queues, and when agents become available, or unavailable to serve call queues. The messaging between the CAM and the application drives the queueing and dequeueing actions in the CAM. In addition to messaging with the application, the CAM has a one-way interface to the force management interface. The force management interface receives pertinent force statistics from the CAM, and uses these statistics to drive real-time displays and periodic reports.

Call-processing application

The call-processing application determines:

- whether an agent or operator is required for a given call

- which call queue should be assigned to a call that requires an agent

- when a call has left an agent

While the call is at an agent, the application controls the processing of the data entered at the agent's terminal, determines the terminal screen displays, and controls the call processing associated with the call. In addition, when an agent logs on, the application informs the CAM of the queues the agent serves. When an agent logs out, the application must notify the CAM of that agent's unavailability.

The CAM component of QMS is generic to the extent that it does not vary with different applications. A telemarketing call-processing application and an operator services call-processing application, for example, would use identical CAM components.

In comparison with the application, the FM and CAM components of QMS are in a reactive mode, whereas the application is more proactive. The application initiates all requests to add or delete calls or agents from the queueing structures controlled by the CAM. Also, the application controls the events for which FM statistics are reported.

Force management

The FM interface component receives a continuous stream of event-driven messages from the CAM.

The FM interface is responsible for:

- Interpreting the messages it receives

- Accumulating the statistics corresponding to the reported events

- Driving real-time displays based on these statistics

Traditionally, this statistical accumulation has been known by the terminology "pegging" the proper "registers." The operating company may choose to display these statistics to the end user in traditional FM-reporting formats.

To allow TOPS to run as an application in QMS, the queueing and force management functions must be separated from the call-processing software, and the QMS messaging protocol must be supported. An existing TOPS office can gradually activate the enhanced TOPS QMS functionality on an incoming trunk group basis, to allow a gradual transition path for an office converting to TOPS QMS.

Cost savings and revenue enhancements

TOPS QMS empowers the operating company to recognize new cost savings, and to explore new revenue enhancements like the following:

- Providing generic TOPS billing and force management capabilities for new services, without requiring a software upgrade

- Providing business office functions through the operator services center, using an assigned group of operators

- Using time of day queueing to extend the concept of "night closedown" to allow dynamic routing of traffic, segregated by the entire range of call queueing criteria, each by its own hour and day criteria

- Prototyping new services by designating a particular group of operators to provide these services, and routing traffic directly to these operators based on dialed digits

Using the Queue Management System

The Queue Management System (QMS) feature is available to TOPS offices and is referred to as TOPS QMS. TOPS QMS is a group of software packages that provide enhanced capabilities for the management of up to 255 call queues (currently limited to 16 services).

Queues can be used to separate types of traffic, for example, 555 directory assistance for the home NPA, 555 directory assistance for a foreign NPA, or 131 and 141 calls from other directory assistance offices. Database searches and call-handling procedures remain essentially the same as for non-QMS positions.

With this feature, operators are assigned based on a profile of their abilities, consideration of the traffic load, and other factors. The following is an example of a call queue and operator profile arrangement:

- profile 1 – directory assistance (English)

- profile 2 – directory assistance (Spanish)

- profile 3 – intercept service (English)

- profile 4 – intercept service (Spanish)

- profile 5 – directory assistance and intercept (English)

- profile 6 – directory assistance and intercept (Spanish)

TOPS QMS also provides for the assignment of up to 255 individual queues such as the following:

- call queue 1 – directory assistance (English)

- call queue 2 – directory assistance (Spanish)

- call queue 3 – intercept service (English)

- call queue 4 – intercept service (Spanish)

TOPS QMS matches the call queue to the operator's profile. In this example, operators assigned profile 1 are sent calls from call queue 1. Operators assigned profile 2 receive calls from call queue 2. Operators assigned profile 5 are sent calls from both call queues 1 and 3.

When an operator logs on to a suitably configured operator position, calls are presented according to the operator's call-selection profile. Once a call arrives at a position, the operator may provide any service defined in the operator's QMS service profile.

This feature also provides the ability to create a class of senior operators who can assist other operators as well as serve regular operator traffic.

Logging on to a QMS position

To log on to a TOPS QMS position, perform the following steps. A successful logon screen (before pressing the **Make Busy** key to accept calls) is shown in the following figure. The letter G in this example refers to the classification of general operator.

Example of successful logon to QMS position

```
┌──────────────────────────────────────────────────────────┐
│  ┌────────────────────────────────────────────────────┐   │
│  │                                                    │   │
│  │                                                    │   │
│  │                                                    │   │
│  │                                                    │   │
│  ├────────────────────────────────┬───────────────────┤   │
│  │                                 │  B                │   │
│  │                                 │                   │   │
│  │  BOOK:         LOC:             │  OPR#200     G    │   │
│  │  NAME:           TYPE:    NPA:  │                   │   │
│  │  STRT:         OPER: J. CLAY    │                   │   │
│  │                                 └───────────────────┤   │
│  └────────────────────────────────────────────────────┘   │
└──────────────────────────────────────────────────────────┘
```

Unsuccessful logon

An unsuccessful logon can occur by entering wrong data or using an improper keying sequence. The following figure is an example of the position screen with an unsuccessful logon indication (flashing operator number).

Unsuccessful logon attempt

```
                                Flashing operator number


                                                    ┌──────────────────┐
                                                    │ B                │
                                                    │                  │
    BOOK:              LOC:                         │ <OPR#200>   G    │
    NAME:                  TYPE:        NPA:        │                  │
    STRT:              OPER: J. CLAY                └──────────────────┘
```
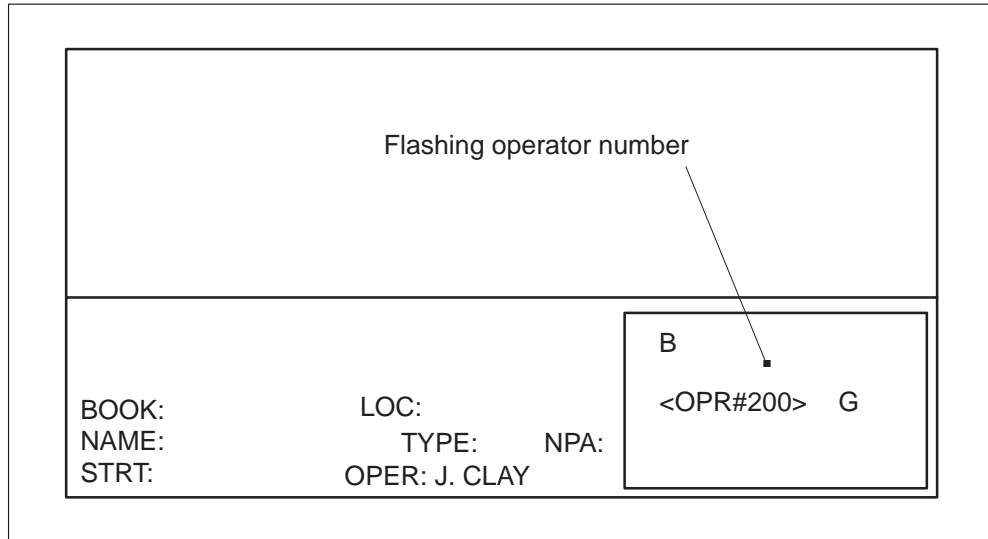
Unsuccessful logon to the database

In the event of a failure to log on to the database (such as directory
assistance), the indicator OH (operator handled) is shown on the screen (see
the following figure). The operator still receives calls for that service, but
the calls have to be processed manually (as locally directed) or the
subscriber is instructed to hang up and try the call again.

Failure to log on to the database

```
                                          Failure to log on to the database


                                                    ┌──────────────────┐
                                                    │ B            OH  │
                                                    │                  │
    BOOK:              LOC:                         │ OPR#200      G   │
    NAME:                  TYPE:        NPA:        │                  │
    STRT:              OPER: J. CLAY                └──────────────────┘
```
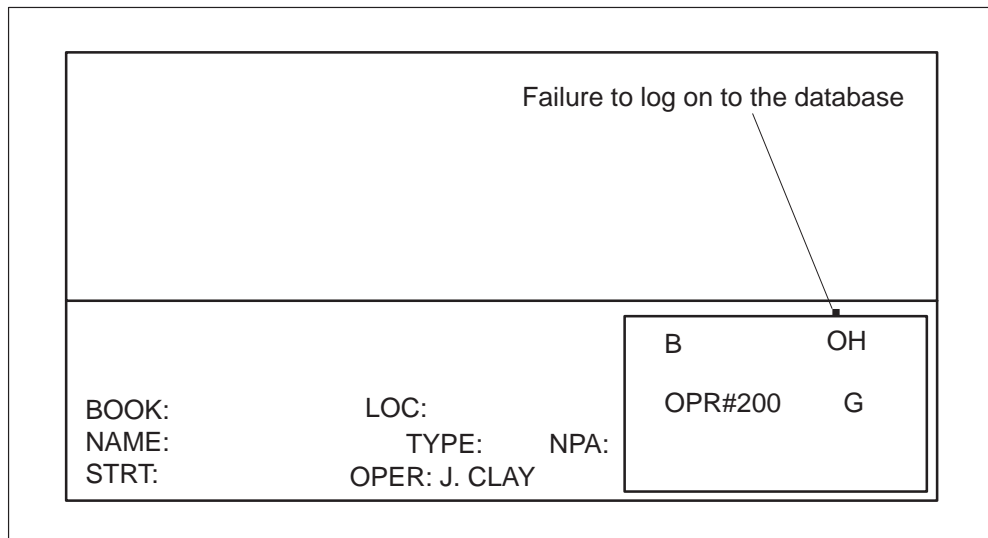
Receiving a call

When a call request is received at the switch, the TOPS call-processing program of the DMS searches for an idle position with a position profile that matches (one that can serve this call type) the requirements of the call. When the required position is found, the call is sent to the position. The following figure shows an example of a call at the operator's position.

Screen display of 555 directory assistance call arrival

```
┌──────────────────────────────────────────────────────────────┐
│  ┌────────────────────────────────────────────────────────┐  │
│  │                                                          │  │
│  │        First two characters of translations table        │  │
│  │        CT4QNAM (Example: HO for home NPA 555)            │  │
│  │                                                          │  │
│  │                                                          │  │
│  │                                                          │  │
│  ├──────────────────────────────┬─────────────────────────┤  │
│  │                              │  CLG# 407–232–4343       │  │
│  │                              │        407               │  │
│  │  BOOK:         LOC:          │                          │  │
│  │  NAME:          TYPE:  NPA:  │  HO              555      │  │
│  │  STRT:         OPER: J. CLAY │                          │  │
│  └──────────────────────────────┴─────────────────────────┘  │
└──────────────────────────────────────────────────────────────┘
```
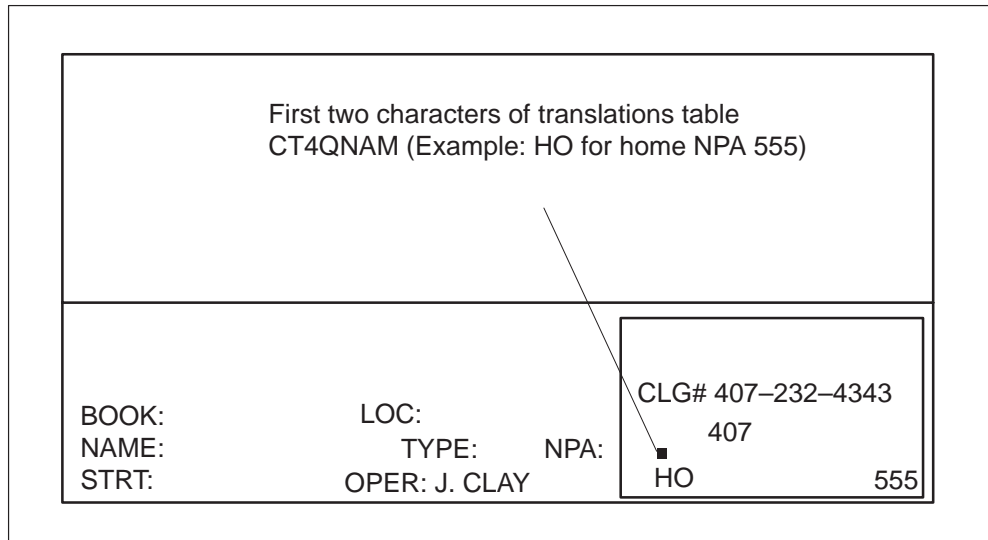
Making changes to a call for recall or transfer

An operator can change the call type for queuing (CT4Q) or the language mark. These capabilities allow an operator who cannot complete the call to transfer the call to another operator who can complete it (through a change of CT4Q or language mark), or to mark the call for recall. When a call marked for recall is released from the first position, it is assigned to another operator who can complete the call.

Transferring a call to another operator

The following figure shows an example of the position screen during the transfer sequence before the position has been released. The x indicates that the call is prepared to be transferred. If the call is marked for recall, the x does not appear, but the CT4Q display changes to the recall indicator.

Screen during call-transfer sequence before position release

```
                                              ┌──────────────────────┐
                                              │                      │
                                              │  CLG# 407–232–4343   │
         BOOK:           LOC:                 │       407      X     │
         NAME:             TYPE:     NPA:      │                      │
         STRT:           OPER: J. CLAY        │  HO              555 │
                                              └──────────────────────┘
```

Senior operator position

In addition to service assistants, TOPS QMS creates a class of operators called senior operators. Service assistants provide assistance to other operators, but unlike senior operators, they cannot serve subscriber-initiated traffic or complete calls for operators who are being assisted. Service assistants can page and monitor other operators, but senior operators cannot. The senior operator capability is available through the use of outgoing trunk keys and loop-around trunks.

Effects of QMS on TOPS MPX SA and IC screens

Although the queueing of calls to SA and IC positions is not affected by QMS, the displays at SA and IC positions differ when QMS is used instead of ACD. SA and IC positions associated with QMS teams of operators have a call waiting (CW) and a call deflect (CD) indicator at the position. These indicators are updated on a ten-second basis. They indicate that a TOPS QMS queue is in a CW or CD state. A force management command is provided at QMS force management TTYs to query which queue is in the CW or CD state. (A TOPS QMS queue is in CW or CD state based on datafill in Tables TQCQINFO and WMSCQDEF.)

IC positions associated with QMS teams have real-time statistics displayed at their positions for back-up purposes. These indicate the total statistics for the positions in their respective teams. The statistics displayed include, for example, the number of positions on the team in made-busy state, the number occupied, and the number out of order.

SA and IC displays associated with TOPS ACD teams remain unchanged.

The CW and CD displays on SA and IC positions associated with QMS teams have the same screen location as on SA and IC positions associated with TOPS ACD teams. The location of the displays is shown in the following two figures. On SA and IC positions associated with QMS teams, the CW and CD statuses are not displayed for each queue.

Note: The QCQ display is not supported on TOPS MPX SA and IC screens. It does appear, however, on the FMCRT screen.

TOPS MPX SA position screen with QMS
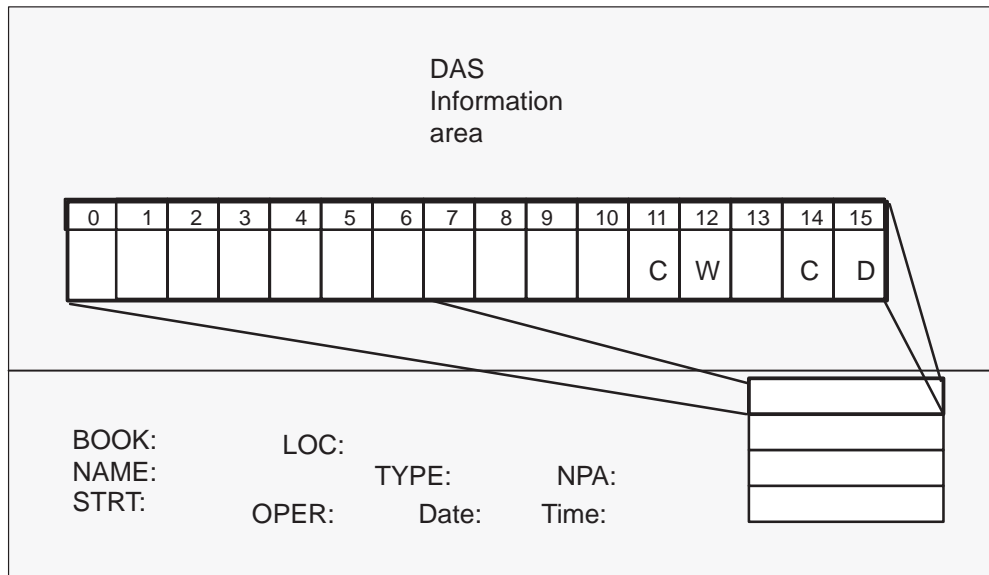
The team statistics displays on IC positions associated with QMS teams have the same screen locations as on IC positions associated with TOPS ACD. The location of the displays is shown in the following figure. IC positions associated with QMS teams do not display statistics for each queue.

TOPS MPX IC position screen with QMS

DAS information area

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
											C	W		C	D
	2	4										U	P	U	D
		3													

BOOK: LOC:

NAME: TYPE: NPA:

STRT: OPER: Date: Time:

In the third row of the previous figure, the sample number 24 indicates the total number of general operator positions in the IC team currently occupied. The characters UP indicate that an unsupervised call is in progress at a position that is not logged on, and the characters UD indicate that an unsupervised call has been disconnected. The sample number 3 in the fourth row indicates the total number of general operator positions in the IC team currently in a made-busy state.

TOPS MPX call processing

This chapter describes how calls are processed in the TOPS MPX system.

User perspective

TOPS MPX enables an operator to service DA and intercept calls using a Directory Assistance System (DAS). TOPS MPX provides a single-terminal operator position, based on an IBM PS/2, that enables the operator to handle DA calls completely. TOPS MPX-IWS operator positions can also handle integrated DA and toll and assist calls.

Additional user perspective information is provided by the *IBM TOPS MPS Terminal Product Specification* and *IBM Programmable Operator Subsystem User Guide,* SC28-8168.

DA service calls

DA service calls are calls for which the called number is requested based on information known about the called party. DA calls are usually originated by the subscriber as a 411, 555-1212, or NPA-555-1212 call. Operator inward DA requests (131, 141) are typically dedicated DA or non-dedicated trunks. Calls are classified as requiring DA service based upon call-origination type.

The following types of incoming DA and intercept calls are processed:

- Regular DA calls – The operator accesses a DAS data base to obtain the requested number, using information acquired from the subscriber as the search key. The operator verbally quotes the search results to the subscriber or releases the call to an automatic recording unit (ARU) for automatic quotation of the results.

- DA operator number identification (ONI) or automatic number identification failure (ANIF) – DA ONI calls originate on trunks designated as ONI and do not automatically provide the calling number. DA ANIF calls originate on trunks that provide automatic number identification (ANI) capability, but have failed to obtain the calling number. If the call is to be billed, the operator may be required to request the calling number from the subscriber and enter it at the TOPS position for DA ONI and DA ANIF calls. This is an optional requirement determined by datafill.

- DA recall (or reconnect) calls — These are DA calls that have been released to an ARU, but because the subscriber remains off-hook after hearing the ARU announcement, the call is reconnected to the DA operator position. Recalls are controlled by datafill, and they go back to the original queue assigned to the DA call.

- Emergency DA call connection – After the operator has accessed the DA database, the caller may want the call to be connected through to the requested number. The operator connects the call by keying in the requested number using the **CLD** key. Unlike operator-handled DA call completion (OHDACC), no separate charge is generated for the call connection.

Intercept service calls

Calls are intercepted at the end office because the called number is no longer valid. They are then routed to TOPS MPX over dedicated intercept trunks or nondedicated trunks. The calls are classified as requiring an intercept operator. The operator may quote intercept calls automatically or verbally.

For instance, when an ARU is not available, intercept calls are operator quoted. The operator accesses the DAS intercept database, using the called number as the search key, to obtain the new called number. The new number is then verbally quoted to the subscriber, and the call is released.

The following call descriptions relate to intercept calls:

- Automatic intercept calls – These are intercept calls in which the called number is transmitted to the DMS. Therefore, these calls are automatically processed without the assistance of an operator. TOPS MPX call processing passes the called number to the DAS to be used as the search key for the intercept listing. Upon finding the intercept entry, the call is connected to an ARU for automatic intercept announcement.

- Intercept ONI and ANIF calls — For intercept calls the called number is transmitted from the end office in the ANI spill. For ONI or ANIF calls, therefore, there is no ANI spill, so the called number is not provided. In either case the called number is not known, so the call must be connected to an operator so that the subscriber may be prompted for the called number. When entered, the called number is sent to the DAS. After the DAS finds the intercept entry, the call is connected to an ARU for automatic intercept announcement.

- Intercept cut-through calls – These calls begin as automatic intercept calls, but are converted to intercept cut-through calls when the subscriber remains off-hook following the automatic intercept announcement. The subscriber is connected to an operator and the intercept listings which resulted from the original search are displayed at the TOPS MPX position. Cut-through calls are controlled by datafill.

- Intercept recalls (or reconnects) — These calls are similar to cut-through calls except that before the automatic announcement the caller was connected to an operator. Recalls are controlled by datafill.

- Intercept special — These recalls occur for reasons such as unsuccessful DAS searches or split referrals that cannot be quoted by voice response.

Call arrival

When the DMS-200 determines that operator assistance is required for call completion, a three-port conference circuit is selected, and the call and operator position are connected to that port. A call-arrival tone alerts the operator when the call arrives at the position, and the related data for the call appears on the screen at the operator position.

ADACC availability

Automated directory assistance call completion (ADACC) is available for DA calls that are station-paid or toll free.

Call monitoring

In TOPS, a service assistant or an in-charge (IC) manager can monitor a general operator's activity. The DMS switch supports screen-by-screen monitoring for any two positions within the same OSC. This means that information for screen display is sent to both the general operator position and the monitoring position.

The IBM DAS also supports screen-by-screen monitoring, with the restriction that the two positions must be interfaced to the same IBM DAS TPC. If, in the future, inter-LAN bridging capability is provided, the IBM DAS restriction requiring the two positions to be on the same IBM DAS TPC will be removed. Also, the IBM DA will then be capable of supporting character-by-character monitoring. Character-by-character monitoring

means that the screen of both the general operator position and the monitoring position are simultaneously updated character by character.

Call distribution and queueing system

One of two queueing strategies is applicable, depending on whether the Queue Management System (QMS) is provided in the DMS.

Handling of queued calls without QMS

If no operator is available to service the call, DA or intercept calls are placed in a queue. Calls are queued in the GEN, XFR1, XFR2, or DA calls-waiting (CW) queue. Ringing is then applied to the subscriber while the call remains in queue. Ringing is not applied to calls in the recall queues.

For an operator position to service a call requiring intercept service, the appropriate queue and table must be datafilled to provide this definition. Similarly, to enable the position to handle intercept and DA service, the operator's service set must be datafilled to select DA and intercept service.

If there is already an excess of calls in the GEN/DA/XFR1/XFR2 CW queue and the call is not a recall, the call is not queued but is deflected to treatment. DA calls are deflected to emergency treatment 5 (EMR5). Intercept calls are deflected to emergency treatment 6 (EMR6). If no queueing resources are available, the call cannot be placed in queue but is sent to the queue overflow treatment. In situations when one of these treatments might be used to overflow to a trunk group to extend to another DA switch, the called digits cannot be sent forward. If the call requires no additional service after treatment, processing terminates the call.

Queueing enhancements with QMS

The queueing enhancements for TOPS provided by QMS include the following:

- The maximum number of assignable call queues available in TOPS is increased to 255.

- Priority queueing of operators is combined with assignable grade of service (AGS), on an operator profile basis. This allows the operating company to introduce the concept of primary and secondary responsibilities for operators. For example, a group of operators may be assigned to provide directory assistance service as a primary responsibility, but also serve toll and assistance calls as a secondary responsibility when traffic conditions warrant.

- TOPS QMS allows the operating company to segregate traffic across the 255 queues by a wide range of criteria, including time of day, called digits, incoming trunk group, calling digits, Inter-LATA carrier, class of service, restricted billing index, prefix dialing, and others.

Call transfer

Calls can be transferred from one operator to another through DA forward-dialing capability and through loop access.

DA forward-dialing capability

When handling DA calls, the TOPS MPX operator can forward the call to certain destinations by pressing the **OGT** key, entering a two-digit OGT number, and pressing the **Start** key. These OGT numbers are usually associated with frequently called numbers such as police, fire departments, or telephone repair service.

The TOPS MPX operator can also enter **Cld** plus a seven or ten-digit forward number and press the **Start** key. The DMS switch interprets this key sequence to mean that a forward number was entered. In this case, the routing of the call is determined by datafill in the DMS switch. The latter type of call completion are supported by integrated toll and assist service in TOPS MPX-IWS.

Standard DA billing records are produced for all of these calls. A new value has been added in Table 423 in TOPS expanded Bellcore AMA format (EBAF, AF1726), Module Code 307 (line number) to indicate that a forward number was connected on a DA call and to identify the number.

Loop access

A general operator handling a DA call is blocked from accessing a second loop. Second loop access will be provided when TA service is provided through TOPS MPX-IWS. IC managers and service assistants are permitted to access a second loop.

Controlled traffic mode

Operators can be assigned to handle a selection of call types, which may vary from all call types to a single call type. Operators barred from handling specific call types are placed in controlled traffic mode by the IC manager. No more than 25% of the operators should be logged on to perform this type of call handling, because overuse of controlled traffic mode reduces overall system capacity.

Special call-processing treatments

Special call-processing treatments include IBM DAS commands, DA and intercept search requests, announcements, and multiple requests.

IBM DAS commands

The TOPS MPX position interactions with the IBM DAS are described in *IBM Programmable Operator Subsystem User Guide*, SC28-8168. The following is a brief overview of the commands used. The IBM DAS

provides commands that are assigned supervisory or inquiry privilege levels. These privileges are assigned to the operator when IBM DAS is installed. Refer to *IBM Directory Assistance System, Statistics Processor User Guide* for more information about operator privilege levels and the instructions to define operator privileges. Recommended assignment of commands for general operators, service assistance/in-charge (IC) operators, and crafts personnel is indicated in the list of commands. Actual assignment of commands to the privilege levels is determined by the operating company.

To access the message/command line on TOPS MPX, the operator presses the **Cmd** key. The IBM DAS responds with the header "CMD:" and the cursor is positioned one space after the colon. The operator can then type in a command name and issue the command by pressing the **Enter** key. If more input is required, the IBM DAS prompts the operator on the command line. If the operator has the privileges allowed for this command, the command is executed. If the operator does not have the privileges required, the command is not executed, and the IBM DAS responds accordingly. If the operator presses the **Cmd** key sequence and then decides not to enter a command, pressing any DA hardkey causes the position to exit the command mode.

Commands that are available at the TOPS MPX position are listed below, grouped according to recommended usage.

Commands used by all operators
All operators use the following commands:

CNTS {0}   save the current key counters (optional parameter 0 is used to set internally maintained scan code counters to zero)
NPUB   display nonpublished numbers (may be a privileged command)

Commands used by the SA/IC operators or crafts personnel
Service assistants and IC managers or crafts personnel use the following commands:

CMD   execute and define command privileges utility
SGET {nn}   retrieve a previously saved screen (reference number for screen = 1-41)
SSAV {nn}   save current screen at a specific location (reference number for screen = 1-41)
STAT   station status/statistics
TRC   diagnostic transaction trace
ULIM   set unlimited search indicator

Commands used by the crafts personnel
Crafts personnel use the following commands:

DMP   diagnostic transaction dump

EXIT   exit POS and return control to DOS
LST   list saved screens (attached local printer required)
NET   diagnostic display of transport layer network tables
PRT   print contents of current screen (requires that a local printer be attached to the IBM PS/2)

Utilities
The following initialization utilities are available at the position only at the DOS level:

DEFKEY   keyboard utility used to define the various key scan codes. The position is initially set to a default set of key scan codes, which can be changed by means of this utility.
DEFOPT   options utility used to define various options
DEFSCR   screens utility used to define the SA screen
DEFSTA   status messages utility used to define statistics to be collected

Commands not recommended
The service monitoring (SMON) command is offered by the IBM DAS and may be available, but is not recommended to be used by the TOPS MPX operator. It is not needed with the SA/IC capability provided by TOPS MPX.

DA search requests
The operator may perform a DA database search while servicing a DA or intercept call (based on setting of options in the DAS, referred to in the previous section.

The database response is then displayed in the DA area of the screen. If the requested listing is not contained in the initial search response, the operator can perform additional searches.

Intercept search requests
The operator may perform an intercept search while servicing a DA or intercept call by entering the called number in the name field. Unlike DA searches, in which the database returns listings for operator selection, the intercept search is requested, and the call is automatically released to audio announcement, if possible.

The operator can override the automatic release to audio announcement. Overriding the automatic release indicates to the database that the operator wishes the response to be displayed on the terminal so that further call processing is at the operator's discretion.

In the event of intercept reconnects and operator override of the automatic announcement release, audio announcement is not permitted by the DAS; instead the response must be handled verbally by the operator.

Announcements

Once the operator has located the requested listing, the information can be relayed to the subscriber verbally or by audio announcement combined with the position release (**Pos Rls**) key.

DA verbal quotation

The operator quotes subscriber information verbally in several types of situations.   For example, if the audio response system is unavailable or the DMS/DAS link is down, the operator is required to make verbal announcements. The operator also verbally quotes information for multiple request calls and memory quotations.

Audio announcement

Several ways are provided for the operator to release a call to audio announcement. The audio release (**Audio Rel**) key is the primary key used by operators for audio announcements. For offices that support more than one language, an asterisk is placed in the operator name field by the IBM DAS to show that the secondary language is chosen for the audio announcement. The operator can select an alternate language before the request is released to audio announcement. Pressing the alternate language (**Alt Lang**) key causes the alternate language function to be in effect only during the current call. If all billing requirements for the call are satisfied, the position is automatically released. Otherwise, the release is denied, and the operator must enter the required billing information and try again.

IBM DA supports audio announcements for several languages, but only a primary and secondary language can be datafilled in the TOPS MPX IBM DA system at one time.

When an ARU is not available, or if the search is unsuccessful, the call is reconnected to an operator for further handling.

Multiple requests

If a subscriber requests verbal quotation of several numbers during one DA call, the operator may generate an AMA record for each number requested. The generate AMA (**GEN AMA**) key is pressed to generate an AMA billing record.

When the billing information is complete for the first number request the DA screen is cleared, allowing the operator to proceed with the next number request. If the required billing information is not completed, the operator request for DA services is denied. The IBM DAS redisplays the listing data 0and the operator input in the DA service screen. This allows the operator to enter the missing billing information and at the same time presents the respective DA information for reference.

During multiple DA requests from a single subscriber call, the last request may be released to an audio announcement. All the previous requests in the call are verbally quoted.

If multiple requests are sent to the DAS by one operator position before a response to the first request is received, the DAS may update the position with the last inquiry and filter out all other previous requests.

Mixed requests

The handling of mixed requests depends on the combination of requests.

Mixed DA/intercept requests

Calls are presented to TOPS MPX as either DA or intercept calls. A DA database or intercept database session is therefore established on a call-by-call basis between the CC, TOPS MPX, and the IBM DAS. If an intercept search is requested during a DA call (or vice versa), the DAS honors the search request if the datafill at the IBM DAS permits this action. However, this type of mixed search is not recommended because of the way billing and statistics occur on DA versus intercept searches. DA services provided on an intercept call cannot be billed; however, an AMA record is generated.

IBM statistics for a DA inquiry are not reflected in the DA work time, but are seen in the associated intercept work time. The DA query must be verbally quoted, because no line selection characters are displayed. Providing intercept search information on a DA call is billed as if the search were to a DA database.

TOPS MPX administration

Administering TOPS MPX involves monitoring system and operator performance. For additional information on system monitoring, refer to *Operational Measurements Reference Manual*. For additional information on operator performance, refer to *TOPS MPX Force Management Guide,* 297-2291-310.

IBM DAS datafill considerations

The following datafill items must be the same in both the IBM DAS and the DMS:

- position number
- operator identity
- operator complex
- audio response units (ARU)

The following datafill items are required by the TOPS MPX position:

- keyboard key assignment
- screen field assignment
- logical net ID
- NPID – token-ring local area network (LAN) identity
- position number (identity of position on the LAN)

In addition, the identity of DMS gateway positions (which contain a virtual position controller or VPC), as well as the identities of subtending positions, must be coordinated between the DMS and the IBM DAS. The positions numbers for DMS gateway positions always begin with 0 and increase in steps of four (0, 4, 8, and so on).

For redundant TPC datalinks there are two VPCs: one primary and one secondary in each cluster. The primary VPC (DMS gateway) positions must always be assigned a position number beginning with 0, and increasing in steps of N, where N is the number of positions in the cluster. The secondary VPCs (also DMS gateway) must always be assigned the next higher number:

N+1, N+2, and so forth. Each VPC datalink is identified to the DMS as a primary or secondary datalink for the TPC, and all of the positions in the same cluster are associated with that TPC.

Force management administration

Force management administration occurs at the force management center (FMC) under the direction of the force supervisor. In a TOPS MPX system configuration, force management administration occurs at the force management (FM) position for traffic and operator administration, and a VT220-compatible terminal for maintenance and administration duties. Under the FM, one or more force administrators are also responsible for the training of other operators.

Using the force administration data system (FADS) for force management enables the force supervisor to track administrative data for the entire TOPS work force. Information from the FADS TTY, which can be generated in 15 or 30-minute intervals, includes traffic office performance and 6- and 24-hour reports. The FM screen constantly displays loop-accessed positions where either party is attached and off hook, and indicates the number of positions.

The following status data display at an FMCRT:

- occupied

- unoccupied

- made busy by operator

- in controlled traffic mode

- out of service

The summary reports from a FADS TTY detail average work time (AWT), average occupied positions (AOP), initial position seizures (IPS), answer time (ANS), calls waiting (CW) in queue, work volume (WV), and the percentage of occupancy for all TOPS positions. The reports are calculated every 15 minutes for the previous 15-minute period, if requested, or every 30 minutes automatically. Additional summary reports are available every 6 and 24 hours.

Force management CRT

The force management cathode-ray tube (FMCRT) is currently supported only by a TOPS 04 or a TOPS MP position. It is not currently supported as a function of the TOPS MPX position. This function may optionally be performed by interfacing external statistics providers through the QMS MIS interface. The other alternative is to provide this function in a TOPS MPX office by means of a TOPS 04 or TOPS MP position on the DMS switch.

The operators who handle incoming calls in a call-distribution system make up a team called a work force. All the positions served by one DMS constitute one force administration system.

Force management center

The FMC is a centralized location staffed with people who carry out administration tasks for the entire operator work force. In a single-traffic office, force management and traffic functions are combined.

Traffic office administration

Management functions affecting the work force or individual operators depend on the traffic office configuration type. One traffic office consists of one or more operator teams grouped together for statistical or managerial purposes. These operator teams comprise one work force. Each work force can include 1–30 traffic offices. Operator positions within a traffic office can be grouped together or scattered randomly throughout the office.

Traffic office administration can be performed by the force supervisor, the IC manager, or a service assistant. The IC manager is directly responsible for operator supervision. In this capacity, the in-charge manager tracks administrative data for a traffic office. This position supports a maximum of six assistance positions.

The assistance position has five functions:

- handling assistance requests

- monitoring operators

- paging operators

- placing outgoing calls

- performing an administrative search

Force administration data system

The force administration data system (FADS) is used to activate and deactivate force management features and to provide information on the system and on the various traffic offices. A FADS TTY is used for this function.

Traffic office administration data system

The traffic office administration data system (TADS) is used in the individual traffic offices to activate and deactivate force management features and to output information on various aspects of the system for the given traffic office. There is one TADS TTY per traffic office.

System administration data system

The system administration data system (SADS) is used to activate and deactivate force management features and to provide information on the system. A SADS TTY is used for this function.

Mechanized force administration data system

The mechanized force administration data system (MFADS) allows TOPS MPX force management measurements to be polled at 15- or 30-minute intervals.

MFADS is a vendor-supplied minicomputer system that extracts FM measurements from a pollable port in TOPS MPX. The minicomputer uses the data sent by the DMS switch to calculate service and force statistics. These statistics are used to determine the number of operators required. The minicomputer formats these summaries in a way similar to FM periodic reports (those output at the SADS or FADS TTY).

TOPS MPX sends the following FM measurements to the MFADS device:

- the number of scans for TOPS MPX in XCS

- the number of initial position seizures

- work-volume usage accumulated in actual work seconds

- calls-waiting usage for TOPS MPX accumulated in XCS

- occupied position usage accumulated in XCS

Note: XCS is a unit of time equal to 10 seconds.

For offices equipped with the call-transfer feature, TOPS MPX accumulates and sends additional FM statistics for each call-transfer type – transfer 1 (XFR1), transfer 2 (XFR2), and XFR DA.

Note: If an operator serves more than one queue, the AOP is indicated only in the highest number queue; that is, an operator serving XFR1 and XFR2 queues shows an AOP in XFR2 only.

STATSPAC force management capability

The STATSPAC feature is an optional feature for generating force management statistics. The main function of the STATSPAC feature is to deliver raw data to a device provided by the operating company for every operator logged on for a previous interval of time.

The STATSPAC feature eliminates the need for study registers by sending all FM data directly to the vendor-supplied operating company device. With this feature, the operating company can perform its own statistical analyses,

since the raw data is provided and the operating company can choose the format of the output report.

The following raw data is delivered to the operating company device for each 15- or 30-minute time interval.

- operator number

- operator team number

- number of logons and logoffs

- operator idle time in seconds

- initial position seizures for each call type

- work volume for each call type

Call transfer

Four call transfer capabilities are optionally available for calls in the TOPS MPX system:

- transfering calls from one operator to another who is designated as a transfer operator

- routing specific call types directly to a transfer CW queue

- routing calls incoming over a specified trunk group directly to a specified transfer CW queue

- accumulating different statistics for different services (for example, toll versus DA)

TOPS MPX provides these call-transfer capabilities to guarantee that calls requiring the services of a transfer operator are connected to positions and operators providing transfer services. For example, the transfer service could provide operators capable of speaking an alternate language.

Calls requiring transfer services are placed in the transfer queue either directly based on the datafill or by another operator transferring the call by keying **Opr** + digits + **Start**. When a transfer operator reaches the top of the idle position queue, the system routes calls placed in the CW queue on a first-in, first-out (FIFO) basis. Positions are enabled to receive both transfer and nontransfer calls on a FIFO basis.

Note: The CW: display at the service assistance screen in call-control group 1 indicates that the number of calls waiting to be handled is greater than the threshold value. The CD display indicates that the number of calls deflected is greater than the threshold value. For the in-charge display, X0123 indicates that calls are either waiting in queue or being deflected to a specific queue (0-3). Steady numbers indicate that calls are waiting, while flashing numbers indicate that calls are being deflected.

Call transfer from one position to another

The ability to transfer calls from one operator to another was originally intended to solve language incompatibility between operator and customer. This feature enables a unilingual operator to transfer any call to a bilingual operator or to transfer certain calls to other operators in the same traffic office.

When an operator logs on to a position, the operator profile is associated with the position type. The position type can be XFR1, XFR2, GEN, DA or any combination of these. The position assignments are modifiable only through a DMO request to change the datafill. Calls are transferred to transfer positions by keying **Opr** + digits (of the desired queue) + **Start**. The service type is changed to transfer 1 or XFR2 when the general operator presses **Opr** +1 (2 or 3) + **Start**.

A call is transferred only if the combined profile of the transferring operator does not contain the appropriate transfer type. For example, if operator 101 has a combined profile containing both GEN and XFR1, operator 101 must handle any general and XFR1 calls that arrive at that position. Operator 101 must transfer any calls that require XFR2 or DA assistance. In addition, a call cannot be transferred to an inactive queue.

Call transfer based on call type

The DMS switch can route specific call types directly to transfer positions when the datafill specifies that certain call types are to be routed to a transfer position type. During translations, a call is assigned a call-origination type. This feature can be used, for example, to route 411 calls directly to a specified transfer operator who is provided with the facilities required to provide directory assistance.

Call transfer based on the trunk group

Calls can also be routed directly to transfer positions based on the trunk group over which the calls arrive.

Position status checks

The position status checks are useful to the IC manager in meeting efficiency and speed-of-answer objectives and analyzing periods when these goals are consistently not met.

The IC position screen displays statistics concerning the number of occupied and made-busy general operator positions in the IC manager's team. Line 2 of the IC position screen displays the OCC statistics and has four numbers. The first number is a count of all general operator positions in the IC manager's team that are in an occupied state. The second, third, and fourth numbers are counts of general operators in the occupied state who can serve the XFR1, XFR2, and DA queues, respectively.

Line 3 of the IC screen displays the made-busy statistics. It has four numbers. The first number is a count of all general operator positions in the IC operator's team in the made-busy state. This count is independent of which queue each general operator serves. The second, third, and fourth numbers are counts of general operators in the made-busy state who can serve the XFR1, XFR2, and XFR DA queues, respectively.

ACD call distribution

This section applies only to offices that do not have Queue Management System (QMS).

In the automatic call distribution (ACD) system, the IC screen displays statistics on the number of occupied and made-busy general operator positions in the team. Line 2 of the IC screen displays the OCC statistics, and has four numbers. The first number is a count of all general operator positions in the IC operator's team that are in an occupied state. The second, third, and fourth numbers are counts of general operators in the occupied state who can serve the XFR1, XFR2, and DA queues, respectively.

TOPS MPX uses queues to manage calls requiring operator assistance. Two queues used for position management, and eight are used to distribute incoming calls.

Incoming calls are generally placed in queue and distributed on a FIFO basis and routed to any occupied but idle operator position.

The position management queues are referred to as idle position queues that allow TOPS MPX to route an incoming call to the most idle TOPS MPX operator position.

The eight queues are classified as calls-waiting (CW) queues and are broken down into the following four categories:

* general (GEN)

- transfer 1 (XFR1)
- transfer 2 (XFR2)
- directory assistance (XFR DA)

Each category has a recall (for reconnects) and a nonrecall queue.

> *Note:* There are no restrictions preventing the operating company from queuing non-DA calls in the DA queue or from queuing DA calls in non-DA queues (GEN, XFR1, or XFR2); provided that the queues are not dedicated. However, unless the office is strictly a DA-only office, FM statistics will be skewed.

Idle position queues

TOPS MPX maintains two queues associated with operator positions. These queues keep track of the positions that have a loop (loop1) available. In determining which position to connect the call with, TOPS MPX searches the queue for the most idle position and connects the call to that position. If there are no positions available, TOPS MPX places the call in one of the CW queues.

> *Note:* When connecting calls to positions, fully idle positions are considered first. For DA and intercept calls, there can only be one DA or intercept call at a position.

Calls-waiting queues

When the DMS switch detects a trunk seizure on a trunk carrying operator traffic, it searches the position idle queue for an idle operator position. When an available position is found, the DMS switch selects a three-port conference circuit and connects the call and operator position to that port. If no operator position is found, the DMS switch time-stamps the call and places it in the appropriate calls-waiting queue. When a call is placed in one of the calls-waiting queues, ringing is applied, and the call waits in the queue until an operator is available. Reconnects (calls that have already received operator service but require additional operator service) are handled before any other calls in the queue.

When an operator position becomes available, the DMS switch searches the CW queue and connects a call to the idle position in the following order of priority:

1 reconnects (oldest reconnect first)

2 nonreconnects (oldest call first)

Note: The separation of TOPS MPX positions into administrative entities (traffic offices), some or all of which may be remotely located from the base unit, does not affect this distribution of calls. The distribution of calls is modified under certain operating conditions.

When the call reaches an operator position, a call-arrival tone alerts the operator, and the call information is displayed on the operator position screen. The operator uses the information displayed, along with the information the subscriber provides, to process the call.

Once the connection between the incoming and outgoing trunks is made, the operator can either release the call or use **Split/Join** key. The split/join function is similar to the hold function in that the subscriber remains connected to the position but cannot hear the operator until **Split/Join** is pressed again to join the connection. The call remains at the position until the operator presses **Pos Rls**.

When the call is completed (both the calling and called parties go on-hook), the system generates an automatic message accounting (AMA) record for billing. A DA call is cleared when the operator releases the call to audio or presses **Pos Rls**.

Conditions that affect call distribution

System-returned calls (known as reconnects or recalls) are distributed on a FIFO basis before any initial position seizures (IPS) are distributed and thus facilitate operator recall at the prescribed time.

Calls-waiting queue servicing

This section applies only to offices that do not have the Queue Management System (QMS).

Calls-waiting queues

The calls-waiting (CW) queues in a TOPS office are divided into two priority levels, and all calls within a priority level are serviced on a FIFO basis.

The queues are as follows:

1   First priority – recall (or reconnect)

— general (GEN)

— transfer 1 (XFR1)

— transfer 2 (XFR2)

— transfer 3 (DA)

2   Second priority – nonrecall

— general (GEN)

— transfer 1 (XFR1)

— transfer 2 (XFR2)

— transfer 3 (XFR DA)

The recall (or reconnect) category consists of call types that have been previously connected to an operator but that require additional assistance. For example, a call transferred from an operator to a transfer operator is a transfer recall (reconnect). An operator-handled call in which the subscriber reconnected to an operator is a general recall (reconnect) if the call was not originally a transfer call.

Note: The terms nontransfer and general are frequently interchanged within TOPS MPX. They both mean that the operator receives general calls.

The nonrecall category consists of newly originated call service types that have not yet received operator assistance. This category includes calls requiring general operator assistance and calls routed directly to transfer 1, transfer 2, or transfer 3 operators.

When a call arrives at the TOPS MPX office and an operator is available to process the call, the call is connected directly to an available position. However, if the position is not available, the call is time-stamped and placed in one of the CW queues.

The DMS switch distributes calls evenly across all positions so that no one position is overburdened.

Each operator position, operator, and call has a service associated with it. Calls are stamped with a service type based on their call-origination type. The service types that the operator and position can handle are defined in datafill. The queue in which a call was placed does not determine its service type.

Calls waiting queue service types

Within the two priority levels, calls are separated into one of the following four categories:

- General (nontransfer). Calls that do not require any of the special capabilities supplied by the transfer 1, transfer 2, or transfer 3 operators are placed in the GEN portion of the CW queue.

- Transfer 1 (XFR1). Calls that require the special capabilities supplied by transfer 1 operators are placed in the XFR1 portion of the CW queue.

- Transfer 2 (XFR2). Calls that require the special capabilities supplied by transfer 2 operators are placed in the XFR2 portion of the CW queue.

- Transfer 3 (XFR DA). Calls that require the special capabilities supplied by transfer 3 operators are placed in the XFR DA portion of the CW queue.

     Note: There are no restrictions preventing the operating company from queuing non-DA calls in the DA queue or from queuing DA calls in non-DA queues (GEN, XFR1, or XFR2), provided that the queues are not dedicated. However, unless the office is strictly a DA-only office, FM statistics will be skewed.

Queueing calls

Calls that have already received operator service but require additional service are placed in one of the recall queues, depending on the transfer type of the call. When a new call arrives, it is placed in one of the non-recall queues (general, transfer 1, transfer 2, or transfer 3), also depending on the transfer type of the call.

Dequeueing calls

Within each priority level, calls are serviced on a FIFO basis, depending on the type of call the available operator can service. For example, when a position that can service all types of calls (GEN, XFR1, XFR2, XFR DA) becomes available, the DMS switch checks the recall queues to determine which call from which queue should be serviced first. If more than one recall queue contains a call, the DMS switch distributes the oldest call waiting in the recall queues.

When no recalls (reconnects) are queued, the DMS switch checks the nonrecall queues for a call to distribute to the idle position. If more than one nonrecall queue contains calls, the oldest call waiting in the nonrecall queues is serviced first.

Since not all positions provide all types of service, the DMS switch processes the oldest call within the recall queues that matches both the service type (GEN, XFR1, XFR2, or XFR DA) of an available position and the call types that the operator at that position can receive. After recalls are processed, the DMS switch processes the oldest call waiting in the nonrecall queue that matches both the service type (XFR1, XFR2, GEN, or XFR DA) of an available position and the call types that the operator can receive.

Calls-waiting queue thresholding

This section applies only to offices that do not have the Queue Management System (QMS).

If the call-arrival rate exceeds the operator capacity, calls accumulate in the CW queues. As the queue becomes filled, the amount of time an incoming call waits to obtain an operator increases. Queue thresholding provides a mechanism to limit this wait time to a maximum value for each transfer type. This is desirable, since a subscriber who has been waiting in the CW queue for a long period of time is likely to terminate the call and try again. When subscribers redial, their calls are placed at the end of the queue. TOPS MPX dynamically selects a maximum value for each transfer type. However, through commands at the TTY, a manager can manually select one of the six tables used to determine the queue threshold for a transfer type.

To implement queue thresholding, the amount of time a call remains in its queue before being attached to an operator must be estimated. The time a call spends in its CW queue depends on the average speed of answer for calls, the capacity of the operator work force to service calls of that transfer type, and how many calls have been queued ahead of the call.

The following factors determine the queuing threshold for a given queue:

- The average speed of answer (ANS) — This value is the average amount of time a call waits in the CW queue; it is assumed to remain constant. The most common values for ANS are 2.1, 3.5, and 5.0 seconds. Three sets of queue threshold tables based on these values have been developed. For a complete description of these tables, refer to the data schema section of the *Translations Guide*. Note that the CWOFF and CWON threshold values vary with the ANS objective; the DEFLECT threshold values, however, do not.

- The number of calls in the CW queue — The queued call counter is updated on a transactional basis to continuously reflect the actual number of calls waiting for position attachment. New calls placed in the queue increase the counter. Queued calls that are served decrease the counter.

- The number of occupied positions available to service calls — This value is obtained from the same scan program (in XCS) that accumulates FM measurements and is updated every 10 seconds.

- The average work time (AWT) — This value is the average amount of time it takes an operator to service a call. This value is calculated for each transfer type and is output as the AWT value in the FM output reports.

The operator capacity for each call-transfer type is determined by the number of positions available to service that transfer type and the amount of time it takes to service a call of that type.

The operator capacity is inversely proportional to the average work time (AWT). As the amount of time it takes operators to service calls decreases, the same number of operators are capable of servicing more calls (operator capacity). As the AWT increases, the operator capacity decreases.

The number of operator positions available to service calls also contributes to the operator capacity. The operator capacity is proportional to the number of positions. As the number of positions increases, the operator capacity increases. As the number of positions decreases, the operator capacity decreases.

As the operator capacity changes, there is a corresponding change in the number of calls that can be placed in the queue but still serviced within a specified time limit. To accommodate fluctuating operator capacity, TOPS MPX provides six data tables that are used to limit queue size. Recalls (reconnects) and 0– calls are never deflected.

Thresholding – calls deflect

Queue thresholding is designed to determine whether a new call can be added to a queue or must be deflected. This determination is based on the number of calls queued, the number of positions that can service that type of call, and how long it takes to service calls of that type.

When a call is queued, the following factors determine whether the call should be deflected or placed in the CW queue:

- The current AWT for the transfer type of the call is used as the index into table QTTIDX. The nontransfer AWT includes work-time contributions from general calls and general recalls (reconnects). The XFR1 AWT includes work time contributions from XFR1 calls and XFR1 recalls. The XFR2 AWT includes work time contributions from XFR2 calls and XFR2 recalls. The XFR DA AWT includes work time contributions from XFR DA calls and XFR DA recalls.

- The sum of all positions capable of handling that call type (regardless of whether the positions also handle other call types) is used as an index into the QT table to obtain the threshold values.

- The sum of the number of calls in the appropriate call and recall queues plus the call to be queued is compared to the deflect threshold to determine whether the call should be queued or deflected. If the call is deflected, the X0123 indicator is displayed at all administrative position screens.

Calls can also be deflected when an overflow condition happens and all queuing resources are in use.

Considerations for offices with combined transfer positions

In offices with positions that have combined transfer profiles, it could happen that an incoming call is placed in a CW queue when it should have been deflected. For this reason, it is advisable to limit the number of operators capable of handling more than one transfer type.

Assignable grade of service feature – artificial aging

TOPS MPX uses queues to segregate waiting calls. These queues are categorized into GEN, XFR1, XFR2, and XFR DA. When an operator becomes available, the DMS switch scans that operator's designated queues for a waiting call, starting with all recall queues and then all nonrecall queues. The call that has been waiting the longest in the recall queues is always selected first, regardless of queue type. If no calls are in the recall queues, the call that has been waiting the longest in the nonrecall queues is selected, regardless of queue type.

All TOPS MPX calls are stamped with the arrival time as soon as they appear at the DMS switch. If no operators are available, the call waits in one of the TOPS MPX queues. When an operator becomes available, the DMS switch examines the first call in each of the queues in that operator's transfer profile. The call-arrival time is subtracted from the current time to determine the age of each call, and the oldest call is sent to the operator first. As a call waits in queue, it grows older, or ages.

Each TOPS MPX queue is assigned a uniform aging factor. A weighted aging factor can be assigned in datafill to artificially age the calls in a queue.

> *Note:* Offices that use datafillable grade of service should not mix calls of different service types in the same queue. This practice would render artificial aging useless, because calls are aged based on queue, not on type of service.

TOPS call queue assignment with QMS

Adding QMS to a TOPS office expands the number of call queues available to 255 and improves the operating company's ability to segregate traffic across these call queues. Office datafill in a group of DMS tables makes it possible to exploit the expanded number of call queues available with QMS.

Call queue assignment happens in three phases:

1   TOPS uses one of two tables to derive an initial call type for queueing purposes.

2   TOPS uses a series of tables to sequentially refine the call type for queueing purposes associated with a call.

3   TOPS maps the call type for queueing purposes into the call queue and service values understood by the QMS call and agent manager (CAM) for final call queue assignment.

Phase 1: initial call type assignment

Because TOPS QMS can coexist with a non-QMS ACD system, the first step of call queue assignment is to determine whether this call should go to QMS at all. To allow for gradual transition to TOPS QMS, table TOPSTOPT lets operating companies turn on QMS on a trunk group basis. Specifying QMSCAM in the ACD field for a given trunk causes operator-handled calls arriving over that trunk to be handled by QMS. Specifying TOPSACD, or not datafilling a trunk at all in table TOPSTOPT, causes the operator-handled calls on that trunk to be handled as in non-QMS ACD.

Each call that arrives in a TOPS office is first checked against table TOPSTOPT to see whether it should go to QMS. If it is determined that the call is non-QMS, the initial call-origination type is determined from table TOPS, and the other three existing mechanisms for call queue assignment in non-QMS ACD are used. If the call is marked as QMS, the initial call type for queueing is derived from table QMSTOPS.

Table TOPS is used to derive call queue and class of service for traffic designated as non-QMS in table TOPSTOPT. Table TOPS provides only four queues for non-QMS calls in the TOPS environment. Table TOPS is a fixed table, meaning that it has a fixed number of tuples with fixed indexes. The only change to table TOPS made by this feature is to extend the number of spare call-origination types, effectively enlarging the table. This change increases the flexibility of QMS by providing a larger range of initial call types for queueing.

Operator-handled calls that have been marked for QMS in table TOPSTOPT encounter the first phase of call queue assignment in table QMSTOPS. Table QMSTOPS is indexed by the same range of call-origination types that are used as indexes to table TOPS. Therefore, table QMSTOPS is a fixed table, like table TOPS. Unlike table TOPS, however, table QMSTOPS does not map call-origination type directly to a call queue. Instead, for each call-origination type, table QMSTOPS provides a new call type for queueing. The tables in QMS call type for queueing refinement are all based on the range of call type for queueing values. The range of call type for queueing values is defined in table CT4QNAMS, which associates each external, symbolic name with an internal integer index. Table QMSTOPS is used to provide an initial call type for queueing value for each call. This

initial call type for queueing is the starting point for the second phase of call queue assignment: the refinement of call types for queueing.

Table QMSTOPS assigns initial call type for queueing values for each call-origination type. The range of allowable values for call types for queueing is defined in table CT4QNAMS, which allows an alphabetic name (a string range) to be associated with an internal integer value. An optional eight-character display for presentation to the operator may be datafilled against each call type for queueing. Existing TOPS call-origination displays continue to be provided in QMS TOPS, because of their indispensability for operator training. Redundant displays for call types for queueing might prove confusing for the operator, so it is recommended that only unique QMS-related displays be datafilled.

For more information about datafilling these tables, refer to *Translations Guide*.

Phase 2: refinement of call type for queueing

In phase 2, the call type for queueing assigned in phase 1 may be refined by successively comparing the characteristics of the call against datafillable queueing criteria. This refining phase allows the office to divide incoming traffic into separately manageable categories based on different call attributes, according to its office-specific criteria.

After passing through all the criteria of call type for queueing refinement, a given call may have had its call type for queueing changed several times, or it may still have its initial call type for queueing. In either case, the call type for queueing associated with the call at the completion of phase 2 of call queue assignment is the call type for queueing that determines the call queue and service to be assigned to the call in phase 3.

Each office using QMS may have a different mix of categories that are optimal for the traffic in that office, just as each office has different translations datafill for the traffic in that office. To allow for the expected variation in the ways different offices wish to use QMS, call type for queueing refinement is designed to be as flexible as possible. The order in which the tables are scanned, as well as the criteria applied, helps provide flexibility.

TOPS QMS provides the following criteria, each with its corresponding table:

- class of service (table CT4QCLAS)
- restricted billing index (table CT4QREST)
- inter-LATA carrier (table CT4QCAR)
- prefix call type (table CT4QPFXT)

- dialed digits (table CT4QCLD)

- originating location (table CT4QORIG)

- time of day (table CT4QTIME)

- partially automated service (table CT4QAUTO)

- language (table CT4QLANG)

The class-of-service criterion is used to modify the call type for queueing purposes by class of service information associated with the calling number. For example, a call may be designated as coin, hotel, station, or restricted. If this information is missing or incomplete, the call is designated as unknown class.

TOPS software provides for 100 different varieties of restricted telephones. Often these telephones require special treatment, which might involve a different queue. If a match is found in table CT4QREST, this table overrides any previous determination of call type for queueing.

Inter-LATA carrier processing can have a significant impact on call queueing. An operating company may choose to provide operator services on a per-carrier basis through a TOPS software package called TOPS inter-LATA carrier service (TICS). If TICS is in the office, this table allows all calls for a particular carrier to be routed to a particular call type for queueing, which may then map to a call queue number staffed by operators dedicated to the particular carrier.

The prefix dialing of a call is used as a criterion in table CT4QPFXT. This table allows the operating company to refine the call type for queueing by the prefix type of call: operator assisted (OA) or direct dialed (DD). This information is not available based upon dialed digits, because the prefix information is taken off at an end office. It is, however, available from signaling. This differentiation is useful when offices have positions with different capabilities. For example, a TOPS basic position can process a call dialed 1+555-1212, but it cannot process a call dialed 0+555-1212, because that requires alternate billing capabilities a TOPS basic position does not have. The operating company, therefore, might wish to route 1+555-1212 calls to a different queue from 0+555-1212 calls. Used in combination, tables CT4QPFXT and CXT4QCLAS can provide queue selection capabilities similar to those provided for TOPS ACD by table BPQUEUE.

QMS TOPS can also route traffic based on the dialed (or called) digits entered by the subscriber. Because the range of possible called digits is quite large, data store and run-time efficiency are potential problems. To provide maximum flexibility without sacrificing efficiency, a two-step process segregates calls by dialed digit. The first step associates groups of called digits with symbolic names in table TQCLDDIG. The symbolic

names are used as a criterion for traffic segregation in table CT4QCLD. An operating company might use the dialed digits criterion to streamline its work force by folding its business office functions into the operator service center. Or an operating company might prototype new services, such as weather forecasts, hotel and restaurant guide, or operator-assisted yellow pages, on the basis of the dialed number, routing these calls to a special team of operators.

The originating-location criterion of a call can be used to segregate traffic with table CT4QORIG. This table can be used to provide local knowledge operators for DA calls, by routing 411 calls that originate from particular areas to operators who are knowledgeable about those areas. Another use for this table is to route traffic from disabled subscribers to special groups of operators with the enhanced training or equipment needed to best serve these subscribers. This table can also be used to segregate traffic based on predominant language needs of different locations. If a group of dialing numbers or a trunk group is known to be populated by a group of subscribers who predominantly speak a given language, for example, this origination criterion may be used to select a call type for queueing staffed primarily by operators who speak that language. Just as with the dialed digits feature, TOPS uses a two-step process to provide maximum flexibility without sacrificing efficiency. The first step associates groups of originating digits with symbolic names, in a table called TQORGDIG. Then, once an originating location is determined for the call, table CT4QORIG is referenced. In the call-type-for-queueing field, this table matches old values against the criterion to yield new call-type-for-queueing values.

The time-of-day criterion allows for the dynamic segregation of traffic on the basis of time of day. A set of tables allows differently treated times of day to be specified for each day of the week and for holidays. When a call arrives, the current date and time are translated through these tables into a value. Table CT4QTIME allows any type of traffic to be diverted to a new call type for queueing based on the value determined upon call arrival. This feature can be used to consolidate several different types of traffic into a smaller number of call types for queueing at known low-traffic periods of the day or night, providing savings in staffing requirements for low traffic periods. For example, all coin and hotel traffic could be routed to a particular team at night, and the other teams could be staffed with operators not yet trained for coin or hotel. Used with host/remote networking by queue type, TOPS QMS expands the capabilities of operator centralization by allowing any type of traffic to be routed to other switches in the operator centralization network by any of the call type refinement criteria.

It might be advisable for an office to segregate traffic that has already received automated service. An example of a partially automated call is a calling card call that initially routes to Mechanized Calling Card Service (MCCS) or Automatic Calling Card Service (ACCS), but for which the

subscriber does not enter the calling card number. When this happens, TOPS tries to connect the call to an operator. Special groups of operators could be used to handle different types of partially automated calls. This segregation would allow the operating company to have a large group of operators who do not need to serve partially automated calls and thus do not require the special training for handling these calls. Table CT4QAUTO allows all the automated services TOPS provides [Automatic Coin Toll Service (ACTS), ACCS, MCCS, Automated Alternate Billing Service (AABS), and Automatic Directory Assistance Call Completion (ADACC)] to be used as a criterion for queueing.

Table TOPSLANG is used to define a language attribute for TOPS calls. A language value is assigned to a call either through operator keying action or by an automated service. Once a language is assigned to a call, it may be used as a criterion for queueing in table CT4QLANG. Since language is not assigned until the call has been to an operator or an automated service, this table is useful only for those two types of calls.

Phase 3: final call queue assignment

The refinement phase ends when the characteristics of the call have been applied to all the call-type-for-queueing tables in the appropriate order. The call type for queueing associated with the call following the call-type-for-queueing refinement phase may be the same as the initial call type assigned in phase 1, or it may have changed several times in phase 2. In either case, the refined call type is used in phase 3 as the basis for the assignment of the QMS queue number in table TQMSFCQA. The final call type for queueing is used as an index to this table, which returns a numeric value that can be identified by the CAM component of QMS.

An important consequence of converting a TOPS office to TOPS QMS is that the default (hardcoded) priorities associated with recalls in the non-QMS environment must be datafilled in TOPS QMS, through table TQMSFCQA. This table provides much greater flexibility over the handling of recall priorities, but it requires explicit specification for each potential type of recall.

Afterward, the call routes to an operator who serves that call queue. When that operator releases the call, it may recall to TOPS, requiring further operator assistance. For example, on a DA call a subscriber may remain off-hook following an automated recording unit announcement to return to a live operator. In the ACD system, calls that recall to the system are serviced before calls that have not yet been to an operator. In QMS, relative priorities are expressed on the basis of call queues, so a method is provided to allow recalls to route to different call queues. For traffic that recalls to the operator, once a recall has been refined by the call type for queueing tables, a different call queue may be associated with the final call type for queueing.

Note: TOPS QMS does not affect the queueing of assistance and in-charge positions. Queueing associated with assistance and IC positions remains unchanged.

Standalone TOPS MPX with QMS

The TOPS call-processing application performs five functions associated with queueing TOPS positions and calls:

- defining and undefining positions to the CAM

- making positions available and unavailable

- assigning a call queue to each call that arrives at TOPS

- requesting and canceling positions

When an operator logs in at a position, TOPS defines that position to the QMS CAM. Defining the position tells the CAM which call queues the position can serve while that operator is logged in. It also identifies the queue to which the position belongs when it is idle. TOPS call processing also undefines positions from the QMS CAM during operator logout. This tells the QMS CAM to cancel any data associated with the position.

TOPS call processing tells the QMS CAM whether a position is available or unavailable to accept calls. An available position becomes unavailable to serve calls when made busy by an operator using the **Make Busy** key, or when a call arrives at the position. An unavailable position becomes available when made available by an operator using the **Make Busy** key, or when an operator at the position releases a call.

Each call that arrives at TOPS is assigned to a call queue based on varying criteria specified by the operating company. When an operator position is required for a call, TOPS call processing asks the CAM for an operator position capable of serving the particular call queue assigned to the call.

TOPS call processing determines whether an operator position is required for a call. If a position is required, TOPS asks the CAM for a position capable of serving the call queue assigned to the call. TOPS call processing can also cancel a previous request for an operator. (This would occur if a calling party went on-hook while waiting for an operator.)

Operator profiles

TOPS QMS provides the ability to create call queue, controlled traffic, and service profiles for operators through the use of profile tables. Call queue profiles allow an operating company to specify the call queues an operator can serve by associating a particular call queue profile with an operator number.

Controlled traffic profiles allow an operating company to specify the types of calls an operator can serve. They are used mainly for operator training.

Service profiles allow an operating company to associate a list of service names with a service profile number. The service profiles are then associated with operators and positions to indicate their service-handling capabilities. During login and datafill, TOPS software checks to ensure that the service profiles match the equipment and operator profiles.

> *Note:* When an operating company adds operator IDs to accommodate QMS, it is crucial that the database vendor be given the correct updated lists of operator and position IDs, so that the vendor can assign permissions appropriately.

Senior operators

Using TOPS MPX with QMS allows an operating company to create a new class of operators called senior operators, who can assist other operators (even completing their calls) as their primary task and serve subscriber-initiated operator traffic as their secondary task. Unlike service assistants, senior operators can serve subscriber-initiated traffic and complete the calls to which they provide assistance. They cannot, however, monitor and page other operators as service assistants can. The following table summarizes the major differences between the capabilities of senior operators and those of service assistants.

Capabilities of senior operators versus service assistants

Capability	Senior operator	Service assistant
Use QMS queueing	Yes	No
Call completion for assistance calls	Yes	No
Serve non-assistant traffic	Yes	No
Receive directed calls	No	Yes
Paging capability	No	Yes
Monitor capability	No	Yes

Coexistence of TOPS ACD and QMS

Because QMS may need to be introduced into a traffic office gradually, it is designed to coexist with the ACD system. A gradual transition may be made from TOPS ACD to QMS on a position and trunk-group basis.

Datafill in table TOPSPOS specifies the type of queueing to be used by each position. Datafill in table TOPSTOPT specifies the type of queueing to be used by each trunk group. This allows for the gradual transition of operator positions from TOPS ACD to QMS, on a position-by-position and trunk-group by trunk-group basis.

Note: To be used in QMS, positions must be defined on a QMS team.

Host/remote networking by queue type renamed the datafill for TOPS ACD queues from GEN, XFR1, XFR2, and DA to CQ0, CQ1, CQ2, and CQ3. For offices where TOPS ACD and QMS coexist, the operating company must reserve the first four call queues (CQ0 through CQ3) for TOPS ACD. In this situation, TOPS QMS may use call queues beginning with CQ4.

Note: Routing to an alternate host is not without risk. It may cause an already overloaded network to be further overloaded by trying to route a call first to the primary host then to an alternate host, creating twice the work and messaging. The decision to route a call to an alternate host is generally a good one if the alternate host is available. However, if the alternate host is unavailable for some reason, twice the messaging is used for same result (a call routed to treatment). For example, using an alternate host would have adverse effects during a nationwide or region-wide traffic overload such as occurs during Christmas. In this case the extra messaging would serve only to further degrade performance on an already overloaded network.

TOPS MPX maintenance

This chapter provides a brief overview of TOPS MPX maintenance issues.

Maintainability

The TOPS MPX maintenance philosophy is to detect failures down to the replaceable unit. The TOPS MPX replaceable units for the terminal are the PS/2 base, including the appropriate cards, the keyboard, and the monitor. An operator at a failed terminal is expected to move to another working terminal in the operator service center. Maintenance personnel should then replace the failed unit. The central control (CC) supports audit procedures to detect terminal failures that occur during operation.

The initial release of TOPS MPX supports self-test of the terminal for power on. At power on, the TOPS MPX position runs a series of tests that include memory test, checksum verification of read-only memory, keyboard test, and checks that all configured plug-in cards are present.

TOPS MPX system maintenance

The maintenance of TOPS MPX from the MAP (maintenance and administration position) includes the ability to return to service (RTS), manual busy (MB), and test the TOPS MPX. All audits that attempt to recover positions are applicable.

Knowledge at the DMS MAP of the TOPS MPX components is limited to the TOPS MP and TPC, where TOPS MP is equivalent to the TOPS MPX operator position and TPC represents the virtual position controller (VPC) residing in the TOPS MPX DMS gateway position.

The TOPS MPX handling of return-to-service, busy, and test messages is as follows:

- Return-to-service — This message is sent by the DMS switch to the TOPS MPX position being returned to service. TOPS MPX takes the appropriate action to return the position to service and sends a positive response back to the DMS switch. If TOPS MPX cannot respond within a time-out period or sends a negative reply, the position fails to return to service. No reason for the failure is indicated at the MAP, only the fact that the return-to-service failed.

- Busy — This message is sent by the DMS switch to the TOPS MPX position being busied. TOPS MPX takes the appropriate action to make the position busy and sends a positive response back to the DMS switch. If TOPS MPX cannot respond within a time-out period or sends back a negative reply, the position is still made busy at the DMS switch.

- Test — This message is sent by the DMS switch to the TOPS MPX position being tested. The TOPS MPX position normally returns a positive reply. If the position fails to reply or returns a negative response, the test fails. No reason for the failure is indicated, only the fact that the test failed.

TOPS MPX terminal failures are automatically detected and reported using the DMS log system. Failures of the CC data links to TOPS MPX are also reported by the DMS. Failures of the IBM DAS data links are detected and reported by the IBM DAS maintenance reporting system.

TOPS position controller maintenance

TOPS position controller (TPC) maintenance and the TPC MP level are required, even though a physical TPC does not exist. TOPS MPX provides a VPC, associated with a cluster of one to four TOPS MPX positions, that is functionally equivalent to the TPC. The VPC software is resident in the TOPS MPX DMS gateway positions.

Note: IBM documents contain references to a teleprocessing controller (TPC), which is a different unit within the IBM DAS.

When receiving a TPC RTS or busy message, TOPS MPX, acting as the VPC, always replies with a positive message if it is able to respond. If the VPC cannot respond to an RTS message, the RTS fails with no reason reported. If the VPC does not respond to a busy message, the TPC still becomes busy at the MAP level.

Dial-up maintenance with the DMS MAP

The DMS MAP has dial-up maintenance capability with TOPS MPX. This capability is identical to the capability of TOPS MP. The MAP terminal can be remotely located with dial-up access to the DMS switch.

Audits

Audits that apply to the CC/DAS GTWY interface are provided as described in IBM DA Protocol and Simulator (AF1266). These audits are messages sent over the CC/DAS GTWY data links during periods of inactivity to ascertain that the data links are functional.

In addition, audits that normally run in the CC and apply to TOPS MP positions subtending the TMS are provided. These audits ensure application

level connectivity. Also, all audits that attempt to recover positions are applicable.

Audit procedures are employed by the CC and the TOPS MPX DMS gateway positions to detect terminal failures that occur during operation. Position failures are reported to the CC through unsolicited maintenance messages.

Error detection

Methods are provided for detecting errors in TMS/CC messaging, in data transmission, and in the CC software.

TMS/CC messaging

Data errors in TMS/CC messaging over the CC to TMS DS30 links are detected by existing XPM messaging software.

Data transmission

Data transmission errors are detected by the level 2 protocol functions. These functions are described in the CCITT X.25 1980 specification and the *Product Specification: TOPS MP TMS.*

CC software errors

CC processing errors are detected and generate a software error (SWERR) notification. All standard DMS logs are provided. For a description of standard logs, refer to the *Log Reports Reference Manual.*

Log reports

The following log report is introduced by the DMS CC TOPS MPX software:

- TIBM100: This log report informs the craftsperson that an error occurred in the messaging between DMS TOPS and the DAS.   Either the message was unexpected at that point in the call or there was corrupt data. An appropriate error condition is reported in the log to describe the problem that occurred. The following error codes are possible:

   — invalid message

   — invalid message direction

   — invalid message length

   — invalid call ID

   — inactive call ID

   — invalid destination ID

   — nil announcement

Alarms

Standard TOPS DMS alarms are provided. Office alarms are generated for reporting CC to DAS data-link failures. Alarm messages generated in the TOPS MP system and sent to the MP terminal are similarly generated in the TOPS MPX system and sent to the TOPS MPX terminal. These messages are used to produce audible alarms at the TOPS MPX position through the position loudspeaker.

For further information, refer to the following maintenance documents:

- *Alarm and Performance Monitoring Procedures*
- *Trouble Locating and Clearing Procedures*
- *Recovery Procedures*
- *Card Replacement Procedures*

Regulatory and user considerations

This chapter contains regulatory and user considerations pertinent to TOPS MPX.

Regulatory agency approvals

Various subsystems of the TOPS MPX have agency approvals as described in the following paragraphs.

Display monitor and terminal base unit

The TOPS MPX display monitor and terminal base unit shall be UL listed under the requirements of UL1950, "Standards for Safety for Information Technology Equipment Including Electrical Business Equipment," and CSA Certified under the requirements of CSA 22.2, #950 "Information Technology Equipment Including Electrical Business Equipment."

Real-time interface co-processor card

The FC 6401 X.25 real-time interface co-processor (RTIC) card shall be UL listed data processing equipment accessory under the requirements in the standard detailed above for the display monitor and terminal base unit.

Token-ring card

The FC 1133 token-ring card shall be UL listed data processing equipment accessory under the requirements in the standard detailed above for the display monitor and terminal base unit.

Digital telephony card

The digital telephony card shall meet the requirements for UL listing or CSA certification as outlined in the standard detailed above for the display monitor and terminal base unit.

Keyboard

The TOPS MPX keyboard shall meet the requirements as stated above for he display monitor and terminal base unit. UL component recognition and CSA component certification may be appropriate for the keyboard, provided there are no limitations (conditions of acceptability) regarding the enclosure, cable, or connectors. The entire keyboard product (keyboard, printed circuit

board, keycaps, cable, connectors, etc.) shall be included in the recognition/certification. The UL component recognition and CSA component certification shall be in accord with requirements in the standard detailed above for the display monitor and terminal base unit.

Data service unit

Northern Telecom recommends a standalone type UDS D56, or a GDC 56K or GDC 500N DSU equipped with type DB-25 and DDS pin configurations. The DSU shall meet the requirements as stated above for the display monitor and terminal base unit. Alternatively, the unit shall be UL listed under the requirements of UL1459, second edition "Telephone Equipment" and CSA certified under the requirements of CSA 22.2, #225, "Telephone Equipment."

Power strip

Power strips equipped with overvoltage protection shall be UL listed under the requirements of UL1449, "Transient Voltage Surge Suppressors," and CSA certified under the requirements of "Temporary Power Taps," consisting of requirements drawn from CSA 22.2, #8, "EMI Filters"; #21, "Cordsets and Power Supply Cords" and #42 "General Use Receptacles, Attachment Plugs, and Similar Wiring Devices." Power strips without transient voltage surge suppression shall be listed with the appropriate UL and CSA listing standards.

Wiring closet equipment

Equipment provided in the TOPS MPX wiring closet by Northern Telecom shall be UL listed under the requirements of UL1863, "Communications Circuit Accessories."

Regulatory and user requirements

TOPS MPX will meet relevant sections of the National Electrical Code requirements. This includes any ac, dc, inverter, and power equipment that may be required to power the TOPS MPX position. Also, TOPS MPX will be certified to meet the requirements described in the following paragraphs in this section.

Electrostatic discharge (ESD)

All TOPS MPX equipment will be tested at level 1 (2 kV), level 2 (4 kV), level 3 (8 kV), and level 4 (15 kV). Tests will be performed with both polarity (positive and negative) discharges. The required level of ESD tolerance is level 4 (15 kV). Tests will be performed per Bellcore TR-NWT-001089, *"Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Communications Equipment"* Issue 1, October 1991.

An additional Northern Telecom recommended objective is an ESD tolerance of greater than 20 kV for the keyboard, terminal handset, and cords (see NT Corporate Standard 1523.01).

Properly installed electrostatic discharge grounding (ESD) dissipative vinyl or carpet floor coverings are recommended for use in the TOPS MPX operator position area. An ESD ground mat at each TOPS MPX operator position can be used instead of an ESD dissipative floor. Ordinary floor wax should not be used on ESD dissipative vinyl flooring. Refer to the manufacturer recommendations for care of the flooring.

Only carpeting that is intended for ESD control and that meets American Association of Textiles, Chemists, and Colorists (AATCC) Test Method 134 without the use of antistatic sprays should be used in the operator area. Normal carpeting can cause excessive build-up of electrostatic charge. Antistatic carpet sprays are not dependable, need frequent replenishing, and can damage plastic surfaces and finishes of equipment in the operator area.

An ESD dissipative table top is recommended for use in locations historically conducive to ESD activity.

Electromagnetic considerations

TOPS MPX equipment will meet FCC Part 15, Subpart B, Class A requirements.

TOPS MPX equipment must function normally in the presence of a radio frequency (RF) energy field in the relevant frequency range with no unacceptable performance degradation. When placed in an RF screen room and exposed to an RF energy field of 5 V/m for a specific frequency range (10 kHz to 1 GHz), the equipment will continue to function normally in a field of 10 v/m. Refer to Bellcore Reference TR-EOP-000063 for more information on RF susceptibility.

Fire resistance

TOPS MPX equipment and associated products such as external polymeric materials will meet the requirements of Northern Telecom Standard 9001.12, Fire Resistance Central Office Products, with the exception that UL94HB plastic is not used.

All internal components in the system will meet the NT Corporate Standard 4118, Fire Test; 4119, Abnormal Test; and 4120, Operation Test.

TOPS MPX will contain printed wire boards that are UL recognized and meet UL94V-0. Flammability of outside coverings made of polymeric materials will be rated minimally UL94V-1.

All polymeric materials, whether OEM or NTI specified, will have a minimum oxygen index of 28% using the oxygen index method D-2863-77.

All air-handling systems (fans) internal to the system will be UL recognized and meet UL94V-0 requirements. Air filters used in or on products with respect to air-handling systems will be UL recognized (UL900 Class II) and meet a minimal flammability rating of UL94HF1.

Handling and transportation environment

All TOPS MPX equipment will comply with shock and vibration requirements as specified in NEBS Sections 4.4.1, 4.4.2, 4.4.3 of LSSGR Section 14.4.3. These requirements are applicable to equipment in the nonoperating condition during handling and transportation.

Seismic requirements

The TOPS MPX operator position is not required to meet any seismic requirements with regard to remaining operational. However, for safety considerations, the operator position when integrated with associated furniture should remain structurally intact under zone 4 seismic conditions.

Hazardous materials

The customer will be informed of all hazardous materials in the TOPS MPX equipment. Each component will be checked with the manufacturer to verify what hazardous materials are in the component. This information will be forwarded to the product safety engineer to be included in the "Technical Report on Hazardous Materials."

The hazardous materials are referenced in the following sources:

40 C.F.R. 190, Resource Conservation and Recovery Act
49 C.F.R. 702-792, Hazardous Materials Transportation Act
29 C.F.R. 1910, Occupational Safety and Health Act of 1970

List of terms

ABSBH

Average busy season busy hour

access tandem (AT)

An access tandem is a switching system that provides a traffic concentration and distribution function for interLATA traffic originating/terminating within a local access and transport area (LATA). The access tandem provides the InterLATA carrier with access to more than one end office within the LATA. The access tandem also acts as a toll tandem for IntraLATA traffic. The access tandem technical functions include AMA recording, routing, and call supervision.

active register

A register that stores peg and usage count data. Active registers are updated whenever new data is entered. The operational measurement data accumulated in an active register applies to a certain time period. Periodically, the contents of an active register is transferred to a holding register. After the transfer, the register is cleared so new data can be accumulated.

AMA

Automatic message accounting

ANI

Automatic number identification

ANIF

Automatic number identification fail

AOSS

Auxiliary Operator Services System

APT

Average processing time

ARU

Audio response unit

AT

Access tandem

audio response unit (ARU)

Output device that provides a spoken response to digital inquiries from a telephone or other device. The response is usually assembled by a computer from a prerecorded vocabulary of words.

automatic message accounting (AMA)

An automatic recording system that documents all the necessary billing data of a subscriber-dialed long distance calls.

automatic number identification (ANI)

The number identification of the calling station. This number is used for billing records generated by an interLATA/international carrier.

automatic number identification fail (ANIF)

ANI failure on a call occurs when the calling number is not identified or transmitted to the CAMA office; therefore, billing cannot be done for the call. The operator must manually obtain the calling number and key it in.

Auxiliary Operator Services System (AOSS)

A service-related system in which operators provide subscribers with such services as directory assistance (local and long distance) and call-intercept.

average busy season busy hour (ABSBH)

The three months, not necessarily consecutive, that have the highest traffic in the busy hour are termed the "busy season." The busy hour traffic level averaged across the busy season is termed the ABSBH load.

average processing time (APT)

The time required for the central processor to handle a particular type of call.

average work time (AWT)

The time in seconds required by a TOPS operator to handle an average call and perform other related duties.

AWT

Average work time

BLV

Busy line verification

branding

A feature that allows operating companies the option of connecting customer-definable announcements to DA or toll callers before placing them in a queue or connecting them to an available operator or automated operator system.

busy line verification (BLV)

Action through which a subscriber obtains operator assistance to determine whether a called line is in use or out of order.

CAC

Carrier access code

call and agent manager (CAM)

Module of QMS that stores call agent queues and queue priorities and allocates and manages the call and agent resources according to instructions from the call processing applications module of QMS.

CAM

Call and agent manager

carrier access code (CAC)

A set of three digits designating the InterLATA or international carrier that handles a call. These digits are also known as carrier identification digits.

CC

Central control

CCIS6

Common Channel Interoffice Signaling No. 6

CCITT

Consultative Committee on International Telegraphy and Telephony

CCS

Common Channel Signaling

CCS7

Common Channel Signaling No. 7

central control (CC)

Comprises the data processing functions of the DMS-100 Family, with the associated data store and program store.

central office

A switching office arranged for terminating subscriber lines and provided with switching equipment and trunks for establishing connections to and from other switching offices. Synonymous with Class 5 office; end office; local office.

central processing unit (CPU)

A hardware entity, located in the central control complex frame, that contains the central data processor for the DMS-100 Family system.

channel bank

A part of a carrier-multiplex terminal that performs the first step of modulation. It multiplexes a group of channels into a higher frequency band and, conversely, demultiplexes the higher frequency band into individual channels.

check digit

A number assigned to identify an operator to another operator or to an AMA call record.

CI

Command interpreter

class of service

The categorization of telephone subscribers according to the specific types of service extended. Telephone service distinctions include such items as rate difference between individual and party lines, flat rate and message rate, and restricted and extended area service.

CLLI

Common language location identifier

command interpreter (CI)

A support operating system component that functions as the main interface between machine and user. Its principal roles are as follows:

- to read lines entered by a terminal user
- to break each line into recognizable units
- to analyze the units
- to recognize command item-numbers on the input lines
- to invoke these commands

Common Channel Interoffice Signaling No. 6 (CCIS6)

A Common Channel Signaling system using analog trunks for the North American market. CCIS6 uses fixed length signaling messages.

Common Channel Signaling (CCS)

A signaling system in which a multiplicity of labeled messages may be transmitted over a single channel using time-division digital techniques.

Common Channel Signaling No. 7 (CCS7)

Digital, message-based, network signaling CCITT standard. It separates call signaling information from voice channels so that interoffice signaling is exchanged over a separate signaling link.

Common language location identifier (CLLI)

A standard identification method for trunk groups in the form:

aaaa bb xx yyyy

Where:

aaaa=City code

bb=Province/state code

xx=Trunk group identity

yyy=Trunk number

Consultative Committee on International Telegraphy and Telephony (CCITT)

Committee that is responsible for creating a series of recommendations for telephony service.

CPU

Central processing unit

D-channel handler (DCH)

A card in the TOPS Message Switch (TMS) that provides the interface for DS0 data communication channels. This card is also used in ISDN.

DA

Directory assistance

DAS

Directory Assistance System

data link

An ensemble of terminal installations and the interconnecting network operating in a particular mode that permits information to be exchanged between terminal installations. A bi-directional transmission path for data comprising two data channels in opposite directions which operate together at the same data rate.

DCH

> D-channel handler

DCM

> Digital carrier module

DDD

> Direct distance dialing

dial pulse (DP)

> Method of transmitting signaling information from a telephone set or trunk circuit. Dial pulses are generated by alternately opening and closing a a contact in the telephone through which the dc current flows. Contrast with dual-tone multifrequency dialing.

digital carrier module (DCM)

> A peripheral module, located in a digital carrier equipment frame, that provides speech and signaling interfaces between a DS30 network port and digital trunks. A DCM is provisioned with up to five line cards.

Digital Multiplex System (DMS)

> A central office switching system in which all external signals are converted to digital data and stored in assigned time slots. Switching is performed by reassigning the original time slots.

digital signal 1 (DS1)

> The 8-bit, 24-channel, 1.544 Mb/s digital signaling format as used in the DMS-100 Family. The DS1 is the North American standard for digital trunks. A closely specified bipolar pulse stream with a bit rate of 1.544 Mb/s. It is the standard signal used to interconnect Northern Telecom digital systems. The DS1 signal carries 24 information channels of 64 kbit/s each (DS-0s).

digital trunk controller (DTC)

> A peripheral module that interfaces DS30 links from the network with digital trunk circuits.

Digitone (DT)

> A service-related telephony feature that provides for the generation of address information from a telephone set in the form of dual-tone multifrequency signals by the manual pressing of non-locking buttons. Also known as dual-tone multifrequency dialing. Contrast with dial pulse. Digitone is a trademark of Northern Telecom Ltd.

direct distance dialing (DDD)

> A telephone exchange service that permits a subscriber to call a number outside his local area without operator assistance.

directory assistance (DA)
>DA is a service that allows a subscriber to ask an operator to look up information from a telephone listing database.

Directory Assistance System (DAS)
>A system that provides directory assistance information and information for intercept calls.

DMS
>Digital Multiplex System

DP
>Dial pulse

DS1
>Digital signal 1

DS30
>A 10-bit, 32-channel, 2.048 Mb/s speech-signaling and message-signaling link as used in the DMS-100 Family.

DT
>Digitone

DTC
>Digital trunk controller

DTMF
>Dual-tone multifrequency

dual-tone multifrequency (DTMF) signaling
>A signaling method employing set combinations of two specific voice-band frequencies, one of which is selected from a group of four low frequencies, and the other from a group of three of four relatively high frequencies.

EMPC
>Enhanced multi-protocol controller

end office (EO)
>A switching office arranged for terminating subscriber lines and provided with trunks for establishing connections to and from other switching offices.

enhanced multi-protocol controller (EMPC)

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

EO

End office

foreign exchange (FX)

A service by which a telephone or PBX is served by a distant central office (CO), rather than by the CO in the immediate geographical area.

FX

Foreign exchange

hardkeys

Keys that are not program defined.

HDBH

High day busy hour

high day busy hour (HDBH)

The one day among the same 10 days that has the highest traffic during the busy hour is designated the (annually recurring) "high day". The traffic level in the busy hour of the high day is termed the HDBH load. (There may be some other hour of the high day or another day of the year with a higher traffic level, but normally it would not be used in the engineering database.)

holding register

A register that contains data transferred from an active register to prevent skewing. Data is transferred from an active register to a holding register during periods controlled by office parameter OMXFR in Table OFCENG. After the transfer, the active register is cleared to begin new counts for the next period.

host office

In DMS, a central office equipped to control peripheral modules at remote sites. For TOPS, host refers to a DMS with operators connected to it. The host operators service traffic from remotes in addition to traffic on the host.

incoming start-to-dial delay (ISDD)
>The probability that an incoming trunk to a multifrequency receiver will experience a delay of more than three seconds before the receiver becomes available.

initial position seizures (IPS)
>A count of customer-oriented calls that reach operator positions. This count excludes position reseizures (for example, notify and coin overtime) and operator-originated calls (for example, subsequent attempts).

input/output controller (IOC)
>An equipment shelf that provides an interface between up to thirty-six input/output devices and the central message controller. The IOC contains a peripheral processor that independently performs local tasks, thus relieving the load on the central processing unit.

input/output device (IOD)
>A hardware device that interprets input and formats output for human users or remote computers.

INT
>Intercept service

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

intercept service (INT)
>A service where a call comes to an operator position when a subscriber dials an out-of-service number or a number that has recently been changed.

inter-LATA
>The term that describes telecommunication services, revenues, and functions that originate in one LATA and terminate either outside that LATA or inside another LATA.

inter-LATA carrier
>Any carrier that provides telecommunication services between a point inside a LATA and a point either outside that LATA or inside another LATA.

intra-LATA
>The term that describes telecommunications services, revenues, and functions that originate and terminate inside one LATA.

intra-LATA carrier
>An operating company or carrier that has regulatory approval to provide IntraLATA services.

INW
>Inward call

inward call (INW)
>A call between positions in a traffic office.

IOC
>Input/output controller

IOD
>Input/output device

IPS
>Initial position seizures

ISDD
>Incoming start-to-dial delay

ISDN
>Integrated Services Digital Network

ISDN signaling group
>Signaling protocols for communication between ISDN and host peripherals.

ISG
>ISDN signaling group

ISP
>ISDN signal preprocessor

LATA
>Local access and transport area

LGC
>Line group controller

line group controller (LGC)
>A peripheral module that interfaces DS30 links from the network to line concentrating modules.

line trunk controller (LTC)
>A peripheral module that is a combination of the line group controller and the digital trunk controller, and provides all of the services offered by both.

load sharing

Refers to the operating mode of duplicated units in the DMS-100 Family systems whereby the two units share processing operations. In the event of a failure in one of the units, the other can take over the entire load. Contrast with hot standby.

local access and transport area (LATA)

A geographical area, called an exchange or exchange area in the modified final judgement (MFJ), where an operating company offers telecommunication services. LATA is used in the United States only.

log system

Used by DMS software to record the occurrence of all significant events (for example, equipment failure) and then report the events to the operating company.

LTC

Line trunk controller

Maintenance and Administration Position (MAP)

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

maintenance-busy

An operator position that has been removed from service either automatically by the DMS, or by input command from the MAP or TAMI.

maintenance trunk module (MTM)

A peripheral module, located in a trunk module equipment frame, that is equipped with test and service circuit cards. The MTM contains special buses to accommodate test cards for maintenance purposes. It provides an interface between the DMS-100 Family digital network and digital or analog test and service circuits.

ManB

Manual busy

manual busy (ManB)

The state of trunk circuits which have been removed from service in such a manner. Contrast to manual busy.

MAP

Maintenance and Administration Position

MAU

 Multistation Access Units

mean time between failures (MTBF)

 Mean length of time between failures of equipment components

MF

 Multifrequency

MPC

 Multi-protocol controller

MTBF

 Mean time between failures

MTM

 Maintenance trunk module

multifrequency (MF)

 A method that makes use of pairs of standard tones to transmit signaling codes, digit pulsing, and coin-control signals.

multi-protocol controller (MPC)

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

multistation access units (MAU)

 Units that are cabled together to form a token ring LAN for the TOPS MPX. Each MAU provides connections for up to eight positions.

Northern Telecom publication (NTP)

 A document that contains descriptive information about the DMS-100 Family hardware and software modules, and performance oriented practices for testing and maintaining the system. NTP are supplied as part of the standard documentation package provided to an operating company.

NPA

 Numbering plan area

NTP

 Northern Telecom publication

numbering plan area (NPA)
Any of the designated geographical divisions of the U.S., Canada, Bermuda, Caribbean, Northwestern Mexico, and Hawaii within which no two telephones will have the same seven-digit number. Each NPA is assigned a unique three-digit area code. Also known as area code.

OA&M
Operation, administration, and maintenance

OC
Operator centralization

occupied position
An operator position is considered occupied if a headset is plugged into the headset jack and the position is in an operating mode.

OGT
Outgoing trunk

OM
Operational measurements

ONI
Operator number identification

operating company
The owner/operator of a DMS-100 Family switch.

operation, administration, and maintenance (OA&M)
Consists of all the tasks necessary for providing, maintaining, or modifying the services provided by a switching system. These tasks include provisioning of hardware, creation of service, verification of new service, and trouble recognition and clearance.

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

operator centralization (OC)
An extension of the operator services provided by TOPS. OC enables the operating company to handle traffic in several remote toll centers as though they were operator centers.

operator number identification (ONI)

The equipment used to bring an operator into the circuit to check the calling number when a subscriber has direct-dialed a long distance call that is to be charged on an itemized bill basis by CAMA equipment. Contrast with automatic number identification.

OTH

Other trunk

other trunk (OTH)

All trunks except dial pulse (DP), digitone (DT), multifrequency (MF), Integrated Services Digital Network (ISDN), Common Channel signaling No. 7 (CCS7), nailed up, foreign exchange (FX), and maintenance trunks.

outgoing trunk (OGT)

A trunk used for calls going out to a distant toll center.

PARS

Personal Audio Response System

peg count

Single measured events

peripheral module (PM)

A generic term referring to all hardware modules of the DMS-100 Family systems that provide interfaces with external line, trunk, or service facilities. PM contain peripheral processors which perform local routines, thus relieving the load on the central processing unit.

permanent virtual circuit (PVC)

A user facility that provides a permanent association between two units of data terminal equipment. The association is identical to the data transfer phase of a virtual call. No call setup or clearing procedure is necessary.

Personal Audio Response System (PARS)

A system that offers the ability for an operator to supply customized challenges/prompts, often in the operator's own voice, to a subscriber.

personal identification number (PIN)

A code number dialed by a customer to obtain access to a system, in particular to a least-cost routing service provided by a specialized common carrier.

PIN

Personal identification number

PM

Peripheral module

protocol

A strict procedure required to initiate and maintain communication. Protocols may exist at many levels in one network, such as link-by-link, end-to-end, and subscriber-to-switch.

PVC

Permanent virtual circuit

QMS

Queue Management System

queue

Customers waiting for attachment to operator positions.

queue length

The number of subscribers waiting at a given instant to be attached to an operator position.

Queue Management System (QMS)

A software package which provides enhanced capabilities for the management of call queues and agent queues.

queue threshold

The maximum number of calls in the call queue at one time.

RCC

Remote cluster controller

register

A storage device having a specified storage capacity such as a bit, a byte, or a computer word, and usually intended for a special purpose (OM register).

remote cluster controller (RCC)

A dual-shelf peripheral module that provides a master controller for all units at the remote switching center, and is in turn controlled by the host line trunk controller.

remote operator identification number (RONI)

The equipment used to bring a remote operator into the circuit to check the calling number when a subscriber has direct-dialed a long distance call that is to be charged on an itemized bill basis by CAMA equipment. Contrast with automatic number identification.

RONI

Remote operator identification number

SCCP

Signaling connection control point

signal processor (SP)

The interface between a master processor and the control circuits in the line-side of a line module. Through the SP, the line circuits, ringing multiplexers, programmable ringing generators, and the activity circuit are controlled, and their status reported.

signaling connection control point (SCCP)

A level of Common Channel Signaling No.7 (CCS7) layered protocol. It supports advanced services such as E800/SSP service and Automatic Calling Card Service. The main functions of the SCCP include the transfer of signaling units with or without the use of a logical signaling connection and the provisioning of flexible global title translations for different applications.

Signaling Transfer Point (STP)

A node in a Common Channel Signaling No. 7 (CCS7) network that routes messages between nodes. STPs transfer messages between incoming and outgoing signaling links, but with the exception of network management information, do not originate or terminate messages. STPs are deployed in pairs. If one STP fails, the mate takes over, ensuring that service continues without interruption.

softkeys

User-definable keys

Sonalert

A special tone generated by the administrative positions (not in the headset) that alerts supervisors of special situations that require immediate attention. Sonalert is a trademark of North American Capacitor Company.

SP

Signal processor

STP

Signaling transfer point

subscriber

The individual user of a telephone station set that is connected to a DMS-100 switch. Also known as end user.

SwAct

An activity switch from an active unit to the stand-by or inactive unit.

SysB

> System busy

System busy (SysB)

> The equipment state that occurs when the central control has removed
> equipment from normal service. Contrast with manual busy.

table editor (TE)

> In DMS, software that supports an improved set of table control functions at
> the user interface, using data dictionary, formatter, and table control.
> Operating company personnel can modify or add tuples to a table.

TAS

> Technical Assistance and Support

T&C

> Time and charges

TE

> Table editor

Technical Assistance and Support (TAS)

> Northern Telecom's technical services organization for customers in the
> United States. TAS handles all emergency and non-emergency support,
> technical queries not related to pricing and product availability, cutovers,
> and software updates (including patches).

teletypewriter (TTY)

> An electric typewriting device that generates a coded signal corresponding
> to each typed character. TTY also receives and converts coded signals into
> typewritten copy.

ten high day busy hour (10HDBH)

> Traffic data for the time consistent busy hour is processed all year to identify
> the 10 highest traffic days of the year. The 10-day average traffic level for
> the Time-Consistent (TC) busy hour is the 10HDBH load.

time and charges (T&C)

> A service provided by operators whereby the duration of and charges for a
> long distance call are quoted to a subscriber upon request.

time source generator (TSG)

> A digital clock timing source.

TMS

> TOPS message switch

TO

> Traffic office

toll and Assist

> The service through which an operator helps a subscriber complete a dialed toll call.

TOPS

> Traffic Operator Position System

TOPS closedown

> A feature used with operator centralization that redirects switch traffic between host and remote switches during light traffic hours to consolidate the traffic office personnel.

TOPS message switch (TMS)

> The TMS is an XPM which provides an interface (for voice and data) between the network and the positions.

TOPS MP

> Traffic Operator Position System Multi-Purpose

TOPS MPX

> Traffic Operator Position System MPX

TOPS recording unit (TRU)

> A software storage area designed to hold TOPS call data for use by the central control in the handling of these calls.

TOPS subtending node (TSN)

> A node that subtends the TOPS message switch (TMS). TOPS subtending nodes include the TPC and external databases (DA and ORDB).

traffic office (TO)

> A grouping of operator positions for which the DMS provides discrete administrative data.

Traffic Operator Position System (TOPS)

> A toll operator position consisting of a video display unit (VDU) and keyboard for monitoring call details and entering routing and billing information. TOPS is a trademark of Northern Telecom.

Traffic Operator Position System MPX (TOPS MPX)

> A dedicated DA position based on the IBM PS/2 personal computer with customized software, keyboard, and interface. The TOPS MPX connects to the DMS through the TMS.

Traffic Operator Position System Multi-Purpose (TOPS MP)
>A toll operator's position consisting of a controller, a video display, and a keyboard for monitoring call details and entering routing and billing information.

TRU
>TOPS recording unit

trunk busy
>A trunk circuit that has the maximum amount of traffic (all connections are being used).

TSG
>Time source generator

TSN
>TOPS subtending node

TTY
>Teletypewriter

tuple
>A row in a DMS table

universal tone receiver (UTR)
>A combined service that can perform the function of a Digitone Receiver for lines and a multifrequency (MF) receiver for trunks.

usage counts
>Sampled measurements (states) used to determine the degree of usage of switching hardware and software.

UTR
>Universal tone receiver

virtual position controller (VPC)
>A control unit that functions as a workstation-based microcomputer with networking capabilities.

VPC
>Virtual position controller

XMS-based peripheral module (XPM)
>The generic name for XMS peripherals, which use the Motorola 68000 microprocessor. XPM have two processors, the signaling processor and the master processor, in hot standby configuration.

XPM

XMS-based peripheral module

X.25

CCITT-defined, network layer protocol that is used in packet switching to establish, maintain, and clear virtual circuit connections between an ISDN terminal and a destination in the packet-switched network.

10HDBH

Ten high day busy hour

Index

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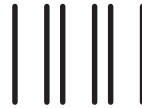
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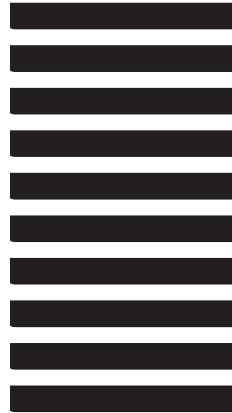Please fold along dotted lines and tape closed.

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Northern Telecom
P.O. Box 13010
RTP, NC 27709–3010
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